



UNITED STATES COAST GUARD

REPORT OF THE INVESTIGATION INTO THE

PIPELINE P00547 RUPTURE AND DISCHARGE OF OIL IN SAN PEDRO BAY APPROXIMATELY 4 MILES FROM HUNTINGTON BEACH, CA, ON OCTOBER 1, 2021



U.S. Department of
Homeland Security

United States
Coast Guard



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16732/IIA #7557355
23 December 2024

**ANCHOR STRIKE RESULTING IN A PIPELINE OIL SPILL FROM
FIXED PLATFORM ELLY IN SAN PEDRO BAY, CALIFORNIA
ON OCTOBER 1, 2021**

ACTION BY THE COMMANDANT

The record and the report of the investigation convened for the subject casualty have been reviewed. The record and the report, including the findings of fact, analysis, conclusions, and recommendations are approved subject to the following comments. This marine casualty investigation is closed.

ACTION ON RECOMMENDATIONS

Recommendation 1: In 2015, the Coastal and Marine Operators Pipeline Industry Initiative (CAMO) conducted a pilot program in which Automatic Identification System (AIS) was used to monitor vessel traffic over two pipelines in the Port Fourchon, LA area. The pilot program was funded by a grant from the Pipeline and Hazardous Materials Safety Administration (PHMSA). The monitoring program employed commercial AIS data to send an alert stating "PIPELINE BELOW" to the AIS receiver of any vessel which passed over one of the designated pipelines at 0.5-knots or less. If the vessel's Electronic Chart Display and Information System (ECDIS) or Automatic Radar Plotting Aid (ARPA) were configured for AIS input, an audible and visual alarm would be received on those devices as well. In addition to an alert on the vessel, the pipeline operator can also subscribe to receive a notification when an alert is triggered. It is recommended that the PHMSA and CAMO collaborate to fund and establish AIS pipeline monitoring programs in areas where there is a high concentration of subsea pipelines and commercial vessel traffic. The Coast Guard and Federal Communications Commission (FCC) should review and approve the monitoring programs.

Action: I concur with this recommendation. Expansion of the pilot program could help to prevent vessel related pipeline incidents in the future and a copy of this report will be sent to PHMSA and CAMO for their consideration. Coast Guard approval (and subsequent FCC licensing) of AIS monitoring-notification systems such as the one implemented for Port Fourchon, Louisiana may be sought through the Coast Guard Private Aids to Navigation Application process outlined in Title 33 Code of Federal Regulations (CFR) Part 66.01-5

It is important to clarify that AIS does not trigger alerts except for the reception of an AIS locating device's (e.g., AIS search and rescue transponder (SART), AIS man overboard (MOB), and emergency position indicating radio beacon (EPIRB)-AIS) broadcasts. The pilot program, referenced in this recommendation, monitored vessel AIS broadcasts and automatically sent AIS safety-related messages to any vessel that appeared to be anchoring (AIS Navigation Status change from underway or anchor) and/or dragging anchor (transiting 0.5 knots or less over the pipeline). Thus, vessels that were potentially

endangering the pipeline received a visual warning on their AIS and other AIS-enabled devices (e.g., radar, ECDIS).

Recommendation 2: Platform controllers failed to recognize the existence of a leak despite multiple warnings. Controllers incorrectly interpreted leak detection system data, attributing high lambdas and persistent alarms to higher-than-normal water content in the postproduction crude oil. To better inform and train its controllers, Amplify and its subsidiaries should update leak detection procedures and require additional leak detection training, to incorporate lessons learned from this event, for all personnel involved in platform or pipeline operations.

Action: I concur with the intent of this recommendation. A copy of this report will be sent to Amplify Energy Corporation and its subsidiaries for their consideration.

Recommendation 3: The platform staffing inadequacies on ELLY resulted in a fatigued crew. The crew may have exhibited better decision making had they been well rested. The Beta Unit encompasses platforms which exist in a dynamic environment. A high volume of commercial shipping traffic and the proximity of sensitive ocean and shoreline habitats make the Beta Unit a high risk and high consequence area for oil production. Given the circumstances under which oil is produced in the Beta Unit, Amplify and its subsidiaries should ensure that all platform workers can receive the Centers for Disease Control and Prevention (CDC) recommended minimum of 7 hours of uninterrupted sleep per day. Platform staffing levels should be increased to facilitate this standard with contingencies in place to account for illness, injury, or other unforeseen personnel shortfalls on all platforms forming the Beta Unit.

Action: I concur with the intent of this recommendation. A copy of this report will be sent to Amplify Energy Corporation and its subsidiaries for their consideration.

Recommendation 4: The federal anchorages outside the ports of Los Angeles and Long Beach are undersized and lack sufficient maneuvering room for modern, large cargo vessels. As of the date of this report, the Coast Guard is engaged in a campaign to restructure federal anchorages nationwide. It is recommended that the Coast Guard Commandant continue the effort to restructure federal anchorages in consultation with Coast Guard District Commanders and Captains of the Port to provide larger anchor watch circles and additional maneuvering room.

Action: I partially concur with this recommendation. The Coast Guard will continue monitoring and assessing the risks associated with anchorage grounds. Anchorage grounds will be modified, as needed, to mitigate risk in the marine transportation system and maintain the safety, security, and environment of the Nation's waterways.

Recommendation 5: In addition to providing position and operating information about a vessel, AIS can also be used to transmit messages. Maritime Automatic Identification Systems (AIS) station operation is governed by 47 CFR Part 80 and under normal circumstances Vessel Traffic Service (VTS) Los Angeles-Long Beach (LA-LB) is not permitted to operate a private coast station unless a waiver is granted by the Federal Communications Commission (FCC). Having the ability to transmit emergency messages would improve the safety of vessel traffic in VTS LA-LB's coverage zone. Emergency text messages could be broadcast quickly and would mitigate language barriers inherent in international shipping. In 2014, VTS LA-LB requested a waiver from the FCC to operate a private AIS coast station which was denied. It is recommended that VTS LA-LB renew their effort to obtain a waiver from the FCC and that the FCC grant a waiver based on the interest of public/environmental safety.

Action: I partially concur with this recommendation. The Coast Guard will pursue National Telecommunications and Information Administration (NTIA) authorization for government

personnel assigned to VTS LA-LB to operate currently owned AIS Base Stations in both receive and transmit mode. Additionally, as the NAIS network is recapitalized, the Coast Guard will integrate NAIS Base Station functionality into all VTS Operational requirements to enable transmission of safety related text messaging to users equipped to receive.

Recommendation 6: The Coast Guard Eleventh District recommends Beta Operating Co. LLC and other platform operators within the Pacific Outer Continental Shelf (OCS) Region to include Beacon West Energy Group, LLC., DCOR LLC., ExxonMobil Corporation, and Freeport-McMoRan Oil & Gas LLC monitor VHF channels 14 and 16. This investigation identified that 4 vessels reported seeing oil in the water via VHF channels 14, and 16 for an hour and forty five minutes preceding platform ELLY receiving its 3rd leak alarm and fourteen hours and 48 minutes before pipeline superintendent identified a visible oil sheen in the vicinity of the pipeline. Furthermore, various other callouts and conversations regarding potential oil in the water took place on VHF channel 14 during this time. There are no indications that platform or Beta Operating Co. LLC shoreside staff were monitoring VHF or marine traffic. Had platform or Beta Operating Co. LLC staff been monitoring VHF marine traffic, it is reasonable to assume they may have associated the various reports of sheening with the observed alarms on platform ELLY, informing subsequent decisions with regards to responding to ELLY's leak alarms. Although this would not have prevented the rupture, it could have minimized the volume of oil discharge and the resulting scope of damage.

Action: I concur with the intent of this recommendation. There are currently no relevant standards, laws, regulations, or Memorandums of Understanding that require the platform shoreside operators within the Pacific OCS region to stand a watch over VHF radio channels 14 and 16. The Coast Guard does not set the regulatory standards for platform workers on the OCS. However, the monitoring of VHF channels 14 and 16 by the ELLY platform workers may have expedited the response efforts and mitigated the environmental impacts from the oil spill in this instance. As such, a copy of this report and this recommendation will be forwarded to the Bureau of Safety and Environmental Enforcement for their consideration.



Wayne K. Arguin
Rear Admiral, U.S. Coast Guard
Assistant Commandant for Prevention Policy (CG-5P)



16732

DEC 08 2023

**PIPELINE P00547 RUPTURE AND DISCHARGE OF OIL IN SAN PEDRO BAY
APPROXIMATELY 4 MILES FROM HUNTINGTON BEACH, CA, ON OCTOBER 1,
2021**

ENDORSEMENT BY THE DISTRICT COMMANDER

The record and report of the investigation convened for the subject casualty have been reviewed. The record and report, including the findings of fact, analysis, conclusions, and recommendations are approved. It is recommended that this marine casualty investigation be closed.

COMMENTS ON THE REPORT

In addition to the Officer in Charge, Marine Inspection's (OCMI) safety recommendations below, the Coast Guard Eleventh District (District) proposes the following additional recommendations as a part of this investigation.

Safety Recommendation: 11479. District recommends Beta Operating Co. LLC and other platform operators within the Pacific OCS Region to include Beacon West Energy Group, LLC., DCOR LLC., ExxonMobil Corporation, and Freeport-McMoran Oil & Gas LLC monitor VHF channels 14 and 16. This investigation identified that 4 vessels reported seeing oil in the water via VHF channels 14, and 16 for an hour and forty five minutes preceding platform ELLY receiving its 3rd leak alarm and fourteen hours and 48 min before pipeline superintendent identified a visible oil sheen in the vicinity of the pipeline. Furthermore, various other callouts and conversations regarding potential oil in the water took place on VHF channel 14 during this time. There are no indications that platform or Beta Operating Co. LLC shoreside staff were monitoring VHF or marine traffic. Had platform or Beta Operating Co. LLC staff been monitoring VHF marine traffic, it is reasonable to assume they may have associated the various reports of sheening with the observed alarms on platform ELLY, informing subsequent decisions with regards to responding to ELLY's leak alarms. Although this would not have prevented the rupture, it could have minimized the volume of oil discharge and the resulting scope of damage.

ENDORSEMENT/ACTION ON RECOMMENDATIONS

Safety Recommendation: 11473 (Paragraph 8.1 of San Pedro Bay Oil Spill Investigating Officer's Report). In 2015, the Coastal and Marine Operators Pipeline Industry Initiative (CAMO) conducted a pilot program in which automatic identification system (AIS) was used to monitor vessel traffic over two pipelines in the Port Fourchon, LA area. The pilot program was funded by a grant from the Pipeline and Hazardous Materials Safety Administration (PHMSA). The monitoring program employed commercial AIS data to send an alert stating "PIPELINE BELOW" to the AIS receiver of any vessel which passed over one of the designated pipelines at 0.5-knots or less. If the vessel's Electronic Chart Display and Information System (ECDIS) or Automatic Radar Plotting Aid (ARPA) were configured for AIS input, an audible and visual alarm would be received on those devices as well. In addition to an alert on the vessel, the pipeline operator can also subscribe to receive a notification when an alert is triggered. It is recommended that the PHMSA and CAMO collaborate to fund and establish AIS pipeline monitoring programs in areas where there is a high concentration of subsea pipelines and commercial vessel traffic. The Coast Guard and Federal Communications Commission should review and approve the monitoring programs.

Endorsement: Concur. District concurs that a PHMSA and CAMO collaboration to establish pipeline monitoring programs in areas of concentrated subsea pipeline and commercial vessel traffic would greatly decrease future incidents such as the pipeline P00547 rupture.

Safety Recommendation: 11474 (Paragraph 8.2 of San Pedro Bay Oil Spill Investigating Officer's Report). Platform controllers failed to recognize the existence of a leak despite multiple warnings. Controllers incorrectly interpreted leak detection system data, attributing high lambdas and persistent alarms to higher-than-normal water content in the postproduction crude oil. To better inform and train its controllers, Amplify and its subsidiaries should update leak detection procedures and require additional leak detection training, to incorporate lessons learned from this event, for all personnel involved in platform or pipeline operations.

Endorsement: Concur. District agrees Amplify and its subsidiaries should update leak detection procedures and require additional leak detection training, to incorporate lessons learned from this event, for all personnel involved in platform or pipeline operations.

Safety Recommendation: 11475 (Paragraph 8.3 of San Pedro Bay Oil Spill Investigating Officer's Report). The platform staffing inadequacies on ELLY resulted in a fatigued crew. The crew may have exhibited better decision making had they been well rested. The Beta Unit encompasses platforms which exist in a dynamic environment. A high volume of commercial shipping traffic and the proximity of sensitive ocean and shoreline habitats make the Beta Unit a high risk and high consequence area for oil production. Given the circumstances under which oil is produced in the Beta Unit, Amplify and its subsidiaries should ensure that all platform workers can receive the Centers for Disease Control (CDC) recommended minimum of 7 hours of uninterrupted sleep per day. Platform staffing levels should be increased to facilitate this standard with contingencies in place to account for illness, injury, or other unforeseen personnel shortfalls on all platforms forming the Beta Unit.

Endorsement: Concur With Intent. District concurs with the OCMI that the Beta Unit, Amplify and its subsidiaries should ensure that all workers aboard their platforms are within appropriate work rest parameters to reduce the risk of crew fatigue related incidents. Offering a slight distinction to the OCMI's recommendation, District recommends that company, not platform, staffing levels be appropriately increased, so the company has the adequate bench strength to staff their platforms with appropriately rested controllers. District did not identify any reason to increase individual platform staffing models or require additional controllers to oversee platform operations.

Safety Recommendation: 11476 (Paragraph 8.4 of San Pedro Bay Oil Spill Investigating Officer's Report). The federal anchorages outside the ports of Los Angeles and Long Beach are undersized and lack sufficient maneuvering room for modern, large cargo vessels. As of the date of this report, the Coast Guard is engaged in a campaign to restructure federal anchorages nationwide. It is recommended that the Coast Guard Commandant continue the effort to restructure federal anchorages in consultation with Coast Guard District Commanders and Captains of the Port to provide larger anchor watch circles and additional maneuvering room.

Endorsement: Concur. District is currently working towards amending regulations for the Los Angeles and Long Beach harbors. This action would amend anchorages F and G to create more space between the center points of anchorages, more space between vessels at anchor to allow for maneuvering through the anchorage area and increase the distance of the anchorages from pipelines on the sea floor. These changes will better accommodate increased vessel sizes, promote navigational safety, and provide for the overall safe and efficient flow of vessel traffic and commerce. The proposed regulation will also require vessels greater than 1600 gross tons in anchorages F and G to place their propulsion plants in immediate standby and a second anchor, if installed, is made ready to let go when the forecasted and/or observed wind speed and gusts is 35 knots or greater, to prevent vessels from dragging anchor or allision.

Safety Recommendation: 11477 (Paragraph 8.5 of San Pedro Bay Oil Spill Investigating Officer's Report). In addition to providing position and operating information about a vessel, AIS can also be used to transmit messages. Maritime AIS station operation is governed by 47 CFR Part 80 and under normal circumstances Vessel Traffic Service (VTS) LA-LB is not permitted to operate a private coast station unless a waiver is granted by the Federal Communications Commission (FCC). Having the ability to transmit emergency messages would improve the safety of vessel traffic in VTS LA-LB's coverage zone. Emergency text messages could be broadcast quickly and would mitigate language barriers inherent in international shipping. In 2014, VTS LA-LB requested a waiver from the FCC to operate a private AIS coast station which was denied. It is recommended that VTS LA-LB renew their effort to obtain a waiver from the FCC and that the FCC grant a waiver based on the interest of public/environmental safety.

Endorsement: Concur. District further recommends that, in the absence of the FCC authorization recommended above, CG-NAV-3 moves to equip the existing Nationwide Automatic Identification System infrastructure with the transmit capability to allow Sector Command Centers and/or Vessel Traffic Services the ability to transmit emergency text messages to vessels via AIS.

Administrative Recommendation 1. Recommend this investigation be closed.

Endorsement: Concur. District agrees with the findings of fact, analysis, and conclusions of the Investigating Officer and the endorsement of the Officer in Charge, Marine Inspection. District recommends the marine casualty investigation be closed, however, further enforcement actions against the involved subjects should be explored.



A. M. SUGIMOTO
Rear Admiral, U.S. Coast Guard
Eleventh District Commander

U.S. Department of
Homeland Security

United States
Coast Guard



Commander
United States Coast Guard
Sector Los Angeles – Long Beach

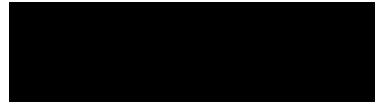
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16732
20 October 2023

**PIPELINE P00547 RUPTURE AND DISCHARGE OF OIL IN SAN PEDRO BAY
APPROXIMATELY 4 MILES FROM HUNTINGTON BEACH, CA,
ON OCTOBER 1, 2021**

ENDORSEMENT BY THE OFFICER IN CHARGE, MARINE INSPECTION

The record and the report of the investigation convened for the subject casualty have been reviewed. The record and the report, including the findings of fact, analysis, conclusions, and recommendations are approved. It is recommended that this marine casualty investigation be closed.



R. D. MANNING
Captain, U.S. Coast Guard
Officer in Charge, Marine Inspection

Enclosures: Investigating Officer's Report



UNITED STATES COAST GUARD

**REPORT OF THE INVESTIGATION
INTO THE**

**PIPELINE P00547 RUPTURE AND DISCHARGE
OF OIL IN SAN PEDRO BAY APPROXIMATELY 4
MILES FROM HUNTINGTON BEACH, CA,
ON OCTOBER 1, 2021**



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U.S. Department of
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16732
2 October 2023

**PIPELINE P00547 RUPTURE AND DISCHARGE OF OIL IN SAN PEDRO BAY
APPROXIMATELY 4 MILES FROM HUNTINGTON BEACH, CA,
ON OCTOBER 1, 2021**

INVESTIGATING OFFICER'S REPORT

Executive Summary

On October 1, 2021, a 16-inch diameter pipeline running from fixed platform ELLY in San Pedro Bay to Long Beach, CA, discharged an estimated 24,696 gallons of post-production crude oil into the Pacific Ocean off the Southern California coast. The pipeline breach was located approximately 4.7 miles offshore in 90 feet of water. The pipeline suffered a 21.4-inch longitudinal split that was 0.008 inches wide at the inner surface as measured by contract divers. At approximately 0907 PDT on October 2, 2021, Amplify Energy, the Responsible Party (RP), notified the National Response Center (NRC)¹ that the pipeline had failed. The initial discharge created a sheen approximately 100 yards wide by 2 miles long. Beta Offshore, a subsidiary of Amplify, sent a dive team to investigate the source of the leak. A remote-operated vehicle (ROV) survey conducted on October 4, 2021, revealed that a 4,025-foot section of pipeline, was laterally displaced up to 105 feet. Drag marks on the seafloor leading to the pipeline indicated that it had been struck by the anchor of a large commercial vessel. Following the oil spill, it was determined that two container vessels, MSC DANIT and BEIJING, drug their anchors over the pipeline and caused its displacement during a storm on January 25, 2021. The damage went undetected for approximately 8 months until the pipeline ruptured and began leaking oil on October 1, 2021. Crude oil was released from the pipeline rupture over a three-day period. Beta Offshore applied a repair consisting of a welded steel cap over the rupture to prevent further oil leakage. After application of the repair, the pipeline was flushed to remove residual oil. The damaged section of pipe was then cut and extracted from the seafloor on October 26, 2022.

As a result of its investigation, the Coast Guard determined that the initiating event for this casualty was the MSC DANIT and BEIJING dragging anchor and striking P00547 on January 25, 2021. This resulted in deformation and coating damage to P00547 which reduced its ability to withstand internal pressure and led to fatigue cracking. The fatigue cracking experienced by P00547 caused it to fail and discharge oil on October 1, 2021, at approximately 1610 PDT. The causal factors that

¹ The NRC is part of the federally established National Response System and is staffed 24 hours a day by the Coast Guard. It is the designated federal point of contact for reporting all oil, chemical, radiological, biological, and etiological discharges into the environment, anywhere in the United States and its territories. Reports to the NRC activate the National Contingency Plan and the federal government's response capabilities. It is the responsibility of the NRC staff to notify the pre-designated On-Scene Coordinator assigned to the area of the incident and to collect available information on the size and nature of the release, the facility or vessel involved, and the party(ies) responsible for the release.

contributed to this casualty include: (1) Failure of MSC DANIT and BEIJING to prepare for adverse weather conditions, (2) Insufficient maneuvering room in Anchorage F for the weather conditions experienced on January 25, 2021, (3) Inadequate heaving power of BEIJING's port anchor windlass, (4) Failure of MSC DANIT and BEIJING to avoid striking P00547, (5) Inability of the damaged P00547 pipeline to withstand alternating mechanical stresses and a high-pressure event on October 1, 2021, (6) Platform controllers' incorrect interpretation of leak detection system data, (7) Failure of platform controllers to properly respond to seven leak alarms, and (8) Operation of platform ELLY with an understaffed and fatigued crew.



Figure 1 Aerial photo of San Pedro Bay oil spill cleanup near Huntington Beach, CA

1. Preliminary Statement

Due to the involvement of a vessel and the quantity of oil discharged, the Coast Guard Assistant Commandant for Prevention Policy (CG-5P) designated the incident a Major Marine Casualty as defined by Title 46, United States Code (USC), Section 6101(i). Following this designation, a marine casualty investigation was conducted, and this report was submitted in accordance with Title 46, Code of Federal Regulations (CFR), Subpart 4.07, and under the authority of Title 46, USC, Chapter 63. The Coast Guard coordinated and led a multiagency team of federal investigators. The Coast Guard investigation team consisted of:

LCDR [REDACTED] Lead Investigating Officer

[REDACTED] Investigating Officer

LCDR [REDACTED] Investigating Officer

LT [REDACTED] Lead witness interviewer

LT [REDACTED] Lead evidence technician

The investigation was joined in the initial stage by LCDR [REDACTED] and Mr. [REDACTED] of the Coast Guard Investigations National Center of Expertise as assistant-advisors. Other federal investigators involved include:

[REDACTED] National Transportation Safety Board (NTSB)

[REDACTED] NTSB

██████████ Pipeline and Hazardous Materials Safety Administration (PHMSA)

██████████ Bureau of Safety and Environmental Enforcement (BSEE)

██████████ BSEE

The first task of the investigation team was to determine which vessel(s) was involved in the pipeline's displacement. An ROV survey conducted in May 2020, sixteen months prior to the October 1, 2021, oil spill, noted no displacement or significant damage to the pipeline. Investigators used this information to narrow the search for vessels of interest to those that were anchored near the pipeline sometime between May 2020 and October 2021. To identify vessels of interest, investigators conducted an anchor drag analysis using historical Automatic Identification System (AIS) data. Investigators also reviewed historical National Oceanographic and Atmospheric Administration (NOAA) weather buoy data and discovered a significant heavy weather event in San Pedro Bay on January 25, 2021, where winds up to 45 mph were recorded. Coincident with that heavy weather event, the CMA CGM NEW JERSEY (IMO No. 9351141) and EVER FRONT (IMO No. 9850549) anchored in the Huntington Beach Anchorage drug anchor and collided with one another at approximately 0425 that morning. Because of the CMA CGM NEW JERSEY and EVER FRONT collision, audio and video playback of the maritime surveillance system used by VTS LA-LB was preserved. Investigators used that playback to review the activity of vessels anchored near the pipeline, nearly seven miles away from the site of the Huntington Beach anchorage collision. The audio and video playback revealed two large containerships, MSC DANIT (IMO No. 9404649) and BEIJING (IMO No. 9308508), appearing to drag anchor over pipeline P00547 on the morning of January 25, 2021. Neither vessel documented a possible pipeline strike in their logbooks and no notifications were made by either vessel to the Coast Guard or VTS LA-LB regarding a possible pipeline strike on January 25, 2021. MSC DANIT and BEIJING are large international seagoing containerships that were on a liner service between the U.S. West Coast and the Far East at the time of the incident and subsequent investigation. By the time investigators were able board the two vessels to conduct interviews and collect evidence related to the October 1, 2021, oil spill, most of the crew that was onboard each vessel during the heavy weather event on January 25, 2021, had changed over due to routine crew transfers. The only individuals involved in anchoring or ship handling on January 25, 2021, that were available for interview were the second officer and electro-technical officer (ETO) on BEIJING and the deck cadet on MSC DANIT. Because of this, investigators relied heavily on written or recorded accounts of the heavy weather event in San Pedro Bay on January 25, 2021.

The oil platforms involved in this casualty are considered fixed outer continental shelf (OCS) facilities since they are bottom-founded and permanently attached to the seabed. The Outer Continental Shelf Lands Act (OCSLA), Title 43, USC, Chapter 29, Subchapter III, provides regulatory authority over activities on the OCS to multiple federal agencies, including the Secretary of the Interior, Secretary of the Army, Secretary of Labor, Secretary of Transportation, Secretary of Energy, and the secretary of the department in which the Coast Guard is operating. The Secretary of the Interior and the Coast Guard (which received a delegation from the Secretary of Homeland Security) are responsible for requiring, wherever practicable, the best available and safest technologies that are economically feasible, wherever failure of equipment would have a significant effect on safety, health, or the environment.² The Coast Guard also promulgates

² 43 USC §§ 1331 et seq. and its implementing regulations, 30 C.F.R. part 250

regulations or standards applying to hazardous working conditions related to activities on the OCS when such regulations or standards are necessary. OCSLA specifically requires the Secretary of the Interior and the Coast Guard to individually or jointly enforce these safety and environmental regulations at least once a year. Such enforcement should include inspecting all safety equipment designed to prevent or ameliorate blowouts, fires, spillages, or other major accidents, and performing a periodic onsite inspection without advance notice to the operator. To meet these requirements, the Coast Guard and BSEE signed a memorandum of understanding (MOU) to delineate inspection authorities between both agencies. The MOU is further broken down into eight memoranda of agreement (MOA). MOA OCS-09 deals specifically with fixed OCS facilities and served as a guide for BSEE and the Coast Guard to jointly conduct regulatory oversight of platforms ELLY, ELLEN, and EUREKA.

P00547 is a subsea OCS pipeline that transports postproduction crude oil which is classified as a hazardous liquid. BSEE and PHMSA are responsible for exercising regulatory authority with respect to federal natural gas and hazardous liquid pipelines located on the OCS. The California State Fire Marshal (CSFM) has regulatory authority (60105(a) Certification) over the portion of the pipeline that is in state waters. Additionally, they are an interstate agent for the PHMSA and as such have limited regulatory authority over the pipeline in state waters. They have been given authority (through a 60106(a) Agreement) to inspect the federal portions of the pipeline but have no enforcement ability. A 60105(a) Certification and 60106(a) Agreement was granted to the CSFM's office. P00547 is subject to OCSLA and the Pipeline Safety Act.

1.1. Parties-in-Interest

The Lead Investigating Officer designated the following organizations as parties-in-interest;

Party	Affiliation	Role
Mediterranean Shipping Company, S.A. (MSC)	MSC DANIT	Operator
Dordellas Finance Corporation	MSC DANIT	Owner
V. Ships Greece Ltd.	BEIJING	Operator
Capetanissa Maritime Corporation of Liberia	BEIJING	Owner
Amplify Energy Corp. (Amplify)	Platform ELLY and Pipeline P00547	Owner of Beta Offshore and San Pedro Bay Pipeline Co.
Beta Operating Co. LLC (Beta Offshore)	Platform ELLY	A wholly owned subsidiary of Amplify - Operator of Platform ELLY
San Pedro Bay Pipeline Co.	Pipeline P00547	A wholly owned subsidiary of Amplify - Operator of Pipeline P00547

Table 1 Parties-in-interest

1.2. Additional Parties

Additional organizations involved in the investigation, but not designated as parties-in-interest;

Party	Role
Vessel Traffic Service Los Angeles – Long Beach (VTS LA-LB)	A non-profit organization staffed by non-federal civilian employees and active-duty Coast Guard members which operates as a Vessel Movement Reporting System (VMRS) as defined by 33 CFR 161.2

Table 2 Additional parties

1.3. Investigation Procedure

The Coast Guard was designated as the lead federal agency for the investigation due to the involvement of a commercial vessel. The Coast Guard and NTSB conducted comprehensive investigations of the anchor dragging events on January 25, 2021 and subsequent oil spill on October 1, 2021. The USCG and NTSB worked separately during the analysis phase of their respective investigations in order to prepare independent conclusions and recommendations.

1.4. Conventions Used in this Report

References to time in this report are approximate unless stated otherwise. Times reflect Pacific Standard Time (UTC -8) for events occurring on January 25, 2021, and Pacific Daylight Time (UTC -7) for events occurring on October 1-2, 2021, and are listed as 24-hour format. All VHF transmissions referenced in this report occurred over channel 14 unless otherwise stated.

2. Involved Subjects

2.1. MSC DANIT



Figure 2 Undated Photograph of MSC DANIT provided by ship-photo-roster.com

Official Name:	MSC DANIT
IMO Number:	9404649
Flag:	Panama
Vessel Class/Type/Sub-Type	Container Ship
Classification Society	DNV
Build Year:	2009
Gross Tonnage:	153,092 Gross Tons
Length:	1199.1 feet
Beam/Width:	168 feet
Draft/Depth:	52.6 feet
Main/Primary Propulsion:	Direct Drive, Slow Speed Diesel, 61,031 hp
Owner:	Dordellas Finance Corporation Panama
Operator:	Mediterranean Shipping Company, S.A. Geneva, Switzerland

Table 3 MSC DANIT particulars

2.2. BEIJING



Figure 3 Undated Photograph of BEIJING provided by commons.wikimedia.org

Official Name:	BEIJING
IMO Number:	9308508
Flag:	Malta
Vessel Class/Type/Sub-Type	Container Ship
Classification Society	DNV
Build Year:	2006
Gross Tonnage:	109149 Gross Tons
Length:	1150.1 feet
Beam/Width:	141.1 feet
Draft/Depth:	49.3 feet
Main/Primary Propulsion:	Direct Drive, Slow Speed Diesel, 101,640 hp
Owner:	Capetanissa Maritime Corporation Liberia
Operator:	V. Ships Greece Ltd Piraeus, Greece

Table 4 BEIJING particulars

2.3. Platforms ELLY, ELLEN, and EUREKA



Figure 4 September 2022 photograph of platforms ELLY (right) and ELLEN (left)



Figure 5 September 2022 photograph of platform EUREKA

Platform Type:	ELLY: Processing Facility ELLEN: Production EUREKA: Production
Build Year:	1980 (ELLY and ELLEN) 1984 (EUREKA)
Depth of Water:	265 feet (ELLY and ELLEN) 700 feet (EUREKA)
Cumulative Oil Production:	ELLEN: 49,357,000 barrels EUREKA: 44,860,000
Cumulative Gas Production:	16,501,000 Mcf (ELLEN) 10,162,000 Mcf (EUREKA)
Owner:	Amplify Energy Corporation
Operator:	Beta Operating Co. LLC
BOEM Lease:	OCS-P 0300 (ELLY and ELLEN) OCS-P 0301 (EUREKA)

Table 5 Particulars of fixed platforms on the Beta Unit

2.4. Development of tract 35-261, (Beta Unit)

Platform Placement and Construction - In December 1975, the mineral rights for tract 35-261, known as the Beta Unit, were sold to the following entities³:

Shell Oil Company

Oxy Petroleum, Inc.

American Independent Oil Company

Hamilton Brothers Oil Company

Chanslor-Western Oil and Development Company

Four fixed OCS platforms would eventually become part of the Beta Unit development. Platforms ELLY and ELLEN were completed in 1980. EDITH and EUREKA, two additional production platforms, were completed in 1984. Platform ELLY serves as a processing platform and is connected via a fixed walkway to ELLEN. A 16" concrete coated pipeline runs from ELLY to shore. The pipeline, known as P00547, makes landfall in Long Beach near Pier H. Prior to development of the Beta Unit, Shell Oil Company submitted a Plan for Development. Permitting for the Beta Unit was overseen by the U.S. Geological Survey with the California State Lands Commission and Port of Long Beach serving as co-leads. Shell Oil Company's Plan for Development was used as the basis for an Environmental Impact Report-Environmental Assessment (EIR-EA). The EIR-EA, which was required by the National Environmental Policy Act and the California Environmental Quality Act, outlined potential impacts to and from development of the Beta Unit. The EIR-EA evaluated the following categories of major environmental impacts:

Air quality

Oil spills and associated impacts

Marine traffic

Energy supply/demand

Oceanographic/water quality

Geotechnical factors

Marine biology

Cultural resources.

³ Bureau of Land Management lease sale document for OCS-P 0300

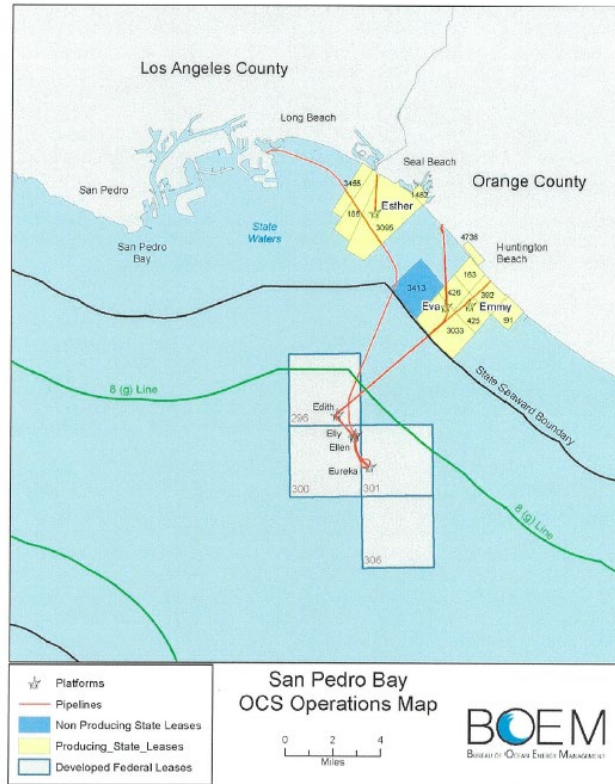


Figure 6 San Pedro Bay OCS Operations Map. BOEM, May 24, 2016, provided by BOEM

Pipeline P00547 placement and construction – The primary means of transporting post-production crude oil from the Beta Unit to shore is a 16-inch outer diameter pipeline. The specification for the pipeline outlined in the EIR-EA called for a seamless or double submerged arc-welded steel pipe with a 0.5-inch wall thickness. Inside the steel pipe would be a 0.156-inch corrosion coating. A 1-inch-thick concrete coating around the entire circumference of the pipeline was used to weigh it down and a 0.5-inch protective lining was installed between the steel pipe and concrete coating. The resulting submerged weight in seawater was approximately 46-lbs/ft when empty and 188-lbs/ft when full of crude oil. Because of this, the pipeline would not need to be buried to keep it from floating when empty. The pipeline had a maximum operating pressure (MOP) of 1,152 psig (pounds per square inch – gauge) but was normally operated in the range of 300-600 psig. Prior to the construction of pipeline P00547, the Coast Guard had proposed the creation of federal anchorage F outside the breakwater. The EIR-EA noted that the P00547 would be unburied but routed around the newly proposed anchorage. Since it was economically and logistically unfeasible to route P00547 around all the anchorages inside the breakwater, that section of the pipeline was buried to a depth of four feet to minimize the possibility of an anchor strike. As built drawings from Shell dated May 1980 were used to chart the pipeline.⁴

⁴ Beta Unit EIR-EA Volume I pp. 56-57

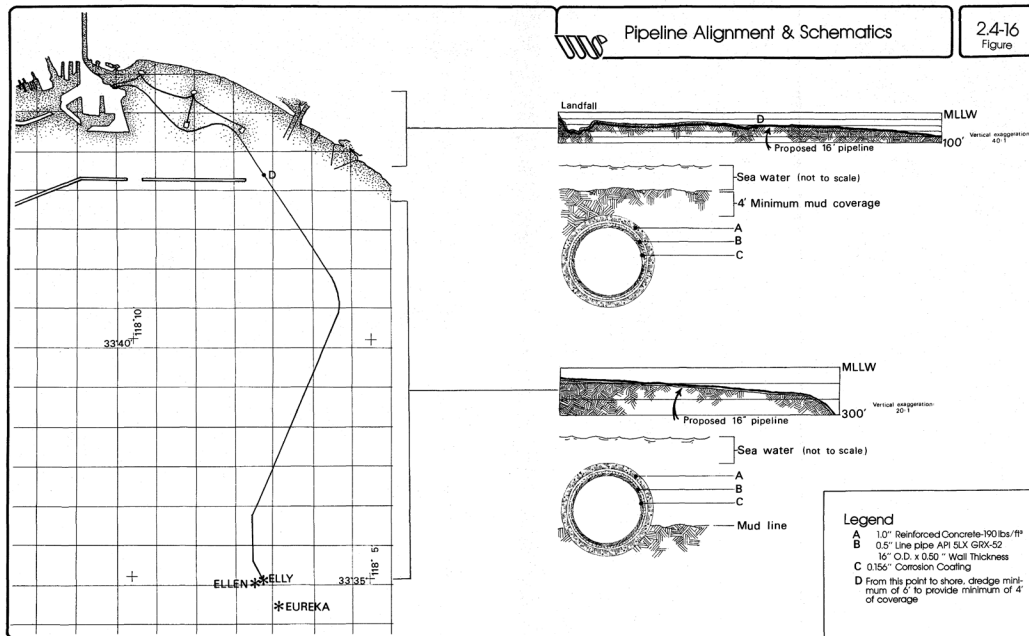


Figure 7 Pipeline Alignment and Schematics from Beta Unit EIR-EA

2.5. Vessel Traffic Service Los Angeles – Long Beach (VTS LA-LB)



Figure 8 Undated Photograph of VTS LA-LB provided by the Marine Exchange of Southern California

VTS LA-LB is a partnership between the Marine Exchange of Southern California (Marine Exchange), a non-profit organization staffed by non-federal civilian employees, and the Coast Guard. It operates as a Vessel Movement Reporting System (VMRS) as defined by 33 CFR 161.2. The goal of VTS LA-LB is to provide navigational information and facilitate the safe, efficient, and reliable transit of vessel traffic within a 25 nautical mile (NM) radius seaward of Point Fermin to berth or anchorage. Within the VTS LA-LB area of responsibility, there are three vessel traffic centers (VTCs), identified in Table 6 below. Each VTC is staffed with a watch stander that monitors and reports traffic information within their sector and coordinates traffic movements across sector boundaries. The Sector Commander of Coast Guard Sector LA-LB authorized VTS

LA-LB to exercise Captain of the Port (COTP) authorities in a limited number of circumstances as outlined in Sector LA-LB memo 150-20.

Sector	Sector Description	VTC Location	VHF-FM Channel	VTC Voice Call
The San Pedro Sector	25 NM seaward of Point Fermin	Marine Exchange	14	“San Pedro Traffic”
The Los Angeles Sector	The area inside the federal breakwater encompassing the port of Los Angeles	Los Angeles Harbor Pilot Station	73	“LA Pilot Station”
The Long Beach Sector	The area inside the federal breakwater encompassing the port of Long Beach	Jacobsen Pilot Station	12	“Long Beach Pilot Station”

Table 6 VTCs of VTS LA-LB from the Harbor Safety Plan for the Port of Los Angeles and Long Beach

3. Deceased, Missing, and/or Injured Persons

3.1. None

4. Findings of Fact

4.1. The Incident: January 2021

January 18, 2021

0615: MSC DANIT was assigned anchorage SF-3 by VTS LA-LB. The vessel’s port anchor was let go at 0615 with seven shots⁵ of anchor chain in the water.⁶

January 23, 2021

2348: BEIJING was assigned anchorage SF-12 by VTS LA-LB. The vessel’s port anchor was walked down to the seafloor with six shots of anchor chain in the water.^{7, 8}

⁵ One shot of anchor chain is equal to 90 feet.

⁶ MSC DANIT Bell Book

⁷ BEIJING master’s Statement of Facts, January 25, 2021

⁸ BEIJING Bell Book

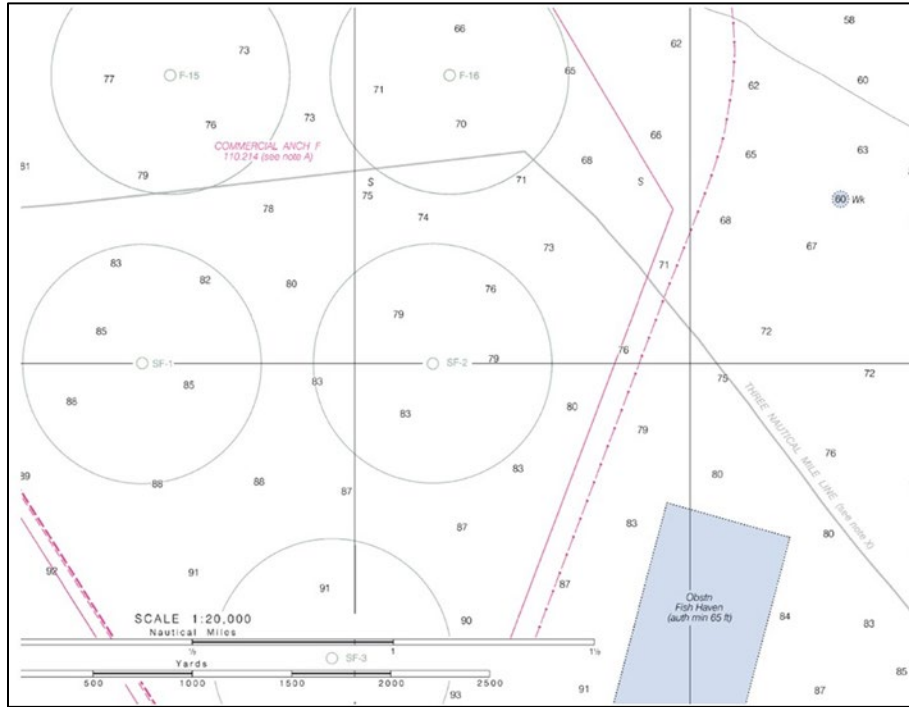


Figure 9 Excerpt from NOAA chart 18749 depicting the Southern corner of anchorage F (note: anchorage SF-12 is a designated contingency anchorage and is located to the southwest of SF-3. It does not appear on a nautical chart.)

January 24, 2021

San Pedro Bay Weather and Waterway Conditions: The National Weather Service issued a gale warning and small craft advisory for the Southern California coast via Navigational Telex (Navtex). Wind gusts up to 57 mph and seas up to 13 feet were forecasted for inner waters from Point Mugu to San Mateo Point.

January 25, 2021

0200: VTS LA-LB commenced hourly VHF broadcasts advising vessels to expect high winds. In the broadcast, the VTS LA-LB advised vessels of the requirement in 33 CFR 110.214(a)(3)(ii) to ensure their propulsion plant was placed in immediate standby and to make a second anchor ready for letting go.⁹

0300 – 0600: watch standers at VTS LA-LB received audible and visual anchor drag alarms¹⁰ for eleven different vessels. For each vessel that received an anchor drag alarm, a watch stander would attempt to hail the vessel via VHF and advise them to check the anchor, put the main engine on

⁹ VTS LA-LB Incident report for CMA CGM NEW JERSEY and EVER FRONT collision on January 25, 2021

¹⁰ VTS LA-LB assigns an anchor watch circle to all vessels anchored in the VTS LA-LB AOR using a Kongsburg Norcontrol maritime surveillance system. The anchor watch circle for each vessel is a radius assigned based on its length overall. If the center point of the vessel (AIS transponder) passes outside the assigned radius, an audible alarm will sound indicating a vessel is potentially dragging anchor. Additionally, the AIS symbol for the vessel will highlight in red on the display screen indicating an anchor watch alarm has triggered for that vessel.

standby and make a second anchor ready for letting go when wind speeds are gusting up to 46 mph or more.¹¹

0315: MSC OLIVER and ARISTARCHOS are anchored to the north of MSC DANIT. HONG KONG SPIRIT is anchored to the west of MSC DANIT and northwest of BEIJING. CMA CGM MEXICO is anchored to the west of BEIJING.

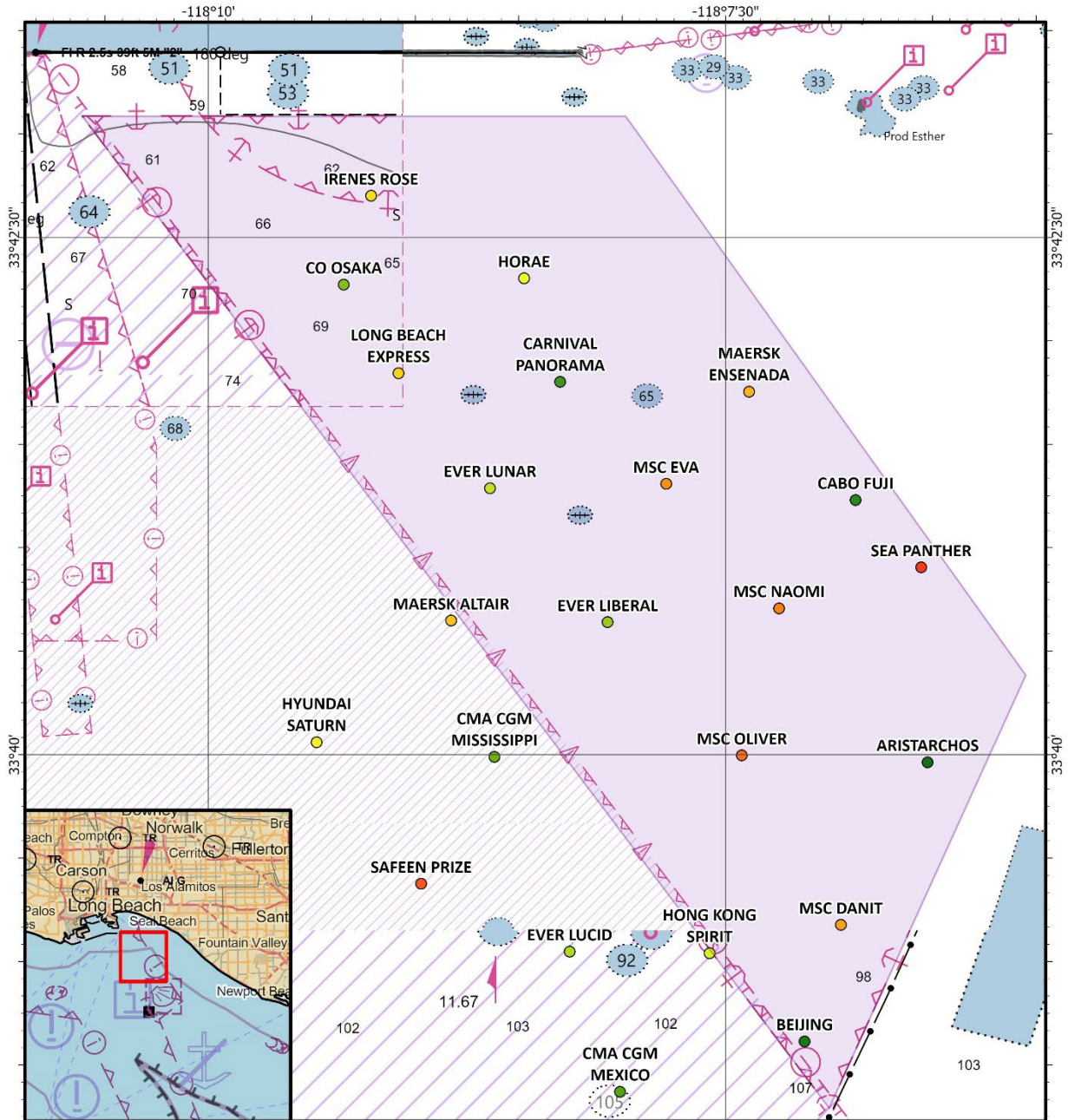


Figure 10 AIS positions of anchored vessels at 0315 on January 25, 2021. (Provided by Coast Guard Navigation Center)

¹¹ Audio and video playback of the Kongsburg Norcontrol maritime surveillance system used by VTS LA-LB

0330: Observed wind speeds at the Marine Exchange's weather station on Point Fermin increased to 54 mph.¹²

0350: As weather conditions deteriorated, the second officer on BEIJING, who was the bridge watch officer, ordered the duty engineer to report to the engine room and prepare the main engine for getting underway. The main engine was in a condition where it could be used with 15 minutes advance notice.¹³

0354: The second officer on BEIJING observed the anchor dragging due to increased wind and wave activity. He informed the master of this development and ordered the duty engineer to make the main engine and bow thruster ready for immediate use. The second officer then advised the chief officer, bosun, and an ordinary seaman (OS) to proceed forward to heave up the anchor.¹⁴

0403: VTS LA-LB advised BEIJING that the vessel was dragging anchor. BEIJING acknowledged and confirmed that the anchor was dragging. BEIJING notified VTS LA-LB that the vessel had begun heaving anchor.¹⁵

0410: The port anchor windlass motor on BEIJING lost electrical power. The ETO was dispatched to the forecandle to investigate and resolve the issue. A few minutes later, with the port anchor still deployed, the vessel began maneuvering using the main engine to avoid collision with nearby vessels.^{16,17}

0418: VTS LA-LB receives an anchor drag alarm for HONG KONG SPIRIT.¹⁸

0422: VTS LA-LB contacts HONG KONG SPIRIT via VHF and asks, "Is your vessel dragging anchor". The bridge watch officer on HONG KONG SPIRIT replies with "Negative. Vessel is not dragging anchor".¹⁹

0425: EVER FRONT informed VTS LA-LB via VHF that the vessel had collided with CMA CGM NEW JERSEY²⁰

0443: VTS LA-LB attempted to contact BEIJING via VHF, with no response received.²¹

0446: VTS LA-LB contacts HONG KONG SPIRIT via VHF and asks if the vessel is dragging anchor or being repositioned. The bridge watch officer on HONG KONG SPIRIT replies with "Yes, sir. We are in a normal condition and we are monitoring the situation, over".²²

¹² Screen shot of anemometer reading at the Marine Exchange, 0330 on January 25, 2021

¹³ BEIJING master's Statement of Facts, January 25, 2021

¹⁴ BEIJING master's Statement of Facts, January 25, 2021

¹⁵ Audio and video playback of the Kongsburg Norcontrol maritime surveillance system used by VTS LA-LB

¹⁶ BEIJING master's Statement of Facts, January 25, 2021

¹⁷ BEIJING Engineer room log, January 25, 2021

¹⁸ Audio and video playback of the Kongsburg Norcontrol maritime surveillance system used by VTS LA-LB

¹⁹ Audio and video playback of the Kongsburg Norcontrol maritime surveillance system used by VTS LA-LB

²⁰ Audio and video playback of the Kongsburg Norcontrol maritime surveillance system used by VTS LA-LB

²¹ Audio and video playback of the Kongsburg Norcontrol maritime surveillance system used by VTS LA-LB

²² Audio and video playback of the Kongsburg Norcontrol maritime surveillance system used by VTS LA-LB

0500: Power was restored to BEIJING's anchor windlass motor and anchor heaving operations resumed.²³

0505: VTS LA-LB notified BEIJING that their anchor was dragging. BEIJING acknowledged the notification and informed VTS LA-LB that the vessel was continuing to heave anchor with one and a half shots of chain remaining in the water.²⁴

0515: The anchor windlass motor on BEIJING lost electrical power. The ETO restored power at 0535 and heaving operations were resumed. At 0545, the anchor windlass motor lost power for a third time and the ETO reported that the electrical motor was "burned out completely".²⁵

0526: VTS LA-LB received an anchor dragging alarm for MSC DANIT and asked the vessel to confirm whether the anchor was holding. MSC DANIT reported that the anchor was "not dragging for the moment". The vessel also reported that the main engine was on standby and a second anchor was ready to let go.²⁶

0549: MSC DANIT notified VTS LA-LB of their intention to heave anchor and proceed offshore to drift until the storm passed. VTS LA-LB acknowledged the vessel's intention.²⁷ One minute later, the vessel began heaving anchor.²⁸

0600: Observed wind speeds at the Marine Exchange's weather station on Point Fermin recorded sustained winds of 36 mph with gusts reaching 57 mph.²⁹

0730: The Junior Electrical Superintendent for V. Ships Greece Ltd, advised BEIJING's crew to replace the inoperable port anchor windlass motor with the starboard motor.³⁰ A short time later, the ETO began this process. In the intervening time, the vessel used its main engine and bow thruster to keep station.³¹

0820: MSC DANIT's anchor was brought home³² and the vessel was underway proceeding offshore.³³

1345: Replacement of BEIJING's port anchor windlass motor was complete. The vessel then requested permission from VTS LA-LB to remain in the anchorage; permission was granted.³⁴

²³ BEIJING master's Statement of Facts, January 25, 2021

²⁴ Audio and video playback of the Kongsburg Norcontrol maritime surveillance system used by VTS LA-LB

²⁵ BEIJING master's Statement of Facts, January 25, 2021

²⁶ Audio and video playback of the Kongsburg Norcontrol maritime surveillance system used by VTS LA-LB

²⁷ Audio and video playback of the Kongsburg Norcontrol maritime surveillance system used by VTS LA-LB

²⁸ MSC DANIT Bell Book

²⁹ Screen shot of anemometer reading at Marine Exchange, January 25 2021

³⁰ Email from V. Ships Greece Junior Electrical Superintendent, January 25, 2021

³¹ BEIJING master's Statement of Facts, January 25, 2021

³² MSC DANIT Bell Book

³³ MSC DANIT Bridge log

³⁴ BEIJING master's Statement of Facts, January 25, 2021

0000: BEIJING requested permission to depart the anchorage and proceed offshore from VTS LA-LB; permission was granted. At 0030, BEIJING was underway and proceeded offshore to drift.³⁵

4.2. The Incident: October 2021

October 1st, 2021

San Pedro Bay Weather and Waterway Conditions: Air temperatures ranged from 60-90°F.³⁶ Winds were sustained at 13 mph or less.³⁷ Maximum wave heights of 3.8 feet were recorded.³⁸

The Pacific Airshow was scheduled to occur near Huntington Beach, CA from October 1-3. The airshow resulted in increased small vessel traffic in San Pedro Bay.³⁹

0500: Platform ELLY controller⁴⁰ 1 arrives on duty at the control console. The previous day, controller 1 worked an extra shift because his relief called in sick. Controller 1 was not relieved until midnight on his prior shift. After being relieved, controller 1 went to bed at 0200 and awoke at 0430 to get to prepare for his next shift which started at 0500.

0600: Controllers on ELLY held a regularly scheduled morning meeting. As a part of routine weekly pipeline maintenance, the controllers confirmed that ELLY would receive a train of three pipeline inspection gauges (PIGs) and a chemical pill from EUREKA through a 10-inch production pipeline. In addition to receiving the PIGs and chemical pill, controllers on ELLY would ship out a PIG through the 16 inch, P00547 pipeline, to Beta station.^{41,42}

0630: A 16-inch diameter PIG was loaded into the launcher destined for Beta Station.⁴²

³⁵ Email from master of BEIJING

³⁶ Historical weather data from John Wayne Airport Weather Station in Huntington Beach, CA, October 1-2, 2021

³⁷ NOAA historical weather data from Angels Gate buoy, October 1-2, 2021

³⁸ NOAA historical weather data from San Pedro Channel buoy, October 1-2, 2021

³⁹ Pacific Airshow website (www.pacificairshow.com)

⁴⁰ Controllers monitor and operate equipment onboard the platform. They communicate with the designated person-in-charge to keep them informed device operation, alarms, and platform equipment status.

⁴¹ Testimony given by platform controller 1 on October 9, 2021

⁴² ELLY Control Room Event Log – Red Log, October 1, 2021

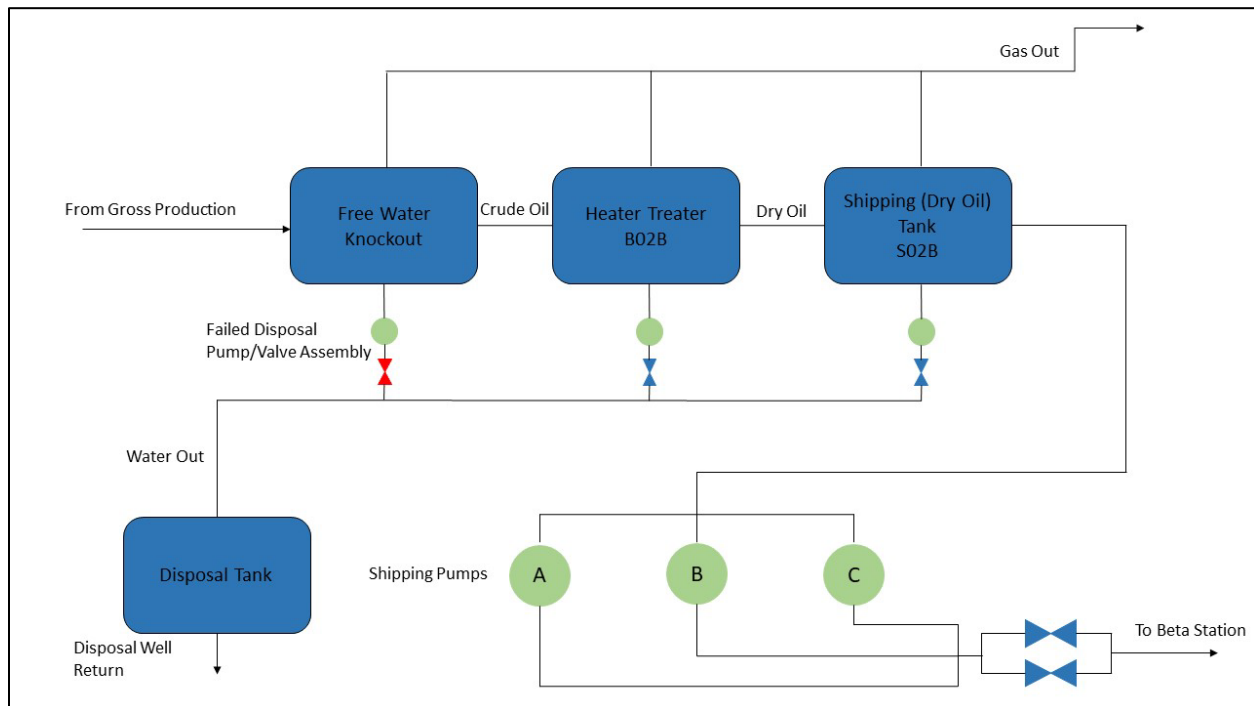


Figure 11 Platform ELLY Simplified Multiphase Separation Piping Diagram

0800: Controllers on ELLY stopped shipping pump A to allow insertion of the 16-inch PIG destined for Beta Station. After inserting the PIG into the launcher, shipping pump A was restarted and slowly brought back up to operating speed to prevent backflow into the PIG launcher.⁴³

0831: Controllers onboard EUREKA followed a similar procedure to ship the first of three PIGs through the 10-inch production line. The second PIG and chemical pill were shipped at 0937, and the third PIG was shipped at 1011.⁴⁴

0945: Controllers on ELLY received the first PIG from EUREKA.⁴⁵

1015: Controllers on ELLY received the second PIG and chemical pill.⁴⁶ Controllers noticed that the water and oil layers in the gross production fluid had flipped due to a high-water content. Controllers also notice the liquid level in the heater treater and dry tanks rising faster than normal. Samples taken from the heater treater discharge indicated a water content of 4-5%, much higher than the normal. Controllers attempted to rectify the problem by diverting liquid from the heater treater and dry oil tanks to the disposal tank.⁴⁷

1230: Controllers on ELLY notified the platform superintendent of the unusually high-water content and rising liquid levels in the heater treater and dry tanks.⁴⁸ The platform superintendent

⁴³ Testimony given by platform controller 1 on October 9, 2021 pp. 14

⁴⁴ ELLY Control Room Event Log – Red Log, October 1, 2021

⁴⁵ ELLY Control Room Event Log – Red Log, October 1, 2021

⁴⁶ ELLY Control Room Event Log – Red Log, October 1, 2021

⁴⁷ Testimony given by platform controller 1 on October 9, 2021 pp. 15

⁴⁸ ELLY Control Room Event Log – Red Log, October 1, 2021

requested controllers on EUREKA and ELLEN to slow production by shutting down their wells.⁴⁹ Shortly after shutting down the wells on EUREKA and ELLEN, the disposal pump and its associated control valve on ELLY malfunctioned. Although production had been slowed, because of the disposal system malfunction, liquid levels in the heater treater and dry tanks continued to rise.⁵⁰

1345: A mechanic dispatched to fix the disposal pump and control valve completed repairs. The platform superintendent called out additional controllers to assist with managing the excess gross production fluid. The water content meter from the dry oil tank discharge had pegged out at 9%. A normal water content reading from that meter was less than 2%.⁵¹

1430: Controllers energized shipping pump B to supplement the flow of pump A. By increasing flow to Beta Station, controllers intended keep pace with, or overcome the rising liquid levels in the heater treater and dry oil tanks.⁵²

1500: With liquid levels in the heater treater and dry oil tanks beginning to stabilize, controllers on ELLY energized shipping pump C, a third pump, to further increase flow to Beta Station.⁵³

1510: Approximately ten minutes after energizing the shipping pump C, controllers noticed cavitation in two of the three shipping pumps. Controllers stopped pumps A and B.⁵⁴

1605: A pipeline pressure spike of 829 psig was recorded on the supervisory control and data acquisition (SCADA) recorder.⁵⁵

1610: Controllers onboard ELLY received the first leak alarm from the ATMOS⁵⁶ leak detection system.^{57, 58} The leak alarm was designed to indicate the leak location. It showed the leak at "Mile 0", indicating that the leak was on the platform.⁵⁹

1639: The leak alarm was acknowledged by a platform operator on the SCADA controller.⁶⁰

1711: Platform controllers stopped pump C. Ten minutes after stopping pump C, the leak alarm cleared.⁶¹

⁴⁹ ELLY Control Room Event Log – Red Log, October 1, 2021

⁵⁰ Testimony given by platform controller 1 on October 9, 2021 pp. 16

⁵¹ Testimony given by platform controller 1 on October 9, 2021 pp. 18

⁵² Testimony given by platform controller 1 on October 9, 2021 pp. 18

⁵³ Testimony given by platform controller 1 on October 9, 2021 pp. 19

⁵⁴ Testimony given by platform controller 1 on October 9, 2021 pp. 20

⁵⁵ SCADA data_10.06.21 Excel Spreadsheet

⁵⁶ ATMOS Pipe is a leak detection system developed and marketed by ATMOS International. The system relies on flow rate instrumentation to measure pipeline inputs and outputs. The software then runs a statistical volume-balancing algorithm to detect system leaks. The company provides 24/7 virtual support to its customers.

⁵⁷ Beta Platform Elly Alarm page pics.pdf

⁵⁸ Miscellaneous Events and Alarms Excel Spreadsheet

⁵⁹ Testimony given by platform controller 2 on October 9, 2021 pp. 28

⁶⁰ Miscellaneous Events and Alarms Excel Spreadsheet

⁶¹ ATMOS Leak Detection Status

1730: Controllers on ELLY informed a shore-based pipeline technician that they received a leak alarm and requested assistance to troubleshoot the issue and conduct manual leak detection at Beta station.⁶²

1730: During a routine patrol, Orange County Sheriff Department's (OCSD) Marine Patrol reported hearing discussion over VHF Ch. 16 about pollution offshore of Huntington Beach, CA. The Marine Patrol investigated and found nothing in the estimated area of pollution.⁶³

1740: Controllers on ELLY energized pump C.⁶⁴

1752: Controllers received the second leak alarm indicating a Mile 0 leak.⁶⁵ Pump C was stopped⁶⁶ and controllers began searching the platform for potential leaks. The alarm cleared at 1805.⁶⁷

1830: An "oil slick" was observed by watch standers on MSC ARIES (IMO No. 9857169) near anchorage HB-2. The oil slick was reported via VHF to VTS LA-LB and the Sector LA-LB Command Center (SCC).⁶⁸

1834: VTS LA-LB contacted CMA CGM A LINCOLN (IMO No. 9780859) via VHF and requested confirmation of oil pollution in the vicinity of the vessel. The vessel confirmed receipt of the request and reported no sight of oil in the water.⁶⁹

1836: VTS LA-LB contacted SCC via landline to discuss the report received from MSC ARIES. The location and possible source of the reported pollution were discussed. SCC requested MSC ARIES to notify the NRC.⁷⁰

1853: VTS LA-LB contacted NORTHERN GUILD (IMO No. 9348467) and ROTTERDAM EXPRESS (IMO No. 9193317), anchored at F-16 and SF-3 respectively, and requested confirmation of oil pollution in the vicinity of either vessel.⁷¹

1854: NORTHERN GUILD reported sighting oil in the water to VTS LA-LB. No specific location was given.⁷²

1856: SCC made initial notification of the reported oil pollution to Sector LA-LB Incident Management Duty Team (Sector IMD).⁷³

⁶² ELLY Shipping Ops Timeline

⁶³ Statement from OCSD Captain

⁶⁴ Miscellaneous Events and Alarms Excel Spreadsheet

⁶⁵ ATMOS Leak Detection Status

⁶⁶ Miscellaneous Events and Alarms Excel Spreadsheet

⁶⁷ ATMOS Leak Detection Status

⁶⁸ Recorded transmission on VHF Ch. 14

⁶⁹ Recorded transmission on VHF Ch. 14

⁷⁰ Recorded transmission on VHF Ch. 14

⁷¹ Recorded transmission on VHF Ch. 14

⁷² Recorded transmission on VHF Ch. 14

⁷³ Statement from Sector IMD Petty Officer

1859: ROTTERDAM EXPRESS reported no sighting of oil in the water to VTS LA-LB via VHF Ch. 14.⁷⁴

1859: JACKSON BAY (IMO No. 9322358) reported sighting oil in the water in the vicinity of anchorage HB-5 to VTS LA-LB via VHF.⁷⁵

1900: OCSD Marine Patrol commenced a survey of the back-bay area on their own initiative after hearing initial reports of pollution over VHF from MSC ARIES. The asset was later re-directed in response to a landside pollution incident in the vicinity of a local high school. The oil spill-related patrol was suspended.⁷⁶

1902: VTS LA-LB contacted SCC via landline to report sighting of the oil spill by NORTHERN GUILD, JACKSON BAY, and MSC ARIES.⁷⁷

1909: Sector IMD briefed the reports of oil pollution to (1) Federal On-Scene Coordinator's Representative, (2) California Oil Spill Prevention & Response, and (3) OCSD/Harbor Patrol. During the brief, Sector IMD requested assistance from the agencies to respond to the location of reported pollution. Sector IMD was informed that all assets had been dispatched to assist with the Pacific Air Show and none were available to investigate reports of pollution.⁷⁸

1915: Controllers on ELLY received the third leak alarm.⁷⁹ Pump C was stopped at 1942⁸⁰ and the alarm cleared at 1955.⁸¹

1958: The NOAA Satellite Analysis Branch discovered satellite imagery of a possible oil anomaly offshore of Huntington Beach, CA.⁸²

1959: A report of an oil sheen of unknown source was received by the NRC from MSC ARIES. The size and location were estimated to be 2 NM in length and 100 meters wide at 33-38.32N 118-04.09W.⁸³

2000: The shore-based pipeline technician arrived at Beta Station to troubleshoot and conduct manual leak detection.⁸⁴

2013: SCC received NRC Report #1318434 initiated by MSC ARIES.⁸⁵

⁷⁴ Recorded transmission on VHF Ch. 14

⁷⁵ Recorded transmission on VHF Ch. 14

⁷⁶ Statement from Statement from OCSD Captain

⁷⁷ Recorded telephone call from VTS LA-LB to SCC

⁷⁸ Statement from Sector IMD Petty Officer

⁷⁹ Beta Platform Elly Alarm page pics.pdf

⁸⁰ Miscellaneous Events and Alarms Excel Spreadsheet

⁸¹ ATMOS Leak Detection Status

⁸² NRC Report #1318442 Initiated by NOAA

⁸³ Recorded telephone call from MSC ARIES to NRC

⁸⁴ ELLY Shipping Ops Timeline

⁸⁵ NRC Report #1318437 Initiated by MSC ARIES

2017: Sector IMD called the Qualified Individual (QI) for MSC ARIES and requested coordination of continuous monitoring of the reported spill.⁸⁶

2022: The California Governor's Office of Emergency Services (Cal OES) received initial notification of the reported oil pollution. Cal OES created and packaged a report for dissemination to a stakeholder's distribution list (Cal OES Control #21-5440). The oil pollution was characterized as an unknown petroleum sheen, 2 NM by 100 meters, in the water near HB-2 in the Pacific Ocean.⁸⁷

2027: The Sector IMD Division Chief called SCC to inquire if there were any assets near the reported oil pollution and what time Coast Guard Station Los Angeles-Long Beach (Station LA-LB) would launch to support the Pacific Airshow the following day. The Sector IMD Division Chief also reported that a first light search for oil pollution would be conducted by OCSD Harbor Patrol.⁸⁸

2029: Pump A was energized.⁸⁹ At 2039, controllers received the fourth leak alarm⁹⁰. Pump A was stopped at 2043⁹¹ and the alarm cleared at 2055.⁹²

2100: The pipeline technician informed the pipeline superintendent of "metering issues" onboard platform ELLY. The pipeline superintendent acknowledged the information.⁹³

2112: Pump A was energized.⁹⁴ At 2123, controllers received the fifth leak alarm.⁹⁵ At 2124, pump A was stopped⁹⁶ and the alarm cleared at 2135.⁹⁷

2144: Pump A was energized.⁹⁸ At 2153, controllers received the sixth leak alarm.⁹⁹ Pump A was stopped at 2234 and the alarm cleared at 2240.¹⁰⁰

2315: Pump A was energized. At 2330, controllers received the seventh leak alarm and failed to immediately stop pump A.¹⁰¹

⁸⁶ Statement from Sector IMD Petty Officer

⁸⁷ California Office of Emergency Services Materials Spill Report #21-5440

⁸⁸ Statement from Sector LA-LB IMD Division Officer

⁸⁹ Miscellaneous Events and Alarms Excel Spreadsheet

⁹⁰ ATMOS Leak Detection Status

⁹¹ Miscellaneous Events and Alarms Excel Spreadsheet

⁹² Miscellaneous Events and Alarms Excel Spreadsheet

⁹³ Testimony given by pipeline superintendent on October 9, 2021 pp. 9

⁹⁴ Miscellaneous Events and Alarms Excel Spreadsheet

⁹⁵ ATMOS Leak Detection Status

⁹⁶ Miscellaneous Events and Alarms Excel Spreadsheet

⁹⁷ ATMOS Leak Detection Status

⁹⁸ Miscellaneous Events and Alarms Excel Spreadsheet

⁹⁹ Beta Platform ELLY Alarm page pics.

¹⁰⁰ ATMOS Leak Detection Status

¹⁰¹ Miscellaneous Events and Alarms Excel Spreadsheet

October 2nd, 2021

0050: Flow readings taken from each end of the pipeline during manual leak detection indicated an approximately 420-gallon difference between the amount of oil leaving ELLY and arriving at Beta Station.¹⁰²

0120: A second set of flow readings taken from each end of the pipeline continued to indicate an approximately 420-gallon difference.¹⁰³

0130: The pipeline superintendent arrived at Beta Station to assist with troubleshooting and manual leak detection.¹⁰⁴

0157: NOAA reported an unconfirmed satellite anomaly measuring approximately 2.8 NM long and 0.7 NM wide to the NRC (NRC Report #1318442).

0205: SCC received NRC Report #1318442 initiated by NOAA.¹⁰⁵

0206: CAL OES received NRC Report #1318442 initiated by NOAA.¹⁰⁶

0227: Controllers on ELLY stopped pump A and the leak alarm received on October 1st, at 2330 cleared at 0235.¹⁰⁷

0330: The platform and pipeline superintendents ordered a vessel from SoCal Ship Services to conduct a pipeline run, which consisted of a visual inspection of the sea surface to look for oil in the water.

0400: the NICHOLAS L (O.N. 562749) began the first pipeline run.^{108, 109}

0510: NICHOLAS L reported no oil observed on the sea surface at the completion of the pipeline run.¹¹⁰

0511: Pump A was energized. At 0528, controllers received the eighth leak alarm. Pump A was stopped at 0601 and the alarm cleared.¹¹¹ The platform and pipeline superintendents ordered a second pipeline run to begin at daylight.¹¹²

¹⁰² Testimony given by platform controller 1 on October 9, 2021 pp. 33

¹⁰³ Testimony given by platform controller 1 on October 9, 2021 pp. 33

¹⁰⁴ ELLY Shipping Ops Timeline

¹⁰⁵ Marine Information for Safety and Law Enforcement (MISLE) Case #1280515

¹⁰⁶ California Office of Emergency Services Materials Spill Report #21-5440

¹⁰⁷ Miscellaneous Events and Alarms Excel Spreadsheet

¹⁰⁸ ELLY Shipping Ops Timeline

¹⁰⁹ ELLY Control Room Event Log – Red Log, October 2, 2021

¹¹⁰ ELLY Control Room Event Log – Red Log, October 2, 2021

¹¹¹ Miscellaneous Events and Alarms Excel

¹¹² ELLY Control Room Event Log – Red Log, October 2, 2021

0648: Calculated time for apparent sunrise on October 2nd, 2021, near the reported oil spill area.

0710: NICHOLAS L begins the second pipeline run.¹¹³

0727: After hearing multiple reports over VHF, USCGC HALIBUT investigated oil pollution on own initiative while underway to support the Pacific Airshow. Crew reported sighting oil in the water near HB anchorages to SCC. The asset continued on to their assigned anchorage location to support the Pacific Airshow.¹¹⁴

0730: Members of Sector IMD were underway from Sunset Beach with OCSD Harbor Patrol to investigate the reported oil pollution.¹¹⁵

0818: NICHOLAS L reported a visible oil sheen on the surface in the vicinity of the pipeline.¹¹⁶

0830: Sector IMD discovered and confirmed oil pollution approximately 3.5 NM west of Huntington Beach in position 33-39.25N 118-05.51W. Sector IMD collected 2 oil samples and obtained imagery of the confirmed oil spill. Sector IMD described pollution as an oil slick with heavy accumulation of crude oil in the middle with weathered oil along the leading edges. Using GPS, Sector IMD estimated the outer perimeter of the oil to be 10 x 10 NM.¹¹⁷

0900: Cal OES briefed the Chief Deputy for California Department of Fish and Wildlife on the oil pollution.¹¹⁸

0907: Witt O'Brien, a crisis and emergency management firm, initiated NRC Report #1318463 on behalf of Beta Offshore. The report described a discharge of an unknown amount of crude oil into the Pacific Ocean at 33-38.59N 118-03.32W. The report further detailed that the discharge was observed in vicinity of the pipeline after a pressure drop occurring at 0230 that morning.¹¹⁹

0925: SCC requested an overflight by Coast Guard Aircraft CG-2707.¹²⁰

0930: OCSD Harbor Patrol informs ELLY of the discovery of oil in the water.

0930: Witt O'Brien notified Sector IMD that Marine Safety Response Corporation (MSRC) was contracted pursuant to the response plan. MSRC deployed six response vessels with several thousand feet of boom and skimmers to commence working the leading edge of the slick. The potential discharge was estimated at 144,480 gallons of oil. In response to this report, the Coast Guard established a safety zone around the oil slick. The safety zone would later be published in a Temporary Final Rule (Docket Number USCG-2021-0384).

¹¹³ ELLY Control Room Event Log – Red Log, October 2, 2021

¹¹⁴ USCGC HALIBUT Bridge log

¹¹⁵ Statements OCSD Captain, Sector IMD Lieutenant, and Sector IMD Petty Officer

¹¹⁶ ELLY Control Room Event Log – Red Log, October 2, 2021

¹¹⁷ Statements from Statement from OCSD Captain, Sector IMD Lieutenant, and Sector IMD Petty Officer

¹¹⁸ Declaration of Fisheries Closure – California Department of Fish and Wildlife

¹¹⁹ NRC Report #1318463 Initiated by Witt O'Brien on behalf of Beta Offshore

¹²⁰ MISLE Case #1280515

0950: USCGC HALIBUT reported an oil slick in position 33-34.08N 118-02.776W, approximately 4 NM from the originally reported position.¹²¹

0956: Coast Guard Aircraft CG-2707 arrived on scene and conducted an overflight to track the position of pollution and obtain imagery.¹²²

1004: CG-2707 reported oil spill coordinates to be 33-30.95N 117-59.41W; 33-31.28N 118-03.0N; and 33-38.15N 118-05.2W. The total size was reported to be a 7 x 3 NM triangle with an area of 10 NM².¹²³

1030: An OCSD helicopter completed an overflight of the area and confirmed an oil slick with dimensions and characteristics similar to the report provided by CG-2707.¹²⁴

1030: Pacific Airshow performance commenced.¹²⁵

1100: Acting Sector LA-LB Commander was briefed on the oil spill by SCC.¹²⁶

1107: @USCGSoCal tweeted that, "A unified command consisting of Beta Offshore, the Coast Guard and the California Department of Fish and Wildlife's Office of Spill Prevention and Response has been established to respond to an oil spill off the coast of Newport Beach."¹²⁷

1138: SCC completed an initial Marine Safety Information Broadcast (MSIB) for a large oil spill in vicinity of Newport Beach, CA. SMIBs are repeated approximately every 60 minutes.¹²⁸

1148: Sector IMD completed Section 7 Consultations as required by the Endangered Species Act.¹²⁹

1200: SCC initiated a Critical Incident Communication call with the Coast Guard National Command Center (NCC). The Responsible Party's response plan was activated; five vessels on-scene and deploying boom.¹³⁰

1200: The Unified Command held the initial operations brief at the Incident Command Post (ICP) at the offices of Beta Offshore in downtown Long Beach, CA.¹³¹

1218: @USCGSoCal tweeted that, "The Coast Guard is responding to an oil slick reported to be approximately 13 square miles in size, 3 miles off Newport Beach. More to follow."¹³²

¹²¹ USCGC HALIBUT Bridge log

¹²² MISLE Case #1280515

¹²³ SCC Smooth log, October 2, 2021

¹²⁴ MISLE Case #1280515

¹²⁵ Pacific Airshow website (www.pacificairshow.com)

¹²⁶ MISLE Case #1280515

¹²⁷ USCG Southern California Tweet, 1107 on October 2, 2021

¹²⁸ SCC Smooth log, October 2, 2021

¹²⁹ Statement from Sector IMD Petty Officer

¹³⁰ MISLE Case #1280515

¹³¹ Statement from Sector LA-LB IMD Division Officer

¹³² USCG Southern California Tweet at 1218 on October 2, 2021

1300: MSRC OCEAN GUARDIAN is confirmed to be on-scene and actively conducting recovery operations. The vessel had the capability to recover 7,400 barrels per day and was equipped with 2,000 feet of boom.¹³³

1319: The Federal On-Scene Coordinator (FOSC) approved the opening of the Oil Spill Liability Trust Fund (OSLTF) with an Authorization To Proceed (ATP) of \$50K and a ceiling of \$50K.¹³⁴

1332: Beta Offshore arranged to conduct a visual inspection of the pipeline using a remote operated vehicle (ROV).

1400: Initial response objectives are developed by the Unified Command.¹³⁵

1445: USCGC HALIBUT, Station LA-LB, and MSRC were on-scene in the vicinity of the oil slick. USCGC HALIBUT was actively attempting to detour vessels transiting the area. MSRC had deployed several 1000-foot booms around the oil slick. USCGC HALIBUT remained on scene overnight.¹³⁶

1559: An underway Station LA-LB asset reported 4-foot diameter oil blobs in vicinity of the Huntington Beach Pier. Crew onboard the asset estimated the oil blobs would make landfall within one hour.¹³⁷

October 4, 2021: An ROV survey of the pipeline revealed anchor drag marks near the fracture location on P00547 approximately 4.2 miles from shore.¹³⁸

4.3. Additional Supporting Information

4.3.1. Pipeline Damage

An 18-inch visible crack was discovered along the toe of the longitudinal seam weld at the rupture location during a post-accident examination. The pipeline was also deformed and gouged in this area (see Figures 12, 13, and 14). A 0.4-inch hole was stop drilled at each end of the crack to prevent further growth. A temporary repair consisting of SynthoGlass® was applied to prevent oil leakage. The temporary repair was later replaced with a welded steel patch until the damaged section of pipeline was removed and replaced. Approximately 331-feet of damaged pipe was removed from the sea floor. The primary damage occurred to a 255-foot section of pipeline, where the rupture occurred, and a 76-foot section of pipeline, located to the south of the 255-foot section. In these areas, the exterior concrete coating was cracked and broken off in many locations. The pipe also suffered several out of roundness deformations indicative of plastic¹³⁹ deformation due to bending or impact. Drag marks and seafloor scouring were initially observed by an ROV and later confirmed by a multibeam survey conducted following the oil release. The NTSB took possession of a 9-foot section of damaged pipe from the portions removed from the sea floor. The

¹³³ Statement from Sector LA-LB Deputy Sector Commander

¹³⁴ MISLE Case #1280515

¹³⁵ Statement from Sector LA-LB Deputy Sector Commander

¹³⁶ USCGC HALIBUT Bridge log

¹³⁷ MISLE Case #1280515

¹³⁸ ROV recording

¹³⁹ Non-reversible deformation of a solid body.

pipe section was sent to the NTSB laboratory in Washington, DC for further examination. This section contained the temporarily repaired rupture site. The NTSB materials laboratory found a 13-inch crack along the toe of the longitudinal seam weld at the rupture site. The fracture surface exhibited a relatively flat region with curved arrest marks extending through the wall from the outer surface to a maximum depth of 0.3-inch. Features consistent with ratchet marks were observed on the fracture surface extending from the outer surface. The fracture appearance was consistent with fatigue cracking initiating from multiple origin areas along the toe of the seam weld on the outer surface of the pipe. No evidence of intergranular or branched cracking was observed. Mechanical properties and material chemistry analysis were consistent with API standards.

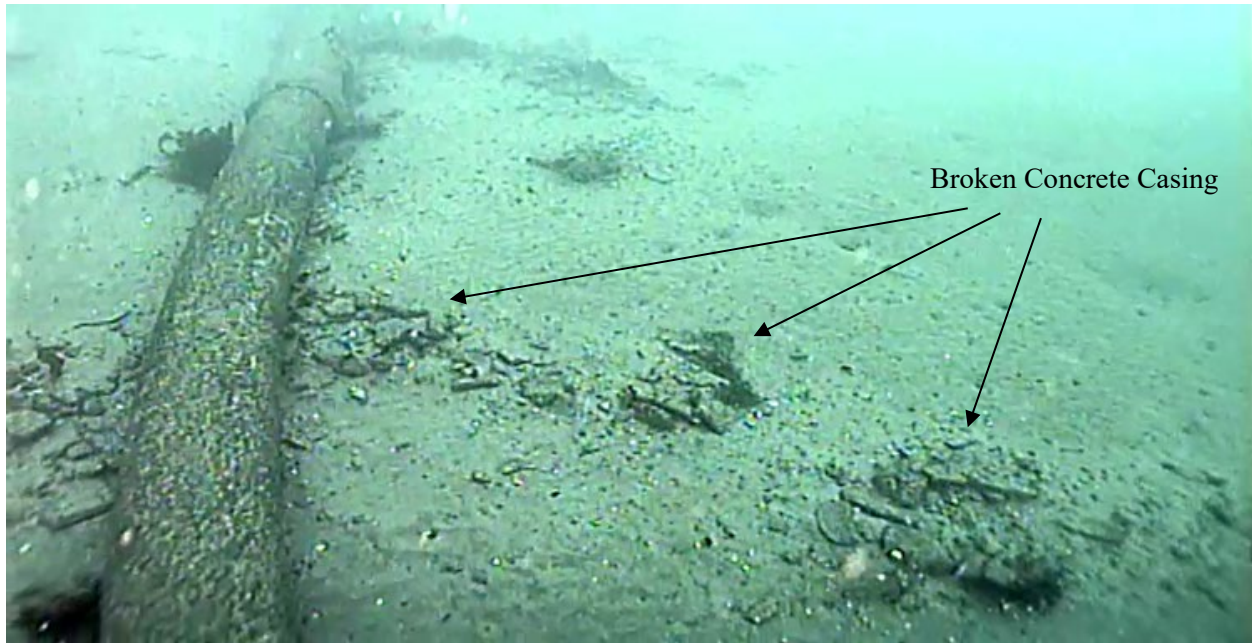


Figure 12 Still Image from ROV survey showing damage (provided by Amplify)



Figure 13 Still image from diver survey showing cleaned and buffed longitudinal crack (provided by Amplify)

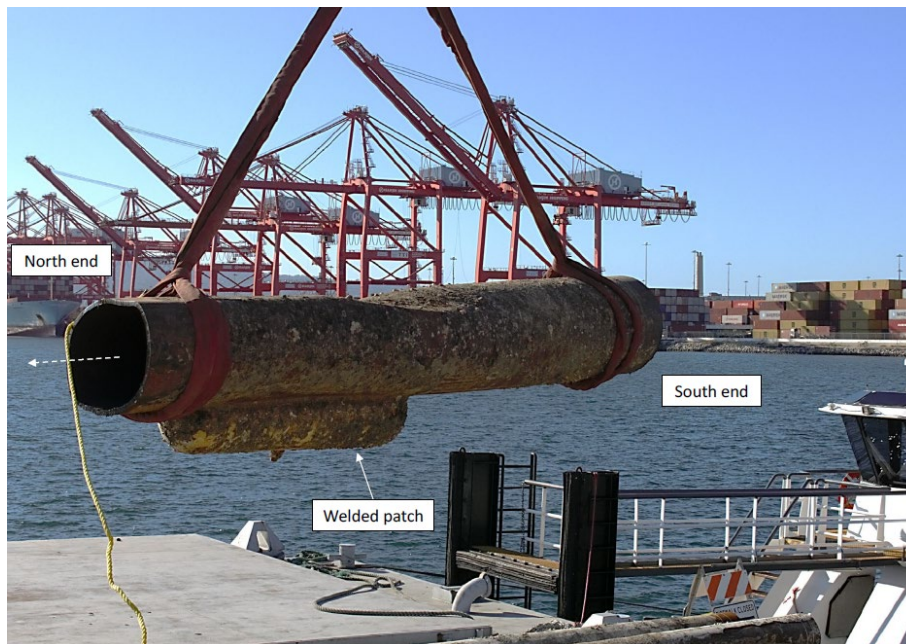


Figure 14 Damaged section of pipe after removal from the sea floor. (Image from NTSB Materials Laboratory Factual Report 23-045)

4.3.2. Vessel Movement

AIS positions from MSC DANIT and BEIJING show that both vessels substantially traversed P00547 while anchored. The largest pipeline displacement occurred near the leak location and is in the vicinity of where MSC DANIT traversed the pipeline. South of the leak location, anchor drag marks correlate with BEIJING's recorded AIS positions.

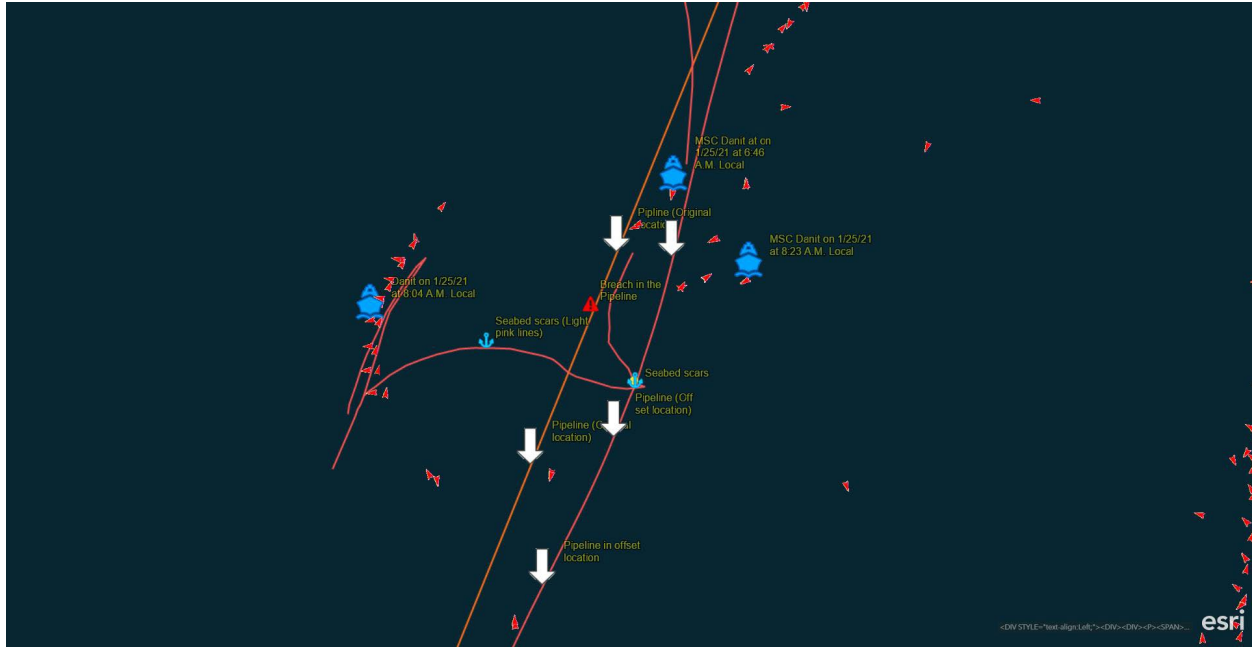


Figure 15 AIS Positions of MSC DANIT with P00547 Overlay

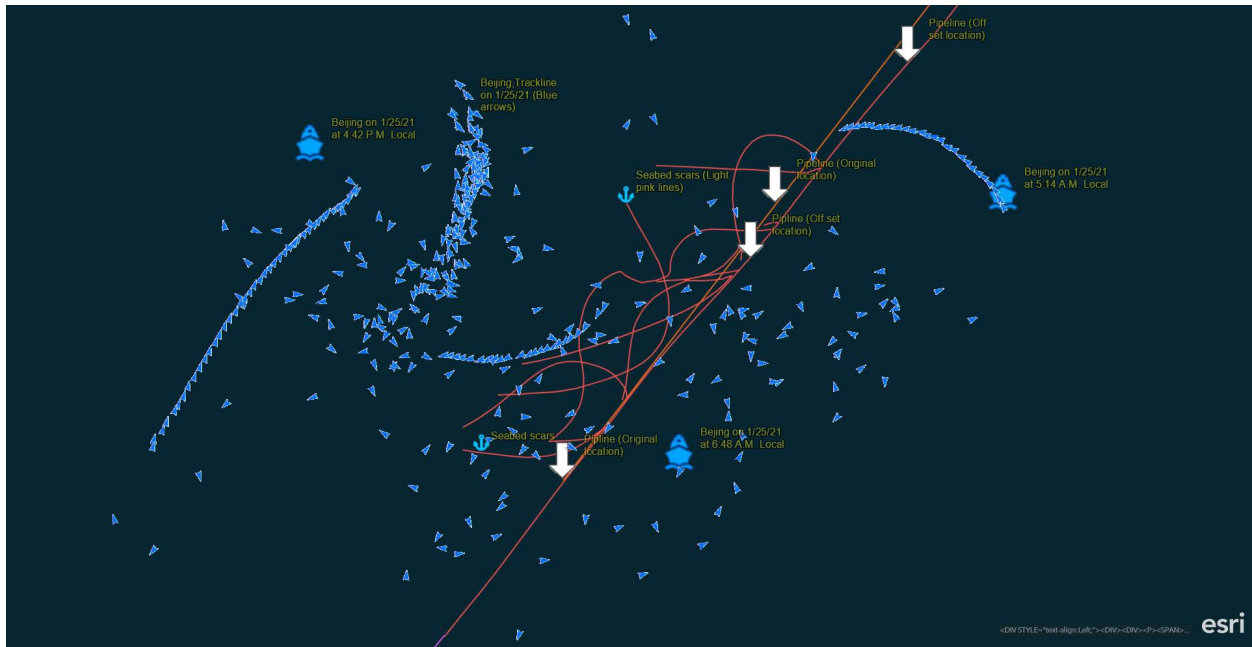


Figure 16 AIS Positions of BEIJING with P00547 Overlay

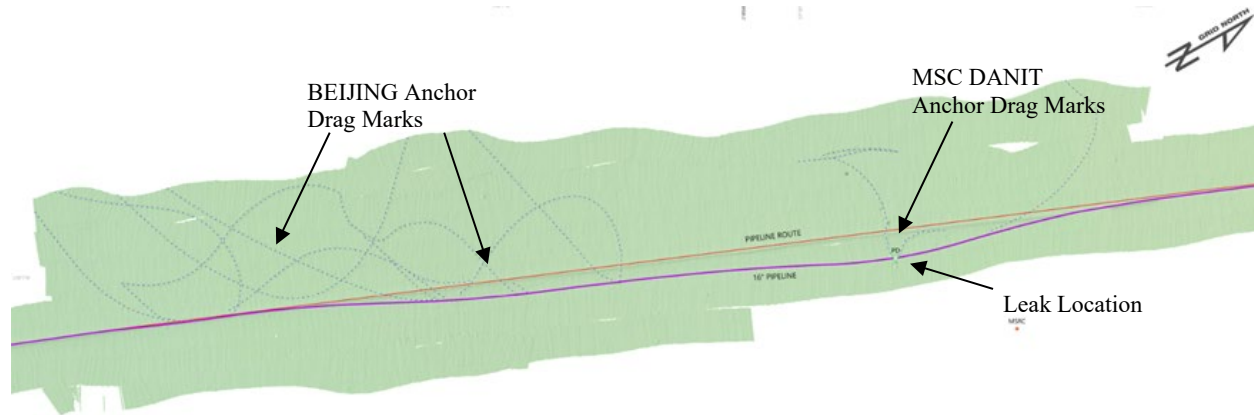


Figure 17 Image from multibeam survey conducted by Fugro (provided by Amplify)

4.3.3. Crude Oil Discharge and Response

An estimated 24,696 gallons of crude oil was discharged and impacted over 80 miles of coastline from Huntington Beach, CA, to beaches in northern Mexico. Several environmentally sensitive sites in the Area Contingency Plan¹⁴⁰ were identified as potential impact areas including lagoons, inlets, and rivers. Additionally, there were several historic properties, and culturally sensitive archeological and tribal sites identified in the impacted area. A Unified Command was established with Coast Guard Sector LA-LB as the FOSC, California Department of Fish and Wildlife's Office of Spill Response and Prevention (OSPR) as the State On-Scene Coordinator (SOSC) and Amplify Energy as the Responsible Party (RP). At the peak of the response effort, 1,800 responders from around the country supported the Unified Command. Over a four-month period, responders recovered 5,544 gallons of on-water oil, 13.6 barrels of tar balls, and 549,658 pounds of oily debris. The collective efforts of the Unified Command and first responders restored the Southern California shoreline to pre-spill conditions or better. Federal funding for the response effort came from the OSLTF to cover the Coast Guard's direct and indirect costs. The OSLTF is a fund authorized by the Oil Pollution Act of 1990 and has several funding sources, including a per-barrel excise tax and post-incident cost recovery from the RP. The total federal cost for the response was estimated to be over \$6 million.¹⁴¹

¹⁴⁰ An Area Contingency Plan is a reference document prepared for the use of all agencies engaged in responding to environmental emergencies within a defined geographic area

¹⁴¹ FOSC Report pp. 4-5

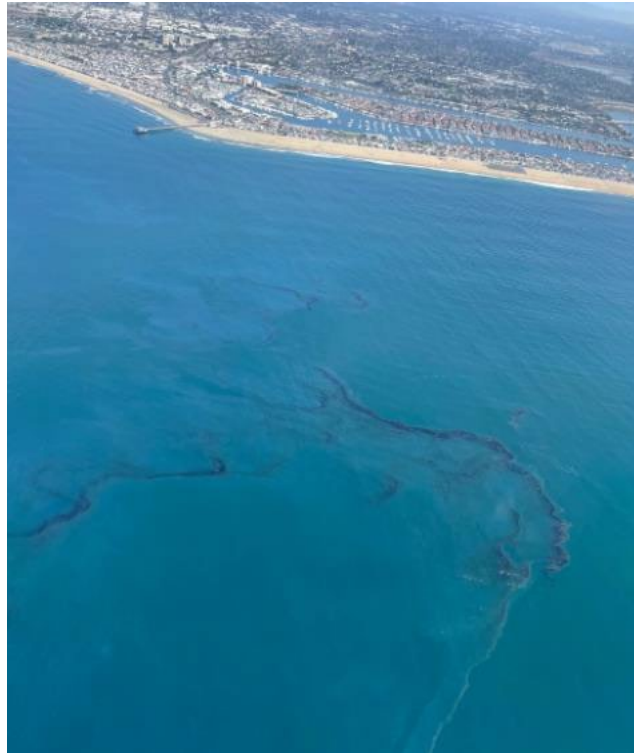


Figure 18 Crude oil in the Pacific Ocean on October 3, 2021 with Newport Beach, CA in the background

4.3.4. Establishment of Anchorage F

The process to establish and chart federal anchorages outside the Los Angeles – Long Beach breakwater began in the 1970s. Discussion in 45 Federal Register 30431 noted that existing anchorages inside the federal breakwater were becoming increasingly crowded from the large size, type, and volume of vessels common to the ports of Los Angeles and Long Beach. Because of this, many vessels were forced to anchor outside the breakwater, which created the potential for obstruction to the harbor entrances unless federal anchorages were established. The final rule, published in the Federal Register on May 8, 1980, reorganized anchorages that were already established inside the breakwater and created two new anchorages outside the breakwater, anchorages F and G. After publication of the final rule, the Coast Guard notified NOAA of the regulatory change and requested F and G anchorages to be charted along with individual anchorage circles. In 2004, prompted by ever-larger vessels calling at the ports of Los Angeles and Long Beach, the Coast Guard increased the radii of some anchorage circles in anchorage F. To add additional anchorage circles to anchorage F, the Coast Guard also proposed enlargement of the anchorage by moving the southwest corner approximately 1 NM to the south. By doing this, three additional anchorages could be added. After receiving no public comment or request for a meeting, in 2006 anchorage F was enlarged as described in the notice of proposed rulemaking. Three additional anchorage circles were added: SF-1, SF-2, and SF-3 with the outer edge of SF-3 being approximately 262 yards from the pipeline. After 2006, nine contingency anchorages were established to the southwest of anchorage F. Anchorages SF-4, SF-5, SF-6, SF-7, SF-8, SF-9, SF-10, SF-11, and SF-12 are designated contingency anchorages. VTS LA-LB assigns vessels to these anchorages if all other anchorages are full. Anchorages SF-4 through SF-12 are not charted on a NOAA chart.

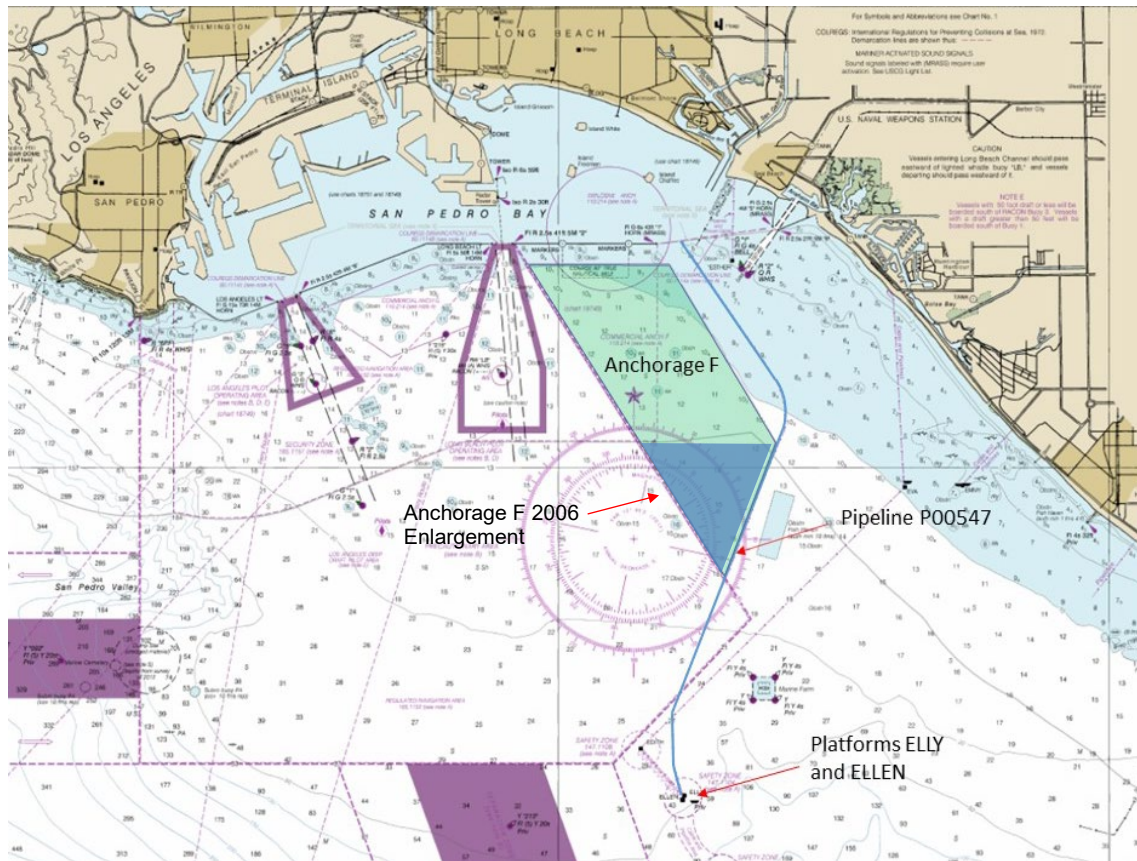


Figure 19 Edited image of NOAA chart 18749 depicting anchorage F, platform ELLY, platform ELLEN, and P00547

4.3.5. May 2020 Pipeline Inspection

As a part of routine pipeline inspection and monitoring, Beta Offshore contracted Aqueos Corporation to conduct an external inspection of pipeline P00547 in May 2020. Aqueos used an ROV to conduct the inspection of P00547 and other pipelines leading to and from platform ELLY. A post inspection report noted that the pipelines were found to be in good condition with no visible external damage. Measurements taken from cathodic potential test points were within specifications indicating that the pipelines were protected from corrosion caused by differences in electrical potential. Various items of debris were located along the pipeline. None of the items appeared to have caused damage or displacement to the pipeline.¹⁴²

4.3.6. Local Seismicity

Seismicity was considered as a potential environmental impact in the EIR-EA. The EIR-EA concluded that the effects of soil liquefaction due to seismic activity from an earthquake would be negligible since the weight of the full pipeline would only be slightly heavier than the liquefied soil.¹⁴³ A pre-spill survey of seismicity was conducted for a period ranging from January-October 2021. The two largest seismic events in this period consisted of an M4.3 near Carson, CA on September 18 and an M2.6 in San Pedro Bay on February 13. Shakemaps of both earthquakes

¹⁴² Aqueos Report dated May 2020 “2020 Platform ELLY to EUREKA External Subsea Pipelines & Power Cables & Platform ELLY to Shore Pipeline Inspection Report”

¹⁴³ Beta Unit EIR-EA Volume I pp. 116-117

showed local disturbance near the pipeline of less than 0.5 cm/s. This small amount of ground disturbance is far less than the expected storm current estimation of 45 cm/s. Seismicity as a contributing factor to the oil spill was ruled out on this basis.

4.3.7. Marine Growth Study

Samples of marine growth from the undisturbed casing and exposed pipeline were taken shortly after discovery of oil in the water to assist in determining the date in which the pipeline was exposed by an anchor strike. The study concluded that settlement of tube worm larvae on the interior section would have occurred some period of time after the pipeline was exposed. Considered together with worm growth and tube construction observed, the study suggests that the tube worm cover and weight observed on the exposed interior would have taken several weeks to a few months to develop. Samples of marine growth from the exterior exposed section were much more diverse and differed statistically from samples taken from the interior. These findings indicate that the interior and exterior sections of the pipeline casing were exposed at different times, and that the interior had been exposed prior to discovery of oil in the water.¹⁴⁴

4.3.8. Anchor Drag Analysis

The Coast Guard reviewed AIS data collected from May 2020 to October 2021, filtering the data to show vessels that crossed over the pipeline while anchored. The review revealed three vessels that crossed over the pipeline during this period: MSC DANIT, BEIJING, and HYUNDAI BUSAN. The HYUNDAI BUSAN was ruled out after its track line was compared with its AIS transceiver mounting position. With the AIS transceiver mounted near the stern, the vessel's anchor remained approximately 150 yards east of P00547's charted location.

5. Analysis

5.1. *Failure of MSC DANIT and BEIJING to prepare for adverse weather conditions.*

The National Weather Service issued a gale warning for the inner waters from Point Mugu to San Mateo Point. Vessels in anchorage F had more than 24 hours to get underway or prepare for heavy weather by veering additional anchor chain or dropping a second anchor. 33 CFR 164.19 requires the master or person in charge of an anchored vessel to prepare for adverse weather, ensure a proper anchor watch is maintained, and implement procedures to detect a dragging anchor. If the weather is likely to cause the vessel to drag anchor, action must be taken to ensure the safety of the vessel, nearby structures, and other vessels. Despite forecasted wind speeds of 57-mph, neither master chose to leave anchorage and proceed offshore where their vessel would pose minimal risk to shore infrastructure or other vessels. As a result, the high winds caused both vessels to drag anchor and subsequently strike P00547.

5.2. *Insufficient maneuvering room in Anchorage F for the weather conditions experienced on January 25, 2021.*

MSC DANIT and BEIJING were surrounded to the northwest by anchored vessels and to the southeast by the pipeline. With sustained 45-mph winds from the west, the vessels had little room to maneuver ahead, slacken the dragging anchor chain, and heave the anchor up. Had Anchorage F been at reduced capacity or had there been a larger distance between the pipeline and the

¹⁴⁴ University of California, Santa Barbara report "Biological Assemblage of the Beta Pipeline and Casing" February, 2022

anchorage boundary, the vessels would have had a larger area to maneuver and avoid striking P00547 or another vessel.

5.3. Inadequate heaving power of BEIJING's port anchor windlass.

The windlass motors on BEIJING were of the type and size required by DNV rules¹⁴⁵ and relevant international standards at the time of the incident. However, the wind and sea conditions in San Pedro Bay on January 25, 2021 were significant. The master attempted to use the bow thruster and main engine to slacken the anchor chain and allow the windlass to heave up the anchor. Vessels anchored nearby limited the amount of maneuvering the master could perform. Because of this, the master relied on the torque of the windlass motor to heave up the anchor. Given the weather conditions and heaving force required, the windlass motor and its electrical supply were inadequate to bring the anchor home.

5.4. Failure of MSC DANIT and BEIJING to avoid striking P00547.

AIS track lines from MSC DANIT and BEIJING show that both vessels substantially traversed P00547 while anchored during a heavy weather event on January 25, 2021. When matched with sea floor scouring marks plotted by a post incident multibeam survey, the track lines and scouring marks show close alignment. A visual inspection of the scouring marks by an ROV indicated that they were made by the anchor of a large vessel. A pipeline inspection conducted in May 2020 verified that P00547 was undamaged and situated in its original location. When considered in totality, it can be concluded that MSC DANIT and BEIJING struck P00547 during the heavy weather event on January 25, 2021. This investigation did not uncover evidence which showed that the crew of MSC DANIT or BEIJING knew that their anchor struck P00547. Nevertheless, following an anchor dragging incident, a prudent mariner would consult vessel position data and objects charted in the vicinity of the anchorage to determine if damage could have been done by a dragging anchor. Submerged cables and pipelines are common fixtures near shore. P00547 was properly charted prior to the incident. Both vessels were anchored for an extended period which would have given every deck officer time to notice that a pipeline was nearby. Had the crew of either vessel recognized that they had substantially traversed P00547 following an anchor drag, a report to VTS LA-LB or the Coast Guard would have resulted in a notification to the Army Corps of Engineers and the pipeline owner who could have conducted further inspection.

5.5. Inability of the damaged P00547 pipeline to withstand alternating mechanical stresses and a high-pressure event on October 1, 2021.

The damage sustained by P00547 consisted of lateral displacement along the seafloor, destruction of a concrete coating, and deformation beyond the pipeline's yield strength which resulted in out of roundness. An applied stress above the yield strength of a material results in permanent plastic deformation which alters its overall stress state. The progressive fracture occurred along the toe of the seam weld where there was already a geometrical stress concentration as well as a residual stress state (metallurgical stress concentration) inherent to the welding process. Deformation further altered this stress state and could have enhanced or relieved local stress concentrations. A crack was not necessarily required to initiate fatigue, but the fracture features near the progressive crack origin are difficult to resolve and interpret as this area of the crack was exposed to the environment and possibly subjected to rubbing/smearing during crack opening and closing cycles. While it cannot be conclusively determined that the presence of a crack resulted from the external

¹⁴⁵ DNV Rules for Classification: DNV-RU-SHIP Pt.3 Ch.11: Hull equipment, supporting structure and appendages

force applied to the pipeline, based on observation of ratchet mark features, it is likely that the altered stress state induced by the deformation damage led to localized crack initiation and propagation due to cyclic pressure loads from normal oil pipeline operations. The damage caused by the anchor strike went unnoticed until after the pipeline failed and oil was discharged in October 2021. Crack propagation and material failure due to fatigue cracking is characterized by the graph in Figure 22.

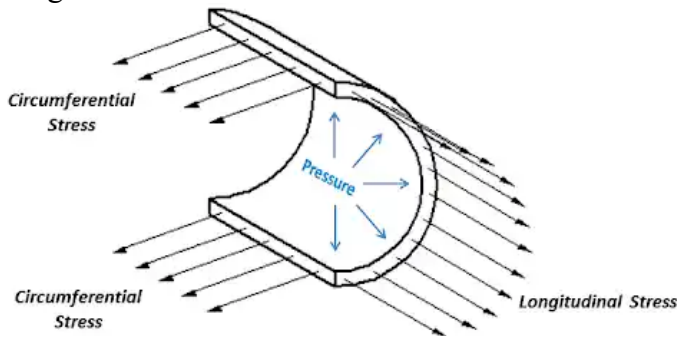


Figure 20 Diagram of pipe stresses (image from ASME BPVC VIII Div 1).

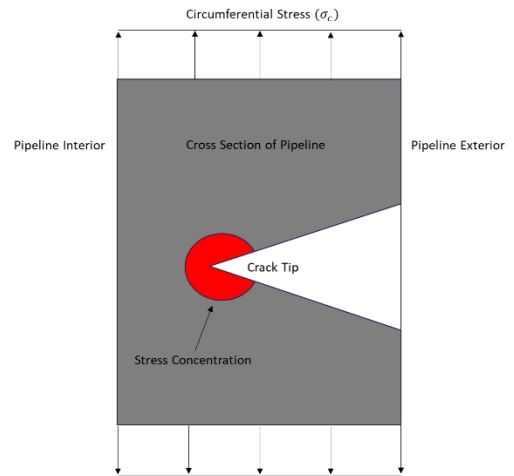


Figure 21 Diagram of pipe cross section representing crack propagation and stress concentration.

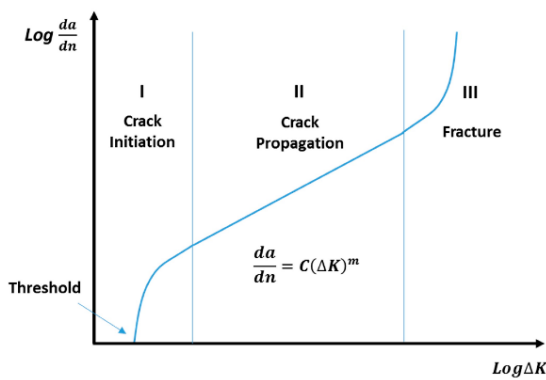


Figure 22 Theoretical crack growth (da/dn) as a function of alternating stress intensity (K) on a logarithmic scale. The values for C and m are material coefficients determined experimentally. (Pons, D.J. and Liu, D. Crack Propagation Mechanisms for Creep Fatigue: A Consolidated Explanation of Fundamental Behaviours from Initiation to Failure. Christchurch: MDPI)

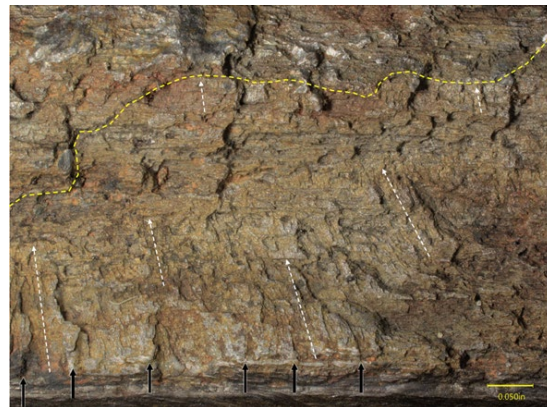


Figure 23 Digital microscope image of the fracture surface. Black arrows indicate features resembling ratchet marks emanating from the outer surface. White arrows indicate fracture progression direction. Yellow dashed line indicates a boundary between the progressive fracture region and overstress region. (Image from NTSB Materials Laboratory Factual Report 23-045).

It can be concluded that when the anchors of MSC DANIT and BEIJING struck and deformed P00547, local stress concentrations developed in the pipeline which allowed cracks to initiate and propagate over time. P00547 eventually failed following a high-pressure event noted on the SCADA recorder at 1605 on October 1, 2021. Although the internal fluid pressure did not exceed

the MOP, the weakened pipeline experienced a circumferential stress which it could not withstand. Following the high-pressure event at 1605, the first leak alarm was received at 1610 indicating that oil was being released.

5.6. Platform controllers' incorrect interpretation of leak detection system data.

Controllers on platform ELLY incorrectly interpreted leak detection alarms and their associated data on the morning of October 1, 2021. They believed that a higher-than-normal water content resulting from a well upset caused the leak alarms. Controllers received a Mile 0 leak alarm indicating that the leak was on platform ELLY and not somewhere along P00547. In response to the alarm, controllers conducted local checks on ELLY and found no leak. The leak detection system was programmed to identify variation in flow and pressure in the pipeline which were displayed as a series of lambdas. Lambdas are a probability factor resulting from a statistical analysis of flow and pressure data. If the lambdas rise to the threshold value of 4.6, an alarm is raised. Controllers are trained to review lambda values which, if interpreted correctly, will validate an alarm. The controller's faulty assumption that the alarms were a result of high-water content were validated when they did not visually detect a leak on ELLY or oil in the water during the pipeline run done by NICHOLAS L. Had the lambdas been interpreted correctly, the controllers would have known that there was a leak despite the contradictory Mile 0 readout.

5.7. Failure of platform controllers to properly respond to seven leak alarms.

A total of eight leak alarms were received throughout the course of the incident. Platform controllers incorrectly concluded that there was no leak and resumed pumping after seven of the alarms while oil continued to be discharged. ATMOS, the leak detection system provider, offered 24-hour real-time technical support to their customers. Neither the controllers nor their supervisors contacted ATMOS to assist with the interpretation of the leak alarms and associated pipeline data. Had they sought out technical support, an ATMOS representative could have alerted controllers to the presence of a leak.

5.8. Operation of platform ELLY with an understaffed and fatigued crew.

On October 1, 2021, controller 1 arrived for his shift at 0500 after completing an 18 hour shift the day before with 5 hours of time off and only 2.5 hours of sleep. Normal shifts for controllers are 12 hours. Controller 1 completed an extended shift the day before due to the late arrival of his relief. The Centers for Disease Control and Prevention (CDC) recommend that adults get 7 or more hours of sleep per night.¹⁴⁶ Notwithstanding the long-term health implications of inadequate sleep, short term effects include impaired performance, increased errors, and greater risk of accidents.¹⁴⁷ Controller 1 was faced with multiple consequential decisions over the course of the oil spill. Had his relief arrived on time, or had there been a backup controller available, he would have received adequate rest and been better prepared to make decisions.

¹⁴⁶ CDC: Sleep and Sleep Disorders website

¹⁴⁷ Watson NF, Badr MS, Belenky G, et al. Recommended amount of sleep for a healthy adult: a joint consensus statement of the American Academy of Sleep Medicine and Sleep Research Society. Sleep. 2015

6. Conclusions

6.1. Cause of the casualty

6.1.1. Initiating event

The initiating event (or first unwanted outcome) was the MSC DANIT and BEIJING dragging anchor and striking P00547 on January 25, 2021. Causal factors that contributed to this event were:

- 1) Failure of MSC DANIT and BEIJING to prepare for adverse weather conditions.
- 2) Insufficient maneuvering room in Anchorage F for the weather conditions experienced on January 25, 2021.
- 3) Inadequate heaving power of BEIJING's port anchor windlass.
- 4) Failure of MSC DANIT and BEIJING to avoid striking P00547.

6.1.2. Subsequent events

After P00547 sustained damage on January 25, 2021, it was in a weakened state and continued to experience cyclical mechanical stresses consistent with its service as a subsea oil pipeline. The pipeline experienced fatigue cracking, failed, and began discharging oil on October 1, 2021. Causal factors that contributed to these events were:

- 5) Inability of the damaged P00547 pipeline to withstand alternating mechanical stresses and a high-pressure event on October 1, 2021.
- 6) Platform controllers' incorrect interpretation of leak detection system data.
- 7) Failure of platform controllers to properly respond to seven leak alarms.
- 8) Operation of platform ELLY with an understaffed and fatigued crew.

6.2. Evidence of Act(s) or Violation(s) of Law by any Coast Guard Credentialed Mariner Subject to Suspension or Revocation:

There is no evidence that there was an act of misconduct, incompetence, negligence, unskillfulness, or willful violation of law committed by any Coast Guard credentialed mariner that contributed to the cause of the casualty.

6.3. Evidence of Act(s) or Violation(s) of Law by Coast Guard Personnel:

There is no evidence that there was an act of misconduct, incompetence, negligence, unskillfulness, or willful violation of law committed by any Coast Guard personnel that contributed to the cause of the casualty.

6.4. Evidence of Act(s) or Violation(s) of Law by any Other Person or Entity:

Concurrent with this investigation, Amplify, Beta Offshore, and the San Pedro Bay Pipeline Co. were investigated, indicted, and pleaded guilty to violating the Clean Water Act by negligently discharging oil into San Pedro Bay.¹⁴⁸

¹⁴⁸ U.S. Department of Justice Press Release dated August 26, 2022

6.5. Evidence of Act(s) Subject to Civil Penalty:

This investigation uncovered evidence of acts that may be subject to civil penalty. At the time of this report's conclusion, a violation analysis was ongoing.

6.6. Need for New or Amended Laws/Regulations:

There is an ongoing effort to restructure anchorages in the ports of Los Angeles and Long Beach. See section 7.2 for more details.

6.7. Unsafe Actions or Conditions that Were not Causal Factors:

BEIJING failed to notify the Coast Guard that the port anchor windlass was inoperable and required replacement. BEIJING was equipped with two stockless bower anchors as required by DNV, the vessel's classification society. After the port anchor winch motor failed, the crew consulted with shoreside technical support and were advised to replace it with the starboard motor. This left the vessel unable to retrieve the starboard anchor if it were deployed. A defect of this type is required to be reported by the master to the flag administration, DNV, and the Coast Guard.¹⁴⁹ After the windlass failure, the Coast Guard did not receive a report from the master of BEIJING.

7. Actions Taken Since the Incident

7.1. Queuing System for Ports of Los Angeles and Long Beach

As a result of generalized supply chain backups beginning in 2020, the number of vessels anchored or loitering offshore was at an all-time high. During this time, the inner and outer anchorages were often at full capacity. In October 2021, the Marine Exchange engaged industry stakeholders to develop and implement a queuing system for vessels crossing the Pacific Ocean. The goal was to reduce anchored or loitering vessels. Prior to implementation of the new system, vessels would enter the queue for longshore labor at a terminal berth when they arrived within 20-nautical miles of the port. This caused ships bound for Los Angeles and Long Beach to steam at full speed across the ocean and then anchor or loiter for extended periods upon arrival. The new system allowed vessels to enter the queue upon departure from their last port of call. This allowed vessels to steam at a slower, more efficient speed across the ocean. After implementation of the new system, the average number of anchored vessels dropped from 50 to 16 with no vessels loitering.

7.2. Anchorages and Anchoring Procedures

As a result of the January 2021 collision between CMA CGM NEW JERSEY and EVER FRONT, the center points between contingency anchorages were adjusted. The adjustment increased center point separation to 0.6-miles. Following the October 2021 oil spill, VTS LA-LB and the Coast Guard discontinued use of anchorage circles F-16, SF-2, SF-3, and SF-12 due to their proximity to the pipeline. Two additional contingency anchorages offshore of Huntington Beach, CA were removed from service due to their proximity to a treated sewage outfall. In December 2021, VTS LA-LB revised its anchoring assignment procedures. The new procedures assigned vessels to anchor in a "checkerboard" style where there is generally an open anchorage on either side of a vessel. This adjustment reduced the number of assignable anchorages from 48 to 21.

¹⁴⁹ SOLAS Chapter 1, Part B, Regulation 11: Maintenance of Conditions After Survey

In May 2022, the Coast Guard Office of Waterways and Ocean Policy (CG-WWM) issued a directive to Coast Guard Districts, Sectors, and Marine Safety Units to conduct a navigation safety risk assessment (NSRA) for all federal anchorages. The directive required units to address the following factors:

- 1) Navigational safety
- 2) Protection of the marine environment
- 3) Proximity to subsea pipelines, cables, tunnels, or other infrastructure
- 4) Safe and efficient use of the maritime transportation system
- 5) The national security of the United States

After completion of the NSRA, CG-WWM instructed units to initiate modifications to federal anchorages or establish new anchorages through the federal rulemaking and National Environmental Policy Act (NEPA) process, after informing the U.S. Congress of proposed modifications. As of the date of this report, the Coast Guard and VTS LA-LB are engaged in the rulemaking process to permanently restructure the federal anchorages.

7.3. VTS LA-LB Maritime Surveillance System Additions

VTS LA-LB added P00547 and other subsea pipelines to the display of their maritime surveillance system.

7.4. Anchoring and Heavy Weather Notification Procedures

In December 2021, VTS LA-LB and Sector LA-LB updated the vessel anchoring and heavy weather notification procedures. Forty-eight hours prior to a forecasted heavy weather event, when winds are forecasted and/or observed at 35 knots or greater, VTS LA-LB would discontinue assigning anchorages outside the breakwater to incoming vessels. All vessels at anchor would be contacted, advised of the weather, and asked if they intended to leave anchorage due to the incoming weather. Vessels still at anchor 24 and 12 hours prior to the forecasted weather event would be contacted again to determine if they intended to remain at anchor or depart. VTS LA-LB commences hourly weather broadcasts 12 hours prior to the forecasted weather event. Depending on the severity of the weather, and the type or loading condition of the vessel, Sector LA-LB may issue a Captain of the Port Order directing it to depart as soon as possible.

7.5. External Inspection of P00547

An was order issued by the Department of Justice on August 26, 2022 which stated in part that:

7. Defendants must conduct actual visual inspections of the Pipeline semiannually (e.g., an ROV). Driving a boat on the surface of the water over the route of the Pipeline is not sufficient. Anomalies found on the Pipeline shall be reported to...the United States Department of Interior Bureau of Safety and Environmental Enforcement ("BSEE")....

Pursuant to this order, BSEE altered the pipeline Right of Way (ROW) Permit No. OCS P-0547 to comply with the new external inspection interval. BSEE notified the operator, Beta Operating Company, LLC via a letter issued on October 12, 2023.

8. Safety Recommendations

8.1. Pipeline Warning System

In 2015, the Coastal and Marine Operators Pipeline Industry Initiative (CAMO) conducted a pilot program in which AIS was used to monitor vessel traffic over two pipelines in the Port Fourchon, LA area. The pilot program was funded by a grant from the PHMSA. The monitoring program employed commercial AIS data to send an alert stating "PIPELINE BELOW" to the AIS receiver of any vessel which passed over one of the designated pipelines at 0.5-knots or less. If the vessel's Electronic Chart Display and Information System (ECDIS) or Automatic Radar Plotting Aid (ARPA) were configured for AIS input, an audible and visual alarm would be received on those devices as well. In addition to an alert on the vessel, the pipeline operator can also subscribe to receive a notification when an alert is triggered. It is recommended that the PHMSA and CAMO collaborate to fund and establish AIS pipeline monitoring programs in areas where there is a high concentration of subsea pipelines and commercial vessel traffic. The Coast Guard and Federal Communications Commission should review and approve the monitoring programs.

8.2. Leak Detection Training

Platform controllers failed to recognize the existence of a leak despite multiple warnings. Controllers incorrectly interpreted leak detection system data, attributing high lambdas and persistent alarms to higher-than-normal water content in the postproduction crude oil. To better inform and train its controllers, Amplify and its subsidiaries should update leak detection procedures and require additional leak detection training, to incorporate lessons learned from this event, for all personnel involved in platform or pipeline operations.

8.3. Platform Staffing

The platform staffing inadequacies on ELLY resulted in a fatigued crew. The crew may have exhibited better decision making had they been well rested. The Beta Unit encompasses platforms which exist in a dynamic environment. A high volume of commercial shipping traffic and the proximity of sensitive ocean and shoreline habitats make the Beta Unit a high risk and high consequence area for oil production. Given the circumstances under which oil is produced in the Beta Unit, Amplify and its subsidiaries should ensure that all platform workers can receive the CDC recommended minimum of 7 hours of uninterrupted sleep per day. Platform staffing levels should be increased to facilitate this standard with contingencies in place to account for illness, injury, or other unforeseen personnel shortfalls on all platforms forming the Beta Unit.

8.4. Anchorage Restructuring

The federal anchorages outside the ports of Los Angeles and Long Beach are undersized and lack sufficient maneuvering room for modern, large cargo vessels. As of the date of this report, the Coast Guard is engaged in a campaign to restructure federal anchorages nationwide. It is recommended that the Coast Guard Commandant continue the effort to restructure federal anchorages in consultation with Coast Guard District Commanders and Captains of the Port to provide larger anchor watch circles and additional maneuvering room.

8.5. Authorize VTS LA-LB to Operate an AIS Coast Station to Transmit Warning Messages via AIS

In addition to providing position and operating information about a vessel, AIS can also be used to transmit messages. Maritime AIS station operation is governed by 47 CFR Part 80 and under normal circumstances VTS LA-LB is not permitted to operate a private coast station unless a waiver is granted by the Federal Communications Commission (FCC). Having the ability to transmit emergency messages would improve the safety of vessel traffic in VTS LA-LB's coverage zone. Emergency text messages could be broadcast quickly and would mitigate language barriers inherent in international shipping. In 2014, VTS LA-LB requested a waiver from the FCC to operate a private AIS coast station which was denied. It is recommended that VTS LA-LB renew their effort to obtain a waiver from the FCC and that the FCC grant a waiver based on the interest of public/environmental safety.

9. Administrative Recommendations

9.1. Investigation disposition

It is recommended that this investigation be closed.

[REDACTED]

[REDACTED] LCDR
Investigating Officer
U.S. Coast Guard