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August 29, 2007

U.S. Environmental Protection Agency
Director, Air Enforcement Division
Ariel Rios Building
1200 Pennsylvania Avenue, N.W.
Mail Code 2242-A
Washington, DC 20460

CERTIFIED MAIL/RETURN RECEIPT
7004 2510 0004 3032 7242

**Re: Report for Hydrocarbon Flaring Incident Ending 07/17/2007
Pursuant to the Consent Decree entered March 5, 2002 by the
U.S. District Court for the District of New Mexico in
United States of America et al. v. Navajo Refining Company, L.L.C. et al.**

CC COPY

Dear Director:

This submittal is provided pursuant to Paragraph 21 of the subject Consent Decree for "control of hydrocarbon incidents." In accordance with the notice provisions of Paragraph 91, copies of this report are being mailed to EPA Region 6 (i.e., the Applicable EPA Region) and to both addresses listed for the State of New Mexico. Navajo is also providing an additional hardcopy to EPA's contractor and electronic-mail copies to the addresses provided in EPA's letter dated August 1, 2002.

The hydrocarbon flaring incident addressed in this submittal was caused by a electrical system problem that shut down several refinery process units.

Paragraph 21 of the Consent Decree requires that Navajo use the reporting procedures set forth in Paragraph 20 for acid gas incidents. The required Paragraph 21 report elements are therefore reported below using the corresponding sub-paragraph designations from Paragraph 20. Some of the report elements consist of, or are contained in, the enclosed referenced documents.

20.A.i

Hydrocarbon flaring began about 2:07 p.m. on July 17, 2007 and continued intermittently until approximately 7:20 p.m. the same day. Note that the only flaring resulting in significant SO₂ emissions occurred during the emergency shut down of the Alkylation Unit. The minor flaring that occurred intermittently during the restarting of the unit did not generate significant SO₂ emissions.

20.A.ii

The estimated quantity of SO₂ released as a result of the hydrocarbon flaring incident was 0.8 tons (rounded consistent with Paragraph 20.D.i). Calculations of the release quantity are in Enclosure 1.

20.A.iii

Navajo operators promptly reduced the Fluid Catalytic Cracking Unit (FCCU) rate to reduce the amount of Alkylation unit feed sent to the flare. The operation of the FCCU Debutanizer column was altered to reduce the sulfur content of the material being flared. Several hydrotreating units were placed in recirculation mode to reduce the acid gas generation and prevent any acid gas flaring and to prevent a sulfur recovery unit tail gas incinerator incident. Once power was restored to the refinery, the units were restarted in a controlled fashion that limited any further flaring. Navajo operators relieved pressure within the process units only as needed to maintain an adequate margin of safety inside the equipment during the start up.

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Director EPA
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20.A.iv

This information is provided in the enclosed incident investigation report (Enclosure 2).

20.A.v

This information is provided in the enclosed incident investigation report (Enclosure 2).

20.A.vi

This information is not relevant to hydrocarbon flaring incidents (see Paragraph 21).

20.A.vii

This information is not applicable since the investigation is complete.

20.A.viii

One of the corrective actions has not been completed. Navajo will submit a follow up report within 30 days of completing the corrective actions. The report will identify the additional corrective actions completed after this report.

We would be pleased to answer any questions EPA may have about this submission. If you have any questions, please contact me.

Sincerely,



Douglas B. Price
Environmental Manager for Air Quality

Enclosures

cc: Bureau Chief
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Environmental File: Consent Decree – Root Cause 2007 (File Room Binder)
[Consent Decree Letter HC Inc 2007-07-17.doc](#)

Navajo Refining Company, L.L.C.
Artesia, NM Refinery

August 29, 2007

ENCLOSURE 1

RELEASE CALCULATIONS

Calculations By:	D. Whaley	Date:	07/18/2007
Checked by:	J. Lackey	Date:	07/18/2007
Description:	Artesia Refinery Alky feed to flare following power outage.		
Approach:	Use flaring duration, flow rate, and H2S Concentration to estimate the total release of SO2		
Unit Operations:	FL - 402		

Constants:			
Data	Unit	Description	Data Source
64	lb/lb-mol	MW of SO2	
8.44E-05	T/scf	Consent Decree Conversion Factor	Paragraph 20.D of consent decree
379	scf/lb-mol	Volumetric conversion factor	
0.0485	lb/MM Btu	NOx Flare emission factor for high-Btu, steam assisted flare (lb/MM Btu)	TCEQ

Inputs:			
Data	Unit	Description	Data Source
960,000	SCF (583 BBL)	Total flow to flare (estimated)	Estimate from Michael Whatley
1,419,291	SCF		
0.01	scf H2S/scf LPG	H2S Concentration in gas	Estimate from Michael Whatley
	scf H2S/scf LPG	H2S Concentration in gas	Estimate from Rick Swafford
2900	Btu/scf (LHV)	Propylene LHV (Btu/scf)	Estimate from Phillips Petroleum Co - Reference Data for Hydrocarbons and Petro-Sulfur Compounds

Dates and Times			
Date & Time		Description	Reason
07/17/2007 14:07:00		Flaring started	From Environmental Compliance form
07/17/2007 16:07:00		Flaring stopped	From Honeywell Data (separate data file), stripper reboiler temp
07/17/2007 16:08:00			
07/17/2007 19:20:00			

Calculations:		
2.000	hr	= Duration of Flaring started to Flaring stopped = (Flaring stopped) - (Flaring started) = (07/17/2007 04:07 PM - 07/17/2007 02:07 PM)
3.200	hr	= Duration of 0 to 0 = (0) - (0) = (07/17/2007 07:20 PM - 07/17/2007 04:08 PM)
5.200	hr	= Total Duration

480,000	SCFH	=Flow rate [FR1]
443,528	SCFH	=Flow rate [FR2]

0.810	Tons SO2	= SO2 release amount (Tons) = [(480000 SCFH)(2 hr)(0.01 scf H2S/scf gas) + (443528 SCFH)(3.2 hr)(0 scf H2S/scf gas)][0.0000844]
1,620.48	lb SO2	= SO2 release amount (pounds) = [(480000 SCFH)(2 hr)(0.01 scf H2S/scf gas) + (443528 SCFH)(3.2 hr)(0 scf H2S/scf gas)][0.0000844] x 2000 lb/Ton

1,392.0	MM Btu/hr	=Heat release rate for FR1
1,286.2	MM Btu/hr	=Heat release rate for FR2

0.167	Tons NOx	= NOx release amount (Tons) = [(1392 MM Btu/hr)(2 hr)+(1286.2 MM Btu/hr)(3.2 hr)][0.0485 lb NOx/MM Btu] / [2000 lb/ton]
334.64	lb NOx	= NOx release amount (pounds) = [(1392 MM Btu/hr)(2 hr)+(1286.2 MM Btu/hr)(3.2 hr)][0.0485 lb NOx/MM Btu]

Navajo Refining Company, L.L.C.
Artesia, NM Refinery

August 29, 2007

ENCLOSURE 2
INVESTIGATION REPORT

2007-07-17 Hydrocarbon Flaring Incident

Description of Incident:

During a routine preventive maintenance inspection on Friday, July 13, 2007, Navajo maintenance personnel discovered a "hot spot" on an electrical connection to an overhead power line that supplies electrical power to Unit 33. The hot spot was discovered during an infrared survey of the electrical lines. From ground level, the warmer than normal temperature indicated for the connection was noticeable, but the remote measurement did not indicate an emergency.

Nevertheless, Navajo contacted one of our electrical contractors, Deans Electric Inc., for an additional inspection. On Tuesday, July 17, 2007, Deans Electric sent a crew with a bucket-lift truck to get a more accurate temperature reading as well as make a visual inspection of the electrical line. Two connections on the electrical line had a temperature of ~80 °F, while the third had a temperature of ~160 °F and some discoloration had taken place due to heat. Deans Electric advised that a connection with a temperature difference greater than 40 °F is cause for concern and recommended repairing the connection. Navajo staff promptly prepared a procedure for supplying power through the back-up circuit and presented it to management at a meeting on Tuesday, July 17 at ~ 2:30pm.

One of the proposed repair steps called for an electrician to check a contactor that was going to be used as an alternate electrical feed to a step down transformer. The transformer has two feeds coming into the high voltage (4160 volts) side of it, and the electrical drawings showed that the transformer had an internal switch that isolated each feed. The drawing was incorrect. The two high voltage feed lines were actually connected together after the main knife-blade switches that are normally used to open a circuit. The switch shown in the drawing actually isolated the two high voltage feeds from the low voltage circuit.

Prior to opening the 4160V electrical switchgear cabinet, the knife-blade switch must be in the open position. The door has a safety interlock that prevents the door from opening unless the switchgear has been de-energized by opening the knife-blade switch. A small window in the panel door allows visual observation of the knife-blade switch position. Navajo and Deans Electric staff visually verified that the back-up circuit knife-blade switch was open, and opened the cabinet to begin testing the back-up circuit prior to switching from the main circuit to the back-up circuit.

When the knife-blade switch is in the open position, it connects to a grounded circuit to discharge any static electricity in the circuit. When the electrician closed the contactor in the back-up circuit, power was back-fed from the main circuit through the contactor and went to the grounded circuit on the knife-blade switch. This caused an arc in the switchgear that resulted in a ground fault for all three-phase of the circuit.

The ground fault caused a main breaker in the Xcel Energy Company substation to open. The Xcel Energy breaker is designed to re-close automatically after a brief interval. This is intended to restore power after a momentary power interruption without requiring the breaker to be reset manually. When the Xcel Energy Company breaker re-closed automatically, it blew the fuses on both the main and back-up circuits in the 4160 V switchgear. This shut down the electrical power to several process units including Alkylation Unit.

At ~2:07 pm, flaring of the Alkylation Unit feed began. When the flaring started, the operators promptly reduced the Alkylation Unit feed rate to minimize the amount of gas flared. In addition,

2007-07-17 Hydrocarbon Flaring Incident

the operators modified the operating parameters in the Fluid Catalytic Cracking Unit (FCCU) absorber tower. The temperature in the stripper reboiler heat exchanger (X-542) was increased and the operating pressure in the absorber tower (W-404) was lowered. Raising the stripper reboiler temperature removes more of the H₂S from the stream and lowering the pressure allows more of the gas to flow to the high-pressure fuel gas system amine contactor. This results in the sulfur compounds going to the fuel gas contactor where they are removed and sent to the sulfur recovery unit rather than going to the flare in the alkylation Unit feed. As a result, although the emissions exceed 500 pounds of SO₂ within the first two hours as the sulfur content declined, the SO₂ emissions were minimized during the remainder of the intermittent flaring.

At ~2:15 pm, Deans Electric and Xcel Energy crews were called out to the plant. Electrical buss bars were removed to isolate the damaged contactor, the hot connection on the overhead line was repaired, and four damaged portions of the overhead electrical line were cut out and replaced. Power to the 480V equipment was restored by ~4:30 pm, and all power was restored by ~8:15pm.

By ~7:20 pm, the intermittent flaring stopped.

It should be noted that prompt action by the Navajo operators prevented this incident from also turning into a Sulfur Recovery Unit (SRU) tail gas incident. Although there were a few hours with tail gas incinerator (TGI) concentrations above the 12-hour rolling average limit of 250 ppmvd SO₂ corrected to zero percent oxygen, the excess emissions were below 500 pounds in a 24 hour period from the tail gas incinerator.

Unwanted Event:

Exceeded the 500 pounds of excess SO₂ emissions in a 24-hour period.

Causal Factors:

The immediate cause was the ground fault that tripped the Xcel Energy electrical substation breaker, causing a loss of power to the Alkylation Unit. The ground fault occurred during preparations for a planned maintenance activity intended to prevent an unexpected loss of electrical power if the malfunctioning connection further overheated and failed. The cause of the ground fault was the reliance on a drawing of the transformer internals that was inaccurate.

Root Cause:

The root cause of this event was the inaccurate electrical drawing of the Substation 4 switchgear and not double-checking that the switchgear was de-energized completely.

Recommendations:

1. Navajo has hired an independent contractor to go through all of the "one-line" electrical drawings and verify the "as-built" configurations. The contractor will use a "TIC tracer" and pen-light tester to verify voltage and circuit connections. Drawings will be updated as necessary and reissued. Due to the length of time required to field review all of the equipment, this corrective action has not been completed at the time of this report. It is anticipated that up to six months may be required to complete this project.

2007-07-17 Hydrocarbon Flaring Incident

2. Navajo has implemented an additional safety procedure when opening high voltage switchgear cabinets. In addition to the standard industry practice of visually inspecting the knife-blade switch, and relying on the safety interlocks that prevent the switchgear cabinet from opening unless the knife-blade switch is open, Navajo will now use a non-contact, high-voltage meter to verify that the circuit is not energized.
3. Navajo has a preventive maintenance program that includes routine thermal scans for this type of electrical equipment. Navajo will continue to implement its preventive maintenance program.

2007-07-17 Hydrocarbon Flaring Incident

Fact Finding Investigation Team	
Name	Title or Department
Doug Price	Environmental Manager for Air Quality
Ricky Swafford	Operations Manager
Doug Drum	Division Foreman
Gerald Collins	Process Engineer
Nicolas Salayandia	Superintendent, Maintenance, Instrumentation & Electrical
John Thurman	Electrical Foreman
Chancy Dozier	Electrician
Bryan Madrid	Electrical Engineer
Jenifer Hilliard	Senior Process Safety Management Engineer

APPROVALS AND DISTRIBUTION

REPORT COMPLETE; SIGNED BY TEAM LEADER

Jenifer Hilliard

TITLE: *Environmental Manager for Air Quality*

DATE: *08/29/2007*

REPORT-CONTENT ADEQUATE; SIGNED BY PSM COORDINATOR OR DESIGNEE

Sp L. Hilliard

TITLE: *Mgr, Safety*

DATE: *08/29/2007*

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