

California State Lands Commission

Safety and Oil Spill Prevention Audit

Aera Onshore, Offshore
Aera Energy LLC, Oil Company



November, 2009

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EXECUTIVE SUMMARY

Executive Summary

Safety Audit of Aera Energy LLC, Huntington Beach

Background: Aera Energy is a California based oil and gas producer, operating properties extending from the LA Basin in the south to Coalinga in the north. Aera Energy is jointly owned by Shell and ExxonMobil.

The company's remaining offshore platform in California, platform Emmy is located in state waters about one mile off Huntington Beach. The nearby Aera Huntington Beach facilities include onshore well areas producing from offshore state leases; an onshore oil dehydration and water processing area; a tank farm with oil sales site; a hydrogen sulfide gas processing unit (Stretford Unit); a dew-point control unit (DCU); a warehouse complex; and related subsea and onshore pipelines. Aera Energy Huntington Beach produces approximately 3,600 barrels of oil and 2000 mcf of natural gas a day.

The oil producing formations are typically below hydrostatic pressure, and the wells require artificial (mechanical) lift to produce. Consequently, the potential for a well blowout is minimal. Platform Emmy's deck and onshore production areas are each designed to provide adequate secondary containment against potential spills. In addition, the onshore graded drainage pattern, location of equipment, pads, and pits are intended to minimize environmental and aesthetic damage.

Safety Audit Objective: The objective of the 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 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 various sections of the Public Resources Code (PRC). The PRC provides authority for MRMD regulations, the existing inspection program, and the safety audit program that complements and augments inspection activities.

The Safety Audit Program was developed in response to PRC 8757 (a), which originated from the Lempert, Keene, and Seastrand Oil Spill Prevention Act. In this Act, existing oil spill prevention programs were considered insufficient to reduce the risk of significant discharges of petroleum into marine waters. The CSLC is required to regularly inspect all marine facilities and monitor operations and their effects on public health, safety, and the environment. The Safety Audit Program was established to augment existing inspection programs and to further prevent oil spills and other accidents through thorough review of design, maintenance, human factors, other evolving technology and areas of oversight.

Safety Audit Procedures: The Safety Audit of Aera Energy LLC followed proven CSLC procedures addressing five functional areas: Equipment and Functionality, Electrical,

Technical, Administrative, and Human Factors. Aera personnel assisted CSLC teams with design, operating, and maintenance information throughout the process. The electrical portion of the audit was primarily carried out on Platform Emmy by personnel from a third party electrical engineering contractor, (Power Engineering Services, Inc.) The Safety Audit addressed Platform Emmy as one facility, and the onshore production well areas and processing facilities used to produce the oil and gas from the offshore state leases as a second facility. The production areas in the Bolsa Chica wetlands were specifically excluded from this Safety Audit.

Safety Audit Results: The audit revealed a total of 159 action items for platform Emmy and the onshore facilities combined. This is less than one third the numbers of items identified at the previous Safety Audit completed in May of 2003. There are 84 items that are attributed to Platform Emmy, about half of all the items identified. The following table shows the location and relative priority of the action items. There was no Priority 1 items which would be those considered with high risk potential for injury, spill, or other adverse impacts. Priority 2 items are moderate risk potential of which only 4% of items were in this category. Priority 3 is considered low risk potential and these items comprised the majority or about 96% of the action items identified. Please see the report for full details.

**Action Items
 Priority**

Area of Investigation	1	2	3	Total
Platform Emmy	0	4	80	84
Onshore Facilities	0	2	73	75
Total	0	6	153	159

The facilities and equipment were observed to be in good working order except in rare instances where age and the continuous exposure to the marine environment have caused degradation. Much of the originally installed equipment has served its useful life yet is being maintained so that it may safely remain in service. The external condition of tanks and pressure vessels and their paint coatings at both the platform and the onshore facility were observed to be in good working order and adequately maintained. The platform has benefitted from a recent major paint and coating renovation since the previous audit. Onshore, a number of tanks have been replaced and other maintenance work has occurred to the pressure vessels and their foundations since the last audit.

A much lower number of electrical action items were identified during this audit. This occurred because substantial electrical maintenance work and upgrades were performed since the previous Safety Audit. Onshore, a large portion of the electrical cable tray systems were renovated or replaced and the electrical action items from the previous audit remained in proper condition. The electrical staff at Aera have

demonstrated very good conformance with the National Electric Code (NEC) and California Electric Code (CEC) in their maintenance, repair, and modification work...

As in the previous audit, personal protective equipment was observed to be readily available and fully utilized. All portable fire fighting and other emergency and spill response equipment were also observed to be in good order and adequately maintained.

The facility control systems have continued to be properly maintained and exhibit a very low failure rate at the CSLC monthly safety testing on platform Emmy. The control and safety systems have generally been upgraded from analog to digital electronic control systems. The control and safety systems on platform Emmy were found to be fully compliant. Onshore, the control and safety systems were segregated by the plant area that they control or serve. They did provide the core protections necessary and are comparable to typical industry practice. These onshore systems remain dependent on live personnel for intervention as a response to process upsets.

Aera Energy's Responsiveness to Audit Results: Aera Energy addressed all but two of the action items before the final Safety Audit report was ready to be issued. All Priority 2 Action Items, both on the platform and onshore, were corrected by February 2009 and most of the Priority 3 items were also complete as of that date.

Aera Energy responded to this Safety Audit with the following actions and improvements:

- Virtually all identified action items were corrected or addressed rapidly.
- All design documentation such as Piping and Instrumentation Diagrams have been properly updated and retained on file.
- Operating procedures and emergency plans for each facility are being properly maintained and updated to guide the operating personnel.
- Other CSLC recommendations were implemented with operating policies or guidelines.

Conclusion: The Aera Energy facilities audited were found to be in a very high state of compliance and there were no Priority 1 Action Items identified and only six Priority 2 Action Items identified. This is a low number compared to other Safety Audits conducted between 2000 and present. Aera personnel were very cooperative in conducting this audit and were extremely responsive in correcting all action items. All but two Action Items have been corrected by Aera Energy at this time. This is a significant result that suggests reduced risk of injury or pollution and possible impact to state revenue. Aera's safety performance and spill prevention compares very favorably with similar production facilities along the coast. Aera Energy and its parent companies, Shell, ExxonMobil should be commended on their efforts and continuing commitment to safety and protection of the environment.

Introduction

1.0 INTRODUCTION:

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. In this Act, existing oil spill prevention programs were considered insufficient to reduce 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 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 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. Because of the overlap of functions, more than one team may identify some items. For this reason, the duplication of findings across multiple teams may appear in this report.

The audit report highlights the findings of each team and the most significant action items. 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.

Aera Energy History:

Aera Energy LLC is a California based oil and gas producer, with headquarters located in Bakersfield, California. The Aera Huntington Beach Field is located approximately 40 miles south of the Los Angeles International Airport. The facility strip area is from 500 to 1,000 feet wide and approximately 8,000 feet long, bounded by the Pacific Coast Highway on the west side and new residential housing on the east. Aera Energy Huntington Beach currently employs approximately thirty-eight people and thirty-five contract personnel. The field is currently producing approximately 5700 barrels of oil per day (Bopd), 122,000 barrels of water per day (Bwpd), and four million one hundred thousand manufactured standard cubic feet per day (4.1 MMSCFD) of natural gas. Regarded as the 12th largest oil field in the United States, the Huntington Beach Field has produced more than one billion barrels of oil in its eighty-three year history. The field was discovered on May 24, 1920 when Standard Oil Company struck oil at 2,199 feet in Huntington Beach.

Platform Emmy was built in 1963, and is 1.3 miles from the shore in approximately 43 feet of water. The platform was installed to complete offshore development of heavy oil reserves. The platform has a total of twenty eight production wells, twenty-five submersible producing wells and three sucker rod pumps. Emmy produces approximately 1,615 Bopd, 28,400 Bwpd and 2.5 MMSCFD. Currently all water injectors are idle after the primary produced fluid subsea line to shore failed a pressure test. The water injection line from shore is temporarily being used as the production pipeline for shipping produced fluid onshore, until repairs are made to the primary production line.

Aera Energy Facilities:

The Huntington Beach facilities consist of: seven onshore producing leases; two offshore producing areas; an onshore oil dehydration and water processing area; a tank farm with oil sales site; an hydrogen sulfide gas processing unit (Stretford Unit); a dew-point control unit (DCU); a warehouse complex; subsea and onshore pipelines. Produced oil, water, and associated natural gas are processed through Free Water Knockouts (FWKO) at the tank farm providing initial separation of the different process streams. Oil and water from Platform Emmy

flows through a subsea pipeline and onshore gathering lines to a FWKO in the tank farm where the water and solids are removed. The oil is then transported from the FWKOs through surface piping to the oil stock tanks. The oil is then metered and custody is transferred to the purchaser via a sales pipeline. Produced water from the FWKOs is treated on site and shipped to the producing locations for injection back into the formation.

The associated gas from the FWKOs is passed through a separator to remove any liquids and Platform Emmy's two high-pressure gas wells along with the casing gas flow through subsea pipelines to onshore gas separators before being routed to the DCU. A slipstream of Emmy gas is blended with the sales gas at the DCU plot limit. The remainder of Emmy's gas stream then flows to Process gas is routed to the DCU main compressor before entering the Iron Sponge Hydrogen Sulfide (H₂S) absorption vessels. The Stretford unit is on stand by. The absorption unit consists of two vessels containing Sulfa Treat material. Contact with this material absorbs H₂S from the gas stream. The sweet gas is routed to Amine unit to remove Co₂. The hydrocarbon condensates are recovered by a gas separator and pressured into a FWKO. The dry sales gas is sent via the Southern California Gas Pipeline System to Southern California Edison (SCE) where it is blended with pipeline quality gas to be used at two nearby power plants.

***Equipment
Functionality &
Integrity Audit
Platform Emmy***

AERA Energy LLC Offshore Report

Goals and Methodology:

The primary goal of the Audit Team was to evaluate the design, physical condition and maintenance of the facilities on Platform Emmy 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 and hazardous gas detection systems, fire detection and suppression systems, spill prevention systems, and spill response equipment. Inspection and evaluation was typically conducted on equipment within a system or category and is reflected in the layout of this report.

The focus of the electrical audit was to evaluate the electrical systems and operations to determine conformance with 2007 California Electric Code (CEC) and established industry standards. The drawings used to conduct the Electrical Audit included the Electrical Single-lines as well as the Area Classification drawings. The layout of this section of the report reflects this methodology

(1) General Facility Conditions

Housekeeping: Platform Emmy appeared exceptionally clean and well maintained. AERA's housekeeping program reinforces the importance of proper housekeeping methods and illustrates the multiple benefits of keeping its work sites in order. Employees understand that "good housekeeping" practices increase safety, improves company image, and enhances space utilization. The company's good housekeeping programs also reduce the amount of crude oil, chemicals, and wastes that could reach the ocean. Containment devices such as drip pans are used to help eliminate ocean contamination if a leak were to occur. AERA also uses preventive maintenance as a companion of good housekeeping to further minimize the occurrence of leaks and releases of chemicals and other materials to containment systems, or to the environment. The adoption of these programs have resulted in reduced regulatory compliance concerns, reduced waste management costs, and reduced spill cleanup costs.

Although Platform Emmy is one of the top state lease facilities, there were some concerns noted. Sinks for hand washing located outside the control room and outside the tool pusher's office did not always have soap and paper towels and both sinks lacked hot water. These sinks are used primarily by contractors and by the well crew respectively. A Priority three-action item was issued to address these concerns and bring the platform into compliance with MRMD regulations as well as Cal OSHA

standards applicable to facilities where substances regulated as carcinogens may be found (EFI - 2.2.1.4)¹.

Stairs, Walkways, and Gratings & Ladders: All stairs, walkways, and gratings found within AERA's offshore facilities are of a safe design and construction. Several of the steps on the stairways located at the southern end of the satellite and the main platform were in need of repair due to corrosion. These deficiencies were corrected right away by replacing the damaged steps (EFI - 2.2.2.02)¹. A broken cage that encloses a fixed ladder on the outside of the Casing Gas Scrubber was found to be loose and re-welded during the audit (EFI - 2.2.2.01)¹. The portable ladders observed were in good usable condition free from oil and grease. Safe work practices define the use and care of lease ladder equipment.

Escape / Emergency Egress / Exits: The escape routes, emergency egress and exits all seemed to be adequately designed for Platform Emmy. There are a total of four safe briefing areas, two being located on the southern end of the platform and two being located on the northern end. The predominant wind direction determines which area is used, the upwind area being the desired location. The type of release determines whether the evacuees remain at a lower level on the platform, or in the case of H₂S, seek higher elevation. Emergency evacuation of the platform can be facilitated by either crew boat or helicopter. There were no access or egress concerns identified.

Labeling, Color Coding and 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 are identified with yellow coloring and fire protection equipment in red. When labels are missing, incorrect or misleading, workplace error becomes a higher risk and mistakes can occur.

Several action items were issued relating to labeling. The identification of the different alarm buttons at the various alarm stations was difficult to read. The combination of the small lettering as well as weathering caused the label to blend with the background (EFI - 2.2.4.01)¹. There was also only one sign posted on the entire platform that listed the contact phone number of the platform to be called in the case of emergency. This sign was faded from the sun and weather, and its size was small making it hard to see at any distance (EFI - 2.2.4.02)¹. An action item was also issued for the Station Bill because the symbols for the fire fighting and gas detection equipment were the same color on the legend. This made it difficult to locate the equipment by

¹ Platform Emmy

type on the drawing (EFI - 2.2.4.05)¹. Pipeline labeling had also been painted over making line selection difficult for operators (EFI - 2.4.1.03)¹.

Security: Platform Emmy 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 deck and there is a sufficient number of restricted access signs posted which are clearly visible from all sides. Entry of authorized personnel to the platform is controlled and monitored by platform personnel via authorization to board the Helicopter or Crew boat at their shore side departure points. Security gate(s) at the boat deck access to the upper areas of the platform may be considered to further limit unauthorized access from small boats or swimmers.

Hazardous Material Handling and Storage: The storage of flammable and combustible liquids on Platform Emmy conforms to Cal-OSHA and NFPA 30 standards. The MSDS are readily available for each hazardous substance on location and can be found inside the Control Room. AERA subscribes to a MSDS service that allows the operators to input the chemical or product name into the computer to display the MSDS information. This information can be printed out if needed.

Chemical and diesel storage on the platform appears to be properly protected against external damage and leaks. Bulk chemical totes have proper labeling and adequate containment in the event of a spill. However, there was a potential for a spill during the transfer of chemicals from mobile totes on the drill deck, to the stationary totes, on the production deck. This was due to the pressure exerted on the cam lock fittings which are supporting the entire weight of the hose. A priority 3 action item was generated to provide additional support for these hoses (EFI - 2.2.6.01)¹. AERA promptly remedied this by providing extra hose support cables.

Another minor problem noted was on the drilling deck where several used paint containers were being openly stored. The used paint cans were brought to the attention of the on duty operator who promptly moved the containers to a flammable storage locker until time for removal.

(2) Field Verification of Piping and Instrumentation Diagrams (P&ID), Fire Main Drawings and Emergency Evacuation Site Plans

Process Flow Diagrams (PFD): Three Process Flow Diagrams (PFD's) were provided by the operator and are still accurate although one system is not in service (gas compressor skid) and one AWT (V-101) is being converted to a Casing Gas Scrubber. The drawings had existing redlines mark-ups to illustrate these changes.

¹ Platform Emmy

Piping and Instrumentation Diagrams (P&ID): Comprehensive field verifications of all of the P&ID's were performed for Offshore Platform Emmy. These drawings are reasonably accurate, but do require some updating. The discrepancies in the P&ID's included, sizing errors in valves and piping connections, missing equipment (valves), erroneous set points, and out of service or removed equipment. (EFI – 2.3.2.01 – 09 & 11-17)¹

In addition, drawings for the electrical systems were reviewed by an outside contractor to verify system safety. The contractor found that Platform Emmy Electrical Area Classification drawings did not show all platform levels and all equipment (ELC - 3.2.01)¹. Areas not shown on the drawings should be added to the drawing set or indicated by note to identify the area as unclassified. If the area classification drawings are not prepared for all areas containing flammable liquids or vapors, then new electrical equipment purchased for installation will have to meet the most stringent requirements and be rated and installed to meet explosion-proof requirements in accordance with the Code.

Some electrical equipment has been added or relocated on the platform. Drawings need to reflect latest equipment locations and any process system changes that might affect the area classification (ELC - 3.2.02 and 03)¹. Each of these matrix items concerning the electric drawings have been completed by AERA prior to this report being issued.

Fire Protection Drawing Verification: Firewater / Foam Utility Flow Diagram and the Platform Station Bill were available and reviewed for Platform Emmy. The Firewater / Foam drawing is current and up to date with only one discrepancy. Utility Flow (Fire Protection) Diagram No. 078-87-411 indicates that the foam tank (V-115) has a sight glass to gauge the tank volume; however, this was removed when the system was updated, but the diagram does not reflect this change (EFI - 2.3.2.09)¹.

The Station Bill was found to have one inconsistency; a priority three-action item required the replacement of two fire extinguishers shown on the drawing but missing from their location (EFI - 2.3.2.10)¹.

Emergency and Evacuation Site Plans were available and reviewed for Platform Emmy and were found to be accurate and up-to-date. Firefighting equipment inspections are conducted monthly by an outside contractor and checks of the firewater system are conducted weekly.

¹ Platform Emmy

(3) Condition and Integrity of Major Systems

Piping: The overall condition of piping on Platform Emmy was rated as good. However, there were a few instances where inappropriate pipe supports were being used. These improper supports included chain and scaffolding wire (EFI - 2.4.1.01)¹. In another instance, a broken u-bolt pipe support on the East AWT allowed the piping to vibrate whenever the instrument air compressor started (EFI - 2.4.1.02)¹. This deficiency was quickly repaired when brought to the attention of the operators.

A damaged section of 1" Diesel fuel line near the northwest corner of the Production Deck was found to be bent and had signs of corrosion. This vertically mounted line extends down from the Drill Deck, and is part of the refueling system for the Primary fire pump and the emergency generator. There is some concern about the piping layout and lack of secondary containment. Since the fuel line extends beyond the platform, any leak in the system would fall into the ocean. While the schedule of piping may be adequate for the service, it was thought advisable to issue a priority three finding on this section of pipe (EFI 2.4.1.04)¹.

Tanks: Platform Emmy has only three active tanks (atmospheric and pressure drain tanks and satellite drip tank). Externally, the three tanks appear to be in good condition. Internal and external tank inspections are SAP generated, conducted by contractors and frequencies are consistent with API 653 recommended intervals. A review of the tank records showed internal inspections and Ultrasonic Testing (UT) had occurred within the past two years for all tanks. Maintenance records also show that AERA completed all contractor recommended repairs and alterations. These records are housed locally and are readily available if needed.

Pressure Vessels: Pressure vessels are monitored and maintained following a program of external and internal examination. The external and internal inspection intervals for all pressure vessels were analyzed for compliance with applicable regulations, recommended practices (API RP 510) and record keeping within a preventative maintenance system.

There are a total of five in-service and five out of service (OOS) pressure vessels. These pressure vessels are inspected by outside contractors every five years. No problems were noted during the internal inspection. Inspection records are well maintained and are easily accessible at AERA's onshore location. The exterior conditions of the pressure vessels appeared to have no signs of major coating failure, corrosion or pitting problems and in good condition.

Relief Systems: The piping for both relief vent systems on Platform Emmy 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 gas vent system. The gas vent system traps and collects liquids before venting to atmosphere. Activated charcoal canisters impregnated with potassium hydroxide have been added upstream of the southeast vent stack. These canisters were added in lieu of installing a flare and are designed to lower the H₂S content of vented gas to 0 ppm. The system appears to have all the necessary Pressure Safety High (PSH), Pressure Safety Low (PSL), and PSV devices.

Service of the platform flame arrestors was sporadic in the past, and not part of the preventive maintenance program. A schedule of inspection and maintenance should be established for flame arrestors. Foreign matter and corrosion can clog the flame bank assembly if not inspected regularly. Frequency of inspection will depend on the service and should occur no less than once annually. A priority three-matrix item recommends that manufacturer's directives for flame arrestor maintenance be followed and documented (EFI - 2.4.4.01)¹.

The maintenance and servicing intervals for all pressure safety valves (PSVs) were examined for compliance with applicable regulations and recommended standards, as well as, record keeping within a preventive maintenance system. PSVs for Platform Emmy are serviced and tested biannually by an outside contractor. Service records were in order with no action items identified.

Fire Detection: Fire detection systems utilized on the platform are designed to detect fires in their earliest stages and alert personnel to the existence of a fire condition on the platform. Both ultraviolet detectors (fire eyes) and a fusible element system are used. The fusible element system uses loops of metallic plugs strategically located throughout the platform. These metallic plugs melt at a set temperature and shutdown production activities by activating the ESD system. Smoke detectors are also employed as required in accommodation spaces. An outside contractor services the platform equipment monthly and maintains proper records. Facility personnel who observe a fire or an alarm may also manually initiate fire suppression systems before automatic sensing devices activate fixed fire suppression systems.

Fire Suppression: Platform Emmy's primary fire pump P-115 is a Worthington vertical shaft turbine pump with a GM diesel driver that appears to be well maintained. The platform has an electrically driven back-up fire water pump P-200. In addition to the two fire pumps, the firefighting system includes the distribution piping, hose stations with reels, the deluge / water spray system, and a 50-gallon foam tank. 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. Distribution piping

¹ Platform Emmy

appears properly supported and adequately maintained. 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. Firewater monitors are positioned in the well bay of the Production Deck to provide maximum wellhead coverage while a deluge system is utilized on the Lower Deck. Additionally the firewater system can pump foam directly to the Atmospheric Drain Tank.

Dry chemical canister fire extinguishers were found to be compliant with NFPA and Cal OSHA regulations, inspected monthly and serviced annually. Cal OSHA regulations stipulate that employees receive annual training in the use of fire extinguishers, and AERA's MEST training fulfills this requirement.

Some minor concerns were noted. The CO₂ fire suppression bottles located at the vent poles lacked proof of current inspection (EFI - 2.4.6.01)¹. A portion of the fire water system piping failed to get painted red when the platform was recently painted, and an action item was issued to mark or label the fire system piping so that it is easily distinguishable (EFI - 2.4.6.03)¹. A fire hose reel located on the satellite platform needed to be repaired or replaced due to a broken hand reel (EFI - 2.4.6.04)¹. Broken seals and missing covers were noted on several extinguishers located at the outside edges of the platform (EFI 2.4.9.01)¹. Lastly, three openings were observed in the firewall located at the south end of the well bay, and an action item was issued to seal the openings (EFI - 2.4.6.05)¹.

The Electrical Audit determined that the motor on Fire Water Pump P-200 is fed from normal power without emergency power backup although the power supply to the electric driven fire water pump has been redesigned to comply with NFPA 20 and CEC 695 requirements. Power to the electric driven firewater pump is taken ahead of the electric service power main. Supply conductors are directly connected to the listed fire pump controller located adjacent to the fire water pump on the lower platform through a primary fused switch and dedicated 300 kVA pad-mounted style of transformer located on the Electrical / MCC Building roof. Paint overspray on the pump controller has obscured the instructional labels, and these need to be replaced or made legible. (ELC - 3.6.02)¹ A sign needs to be placed near the controller indicating the location of the feeder supply service disconnect. (ELC - 3.6.03)¹ A medium-voltage disconnect switch, also located on the roof of the Electrical / MCC Building, feeds the 300 kVA transformer

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and serves as the primary disconnecting means but lacks labeling in accordance with CEC 695.4(3) (ELC - 3.6.04)¹.

Combustible Gas & H₂S Detection: Platform Emmy is equipped with 20 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 20% by triggering an audible alarm; in addition, they automatically activate the shut-in sequences when concentrations reach 40%. These limits more than meet the required standards of 60% and 80% respectively per MRMD 2132(g) (5) (C&D). The tone generated by LEL alarms is the same tone as normal process alarms. Although no MRMD regulations exist pertaining to LEL alarm tones, other state facilities as well as most federal platforms utilize a distinct tone for LEL alarms. This creates a potential human factors issue. The concern is that contract personnel, used to a distinct LEL alarm, may not recognize an existing danger. Due to the potential for explosion and/or fire resulting from a gas leak, staff recommends that AERA consider adding a distinct alarm tone for Emmy's LEL alarms. The gas detection system is tested monthly by AERA operating personnel and witnessed by MRMD inspectors.

Platform Emmy is equipped with 22 hydrogen sulfide (H₂S) detectors. H₂S detection is required because the gas streams could potentially contain concentrations of H₂S that would be dangerous to life and health. MRMD regulations require H₂S detectors on any offshore production facility that handles production known to contain H₂S per MRMD 2132 (g) (6). AERA has in place audible and visual alarms that activate when H₂S concentrations reach 10 parts per million (ppm). When H₂S concentrations at these detectors reach or exceed 20 ppm, they will automatically activate the platform emergency shutdown. The H₂S detectors are tested monthly and the testing is witnessed by MRMD inspectors.

The number and placement of both types of gas sensors on the platform appeared adequate and proper to provide maximum protection for operating personnel. One minor discrepancy was noted between the number of LEL detectors summarized in the Safe Chart and the number of LEL detectors tested in the Monthly Safety Inspection (TEC - 4.2.12)¹

The Electrical Audit noted that both gas detection systems, as part of the platform safety system, are required to perform in emergencies including power failures. In the event of a main power failure these systems are powered by a combination of battery back-up and the uninterruptible power supply (UPS), as well as auxiliary generator power.

Emergency Shutdown System (ESD): The platform is equipped with 14 manual Emergency Shutdown (ESD) stations that will cause shut-in of all wells and pipelines as

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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 14 manual ESD stations on Platform Emmy, along with all other pressure and level shutdowns, are tested monthly by AERA and witnessed by MRMD personnel to verify calibration and proper operation. The ESD system appears fully compliant with API RP 14C with no problems noted.

Safety & Personal Protective Equipment (PPE): AERA has well-defined Personal Protective Equipment (PPE) Requirements that are enumerated in handouts distributed at all AERA safety orientations and recapped in AERA's EHS Contractor Handbook. Only minor deficiencies were noted including two priority three action items due to minor problems with eyewash stations (EFI - 2.4.9.02 and 03)¹. Another action item was issued due to a rusty first aid cabinet (EFI - 2.4.9.17)¹.

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 Emmy. A few gauges appeared to be weathered, but most were readable and seemed to function properly. Platform Emmy instrumentation is tested, maintained, and calibrated on a regular schedule. Records are readily available and the device history can be tracked through the SAP maintenance program. All "direct read" instrumentation appeared to be in good operating condition. Many of the instrument MC cables on the lower deck had been removed from structural supports during the painting of the structure. AERA is in the process of re-supporting these MC cables (ELC - 3.7.01)¹. Two very minor action items were issued and immediately corrected regarding electrical cable and conduit that was no longer in service (EFI - 2.2.1.01 and 03)¹.

The standard for the production safety systems on platform Emmy 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 Emmy was evaluated for appropriate safety devices and

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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. Some of the critical design elements and features from API RP 14C and API RP 14J are mentioned below:

The review found the design of the platform safety system to be fully compliant with API RP 14C. All safety shutdown features were provided as required and the SAFE chart appeared to be current with minor exceptions, including but not limited to; incorrect Safety Analysis Checklist (SAC) references, mislabeled equipment, and the number of devices in the SAFE Chart does not match what is shown on the P&IDs (TEC – 4.2.01 - 08 and 15)¹. The platform's operating history also indicates safe, reliable, and efficient operation.

Lighting: Platform Emmy lighting is provided by ceiling and pole mounted fixtures with high-pressure sodium vapor bulbs or similar type lighting. At the start of the audit, AERA was in the process of conducting a light level test by a design contractor. Burned out bulbs were replaced, and the lighting appears to adequately meet the levels for safety found in API RP 14F. AERA submitted an "as measured" lighting diagram confirming that the location and light levels for all parts of the platform met the minimum standard. The ELC Team noticed that a light fixture was missing on the northwest corner of the Drill Deck. It was said to have been damaged during crane operations (ELC - 3.8.01)¹.

ESP, Pump Units, Wellhead Equipment & Well Safety Systems: A priority three action item was issued when it was noticed that wave action was causing 426-UJ402 wellhead to move back and forth, which in turn, was putting stress on the one inch casing gas line (EFI - 2.4.12.01)¹. AERA removed the casing gas piping spool and installed blind flanges to remedy the situation once notified of the situation. Surface safety valves (SSV), flow safety valves (FSV) and shutdown valves are installed on flow lines, process lines and pipelines to shutdown and isolate a line if a leak was to occur. SSVs and FSVs are checked monthly as required by CSLC regulations to ensure they function and are capable of holding pressure without leaking. No problems were noted during testing.

Auxiliary Generator: The generator is exceptionally clean and appears to be very well maintained. The generator has higher capacity than most and provides 12 hours of power, without refueling, for the office/quarters, emergency lighting system, HVAC system for the Switch Gear Building, air compressors, and utility boat launching system, navigation lights, shutdown valves, and several critical pumps. The generator driver (diesel engine) is tested monthly as part of the MRMD safety inspection. Generator loading should be monitored and recorded to prevent inadvertent overload although

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most of the loads are not expected to operate simultaneously. Generator testing records show that routine operational tests are being performed. The rating of auxiliary power system equipment and components was found to be satisfactory.

Spill Containment: Spill containment on Platform Emmy appeared adequate. Rainwater spills and leaks are handled by deck drains located throughout both the main and satellite platforms. The lower and satellite open deck drains flow to the Satellite Drip Tank T-207 and are then pumped to Atmospheric Drain Tank T-203. Deck drains from the drill deck, production deck and the helicopter deck all flow directly to T-203. Pumps operating on level control transfer the fluid from T-203 into the production header where the fluid commingles with the production emulsion and flows through the 12-inch oil production pipeline to shore.

Platform Emmy maintains a total of seven drums of assorted sorbent pads for use on the platform as well as two 750-foot sections of Series 4300 Expandi-boom to contain any spill that might get into the ocean. These supplies are maintained and inventoried monthly by AERA operating personnel as part of the MRMD monthly safety inspection.

Platform Emmy's containment system described above appears to conform to all spill control and containment (SPCC) regulations.

Spill Response: In addition to Platform Emmy's two Expandi-booms and sorbent pads mentioned above, AERA maintains an 18-foot boat with outboard motor for immediate launch to allow rapid boom deployment should it be necessary. A readily available boat is a significant resource in the event of a spill because most platform operators must await the arrival of a crew boat or response boat in order to deploy their boom. Additional resources maintained on the platform specifically for spill response include marine radios, tracking flags and electronic tracking buoys. These are in addition to phone/fax lines, company radios and the Ship Services contracted supply boat. All of the equipment appears to be well maintained and is inventoried as part of the MRMD monthly safety inspection. Spill drills and boom deployment occur semiannually with the assistance of the Marine Spill Response Corporation.

An Oil Spill Contingency Plan is required by MRMD regulations and 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.

Cranes: The cranes on Platform Emmy consist of an electric driven Weatherford crane and a diesel driven Mariner crane. Both cranes are equipped with 80-foot booms. A priority two deficiency was issued for failure to insure that crane hooks, used for personnel transfers, have a positive latching mechanism thereby creating a personnel

hazard (EFI - 2.4.9.08)¹. A review of crane records determined that maintenance and repair records were not always readily available; a priority three-action item was issued as a result (EFI - 2.4.9.15)¹. After staff expressed some concerns over the Billy Pugh transfer net and personnel transfers, AERA developed written work practices that addressed these items. When staff pointed out that trash bins with no known safety factor were being used for scrap metal, AERA developed work practices to cover the use of trash bins. Two minor deficiencies were also issued to repair or replace the sling storage box and to install standard crane hand signal charts near each crane (EFI - 2.4.9.15 and 04)¹.

(4) Electrical Power Equipment Condition and Functionality

Electrical Power Distribution System: Edison provides electric utility service at one onshore location, and AERA distributes power from there. Platform Emmy receives its power at 12.47 kV from a single submarine cable. On the platform the voltage is stepped down for local utilization to 2,400 V, 480 V, and 120/208 V as required. Edison available fault current should be added to the power system drawing for use in short circuit, arc flash, harmonic and other power system studies (ELC -3.3.1.01)¹. |

Reliability of the electric system is primarily dependent on the availability of the Edison power supply in addition to the condition and operational readiness of the facility distribution system. A sound maintenance and inspection program, properly implemented, is key to assuring the highest level of reliability. Electrical maintenance has been integrated into the Systems Application Programs (SAP) computer database and tracking system which is fully implemented. Maintenance, repair and materials support are controlled by SAP.

The electrical single-line drawings were last revised between 2003 and 2007 and generally match the installed facilities. AERA is currently making major changes to the platform electrical system. Out-of-service isolation transformers on the satellite platform have been removed to allow space to relocate power transformers. In the electrical room, active starters have been relocated, and MCC #3 and #4 have had idle MCC sections removed. This will free up space for the replacement of Centrilift variable speed drives (VSP) for the electric submersible pumps (ESP). Following these changes, affected single line drawings will need to be as-built.

Any future increase in the number of VSP units may affect harmonics in the power system. We recommend the new Centrilift units be provided with input filtering or a study be made of the potential impact of harmonics and possible increased heating to the existing power system.

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The audit focused on power distribution systems 480 V and above and excluded the lower voltage systems. The drawings of the existing facility were generally available for use by personnel on the platform.

Grounding (system and equipment): CEC Articles 250 and 501 provide the rules for power system grounding and bonding in oil production facilities. Significant portions of the requirements for grounding are established to prevent or reduce the possibility of injury to personnel from shock. The rules of grounding also contribute to reduction of equipment damage either from induced voltages or during fault conditions. The three types of grounding required at the facilities are power system grounding, safety or equipment grounding, and static grounding.

Safety Control Systems: API RP 14F recommends that AC electrical safety control systems are supplied through a battery charger-inverter system and that DC controls have a reliable DC supply. This is achieved on Platform Emmy with a combination of UPS and battery backup systems.

The UPS is rated to provide a 120 VAC, 15 Amp, 1.8 kW output. Drawing 078-87-323 identifies the UPS load as a control system computer believed to be PLC1 and PLC2. PLC1 and PLC2 provide the alarm and control logic for all emergency shutdown functions.

Power to actuate PLC emergency shutdown relays and solenoid valves, as well as, PA system, gas, fire, and general alarms on Platform Emmy is provided by the 24 V battery systems through Panel DCP-1. The 24 V batteries are charged by either of two float and equalize battery chargers that are powered from Panel EDP-1. The battery is composed of C&D KCR7 lead acid cells rated for a 195 ampere-hour capacity at a 3-hour discharge rate. The battery serves Panel DCP-1. 24 V Battery Chargers 1 and 2 charge the battery through Panel DCP-1 bus. The battery cells were manufactured and installed in 1988 and may be due for replacement. Battery testing should be conducted in accordance with IEEE Standard 450 to determine the remaining useful life.

Platform Emmy 12 kV switchgear protective relays and MCC-3 shunt trips are powered by the dedicated 48 V switchgear battery system. The 48 V batteries are charged by either of two float and equalize battery chargers that are powered from the Essential Power MCC. 48 V Battery Chargers 1 and 2 charge the battery through Panel DCP-2 bus. The C&D KCR7 lead acid cells are rated for a 195 ampere-hour capacity at a 3-hour discharge rate. The battery serves Panel DCP-2. The battery cells were manufactured and installed in 1988.

The emergency power system did not require correction of any design safety items. However, inspection of emergency panel EDP-1 found two different circuit panels inside the panel door. Since it was not apparent which schedule was correct, AERA will have

to identify the correct circuits and update the proper schedule for placement in the panel (ELC - 3.5.2.01)¹.

Safety Procedures: The Electrical Audit determined issues of electrical safety related to power system configuration, capacity and protection are in general satisfactory. Lock-out/Tag-out practices and the Pre-Job Work Plan Program (including energy control permits) are established. All documentation required is available through the computer network from any of the computer terminals on the platform. Hard copies of the energy control permits with instructions and sign-offs necessary to de-energize equipment for maintenance or constraints for working on energized equipment are available from printers on the platform. Arc-flash labels are required for electrical equipment per CEC 110-16. Arc-flash labels were not found to be installed on every switchboard, panel board and other electrical equipment likely to require examination, adjustment, servicing or maintenance while energized (ELC - 3.3.3.01)¹.

(5) Preventive Maintenance and Mechanical Integrity

This section gives a general evaluation of the maintenance program and comments on managements approach to preventative maintenance. 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. Additionally these plans typically include an active ongoing inspection program for vessels, tanks and piping so that needed repairs can be made before any type of failure occurs. AERA's SAP maintenance program is utilized to schedule preventative and corrective maintenance, track work order status and record costs. On Platform Emmy company personnel provide preventative maintenance on rotating equipment while tank and vessel inspections are contracted through Diversified Technology Services. AERA also uses the team concept to address maintenance needs such as the Equipment Improvement Team (EIT) that identifies a piece of equipment, determines all existing deficiencies and formulates a methodology for restoration. AERA's programs appear to be successful.

The Electrical Audit found that the power system capacity, in general, appears to be adequate. Over-current protection and wire sizes were found to be appropriate. The application of over-current devices with respect to equipment ratings is generally satisfactory. The main switchgear protective relays were last tested and calibrated in August of 2006.

¹ Platform Emmy

***Equipment
Functionality &
Integrity Audit
Onshore Facility***

AERA Energy LLC Onshore Report

Goals and Methodology:

The primary goal of the Audit Team was to evaluate the design, condition, and maintenance of the facility and associated process equipment. A series of system, equipment inspections, field verifications of key drawings/plans, and technical design review of systems were employed to accomplish this goal. The layout of the report reflects this methodology.

(1) General Facility Conditions

Housekeeping: AERA onshore production facilities were exceptionally clean and orderly. The warehouse shipping and receiving areas were clearly marked and well organized. All locations had clearly marked refuse containers with no excess of oilfield wastes and refuse. The restrooms and portable units were in satisfactory condition with no obvious health or sanitation concerns. Organizational policies throughout AERA encourage workers to maintain a clean, safe, and productive workplace.

Stairs, Walkways, Gratings, and Ladders: Stairs, walkways, and gratings at AERA's onshore facilities appear to be of a safe design and construction. Safeguards were in place wherever there was a need to transition between levels and for routine access to equipment. The aisles, passageways, stairs, and gratings had sufficient safe clearances, were in good repair, and were clear with no obstructions across or in the aisles to create a hazard. The portable ladders observed appeared in good usable condition free from oil and grease. Fixed metal ladders and appurtenances were painted to resist corrosion and rusting. Safe work practices define the use and care of ladder equipment on the facility.

Escape / Emergency Egress / Exits: AERA's onshore production facility Escape / Emergency Egress / Exits were clearly recognizable and readily accessible with the exception of the Stretford Unit. There the elevated process lines passing across the walkways pose tripping hazards and hinder emergency exit. A reassessment of the equipment layout and its impact on plant personnel may identify additional Administrative and Engineering Measures to reduce the hazards.

Labeling, Color Coding and 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 are identified by yellow and fire protection equipment by red. By providing identification with (labeling, color-coding, and signs) AERA has minimized error-likely situations. However, one area of concern was with the major process lines in the main pipe trench. These pipelines were not clearly labeled and could be confusing to workers who must occasionally configure these lines (EFI – 2.2.4.03).

Fire diamonds were visible on all tanks, vessels, buildings, and chemical storage totes. The fire diamonds were posted so that when facility doors are opened, shut, or left open, the

fire diamonds remain easily and readily visible. The posting of fire diamonds is an indication of good facility emergency planning and conformance with The Uniform Fire Code.

Security: Physical and operational security measures are in place to prevent unauthorized entry into the onshore facilities. The onshore production facilities are manned twenty-four hours a day, seven days a week with at least two operators present at all times. In addition, a private security guard is present at the main gate during normal business hours. AERA also uses a system of colored placards placed on vehicles entering the lease. These placards are used to determine who is authorized to be on the property and who is not. Facility lighting, locked buildings and electronically controlled gates are also used as a deterrent to unauthorized entry and vandalism. Facility personnel provide additional monitoring with visual inspections of pipelines and production facilities every four hours.

Hazardous Material Handling and Storage: Flammable and combustible liquids were found stored in safety cans and drums in accordance with CAL-OSHA and NFPA 30 regulations. The bulk chemical totes were properly labeled, appeared structurally sound, and had adequate containment in the event of a leak. No loose combustible material or empty drums were present within the containment areas.

Compressed gas cylinders were secured properly, and legibly marked (identifying the gas content). Valves were closed and protection caps in place on all empty and unused cylinders. The cylinders were generally stored in places where they would not be knocked over or damaged by passing or falling objects.

Material Safety Data Sheets (MSDS) containing information on all chemicals used in the workplace were readily accessible to each work shift in the employee work areas.

(2) Field Verification of Piping and Instrumentation Diagrams (P&ID), Fire Main Drawings and Emergency Evacuation Site Plans

Process Flow Diagrams (PFD): AERA's PFD drawings show the general flow of plant processes and equipment along with references to mass balances. The drawings were current, and displayed the information typically included in PFDs and were error free.

Piping & Instrumentation Diagrams (P&ID): The onshore P&IDs for the production facilities were accurate in most instances but some updates were needed. It appears that some red line corrections were missing causing some inaccuracies in the drawings. (EFI – 2.3.2.01 thru 24)

Fire Protection Drawing Verification: The fire protection drawings include the diesel fire pump, firewater distribution pipelines, main valves, stationary monitors, hose reels, portable extinguishers, and hydrants. These drawings were found to be accurate, up-to-date, and no deficiencies were found.

(3) Condition and Integrity of Major Systems

Piping: The purpose of the piping system assessment is to assess the current state of the mechanical integrity of the piping systems. The piping assessment included:

- Reviewing company piping maintenance and inspection information.
- Evaluating the results of company piping and corrosion monitoring inspections.
- Visual external inspection to identify piping systems in need of repair.

AERA uses a combination of on-going routine and condition based piping inspections to achieve a desired level of quality assurance, facility safety, environmental protection, and unscheduled downtime. The company's inspection program is designed to cover the inspection of piping systems that are in service and help identify out of service piping for removal. The established inspection frequencies are based on API RP 570 piping classifications (I, II and III) with DOT pipeline inspections occurring more frequent than class based assessments. Results from thickness measurements, inspections, repairs and other tests are readily available and appropriately recorded within a computer-based maintenance system (SAP). This software system is used for storing and generating maintenance activities as well as saving inspection data.

AERA's selection of piping materials appears compatible with the process, operating variables and the environment. Because a significant proportion of the corrosion problems experienced relate to piping systems, a proactive approach to corrosion control has been adopted. Several different methods are used to improve the life of the piping systems, they include:

- Epoxy and Tape Coatings
- Pipeline Pigs
- Cathodic Protection
- Chemical Treatment

The safety audit's visual external piping inspection checked for the presence of leaks, defects in the support system, vibration, and external corrosion. Piping components such as valves, flanges, bolts, welds, etc. were also included in the assessment.

The safety audit inspection revealed that pipe coatings and tape throughout the facilities were in good condition with systems correctly designed in respect to geometry and location. However, a number of inadequate supports, missing labeling and areas of corrosion were found resulting in Priority 3 action items (EFI – 2.4.1.1 thru 33). These deficiencies were typically found on minor rather than major process lines.

AERA has devoted a great deal of time and resources into removing dead piping and general cleanup of the lease. Their efforts not only have improved the appearance of the lease but also have reduced the chances of human error by improving the work environment.

Tanks: A variety of produced water, rainwater, and petroleum storage tanks are located within AERA's onshore facilities. Welded and bolted steel storage tanks are being used on the lease. They were commonly built with a fixed cone roof and flat bottom placed on gravel or concrete foundations.

Exterior structural members, foundations, shell courses, roofs, drains, valves, piping, as well as, maintenance records were examined as part of the safety audit process. These evaluations determined:

- Extent of external corrosion and/or pitting damage
- Serviceability
- Corrosion allowance remaining
- Condition of the vacuum/relief valves
- Condition of the foundation

Facility tanks are subject to the company's periodic inspection throughout their service life for signs of damage. These inspections are generated electronically by AERA's maintenance program and assigned to the appropriate craft during daily facility meetings. Inspection methods used include ultrasonic and other inspection methods to search for flaws and service induced damage as recommended in API 653. Available records document design information, corrosion rates, maintenance activities, and events that have affected tank integrity.

Tank coatings, piping, valves, walls, anchor bolts, and labeling appeared to be in good condition with no evidence of damage or leaks. However, several of the crude oil stock tanks were not grounded to dissipate static charge resulting in an action item (EFI – 2.4.2.01). There also were no external signs of shell or roof buckling, cracking of welds, or indications of tank settlement problems. The stock tanks were found to be equipped with appropriate high-level shut-in sensors, in accordance with MRMD regulation 2132(g) (2) (c). The safety devices are tested monthly and the test results are recorded within the SAP maintenance program.

Secondary containment of overflow and leaks within the stock tank battery is accomplished by a concrete wall that surrounds the tanks perimeter. The containment system is impermeable to crude oil and can hold a 110 percent of the contents of the largest tank. This system provides adequate containment and is preferable to a low-level sensor when the normal flow of liquids prevents the sensors ability to detect a leak. The high and low level sensors are displayed on the tank farm computers and alarms alert operators to changing tank conditions.

Pressure Vessels: The audit team used a visual examination to assess the general condition of facility pressure vessels and their maintenance history. This method detects specific problems such as coating failure, corrosion, leaks, missing labeling, and lack of internal inspections, inadequate anchoring, and required instrumentation.

Pressure vessels found within the facility are of the stationary and unfired type. They are constructed of carbon steel or stainless alloy and are used for the containment of gases and

liquids. Safety instrumentation for these vessels typically included pressure gauges and sensors. These devices were either direct read-out or the pressure information was communicated to a process control computer. This type of control system is utilized on virtually all pressure vessels in the production system and is used to maintain pressure within desired limits or shut down all or parts of the process system.

The facility pressure vessels and control systems are designed with sufficient safety devices and redundancy to prevent and/or isolate any unintentional release of flammable gas or liquid. Two levels of protection are provided against all potential hazards and the system is designed to be "failsafe". This integrated detection and protection system senses and activates appropriate shutdown devices as a first level. The second level of protection is provided by relief valves. Additional protection is provided by containment and operator intervention as a means of responding to an undesirable event. This safety control scheme is sufficient and adequate for the safe operation of the production facility.

Audit analysis of record data in conjunction with visual examinations determined that inspection redundancy is being achieved through repetitive and independent tests in accordance with API 510 guidelines. Inspection recommendations, maintenance activities, and design information are all documented within the pressure vessels permanent record.

Relief System: AERA has a ground flare system that consists of equipment that safely combusts vented hydrocarbons without compromising plant relief systems. This system handles the discharge of all reliefs inside a number of process units. The flaring system consists of the following major components and subsystems:

- Collection piping within a unit (including a mix of pressure reliefs and vents)
- A flare line to the site
- Knockout drums to recover liquid hydrocarbon from the gas streams
- A ground flare
- An assist system to maintain smokeless burning
- A fuel gas system for pilots together with igniters
- Controls and instrumentation

The flare location complies with all governmental regulations affecting noise, smoke suppression, luminosity, and allowable toxic concentrations. In addition the flare is located a safe distance from process equipment and has sufficient safeguards to protect workers and the public during maximum flaring.

The relief vent system was evaluated for condition, maintenance, and functionality. A visual inspection of the system determined that all laterals and headers are arranged so that the outlet from each relief valve does not form a liquid trap. The sizing of the discharge piping and the relief manifold is also designed not to reduce the relieving capacity of any of the pressure relieving devices below the amount needed to protect the corresponding vessel(s) from overpressure. In addition, the knockout drums appear to be sized for efficient vapor-liquid separation and probable maximum liquid carryover from relief valves. As with older

installations, the relief valves and associated piping were sized for a much higher production rate than present.

Isolation valves are installed on the inlet lines to PSVs and on the outlet lines for ease of maintenance. During normal operations, these valves on the inlet and outlet are opened and locked or sealed in that position. Rupture disks are used to protect against corrosion and reduce fugitive emissions on the upstream side of relief valves in the DCU and Amine facilities. These disks are used in conjunction with computerized sensors to alert operators of an abnormal increase in pressure via tank farm monitors.

The maintenance and servicing intervals for all pressure safety valves (PSVs) comply with applicable regulations and recommended standards. An outside contractor inspects and repairs PSVs throughout the facility. The inspection frequency is normally every six months and up to five years in some cases depending on the application of the relief valve. Service records were in order with no action items identified.

Fire Detection Systems: The fire detection system consists of a grid of smoke detection, gas/vapor, fusible plugs, and UV/IR sensors. Their main function is to quickly identify a developing fire and alert employees and emergency response personnel before extensive damage occurs. The locations of these devices appear to meet the NFPA 72 general spacing considerations. Inspection, maintenance, and testing of these devices are done according to the manufacturer's instructions and NFPA 72 guidelines.

An audit of the smoke detectors found them energized, free of excess dust and physically in good condition. Records showed these smoke detectors are visually inspected on a routine basis and smoke entry tested semiannually according to NFPA 72 inspection frequencies by AERA technicians.

Fusible links are commonly used in the tank farm, DCU and Amine units. The audit team visually inspected the fusible link system and found the system in good working order. The system was pressurized, tubing was not damaged, and the lines were constructed of noncorrosive materials. Inspection, maintenance, and testing records showed AERA technicians inspect the fusible plug system annually according to NFPA 72.

An audit of the fire detection system in the tank farm found that fire detection relies solely on surveillance from operating personnel rather than dedicated detection systems. The tank farm has fusible links at the vapor recovery unit but no other flame detection for the oil storage or production areas. A response to a fire at the tank farm rests on the operator who after observing a fire, must initiate the notification to the local fire department and try to secure the source of fuel. In a worse case scenario, a fire within the tank farm could grow in intensity or involvement before operating or surveillance personnel could detect it. While early detection of a fire is essential, the current protection does provide the minimum level of protection mandated by building codes, insurance agencies, and local authorities established during the construction of the tank farm. In addition, the local fire department located less than two miles from the facility.

The fire detection systems on the Stretford, Amine, and DCU units meet MRMD regulations 2132(g) (4) and are appropriate in design and scope. The fire detection systems in use at the DCU, Amine and the Stretford units consist of IR/UV flame detectors, and combustible gas/vapor detectors. The DCU also employs deluge and fusible plugs in its active fire protection systems. These systems appear to be well maintained and in good operating order with no deficiencies found.

Fire Fighting Equipment: The water fire fighting system consists of a pre-pressurized loop system supplying water to hose, hydrants, deluge sprinklers, stationary monitors, and foam station. A test of the system hydraulics, by AERA's fire protection engineer, showed that the fire pump had the capacity to supply the DCU deluge system and hose streams with adequate flow and pressure. Weekly test results are recorded and retained for comparison purposes as required by NFPA 25, 5-4. The fire fighting system appears to meet the minimum fire equipment requirements found in NFPA 11, 13, 15 and 20 guidelines.

An audit of the firewater piping and fittings found them in good condition (e.g., missing or damaged paint or coating, rust, and corrosion) and free of mechanical damage. Pipe to soil interface was minimal with no corrosion present. Fire loop supports, hangers and braces were secure and undamaged. Hydrants were protected from vehicle impact with adequate barriers and valve handles appeared to be in good condition with hydrant wrenches securely attached. The firewater hoses also appeared to be in good condition with no signs of deterioration or rot.

The fixed water monitors used throughout the processing areas were inspected for leaks and nozzle range of motion. As part of AERA's preventative maintenance program, pivot points on the monitor are regularly greased ensuring proper operation in the event of a fire.

A foam system (3% aqueous film forming foam, AFFF) is employed within the tank farm for controlling pooled liquid hydrocarbon fires on the oil stock tanks. The concentrate storage vessel is adjacent to the tank farm control room and requires operator intervention for activation. The system is designed to provide an air-excluding continuous blanket of foam to the surface of the oil stored in the stock tanks. Dyne Technologies test the foam concentrate for contamination and dilution on a regular basis. Records show a history of continuous testing.

Combustible Gas and H₂S Detection Systems: The gas detection system was reported to be in good working order, designed and functioning properly with only one minor deficiency noted. Amine Unit LEL sensors were difficult to locate because of inadequate labeling. This condition makes worker errors more likely during a stressful situation. Calibration, testing, and maintenance of this system is conducted and recorded monthly by AERA personnel. Sensor histories and test results are kept electronically and available upon request.

The onshore combustible gas detection systems can be found within the DCU, Stretford, and Amine units. These gas detection systems alert personnel to the presence of low-level concentrations (20% of LEL) of flammable gas/vapor by a computer generated alarm and a local beacon. As the concentration of the gas approaches 60% of LEL, shut down (ESD) of the units occur. Operating personnel are alerted to the presence of flammable gas by visual (beacons) and computer generated alarms.

AERA's hydrogen sulfide dispersion modeling assessed the risk to the public and nearby housing tracts. The model predicted a radius of exposure (ROE) for varying hydrogen sulfide concentrations for both continuous and puff instantaneous releases to determine whether additional safeguards are needed. Computer modeling determined that no significant exposure risks were present and that no additional safeguards were needed.

Emergency Shutdown System (ESD): The safety audit assessment of these devices found they were functioning properly, and could be activated manually or automatically by the fire or equipment safety sensors. These ESDs were typically located outside the area that they were protecting and were designed to be "fail safe". Their arrangement and design are such that an accident will not affect the capability of the ESD system to provide the necessary shutdown.

This safety system can be found within each of the onshore facilities (Tank Farm, Stretford DCU and Amine Units). These ESD stations are strategically located and include a number of independent process shutdown devices that could be actuated separately. The ESD system was found to effectively alarm, shutdown all process activity and close SDVs as designed. The safety system also permits the continued operation of the fire fighting systems during an emergency. These stations were clearly identified within the facilities and made of corrosion resistant materials to ensure continual operation in an emergency.

Safety and Personal Protective Equipment (PPE): AERA has a written workplace safety program that is used for identifying, evaluating, analyzing, and controlling workplace safety and health hazards. This program has systematic policies, procedures, and practices, which are fundamental to creating and maintaining a safe and healthy working environment. AERA also considers the prevention of occupational injury and illness to be of such consequence that it is given precedence over productivity.

Personal protective equipment (PPE) is used to reduce employee exposure to hazards when engineering and administrative controls are not feasible or effective in reducing these exposures to acceptable levels. An assessment of their policy found that the company regularly assesses the workplace to determine if hazards are present that require the use of PPE. Hazards are then communicated to the employees, appropriate PPE is selected, and workers are trained in its use. Employees were observed using appropriate PPE as required by company policy or where known hazards exist.

Lighting: AERA has implemented a "good neighbor" policy onshore that entails turning off some non-essential process area lighting that could be a nuisance to nearby residences. This was done to reduce the number of complaints regarding lease lighting and to adopt a good neighbor policy. AERA has achieved this balance through combining general and local lighting by providing the minimum required light with general lighting, adjusting lighting levels at specific locations and providing portable task lighting to its employees. This approach to lighting has maintained:

- A reduced risk of occupational accidents,
- Better concentration and accuracy in work,

- Improved work performance,
- Improved accuracy and increased work speed enhancing production.

Instrumentation, Alarm, and Paging: Major equipment and process controls are graphically displayed on the operators consoles. Each console within the control room monitors any section of an assigned plant but manipulation of any control loop is limited to only one console at a time. The designs of the Wonderware display allow the operator to access information and initiate any action in an uncomplicated manner. Diagrams are available to show present and changed information for process plants and system monitoring control. This type interface tends to be “user friendly” and includes a certain amount of change flexibility.

Common operator actions possible from the displays include:

- Setpoint Change
- Mode (Auto or Manual)
- Output Change
- Trending
- Loop Tuning
- Alarm Management
- Report(s)
- Shutdown of Selected Processes

The alarm systems, whether dedicated or integrated, give an audible indication to alert the operator that an alarm has been activated. The visual indication is then used for alarm identification and evaluation. These audible tones are different for each process location. This difference in sound is used to help operators identify the origin of the alarm. Computer generated process alarms are not only displayed and audible in the control room they are also sent to a paging system that alerts operators who may be away from the control room to alarms generated by the process control computer.

The display methods and components are consistent throughout the Wonderware screens. Adequate information is contained in each of the video displays and all functions are labeled for quick assess of key information. The graphic displays are concise and clear-cut which reduces the possibility of confusion and operator error.

ESP, PUMP Units, and Wellhead Equip & Well Safety Systems: The onshore, wells are considered incapable of flow or after flow, once artificial lift is stopped. Therefore, SSVs or other automated shut down valves are not required on production flow lines. Since gas can flow from the casings, block, and bleed systems have been provided at the wellhead. Onshore ESP wells can be shutdown remotely via Tank Farm lease ESD.

Emergency Generator: Emergency power on the onshore facilities is provided by UPS systems and portable generators. The onshore UPS systems provide approximately ½ hour of backup power to the individual facility PLC’s. If needed, additional power to the PLC’s can be supplied by portable generators. These generators are sized to supply power to a few vital circuits and their operation is only limited by the amount of fuel available. In the event of a

power failure, manual transfer switches isolate circuits from incoming electrical service. If the generator is running and power is restored, these switches keep the power company's electricity from traveling to isolated circuits until the generator is turned off and the switch is reset to the non-backup position. This method of operation allows for the safe transfer and operation of emergency power.

Facility emergency lighting is restricted to handheld flashlights and truck-mounted spotlights. In the event of a power outage, safe shutdown of the facilities can be accomplished using the backup instrument air compressor.

Spill Containment: The secondary containment volumes available onshore are and adequate for meeting the spill control and containment (SPCC) regulations. This system coupled with routine visual inspections, by operating personnel; reduce the potential of a major spill from occurring. The containment volumes provided by the spill containment walls for the tank farm were also carefully reviewed. The assessment found that containment for the stock tanks as well as for the skim tanks is adequately sized. The containment volumes provided will contain more than the volume of the largest tank plus the recommended allowance for precipitation while excluding the volumes occupied by other tanks.

Spill Response: Onshore oil spill response equipment is stored in an emergency trailer located near the electrical personnel office. The trailer is stocked with a variety of pollution control equipment that exceeds minimum equipment requirements. An outside contractor maintains these inventories monthly. The inventory consists of spill booms, absorbent pads, generator, shovels, rakes, hand tools, flashlights, tape, etc. Contract personnel are considered the primary responders to minor onshore spills with AERA personnel available if needed. For larger onshore spills, the same outside contractors mentioned above can and will respond if called on with the addition of ACTI Environmental Services vacuum trucks.

Preventive Maintenance and Mechanical Integrity: This section gives a general evaluation of the company's activities to ensure that mechanical equipment is designed, fabricated, procured, installed, and maintained in a manner appropriate for its intended application.

AERA has replaced the "breakdown" maintenance philosophy, prevalent in oil fields of the past, with an on-going equipment integrity program that ensures that process equipment and instrumentation are designed, constructed, installed, and maintained to minimize the risk of hazardous releases. Operators and technicians focus their efforts on condition monitoring activities to uncover mechanical defects or deficiencies requiring action.

The company has adopted the Total Productive Maintenance (TPM) concept as part of their comprehensive maintenance philosophy. This program brings maintenance into focus as a necessary and important part of the business. In this process, workers are empowered to initiate corrective action before actual equipment failure takes place and recognize potential failure conditions. Operators and maintenance personnel also develop multiple skills and improved flexibility through this system of autonomous maintenance. Employees learn to work as a team to identify the root cause of problems most commonly encountered during normal operation for a particular piece of equipment. During these team meetings, a detailed review

of the work order history or a brainstorming session with operations and maintenance personnel can take place in an effort to identify the source of problems. Through their combined efforts, a solid PM procedure can be developed to combat the root cause of failures. The effectiveness of this program can be seen throughout the lease as improved mechanical reliability and decreased recordable spills. This maintenance philosophy has also streamlined their parts storage allowing more warehouse shelf room for critical parts.

A computer based maintenance program (SAP) captures all maintenance activities and repairs. This system has the ability to plan, schedule, manage inventory control, and record maintenance activities. Preventive maintenance work orders generated by this system are based on manufactures recommendations and operating history. This program is an effective tool for managing and scheduling equipment maintenance and is used extensively by company personnel. The strength of AERA's mechanical integrity program is further demonstrated through their:

- Development of written maintenance procedures
- Training of maintenance personnel
- Periodic inspections and tests
- Correcting equipment deficiencies promptly
- Implementation of quality assurance program

Another group of proactive maintenance tools used within the facility is vibration and oil analysis. This type of equipment monitoring is usually performed on larger, more expensive equipment. The recorded data and test results are merged into the computerized maintenance management system (SAP). When high particle counts or vibrations are detected, action is taken to find and eliminate the root cause of the problem. These programs have proved beneficial in identifying key system component failures and reducing maintenance costs.

Administrative Audit

3.0 ADMINISTRATIVE AUDIT:

Goals and Methodology:

The primary goal of the Administrative Audit (ADM) Team was to evaluate the existence of operating and spill response manuals, supporting documents, and records needed for proper and safe facility operations. The audit included an evaluation of local, State, or Federal regulations/ordinances and industry standards that apply to the operation and the application of AERAs internal policies and procedures. The ADM audit included a review of AERAs manuals, programs, procedures, and its record keeping methodology. These document reviews were conducted during on site visits as well as a review of records and documents maintained by the CSLC. The document reviews were supplemented by reviews of records required for compliance with regulations or consistency with internal policies as well as observations of applications of company policies and procedures.

Operations Manual:

AERA procedure manuals were reviewed for content and accuracy, they included the following:

- Platform Emmy Operating Manual
- Emmy Procedures Manual
- Dew Point Control Unit (DCU) Operating Manual
- Tank Farm and Water Plant Operating Manual
- CLAM Operating Manual
- Facility Procedures Manual

The development of a standard procedure manual appropriate to each major facility is part of a comprehensive safety program. Written procedures enhance the overall safety of the facility and assure that the employees can perform their job tasks in a safe manner. In addition, established written procedures can maintain the on-going integrity of the process equipment.

State Public Resources Code 8750(g) defines AERA's Huntington Beach lease as a marine facility and subject to MRMD regulations 2173(a) and 2175. Operators of a marine facility are required to have an operation manual that describes equipment and procedures employed. The required content of the manual is defined within MRMD regulation 2175 and should contain at minimum, specific information as to the equipment located within each facility, safe operating practices for the equipment, facility startup and shutdown procedures, and emergency procedures. Operating manuals should be arranged in a logical manner and include a table of contents, numbered pages and/or tabs for quick and easy access. Additional materials such as P&IDs, including set points and the location of personal protective equipment (PPE) are also recommended.

A review of Platform Emmy operations manual and Emmy Procedures Manual determined that the content was in compliance with MRMD Regulation 2175. Platform Emmy's manuals are informative and organized in logical manner. The only administrative item was identified by ADM was corrected prior to the issuance of this report. P (ADM 5.3.01)

A comprehensive review of the onshore manuals (DCU, Tank Farm, CLAM Operating Manual, and Facility Procedures Manual) determined that in most cases, pertinent operating information was available within the different manuals. The two items noted concerning the content of the Operations Manual was the lack of detailed information regarding the drainage system and the Firewater Pump is not included. (ADM - 5.2.01 & 02)

The CLAM Operating Manual appears to address basic start-up and shutdown procedures for production, water injection wells, including support and test equipment such as portable well testers, the portable flow line and metering unit (PFAMU). The manual lacks a table of contents, reference tabs, and the pages are not numbered making procedures difficult and time consuming to look-up. (ADM – 5.2.03) It was found that the format is different from the other onshore manuals. AERA is currently updating all of its operational manuals and has assigned a full time person to this task.

Spill Response Plan:

AERA has an extensive facilities response plan that fulfills the requirements for an oil spill contingency plan contained in MRMD regulations, CCR Title 2, Div 3, Chapter 1, Article 3.4, reg. 2139, as well as the Operating Manual requirements for Oil Spill Contingency and Hazardous Material Plan located in the MRMD regulations, in Article 3.6, reg. 2175. The same plan also fulfills the requirement 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 DOT regulations, Title 40, CFR, 112.5. The AERA oil spill contingency plan was reviewed using checklists to verify required content as well as compare spill response equipment inventories and inspection reports with equipment listed in the plan. The format of the plan appears comprehensive and clear. AERA's Incident Command location was observed to be suitable for the intended use in the plan. AERA's oil spill response drill schedule and training were also verified to be up to date.

Required Documents and Records

AERA has a number of regulatory agency required policies that are to be available on both the offshore and onshore operating locations. Some of these policies include an injury and illness policy, spill prevention, business emergency plan, and hazardous materials response plans just to mention a few. AERA management has

implemented a "Consolidated Response Plan" to reduce the size and simplify the libraries on and offshore.

AERA has an Environmental Health and Safety (EHS) Manual that defines management's policies in regards to environmental issues, as well as personnel health and safety policies. Safety orientation training is required for contractors and visitors to ensure they are familiar with AERAs EHS policies before entering any of the operating locations. The training is documented and records are kept on location. The EHS manual also defines policies and procedures for operating tasks such as lock-out/tag-out (LO/TO) and tagging and flagging (T/F). These policy and procedures are in place at all operating locations and thoroughly implemented in operating areas.

In an effort to increase safety and environmental awareness, AERA implemented Management of Change (MOC) throughout all operating locations. MOC is used to provide guidance and establish the appropriate steps to be taken to identify and control any inadvertently introduced new hazards. AERA has several of the elements required by the 5189 standard already in place; including, the MOC policy, PHA, hot work permit policies, operating procedures, and accident investigation procedures.

Training, Drills, and Applications:

AERA has a comprehensive ongoing training program that includes optional and mandatory training for its personnel. A sample of the training provided includes classes on, confined space entry, DOT pipeline operations, oil spill drills, hazard communication, HAZWOPER, hot work permitting, H₂S, and lock-out/tag-out. The program includes mandatory training as required by OSHA and the Office of Oil Spill Prevention and Response (OSPR).

Drills, exercises, and safety meetings are conducted throughout the year. Spill response, evacuation, and other safety and environmental training, drills, and exercises have been instituted and documented. Both monthly and morning safety meetings are conducted as scheduled. General and topic specific monthly and weekly safety meetings, training, and pre-job safety meetings are recorded and records of the meetings are maintained. The importance of PPE is understood and enforced for all personnel on the platform and onshore operations.

Human Factors

6.0 HUMAN FACTORS AUDIT:

Goals of the Human Factors Audit:

The primary goal of the Human Factors Team was to evaluate Aeras human and organizational factors through the safety assessment of management systems (SAMS) interview process.

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 was derived from a general question with numerous 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.

Human Factors Audit Methodology:

Representatives of the CSLC Mineral Resources Management Division will be scheduling the SAMS following the completion of this report. The MRMD staff will present the findings of the SAMS and a written report to Aera management.

Appendices

TEAM MEMBERS

EQUIPMENT FUNCTIONALITY AND INTEGRITY TEAM

CSLC – MRMD	Mark Steinhilber Dave Rodriguez Daryl Hutchins Steve Staker
Aera	Brent Boyce David Cunningham Larry Miller William Morris Corbin Weed

TECHNICAL TEAM

CSLC – MRMD	Mark Steinhilber Dave Rodriguez Daryl Hutchins Steve Staker
Aera	Brent Boyce David Cunningham Larry Miller William Morris Corbin Weed

ADMINISTRATIVE TEAM

CSLC – MRMD	Mark Steinhilber David Rodriguez Daryl Hutchins Steve Staker
Aera	Brent Boyce David Cunningham Larry Miller William Morris Corbin Weed

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 ₂ 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 *Means of Egress*
 - 3222 *Arrangement and Distance to Exits*
 - 3225 *Maintenance and Access to Exits*
 - 3308 *Hot Pipes and Hot Surfaces*
 - 3340 *Accident Prevention Signs*
 - 5189 *Process Safety Management of Acutely Hazardous Materials*
 - 6533 *Pipe Lines, Fittings, and Valves*
 - 6551 *Vessels, Boilers and Pressure Relief Devices*
 - 6556 *Identification of Wells and Equipment*
- CCR California Code of Regulations
- 1722.1.1 *Well and Operator Identification*
 - 1774 *Oil Field Facilities and Equipment Maintenance*
 - 1900-2954 *California State Lands Commission, Mineral Resources Management Division Regulations*
- CFR Code of Federal Regulations
- 29 CFR *Part 1910.119 Process Safety management of Highly Hazardous Chemicals*
 - 30 CFR *Part 250 Oil and Gas Sulphur Regulations in the Outer Continental Shelf*
 - 33 CFR *Chapter I, Subchapter N Artificial Islands and Fixed Structures on the Outer Continental Shelf*
 - 40 CFR *Part 112, Chapter I, Subchapter D Oil Pollution Prevention*
 - 49 CFR *Part 192, Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standard*
 - 49 CFR *Part 195, Transportation of Liquids by Pipeline*

INDUSTRY CODES, STANDARDS, AND RECOMMENDED PRACTICES

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

- 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