UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF SAFETY AND ENVIRONMENTAL ENFORCEMENT
GULF OF MEXICO REGION

ACCIDENT INVESTIGATION REPORT

1. OCCURRED
   DATE: **20-NOV-2021** TIME: **1315** HOURS
2. OPERATOR: **Murphy Exploration & Production C**
   REPRESENTATIVE: **Sayre, Kim**
   TELEPHONE: **(832) 792-5702**
   CONTRACTOR:
   REPRESENTATIVE:
   TELEPHONE:

- [ ] STRUCTURAL DAMAGE
- [X] CRANE
- [ ] OTHER LIFTING
- [ ] DAMAGED/DISABLED SAFETY SYS.
- [ ] INCIDENT >$25K
- [ ] H2S/15MIN./20PPM
- [ ] REQUIRED MUSTER
- [ ] SHUTDOWN FROM GAS RELEASE
- [ ] OTHER

3. OPERATOR/CONTRACTOR REPRESENTATIVE/SUPERVISOR ON SITE AT TIME OF INCIDENT:

4. LEASE: **G21790**
   AREA: **GC** LATITUDE:
   BLOCK: **338** LONGITUDE:

5. PLATFORM: **A-Front Runner**
   RIG NAME:

6. ACTIVITY:
   - [ ] EXPLORATION(POE)
   - [X] DEVELOPMENT/PRODUCTION (DOCD/POD)

7. TYPE:
   INJURIES:
   - [ ] HISTORIC INJURY

	OPERATOR	CONTRACTOR
[ ] REQUIRED EVACUATION		
[ ] LTA (1-3 days)		
[ ] LTA (>3 days)		
[ ] RW/JT (1-3 days)		
[ ] RW/JT (>3 days)		
[ ] FATALITY		
[ ] Other Injury		

   - [ ] POLLUTION
   - [ ] FIRE
   - [ ] EXPLOSION

   LWC
   - [ ] HISTORIC BLOWOUT
   - [ ] UNDERGROUND
   - [ ] SURFACE
   - [ ] DEVERTER
   - [ ] SURFACE EQUIPMENT FAILURE OR PROCEDURES

   COLLISION [ ] HISTORIC [ ] >$25K [ ] <=$25K

8. OPERATION:
   - [X] PRODUCTION
   - [ ] DRILLING
   - [ ] WORKOVER
   - [ ] COMPLETION
   - [ ] HELICOPTER
   - [ ] MOTOR VESSEL
   - [ ] PIPELINE SEGMENT NO.
   - [ ] OTHER

9. CAUSE:
   - [X] EQUIPMENT FAILURE
   - [X] HUMAN ERROR
   - [ ] EXTERNAL DAMAGE
   - [ ] SLIP/TRIP/FALL
   - [ ] WEATHER RELATED
   - [ ] LEAK
   - [ ] UPSET H2O TREATING
   - [ ] OVERBOARD DRILLING FLUID
   - [ ] OTHER _____

10. WATER DEPTH: **3330** FT.
11. DISTANCE FROM SHORE: **110** MI.
12. WIND DIRECTION: **ENE**
    SPEED: **15** M.P.H.
13. CURRENT DIRECTION: **E**
    SPEED: **4** M.P.H.
14. SEA STATE: **3** FT.
15. PICTURES TAKEN: **YES**
16. STATEMENT TAKEN: **YES**

17. INVESTIGATION FINDINGS:

Incident Summary
On November 20, 2021, a crane incident occurred at the Green Canyon Block 338 Platform A, “Front Runner” SPAR, a facility operated by Murphy Exploration & Production Company- USA (Murphy). While offloading a Conex cargo box from the offshore supply vessel (OSV) “Canyon Runner” owned by Laborde Marine, L.L.C., a failure of the Front Runner’s West crane auxiliary (aux) winch hoist caused the Conex box to free fall approximately 20-30 feet before striking the side of the OSV and then falling into offshore waters. The Murphy Crane Operator (CO) reported that he noticed that the aux line stopped coming up, heard a loud noise, and the aux winch free spooled downward.

On November 30, 2021, the failed aux winch was removed and shipped onshore where a teardown inspection was completed. The disassembled winch components were sent to a laboratory for testing. The current total estimated cost of damage associated with this incident is over $200,000. No injuries occurred as a result of the incident.

BSEE INVESTIGATION
Due to COVID-19 Restrictions and protocal, the Bureau of Safety and Environmental Enforcement (BSEE) Incident Follow-Up (IF) efforts were delayed until December 1, 2021. On December 1, 2021, BSEE Houma District Investigators began an Incident Investigation at an Oil States facility in Houma, LA. During this initial IF Inspection, BSEE witnessed the teardown of the failed aux winch from the Front Runner facility, photographed the condition of the aux winch components, and conducted interviews. There were several companies in attendance including the following: Oil State’s Technical Support Manager (TSM), Representatives and Crane Mechanics (CM) from Sparrows (the crane's service company), the Senior District Sales Manager (DM) from the winch manufacturing company (Braden Paccar), and Murphy representatives including the Front Runner Offshore Installation Manager on the date of the incident.

During the teardown inspection, BSEE noted multiple areas of damage including: primary planetary gears, carrier and shaft, the output planetary gears and shaft, output planetary carrier, and output sun gear. The ring gear was also found to be sheared lengthwise into six separate segments. While inspecting the ring gear, the following information was found permanently marked on the outer surface: serial number-0201616, 4/18/05, 9/18/09, and 8/18/14. The Oil State’s TSM and Sparrows CM reported to BSEE that the dates that were marked on the ring gear were the previous magnetic particle inspection (MPI) dates. The Oil State’s TSM reported to BSEE that he would provide the associated bulletins regarding the markings.

BSEE investigators interviewed the Sparrows CM, he reported that he assembled, inspected, and certified the aux winch prior to its installation on the Front Runner on December 28, 2020. The Sparrows' CM and Oil State’s TSM reported to BSEE Investigators that the sprag clutch present in the aux winch at the time of the teardown was an upgraded part and was not the same sprag clutch that was installed when it was certified. The Sparrows' CM and Oil State’s TSM both stated that the upgraded sprag clutch had a retainer spring around the cams that was not present on the sprag clutch initially installed. The Sparrows' DM confirmed the newer sprag clutch had not been made available until March of 2021. This indicated to BSEE Investigators that the sprag clutch may have been changed at some point between the installation of the aux winch and its failure. BSEE Investigators asked the Sparrows' CM, DM, and Oil State’s TSM about the possible causes of sprag clutch and ring gear failures. All three representatives reported shock loading and overloading the crane as possible causes.

During the inspection, BSEE Investigators observed an oil sample being taken from the aux winch. Murphy reported that the oil sample would be sent off for analysis. BSEE Investigators requested Murphy provide the oil sample analysis report and sent a follow-up request later that same day via BSEE’s eWell Incident Reporting system to

document the request.

On December 6, 2021, the disassembled aux winch components arrived at Stress Laboratory in Houston, TX for metallurgical analysis. On December 7, 2021, BSEE conducted an onsite IF Inspection at the Front Runner facility. BSEE Investigators interviewed a Murphy CM and asked if the sprag clutch had been replaced as identified during the teardown inspection on December 1, 2021, by the Oil State's TSM, Sparrows CM, and DM. The Murphy CM verbally confirmed and reported that the sprag clutch had been replaced on July 15, 2021. On December 8, 2021, BSEE made the initial requests via eWell to Murphy to provide documentation of the sprag clutch replacement.

On December 23, 2021, the Conex box was lowered to the gulf floor in a safe zone away from the SPAR and subsea infrastructure and remains there today with no plans to recover. Murphy reported that they will inspect the Conex box during the next remotely operated vehicle visit. BSEE requested written information from Murphy accounting for the 32 days of work associated with lowering the Conex box to the gulf floor that has yet to be provided.

On February 23, March 7, and March 10, 2022, BSEE Investigators requested additional documents, including the west crane Cranesmart monitoring and control system logs. On April 4, 2022, Murphy representatives reported to BSEE Investigators that a load never slipped and dismissed the reporting from the Murphy CM. Murphy representatives informed BSEE that a brake test was completed as part of a Pre-Use Inspection and not because of load slippage. Due to inconsistencies, BSEE informed Murphy representatives that the irregularities would be included in BSEE's Final Investigation Report.

On April 5, 2022, Murphy submitted the Murphy CM's statement confirming the initial comments to BSEE Investigators on December 7, 2021. Murphy also submitted the following documentation associated with the purchase and replacement of the sprag clutch assembly on July 14 and 15, 2021: a purchase order document, sprag clutch shipping documents, certifications of the Murphy CO's and CM, and Job Safety Analysis (JSA) for the sprag replacement. In response to BSEE's previous request on December 1, 2021, for the oil sample analysis from the aux winch, Murphy incorrectly submitted a report for an "Internal Line Heater" sampled on February 18, 2022. BSEE Investigators replied to Murphy that the submitted oil analysis report was not the oil sample analysis for the aux winch. On April 13, 2022, a Murphy representative reported that the aux winch oil analysis was never completed and that "Due to the extensive damage to the internal components they saw no value in performing further fluid analysis…there was no water separation."

MANUFACTURER RECOMMENDATIONS BULLETINS

On December 9, 2021, the Oil State's TSM responded to BSEE's request for additional information regarding the MPI markings on the failed aux winch ring gear by providing the manufacturer's Recommendation Bulletin LIT2162 Revision 2 dated May 2004. The Bulletin states that in the two years prior, a total of five CH150A hoists failed due to fatigue or overload. The bulletin strongly recommended teardown inspections of all CH150A hoists to permit MPI of ring gear Part Number P/N 24446 while also recommending periodic teardown inspections of wear parts and MPI of ring gears based on usage category: annually-Severe Duty Category, every 3 years-Heavy Usage, every 4 years-Moderate, and every 5 years-Infrequent Usage unless oil analysis indicated more frequent teardown inspections were warranted. The Bulletin also reported that 3rd Party Metallurgical Analysis was conducted and found that CH150A ring gears met all specifications and further indicated fatigue as the mode of failure resulting from "overloads or running hoists for extended times at or above published ratings". The Bulletin also provided a MPI procedure of the P/N 24446 ring gears including permanently marking MPI dates and serial numbers using a specific engraving tool on the outside diameter of the ring gear.

According to Murphy, the Front Runner West crane is categorized as a “Moderate Usage” which does not require Monthly Inspections. BSEE Investigators were not able to verify proper categorization of the crane because Murphy did not provide requested records of crane utilization time. According to Murphy, crane time is not documented on the Pre-Use Inspection Checklist and their crane usage time is submitted to “a computer program in Houston”.

During BSEE’s research of Manufacturer’s Recommendations Bulletins, BSEE reviewed Bulletin LIT2177, correspondence letters from Braden Paccar to industry regarding a LIT 2162 Bulletin on CH150A ring gears dated April 17, 2003, March 5 and 22 2004, and Bulletin LIT2177 dated April 2004 entitled “CH150/CH175 Planetary Hoist Ring Gear Upgrade”. Bulletin LIT2177 introduced product improvement to CH150A ring gears with P/N 24446 and stated that they were being replaced in production and for service by ring gears with the P/N 105254. Bulletin LIT2177 went on to report that the new P/N 105254 ring gears replace the P/N 24446 ring gears without further modifications. According to Bulletin LIT2177, the P/N 105254 ring gears were designed to provide longer life in harsh environments and that the new ring gears became effective in March 2004.

CRANE MONITORING AND CONTROL SYSTEM

Front Runner’s West crane is equipped with a monitoring and control system (Crane System) which meets OSHA, API, ASME, ISO, and ANSI standards. The Crane System provides safety control functions for unsafe conditions such as overload, anti-two block, and high angle. During these unsafe conditions, the Crane System shuts down certain functions of the crane. According to the Crane System’s Technical Support (TS) and the Murphy provided User Manual for the Crane System, the system displays and records sensor transmissions including calibrated weight indication, boom angle, boom tip height, boom radius, and wind speeds. All logged data is able to be retrieved by downloading from the Crane System to a USB. When speaking with both COs from Front Runner on April 22, 2022, both confirmed that alarm functions of the Crane System “will notify the operator of any unsafe condition via the built in audible and visual alarms”. Both Murphy COs reported that a loud beep from a speaker will notify the CO who should be able to see the unsafe condition illuminated on a display. The TS and Murphy COs described the Crane System control functions as detailed in the user manual description as “shut-off” functions. “Overload” and “Alarm over 90%” conditions temporarily disable “winch up” and “boom down” functions on both the aux and main lines, unless manually bypassed. The TS stated when “Overload” or “Over 90% Alarms” happen that the hydraulic control valves “slam shut and do not allow for gradual slowing or stopping of loads being lifted”. The TS also explained that Dynamic Loading and rapid acceleration of the load during lifting could cause loads that would typically not trigger “Overload Alarms” in a static state to trigger alarms in a dynamic state. The TS also mentioned that a sudden stop from the “Overloads” alarms would cause shock loading.

During investigation, BSEE interviewed two Subject Matter Experts (SMEs) from Sparrows. One SME is a “Competence Lead” and member of the American Petroleum Institute Committee that assists in revisions of API Crane Specifications and the other SME is a “Technical Performance Manager”. Both SMEs stated that the shutdown function of the Crane System in alarm status during rapid acceleration/dynamic loading would cause “dynamic shock loading”. The SMEs reported that either sudden jerking of the load while lifting or abrupt stopping causes shock-loading and affects the crane structure and components. In regard to dynamic loading, they cited their observations during load tests when abrupt lowering or lifting caused spikes in the weight indicated on the dynamometer. One SME cited Annex B.3.2.3. of the 6th Edition of API Recommended Practice 2D where it mentions that “Acceleration or deceleration of the moving load is accomplished in a smooth manner”. The SME also mentioned that if a crane operator is not “smooth” it can cause some additional shocks with increase in force of the load with sudden stops and starts.

During interviews with Murphy COs, they confirmed that audible and visual alarms occur in alarm status and the display of the weight indicator turns red for “Overload alarm” and orange for “Over 90% alarm”. However, contrary to Crane System records, the Murphy CO at the time of the aux winch’s failure reported to BSEE that no audible or visual alarms occurred. The TS stated that if the alarms were logged, then the alarms were visually and audibly functional. When asked to provide record of calibration of the load cell (weight indicator) of the Crane System, Murphy was unable to provide them to BSEE. BSEE reached out to the TS, and informed that according to their records, the weight indicator for the aux line was last calibrated on 7/7/20. After the aux winch’s installation on January 8, 2021, a load test was performed on January 28, 2021, during the Offshore Crane Test Report. During the load test, the Crane System records logged the weight indicator reading 11,300 lbs. while the calibrated dynamometer (November 16, 2020) read 11,500 lbs. BSEE concludes as of January 28, 2021, the West crane weight indicator was calibrated within 2% accuracy and measuring loads 200 lbs. lighter than their actual weight. While speaking with the TS, BSEE was able to get clarification on multiple “Aux1 Load Comm Failure” alarms captured in the Crane System records. The TS explained that this alarm indicated signal interruption and was common when the wireless signal is obstructed by thick iron in between the aux ball where the sensor is located and the receiver nearer the pedestal or when the sensor is considerably below the receiver. The TS stated that backloading operations offshore would readily cause this alarm and that the signal could be strengthened by installing a “Repeater” at the Boom Tip to avoid signal interruption.

Upon review of the Crane System records for 2021, BSEE Investigators found that the Front Runner’s West Crane lifted over 95% of the Safe Working Load (SWL) on February 3, July 23, July 28, August 4, September 3, October 3, 2021. BSEE Investigators noted that on July 14, 2021, the date the Murphy CO reported load slippage to the CM, an “Over 90% Alarm” registered on the aux winch at 11,300 lbs (94% of the SWL). Crane System records captured loads exceeding 100% of the SWL on the following dates in 2021: January 20 (13,000 lbs), March 20 (12,600 lbs), April 7 (12,900 lbs), April 28 (12,600 lbs), May 12 (13,000 lbs), June 9 (12,700 lbs), June 16 (12,600 lbs), June 23 (12,200 lbs), August 11 (12,800 lbs), October 10 (12,700 lbs), October 13 (12,300 lbs), October 20 (12,800 lbs), November 3 (12,900 lbs), and on November 20 (12,100 lbs). BSEE noted during review of Crane System records from 2020, that 33 days were documented where the aux winch registered weight over 90% and 17 days of Crane Overload above 100% of the SWL. Both the Crane System records and BSEE’s requested Cargo Manifests illustrate multiple examples of overloads and shock-loading in different ways. In some cases, at the beginning of the lift, loads indicate weights over the SWL (Overload) or Over 90% of the SWL causing alarm status, then as the shutdown function of the crane’s control system disables the aux line up control as a result of alarm, dynamic loading ceases, alarms clear, and static conditions reveal that the load in fact weighed below SWL and 90% alarm settings. These examples of dynamic overloading can be differentiated from other overloading of the crane whenever “Overload” or “Over 90%” alarms trip, shutdown functions occur, and alarm status is maintained for extended periods despite static conditions caused by disabling of the aux winch line up function. In cases when alarms do not clear after shutdown functions occur, alarm status is maintained and overloading of the crane void of dynamic loading is evident. The crane incident on November 20, 2021 is an example of Crane Overload void of dynamic loading forces as the West crane was overloaded to 12,100 lbs. from 14:29 to 14:31, the moment of the catastrophic failure of the aux winch.

CRANE INSPECTION/TESTING

Records provided by Murphy showed that MPI testing was completed on November 3, 2020, prior to the assembly of the aux winch. The MPI testing report stated that the Fluorescent Fixed AC Method was utilized and that all components tested were found “Acceptable to Specification”. The Certification for Personnel Handling of the aux winch was completed on December 28, 2020, and shipping tickets document the transport of the aux winch to Front Runner on January 3, 2021. Records provided from January 8,

2021, documented the CH150A-23120-02-1 aux winch (serial number 0201616) installation on the West crane, a Nautilus 1100L Crane 5th Edition 2C Crane with a 140’ boom length (lattice)SN-080202C.

On January 27, 2021, Sparrows completed an Annual Crane Inspection and on January 28, 2021, an Offshore Crane Test Report was completed including a load test, brake test, and lube oil sample was taken. Hydraulic oil samples were reportedly taken by Murphy during the Quarterly Crane Inspections on April 26, 2021, July 30, 2021, and October 10, 2021. BSEE requested documentations of the oil samples taken during the Quarterly Crane Inspections however, Murphy did not provide BSEE with requested copies of analysis.
BSEE Investigators found from documents provided, Monthly Crane Inspections were completed within the calendar year 2021 in February, March, May, June, July, August, September, and December. During these Inspections, brake tests were documented as having been completed with no indication of failure. For the months of April, October and November of 2021, Murphy did not provide/submit records of the monthly crane inspection.

JOB SAFETY ANALYSIS
Murphy provided BSEE with a JSA dated November 20, 2021 and titled “Offload and Backload Grocery Boat”. The Cargo Manifest requested by BSEE for November 20, 2021, listed a total of 27 lifts to be made from the OSV “Canyon Runner”. It included 14 tote tanks of chemicals including hydrate inhibitor and asphaltene inhibitor typically utilized for daily production operations that weighed approximately 3,500-4,500 lbs. each and three cargo boxes weighing 7,000-9500 lbs. each. The weather report from Murphy during the duration of crane use that day forecasted the sea state ranging from 1-3 feet and winds at 15 mph.

A copy of the Nautilus Model 1100L Load Chart sent to BSEE Investigators provided by Murphy listed sea state conditions of 3 feet and 6 feet seas for Boat to Deck Lifts with the SWL for the aux winch/hoist to be 12,014 lbs. at all boom angles. Records from the Crane System provided by Murphy indicate that the Murphy CO set the “Aux Load Max Load Capacity” setpoints/alarms of the aux hoist correctly at 12,014 lbs. prior to beginning offloading of the OSV. Murphy documents verified that the certified Murphy CO at the time of the incident completed a Pre-Use Inspection of the West crane prior to beginning offloading.

Crane System records reviewed by BSEE Investigators indicate that on November 20, 2021, a Pre-Use Inspection was completed and lifts began around 13:30. Approximately 14 lifts were successfully completed before the failure of the aux winch. Prior to the last lift the highest weight indicated was 7,000 lbs. The West crane was shutdown at approximately 14:38 and at approximately 14:39, the Crane System records indicate a weight of 12,100 lbs. tripped an “Overload” alarm. The crane remained in the “Overload” status for 1 minute and 44 seconds with a static weight of 12,100 lbs. when the aux winch failed.
The Cargo Manifest for November 20, 2021, requested by BSEE listed the Conex box that was being lifted at the time of the aux winch failure as 8,300 lbs. BSEE noted that during investigation of the Crane System records for November 20, 2021, that with the exception of the reportedly 8,300 lbs cargo box, all logged weights of lifts were consistent with manifested weights. The heaviest lift listed on the Cargo Manifest for that day is listed as 9,500 lbs. and the greatest weight lift on the Crane System records indicated on November 20 was 7,000 lbs.; 20 minutes and 4 completed lifts prior to the aux winch failure.

SAFE WORK PRACTICES
Murphy’s Safe Work Practice (SWP) Element 6 entitled “Crane-Lifting Operations Standard”, page 17, states that it is required that a load not exceed the dynamic and/or static capacities of the lifting equipment. On page 20 Murphy states that lifts

above 95% of rated capacity are strictly prohibited. The SWP also states that lifts greater than 75% of the Rated Capacity are categorized as “Critical Lifts” and “Heavy Lift” as greater than 75% of the rated capacity (per the load chart) of the crane hoist. On page 19, Murphy requires “Heavy Lifts” to consist of all the items required for a Quarterly Inspection including a load test to the expected weight of the lift (never to exceed crane capacity). On page 25 of the SWP, it states Quarterly Inspections should include: a brake test, visual inspections of the oil sample from each hydraulic hoist for quality of oil and presence of metal, sending both engine and hydraulic oil samples to the lab for analysis, and a completion of a Hook Inspection Report.

Despite numerous “Heavy Lifts” during 2021, Murphy was did not produce documentation verifying compliance with SWP “Heavy Lift” requirements. On page 8 of the SWP, it states that following a crane overload, Murphy will inspect the equipment equivalent to an Annual Inspection. Documentation of compliance with Murphy’s SWP on “Heavy Lifts” was not provided to BSEE as of June 8, 2022.

Murphy’s SWP defines Dynamic Loading as “loads introduced into the machine or its components due to accelerating or decelerating forces”. The API Specification 2C defines Safe SWL as “the maximum rated load within crane rated capacity for the given operating conditions”. Overload is defined by Sparrows documentation as “a load above the SWL” and shock-loading “can occur in any situation where the load on the crane suddenly increases or decreases”.

OPERATOR REPORT AND 3RD PARTY ANALYSIS REPORT

On January 28, 2022, Stress completed a metallurgical analysis of the aux winch components and submitted an examination report entitled “Murphy Front Runner Crane Winch-Braden CH Series of Planetary Hoist 2nd Edition SN-0201616”. Stress concluded that the crane winch suffered a catastrophic failure of the ring gear resulting from multiple fatigue cracks that caused the ring gear to fracture into six separate fragments. BSEE Investigators identified substantial evidence of fatigue caused by multiple overloads or shock-loads supporting Stress’s conclusion that multiple fatigue cracks caused the ring gear to fracture.

On February 3, 2022, Murphy submitted a “Learning From Lessons-Winch Gear Failure” (LFL) Report. Murphy listed several Key Causal Factors of the Winch Gear failure including “Improper Practice or Short Cutting” by utilizing the 1100 crane aux line to lift loads exceeding the 12,000 lbs. (12K) SWL. BSEE Investigator’s review of Crane System records listed a significant timeline supporting Murphy’s claim of overloading the West crane by utilizing the aux line instead of the main line. The LFL document lists Key Causal Factors associated with the following: “Equipment/Tools Defective or Damaged-Ring Gear Failure due to Fatigue Cracks”, “Inadequate Maintenance Based on Service Bulletin LIT2177" from Braden dated April 2004 entitled “CH150/CH175 Planetary Hoist Ring Gear Upgrade”, and “Inadequate Inspection of Good Receiving Possibly Improper Magnetic Particle Inspection”. Through inspection of crane records, BSEE Investigators were able to verify compliance with Revision 2 of Bulletin LIT2162 released after Bulletin LIT2177. Revision 2 of LIT2162 also proved through metallurgical analysis that ring gears P/N 24446 were not defective and verified that information found permanently marked on the outer surface of the shattered ring gear of the failed aux winch during the teardown inspection on December 1, 2021, exhibited proper MPI testing frequency and compliance. Proper MPI is also verified through documentation of MPI Testing on November 3, 2020 prior to the assembly of the aux winch. Therefore, the BSEE Investigation does not support Murphy’s conclusion that Inadequate Maintenance and improper MPI were key causal factors. Murphy LFL report also concluded that a suitable monitoring process ensuring workplace compliance was needed as well as review/revision of Crane Policies. The BSEE Incident Investigation identified multiple examples of Murphy’s failure to comply SWP’s associated with Crane Lifting Operations Standards. As of June 8, 2022, Murphy has not presented evidence

supporting revision or review of crane policies.
The Murphy LFL report lists “Manifesting of weights” as a key causal factor and offers an explanation in the “Corrective Actions” section stating they (Murphy) are “in progress” of beginning a procedure where they plan on updating cargo manifests to show weight limits for the platform aux lines and flagging each item that is over the limit on the vessel with red flagging on the d-ring of the sling. On April 21 and 22, 2022, BSEE Investigators spoke with both Murphy Front Runner COs who reported that procedures have not changed.

Murphy has not provided documentation of future training implementation. Murphy listed “Inadequate Training or Competence” regarding crane operator skills and knowledge with the Crane System and identifying alarms and downloading data. BSEE Investigators were able to verify through interviews with a Murphy HSE Team Lead and Murphy Front Runner CO’s that as of June 8, 2022, no additional training has been provided to the Murphy Front Runner CO’s.

CONCLUSIONS
BSEE Investigation including review of Front Runner West Crane System records indicate that Murphy COs are utilizing the West crane to lift loads that are too close to the limitations set by the Load Chart. Therefore, the BSEE Investigation Team concludes that the West crane aux winch was subjected to substantial overloading and shock-loading resulting in the sprag clutch and ring gear failure. Dynamic Loading and acceleration of loads must be considered when choosing the aux or main winches for lifting operations. Crane records indicate that no such consideration is being taken. The BSEE Investigation also concludes that the Cargo Manifest for November 20, 2021, showed an incorrect weight for the Conex box and that the Conex box was improperly manifested. In cases of overloading caused Dynamic Loading of the West crane, it is concluded that shock-loading would have also occurred due to rapid closure of the hydraulic control valves initiated by the shutdown function of the crane monitoring and control system. Between the installation of the aux winch on January 8, 2021, and July 15, 2021, Murphy overloaded the crane beyond its SWL eight times with multiple incidents of shock-loading. By the end of 2021, Murphy had overloaded the west crane 14 times including the failure of the critical aux winch that warranted reporting due to overload at the moment of failure on November 20, 2021.

18. LIST THE PROBABLE CAUSE(S) OF ACCIDENT:

Equipment Failure caused by the weight capacity of the West crane being exceeded when lifting the Conex box, causing the aux winch to fail due to overloading and shock-loading of the crane.

19. LIST THE CONTRIBUTING CAUSE(S) OF ACCIDENT:

Human Performance Errors, inadequate knowledge of equipment operation, labeling the cargo manifest with the wrong Conex box weight, and lack of personnel training

20. LIST THE ADDITIONAL INFORMATION:

The Crane System User Manuel and the TS as well as both Murphy COs report on the immediate loss of control functions caused by Crane System alarm status. The Crane System control is designed to rapidly close hydraulic control valves which causes shock-loading that could be prevented by more gradual closure. SMEs and the BSEE have also identified that loss of crane functionality due to alarm status creates additional hazards in limiting reaction time in a state of emergency. The Crane System design currently allows for a bypass to be performed in order to restore crane functionality when in alarm status. However, the BSEE and SMEs agree that this would hinder reaction time in an emergency situation leading to more serious consequences. BSEE therefore recommends further evaluation of the current Crane System.

21. PROPERTY DAMAGED: NATURE OF DAMAGE:

Offshore Service Vessel "Canyon Runner"- $16,894.97, new aux winch cable/wire rope- $3,000, load cell-$3,000, aux winch brakes- $9,000, new aux winch-$70,000, head ache ball-$18,000, stinger-$3,500, conex contents-$81,200= $204,594.97

The Offshore Service Vessel "Canyon Runner" was damaged when the Front Runner West crane's aux winch failed and a conex box struck the OSV. The aux winch failed due to overloading and shockloading of the crane as well as inadequate inspection.

ESTIMATED AMOUNT (TOTAL): **$205,000**

22. RECOMMENDATIONS TO PREVENT RECURRANCE NARRATIVE:

BSEE Houma District has no recommendations for the Office of Incident Investigations at this time.

23. POSSIBLE OCS VIOLATIONS RELATED TO ACCIDENT: **NO**

24. SPECIFY VIOLATIONS DIRECTLY OR INDIRECTLY CONTRIBUTING. NARRATIVE:

None

25. DATE OF ONSITE INVESTIGATION:

07-DEC-2021

26. INVESTIGATION TEAM MEMBERS:

Bruce Crabtree / Brandon Dunigan /

27. OPERATOR REPORT ON FILE: **YES**

28. ACCIDENT CLASSIFICATION:

MAJOR

29. ACCIDENT INVESTIGATION PANEL FORMED: **NO**

OCS REPORT:

30. DISTRICT SUPERVISOR:

Amy Pellegrin

APPROVED DATE: **28-JUL-2022**