SECTION I: PLANS AND SCHEDULES

This section lists all plans approved by AQMD for the purpose of meeting the requirements of applicable AQMD rules specified below. The operator shall comply with all conditions specified in the approval of these plans, with the following exceptions:

a. The operator does not have to comply with NOx and SOx emission limits from rules identified in Table 1 or Table 2 of Rule 2001(j) which became effective after December 31, 1993.

b. The operator does not have to comply with NOx or SOx emission limits from rules identified in Table 1 or Table 2 of Rule 2001(j) after the facility has received final certification of all monitoring and reporting requirements specified in Section F and Section G.

Documents pertaining to the plan applications listed below are available for public review at AQMD Headquarters. Any changes to plan applications will require permit modification in accordance with Title V permit revision procedures.

List of approved plans:

Application	Rule
474117	1123
474150	1118
474575	63Subpart UUU
474581	1105.1
474582	2002
559295	463
474591	63Subpart UUU
476368	1176
476506	1173
494845	1472
549262	**1118**

FLARE MINIMIZATION PLAN – TESORO REFINING & MARKETING COMPANY LLC LOS ANGELES REFINERY

Prepared For

Tesoro Refining and Marketing Company
Los Angeles Refinery
2101 East Pacific Coast Highway
Wilmington, California 90744

and

Sulfur Recovery Plant
23208 South Alameda Street
Carson, California 90810

Submitted to

South Coast Air Quality Management District
21865 East Copley Drive
Diamond Bar, California 91765-4182

March 28, 2013

FLARE MINIMIZATION PLAN

TESORO LOS ANGELES REFINERY AND SULFUR RECOVERY PLANT FLARE SYSTEMS

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SECTION 1

INTRODUCTION

1.0 PURPOSE

On November 4, 2005, the South Coast Air Quality Management District (SCAQMD) amended Rule 1118 – Control of Emissions from Refinery Flares. The Rule applies to all gas flares used at petroleum refineries, sulfur recovery plants and hydrogen production plants. Rule 1118 as amended on November 4, 2005, contains an SO2 Performance Target which for the Tesoro Los Angeles Refinery applies to the combined emissions from the Los Angeles Refinery and Sulfur Recovery Plant Flares. The combined emissions from the LAR and SRP Flares exceeded the SO2 Performance Target for calendar year 2012. A Notice of Sulfur Dioxide Exceedance for Calendar Year 2012 was issued to Tesoro on February 22, 2012, as required by Rule 1118(d)(2). A copy is included as Appendix A of this FMP.

One of the requirements of Rule 1118(d)(3) is to prepare and submit to the SCAQMD a Flare Minimization Plan (hereafter referred to as "FMP") as required by Section 1118(d)(3)(A) to identify any policies, procedures or equipment improvements to be implemented to minimize flaring and flare emissions in order to comply with SO2 Performance Targets. Tesoro Refining & Marketing Company LLC is submitting this FMP for the Los Angeles Refinery (LAR) Flare System located at 2101 E. Pacific Coast Hwy in Wilmington, California (Facility ID No. 800436) and associated Sulfur Recovery Plant (SRP) located at 23208 S. Alameda Street in Carson, California (Facility ID No. (151798).

1.1 SUMMARY OF RULE REQUIREMENTS FOR FLARE MINIMIZATION PLAN

On November 4, 2005, the South Coast Air Quality Management District (SCAQMD) amended Rule 1118 – Control of Emissions from Refinery Flares. The purpose of this Rule is to monitor and control refinery and related flaring operations. The Rule applies to all gas flares used at petroleum refineries, sulfur recovery plants and hydrogen production plants.

As noted above, one of the requirements of Rule 1118 is to prepare and submit to the SCAQMD a FMP if the SO2 Performance Target is exceeded. The combined SO2 emissions from the Tesoro LAR and SRP exceeded the SO2 Performance Target in Calendar Year 2012. Therefore, an FMP must be submitted to the SCAQMD which includes the information required by Rule 1118(e)(1):

(A) A complete description and technical specifications for each flare and associated knock-out pots, surge drums, water seals and flare gas recovery systems;

(B) Detailed process flow diagrams of all upstream equipment and process units venting to each flare, identifying the type and location of all control equipment;

(C) Refinery policies and procedures to be implemented and any equipment improvements to minimize flaring and flare emissions and comply with the performance targets of paragraph (d)(1) for:

(i) Planned turnarounds and other scheduled maintenance, based on an evaluation of these activities during the previous five years;

(ii) Essential operational needs and the technical reason for which the vent gas cannot be prevented from being flared during each specific situation, based on supporting documentation on flare gas recovery systems, excess gas storage and gas treating capacity available for each flare; and

(iii) Emergencies, including procedures that will be used to prevent recurring equipment breakdowns and process upset, based on an evaluation of the adequacy of maintenance schedules for equipment, process and control instrumentation.

(D) Any flare gas recovery equipment and treatment system(s) to be installed to comply with the performance targets of paragraph (d)(1).

Please note that the drawings and information contained in Appendices B, C, and D is confidential and is a trade secret as defined in government code sections 6254 and 6254.7 and shall not be released to any person, party, organization or other agency without the written permission of Tesoro Refining & Marketing Company LLC.

SECTION 2

EXECUTIVE SUMMARY

The combined SO2 emissions from the Los Angeles Refinery (LAR) and Sulfur Recovery Plant (SRP) were estimated to be approximately 37,043 lbs as compared to our Rule 1118 SO2 Performance Target for calendar year 2012 of 36,051 lbs. As a result of exceeding the SO2 Performance Target for calendar year 2012, we have prepared and are submitting this Flare Minimization Plan (FMP) to identify the cause(s) of the exceedance and corrective actions taken and or to be taken to comply with the SO2 Performance Targets.

As discussed in detail and summarized in Section 3 of this FMP, the exceedance of the SO2 Performance Target in Calendar Year 2012 resulted primarily from 2 unplanned flare events involving unscheduled shutdowns of DCU Wet Gas Compressor C-87 (C-87) on April 17 and August 31, 2012. The SO2 emissions from the LAR Flare during those two flare events resulted in estimated SO2 emissions of 35,674 lbs. The August 31, 2012, unscheduled shutdown of C-87 at the DCU was the result of loss of power from LAR Substation 10. Although the shutdown of C-87 at approximately 9 am on April 17, 2012, was not the result of a loss of power, the duration of that flare event was extended significantly beyond the first attempt to restart C-87 at approximately 9:20 am on April 17, 2012, due to an open neutral wire in the C-87 start circuit. Had there not been an issue with the open neutral wire in the C-87 start circuit which prevented the restart of C-87 at 9:20 am, it is estimated that SO2 emissions from the LAR Flare would have been limited to 2,800 lbs as compared to the estimated SO2 emissions from that flare event of approximately 25,300 lb. Without that significant delay of the restart of C-87 on April 17, 2012, the SO2 Performance Target in Calendar Year 2012 would have been met. As discussed in Section 4 of this FMP, flare events due to planned activities or essential operational needs at LAR did not contribute significant SO2 emissions and there were no applicable flare events at the SRP during calendar year 2012. Therefore, the primary cause of the exceedance of the SO2 Performance Target in calendar year was determined to be issues related to the reliability of the electrical/power supply for C-87. As outlined below, and discussed in Section 3 and Section 4(C)(iii), corrective actions have been taken and/or will be taken to improve the reliability of the electrical/power supply for C-87.

The corrective action implemented as a result of the investigation into the safety shutdown and delayed restart of DCU Wet Gas Compressor C-87 on April 17, 2012, to improve the reliability of the electrical/power supply for C-87 is outlined below:

E&I personnel identified the open neutral wire on C-87, switched to the spare neutral wire, tested the breaker and turned C-87 over to Operations for restart by approximately 2 pm. C-87 was restarted at approximately 2:21 pm on April 17, 2012.

The corrective actions implemented and/or identified for evaluation and/or implementation as a result of the investigation into the shutdown of DCU Wet Gas Compressor C-87 due to loss of power from LAR Substation 10 on August 31, 2012, to improve the reliability of the electrical/power supply for C-87 are outlined below:

Corrective action(s) taken prior to completion of the investigation:

1. E&I personnel isolated the electrical problem at LAR Substation 10 to a ground fault between Transformers 61 and 62 (TR-61 and TR-62) and Breaker 10C3 on Bus 10 C in Substation 10. This allowed Breaker 10C5 on Bus 10C which provides power to the motor for DCU C-87 to be reset. Once power was restored, C-87 was turned over to Operations for start up. C-87 was restarted at approximately 10 pm on August 31, 2012. This reduced the vent gas flow to the Refinery Flare Gas Recovery Header such that the water seal level in the Flare Knockout (KO)/Water (H2O) Seal Drum could be restored and vent gas flow to the LAR Flare was stopped at approximately 10:16 pm on August 31, 2012. Portable generators were brought in to provide power to equipment at the DCU and GCP on 10C3.

2. During the follow-up investigation, the location of the ground fault was located. The existing cable was pulled out, the integrity of the conduit was verified, and approximately 150 feet of replacement cable was pulled/installed. This work was completed on September 23, 2012.

3. After checking the system, approval was given to reset Breaker 10C3 and remove the portable generators. This allowed the equipment affected by the loss of power due to the isolation of 10C3 to be restarted on normal power from LAR Substation 10 on September 26 & 27, 2012.

Corrective actions identified as a result of the investigation into this flare event are:

An additional item identified as a result of the investigation into the unscheduled shutdown of DCU C-87 on August 31, 2012, was to evaluate an independent power supply for C-87 outside of Bus C. This evaluation was completed on February 28, 2013. LAR Technical Staff has evaluated the idea of relocating the electrical feeder breaker 10C5 for C-87 Gas Compressor motor M-1005 to a separate bus in Substation 10; the objective is to mitigate the nuisance tripping of the compressor due to electrical faults emanating from the adjacent feeder branches. The findings show that it is not necessary to move the C-87 feeder to a separate bus; the breaker 10C5 is already providing a dedicated service and protections to the compressor motor at the Bus 10C. A simplified line drawing of Substation 10 is included in Appendix E.

As a result of completing the above evaluation, an additional corrective action was identified. The last episode of power loss for the entire Bus 10C originated from an electrical ground fault on the adjacent feeder 10C3. Breaker 10C3 did not clear the fault sufficiently fast enough, but the main breaker 10C1 sensed the fault and opened, thus dropping power to the entire Bus 10C to prevent further damage to other loads on the same bus. Because the ground fault started on feeder 10C3, the feeder breaker 10C3 should have cleared without allowing the fault current to propagate upwards, causing the upstream protective device (10C1) to trip. The cause is a lack of good coordination between downstream and upstream devices. Subsequent investigation confirmed that the time settings and current magnitudes for feeders 10C3 and 10C5 were set much higher than the 10C1. Therefore, the 10C1 will clear sooner before allowing feeder branches to clear first. Because of this coordination problem; LAR will perform a full coordination study for the protective device settings on Bus 10C. Once the correct and coordinated settings are determined, each protective device will be reset and tested according to the correct and coordinated value. This procedure will prevent the same episode from happening again in the future. This procedure will be completed by August 1, 2013.

SECTION 3

ANALYSIS OF FLARE EVENTS RESULTING IN THE EXCEEDANCE OF THE SO2 PERFORMANCE TARGET IN CALENDAR YEAR 2012 AND CORRECTIVE ACTIONS TAKEN AND/OR TO BE TAKEN TO PREVENT REOCCURRENCE

3.1 Results of Analysis of Cause Of Exceedance of the SO2 Performance Target in 2012

As indicated in Table 3-1 below, the exceedance of the SO2 Performance Target for Calendar Year 2012 was primarily the result of 2 unplanned flare events resulting from the unscheduled shutdown of the Delayed Coking Unit (DCU) Wet Gas Compressor C-87 which occurred on April 17, 2012, and August 31, 2012. These 2 unplanned flare events resulted in estimated SO2 emissions of 35,674 lbs which represented 96.4% of the total SO2 emissions from combustion of vent gases in the LAR Flare in 2012 and approximately 99% of the SO2 Performance Target of 36,051 lbs. An additional unplanned flare event resulting from an emergency shutdown of the Hydrocracking Unit (HCU) on August 18, 2012, resulted in an additional 739 lbs of SO2 being emitted from the LAR Flare. When combined with the estimated 35,674 lbs of SO2 from the DCU flare events, the SO2 emissions from the LAR Flare exceeded the SO2 Performance Target of 36,051 lbs.

Table 3-1

Estimated Vent Gas Flow and SO2 Emissions For Tesoro LAR Flare In 2012

Type/Source	Vent Gas Flow (scf)	SO2 Emissions from Combustion of Vent Gases (Lbs)	SO2 Emissions (% of Total)
Main Categories			
Total	4,743,569	37,018	----
Planned	41,032	32	0.1
Unplanned	4,702,537	36,986	99.9
Unplanned Events			
DCU C-87 Shutdowns	3,941,911	35,674	96.4
HCU Emergency Shutdown	353,244	739	2.0
Other Unplanned	407,382	573	1.5

As can be seen in Table 3-1 above, SO2 emissions from planned activities i.e. shutdowns, start ups, turnarounds and maintenance were only estimated to be 32 lbs which represents only 0.1% of the total SO2 emissions from the LAR Flare in 2012.

The 3 major unplanned flare events in 2012 were all Specific Cause Analysis Flare Events. As required an investigation was conducted and Specific Cause Flare Event Reports were submitted to the District within 30 days. A summary of the results of the investigations conducted for these Specific Cause Analysis Flare Events including incident descriptions, cause(s) and corrective actions taken and/or to be taken are summarized in the section below.

3.2 Results of Investigations into Cause(s) of the Major Flare Events in 2012 that Caused the Exceedance of the SO2 Performance Target in 2012 and Corrective Actions Taken and/or To Be Taken To Prevent Reoccurrence

APRIL 17, 2012 DCU WET GAS COMPRESSOR C-87 SHUTDOWN

Incident Description

On Tuesday April 17, 2012, the daily maintenance schedule called for cleaning of the suction strainer on Cooling Water Booster Bump (P-2402). At 8:45 am P-2402 was shutdown and suction/discharge block valves were isolated. However, one of the block valves around the by-pass check valve was left closed. At 8:48 am the high pressure alarm (3PC1314) activated on Vaccum Tower V-899 and at 8:52 am the Heavy Vacuum Gas Oil Reflux Pump (P-3381) shut down due to high vibration. The C-87 high motor amperage alarm activated at 8:49 am and field operators proceeded to check potential sources of excess gas to the suction of C-87. At 9:00 am, a safety shutdown of C-87 was initiated by high motor amperage and shortly thereafter, DCU overhead gases vented as designed through pressure control valve 3PV1316A to the DCU Flare Gas Recovery Header.

Operations personnel opened suction/discharge block valves and restarted P-2402 at 9:10 AM. In parallel, Operations prepared C-87 for restart by 9:20 am. When the start button was pressed, C-87 would not start. At 9:40 am, Operations noted that the cooling water supply pressure was low. They determined that the discharge block valve for P-2402 had broken closed and that the pump bypass system was not lined up. They proceeded to shutdown P-2402 and line up the by-pass system. This re-established cooling water flow to the C-87 suction condensers. However, operational troubleshooing efforts on C-87 start-up were not successful, and at 10:00 am, the equipment was turned over to Maintenance for more detailed troubleshooting.
At 10:00 am, initial maintenance response determined that the C-87 breaker had not tripped. Instrument Technicians started checking the safety instrumented system to verify that there were no instrument issues preventing C-87 from starting. At 11:00 am, Electrical Technicians started checking the cubicle breaker circuit. At 12:18 am, a neutral wire for the start circuit was found to be open. The open neutral wire was switched to an existing spare wire by 1:00 pm. After testing the breaker in the test station, Electrical Technicians proceeded to place the breaker into the test position in the cubicle to determine if the circuit would operate properly. At 2:00 pm, the breaker was racked in to the cubicle and C-87 was released to Operations. C-87 was restarted at 2:21 pm after pre-startup safety checks were performed. Flaring stopped at approximately 2:37 pm.

During the troubleshooting efforts for the DCU C-87 start circuit described above, the current DCU batch drum cycle processing was set to complete at 4:00 PM. During this time Operations personnel minimized flaring by reducing Coker Heater Charge. Additionally to reduce vent gas flow flare to the LAR Flare, Operations shutdown Transmix processing, rerouted Crude Unit Butanes away from the DCU, and minimized Fractionator overhead temperature. Had C-87 not been started before the end of the cycle, Operations developed a plan to go into circulation mode.

Results of Investigation Into Cause

The Specific Cause Analysis Flare Event which occurred at the DCU at the Los Angeles Refinery on April 17, 2012, resulted from a safety shutdown of DCU Wet Gas Compressor C-87 initiated by high motor amperage caused by a process upset resulting from loss of cooling water to the Vacuum Ejector and Fractionator Overhead Condensers due to a procedural error during the shutdown of DCU Cooling Water Booster Pump P-2402. This resulted in an increase in pressure in the DCU Fractionator Overhead Accumulator and opening of a pressure controller to the DCU Flare Header to relieve the pressure as designed. The vent gas flow from the DCU to the Refinery Flare Gas Recovery Header exceeded the capacity of the FGRS Compressors resulting in vent gas flow to the LAR Flare at approximately 9:02 am on April 17, 2012. The duration of the flaring incident was significantly extended beyond the first attempt to restart C-87 at approximately 9:20 am on April 17, 2012, due to an open neutral wire in the C-87 start circuit. Had there not been an issue with the open neutral wire in the C-87 start circuit which prevented the restart of C-87 at 9:20 am, it is estimated that SO2 emissions from the LAR Flare would have been limited to 2800 lbs as compared to the estimated SO2 emissions from this flare event of approximately 25300 lb.

Corrective Actions Taken and/or To Be Taken To Prevent Reoccurrence

Corrective action(s) taken prior to completion of the investigation:

E&I personnel identified the open neutral wire on C-87, switched to the spare neutral wire, tested the breaker and turned C-87 over to Operations for restart by approximately 2 pm. C-87 was restarted at approximately 2:21 pm on April 17, 2012. The start up of C-87 was successful in stopping vent gas flow from the DCU to the Refinery Flare Gas Recovery Header. This reduced the vent gas flow to the Refinery Flare Gas Recovery Header such that the water seal level in the Flare KO/H2O Seal Drum could be restored and the FGRS Compressors returned to service. This was successful in stopping vent gas flow to the LAR Flare at approximately 2:37 pm on April 17, 2012.

Corrective actions identified for evaluation and/or implementation as a result of the investigation into the safety shutdown of DCU Wet Gas Compressor C-87 on April 17, 2012, are outlined below:

1. With regard to the causal factor concerning the line-up of the bypass system for DCU Cooling Water Booster Pump P-2402 during shutdown of the pump for scheduled maintenance:

    a. Evaluate and implement corrective actions to ensure that the Cooling Water Booster Pump bypass system is available at all times. This may include locking open valves, installing a sign(s), developing a job aid, updating the training manual and conducting refresher training for Operations personnel. - Completed on 7/30/12

    b. Evaluate the need to create a process to ensure availability of all critical back-up equipment such as auto-start pumps, bypass systems, etc. – Completed on 9/30/12

2. With regard to the causal factor related to communication between the Console and Field Operator during shutdown of DCU Cooling Water Booster Pump P-2402, determine and implement a method to ensure adequate Console and Field communication during start up, shutdown and switching activities– Completed on 7/30/12

3. With regard to the causal factor related to the open neutral wire which prevented the timely restart of C-87 and significantly extended the duration of this Specific Cause Analysis Flare Event, review and determine if start/stop circuits for critical compressors with potential environmental impacts can be tested for integrity. – Completed on 7/30/12

AUGUST 18, 2012 EMERGENCY SHUTDOWN OF THE HCU

Incident Description

On Saturday, August 18, 2012 at approximately 3:03 pm Air Products (APCI) Carson Pressure Swing Absorption (PSA) unit shutdown. APCI Carson Plant supplies 52 mmscfd of hydrogen (H2) to the Tesoro Los Angeles Refinery (LAR), the APCI Wimington Plant supplies 25 mmscfd, for a total of 77 mmscfd of H2 supplied to Tesoro LAR through the APCI Carson flowmeter. The total H2 flow from APCI Carson dropped from approx 71 mmscfd to approx 5 mmscfd in a matter of minutes. APCI Carson was trying to get the 25 mmscfd of APCI Wilmington H2 lined up to Tesoro LAR. (Note: APCI Carson boosts the medium pressure 800 psig APCI Wilmington H2 to the Tesoro LAR supply pressure of 1800 psig through the booster compressors which were still running). HTU-4 Gas Oil Hydrotreater was cutting rate to free up available H2 for the HCU, HTU-4 cut rate from 38 mbpd to 22 mbpd and at approx 3:25 pm HTU4 shutdown due to low H2 supply and dropping High Purity H2 header pressure. Various other units were also shutdown in an attempt to free up enough H2 to keep the HCU unit pressure up.

The HCU was losing unit pressure and at approx 3:26 pm HCU Operations personnel shut down the 2nd Stage Charge Pump, P-1386. The normal practice is for HCU Operations personnel to shut down the 2nd Stage if the unit pressure is 1200 psig or less, this reduces the HCU H2 demand by stopping hydrocarbon flow/H2 consumption in the R3 reactor, the 1st Stage continues to operate, the R1 and R2 Reactors. The HCU Outside Operator was present when the HCU Console Operator shut down the 2nd Stage Charge Pump. Once confirmed the pump was slowing down, the Outside Operator proceeded to the H-302/303 Heaters to block in the fuel gas The HCU H-302/303 Heaters are the H2/Oil heaters for the HCU 2nd Stage R3. Upon completing this task and walking back toward the HCU 2nd Stage Charge Pump, P1386, the Outside Operator noticed a hydrocarbon leak and vapor cloud. Due to the report of the vapor cloud, the Console Operator initiated the HCU 100# Depressuring System at approx 3:56 pm. Vent gas flow to the Refinery Flare Gas Recovery Header exceeded the recovery capacity of the the Flare Gas Recovery Compressors resulting in vent gas flow to the LAR Flare at approximately 3:57 pm.

Results of Investigation Into Cause

An initial inspection of the HCU 2nd Stage Charge Pump, P-1386 was conducted as part of completing the repairs to the pump. During the repair, mechanical noted the following: The outboard seal, not the inboard seal, was leaking. It was noted that two of the three set screws that held the seal sleeve tight to the shaft had moved outwards nearly ¼", which over-compressed the seal. That over-compression caused the excessive wear on the seal faces and caused the seal to leak. Repairs including installation of rebuilt seals and replacement of the bearings were completed in preparation for start up. The cause(s) of the HCU 2nd Stage Charge Pump P-1386 seal leak are summarized below:

The outboard seal, not the inboard seal, was leaking. A key finding during subsequent interviews was that the machinists who repaired the seal reported that two of the three set screws that held the seal sleeve tight to the shaft that had moved outwards nearly ¼", which over-compressed the seal. That over-compression caused the excessive wear on the seal faces and caused the seal to leak.

Flowserve seal division verified that the set screws were the correct material and type for this application. These seals had been installed in early 2007 and had nearly a 5 ½ year run. The set screws, along with the graphoil sleeve packing, held the seal sleeve in the correct position for the duration of that 5 ½ year run. The pump has been through many temperature cycles during the 5 ½ year run time, it is possible those temperature cycles caused the set screws to lose their compression on the shaft and work loose. This particular seal has 3 set screws, where other seals of this size and type have 8 to 12 set screws which are more robust in design. This type of seal also has a graphoil packing which aids in the clamping on the shaft, in addition to the 3 set screws.

There was no evidence that would lead Tesoro Mechanical personnel to believe this leak had anything to do with the way this pump was operated during or prior to the loss of hydrogen. Mechanical believes the seal leak was not caused by or directly related to either the pump shutting down as the seal wear came from long term, not short term operation.

Corrective Actions Taken and/or To Be Taken To Prevent Reoccurrence

Corrective action(s) taken prior to completion of the investigation:

The HCU 2nd Stage Charge Pump, P-1386, was shut down and secured for inspection and repair. Repairs including installation of rebuilt seals and replacement of the bearings were completed in preparation for start up.

Corrective actions identified as a result of the investigation into this Specific Cause Analysis Flare Event are:

1. Upgrade P1386 Seal to Dual Seal (with Secondary Containment) and more robust clamping (more than 3 set screws) during HCU turnaround. Install seal flush if required. – Complete during next scheduled turnaround currently scheduled for 2014

2. Implement practice of using set screw torque table whenever feasible. Add it to pump repair procedure and train machinist. – Completed on November 1, 2012

3. Mechanical Inspectors to perform periodic rounds and visually inspect pump seal sleeves on critical pumps. – Completed on October 1, 2012

4. Mechanical Inspectors to review similar seal flush designs in their area to insure that there are no issues. – Completed on December 31, 2012

AUGUST 31, 2012 LOSS OF POWER FROM LAR SUBSTATION 10 RESULTING IN DCU WET GAS COMPRESSOR C-87 SHUTDOWN

Incident Description

On Friday August 31, 2012, On August 31st, at approximately 6:40 pm, C-87 tripped. This caused the suction pressure of the compressor to increase and subsequently cause 3PC1316A to open as designed, venting DCU Fractionator Overhead gases to the Refinery Flare Gas Recovery Header. The vent gas flow rate in the Refinery Flare Gas Recovery Header exceeded the capacity of the Flare Gas Recovery System (FGRS) Compressors and proceeded to blow out the water level in the Flare KO/H2O Seal Drum resulting in vent gas flow to the LAR Flare at approximately 6:42 pm.

During the time C-87 was down, vapors from Coke Drum V-897 continued to flow through the DCU Blowdown Contactor into the DCU Fractionator and out to the DCU Flare Header as per normal operations.

Electrical and Instrumentation and Technical Support personnel were called out to troubleshoot the issue with LAR Substation 10. At approximately 9:05 pm, the 10C1, 10C3, 10C4, 10C5, and 10C6 were reset. However, the 10C3 breaker (Feeds TR-61 & 62) would not reset. Circuit breakers 10C2 and 10D2 had also tripped but were not reset.

Operations continued to stabilize the unit and bring equipment online once the breakers 10C1, 10C4, 10C5, and 10C6 were reset (except for 10C3). C-87 was restarted and began to recover the DCU Fractionator Overhead gases reducing the vent gas flow in the Refinery Flare Gas Recovery Header such that the water seal level in the Flare Knockout (KO)/Water (H2O) Seal Drum could be restored and vent gas flow to the LAR Flare was stopped at approximately 10:16 pm on August 31, 2012. The SO2 emissions from the LAR Flare from combustion of the DCU Fractionator Overhead and Coke Drum vent gases during this flare event are estimated to be approximately 10,160 pounds.

A subsequent flare event occurred from approximately 2:34 to 3:53 am on September 1, 2012, as the DCU Recovery Section was being lined out after DCU C-87 was restarted which resulted in approximately 206 pounds of SO2 emissions from the LAR Flare. Although, the SO2 emissions are included in the total SO2 emissions for the 24 hour period following the initial flare event resulting from the unscheduled shutdown of DCU C-87, this flare was not included in the scope of the investigation as the unscheduled shutdown of DCU C-87 caused the Hydrocarbon Flaring Incident.

Results of Investigation Into Cause

The follow-up investigation confirmed that the unscheduled shutdown of DCU C-87 on August 31, 2012, was caused due to the tripping of circuit breaker 10C3 which in turn caused some other circuit breakers to trip on the same bus, i.e. Bus 10C. Circuit breaker 10C3 had a ground fault which operated the ground relay as well as a lock out relay that locked out all the other circuit breakers on Bus 10C including circuit breaker 10C5 which supplies power to DCU C-87. The lock out relay is designed to protect the other circuit breakers and equipment from damage. The cause for the failure of 10C3 was a ground fault between phase A and the underground conduit that feeds transformer TR61. The most likely cause of this cable failure is deterioration over time.

Corrective Actions Taken and/or To Be Taken To Prevent Reoccurrence

Corrective action(s) taken prior to completion of the investigation:

1. E&I personnel isolated the electrical problem to a ground fault between Transformers 61 and 62 (TR-61 and TR-62) and Breaker 10C3 on Bus 10 C in Substation 10. This allowed Breaker 10C5 on Bus 10C which provides power to the motor for DCU C-87 to be reset. Once power was restored, C-87 was turned over to Operations for start up. C-87 was restarted at approximately 10 pm on August 31, 2012. This reduced the vent gas flow to the Refinery Flare Gas Recovery Header such that the water seal level in the Flare Knockout (KO)/Water (H2O) Seal Drum could be restored and vent gas flow to the LAR Flare was stopped at approximately 10:16 pm on August 31, 2012. Portable generators were brought in to provide power to equipment at the DCU and GCP on 10C3.

2. During the follow-up investigation, the location of the ground fault was located. The existing cable was pulled out, the integrity of the conduit was verified, and approximately 150 feet of replacement cable was pulled/installed. This work was completed on September 23, 2012.

3. After checking the system, approval was given to reset Breaker 10C3 and remove the portable generators. This allowed the equipment affected by the loss of power due to the isolation of 10C3 to be restarted on normal power from LAR Substation 10 on September 26 & 27, 2012.

Corrective actions identified as a result of the investigation into this Specific Cause Analysis Flare Event are:

An additional item identified as a result of the investigation into the unscheduled shutdown of DCU C-87 on August 31, 2012, was to evaluate an independent power supply for C-87 outside of Bus C. This evaluation was completed on February 28, 2013. LAR Technical Staff has evaluated the idea of relocating the electrical feeder breaker 10C5 for C-87 Gas Compressor motor M-1005 to a separate bus in Substation 10; the objective is to mitigate the nuisance tripping of the compressor due to electrical faults emanating from the adjacent feeder branches. The findings show that it is not necessary to move the C-87 feeder to a separate bus; the breaker 10C5 is already providing a dedicated service and protections to the compressor motor at the Bus 10C. A simplified line drawing of Substation 10 is included as Appendix E of this FMP.

As a result of completing the above evaluation, an additional corrective action was identified. The last episode of power loss for the entire Bus 10C originated from an electrical ground fault on the adjacent feeder 10C3. Breaker 10C3 did not clear the fault sufficiently fast enough, but the main breaker 10C1 sensed the fault and opened, thus dropping power to the entire Bus 10C to prevent further damage to other loads on the same bus. Because the ground fault started on feeder 10C3, the feeder breaker 10C3 should have cleared without allowing the fault current to propagate upwards, causing the upstream protective device (10C1) to trip. The cause is a lack of good coordination between downstream and upstream devices. Subsequent investigation confirmed that the time settings and current magnitudes for feeders 10C3 and 10C5 were set much higher than the 10C1. Therefore, the 10C1 will clear sooner before allowing feeder branches to clear first. Because of this coordination problem; LAR will perform a full coordination study for the protective device settings on Bus 10C. Once the correct and coordinated settings are determined, each protective device will be reset and tested according to the correct and coordinated value. This procedure will prevent the same episode from happening again in the future. This procedure will be completed by August 1, 2013.

3.3 Summary

In summary, the exceedance of the SO2 Performance Target in Calendar Year 2012 resulted primarily from 2 flare events involving unscheduled shutdowns of the DCU Wet Gas Compressor C-87 due to internal electrical/power supply issues. Although the shutdown of C-87 at approximately 9 am on April 17, 2012, was not the result of a loss of power, the duration of that flare event was extended significantly beyond the first attempt to restart C-87 at approximately 9:20 am on April 17, 2012, due to an open neutral wire in the C-87 start circuit. Had there not been an issue with the open neutral wire in the C-87 start circuit which prevented the restart of C-87 at 9:20 am, it is estimated that SO2 emissions from the LAR Flare would have been limited to 2,800 lbs as compared to the estimated SO2 emissions from that flare event of approximately 25,300 lb. Without that significant delay of the restart of C-87 on April 17, 2012, the SO2 Performance Target in Calendar Year 2012 would have been met. As outlined above, and discussed again in Section 4(C)(iii), corrective actions have been taken to improve the reliability of the electrical/power supply for C-87. There is one corrective action that was identified while completing a follow-up evaluation item in March 2013 which will be completed by August 1, 2013.

SECTION 4

PLAN REQUIREMENTS

This section of the Flare Minimization Plan prepared for the Tesoro Los Angeles Refinery (LAR) provides information required under Rule 1118(e)(1). Subheadings are consistent with FMP requirements in Rule 1118(e)(1). The term "Appendix" when used herein refers to appendix materials contained in this FMP.

(A) A complete description and technical specifications for each flare and associated knock-out pots, surge drums, water seals and flare gas recovery systems

LOS ANGELES REFINERY (LAR)

Flare System

Design Capacity - The Refinery Flare System has a design capacity of 1,040,000 lb/hr of maximum relief load with an average molecular weight of 37 lb/lb-mole and an average temperature of 21 0^0F. This and other design information is summarized in Table 4-1.

Table 4-1
Flare System Design Capacity

Los Angeles Refinery Flare System

Design Capacity	1,040,000 lb/hr (max. relief)
Average Molecular Weight (MW)	37 lb/lb-mole
Average Temperature	210 F
Design Flow	178,000 scfm ~ 600 F
10% Design Flow	17,800 scfm ~600 F

Operating Information - The refinery flare header starts at the southeast end of the Delayed Coking Unit as a 16-inch header. The header gradually increases to a final size of 36 inches as it picks up additional flare subheaders from other refinery process units. The major process units that are connected to the refinery flare system include:

- 1 Fluid Catalytic Cracking Unit (FCCU)
- 1 Delayed Coking Unit (DCU)
- 1 Crude Unit
- 1 Hydrocracking Unit (HCU)
- 1 Alkylation Unit and Alkylation Feed Treatment Unit
- 4 Hydrotreating Units (HTU)
- 2 Catalytic Reforming Units (CRU)
- 1 Benzene Saturation Units (Bensat)
- 1 Hydrogen Generation Unit (HGU)
- 1 Isomerization Unit (Isom)
- 1 Depentanizer
- 2 Cogeneration Units (Cogen)
- 1 Gas Compression Plant (GCP)

A process flow diagram showing the process units connected to the Refinery Flare System is provided in Appendix C.

Two refinery flare knock-out drums, V-847 servicing Flare #2 and V-848 servicing Flare #1, are located near the base of the two flare stacks. Water seals in these drums prevent air from flowing back through the flare stack into the flare header, preventing a potentially explosive condition. The water seals also maintain a slight backpressure in the flare header, which permits gas to be recovered from the flare system by the flare gas recovery compressor.

Flare gas will flow to the flare gas recovery compressor to the extent of compressor capacity. When flare gas production exceeds compressor capacity, pressure upstream of the water seal will increase until one of the seals is broken; gas is then discharged to the flare stack. The Flare Gas Recovery System has a capacity of 240,000 standard cubic feet per hour (scfh). The liquid levels in the water seal pans are maintained in a manner such that flare gas is preferentially sent to either Flare #1 or Flare #2. During a major upset in operation, such as a power failure or cooling water failure, when the total flare load exceeds 10% design capacity (or 17,800 scfm), the released gas is flared through both flare stacks.

Maintenance Information - Tesoro has maintenance procedures to ensure the flare system is in good working order. The flare system is monitored on a continuous basis. Daily inspection by operators includes checking for proper lubrication, inspecting the operation of the flare pump, monitoring liquid levels, checking flare pressure and checking the flare pilot temperature. Operators alert plant personnel of abnormal operating conditions and problems are investigated and addressed. The refinery flare system is monitored on a continuous basis and preventive maintenance is performed at defined intervals. Conditions that indicate potential mechanical, electrical or instrumentation problems are investigated and addressed.

For safety reasons, inspection, testing and maintenance on flare tips and stacks may only be conducted when certain process units are not operating and sufficient relief capacity for operating process units is provided by one flare. Turnarounds for the Flare are normally scheduled during HCU turnarounds. A work list during a turnaround can include inspection and cleaning of flare thermocouples and electrical parts, flare igniters, flare alarms, flare regulators and flare drums. In addition, flare stack tips, pilot tips, steam rings and refractory are inspected and tested.

Pilot and Purge Gas - The Refinery Flare System uses purchased natural gas from the Southern California Gas Company as pilot gas for each flare stack. Hydrocarbon purge gas is not normally used in this system. Nitrogen is the normal purge gas used with purchased natural gas from the Southern California Gas Company as a back up source of purge gas. Occasionally, steam may be used as the purge medium in isolated sections of the flare system.

Table 4-2

Purge and Pilot Gas Operating Flow Rates

Flare Stack	Pilot Gas Flow Rate (scfm)	Purge Gas Flow Rate (scfm)
LAR No. 1 Flare	15	295
LAR No. 2 Flare	15	295

The maximum total sulfur content of the pilot and purge gas, as purchased from the Southern California Gas Company, is 0.2 grains/scf.

The average higher (gross) heating value of the pilot and purge gas, as purchased from the Southern California Gas Company, is 1,020 BTU/scf.

Assist System Process Control - The flares are equipped with John Zink smokeless tips, which utilize low-pressure (18-psig) steam as an external motive force to produce efficient gas/air mixtures. Turbulence from the momentum transferred by the high velocity of the steam jet stream helps in maintaining a well-mixed, smokeless flare. Steam flow control valves are located at the flare site with flow controllers located in the control room. Two steam control valves are used in the steam line to each flare stack to compensate for lower or higher flaring rates from the flare stack. Visual monitors located in the control room allow operators to monitor visual emissions from each flare tip in real time.

Flame Detection System and Pilot Ignition System - The prescence of a pilot flame is continuously monitored using thermocouples for each of the three pilots with the temperature indicated locally and on the TDC Console. When the temperature of all three pilots drops below the set point, of 500^0F, an alarm will register on the TDC console in the control room and an alarm horn will sound at the flare site.

The flares are equipped with both auto and manual re-ignition capabilities. When the temperature of any of the pilots drops below 500 F an automatic reignition sequence is started. This sequence will be repeated until the temperature of the flare pilot exceeds the set point of the temperature indicator. Re-ignition can also be initiated manually at the Flare. A red indicator light signifies the panel is ready for ignition.

Knockout Drums and Water Seals

Each flare has a dedicated knock out drum located near the base of the flare stack. Water seals in these drums maintain a slight backpressure in the flare header which permits gas to be taken from the flare header by the flare gas recovery compressor. A drawing showing the details of the Flare Knockout Drums is included in Appendix B. Water seals in the drums, V-847/ 848, protect the flare system from air ingress. Presently, the water seal level is at 4' 1/3" which dictates a seal height of about 2' 1" or 0.9 psig before the seal can be broken by the flare gas. The water seals in V-847 and V-848 are maintained automatically be level controllers. Presently upon loss of seal level detected by a level switch on each drum and low flare flow to the stack, the DCU blow down compressor C-137, shuts down to prevent air ingress into the system. This compressor presently recovers plant base load and DCU blow down gases. Flare gas will flow to the compressor to the extent of compressor capacity. When flare gas flow exceeds compressor capacity, pressure upstream of the water seal will increase until one of the seals is broken and gas is then discharged to the flare stack. The water seal in one knockout drum is maintained at a higher level than the other, resulting in higher backpressure at one of the two flares. Thus, gas exceeding the capacity of the flare gas recovery compressor is flared preferentially through a single flare stack. During a major upset in operation, such as a power failure, cooling water failure, etc., when the total flare load exceeds 10% design flow (or 17,800 scfm @ 60^0F), the released gas is flared through both flare stacks.

Flare Gas Recovery System

The Flare Gas Recovery System (FGRS) uses five (5) liquid ring compressors to recover flare gases from the main 36” flare header upstream of the #1 and #2 Flare Knock Out Drum, V-847/848, and the Parametric flare monitoring sample point.

Water seals in the drums, V-847/ 848, protect the flare system from air ingress. Presently, the water seal level is at 4’ 1/3” which dictates a seal height of about 2’ 1” or 0.9 psig before the seal can be broken by the flare gas. The water seals in V-847 and V-848 are maintained automatically be level controllers 45LC5246A and 45LC5442A, respectively.

The flare gas recovery compressors recover the plant base load and C-137 is primarily used for the DCU system but also serves as a spare for the FGRS compressors. Loss of seal in V-847/ 848 does not shut down C-137 and this logic is disconnected from the existing system.

The FGR suction header pulls flare gases from the main 36” flare header upstream Flare # 1 and Flare #2 seal drums. This Unit is programmed through instrumented logic to protect the fuel gas header from air ingress and to protect the compressors against mechanical damage.

The suction header pressure is maintained at 0.5 psig using fuel gas from the Refinery header through 45PV285 and three (3) pressure transmitters 45PT285A/B/C using the middle of the three readings. Suction header Slam Valve 45HV282 shuts down when either of the flare drums lose the seal pan level and the header pressure falls below 0.1 psig reading through three pressure transmitters 45PT284A/B/C on two out of three voting. When 45XV282 is shut down all compressors will trip and the condensate seal flush slam valve 45HV251 will close.

The FGR Unit has five (5) liquid ring compressors (C-167/C-168/C-169/C-170/C-171) to recover flare gas from the main header. C-137 located in the GCP will be exclusively recovering DCU blow down and off gas while the flare gas recovery compressors will recover gas from the main flare header. When C-137 is down for maintenance, the blow down gas is routed to the main flare header to be recovered with the Refinery flare base load.

Each compressor capacity is 60 MSCFH with a 600HP motor. Two (2) compressors are selected by the Operator for normal operation and two are selected ready for auto start.

The fifth compressor is always a spare for maintenance.

Each compressor has a suction nozzle for flare gas and another suction nozzle for ring liquid. Discharge flow is a mixture of flare gas and ring liquid feeding symmetrically to two separators. Suction pressure is 0.5 psig and discharge pressure is held at 100 psig through 45PC316 located at the battery limit.

The compressors auto-start and auto-shut down when they meet a set of pre-programmed permissives and motor reliability time out switches.

The permissives are as follows:

1. Ring liquid Slam Valve position
2. Ring liquid flow rate 3. Ring liquid level in compressor casing
4. Compressor discharge Slam Valve position
5. Compressor discharge temperature
6. Condensate makeup/seal flush flow
7. Condensate makeup Slam Valve position
8. Separator ring liquid level
9. Gas common suction manifold pressure
10. Gas common suction manifold temperature
11. Compressor run time duration

As hot flare gas and heat of compression can vaporize water, make-up water is required to be added. Also as the level of contaminants, ammonium bisulfide (NH4HS), pH, chloride, and sulfate, increases in the ring liquid, additional make-up water is required. A sample point is provided for testing the sour water for the above chemicals. High levels of these chemicals are not recommended for compressor material integrity. Condensate is used to flush the seals and for make-up water at the rate of 3 GPM through individual restriction orifices at each compressors. Make up condensate is also added to the system using 45FV276 controlled by the Operator.

There are two 3-phase separators (V-2358/V-2359) receiving flow from the compressors. The feed from the discharge of the compressors is separated into sour gas routed to the GCP, ring liquid recycled back to the compressors (C-167/C-168/C-169/C-170/C-171) suction nozzle, recovered oil routed to the DCU fractionator overhead drum V-905, and sour water purge routed to FCCU sour water flash drum. Provisions have been made to route the sour water purge to a future GCP sour water flash drum.

Sour gases from the separators are cooled down in the trim coolers (E-1900/E-1901). Each separator is coupled with one gas trim cooler for ease of down time maintenance. Gas is cooled down to less than 100 F leaving the FGR Unit before being routed to the Amine Tower. Cooling water from cooling tower #12 is used as a cooling medium. If cooling tower #12 is down for maintenance a connection is provided for firewater as a temporary source of cooling medium. Condensed materials from gas trim coolers are fed to the corresponding separator though a gravity line.

The ring liquid leaving the separators is filtered through a set of parallel ring liquid basket strainers (ME-800/801) upstream of the air cooler. One (1) strainer is used as a spare. Liquid from the strainer is routed to the drain out pot. Local pressure differential indicator is used to detect when the strainer basket is to be cleaned. The ring liquid is cooled through the air coolers (E-1902/E-1903). Each air cooler can be shut down for cleaning and maintenance. (The total rate of ring liquid can be cooled through the one air cooler.)

The blow pot system is used to collect all hydrocarbon and water drains. The hydrocarbon/water drains are returned to the Refinery. The drain out pot (V-2360) services all equipment and piping drain out. The Operator drains equipment to the blow pot by pressure and gravity, by routing the equipment and lines to the pot. A vent line is provided for venting the pot to the Flare Gas Recovery Suction Header. Accumulated liquid is blown out of the pot using sour gas from the separators to pressurize to the FGR sour water header leaving the Unit to the FCCU sour water flash drum. The pot is equipped with a level gage to monitor liquid level. Condensate from Tank 7002 at the HGU-2 is pumped to the FGR Unit for seal flush and make-up water. Both pumps are for FGR unit service only but are operated in Hydrogen Generation Unit #2 (HGU#2). One (1) pump is used as a spare. Low pressure switch at the common discharge will start the second pump when the running pump shuts down. During a TK-7002 turnaround stripped sour water from Hydrotreating Unit #4 (HTU#4) from pump P-3379 is used as a back up make up water.

The only other vapor/flare gas recovery compressor that has an interconnection to the flare is the DCU Blowdown/Flare Gas Recovery Compressor (C-137). The DCU Blowdown/Flare Gas Recovery Compressor, C-137, extracts gas from the plant flare header system and, after compression and treatment for hydrogen sulfide removal, discharges it into the plant fuel gas system. The primary purpose of this system is to treat blowdown gas from the Delayed Coking Unit (DCU), such that it can be burned as fuel gas. The flare gas recovery compressor is designed to process the maximum DCU blowdown gas production rate (equivalent to 180,000 standard cubic feet per hour at the compressor). However, since the blowdown gas rate varies greatly, the flare gas recovery facilities also recover gas from the main refinery flare header when production from the DCU is less than maximum. The gas feed to the recovery facilities is taken from the DCU flare header in order to ensure that DCU blowdown gas will be drawn preferentially into the compressor. A process flow diagram for the Flare Gas Recovery System and more detailed description of the operation of the Flare Gas Recovery System are included in Appendix B of this FMP.

Mechanical information for the flare gas recovery compressors is summarized in Table 4-3.

Table 4-3

Compressor Mechanical Information

	Flare Gas Recovery Compressors (C-167, 168, 169, 170 & 171) Each	**DCU Blowdown/Spare Flare Gas Recovery Compressor (C-137)**
Manufacturer	Garo	Cooper-Bessemer
Type	Liquid Ring	Reciprocating
Capacity (scfh)	240,000 (Total) 60,000 (Each Compressor)	200,000
Motor (hp)	600	800
Suction Pressure (psia)	0.5	9.7
Discharge Pressure (psia)	100	80

SULFUR RECOVERY PLANT (SRP)

Flare System

Design Capacity - The SRP Flare System has a design capacity of 41,100 lb/hr. The molecular weight of the SRP flare gas can vary from 20 to 42 lb/lb-mole. The temperature can vary from 100 to 300^{0}F. This information is summarized in Table 4-4.

Table 4-4
Flare System Design Capacity

Sulfur Recovery Plant Flare System

Design Capacity	41,100 lb/hr (max. relief)
Molecular Weight (MW)	20 -44 lb/lb-mole
Temperature	100-300^{0}F

Operation Information - The SRP flare has a dedicated liquid knock out drum, and occasionally receives minor quantities of hydrocarbon flash gas and H2S from the H2S-rich diethanolamine (DEA) fuel gas treating solution. The amine/sour water strippers, vapor recovery compressor, and various associated process/fuel gas knock out drums can also relieve to the flare under conditions of abnormally high pressure, although such an occurrence is extremely unlikely and in fact has never happened. A process flow diagram showing the process units and the SRP flare is provided in Appendix D.

The following equipment can relieve to the SRP Flare System:

- Two (2) Rich DEA Flash Drums (one idle)
- Two (2) Sour Water Stripper (SWS) Units (North SWS and South SWS)
- Three (3) DEA Stripper Units (#100, #200 and #550)
- Two (2) Tail Gas Treating Unit Methyldiethanolamine (MDEA) Stripper Units (#400 and 500)
- One (1) Vapor Recovery Compressor (C-115) and Suction knockout Drum
- Two (2) Ammonia Gas knockout Drums (SWS NH_3 KO and #750 NH_3 KO)
- One (1) Fuel Gas Knockout Drum
- One (1) Acid Gas knockout Drum (Main H_25 KO)
- One (1) Foul Water Stripper Unit (# 250 Reflux Stripper)

When maintenance is required on SRP Flare, C96, the Portable Rental Flare, C183, is brought in and put in service for up to two weeks.

<u>Maintenance Information</u> – Tesoro has comprehensive maintenance procedures to ensure the SRP Flare System and its components are maintained in good working order. Visual inspections by operators alert plant personnel to abnormal operating conditions. Potential mechanical, electrical or instrumentation problems are investigated and addressed. For safety reasons, inspection and testing of flare tips is conducted only when the SRP Flare, C96, is removed from service. SCAQMD Rule 1118 requires annual inspection of PRVs connected directly to a flare. This will be required for all PRVs connected to SRP Flare.

A work list for such a turnaround can include inspection of the burner tips, steam ring, thermocouples and associated instruments and alarms.

The SRP flare, C96, is removed from service for inspection and testing approximately every ten years. The Portable Rental Flare, C183, is installed for up to two weeks for uninterrupted protection when the SRP Flare, C96, is out of service.

Pilot and Purge Gas - The SRP Flare System uses purchased natural gas from the Southern California Gas Company as both pilot gas and purge gas.

Table 4-5

Purge and Pilot Gas Operating Flow Rates

Flare Stack	Pilot Gas Flow Rate (scfm)	Purge Gas Flow Rate (scfm)
SRP Flare System	6	3-15

The maximum total sulfur content of the pilot and purge gas, as purchased from the Southern California Gas Company, is 0.2 grains/scf.

The average higher (gross) heating value of the pilot and purge gas, as purchased from the Southern California Gas Company, is 1,020 BTU/scf.

Assist System Process Control - The SRP flare is equipped with a smokeless tip, which uses high velocity, low-pressure (40 psig) steam to enhance turbulent mixing thereby minimizing the formation of visible smoke particles. A steam flow control valve allows operators to adjust steam flow rates from a remote field location.

Flame Detection System and Pilot Ignition System - The prescence of a pilot flame is continuously monitored using thermocouples for each flare pilot. When the measured temperature drops below 300^0F, a low temperature TDC console alarm will register in the control room. An audible alarm will sound, notifying operators to check the flare pilots and manually re-ignite the flare if necessary. Flameouts are extremely rare.

Vapor Recovery System

The SRP Flare System which includes the SRP Flare, C96, and Portable Rental Flare, C183, serves sour water/amine strippers that are part of the sulfur recovery processes for the refinery. The primary function of the SRP flare is to burn non-routine hydrocarbon flash gas from the rich DEA solution (via V-1292) used to remove hydrogen sulfide from refinery-produced fuel gas and liquid propane/ propylene. This hydrocarbon flash gas characteristically contains about 7% hydrogen sulfide, prior to dilution with the natural gas purge. The vapor recovery compressor, designated C-115, normally recovers this gas and treats it to remove hydrogen sulfide prior to use as fuel gas. Only abnormal quantities of hydrocarbons that exceed the design capacity of the vapor recovery compressor are sent to the flare. This gas may also be flared when the compressor is out of service for periodic maintenance. Evolution of hydrocarbon gas to the SRP flare is minimized by the fact that the rich DEA is flashed at low pressure (about 2 psig) to the LAR refinery vapor recovery system prior to transfer to the SRP flash drum.

The SRP has fixed roof storage tanks that are blanketed with natural gas. Excess blanket gas is recovered by a vapor recovery compressor designated C-115 and shown in the process flow diagram in Appendix D. Following compression the gas is scrubbed with lean DEA in the vapor recovery absorber designated V-1256 prior to use in the SRP fuel gas system. Vapor recovery gas is only occasionally routed to the flare when the vapor recovery compressor is down, or the volume of rich DEA flash drum off-gas exceeds the capacity of the vapor recovery compressor.

Vapor recovery compressor C-115 is a single-stage reciprocating compressor with a nominal capacity of 250 CFM. The duty cycle and suction pressure are not recorded, nor are flow rates measured.

Please note that the Tesoro SRP does not have a flare gas recovery system. There is no interconnection between the flare header and C-115 (other than the common connection to the rich DEA flash drum). The compressor recovers the gases from the flash drum during normal operation, and excessive volumes of flash gas, which may exceed compressor capacity during process upsets, will automatically vent to the flare system.

(B) Detailed process flow diagrams of all upstream equipment and process units venting to each flare, identifying the type and location of all control equipment;

The required flow diagrams for LAR are included in Appendix C. The required flow diagrams for the SRP are included in Appendix D.

(**C) Refinery policies and procedures to be implemented and any equipment improvements to minimize flaring and flare emissions and comply with the performance targets of paragraph (d)(1)**

(i) Planned turnarounds and other scheduled maintenance, based on an evaluation of these activities during the previous five years;

We completed a 5-year look back for 2008-2012 to evaluate flare flow and SO2 emissions from planned activities. Flaring occurs during equipment and process unit shutdowns and start ups in preparation for planned turnarounds and maintenance but normally not during the maintenance or turnaround activities. Tables 4-6 and 4-7, below, provide a comparison of vent gas flows and SO2 emissions from planned shutdowns and start ups to the total Calendar Year vent gas flow and SO2 emissions for 2008-2012 for LAR and SRP.

Table 4-6

Comparison of Estimated Vent Gas Flow and SO2 Emissions For Tesoro LAR Flare For Planned Activities Per Calendar Year Totals For 2008-2012

Year	Total Vent Gas Flow (scf)	Total SO2 Emissions (Lbs)	Vent Gas Flow From Planned Activities (scf)	SO2 Emissions From Planned Activities (Lbs)	SO2 Emissions (% of Total)
2008	**52,717,574**	**6,681**	**31,951,282**	**350**	**5.2**
2009	**48,753,435**	**37,092**	**42,827,995**	**23,465**	**63.3**
2010	**26,405,440**	**33,153**	**6,086,953**	**6,736**	**20.3**
2011	**10,877,917**	**8,013**	**4,127,909**	**2,829**	**35.3**
2012	**4,743,569**	**37,018**	**48,707**	**32**	**0.1**

The data shows a decrease in vent gas flows from planned unit shutdowns and start ups from 2008-2012 and a decrease in SO2 emissions from 2009- 2012, this is somewhat dependent on the number and type of units scheduled for turnarounds or maintenance downperiods. Developing procedures to optimize the recovery capacity of the new FGRS Compressors which were installed and operational by December 2008 has resulted in a reduction of vent gas flow and SO2 emissions from the LAR Flare.

In 2012, there were 7 flare events due to planned shutdowns or start-ups at LAR which resulted in 48,707scf of vent gas flow and 32 lbs of SO2 emissions. These minor flare events did not contribute significant vent gas flow or SO2 emissions from the LAR Flare during calendar year 2012.

Therefore, no additional policies, procedures or equipment improvements need to be implemented at LAR to comply with the SO2 Performance Target.

Table 4-7

Comparison of Estimated Vent Gas Flow and SO2 Emissions For Tesoro SRP Flare For Planned Activities Per Calendar Year Totals For 2008-2012

Year	Total Vent Gas Flow (scf)	Total SO2 Emissions (Lbs)	Vent Gas Flow From Planned Activities (scf)	SO2 Emissions From Planned Activities (Lbs)	SO2 Emissions (% of Total)
2008	99,327	1087	59483	230	21.1
2009	427,423	644	377,128	637	99.0
2010	81,687	754	0	0	0.0
2011	290,126	58	210,641	58	87.8
2012	0	0	0	0	NA

As indicated in Table 4-7, above, the SRP Flare SO2 emissions from all activities and planned activities have decreased significantly since 2010 and 2009, respectively. There were no applicable SO2 emissions from combustion of vent gases in the SRP Flare during calendar year 2012. Therefore, no additional policies, procedures or equipment improvements need to be implemented to comply with the SO2 Performance Target.

(ii) Essential operational needs and the technical reason for which the vent gas cannot be prevented from being flared during each specific situation, based on supporting documentation on flare gas recovery systems, excess gas storage and gas treating capacity available for each flare; and

(a)Temporary fuel gas system imbalance due to:
(1) Inability to accept gas compliant with Rule 431.1 by an electric generation unit at the facility that produces electricity to be used in a state grid system, or
(2) Inability to accept gas compliant with Rule 431.1 by a third party that has a contractual gas purchase agreement with the facility, or
(3) The sudden shutdown of a refinery fuel gas combustion device for reasons other than poor maintenance or operator error;

Tesoro LAR and SRP do not currently have any agreements to supply gas compliant with Rule 431.1 to an electric generation unit. In 2012, there was 1 flare event due to a fuel gas imbalance at LAR which resulted in 10,474 scf of vent gas flow and 2 lbs of SO2 emissions. The flare event did not contribute significant vent gas flow or SO2 emissions from the LAR Flare during calendar year 2012. Therefore current procedures for control of pressure in the Refinery Fuel Gas Mix Drum (FGMD) to stay below the pressure controller set points and to recover from temporary fuel gas imbalances caused by the sudden shutdown of refinery fuel gas combustion devices were determined to be adequate. Therefore, no additional policies, procedures or equipment improvements need to be implemented to comply with the SO2 Performance Targets.

(b) Relief valve leakage due to malfunction;

All PRVs at LAR are upstream of the FGRS Compressors. Therefore, leakage from PRV malfunctions is recovered by the FGRS Compressors. In the event that a PRV relieves to the Refinery Flare Gas Recovery Header, the PRV is checked to insure it is functional and has reseated properly. The spare is put in service until the PRV has been checked.

At the SRP, PRVs are downstream from any Vapor Recovery System Compressors. PRVs at the SRP are checked annually for leakage Rule 1118(c)(1)(C). In addition any relief valve leakage will be identified by an increase in the Total Sulfur Concentration (TSC) in the SRP Flare Header as measured by the TSC analyzers installed in accordance with the requirements of Rule 1118(g)(3).

There were no flare events at LAR or the SRP in calendar year 2012 resulting from relief valve leakage. Therefore, no additional policies, procedures or equipment improvements need to be implemented to comply with the SO2 Performance Target.

(c) Venting of streams that cannot be recovered due to incompatibility with recovery system equipment or with refinery fuel gas systems, including supplemental natural gas or other gas compliant with Rule 431.1 that is used for the purpose of maintaining the higher heating value of the vent gas above 300 British Thermal Units per standard cubic foot. Such streams include inert gases, oxygen, gases with low or high molecular weights outside the design operating range of the recovery system equipment and gases with low or high higher heating values that could render refinery fuel gas systems and/or combustion devices unsafe;

This would normally occur during planned unit shutdown or start ups when vessels are being cleared and decontaminated in preparation for maintenance. Recovering of high volume process unit purges with nitrogen or unit steam outs is not always feasible due to incompatibility with the refinery fuel gas system and FGRS Compressors, respectively. High volume nitrogen purges for vessel clearing to the Flare Gas Recovery Header results in a decrease in the Higher Heating Value (HHV) of the refinery fuel gas and can upset the operation of refinery process heaters. When nitrogen pressure popping is utilized to clear vessels to the Flare Gas Recovery Header, the FGRS Compressors remain in service and recover vent gases from the pressure popping steps up to the recovery capacity of the compressors.

High volumes of vent gases from vessel steam outs can result in elevated vent gas temperatures in the Flare Gas Recovery Header. The FGRS Compressors have safety shutdowns that are initiated by high Flare Gas Recovery Header and/or FGRS Compressor Ring Water Temperature which could require shutdown/circulation of the FGRS. The set point for the safety shutdowns for Flare Gas Recovery Header Suction and Compressor Discharge Temperature is 176 F.

(d) Venting of clean service streams to a clean service flare or a general service flare;

This is not an issue at LAR or SRP. SRP does not have or vent any clean service streams to the SRP Flare. Any treated LPGs at LAR that would be vented to the Refinery Flare Gas Recovery Header are vented at a controlled rate such that the vent gases are recovered by the FGRS Compressors. Therefore, no additional policies, procedures or equipment improvements need to be implemented to comply with the SO2 Performance Target.

(e) Intermittent minor venting from:

(1) Sight glasses;
(2) Compressor bottles;
(3) Sampling systems; or
(4) Pump or compressor vents; or

All such minor venting is done to the Refinery Flare Gas Recovery Header upsteam of the FGRS Compressors and is normally recovered by the FGRS compressors. On occasion there is a sudden spike in vent gas flow to the Refinery Flare Gas Recovery Header which momentarily exceeds the recovery capacity of the FGRS Compressors. In 2012, there were 6 flare events due to intermittent minor venting at LAR which resulted in 10,862 scf of vent gas flow and 3 lbs of SO2 emissions. These minor flare events did not contribute significant vent gas flow or SO2 emissions from the LAR Flare during calendar year 2012.

There were no applicable SO2 emissions from combustion of vent gases in the SRP Flare during calendar year 2012.

Therefore, no additional policies, procedures or equipment improvements need to be implemented to comply with the SO2 Performance Target.

(f) An emergency situation in the process operation resulting from the vessel operating pressure rising above pressure relief devices' set points, or maximum vessel operating temperature set point.

Process upsets and/or emergency situations resulting from vessel pressures or temperatures rising above pressure and/or temperature set points are managed in accordance with a standing instruction which authorizes Operations personnel to stabilize, slowdown, or shutdown and restart operating units. In 2012 there were 2 flare events due to process upsets which resulted in sudden increases in unit pressures at LAR which resulted in 13,325 scf of vent gas flow and 31 lbs of SO2 emissions. These minor flare events did not contribute significant vent gas flow or SO2 emissions from the LAR Flare during calendar year 2012.

There were no applicable SO2 emissions from combustion of vent gases in the SRP Flare during calendar year 2012.

Therefore, no additional policies, procedures or equipment improvements need to be implemented to comply with the SO2 Performance Target.

(iii) Emergencies, including procedures that will be used to prevent recurring equipment breakdowns and process upset, based on an evaluation of the adequacy of maintenance schedules for equipment, process and control instrumentation.

As part of the 5-year look back for 2008-2012 to evaluate flare flow and SO2 emissions from planned activities discussed above, we also reviewed emergency flare events. Table 4-8 below provides a comparison of vent gas flows and SO2 emissions from emergency flare events to the total Calendar Year vent gas flow and SO2 emissions for 2008-2012.

Table 4-8

Comparison of Estimated Vent Gas Flow and SO2 Emissions For Tesoro LAR Flare To Emergency Flaring Per Calendar Year Totals For 2008-2012

Year	Total Vent Gas Flow (scf)	Total SO2 Emissions (Lbs)	Vent Gas Flow From Emergency Flare Events (scf)	SO2 Emissions From Emergency Flare Events (Lbs)	SO2 Emissions (% of Total)
2008	52,717,574	6,681	8,360,292	1,146	17.1
2009	48,753,435	37,092	576,319	373	1.0
2010	26,405,440	33,153	20,392,505	21,944	66.2
2011	10,877,917	8,013	6,659,831	4,997	62.4
2012	4,743,569	37,018	4,644,282	36,944	99.8

The vent gas flow to the LAR Flare for all flare events has decreased every year from 2008 to 2012 while the vent gas flow to the LAR Flare during emergency flare events did not show the same trend of annual decreases until 2010. As discussed in the Analysis of Flare Events Resulting In The Exceedance Of The SO2 Performance Target In Calendar Year 2012 and Corrective Actions Taken and/or To Be Taken To Prevent Reoccurrence Section (ie Section 3), above, the exceedance of the SO2 Performance Target in Calendar Year 2012 resulted from 2 flare events involving unscheduled shutdowns of the DCU Wet Gas Compressor C-87 due to internal electrical/power supply issues. As summarized below, corrective actions have been taken to prevent reoccurrence. There is one corrective action remaining to be completed by August 1, 2013.

As discussed in Section 3 of this FMP, corrective actions implemented and/or identified for evaluation and/or implementation as a result of the investigation into the safety shutdown of DCU Wet Gas Compressor C-87 on April 17, 2012, are outlined below:

Corrective action(s) taken prior to completion of the investigation:

E&I personnel identified the open neutral wire on C-87, switched to the spare neutral wire, tested the breaker and turned C-87 over to Operations for restart by approximately 2 pm. C-87 was restarted at approximately 2:21 pm on April 17, 2012. The start up of C-87 was successful in stopping vent gas flow from the DCU to the Refinery Flare Gas Recovery Header. This reduced the vent gas flow to the Refinery Flare Gas Recovery Header such that the water seal level in the Flare KO/H2O Seal Drum could be restored and the FGRS Compressors returned to service. This was successful in stopping vent gas flow to the LAR Flare at approximately 2:37 pm on April 17, 2012.

Corrective actions identified for evaluation and/or implementation as a result of the investigation into the safety shutdown of DCU Wet Gas Compressor C-87 on April 17, 2012, are outlined below:

1. With regard to the causal factor concerning the line-up of the bypass system for DCU Cooling Water Booster Pump P-2402 during shutdown of the pump for scheduled maintenance:

   b. Evaluate and implement corrective actions to ensure that the Cooling Water Booster Pump bypass system is available at all times. This may include locking open valves, installing a sign(s), developing a job aid, updating the training manual and conducting refresher training for Operations personnel. - Completed on 7/30/12

   c. Evaluate the need to create a process to ensure availability of all critical back-up equipment such as auto-start pumps, bypass systems, etc. – Completed on 9/30/12

2. With regard to the causal factor related to communication between the Console and Field Operator during shutdown of DCU Cooling Water Booster Pump P-2402, determine and implement a method to ensure adequate Console and Field communication during start up, shutdown and switching activities– Completed on 7/30/12

3. With regard to the causal factor related to the open neutral wire which prevented the timely restart of C-87 and significantly extended the duration of this Specific Cause Analysis Flare Event, review and determine if start/stop circuits for critical compressors with potential environmental impacts can be tested for integrity. – Completed on 7/30/12

As discussed in Section 3 of this FMP, corrective actions implemented and/or identified for evaluation and/or implementation as a result of the investigation into the shutdown of DCU Wet Gas Compressor C-87 due to loss of power from LAR Substation 10 on August 31, 2012, are outlined below:

Corrective action(s) taken prior to completion of the investigation:

4. E&I personnel isolated the electrical problem to a ground fault between Transformers 61 and 62 (TR-61 and TR-62) and Breaker 10C3 on Bus 10 C in Substation 10. This allowed Breaker 10C5 on Bus 10C which provides power to the motor for DCU C-87 to be reset. Once power was restored, C-87 was turned over to Operations for start up. C-87 was restarted at approximately 10 pm on August 31, 2012. This reduced the vent gas flow to the Refinery Flare Gas Recovery Header such that the water seal level in the Flare Knockout (KO)/Water (H2O) Seal Drum could be restored and vent gas flow to the LAR Flare was stopped at approximately 10:16 pm on August 31, 2012. Portable generators were brought in to provide power to equipment at the DCU and GCP on 10C3.

5. During the follow-up investigation, the location of the ground fault was located. The existing cable was pulled out, the integrity of the conduit was verified, and approximately 150 feet of replacement cable was pulled/installed. This work was completed on September 23, 2012.

6. After checking the system, approval was given to reset Breaker 10C3 and remove the portable generators. This allowed the equipment affected by the loss of power due to the isolation of 10C3 to be restarted on normal power from LAR Substation 10 on September 26 & 27, 2012.

Corrective actions identified as a result of the investigation into this Specific Cause Analysis Flare Event are:

An additional item identified as a result of the investigation into the unscheduled shutdown of DCU C-87 on August 31, 2012, was to evaluate an independent power supply for C-87 outside of Bus C. This evaluation was completed on February 28, 2013. LAR Technical Staff has evaluated the idea of relocating the electrical feeder breaker 10C5 for C-87 Gas Compressor motor M-1005 to a separate bus in Substation 10; the objective is to mitigate the nuisance tripping of the compressor due to electrical faults emanating from the adjacent feeder branches. The findings show that it is not necessary to move the C-87 feeder to a separate bus; the breaker 10C5 is already providing a dedicated service and protections to the compressor motor at the Bus 10C. A simplified line drawing of Substation 10 is included in Appendix E.

As a result of completing the above evaluation, an additional corrective action was identified. The last episode of power loss for the entire Bus 10C originated from an electrical ground fault on the adjacent feeder 10C3. Breaker 10C3 did not clear the fault sufficiently fast enough, but the main breaker 10C1 sensed the fault and opened, thus dropping power to the entire Bus 10C to prevent further damage to other loads on the same bus. Because the ground fault started on feeder 10C3, the feeder breaker 10C3 should have cleared without allowing the fault current to propagate upwards, causing the upstream protective device (10C1) to trip. The cause is a lack of good coordination between downstream and upstream devices. Subsequent investigation confirmed that the time settings and current magnitudes for feeders 10C3 and 10C5 were set much higher than the 10C1. Therefore, the 10C1 will clear sooner before allowing feeder branches to clear first. Because of this coordination problem; LAR will perform a full coordination study for the protective device settings on Bus 10C. Once the correct and coordinated settings are determined, each protective device will be reset and tested according to the correct and coordinated value. This procedure will prevent the same episode from happening again in the future. This procedure will be completed by August 1, 2013.

In 2010 LAR experienced 6 emergency flare events as a result of unscheduled shutdowns of the HCU which resulted in emergency vent gas flow of 15,888,751 scf and SO2 emissions from LAR Flare of 17,394 lbs (52% of the Calendar Year total) and 3 emergency flare events in early 2011 which resulted in emergency vent gas flow of 4,308,981 scf and SO2 emissions from LAR Flare of 3,269 lbs (41% of the Calendar Year total). As a result of corrective actions identified during investigations of those emergency flare events there have been no such unscheduled shutdowns of the HCU since April 2011. The emergency shutdown of the HCU in 2012 resulted from a failure of the seal for HCU 2nd Stage Charge Pump, P-1386, which necessitated an Operator initiated emergency unit shutdown to stop the leak. As noted in the Analysis of Flare Events Resulting In The Exceedance Of The SO2 Performance Target In Calendar Year 2012 and Corrective Actions Taken and/or To Be Taken To Prevent Reoccurrence Section (ie Section 3), above, corrective actions were identified and implemented. As summarized below, corrective actions have been taken to prevent reoccurrence. There is one remaining corrective action to be completed during the next HCU turnaround currently scheduled for 2014.

As discussed in Section 3 of this FMP, corrective actions implemented and/or identified for evaluation and/or implementation as a result of the investigation into the emergency shutdown of the HCU on August 18, 2012, due to a hydrocarbon release resulting from failure of the pump seal for HCU 2nd Stage Charge Pump, P-1386, are outlined below:

Corrective action(s) taken prior to completion of the investigation:

The HCU 2nd Stage Charge Pump, P-1386, was shut down and secured for inspection and repair. Repairs including installation of rebuilt seals and replacement of the bearings were completed in preparation for start up.

Corrective actions identified as a result of the investigation into this Specific Cause Analysis Flare Event are:

1. Upgrade P1386 Seal to Dual Seal (with Secondary Containment) and more robust clamping (more than 3 set screws) during HCU turnaround. Install seal flush if required. – Complete during next scheduled turnaround currently scheduled for 2014

2. Implement practice of using set screw torque table whenever feasible. Add it to pump repair procedure and train machinist. – Completed on November 1, 2012

3. Mechanical Inspectors to perform periodic rounds and visually inspect pump seal sleeves on critical pumps. – Completed on October 1, 2012

4. Mechanical Inspectors to review similar seal flush designs in their area to insure that there are no issues. – Completed on December 31, 2012

Table 4-9

Comparison of Estimated Vent Gas Flow and SO2 Emissions for Tesoro SRP Flare To Emergency Flaring Per Calendar Year Totals For 2008-2012

Year	Total Vent Gas Flow (scf)	Total SO2 Emissions (Lbs)	Vent Gas Flow From Emergency Flare Events (scf)	SO2 Emissions From Emergency Flare Events (Lbs)	SO2 Emissions (% of Total)
2008	**99,327**	**1087**	**31,524**	**653**	**60.1**
2009	**427,423**	**644**	**49,916**	**0.1**	**0.0**
2010	**81,687**	**754**	**80,790**	**754**	**100.0**
2011	**290,126**	**58**	**79,485**	**8**	**12.2**
2012	**0**	**0**	**0**	**0**	**NA**

As indicated in Table 4-9, above, the SRP Flare SO2 emissions from all activities and emergency flare events have decreased significantly since 2010. There were no applicable SO2 emissions from combustion of vent gases in the SRP Flare during calendar year 2012. Therefore, no additional policies, procedures or equipment improvements need to be implemented at the SRP to comply with the SO2 Performance Target.

(D) Any flare gas recovery equipment and treatment system(s) to be installed to comply with the performance targets of paragraph (d)(1).

A new Flare Gas Recovery System was installed at LAR and commenced operation in December 2008. The new Flare Gas Recovery System provides a recovery capacity of 240,000 scfh. Therefore, no new flare gas recovery or treatment systems are required to be installed to comply with the SO2 Performance Target.

APPENDIX A

NOTICE OF SULFUR DIOXIDE EXCEEDANCE FOR CALENDAR YEAR 2012

APPENDIX B

LOS ANGELES REFINERY FLARE SYSTEM, KNOCKOUT DRUMS AND FLARE GAS RECOVERY SYSTEM

Please note that the drawings and information contained in Appendices B, C, and D is confidential and is a trade secret as defined in government code sections 6254 and 6254.7 and shall not be released to any person, party, organization or other agency without the written permission of Tesoro Refining & Marketing Company LLC.

APPENDIX C

LOS ANGELES REFINERY RELIEF COLLECTION SYSTEM DRAWINGS

Please note that the drawings and information contained in Appendices B, C, and D is confidential and is a trade secret as defined in government code sections 6254 and 6254.7 and shall not be released to any person, party, organization or other agency without the written permission of Tesoro Refining & Marketing Company LLC.

APPENDIX D

SULFUR RECOVERY PLANT RELIEF COLLECTION AND VAPOR RECOVERY SYSTEM DRAWINGS

Please note that the drawings and information contained in Appendices B, C, and D is confidential and is a trade secret as defined in government code sections 6254 and 6254.7 and shall not be released to any person, party, organization or other agency without the written permission of Tesoro Refining & Marketing Company LLC.

APPENDIX E

SIMPLIFIED LINE DIAGRAM FOR LOS ANGELES REFINERY SUBSTATION 10