

*California State Lands Commission*

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# **Safety and Oil Spill Prevention Audit**

## **Platform ESTHER Dos Cuadras Offshore Resources (DCOR)**



**February, 2010**

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## **EXECUTIVE SUMMARY**

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### **Platform Esther Safety Audit**

The objective of each Safety Audit is to ensure that all oil and gas production facilities on State leases or granted lands are operated in a safe and environmentally sound manner complying with all applicable federal, state and local laws, rules, regulations, and codes, as well as industry standards considered good engineering practice.

The safety audit of DCOR's Platform Esther was conducted from April 2009, through November 2009 with the final report being issued in February 2010.

#### ***Background***

DCOR LLC is a privately owned company categorized under Oil and Gas Exploration and Development, located in Ventura, CA. The company was established in 2001 and incorporated in Texas. Currently the facility is producing approximately 290 Bbl. /day of oil, 3800 Bbl. /day of water and 80 MCFD of natural gas. After processing oil is transported via DCOR's 3-1/2" subsea pipeline, which ties into Chevron Pipeline Company's 8-inch gathering line in Seal Beach. Produced water is separated on Esther and receives additional treatment to make it suitable for reinjection for enhanced recovery. Currently most of the produced gas is consumed by the two 250kW micro-turbines to reduce utility power consumption on the platform.

#### ***Safety Audit Results***

The facility was found to be in generally good operating condition except where noted by specific action items listed in the Action Item listing contained in the report. Both operations and maintenance appear to be performed in a safe and workmanlike manner consistent with applicable standards and codes. Firefighting and other emergency and spill response equipment were also observed to be maintained in good working order. Personal protective equipment was readily available and conscientiously used with company safety programs in place and functioning. The facility control and safety shutdown systems also appeared to be compliant with both MRMD regulations and API RP 14C.

The safety audit revealed 134 action items, none of which were considered a Priority One Action Item. Establishing a robust tank and vessel inspection program is the one area identified in the audit that could afford DCOR opportunity to improve safety and reliability. Four of the eight Priority Two Action Items resulted from tank and pressure vessel inspection issues. The following table shows the Priority level and the nature of the Action Items:

<b>Action Item Priority</b>				
	<b>1</b>	<b>2</b>	<b>3</b>	<b>Amount</b>
Admin	0	1	7	8
EFI	0	4	48	52
Elect	0	2	55	57
Tech	0	1	16	17
<b>TOTAL</b>	<b>0</b>	<b>8</b>	<b>126</b>	<b>134</b>

Equipment Functionality and Integrity issues accounted for 52 of the 134 Action Items or about 39 percent. These items typically relate to inaccuracies within the P&ID's, hazards pertaining to equipment /facility or inspection records that are missing. Technical issues accounted for 17 of the 134 Actions Items or about 13 percent. These items typically relate to issues with the pipelines or operating system.

Electrical items accounted for another 57 (42 percent) of the 134 Action Items. This was comparable to results observed for similar facilities. New electrical equipment has recently been installed on Platform Esther to allow for the new wells to be added to production. The electrical work was observed to adhere to requirements of the National Electric Code (NEC) and California Electric Code (CEC). The remaining 6 percent were all considered administrative items relating to required plans and manuals.

**Conclusion**

DCOR's Platform Esther was found to be in overall compliance with applicable regulations, codes, standards and MRMD regulations. There were 134 action items identified in this audit versus 160 items identified in the last audit.

This assessment indicates there are opportunities to improve the overall effectiveness of the facility planned maintenance program. As mentioned previously a robust tank and vessel inspection program would provide measurable benefit. In particular, some of the items identified in this audit relating to tank and vessel inspections were repeats from the prior audit that were never completed.

Throughout the audit, DCOR personnel were very cooperative and demonstrated responsiveness, when action items were identified. When all Safety Audit Action Items have been fully addressed, DCOR's accident and spill prevention will be commensurate with similar offshore production facilities along the coast.

# ***Introduction***

## **1.0 INTRODUCTION:**

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### **1.1 Safety Audit Background:**

The California State Lands Commission (CSLC) Mineral Resources Management Division (MRMD) staff is conducting detailed safety audits of operators and/or contractors for lands in which the State has an interest. The objective of these safety audits is to ensure that all oil and gas production facilities on State leases or granted lands are operated in a safe and environmentally sound manner and comply with Federal, State, and local codes/permits, as well as industry standards and practices. The MRMD staff is tasked with providing for the prevention and elimination of any contamination or pollution of the ocean and tidelands, for the prevention of waste, for the conservation of natural resources, and for the protection of human health, safety and property by sections 6103, 6108, 6216, 6301, and 6873(d) of the Public Resources Code (PRC). These PRC sections provide authority for MRMD regulations as well as the existing inspection program and the safety audit program that augments it.

The Safety Audit Program was developed in response to PRC 8757 (a), which originated from the Lempert, Keene, and Seastrand Oil Spill Prevention Act. This legislation considered existing oil spill prevention programs inadequate in reducing the risk of significant discharges of petroleum into marine waters. Marine facilities were specifically required to employ best achievable technology or protection and the CSLC was required to regularly inspect all marine facilities and monitor their operations and their effects on public health and safety, and the environment and regulations. The Safety Audit Program was established, as a result, to augment the existing platform inspection program, further preventing oil spills and other accidents. The Safety Audit Program augments prevention efforts by way of a thorough review of design, maintenance, human factors, and other evolving areas. The Safety Audit Program enhances prevention efforts through a review of facility siting, maintenance, human factors, and other evolving areas.

The MRMD uses five teams, each with specific focus, to conduct the safety audit. The five teams systematically evaluate the facilities, operations, personnel, and management from many different perspectives. The five teams and their areas of emphasis include:

- 1) Equipment Functionality and Integrity (EFI)
- 2) Electrical (ELC)
- 3) Technical (TEC)
- 4) Administrative (ADM)
- 5) Human Factors (HF)

Each team reports progress and findings periodically throughout their audit evaluations. For each of the teams appropriate company contacts and resources are identified. Each team records findings on an action item matrix for its area with recommended corrective actions and a priority ranking for the specified corrective action.

The audit report highlights the findings of each team and the most significant action items on a system by system basis that helps avoid duplication of finding presented by the

various teams it also includes the complete matrix of action items. Draft copies of the audit report and the matrix of action items are provided to the company periodically throughout the audit. The final audit report is provided to company management during a formal presentation of the results. The presentation affords the opportunity to discuss the findings and the corrective actions proposed in the final report. The MRMD continues to assist the operator in resolving the action items and tracks progress of the proposed corrective actions. Adjustments to the inspection program are then made based on the Safety Audit.

This program could not be successfully undertaken without the cooperation and support of the operating company. It is designed to benefit both the company and the State by reducing the risk of personnel or environmental accidents, damage, and in particular, oil spills. Previous experience shows that the safety assessments help increase operating effectiveness and efficiency and lower cost. History has shown that improving safety and reducing accidents makes good business sense.

## **1.2 Platform Esther History:**

Platform Esther is an offshore oil and gas production facility operating within the boundaries of the State of California in the Belmont Oil Field. The facility is located approximately 1.5 miles offshore of Seal Beach, California on State Oil and Gas Leases PRC 3095.1 (Parcel 16A) in thirty-eight feet of water. Initial production began in September 1965 on a manmade island. A total of ninety wells were drilled. In January 1983 a winter storm struck, which washed away the island and facilities, leaving only well casing above the ocean surface. Fabrication of a new platform began later that same year, and was installed in 1985. At that time, all but the current twenty-one wells being used were plugged. Production testing began in May of 1991. Offshore processing facilities were placed on line in late 1995 that dehydrate the oil onboard the platform and reject the produced water, so that sales quality oil is shipped directly to Chevron pipeline from platform. Platform Esther is a permanent, fixed base, sixty four-slot drilling and production platform. The field is currently producing approximately 500 barrels of oil per day (bopd), 7500 barrels of water per day (bwpd), and two hundred fifty thousand cubic feet per day (150 MCFD) of natural gas. There are thirteen active wells producing oil and gas and four wells used for water injection. Platform operations are continually manned by a daily complement of ten personnel, five personnel per twelve hour shift. The field foreman is responsible for the operating personnel on the platform. Visitors and contract personnel vary as to platform operations and maintenance. Dos Cuadras Resources Offshore (DCOR) is owned entirely by Castle Peak Resources, LLC, and a Texas LLC, which in turn is owned entirely by Crescent Resources, LLC, and a California limited liability company. All of these limited liability companies are 99% owned and controlled by Mr. William M. Templeton.

## **1.3 Platform Esther Description:**

The primary purpose of Platform Esther is to recover and process oil production which is marketed to Conoco Phillips via Chevron Texaco pipelines. Natural gas is sold to Breitburn

Energy for final processing and sales. The platform consists of two primary decks, a Mezzanine area between a portion of these two decks, two small sub decks and a lower level for boat access and diving operations. For the purpose of this report the decks will be referred to as follows: The upper primary deck is the Drilling Deck which houses the diesel crane, rain water storage tanks, chemical and maintenance equipment storage area, spill booms, and various other equipment to support drilling / workover operations. The lower primary deck is known as the Production Deck and is separated into two sections by a firewall. The South side of the Production Deck houses the well bay which includes the production and injection wellheads and their flow lines, and the Production Deck also contains the process tanks, pressure vessels and pumps. The North side of the firewall of this deck contains the control room, welding shop, electrical switchgear, motor control center and other equipment required to support platform production operations. The North and South Sub Decks, located just below the Production Deck, contain waste collection tanks and pumps that are used to capture and separate hydrocarbon fluids recovered from process and gravity drains, including rainwater. The lowest level or boat access deck is referred to as the Dive Deck. The Dive Deck is located just above the water level and consists mainly of grated walkways around the majority of the platform perimeter. It is utilized mainly as a crew boat landing area where personnel are transferred on and off the platform, an area for diving operations allowing inspection of the platform legs and under structure, and provides access to actual wellhead valves.

There are currently 13 active producing wells and 4 water injectors. The production wells are identified in two series, the 100 and the 200 series wells. Produced fluid is pumped to the surface using variable speed downhole electrical submersible pumps (ESP). The field has been produced under water flood since the 1960s and water cuts are typically high. The produced fluid is pumped directly into the gross oil three-phase separators V-5 and V-6, operating in parallel, where the produced oil, water and gas are separated. There is a third gross oil three-phase separator (V-7) but it is typically used as the oil "well clean" separator. The free oil leaving the gross separator is sales quality, and no further treatment is needed. There are two test separators utilized on the platform, V-1 and V-2, in which wells selected for test are manually routed. Typically the 100 series wells are lined up to V-1 and the 200 series wells to V-2; however, they can be switched and often are to verify test results. Oil and water separated in the tester is commingled and reintroduced into the main production stream before the gross oil three-phase separators. After metering, the oil is then transferred to the shipping tank and pumped to shore via the 3" wet oil line where it ties into the Chevron Texaco oil pipeline.

Produced water which is recovered from the gross separator requires additional treatment through a series of vessels which progressively de-oil and filter the water so it is suitable for injection.

The first process vessel is the Surge Vessel (V-201) which dampens flow surges from the oil plant and is the first step in removing residual oil from the water. Next is the Flotation Cell (V-202) which is fed by the Surge Tank and Flotation Cell Pumps (P-202 A/B). The Flotation Cell removes the bulk of the residual oil and some suspended solids. It operates by using an eductor-dispersion system to mix gas from the vessel head space with the produced water. This water-gas mixture goes into the vessels riser-tub-pack where the bubbles coalesce. The bubbles form a foamy froth which is removed by periodic skimming. The water

then flows to the Filtration Vessel (V-204), which is a walnut shell filter, to remove the bulk of suspended solids and trace oil. From the filtration vessel the water enters the Guard Filters (F-204 A/B), which polish-filters the water. From the guard filters the water enters the Pump Surge Vessel (V-206). The pump surge vessel dampens flow surges and enables smooth flow control of the Produced Water Injection Pumps (P-207 A/B/C). Potable water is supplied to the platform through a 4" pipeline from shore.

The gas collection system collects low pressure gas from the wells and separated and recovered gas from the oil and water plants process vessels. Collected gas then flows to the Suction Scrubber (V-302A) which is used to remove slugs of fluid from the gas stream before it reaches the gas compressor skid. Liquids separated from the gas by the scrubber are reintroduced back into the produced fluid stream before the dehydration process. The gas compressor discharges gas to the sales gas header and provides make-up gas to the oil and water plants. The flow of sales gas is recorded by a local flow recorder before it is sent to shore via the 10" sales gas pipeline to shore.

The produced water is injected into wells as part of an enhanced oil recovery system. The injection wells receive high pressure polished filtered water from the water plant. The water is injected downhole at a depth of about 4,500 feet into flood zones.

***Equipment  
Functionality &  
Integrity***

## 2.0 EQUIPMENT FUNCTIONALITY & INTEGRITY AUDIT:

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### 2.1 Goals and Methodology:

The primary goal of the Audit Team was to evaluate the design, physical condition and maintenance of the facilities on Platform Esther as well as reviewing the supporting documentation. This was accomplished through a series of inspections that included the verification of Process Flow Diagrams (PFDs), Piping and Instrumentation Diagrams (P&IDs), and other key diagrams and plans. The design review focused on process safety, emergency shutdown systems, pressure relief and vent systems, combustible gas detection systems, fire detection and suppression systems, spill prevention systems, and spill response equipment.

The focus of the electrical audit was to evaluate the electrical systems and operations to determine conformance with California Electric Code (CEC) and established industry standards. The drawings used to conduct the Electrical Audit included the Electrical Single-lines and the Area Classification drawings for Platform Esther. The layout of the audit finding in this report is organized by system or category for the convenience.

### 2.2 General Facility Conditions:

2.2.1 Housekeeping: The Platform Esther Audit was conducted while drilling operations were in progress on the platform. In addition to the drilling rig and related component equipment, housing and galley facilities were installed for Neighbor's Drilling Company personnel. Contract galley personnel were utilized to prepare meals as well as to maintain sleeping quarters and restrooms. Restrooms, located on both the Drilling Deck and Production Deck, were found to be well maintained with no obvious health or sanitation concerns. Since space was at a premium, tubular goods and other materials were tightly stored on the Drilling Deck with some surplus material stored on the Production Deck out of necessity. DCOR provided an adequate number of clearly marked refuse containers and stressed the importance of good housekeeping at drilling crew changeovers. No noticeable debris was observed on the platform.

2.2.2 Stairs, Walkways, Gratings, and Ladders: All stairs, walkways, and gratings appear to be of a safe design and construction. These structures afford access to maintain and operate equipment throughout the platform. Safe work practices are utilized to address ladder safety.

2.2.3 Escape / Emergency Egress / Exits: Escape routes, emergency egress and exits all seemed adequate for Platform Esther. Safe briefing areas are indicated in the Station Bill and discussed in detail at during platform orientation. In the event of an emergency, personnel will be directed by intercom to report to the appropriate safe briefing area based upon the location of the emergency and/or wind direction. Windssocks are located for maximum visibility and appeared to be in serviceable

condition. Emergency lighting is in place and functional in the control room, galley and motor control centers. Emergency evacuation of the platform would likely be by crew boat with evacuation by helicopter as an option. The one concern identified, due to drilling operations taking place, was that a Medi-vac helicopter would have difficulty landing due to space limitations around the helipad. DCOR agreed and adopted a procedure whereby platform personnel would contact the Coast Guard in the event that a medical emergency would require helicopter evacuation.

2.2.4 Labeling, Color Coding & Signs: The design, application, and use of signs and symbols within the facilities define the specific hazards to workers and/or public. All employees are instructed on what the signs indicate and what if any special precautions are necessary to perform their task safely. Physical hazards such as tripping hazards are identified with yellow coloring and fire protection equipment in red. Tanks and vessels throughout the platform were clearly identified as confined spaces with warning placards posted at the manhole entrance points to warn personnel of potential hazards.

Several action items were issued relating to labeling and signs. The posted illustration showing platform layout and required firefighting information and gas detection points still utilized an old Unocal plot plan with one color scheme makes it hard to understand the drawing. Two deficiencies (EFI 2.21 & 2.22) were issued as a result. The deficiencies call on DCOR to update the plot plan and properly color code both the firefighting information and gas detection points for clarity and improved readability. Another action item (EFI 2.26) was issued due to the manual ESD stations lacking visibility and subsequently blending in with their background. It was observed that ESD station signs were labeled with ¼" lettering while 1-1/2" lettering was used for Fire Alarm and Abandon Platform signs. Replacement signs with the larger lettering were requested for all ESD stations. Additionally contrasting paint schemes were suggested to more readily identify solitary ESD stations. The GAI-Tronics Paging Stations had multiple paint schemes added over time. An action item (EFI 2.27) was issued to standardize the paint scheme for quick recognition by contractors and visitors. Lastly there was no sign posted on the platform for the general public that listed the contact phone number(s) to be called in the event of an emergency. An action item (EFI 2.28) was issued to post emergency phone number(s) so that they can be easily read by boaters/general public.

2.2.5 Security: Platform Esther has both physical and operational security measures in place to prevent unauthorized entry. The platform is manned twenty-four hours a day, seven days a week with at least two operators present at all times. There is a limited route of access from the boat landing, and restricted access signs are posted and are visible from all sides. Entry of authorized personnel to the platform is further controlled and monitored by authorization to board the crew boat at its shore side departure points. Deck hands on the crew boat are instructed to check the credentials including swing rope certification of personnel that they do not recognize.

2.2.6 Hazardous Material Handling and Storage: The storage of flammable and combustible liquids on Platform Esther appears to conform to both Cal-OSHA and

NFPA 30 standards. Material Safety Data Sheets (MSDS) are available for each hazardous substance on location and can be found inside the Control Room. Chemical and diesel storage on the platform appears to be properly located and protected against external damage and leaks. Bulk chemical totes have proper labeling and adequate containment in the event of a spill.

## **2.3 Field Verification of Plans:**

2.3.1 Process Flow Diagrams (PFD): A Process Flow Diagram (PFD) was provided by DCOR, and a full size hard copy PFD, which DCOR was not aware existed, was found on the platform. This full size PFD, which was well designed and color coded, was scanned and forwarded to DCOR. Both versions will require some updating (EFI 2.29 – 2.32); however, DCOR will only be required to update the version of the PFD that they prefer to use.

2.3.2 Piping and Instrumentation Diagrams (P&ID): Field verifications of the P&ID's were performed for Offshore Platform Esther. These drawings are reasonably accurate, but do require updating. Although P&ID's, marked as red line copies, were kept in the Control Room, changes had not been recorded on these drawings. Discrepancies noted in the P&ID's included: sizing errors in valves and piping connections, erroneous set points, piping changes and equipment that has been removed but is still shown. (EFI – 2.00 thru 2.20 and 2.33)

2.3.3 Electrical Area Classification Drawings: Drawings for the electrical systems were reviewed by an outside electrical engineering contractor to verify system safety. The contractor found that Platform Esther Electrical Area Classification drawings require some updating to show recently installed equipment. (ELECT 4.01 & 4.02) Additionally, one deficiency (ELECT 4.03) was issued because no platform elevation drawing was received to show the vertical extent of any potential hazard between the drill deck and the well bay. Two sets of electrical single-line drawings were received. The first set showing the existing facility and the second covering the well expansion project. Both were used in the review of platform facilities. Small discrepancies between the drawings and physical inspection are noted in the matrix (ELECT 4.07 & 4.08). The drawing sets taken together are generally representative of the electrical power system. Following completion of the well expansion project a single comprehensive set of as-built drawings should be incorporated.

2.3.4 Fire Protection Drawing Verification: The Fire Pump System for Platform Esther was reviewed along with the Platform Station Bill. No discrepancies were noted in either. Emergency Evacuation Plans were also available and reviewed in conjunction with the aforementioned. Under MRMD requirements the firefighting system is maintained in operating condition in accordance with the National Fire Protection Association (NFPA) standards.

## 2.4 Condition and Integrity of Major Systems:

2.4.1 Piping: The overall condition of process piping on Platform Esther appears acceptable although the lack of consistent application of the maintenance program is beginning to show. There were several instances where temporary or improper pipe supports were being used. (EFI 3.03 & 3.04) In other instances, temporary pipe clamps were observed on the bypass lines of all three gross production separators. (EFI 3.05 – 3.07) Suitable and timely permanent repair still appears to be an ongoing problem. Mild to moderate corrosion observed on process piping was due to lack of proper coating and resulted in an action item. (EFI 3.13)

Some of the previously mentioned problems noted for the process piping were also observed in the fire water piping. Three priority three deficiencies were noted due to corrosion, improper supports and the lack of proper coating. (EFI 3.09, 3.10 & 3.12)

2.4.2 Pipelines: Esther's subsea pipelines include a 10-inch gas pipeline and a 3-1/2" oil pipeline encased in the original 10-inch oil pipeline. Both lines run to an underground vault located near 1<sup>st</sup> Avenue and Marina Drive in Seal Beach. This vault has valves that can isolate both pipelines and also houses the pig receivers.

A review of pipeline operating practices resulted in several action items including one Priority Two Action Item. Chevron Pipeline Company lowered the maximum allowable operating pressure (MAOP) on their onshore oil pipeline in February 2009; however, DCOR did not adjust operating limits to protect these lines and thereby incurred a Priority Two item. (Tech 5.02) As mentioned DCOR's subsea 3-1/2" oil line is encased in the original 10-inch oil pipeline, which has been nitrogen charged and serves as a de-facto leak detection system. A discrepancy was noted between the written procedures pertaining to this encased line and actual procedures employed in normal operations resulting in a Priority Three Action Item. (Tech 5.04) Additionally an action item was issued to add the pig launchers, receivers and the oil pipeline casing annulus to the Safe Chart. (Tech 5.00)

Staff concurs that the Department of Transportation (DOT) has jurisdiction of the Esther onshore gas line located upstream of the vault and DOT regulations are applicable. Because this gas pipeline runs through some of Seal Beach's most densely populated neighborhoods, DCOR was asked to re-evaluate whether a gas odorant system is needed on this gas pipeline to protect public safety and to also confirm with the DOT that the Esther gas line meets all DOT requirements. (Tech 5.01) DCOR presented their interpretation of DOT regulations pertaining to the Esther gas pipeline and is currently awaiting confirmation by DOT.

2.4.3 Tanks: Tanks on an offshore platform are to be maintained following a program of external and internal examinations based upon API RP 653. The tanks located on Platform Esther were included in a DCOR Internal Inspection Schedule showing that Tanks T-7 and T-9 would be cleaned and inspected in 2008. This had not

occurred by the time of this audit on Tanks T-7 and T-9; a Priority 2 action item (EFI 3.16) was issued to conduct visual internal inspections per the established schedule.

2.4.4 Pressure Vessels: External/internal inspections are to follow API RP 510 for inspection and internal examination. The previous audit conducted in 2005 concluded that while ultrasonic testing and some external inspections were being performed on a periodic basis, internal examination records were limited to a few vessels that routinely required clean out. There did not appear to be a systematic plan to inspect and maintain these vessels in accordance with API/ASME vessel codes, so DCOR indicated this activity would be handled by a contractor and the pressure vessel inspection program based upon API RP 510 criteria would be implemented. DCOR supplied an Internal Inspection Schedule dated January 2, 2008 to address deficiencies from the 2005 audit. All three of the gross separators were scheduled to be cleaned and inspected in 2008; however, no vessels had been cleaned or inspected at the time of this audit. At the start of this audit V-5 and V-6 both had high sand levels that interfered with the proper operation of the interface level controller. V-7 had been removed from service due to a leak in attached piping. Additionally Test Separators V-1 and V-2, as well as Shipping Tank V-301 were also overdue for internal inspections. A Priority 2 Action Item (EFI 3.02) was issued to conduct visual internal inspections per the established schedule. DCOR has subsequently cleaned and repaired both V-7 and V-6.

The safety audit has found that the maintenance, inspection and repair of pressure vessels is not occurring on a schedule as indicated by Cal OSHA regulations addressing unfired pressure vessels. Additionally DCOR is not meeting its own Spill Prevention, Control and Countermeasure Plan (SPCC), which states that pressurized Containers will be tested for integrity on a regular schedule as part of the company mechanical integrity program that is intended to follow API recommended practice.

2.4.5 Relief System: The piping for the relief vent system on Platform Esther was evaluated for condition, maintenance, and functionality. Normal venting and process upsets, which result in releases of process vapors, are directed to safe locations by means of the relief vent system. The relief vent system is designed with a flame arrestor and vent stack, it utilizes Relief Scrubber V-9 to trap and collect any liquid. The flame arrestor reduces the danger of combustion within the vent system from an external source. The system was evaluated and found to have all the necessary Pressure Safety High (PSH), Pressure Safety Low (PSL), and PSV devices

MRMD regulations require relief valves to be tested every six months. Service records were in order indicating that testing took place as required; however, there were some issues regarding the set points of the relief valves. One discrepancy was identified where a pressure shutdown (PSH) was set higher than the relief valve. (EFI 3.00) Another discrepancy was identified where the relief valve on the oil pig launcher was set higher than the maximum allowable operating pressure (MAOP) of the 3-1/2" subsea oil line. (EFI 3.01)

2.4.6 Instrumentation, Alarm & Paging: The process control system uses a combination of pneumatic, hydraulic and electrical instruments and controls. Process control includes the use of computers, PLC's and relay logic to control and interface with valves, solenoids and pump controllers. Alarms are produced from level, temperature, pressure and flow sensors advising operators of process conditions. Local annunciators or displays are then used to troubleshoot the cause of a general alarm or shutdown.

Pressure and temperature gauges are located throughout all processes on Platform Esther. A few gauges appeared to be weathered, but most were readable and functioning properly. Platform Esther technicians test and calibrate instrumentation on a regular basis. The platform's operating computers were in the process of being replaced while the audit was being conducted.

2.4.7 Emergency Shutdown System (ESD): The platform is equipped with 8 manual Emergency Shutdown (ESD) stations that will cause shut-in of all wells and pipelines as well as the complete shutdown of the production facility in the event of fire, pipeline failure or other catastrophe. MRMD regulations specify that ESD shutdowns be located at the helicopter deck and at the boat landing, and these locations are included. Additional operational safeguards include shutdowns based on pressure or level parameters. These shutdowns protect against overpressure as well as under pressure. Similarly shutdowns protect against abnormal levels. The 8 manual ESD stations on Platform Esther, along with all other pressure and level shutdowns, are tested monthly by DCOR and witnessed by MRMD personnel to verify calibration and proper operation. The ESD system was evaluated to verify compliance with API RP 14C with no problems noted.

2.4.8 Combustible Gas & H<sub>2</sub>S Detection: Platform Esther is equipped with 8 fixed gas Lower Explosive Limit (LEL) detectors. The detectors continuously monitor for the presence of combustible gas and are set to detect lower explosive level concentrations at 25%, triggering an audible alarm; in addition they automatically activate the shut-in sequences when concentrations reach 45%. These limits more than meet the required standards of 60% and 80% respectively per MRMD 2132(g) (5) (C&D). The gas detection system is tested monthly by DCOR operating personnel and witnessed by MRMD inspectors. The number and placement of gas sensors on the platform appeared adequate to protect operating personnel.

Because there is no H<sub>2</sub>S in production on Platform Esther no H<sub>2</sub>S detection is required.

2.4.9 Fire Detection Systems: Fire detection systems utilized on platforms are designed to detect fires in their earliest stages and alert personnel to the existence of a fire on the platform. The fire system utilized on Platform Esther is comprised of an ultraviolet / infrared fire eye flame detection system utilizing thirty-three detectors, which will activate the deluge system and also result in a shutdown of the platform. The fire system is set up with bypasses to allow the fire eyes to be tested monthly. Seventeen

smoke detectors are also employed in accommodation spaces such as the production office and change rooms. Facility personnel who observe a fire can activate one of Esther's fourteen fire alarms and/or manually initiate fire suppression before automatic sensing devices activate the fixed fire suppression deluge system. No discrepancies were noted.

2.4.10 Fire Suppression: Platform Esther's fire suppression system consists of a jockey pump that supplies utility water to maintain the Esther firewater header at approximately 150 psig. A 400 horsepower electrically driven vertical shaft turbine fire water pump P-8 operating on a pressure switch automatically starts if the firewater header pressure drops to 130 psig. A further drop to 110 psig will automatically start the Caterpillar diesel driven vertical shaft turbine firewater pump P-9. While P-8 is considered the primary firewater pump, P-9 can always be utilized as in the event of a power failure. Both pumps are rated at 2500-gallon per minute (gpm) supplying seawater at 169.3 psi. In addition to the two fire pumps, the firefighting system includes the distribution piping, hose stations with reels, a deluge system that protects the well bay and process equipment, and foam system. MRMD regulations require that firefighting systems be maintained in accordance with applicable NFPA standards. These standards require that flow tests to measure output and pressure be performed annually on the system components. The firewater hose stations are strategically located throughout the platform and appear accessible from other decks. Firewater hose stations appear to provide proper coverage of the target area and typically from two directions. This system is started automatically by the fire eye flame detection system or it can be operated manually. Testing of the firewater pumps are performed weekly and the deluge systems are tested monthly as required by MRMD regulations.

Dry chemical canister fire extinguishers are located strategically about the platform all and had been serviced by a third party contractor. Cal OSHA regulations require that employees receive annual training in the use of fire extinguishers, and DCOR's annual block training fulfills this requirement.

Since the design of Platform Esther's fire suppression system activates the fire pump by pressure drops in the firewater header pressure. The drop in pressure can be a critical factor. It is recommendation that DCOR include testing these two pressure switches as part of the Monthly Safety Inspection.

2.4.11 Spill Containment: Spill containment appeared to be adequate throughout the platform. Rainwater, spills and any process leaks are handled by deck drains that flow to the Waste Water Tanks located on the Sub Deck. Fluid from the Waste Water Tanks can then be pumped to the gross oil separators.

Rainwater tanks T-100 and T-101 were removed from the Drill Deck prior to the beginning of the drilling program underway at the time of the audit. These rainwater tanks were included as part of the Spill Prevention, Control and Countermeasure Plan (SPCC). Although the SPCC Plan will be addressed in the Administrative Audit, staff

recommends that DCOR evaluate the effectiveness of Esther's SPCC Plan without these rainwater tanks.

2.4.12 Spill Response: Platform Esther has a 1500-foot Expandi-boom as well as sorbent boom and sorbent pads in their oil spill response inventory. This boom can be deployed for initial containment in conjunction with the crew boat until Marine Spill Response Corp. (MSRC) arrives on location to assume coordination and control of remediation activities. Additional resources maintained on the platform specifically for spill response include marine radios and tracking flags. These are in addition to phone/fax lines, company radios and the Ship Services contracted crew boat. All of the equipment appears to be well maintained and is inventoried as part of the MRMD monthly safety inspection. Spill drills with boom deployment occur semi-annually in conjunction with MSRC.

The above mentioned equipment is required by federal and state regulations and is listed in the Oil Spill Contingency Plan (OSCP). An Oil Spill Contingency Plan is required by California Department of Fish and Game, Office of Spill Prevention and Response (OSPR) regulations and a Facility Response Plan is required by federal Environmental Protection Agency (EPA) regulations. These will be discussed in more detail in the Administrative Audit.

2.4.13 Mechanical Lockout – Tagout, Safety, and Personal Protective Equipment (PPE): DCOR has Personal Protective Equipment (PPE) Requirements that are clearly explained at all DCOR safety orientations for first time visitors to the platform. Staff observed that Safety & PPE were constant topics and continually recapped in both DCOR Safety Meetings as well as morning drilling crew turnover/safety meetings. No PPE deficiencies or infractions were observed on the platform.

DCOR conducts annual block training to cover Cal OSHA and federal requirements. Topics typically included cover CPR, First Aid, AED training, HAZWOPER update, lockout/tagout, emergency response, and fire extinguisher training.

2.4.14 Compressed Air System: Esther has two air compressors to supply platform air receiver V-3. One compressor is used continuously to provide instrument and tool air while the other compressor is maintained in standby. An air dryer is located between the discharge of the compressors and the tool air receiver to remove moisture.

2.4.15 Pump Units, Wellhead Equipment & Well Safety Systems: Platform Esther utilizes electric submersible pumps (ESP) to produce oil via the tubing while gas is produced through the casing annulus. Production wells are equipped with Surface Safety Valves (SSV) and Surface Controlled Subsurface Safety Valves (SCSSV). In addition, flow safety valves (FSV) are installed on each individual flow line upstream of the group header. The SSV's, SCSSV's and FSV's are tested monthly as required by MRMD regulations and have a history of reliability.

Injection wells are equipped with the required check valve in the flow line to prevent back flow in the event of a surface line rupture. There have been no significant problems identified with this equipment.

The standard for the production safety systems on Platform Esther is API RP 14C as required by MRMD regulation 2132(g). MRMD regulations also further modify those requirements. The API RP 14C recommended practice requires two levels of protection independent of and in addition to the control devices used in normal process operation. The SAFE chart for Platform Esther was evaluated for appropriate safety devices and adequate levels of safeguards beyond normal process control. The design of the platform was also evaluated for the elimination of hazards and adherence to safe design concepts identified in API RP 14J.

The Safe Chart review noted some omissions as well as some changes in operating practices that require updating in safety parameters. Only one injection well was shown on the Safe Chart but there are 3 injection wells (Tech 5.05) Some equipment has been removed but is still listed on the Safe Chart and should be removed from the Safe Chart (Tech 5.12) while some Safe Chart terminology conflicted with the P&ID's or operating terminal designations and should be made consistent. (Tech 5.15 & 5.16)

A review of current operating practices resulted in several Priority Three items. One discrepancy (Tech 5.03) involved the erroneous identification of both alarms and shutdowns shown on DCOR's operating computer terminal screens. Several Priority Three items were incurred because the actual set points for low and high pressure shutdown devices did not conform to normal operating pressure ranges. (Tech 5.06 – 5.10, 5.13 & 5.14)

2.4.16 Cranes: Platform Esther's main crane is a Nautilus 5071-C nominally rated at 30 Tons. There is also a Tech crane available for light loads. Maintenance is performed by a contracted crane inspection and servicing company. Records reflect both cranes were load tested prior to the commencement of Esther's drilling program. No problems were noted.

2.4.17 Electrical Power Distribution Systems: Electric utility service is supplied by Edison at 12 kV via submarine cable from shore (Edison Building). Electric service is provided under the terms of an I6 contract and includes provision for interruption of service with a 30-minute prior notification.

The service location is at the Edison 1<sup>st</sup> Street facility. The Edison disconnect supplies power to platform Esther via 1-3/C #500kcmil 15kV cable routed in below-grade conduit to a on-shore vault and then by submarine cable to the platform.

The submarine cable to platform Esther supplies 12kV electrical power to the main Switchboard (MSW-1). This switchboard lineup consists of a one main fused

disconnect switch for the 12kV supply and three branch fused disconnect switch positions supplying transformers on the platform as follows:

- The first fused disconnect position feeds a 3750/4200kVA; 12kV-2400V transformer (TX-1) located above the switchgear room and is used to supply power to the operating platform main 2.4kV switchgear (MSW-2 and MSW-3).
- The second fused disconnect position supplies the first position of a three-position SF6 sectionalizing switch (MSW-4) located above the switchgear room. The SF6 switch position 2 is a 600-amp rated RFI (resettable fault interrupter) that feeds the 2500/2800kVA, 12kV-480V transformer (TX-2), located above the switchgear room, and is used to supply power to the 480V motor control center lineup (MCC-1) in the main switchgear room. SF6 switch position 3 in a 600-amp RFI that supplies power to the 3000/3750kVA Rig transformer (TX-D).
- The third fused disconnect position is connected to a 1000/1120kVA, 12kV-480/277V transformer (TX-3) located at the southeast corner of the production deck.

Nameplate descriptions on the 12kV main switchboard (MWS-1) have not been updated for the latest changes in feeders. Provide updated nameplates identifying downstream equipment supplied from switchboard needs to be provided (ELECT 4.56 & 4.57).

At the time of the inspection the DCOR well expansion project was nearing completion. Transformer TX-3 was raised to the roof of the new expansion pump control house and the transformer secondary bus compartment modified to accommodate cables to supply both the existing MCC "AUX" building and the expansion pump control building. MC Cables from new VFDs in the building are routed through step-up transformers and in cable tray to junction boxes in the well bay. The quality of work on the expansion project thus far is excellent and meets code requirements. Still to complete is the MC Cable routing, support and connection from the J-boxes to each wellhead.

2.4.18 Emergency Generator: MRMD regulations require an auxiliary electrical power supply that provides sufficient emergency power for equipment required to maintain safe operations in the event of a power failure. Platform Esther's generator appears adequate to supply the present emergency needs of the platform. This generator powers an emergency panel that includes the fire monitors, combustible gas detection, emergency lighting, foghorn, navigation lights, general alarms and operational computers. The Uninterruptible Power Supply (UPS) is provided from a 20kW unit in the main switchgear room. This is a packaged unit complete with bypass and batteries in a common cabinet and has full load battery capacity in excess of 4

hours. The auxiliary generator is tested at minimum monthly and may be witnessed by MRMD inspectors.

2.4.19 Grounding (System and Equipment): CEC Article 250 provides the rules for power system grounding and bonding. The requirements for grounding are established to prevent or reduce the possibility of personnel injury due to shock hazards resulting from elevated touch potential as a result of improper grounding. The rules of grounding also contribute to reduction of equipment damage. Three specific types of grounding are required at the facilities; power system grounding, safety or equipment grounding, and static grounding.

System grounding is as follows:

- Transformer TX-1, 12kV-2.4kV, 3-phase, 4-wire is resistance grounded through a 400A, 10-Sec resistor.
- Transformer TX-2, 12kV-480V is high resistance grounded 5-Amp, with ground indication and alarm on the MCC-1 main switchgear room.
- Transformer TX-3, 12kV-480V is solidly grounded at the Auxiliary MCC building.
- Transformers TX-4 and TX-5 located above the main switchgear room and the 15kV transformer in the Auxiliary MCC building provide separately derived systems, for 208Y/120 Volt equipment. These transformers are solidly grounded and satisfy Code requirements for power system grounding.

Article 501-16, Bonding in Class I areas, states that all non current carrying metal parts and enclosures associated with electrical components shall be connected together, bonded, and be continuous between the Class I area equipment and the supply system ground. Bonding shall provide reliable grounding continuity from the load back to the power transformer grounding. The best way to achieve this is to include properly sized equipment grounding conductors with each set of power conductors from the source of power to each of the equipment grounding points and include bonding jumpers at points of discontinuity along the route. Equipment grounding conductors are not installed on all circuits and bonding is achieved through continuity of raceways and fittings. Equipment bonding conductors to major equipment; transformers, switchgear and the like, were installed and appeared adequate. Ground wire on well transformer T-102 was disconnected and needs to be reattached. (ELECT 4.19)

Static grounding conductors to the portable storage containers (some containing hazardous liquids) were found to be not connected (clamps not attached) on the Drill Deck and are required. Some of these containers were set on wood blocks allowing for the buildup of a static charge. (ELECT 4.18)

CEC 501-16(b) requires that all liquid-tight conduit used in a hazardous area be supplemented with either an internal or external ground bonding jumper. In the past flex conduits that have bonding included were identified with a distinctive green mark painted on the conduit. Spot check of the marked conduits confirmed bonding. Some unmarked flex conduits were spot-checked and the required bonding conductors found to be missing. (ELECT 4.16 & 4.17)

2.4.20 Wiring Methods and Enclosures: Given the harsh environmental conditions of the open sea, the overall condition of electrical equipment can be rated as good. Several locations where conduit supports were rusted or otherwise inadequate are noted in the Matrix (ELC - 3.4.1.13 and ELC – 3.4.1.19) A few missing covers, Broken and missing supports, rusted enclosures, deteriorated weatherproof gaskets and missing bolts occur to a small extent throughout the facilities (ELC - 3.4.1.14 through ELC 3.3.4.16).

Several down well ESP instrumentation boxes associated with VFD transformers were not properly secured and/or had exposed conduit entry holes not plugged (ELC - 3.4.1.21 through ELC 3.4.1.25).

Several existing MC cables feeding the submersible well pumps are routed and supported from process piping in the well bay. In some cases these cables are merely laid on the overhead piping or attached with tie wraps. These cables need to be properly supported and secured per code (ELC – 3.4.1.04).

2.4.21 Electrical Lockout – Tagout and Safety Procedures: Safety Standards (procedures) Document for the lockout/tagout/blockout program was reviewed and found to be adequate and complete.

Arc flash hazard labeling and PPE requirements are currently being updated by DCOR and were not available for review. (ELECT 4.45) Arc Flash labels have been ordered but not yet installed on electrical equipment. (ELECT 4.46)

2.4.22 Communication Equipment: Communications systems are established to provide for normal and emergency operations. Systems used for emergency communication should have battery-operated supplies good for at least four hours continuous operation as required by API RP 14F. A UPS capable of providing power for four hours supplies the communications equipment.

Communications equipment is located in the telecom room adjacent to the control room.

Incoming Service: Verizon phone service is connected through a fiber optic (FO) line that is included within the incoming 34.5kV power submarine cable from shore (Fort Apache) to Platform Eva. At Eva, the fiber optic cable is separated from the power

cables at the main interrupter switchgear in the switchgear room and routed through a FO/Ethernet converter to the platform Ethernet. A spread spectrum radio system links the telecom system at Eva to platform Esther. Communications equipment on Esther is powered through the UPS unit.

GAI-Tronics communications weatherproof handsets are located throughout the facility. The latching handles on several of the weatherproof enclosures are broken or doors missing. (ELC – 3.9.5.01 – 5.03)

A radio base station in the telecom room with a remote terminal in the control room provides radio communication with the crew boat.

**2.4.23 Lighting:** Platform Esther appears to have sufficient lighting to conduct safe operations throughout the platform. Mounted fixtures with high-pressure sodium vapor provide primary area lighting or similar type lighting is used. Control room and emergency lighting is tied into the emergency generator and is designed to operate if the platform loses its primary electrical supply.

## **2.5 Preventive Maintenance and Mechanical Reliability:**

This section gives a general evaluation of the maintenance program. This section also provides comments on specific areas of concern.

Typically a preventative maintenance plan for critical process equipment such as pumps and compressors is developed so that mechanical problems can be detected and remedied. These maintenance plans also typically include an ongoing inspection program for vessels, tanks and piping so that needed repairs can be made before any type of failure occurs. DCOR's Mainsaver Program is utilized to schedule preventative and corrective maintenance, track work order status and record costs. Establishing a more robust internal vessel inspection program is the one area identified in the audit that could afford DCOR opportunity to improve safety and reliability. DCOR has a back log of internal vessel inspections to be conducted on Platform Esther. V-7 and V-6 were cleaned and inspected and DCOR plans to move on to the other vessels.

# ***Administrative Audit***

### **3.0 ADMINISTRATIVE AUDIT:**

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#### **3.1 Goals and Methodology:**

The goal of the administrative audit (ADM) team was to verify the availability of and review the manuals, programs, procedures, and records required by Federal, State and local authorities as well as adherence to applicable industry standards. The primary emphasis of the ADM team was the evaluation of the required Dos Cuadras Offshore Resources (DCOR) Operations Manual and the Marine Facility Oil Spill Response Plan which are required by CSLC regs. A secondary effort was placed on the evaluation of other required or associated plans, manuals, policies, and documents that are needed for proper and safe facility operations. Document reviews were conducted using the latest hardcopy version of the Operating Manual, both on location and within the CSLC offices. Other manuals such as the Oil Spill Response were reviewed on the platform. Review of company policy and records were conducted at platform Esther, as well as observing the application of policies and procedures in the field.

#### **3.2 Operations Manual:**

DCOR procedure manuals were reviewed for content and accuracy. Manuals provided Included the following:

- Platform Esther Operating Manual
- Spill Prevention Control and Countermeasure Plan
- Oil Spill Response Plan

The primary copy of the Operations Manual is located in the platform control room in a location that is easily accessible to all personnel. A second manual was provided to the safety audit team for evaluation and retention by MRMD. A detailed review of the Platform Esther Operations Manual was conducted against the standards contained in the MRMD Regulation 2175. The Operating Manual followed the MRMD regulation format and was arranged in a logical manner including a table of contents, numbered pages and tabs for quick and easy access. MRMD requirements include specific information as to the equipment located within each facility, safe operating practices for the equipment, facility startup and shutdown procedures, and emergency procedures. In-depth review of these required elements determined that the content of the manual was not totally in compliance and resulted in some Priority 3 action items being generated. All Manuals need to be updated with changes that have happened to the Platform. For example the removal of tanks T100 and T101 have not been updated in the Operations Procedures manual. (ADM - 6.06)

#### **3.3 Oil Spill Response Plan:**

DCOR has an extensive Oil Spill Response Plan (OSRP) that fulfills the requirements for an Oil Spill Contingency Plan contained in the California Department of Fish and Game, Office of Spill Prevention and Response (OSPR) regulations, CCR Title 14, reg 817. The plan is also coordinated with the Federal Spill Prevention, Control, and Countermeasures (SPCC)

Plan requirements that are contained in the EPA regulations, Title 40, CFR, 112.5. The SPCC is addressed in section 5.4

The DCOR OSRP was found to be comprehensive and in a clear format. The plan contained the following significant required content:

- Facility description
- Hazards Evaluation Study and potential worst case spill scenario evaluation
- On-water containment and recovery procedures
- Shoreline protection and clean-up, and
- Response procedures.

The OSRP was thoroughly reviewed using CSLC checklists developed from the regulations to verify detailed content requirements. The oil spill response training and drill schedule were found to be up to date. Only a few minor concerns were noted within the OSRP and it was concerning the Section 5.3 - Part I, Management Approval has not been signed by management. (ADM - 6.00) and Section 5.3, Part I - Management Certification has not been reviewed or certified by a PE. (ADM - 6.01) and Section 5.3 - Drawings provided in manual are old Nuevo drawings. And Section 5.3, Part III, and G Corrosion Protection for Containers: Containers (Atmospheric and Pressurized) are tested for integrity on a regular schedule as part of the company mechanical integrity program that follows API recommended practices. DCOR's failure to properly address tank and vessel inspections puts DCOR out of compliance with their SPCC Plan. (ADM - 6.05)

### **3.4 Required Documents and Records**

DCOR has a number of regulatory agency required policies available on both the platform and at the main office. These documents include a Business Emergency Plan (BEP), Spill Prevention Control and Countermeasure (SPCC) Plan, the Emergency Response Plan (ERP) and the Safety and Health Manual. The manuals referenced are reviewed for content, accuracy and compliance with regulatory requirements.

The purpose of the BEP is to provide the local fire jurisdiction with a facility site map and a list of potentially hazardous materials and chemicals in the event of a fire or major incident. The information contained in the BEP is used by firefighters, health officials, planners, public safety officers, health care providers, regulatory agencies and other interested persons on the location, type, quantity, and the health risks of hazardous materials handled, used, stored, or disposed of by DCOR in order to prevent or mitigate the damage from the release or threatened release of hazardous materials into the workplace and environment. It also provides guidance to DCOR personnel in their response to a release or threatened release of hazardous chemicals, including evacuation procedures, maintaining an inventory of hazardous materials and provides guidance for cooperation with appropriate officials. The BEP was just recently updated with current company and operating information. A thorough review found the information to be accurate and up-to-date.

The SPCC has been prepared and implemented as required by the U.S. Environmental Protection Agency (EPA) regulations contained in Title 40, Code of Federal Regulations, and

Part 112. The SPCC plan establishes procedures, methods and equipment requirements to prevent the discharge of oil from offshore facilities into navigable waters or adjoining shorelines.

Platform Esther's ERP was developed to provide guidelines for employees who might respond to abnormal events at the platform. The ERP provides a reference for employees and contractors and for Emergency Response organizations such as the Huntington Beach Fire Department. The main focus of the ERP is to provide structure and guidance in the response actions required to effectively mitigate emergencies. The manual appears to have all the required information and is organized in a logical manner, however, there were some minor Priority 3 action items identified. The DCOR Oil Spill Response Plan Vol. 1 & 2 is not on file with the State Lands Commission. (ADM-6.07) Section 5.3, Part II, and J. 3 Quarterly visual inspections of the facility are conducted by the field foreman or his designee. Inspection records shall be retained with the SPCC Plan for a minimum of 3 years. Only one inspection from 2004 was included. (ADM-6.03)

### **3.5 Training, Drills, and Applications:**

DCOR has a policy requiring all employees, contractors and visitors to receive safety orientation training and sign-in prior to entering an operating location. This policy provides a record to be used to account for personnel during an evacuation and enhances safety awareness and accountability. This system appears to be effective.

DCOR has an ongoing training program for platform Esther personnel and contractors that includes the required regulatory training. This training includes: confined space entry, oil spill drills, hazardous communications, HAZWOPER, hot/safe work permitting, H<sub>2</sub>S, lockout / tag out, and personal protective equipment. The program appears to include all mandatory training as required by the MRMD, OSHA and the Office of Spill Prevention and Response. The training matrix appears to be well defined for each particular job description. This program appears to also be effective.

Drills, exercises, and safety meetings are conducted following an appropriate schedule. Esther personnel conduct morning safety meetings that include all persons performing work on the platform for both general and topic specific safety subjects. Training, and pre-job safety meetings are recorded and the records are retained for a predetermined amount of time. The audit team has observed that platform Esther personnel recognize the importance of PPE and that the requirements are strictly enforced. There were no action items identified regarding these safety elements.

# ***Human Factors Audit***

## **4.0 HUMAN FACTORS AUDIT:**

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### **4.1 Goals of the Human Factors Audit:**

The primary goal of the Human Factors Team is to evaluate the operating company's human and organizational factors by using the Safety Assessment of Management Systems (SAMS) interview process. The SAMS is planned to be conducted following audits of the three state lease facilities. Results of this team's work will be considered confidential between CSLC, and Plains Exploration and Production Company and will be contained in a separate report.

SAMS was developed under the sponsorship of government agencies and oil companies from the United States, Canada, and the United Kingdom to assess organizational factors, enabling companies to reduce organizational errors, reduce the risk of environmental accidents, and increase safety. The assessment was divided into nine major categories to examine the following areas (The number of sub-categories or areas of assessment for each category are included in parentheses.):

- Management and Organizational Issues (9),
- Hazards Analysis (9),
- Management of Change (8),
- Operating Procedures (7),
- Safe Work Practices (5),
- Training and Selection (14),
- Mechanical Integrity (12),
- Emergency Response (8), and
- Investigation and Audit (9).

Assessment of each of the sub-categories is derived from one main question with a number of associated and detailed questions to help better define the issues.

The SAMS process is not intended to generate a list of action items. Its purpose is to provide the company with a confidential assessment of where it stands in developing and implementing its safety culture and a benchmark for future assessments.

### **4.2 Human Factors Audit Methodology:**

The CSLC Mineral Resources Management Division will schedule the SAMS interviews with the operator's staff and sub-contractors in coming months. The assessors will evaluate the responses based on SAMS guidelines and develop a separate confidential report for the operating company. The MRMD staff will provide the confidential report accompanied by a formal presentation that summarizes the report.

# ***Appendices***

## **TEAM MEMBERS**

### **EQUIPMENT FUNCTIONALITY AND INTEGRITY TEAM**

CSLC – MRMD	Mark Steinhilber PW Lowry Daryl Hutchins
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DCOR	Mike Finch Rob Hurley Angelo Nicotera Matt Civitelli Tina Wiegman Dave Hayes Dean Mesner
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### **TECHNICAL TEAM**

CSLC – MRMD	Mark Steinhilber  PW Lowry Daryl Hutchins
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DCOR	Mike Finch Rob Hurley Angelo Nicotera Matt Civitelli Tina Wiegman Dan Armendariz Robert Johnson
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### **ADMINISTRATIVE TEAM**

CSLC – MRMD	Mark Steinhilber  PW Lowry Daryl Hutchins
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DCOR	Mike Finch Rob Hurley Angelo Nicotera Matt Civitelli Dan Armendariz Robert Johnson
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### **ELECTRICAL TEAM**

Power Engineering	Doug Effenberger
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**ELECTRICAL TEAM**

Power Engineering  
Services (PES)

Doug Effenberger  
Larry Collins

DCOR

Dennis Conley  
Emily Conley

## ACRONYMS

ADM	Administration
ANSI	American National Standards Institute
API	American Petroleum Institute
BAT	Best Achievable Technology
CEC	California Electrical Code
CFC	California Fire Code
CSLC	California State Lands Commission
EFI	Equipment Functionality and Integrity
ELC	Electrical
ESD	Emergency Shutdown
ESP	Electric Submersible Pump
FSL	Flow Safety Low
FSV	Flow Safety Valve
HF	Human Factor
H <sub>2</sub> S	Hydrogen Sulfide
kVA	KiloVolt Amperes
kW	Kilowatts
LACT	Lease Automatic Custody Transfer
MOC	Management of Change
MRMD	Mineral Resources Management Division
NEC	National Electrical Code
NFPA	National Fire Protection Association
OSHA	California Occupational Safety & Health Administration
OSPR	Office of Spill Prevention and Response
P&ID	Piping and Instrumentation Diagrams
PHA	Process Hazard Analysis
PM	Preventative Maintenance
PPE	Personal Protective Equipment
PRC	Public Resources Code
PSH	Pressure Safety High
PSHL	Pressure Safety High-Low
Psi	Pounds per Square Inch
PSL	Pressure Safety Low
PSM	Process Safety Management
PSV	Pressure Safety Valve
RP	Recommended Practice
SAFE	Safety Analysis Function Evaluation
SAC	Safety Analysis Checklist
SAMS	Safety Assessment of Management Systems
SCADA	Supervisory Control and Data Acquisition
SCBA	Self Contained Breathing Apparatus
SCE	Southern California Edison
SSV	Surface Safety Valve
TEC	Technical
UBC	Uniform Building Code
UFC	Uniform Fire Code
VSD	Variable Speed Drive

## REFERENCES

### GOVERNMENT CODES, RULES, AND REGULATIONS

Cal OSHA	California Occupational Health and Safety
3215	<i>Means of Egress</i>
3222	<i>Arrangement and Distance to Exits</i>
3225	<i>Maintenance and Access to Exits</i>
3308	<i>Hot Pipes and Hot Surfaces</i>
3340	<i>Accident Prevention Signs</i>
5189	<i>Process Safety Management of Acutely Hazardous Materials</i>
6533	<i>Pipe Lines, Fittings, and Valves</i>
6551	<i>Vessels, Boilers and Pressure Relief Devices</i>
6556	<i>Identification of Wells and Equipment</i>
CCR	California Code of Regulations
1722.1.1	<i>Well and Operator Identification</i>
1774	<i>Oil Field Facilities and Equipment Maintenance</i>
1900-2954	<i>California State Lands Commission, Mineral Resources Management Division Regulations</i>
CFR	Code of Federal Regulations
29 CFR	<i>Part 1910.119 Process Safety management of Highly Hazardous Chemicals</i>
30 CFR	<i>Part 250 Oil and Gas Sulphur Regulations in the Outer Continental Shelf</i>
33 CFR	<i>Chapter I, Subchapter N Artificial Islands and Fixed Structures on the Outer Continental Shelf</i>
40 CFR	<i>Part 112, Chapter I, Subchapter D Oil Pollution Prevention</i>
49 CFR	<i>Part 192, Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standard</i>
49 CFR	<i>Part 195, Transportation of Liquids by Pipeline</i>

### INDUSTRY CODES, STANDARDS, AND RECOMMENDED PRACTICES

ANSI	American National Standards Institute
B31.3	<i>Petroleum Refinery Piping</i>
B31.4	<i>Liquid petroleum Transportation Piping Systems</i>
B31.8	<i>Gas Transmission and Distribution Piping Systems</i>
Y32.11	<i>Graphical Symbols for Process Flow Diagrams</i>
API	American Petroleum Institute
RP 14B	<i>Design, Installation and Operation of Sub-Surface Safety Valve Systems</i>

- RP 14C *Analysis, Design, Installation, and Testing of Basic Surface Safety Systems for Offshore Production Platforms*
- RP 14E *Design and Installation of Offshore Production Platform Piping Systems*
- RP 14F *Design and Installation of Electrical Systems for Offshore Production Platforms*
- RP 14G *Fire Prevention and Control on Open Type Offshore Production Platforms*
- RP 14H *Use of Surface Safety Valves and Underwater Safety Valves Offshore*
- RP 14J *Design and Hazards Analysis for Offshore Production Facilities*
- RP 51 *Onshore Oil and Gas Production Practices for Protection of the Environment*
- RP 55 *Oil and Gas Producing and Gas Processing Plant Operations Involving Hydrogen Sulfide*
- RP 500 *Classification of Locations for Electrical Installations at Petroleum Facilities*
- RP 505 *Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Zone 0, Zone 1, and Zone 2*
- API 510 *Pressure Vessel Inspection Code: Maintenance Inspection, Rating, Repair, and Alteration*
- RP 520 *Design and Installation of Pressure Relieving Systems in Refineries, Parts I and II*
- RP 521 *Guide for Pressure-Relieving and Depressuring Systems*
- RP 540 *Electrical Installations in Petroleum Processing Plants*
- RP 550 *Manual on Installation of Refinery Instruments and Control Systems*
- RP 570 *Piping Inspection Code*
- RP 651 *Cathodic Protection of Aboveground Petroleum Storage Tanks*
- Spec 6A *Wellhead Equipment*
- Spec 6D *Pipeline Valves, End Closures, Connectors, and Swivels*
- Spec 12B *Specification for Bolted Tanks for Storage of Production Liquids*
- Spec 12J *Specification for Oil and Gas Separators*
- Spec 12R1 *Recommended Practice for Setting, Maintenance, Inspection, Operation, and Repair of Tanks in Production Service*
- Spec 14A *Subsurface Safety Valve Equipment*

ASME American Society of Mechanical Engineers

*Boiler and Pressure Vessel Code, Section VIII, "Pressure Vessels," Divisions 1 and 2*

ISA Instrument Society of America

- 55.1 *Instrument Symbols and Identification*
- 102-198X *Standard for Gas Detector Tube Units – Short Term Type for Toxic Gases and Vapors in Working Environments*
- S12.15 *Part I, Performance Requirements, Hydrogen Sulfide Gas Detectors*
- S12.15 *Part II, Installation, Operation, and maintenance of Hydrogen Sulfide Gas Detection Instruments*
- S12.13 *Part I, Performance Requirements, Combustible Gas Detectors*

S12.13	<i>Part II, Installation, Operation, and Maintenance of Combustible Gas Detection Instruments</i>
NACE	National Association of Corrosion Engineers
RPO169	<i>Control of External Corrosion on Underground or Submerged Metallic Piping Systems</i>
NFPA	National Fire Protection Agency
20	<i>Stationary Pumps for Fire Detection</i>
25	<i>Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems</i>
70	<i>National Electric Code</i>
704	<i>Identification of the Hazards of Materials for Emergency Response</i>
CEC	California Electric Code