Illinois Environmental Protection Agency
Bureau of Air
August 2008

Supplemental Responsiveness Summary for Public Comments and Questions on the Coker and Refinery Expansion (CORE) Project at the Wood River Refinery in Roxana, Illinois

Facility Identification: 119090AAA
Application No.: 06050052

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DECISION

On August 5, 2008, the Illinois Environmental Protection Agency (Illinois EPA), Bureau of Air issued a construction permit to ConocoPhillips for the Coker and Refinery Expansion (CORE) Project at its Wood River Refinery at 900 South Central Avenue in Roxana, Illinois. The emissions of the proposed project are such that the project is considered a major modification of this source and the project is subject to the federal rules for Prevention of Significant Deterioration of Air Quality (PSD), 40 CFR 52.21. Upon review of comments received during the public comment period, and final review of the application and other relevant materials, the Illinois EPA has determined the proposed project meets the standard for issuance of a construction permit. This permit takes the place of a previous permit issued by the Illinois EPA on July 19, 2007 for this proposed project. That permit was remanded or sent back to the Illinois EPA pursuant to an order from the USEPA's Environmental Appeals Board (Appeals Board).

Simultaneously with the issuance of this permit, the Illinois EPA released this Supplemental Responsiveness Summary to address certain questions relevant to the issuance of this permit raised during the comment period and in the subsequent appeal of the permit previously issued on July 19, 2007. Other questions and comments with regard to this project, which were not subject to the remand order by the Appeals Board, are addressed in the original Responsiveness Summary, which was released with the previous permit on July 19, 2007.

GENERAL INFORMATION

Background

ConocoPhillips operates the Wood River Refinery located in Roxana, Illinois to produce a variety of petroleum products for distribution in the St. Louis, Chicago, and Indianapolis Metropolitan areas and throughout the Midwest. Wood River is positioned by refining capacity and by geographical location to process the growing volumes of heavy crude oil from Canada.

On May 15, 2006, the Illinois EPA, Bureau of Air received applications from ConocoPhillips for a Coker and Refinery Expansion (CORE) Project and for the Wood River Products Terminal Project located at 2150 South Delmar at Hartford, Illinois. The CORE Project entails installing facilities to increase both the total crude processing and percentage of heavier crude at the Wood River Refinery in order to increase the supply of petroleum products to the Upper Midwest. In order to handle the increased product throughput, ConocoPhillips also proposed certain changes at the Wood River Products Terminal (also owned by ConocoPhillips). The Illinois EPA considered ConocoPhillips's CORE project and the changes to the Wood River Products Terminal to comprise a single larger project for the purpose of the federal rules for PSD and Illinois' rules for Major Stationary Sources Construction and Modification (MSSCAM).

Following its initial technical review of ConocoPhillips' applications for the CORE Project, the Illinois EPA Bureau of Air made a preliminary determination that the applications met the standards for issuance of a construction permit. The Illinois EPA prepared draft permits of the permits that it would propose to issue and held a public comment period on the proposed

issuance of those permits.[1] The public comment period opened with the publication of a notice in the Alton Telegraph on March 24, 2007. A public hearing was held on May 8, 2007, at the Hartford Elementary School in Hartford to accept oral comments and answer questions about the proposed project. The written comment period remained open until June 15, 2007.

On July 19, 2007, the Illinois EPA, Bureau of Air issued two construction permits to ConocoPhillips for the CORE Project at its Wood River Refinery in Roxana and its associated Wood River Products Terminal in Hartford. No parties appealed the permit for the related terminal expansion and as such, Construction Permit No. 06110049 for the terminal expansion project is final and effective. However, two environmental advocacy organizations filed a petition with the USEPA's Environmental Appeals Board (Appeals Board) appealing the permit for the CORE Project at the Wood River Refinery. The permit issued by the Illinois EPA on August 5, 2008, takes the place of that previous permit for this project issued on July 19, 2007.

The permit for the CORE Project at the Wood River Refinery issued on July 19, 2007 was remanded or sent back to the Illinois EPA pursuant to an order from the Appeals Board. In its decision on June 2, 2008, *In re ConocoPhillips Co.*, PSD No. 07-02,[2] the Appeals Board denied review, in part, and remanded, in part, Construction Permit No. 06050052 issued by the Illinois EPA on July 19, 2007, a permit identified as a combined "Construction Permit – NESHAP – NSPS – PSD Approval." The Appeals Board remanded the permit due to its concern that the Illinois EPA had failed to adequately identify and explain the provisions of the draft permit that had been changed in the final decision and to adequately explain the rationale for these changes in its Responsiveness Summary. The Appeals Board went on to hold that these deficiencies made it impossible to reasonably evaluate the adequacy of the flaring controls for the emissions of carbon monoxide (CO) from the new flares that would be installed with the new Delayed Coker Unit and the new Hydrogen Plant and the practical enforceability of those measures in the permit. Consequently, the Appeals Board remanded those conditions to the Illinois EPA with direction to the Illinois EPA to identify and explain all changes in the final permit, including an explanation of how the Illinois EPA determined Best Available Control Technology (BACT) for CO emissions from these new flares and how the permit's monitoring and observation conditions ensured the practical enforceability of the BACT requirements for CO.

Accordingly, this Supplemental Responsiveness Summary only addresses the subject matter of the Appeals Board's June 2, 2008, partial remand of the appealed permit for the CORE Project. In particular, this Supplemental Responsiveness Summary specifically lists and explains changes to the permit made by the Illinois EPA in its final permitting decision (See Attachment A for the itemized listing of changes). This permit also provides a detailed explanation of the BACT determination that was made for emissions of CO from the new flares that would be installed at the new Delayed Coker Unit and the new Hydrogen Plant to be constructed as part of the CORE

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[1] This comment period also addressed ConocoPhillips' application for revision and reissuance of its National Pollutant Discharge Elimination System (NPDES) permit to allow increased wastewater discharges from the Wood River Refinery due to the CORE project. The Illinois EPA has not yet taken final action on that application. Comments and questions concerning that application, which were made during the public comment period, will be addressed by the Illinois EPA, Bureau of Water, in a separate Responsiveness Summary when the Bureau of Water takes final action on that application.

[2] A copy of the Appeals Board's June 2, 2008, decision may be found at its website at www.epa.gov/eab or obtained from the Illinois EPA by contacting Bradley Frost by one of the methods indicated in this document.

Project (refer to the "Discussion of the Illinois EPA's Review of the New Flares"). This Supplemental Responsiveness Summary also addresses the compliance procedures, i.e., provisions for monitoring, recordkeeping and reporting, accompanying the BACT determination to ensure the practical enforceability of that determination on an ongoing basis.

Availability Of Documents

The construction permit issued to ConocoPhillips for the CORE Project at the Wood River Refinery, this Supplemental Responsiveness Summary, and the original Responsiveness Summary are available by the following means:

1. By viewing the documents at one of the following repositories:

Illinois EPA 1021 N. Grand Avenue, East Springfield, IL 62794 217/782-7027	Illinois EPA 2009 Mall Street Collinsville, IL 62234 618/346-5120	Hartford Public Library 145 West Hawthorne Street Hartford, IL 62048 618/254-9394

2. By contacting the Illinois EPA by mail, telephone, facsimile or electronic mail as follows, to obtain a printed copy of the documents by mail and free of charge:

   Illinois EPA
   Attention: Bradley Frost
   1021 North Grand Avenue, East
   P.O. Box 19506
   Springfield, Illinois 62794-9506

   217/782-7027 Desk Line
   217/782-9143 TDD
   1-888-372-1996 Toll-Free
   217/524-5023 Facsimile

   brad.frost@illinois.gov

3. By accessing the World Wide Web at www.epa.state.il.us/public notices/general notices.html or www.epa.gov/region5/air/permits/ilonline.htm. Look under "All Permit Records, PSD, New" and then under "ConocoPhillips Wood River Refinery."

Appeal Provisions

To the extent review was granted by the Appeals Board in its Order of June 2, 2008, this construction permit now being issued for the proposed project grants approval to construct pursuant to the federal PSD rules, 40 CFR 52.21. In so doing, this construction permit and the further work performed by the Illinois EPA, including the preparation of this Supplemental Responsiveness Summary, respond to the Appeals Board's Order finding that the Illinois EPA's prior explanation of the BACT determination for CO emissions from the new Delayed Coker Unit and new Hydrogen Plant flares, including the explanation for the practical enforceability of the related monitoring and observation conditions, was deficient. Accordingly this decision may be appealed to the Appeals Board as provided by 40 CFR 124.19 "Appeal of RCRA, NPDES

UIC, and PSD Permits," as further specifically discussed in the Order by the Appeals Board.[3] If an appeal request will be filed by regular Unites States Postal Service delivery, it should be sent on a timely basis to the following address. If an appeal request will be submitted to USEPA by a means other than regular mail, refer to the Appeals Board's website for instructions.[4]

U.S. Environmental Protection Agency
Clerk of the Board, Environmental Appeals Board (MC 1103B)
Ariel Rios Building
1200 Pennsylvania Avenue, N.W.
Washington, D.C. 20460-0001
Telephone: 202/233-0122

DISCUSSION OF THE ILLINOIS EPA'S REVIEW OF THE NEW FLARES

Introduction

Two new flares would be installed with the CORE Project, one at the new Delayed Coker Unit and one at the new Hydrogen Plant.[5] These new flares are safety devices used to dispose of combustible gases that are vented from the associated processing units due to equipment malfunctions, process upsets or other conditions that prevent the vented gases from being recovered for use as fuel at the refinery. Most releases of combustible gases from the new Delayed Coker Unit and the new Hydrogen Plant will be such that they can be recovered and used as fuel at the refinery, rather than being flared. Only the releases that cannot be recovered would be sent to a flare, to be combusted in a burner system that has been designed for safe and effective combustion of the large release of flammable gas that can occur during an equipment malfunction or process upset at the associated processing units. Combustion of those releases in the flare would convert the organic compounds, hydrogen and sulfur in the releases into water, carbon dioxide and sulfur dioxide, with some carbon monoxide (CO) emitted as a product of incomplete combustion.

ConocoPhillips must take measures to recover most of the process gases or vent gases generated by these new processing units so as to minimize the amount of vent gas from these units that is flared. In this regard, these new units must be designed, operated and maintained so that vent gas is not flared during normal operation of the units. As certain vent gases are generated by the

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[3] In its Partial Remand Order, the Appeals Board states "Petitioners or other participants in any such subsequent IEPA proceeding who are not satisfied with IEPA's explanation of changes on remand may appeal the IEPA determination to this Board pursuant to 40 C.F.R. § 124.19." In re *ConocoPhillips Co.*, PSD Appeal No. 07-02, slip opinion at page 51.

[4] For information on filing of material by express mail or by other means refer to the Appeals Board Website: yosemite.epa.gov/oa/EAB_Web_Docket.nsf/General+Information/Frequently+Asked+Questions?OpenDocument#3 or www.epa.gov/eab/eabfaq.htm#3.

[5] This discussion does not address the operation and emissions of existing flares at the refinery, which are not modified under the PSD or MSSCAM regulations. The circumstances of these existing flares are generally similar to those of the new flares. However, they are not subject to BACT or LAER under the PSD or MSSCAM regulations. The use of and emissions from existing flares is addressed by a Consent Decree between USEPA and various states and ConocoPhillips that addresses existing operations at refineries operated by ConocoPhillips.

new processing units that are not recovered and flaring events do occur, the associated flares must be operated to effectively combust that vent gas, minimizing the amount of CO that is emitted from flaring as a product of incomplete combustion. ConocoPhillips must also take measures on an ongoing basis with the objective of reducing the number and extent of these flaring events due to upsets, malfunctions or other conditions in which the amount or nature of the vent gas from a unit is such that it cannot be recovered for use as fuel. The resulting determination of Best Available Control Technology (BACT) for emissions of CO from flaring is a collection of requirements that address different aspects or dimensions of the flares and the associated processing units that potentially contribute to emissions of CO. The operational restriction and required work practices for different aspect of flaring are the product of an evaluation by the Illinois EPA of the available control methods for each of those separate aspects of flaring. As the emissions of CO from the flares will be reduced by these operational restrictions and required measures, emissions of other pollutants associated with flaring will also be reduced.

Design of the New Processing Units for Recovery of Process Gas

The new Delayed Coker Unit and the new Hydrogen Plant must be designed and operated so that the process or vent gas that is normally generated by these units is recovered and is not flared. This requirement is now explicitly stated in the issued permit.

For the new Delayed Coker Unit, this requirement will be met with the Flare Gas Recovery System that is a feature of this unit. The vent gas from the Delayed Coker Unit is usually a normal byproduct of the coking process.[6] The Flare Gas Recovery System would divert this vent gas normally generated by the Delayed Coker Unit from the header or duct leading to the flare system for this unit to the fuel gas treatment system for removal of sulfur compounds in preparation for being used as fuel at the refinery. To enable recovery of vent gas during outages of recovery compressors, which must occur periodically for performance of routine maintenance, the Flare Gas Recovery System for the new Delayed Coker Unit must have two gas recovery compressors to collect the vent gas normally generated by the coking process and send it to the fuel gas system for the refinery. Each gas recovery compressor must be designed for at least 100 percent of the routine gas flow from this unit, so as to prevent the routine flaring of vent gas. The second compressor would be a reserve so that if one compressor is unavailable or fails, routine flaring would still be avoided or be at most of very short duration. The use of a Flare Gas Recovery System with a redundant compressor is required by the issued permit.

Given the much greater rate at which gases would be released during equipment malfunction or process upset, this gas recovery system would not be able to address unplanned, “emergency” flaring. “Emergency flaring” at the Delayed Coking Unit would be reduced through preparation

[6] In the Delayed Coker Unit, larger organic molecules present in the incoming crude oil stream being processed by a refinery, which cannot be used as fuel, are reduced in size so that they are suitable for use in the production of gasoline and other liquid fuels. This “cracking” reaction also reduces a fraction of the incoming stream to gaseous material. While this byproduct gas stream cannot be used for making liquid fuels, it can be used as fuel at the refinery once it has been processed to remove the hydrogen sulfide that is also released from the feedstock by the coking process. Modern Delayed Coker Units are designed to treat and recover most of this byproduct gas stream for use as fuel at the refinery, supplying the energy for the operation of the Delayed Coker Unit, itself, and other processing units at the refinery.

and implementation of a Flare Minimization Plan and through performance of event-specific Root Cause Analyses, as are addressed later in this discussion.

The design of the Hydrogen Plant would directly minimize flaring of gas vented from this plant. This plant normally operates using the byproduct gas generated by the Pressure Swing (PS) Absorbers, which purify the hydrogen made by this plant, as the fuel for the reformer furnace in the plant. The vent gas from the PS Absorbers can normally be directly used as the fuel for the reformer furnace without first having to undergo de-sulfurization and without need for gas recovery compressors. This is because the sulfur content of the vent gas from the PS absorbers will be very low, as the catalyst used in the plant to produce hydrogen is poisoned by sulfur. In addition, the operating pressure of the PS Absorbers is such that the vent gas can be sent directly to the reformer furnace without the need for a compressor.

During startup of the Hydrogen Plant, when the heat content of the byproduct gas from the PS Absorbers is variable and outside the normal range, this gas would be flared because it cannot be safely used as fuel in the furnace. This flaring would be minimized by process unit design as the Hydrogen Plant is designed to operate for several years between scheduled outages for maintenance, so that the startup of the plant should be very infrequent. In this regard, the operation of a hydrogen plant, which converts a gaseous feedstock into hydrogen by steam reforming, is generally considered more stable than many refining processes, which involve liquid petroleum streams whose composition and properties routinely vary. Given these circumstances for the new Hydrogen Plant, a separate Flare Gas Recovery System that would operate only during startup is impractical, with costs that would be excessive.[7, 8] Notwithstanding these circumstances, flaring associated with the startup of the Hydrogen Plant, as well as emergency flaring at this plant, must also be reduced on an ongoing basis through preparation and implementation of a Flare Minimization Plan and performance of Root Cause Analyses for significant flaring incidents that do occur.

<u>Emissions from Pilot and Purge Gas Needed to Maintain the Readiness of a Flare</u>

During normal operation of the new Delayed Coking Unit and the new Hydrogen Plant, the only emissions from the associated flares would be from combustion of the natural gas and refinery fuel gas used as pilot gas and purge gas in the flares. These gas flows are needed to continually maintain the readiness of the flare for releases of vent gases from the associated processing units. The flares must be operated with pilot burners so that a flame is present at the flare burner at all times and any gases vented to the flare are ignited and combusted. In addition, a minimum flow of "purge gas" is needed through the piping between the inlet to the flare system and the flare burner to protect against air infiltration and the potential for combustion inside this piping, which

[7] Because a compressor system would only recover vent gas from the new Hydrogen Plant during startup, rather than during routine operation of the plant, such a system would have a calculated cost-effectiveness of more than $200,000 per ton of CO that would be controlled, which is excessive. As the calculations of cost-effectiveness overstate the actual reduction in CO emissions that would be provided, given the conservative way in which the CO emissions from flares are calculated, the actual cost-effectiveness of such a system could be several times higher, i.e., worse, than the calculated cost-effectiveness.

[8] For the new Hydrogen Plant, the costs of installing and operating a Flare Gas Recovery System that would control vent gas only during startup also cannot be justified based on the emissions of sulfur dioxide (SO_2) that would be controlled by such a system, given the very low sulfur content of vent gas from the PS Absorbers.

would not be safe.

To address this aspect of operation of the new flares, the issued permit sets unit-specific limits on the total amount of pilot and purge gas used by each flare. These operational limits are lower than the limits recently set in the New Source Performance Standards (NSPS) for Petroleum Refineries, 40 CFR 60, Subpart Ja, which were adopted by USEPA on June 24, 2008.[9, 10] This is because the limits are based on the design gas flows for each new flare, as provided by ConocoPhillips. Other aspects of these limits reflect the provisions of the NSPS, e.g., the compliance time period for these limits is a 30-day rolling average.

The issued permit also requires that each flare be equipped with an automatic igniter device. These devices enable the pilot burners in a flare to be immediately relit if they are blown out. This requirement has been included in the issued permit at the request of ConocoPhillips. It has committed to the use of such devices to respond to public concerns that a pilot flame always be present at a flare, so that vent gas sent to a flare are always combusted.

Effective Destruction of Gases Vented to a Flare

As these flares for the new Delayed Coker Unit and the new Hydrogen Plant would at times combust gases vented from the associated units under conditions when a release of gas cannot be recovered, the flares must comply with applicable federal standards for proper design and operation of a flare for efficient destruction of organic compounds, 40 CFR 60.18. Compliance with these standards would also act to minimize the formation of CO from flaring, as these standards set work practices to ensure good combustion or "destruction efficiency" for the organic compounds in the flared vent gas. To facilitate compliance with these federal standards, the flares for the new Delayed Coker Unit and new Hydrogen Plant would be "steam-assisted," i.e., equipped to inject steam into the vented gases at the flare tip to increase turbulence and assure more complete combustion without visible emissions or smoking.

Based on research conducted by USEPA, compliance with these NSPS standards by the new flares is expected to provide 99.5+ percent destruction efficiency for organic compounds for the vent gases that are actually sent to the flares.[11] However, actual flare efficiency and emissions cannot be directly verified. This is because continuous operational or emissions monitoring methods (or methods for directly testing the performance of flares on a periodic basis) have not been developed for the large, elevated flares used at petroleum refineries. Accordingly,

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[9] The NSPS limits the combined flow of pilot and purge gas by a new flare to 250,000 scf/day, 30 day average, 40 CFR 60.102(g)(3). The issued permit limits these flows to 80,000 and 98,000 scf/day, respectively for the new Delayed Coker Unit and the new Hydrogen Plant.

[10.] Even though the requirements of the new federal New Source Performance Standards (NSPS) for Petroleum Refineries, 40 CFR 60 Subpart J and Ja, which were adopted by USEPA on June 24, 2008, are not addressed by the issued permit for emission units other than the new flares, the requirements of these NSPS are directly applicable as a matter of rule to the process heaters and other subject units that would be constructed as part of the CORE Project.

[11] USEPA has conducted research into the destruction efficiency of flares using specially assembled apparatus to enable testing of a flare. This research shows that properly operated flares, burning combustible gases with adequate heat content to support stable combustion, had destruction efficiencies that were typically greater than 99.5 percent. *Flare Efficiency Study*, USEPA, EPA-600/2-83-052, July 1983. Similar results have been found for flares that are used for gas streams that are mainly hydrogen, "Basis and Purpose Documents on Specifications for Hydrogen-Fueled Flares," USEPA, March 1998.

compliance with the work practice standards for flares in the NSPS must be relied upon to demonstrate that a flare is properly operated for efficient destruction.

Practices to Reduce the Amount of Process Upset Gas Vented to a Flare

Emergency flaring at the new Delayed Coking Unit and the new Hydrogen Plant would be reduced through preparation and implementation of Flare Minimization Plans to ensure that these units are operated and maintained in a manner that minimizes emergency conditions that could lead to flaring. Event-specific Root Cause Analysis would also be conducted for significant flaring events that do occur, to identify the underlying cause(s) for such flaring and to enable actions to be taken to reduce the likelihood of or to prevent similar flaring incidents in the future. These procedural activities are demonstrated measures to reduce and prevent flaring. They are generally required for new flares by the new NSPS for Petroleum Refineries, 40 CFR 60, Subpart Ja. They are already required for existing flares at the Wood River Refinery by the Consent Decree.[12]

The provisions for Flare Minimization Plans in the issued permit reflect the substantive requirements for such Plans in the regulations of the Bay Area Air Quality Maintenance District (BAQMD) and South Coast Air Quality Maintenance District (SCAQMD) in California (i.e., the Greater San Francisco area and the Greater Los Angeles area), with appropriate adjustments as needed to accommodate new flares, rather than existing flares that have an operating history. These rules require that flare minimization plans specifically consider three ways in which flaring can be prevented. These are planning in an effort to prevent flaring due to major maintenance activities, including startup and shutdown, planning to address flaring due to issues of gas quantity and quality and planning to address flaring due to recurrent failures of equipment.

The provisions in the issued permit for Flare Minimization Plans also reflect the elements of the Plan prepared by Shell for its refinery in Martinez, California. Shell was specifically cited in public comments as having been very effective in minimizing its emissions from flaring. The Illinois EPA's review of the Flare Minimization Plan prepared by Shell, Martinez, indicated that flaring minimization must be a consideration in the procedures for normal operation of processing units, the procedures for operation and maintenance of the fuel gas systems (so as to facilitate use of recovered vent gas), the procedures for preventative maintenance of units, the planning for major maintenance and turnarounds, and the coordination of the activities and efforts of the various individuals who are responsible for operation and maintenance of different units at a refinery. In addition, effective flare minimization also requires development of procedures to specifically address and prevent flaring due to process upsets and equipment failures. Finally, effective flare minimization planning requires periodic self-evaluation by a refinery of the effectiveness of its efforts in preventing and minimizing flaring.

The provisions for flare minimization planning in the issued permit also require that ConocoPhillips review the Flare Minimization Plans prepared by other refineries and include a

[12] "United States of America, State of Illinois, State of Louisiana, State of New Jersey, Commonwealth of Pennsylvania and Northwest Clean Air Agency, Plaintiffs, v. ConocoPhillips Company, Defendant," entered in the United States District Court for the Southern District of Texas, Civil Action No. H-05-0258, on January 27, 2005.

comparison with the practices used at those refineries, including the flare gas recovery systems, other equipment, and work practices used to minimize flaring at those other refineries. This requirement has been included in the issued permit at the request of ConocoPhillips. It has committed to this practice to further respond to public concerns about the adequacy of the flare minimization planning that will be conducted for the new flares.

As an administrative matter, the issued permit treats flare minimization planning as an activity that ConocoPhillips must conduct subject to general oversight by the Illinois EPA. The Illinois EPA has generally used the administrative process associated with Startup Shutdown and Malfunction Plans under 40 CFR 63.6(e) as the appropriate process for the handling of these plans. This process does not require the Illinois EPA to formally approve the Flare Minimization Plan for each flare. Instead, ConocoPhillips is generally required to maintain and implement a Plan that is up-to-date, revising the Plan as needed to address developments or events that have occurred. In addition, ConocoPhillips must update a plan if required by the Illinois EPA to address apparent deficiencies in the plan. To provide further oversight by the Illinois EPA, the initial Plan for each new processing unit must be submitted to the Illinois EPA at least 90 days before the initial startup of the unit, which will enable the Illinois EPA to review and, if needed, comment, upon that plan. This approach has been taken because flare minimization planning is being required for new flares and new processing units. Thus, they lack the operating history that is necessary to assess the effectiveness of the Plan as a practical matter. In addition, as the Plans address new units, for which effective minimization of flaring will be a consideration during the design of the units, it should be expected that the level of flaring that occurs will be far less than occurs with existing units for which flaring was a secondary consideration during the design of the unit or that have had many years of operation. These circumstances are distinguishable from those associated with flare minimization planning by the Bay Area Air Quality Maintenance District (BAAQMD) and the South Coast Air Quality Maintenance District (SCAQMD). Those jurisdictions were addressing flaring from existing processing units, all of which had operating histories, some of which appear to have involved excessive levels of flaring that could be prevented through implementation of flare minimization planning.

The provisions in the issued permit for Root Cause Analyses generally reflect the detailed provisions for such analyses in the Consent Decree. As such, Root Cause Analyses must consist of a systematic investigation of a significant flaring incident to identifying and assess corrective measures that are available to prevent or reduce the likelihood of recurrence of a similar incident (including design, operation and maintenance changes). A Root Cause Analysis must also lead to the development of a program of interim and long-term corrective actions, if any, as are consistent with good engineering practice, to minimize the likelihood of a recurrence of the conditions that caused the incident, with a schedule for implementation of the measures that cannot immediately be implemented. The performance of a Root Cause Analysis must be accompanied by the preparation of a detailed report for the Analysis.

A key aspect of the provisions for Root Cause Analyses is the criteria used to define a significant flaring incident, for which such an Analysis must be performed. The criteria for a significant flaring incident set by the permit are a flaring event with VOM emissions of 50 pounds or more in a 24-hour period or flaring of 100,000 scf or more of vent gas in a 24-hour period. These criteria are derived from the criteria in BAAQMD Rule 12-12-405 and SCAQMD Rule 1118.

The criteria in those rules have been tightened significantly to reflect the more stringent requirements that should apply to new flares for new processing units, rather than flares serving existing processing units or multi-unit flares generally serving an existing refinery, as addressed by the BAAQMD and SCAQMD rules. A separate criterion is not set in terms of CO because any such criteria would merely restate the VOM criteria in different terms.[13] In addition, neither the BAAQMD nor SCAQMD rules set a criterion for performance of root cause analysis that is expressed in terms of CO emissions.

The issued permit also requires an annual leak survey for all pressure relief devices connected directly to a flare, rather than to the flare header before the liquid seal. The concern for these devices is that they may not fully reseal after a pressure release and some vent gases may continue to be flared due to leakage of the pressure relief device. To address this potential contribution to flaring, the issued permit requires an annual acoustical or temperature leak survey of all such pressure relief devices connected directly to a flare. Any devices that found to be leaking must be repaired no later than the next turnaround of the units.

Emission Limits for CO

The CO BACT determination in the issued permit also includes limits on the annual emissions of CO from each of the new flares. These limits set an additional constraint on the emissions from the flares, reflecting the greatest amount of emissions that should occur in any year. These limits also indirectly serve to restrict the amount of vent gas that is combusted on an annual basis by each flare, rather than being recovered, in addition to the amount of pilot and purge gas that is combusted by each flare. However, as the limits must accommodate variability in non-routine flaring from year-to-year, the actual CO emissions should be substantially lower than these limits in most years. In most years, the extent of emergency flaring should be lower than assumed in setting these limits as emergency flaring is prevented and minimized by flare minimization planning and Root Cause Analyses. This is particularly true as Root Cause Analyses will progressively prevent or reduce the likelihood of reoccurrence of significant flaring incidents year-by-year, as these analyses respond to incidents that have actually occurred and lead to actions to prevent similar incidents in subsequent years. Accordingly, these limits that are being set for CO emissions are considered to be secondary BACT limits, since the primary means by which the CO emissions of the new flares are to be controlled is through the collection of work practices that is set as BACT.

The challenge in developing these limits was in selecting scenarios for each new processing unit that reasonably accounted for the occurrence of non-routine, emergency flaring of vent gas due

[13] VOM and CO emissions of the new flares are to be generally determined by the heat content of the flared vent gas and established USEPA emission factors from USEPA's *Compilation of Air Pollutant Emission Factors*, which are representative of proper operation of flares for effective combustion of the vent gas, i.e., emissions of 0.063 and 0.37 lb/million Btu for VOM and CO, respectively. Accordingly, CO emissions of a flare, if relevant for determining whether a Root Cause Analysis must be conducted, would always be 5.87 times the VOM emissions, so would not yield a different result from a criterion in terms of VOM emissions. This is distinguishable from the flow criterion for performance of a root cause analysis, which addresses a separate dimension of a flaring incident, i.e., the volume of gases that are flared. Likewise, a criterion in terms of SO_2 emissions, as relevant for root cause analysis under the NSPS, considers another aspect of a flaring incident, i.e., the sulfur content of the vent gases that are flared.

to equipment malfunctions and process upsets. ConocoPhillips developed specific scenarios for the new Delayed Coker Unit and new Hydrogen Plant. For the Delayed Coker Unit, the scenario involved two major malfunctions and flaring incidents each year, one for each for the Coker Drum Area and the Fractionator/Feed Area. These are the two principle areas in the unit for which a malfunction would be accompanied by the release of vent gas that could not be recovered. For the new Hydrogen Plant, the scenario involved one major malfunction of the Pressure Swing (PS) Absorber System, for which a malfunction would also be accompanied by the release of vent gas that could not be recovered. In each case, the amount of vent gas that was flared was based on the design of the new units and ConocoPhillips' experience with the downtime and recovery time associated with malfunctions with similar equipment at other refineries. The scenarios used for the issued permit are less cautious than the scenarios that were originally used by ConocoPhillips to estimate the potential emissions of the new units,[14] so that the limits are lower than those in the draft permit and in the permit issued in July 2007. This is in part because of the effect of the additional measures that must now specifically be implemented to prevent and minimize flaring, which were not considered when ConocoPhillips prepared its original application for the CORE Project. It was also a response by ConocoPhillips to concerns about the potential emissions of the flares expressed by certain members of the public. From the Illinois EPA's perspective, this revision to the scenarios used to determine emission limits, which more realistically accounts for the occurrence of flaring due to malfunctions, was also needed as the limits on potential or permitted emissions of CO set by the permit are now also serving as BACT limits.

The established USEPA emission factor for a properly operated flare, 0.37 lb CO/million Btu heat input, was used to calculate emissions of CO from the new flares. To maintain consistency with the manner in which the limits were established, the permit also requires compliance with these limits, as they serve as BACT limits, to be calculated using the emission factor established by USEPA. This factor is conservatively based on a properly operated flare only achieving 98 percent destruction of the organic content in the vent gases sent to the flare. Because the CO emissions of the new flares are based on emission factors that reflect only 98 percent destruction, they very conservatively address the CO emission of the new flares, which in practice may easily be one half or one third those indicated by the emission factor that must be used to calculate CO emissions, based on the actual combustion efficiency of a flare.

These limits are a new feature of the CO BACT determination, which was not present in the permit issued in July 2007. While that permit set limits on the potential emissions of the flares, the CO limits were not linked to the BACT determination. Limits on CO emission are now being included in the CO BACT determination in response to the partial remand of the July 2007 permit, in which the Appeals Board expressed about how the emission limits for CO in the permit were developed and whether they reflected BACT.

Compliance Procedures

[14] ConocoPhillips' original scenario for the Delayed Coker Unit involved four major malfunctions of the Coker Drum Area and two major malfunctions of the Fractionator/Feed Area. For the new Hydrogen Plant, the scenario involved three major malfunctions of the PS Absorber Area.

Compliance procedures, including continuous monitoring of certain parameters and operational aspects of the new flares, are established to implement and enforce the various emission control measures that are being set for the new flares, as well as to facilitate operation of the flares in accordance with good air pollution practice.

For each new flare, continuous monitoring is required for the flow rate of vent gas that is flared. The issued permit includes additional requirements for these monitoring systems beyond those found in the NSPS, including specific performance specifications for these monitoring systems and a requirement for annual verification of accuracy, as required by the BAAQMD's rules for flares at petroleum refineries. Continuous monitoring is required for the sulfur content of vent gas that is flared. Such monitoring is now required by the new NSPS, 40 CFR 60.107a(e). The issued permit addresses the VOM content of the vent gas that is flared with requirements for regular sampling of the vent gas when flaring occurs, followed by appropriate analysis of the collected samples. Provisions are also included that accommodate use of continuous monitoring systems as an alternative to sampling and analysis of flared vent gas. This approach is consistent with the approach taken in Rule 12-11-502 by the BAAQMD. Separate monitoring systems are also required for the flow of pilot and purge gas to each flare. Monitoring is also required for proper operation of each flare system, including the presence of a pilot flame, the operating parameters of the seal drum, and the appearance of the flame during flaring, as recorded with video monitoring.

Specific procedures are set for flare minimization planning and Root Cause Analyses to provide for oversight by the Illinois EPA, as have already been discussed. Requirements for recordkeeping and reporting are established for the ongoing implementation and enforcement of these control measures and other control measures that are being set for the new flares. Recordkeeping is required to verify compliance with the design requirements that are established, notably the design of the Flare Gas Recovery System for the new Delayed Coker Unit. Periodic compliance reports summarizing flaring activity during the reporting period are required. Comprehensive reports are required on an annual basis that provide information on flaring during the previous calendar year, as well as necessary background information to compare that flaring activity in the previous calendar year to flaring activity in previous years and information on actions that have been and will be taken to prevent and minimize flaring. Lastly, specific procedures are set forth for the calculation of VOM and CO emissions to standardize the identification of significant flaring events based on VOM emissions and the compliance determinations for the CO emission limits that are set as part of the BACT determination for CO.

Differences between the Issued Permit and the Remanded Permit

The provisions related to flaring in the permit now being issued reflect further development and enhancement of the provisions in the permit that was issued on July 19, 2007. This has occurred for several reasons, most notably the partial remand of the permit issued on July 17, 2007 by the USEPA's Appeals Board. In addition to specifically responding to the deficiencies identified in the remand order, the Illinois EPA also wants to provide a response that unequivocally addresses the relevant requirements of the PSD rules. The Illinois EPA does not wish to be subject to a further partial remand on particular aspects of the decision that is now being made. Other

reasons for changes between the issued permit and the remanded permit include the provisions for refinery flares in the new NSPS adopted by USEPA, the additional insights into flaring that accompanied the work of responding to the partial remand order, and the experience acquired with applications for other projects in the last 12-months since July 2007. A final reason for changes is certain enhancements to the provisions for flaring that were specifically requested by ConocoPhillips to respond to particular concerns expressed by certain members of the public about the measures that would be used to address and control emissions from the new flares that would be constructed as part of the CORE Project.

As a general matter, the July 19, 2007 permit that was the subject of the partial remand contained the basic elements of the BACT and LAER determination that is being made in the permit that is being issued simultaneously with the release of this Supplemental Responsiveness Summary. In response to comments received during the public comment period, the Illinois EPA conducted a further evaluation of control measures and approaches that could be used to prevent and minimize emissions from the new flares. The permit issued on July 19, 2007 substantially expanded the scope of the BACT and LAER determination from that in the draft permit to address not only proper operation of new flares for good destruction, but also to explicitly address measures to prevent and minimize the occurrence of flaring. This included design and operation of the new processing units for effective recovery of vent gas during normal operation of the units. It also included implementation of flare minimization planning and root cause analyses to further prevent flaring and respond to significant flaring incidents that do occur. The requirement that vent gas not be flared during normal operation of processing units is now more clearly stated. The provisions for flare minimization planning and root cause analyses, which are ongoing, iterative procedural requirements, have been further clarified and elaborated upon in the new permit, to better identify the scope and nature of these activities. The issued permit also includes certain additional control measures, such as limits on the flow of pilot and purge gas and "secondary" limits on CO emissions, which were identified as additional measures that could be imposed to constrain and control the CO emissions of the new flares.

In response to comments received during the public comment period, accompanying the further evaluation of control measures that could be used for the new flares, the Illinois EPA also reevaluated the monitoring and other compliance procedures that should be required for the new flares. The permit issued on July 19, 2007 substantially developed the scope of required monitoring and compliance procedures from those in the draft permit to require the collection of information needed to implement the additional control measures that were also being required by the permit. In particular, the July 19, 2007 permit required operational monitoring and recordkeeping for process and operating data as necessary to determine the occurrence and magnitude of flaring that occurs and to reasonably estimate the emissions accompanying such flaring. The new permit substantially increases the rigor of monitoring required for the new flares. Monitoring for flow rate and sulfur content of vent gases that are being flared is now required. This is a consequence of USEPA's adoption of "new" federal New Source Performance Standards (NSPS) for Petroleum Refineries, 40 CFR 60 Subpart Ja, on June 24, 2008, which generally require such monitoring for new flares. However, it is also consistent with a reassessment of monitoring requirements for the new flares by the Illinois EPA that concluded that this monitoring should generally be consistent with relevant provisions of the SCAQMD and BAAQMD rules, except when specific reasons exist to deviate from those

provisions. ConocoPhillips has not come forward with any such reasons and has instead requested that certain additional monitoring requirements be included in the permit to respond to particular concerns expressed by certain members of the public about the monitoring that would be conducted for the new flares. Accordingly, the issued permit also requires sampling and analysis, or alternatively continuous emissions monitoring, to determine the composition of vent gas that is flared. The permit also requires that video imaging be conducted for each of the new flares. The issued permit also includes certain other monitoring and compliance procedures as are necessary to implement and enforce the additional control measures that have been imposed, such as monitoring for flow of pilot and purge gas to verify compliance with the limits set for these flows, and procedures to determine CO emissions for the purpose of determining compliance with the "secondary" limits on CO emissions.

The new permit also addresses all relevant provisions of the "new" NSPS, 40 CFR 60 Subpart Ja, for the new flares, which are subject to the partial remand, rather than the provisions of 40 CFR 60, Subpart J, which were previously addressed. The new permit includes a number of changes to improve the organization, clarity and terminology in the provisions of the permit for the new flares to increase the accessibility and understandability of those provisions. Finally, the new permit corrects various errors in grammar and wording in the July 19, 2007 permit.

SELECTED COMMENTS WITH RESPONSES BY THE ILLINOIS EPA

The following section of this Responsiveness Summary provides revised responses by the Illinois EPA to comments from the public related, either in whole or in part, to the control of CO emissions from flaring and the determination of Best Available Control Technology (BACT) for the new flares that would be constructed as part of the CORE Project.[15] The responses originally provided by the Illinois EPA to these comments are also repeated to enable the changes in and enhancements of the response to be readily identified. Responses on other matters, which are not the subject of the Appeals Board's partial remand order, are provided in the Responsiveness Summary released when the original permit was issued in July 2007.

General

11. Rather than flaring waste gases, ConocoPhillips should capture the energy value of waste gases by capturing them and using them as fuel.

    Original Response - These recovery systems are already in place at the refinery. For example, the majority of fuel gases used in the refinery, which are used as fuel in the heaters and boilers, comes from recovered process gas.

    Revised Response- Recovery systems are already in place at the refinery to recover the energy value of "waste gas" for use as fuel in the heaters, furnaces and boilers at the refinery. The majority of fuel used at the refinery comes from recovered

[15] In particular, this Supplemental Response further addresses Comments 11, 24, 25, 27, 28, 29, 30, 58, 60, 61, 62, 63, 64, 65, 66, 68, 69 ,70, 71, 72, 73, 74, 75, 76, 78, 79 and 84 in the original Responsiveness Summary.

process gas. The fuel for the new processing units being constructed as part of the CORE Project will also be provided by waste or process gas so that the use of commercial fuel, i.e., natural gas, by the refinery should not increase with the CORE Project. The new Delayed Coker Unit would be equipped with a Flare Gas Recovery System, with a second, spare compressor, to facilitate effective recovery of process gas from this processing unit. The new Hydrogen Plant would have an integrated design that would also provide for effective recovery of process gas at this unit. The gas generated by the Pressure Swing Absorbers at the new Hydrogen Plant would normally be the fuel for the operation of the plant.

New Source Review - BACT/LAER

24. The CO emission limit proposed in the application as BACT for flaring, 0.37 lbs/million Btu, would not be enforceable. There is no practical method to enforce this limit, which by its nature is an emission factor and not a measurement. ConocoPhillips also has not proposed any method to verify compliance with this limit. It would be very convenient for ConocoPhillips to have a BACT limit that by definition is met independent of how much CO a flare emits, with the calculated emissions always being equal to the limit.

Original Response - As noted by this comment, the CO emission limit proposed by ConocoPhillips as BACT for flaring is a USEPA emission factor and was not intended to be enforceable in the same manner as a more traditional emission limit. Instead, the proposed CO emission limit was intended to serve as a representation of the CO emissions of a properly operated flare. However, as implied by this comment, proper operation of a flare should be directly addressed by specifying the particular work practices that must be implemented for the flare. It would be poor regulatory practice to rely on an emission limit to implicitly require proper operation of a flare as specific practices for proper operation can readily be set. In addition, setting BACT solely in terms of an emission limit would not act to require practices to prevent and minimize flaring.

Revised Response - As noted by this comment, the CO emission limit originally proposed in the application by ConocoPhillips as BACT for flaring, 0.37 lbs/million Btu, is an emission factor developed by USEPA. It would not have been enforceable in the same manner as a more traditional emission limit. It was not part of the proposed CO BACT determination for the new flares that are part of the CORE Project in the draft permit. As implied by this comment, proper operation of a flare should be directly addressed by specifying the particular work practices that must be implemented for the flare, not by an emission factor that would not act to require proper operation of the flare or otherwise serve to minimize emissions of the flare. Accordingly, the CO BACT determination for the new flares is generally set as a collection of specific work practices to minimize emissions of CO (and indirectly emissions of other pollutants) from the new flares. These practices have been further developed and expanded compared to the work practices that would have been required by the draft permit.

As already discussed, the CO BACT determination in the issued permit does include limits on the annual emissions of CO from each of the new flares. As annual limits, these limits do serve to restrict or constrain the emissions of these flares. The limits also indirectly restrict the amount of vent gas that is combusted on an annual basis by each flare, rather than being recovered, in addition to indirectly restricting the amount of pilot and purge gas that is combusted by each flare.

25. The CO emission limit proposed in the application by ConocoPhillips as BACT for flaring, 0.37 lbs/million Btu (proposed on page 7-9 of the application) was correctly rejected by the Illinois EPA. Setting BACT as this emission limit would not serve to reduce CO emissions by reducing the amount of flaring that occurs. While it does not appear that the Illinois EPA has applied this limit as BACT, it is what ConocoPhillips proposed. In case the Illinois EPA is still considering this limit or has somehow included it in its calculations underlying other limits in the draft permit, the Illinois EPA should reject such a notion. The proposed limit is actually a USEPA emission factor for CO emissions expressed in terms of the fuel value of the waste gas that is flared. This factor has nothing to do with BACT. Such a limit would allow unlimited hours of routine flaring at this rate, and by definition is not the best available technology but is instead an average or typical CO emission factor for flaring.

Original Response - The issued permit does not set BACT for CO in terms of this emission rate originally proposed by ConocoPhillips. BACT for CO is set in terms of work practices to minimize CO emissions, consistent with the general approach taken in the draft permit. These work practices have been further developed as a result of further review by the Illinois EPA in response to other public comments.

Revised Response – The issued permit does not set BACT for CO in terms of this emission rate, 0.37 lbs/million Btu, originally proposed by ConocoPhillips. BACT for CO is set in terms of work practices to minimize CO emissions, consistent with the general approach taken in the draft permit. These work practices were further developed as a result of further review by the Illinois EPA in response to other public comments. These work practices have now been further enhanced in response to the remand of the permit by the Appeals Board, i.e., with both more elaboration on flare minimization planning and Root Cause Analyses, which are the primary methods to prevent and minimize flaring, and with identification of additional control practices that can be implemented, such as limits on usage of pilot and purge gas and leak survey and repair requirements for any pressure relief devices that must be ducted directly to a new flare system.

As explained above, this emission factor has been appropriately used to set secondary BACT limits for CO emissions from flaring. These limits, which are expressed as annual emission limits, do act to set a limit on the amount of flaring that occurs at new processing units constructed as part of the CORE Project.[16]

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[16] **The annual emission limits set as secondary BACT limits for emissions of CO in the issued permit directly limit the amount of flaring that occurs as they act to restrict the energy content of the vent gases that may be flared. This is because the permit provides that compliance with these CO limits must be determined using**

27. The draft permit would set "blended limits" for emissions from the flare for the new Hydrogen Plant so that separate BACT and LAER limits for flaring would not be set. The limits that are set for the new Hydrogen Plant (HP2) would address the Hydrogen Plant Heater (HP2 H-1), the associated Cooling Water Tower (CWT 24) and, fugitive emissions, as well as the flare (HP2F). The scope of these limits obscures exactly how much emissions of CO and VOM would be allowed for flaring with BACT and LAER. The application must provide a clear and complete project description and the permit must set limits for this flare to ensure that it meets BACT and LAER.

Original Response - While blended limits are set for the permitted annual emissions of the flare for the new Hydrogen Plant, the flare is permitted to emit up to the limits in Condition 4.7.6. However, separate, lower limits are also set in Condition 4.1.6 for the process heater for the plant, Heater HP2 H-1. Condition 4.6.6 sets a limit on the VOM emissions of Cooling Water Tower 24, allowing only minimal VOM emissions. The emissions of the flare by itself are expected to be no more than the difference in these limits. For example, the expected annual emissions of CO would be no more than 36.2 tons.[17] While annual CO emissions could be greater (but in no case more than 147.9 tons as limited by Condition 4.7.6), this could only occur with circumstances that acted to lower CO emissions of the process heater. This approach has been taken for the new Hydrogen Plant given the nature and design of the unit, which generates a low VOM content, byproduct waste gas stream that is normally used as fuel in the unit itself.

Revised Response – Separate, stand-alone limits have been set for the emissions from the flare for the new Hydrogen Plant, to specifically address its emissions. These limits reflect the more refined scenarios for estimating the amount of flaring that should occur at this plant in any 12-month period, as now provided by ConocoPhillips.

The blended limits for the new Hydrogen Plant from the draft permit are also retained as they are another constraint on emissions of this new plant that was proposed in the draft permit and serve to restrict the overall emissions of this plant. However, these overall, plant-wide limits in the issued permit are lower as they account for the refined scenarios for flaring. These limits are also now located in Condition 3.4.4, with other conditions that address certain groups of emission units, as is more appropriate for a condition that sets limits on the overall emissions of the various emission units that will be part of the new Hydrogen Plant.

28. The BACT/LAER evaluation for flaring did not evaluate the most stringent technologies

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the established USEPA emission factor that is representative of proper operation of a flare for effective combustion of the vent gas, i.e., emissions of 0.37 lb CO per million Btu heat input in the gases being combusted. Accordingly, each pound of CO emissions for which a flare is permitted by these secondary limits directly correlates to flaring of an amount of vent gas containing a set amount of energy.

[17] **147.9 tons (overall limit on CO emissions) – 111.7 tons (limit on heater CO emissions) = 36.2 tons (remainder available for flare).**

available, which prevent entire flaring events and achieve the maximum degree of CO and VOM emission reductions. In this regard, the application incorrectly indicates that there are no "technically feasible CO control options" for the flares. (See Sections 7.3 of the application.) Other refineries have equipment and practices that minimize flaring emissions by minimizing flaring. Such approaches were not evaluated for the project. Preventing flaring events completely or minimizing the quantities of gases flared is the best method to prevent both VOM and CO emissions and all other flaring emissions (including carbon dioxide (CO_2)). Such methods were not evaluated in the application for the proposed project.

Original Response - The BACT/LAER evaluations for the proposed project for flaring was made based on the features in the design of the new Delayed Coker Unit that will act to minimize flaring and in the context of existing requirements that address flaring at the Wood River refinery. In particular, the Consent Decree also includes requirements related to hydrocarbon flaring events, as is relevant to emissions of CO and VOM from flaring. The cause of significant hydrocarbon flaring incidents must be investigated, including performance of root cause analyses, steps must be taken to correct the conditions that cause such incidents, and the number and extent of such incidents must be minimized. Detailed reporting is also required for these incidents. Provisions have been included in the issued permit that make similar requirement applicable for the new flares that would be installed with the proposed project.

Revised Response - The BACT/LAER determination in the issued permit reflects an evaluation of available control techniques to minimize emissions from flaring, including techniques that will prevent routine flaring of vent gas and minimize non-routine flaring of vent gas. Because there are different aspects of "flares" and "flaring" that contribute to emissions, control techniques for each aspect were each separately considered. The resulting BACT/LAER determination is a collection of stringent control measures that individually address those different aspects, with each control measure generally constituting the most stringent control measure that has been required and used in practice to prevent and/or minimize emissions from that aspect of flaring, as relevant for that aspect of flaring.

As discussed, the resulting BACT/LAER determination requires that the new Delayed Coker Unit and the new Hydrogen Plant each be designed to prevent flaring of vent gas during the normal operation of the associated processing units. It also requires that flaring that does occur to be conducted with good combustion practices to ensure high destruction efficiency and minimize accompanying emissions of CO and VOM. The more challenging aspect of controlling the emissions of flaring is preventing non-routine, emergency flaring. To address this aspect of flaring, the BACT/LAER determination imposes rigorous requirements for flare minimization planning and root cause analyses, which are the demonstrated measures to prevent and minimize non-routine flaring. The BACT determination also sets an annual limit on the overall emissions of CO from each flare, to serve as a secondary BACT limit to quantitatively address the emissions of

each flare. While these control measures, other than good combustion practices, were not addressed in the application for the CORE Project, these measures were addressed by the Illinois EPA in response to comments received during the public comment period and were included in the initial permit that was issued for the CORE Project on July 17, 2008. These control measures have been further developed and enhanced in the permit now being issued for this project.

This BACT/LAER determination that has been made for the new flares that are part of the CORE Project builds upon the existing requirements that are already in place and serve to minimize flaring at the existing Wood River Refinery. In particular, ConocoPhillips is subject to a Consent Decree[18] that includes provisions to reduce emissions from flaring by existing processing units at the refinery. Planning is required to minimize flaring. Root Cause Analyses are also required in response to significant flaring events, to identify the conditions that cause such incidents and undertake corrective actions, so that the number and extent of such incidents are minimized over time as causes for such incidents are reduced or eliminated.

29. Additional evaluation of BACT and LAER is needed for venting of pressure relief devices to gas recovery systems (while adding sufficient compressor capacity so that this does not cause additional flaring).

Original Response - Pressure relief devices are addressed by the provisions for flaring, as they are mechanisms through which waste gases are vented from process units at refineries for recovery or flaring.

Revised Response – "Pressure relief devices" are generally addressed by the other provisions to prevent and reduce flaring, as pressure relief devices are merely the mechanisms through which vent gases are released from process units to either be recovered for use as fuel or flared. The exception is certain pressure relief devices on processing units that in order to ensure safety of personnel and equipment must be ducted directly to a flare, without opportunity for recovery of the vent gas. (Given the nature of the extreme releases through such devices is not realistic to expect such releases would be recovered even if they entered the vent gas ductwork upstream of the flare.) The concern for these particular pressure relief devices is not the direct release of vent gas through such devices during an over-pressure event, which is non-routine flaring addressed with the requirements for flare minimization planning and root cause analyses. The concern for these devices is that they may not fully reseal after a pressure release and some vent gases may continue to be flared due to leakage of the pressure relief device. The issued permit includes measures to minimize such leakage, based on SCAQMD Rule 1118(c)(1)(C). ConocoPhillips must conduct an annual acoustical or temperature

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[18] **"United States of America, State of Illinois, State of Louisiana, State of New Jersey, Commonwealth of Pennsylvania and Northwest Clean Air Agency, Plaintiffs, v. ConocoPhillips Company, Defendant," entered in the United States District Court for the Southern District of Texas, Civil Action No. H-05-0258, on January 27, 2005.**

leak survey of all pressure relief devices connected directly to a flare and repair leaking pressure relief devices no later than the next turnaround. The survey must also be conducted no earlier than 90 days prior to the scheduled turnaround of a processing unit.

30. The annual VOM emission rate from flaring achieved by Shell, Martinez, should be used as the basis to set a LAER limit for the proposed project. This results in a LAER limit for the Wood River refinery of 5.9 tons/year, given that the Wood River refinery is about four times larger than the Martinez refinery.[19] Shell states in its Flare Minimization Plan that it has been able to achieve low flaring emissions including emergencies in a safe manner. Nothing in the BAAQMD flare rule with its requirement for a Flare Minimization Plan (FMP) causes any compromise in safe refinery operations, which allow flaring in a true emergency. However, the FMP does require rigorous monitoring, reporting, planning, and evaluation of flare events, and equipment improvements so that methods and equipment are in place to prevent emergencies and minimize flaring. These methods make the refinery safer by minimizing emergency shutdowns and reducing repeated flaring emissions.

Original Response - The information cited in this comment does not support setting a LAER requirement for the Wood River refinery or the new flares that is expressed in terms of annual emissions. As noted by the comment, the relevant BAAQMD regulations do not prohibit flaring, as flaring is an appropriate action to address disposal of process gas in emergencies. Likewise, the Flare Minimization Plan prepared by Shell Martinez indicates that none of the procedures that are part of that plan would act to restrict access to flares when flaring is viewed as necessary for personnel or equipment safety, which further necessitates flaring by operators without hesitation when warranted for safety. Setting a limit in terms of annual emissions of flaring, in the manner proposed by this comment, would potentially act to prohibit flaring when it was appropriate. It would set an absolute, enforceable limit on the extent of flaring that could occur at the refinery independent of the actual circumstances at the refinery in a particular year.

Revised Response – The annual emission limits that are part of the CO BACT determination in the issued permit were appropriately developed to serve as BACT limits. They reflect a reasoned assessment of the <u>greatest</u> amount of flaring and CO emissions that should be expected to occur at either flare <u>in any year</u>. The information cited in this comment does not provide a sound basis to set either LAER or BACT limits on the annual emission of the new flares in the CORE Project. First, it is not supported by the BAAQMD rules, which do not set limits on the emission from flares at refineries. The relevant BAAQMD regulations require the implementation of work practices that act to minimize flaring. However, as noted by this comment, the relevant BAAQMD regulations do not prohibit flaring, as flaring is an appropriate action to dispose of vent gas in emergencies. Likewise, the Flare Minimization Plans prepared by Shell Martinez indicate that none of the procedures that are part of those plans would restrict access to the flares when

[19] (385,000 barrels per day (bpd) projected for ConocoPhillips)/(98,500 bpd Shell Martinez) x 1.5 tpy = 5.9 tpy

flaring is viewed as necessary for personnel or equipment safety. Operators of processing units must flare vent gas without hesitation when it is believed to be warranted for safety of equipment and personnel.

Second, such limits would not reflect a reasoned determination of the emission rates that are "achievable," as that term "achievable" is present in the definition of BACT. In this regard, emission limits set as BACT must be achievable on an ongoing basis, year after year, and address normal variation in the proper operation of an emission unit. As such, the BACT emission limits set for the new flares that are part of the CORE Project must reasonably account for the greatest amount of "emergency flaring" that should occur in any year. This is because the purpose of a flare is to safely dispose of vent gases from the associated processing unit in circumstances in which they cannot be recovered and the actual occurrence of emergencies should be highly variable from year-to-year, as flaring will be minimized by a collection of measures, including the Flare Minimization Plan has been prepared and the Root Cause Analyses have been conducted and implemented to eliminate routine flaring and minimize non-routine flaring. Setting limits based on the actual performance of the Shell Martinez refinery in particular years, including the number of emergencies that it experienced during those years, would not include such an allowance. As the actual performance could reflects a series of "good years" by the Shell Martinez refinery or "unique favorable circumstances" at that refinery that are not immediately apparent, its actual performance would certainly not necessarily be transferable to the new processing units that are part of the CORE Project. Accordingly, setting any limit on annual emissions from flaring based on the actual amount of flaring that occurred at another refinery in particular years, in the manner generally proposed by this comment, would improperly act to potentially prohibit flaring in circumstances in which it was necessary and appropriate. In summary, while the Shell Martinez refinery may provide valuable information for the flare minimization planning to be conducted by ConocoPhillips, it does not provide basis to set a limit on flaring.

Incidentally, if a regulatory program restricting the amount of emissions from a group of refineries were to be established, one model for that program would be the SCAQMD program for control of SO_2 emissions under Rule 1118(d). This program sets annual targets for the SO_2 emissions with the consequence of "extra emissions" being a mitigation fee that is payable per ton of SO_2 emissions above the target.[20] This program established a monetary incentive for a refinery to minimize flaring related to SO_2 emissions. However, a refinery is not out of compliance if the target cannot be met in a particular year.

<u>Air Permitting - Flaring</u>

[20] In the SCAQMD's Performance Target program for SO_2 emissions from flaring at petroleum refineries, the targets are expressed in lbs SO_2 per million barrels of annual crude oil processing capacity, with the targets dropping over time. The Mitigation Fees are on a sliding scale depending upon the extent to which the target was exceeded. For example, if the exceedance was by no more than 10 percent of the target, the Mitigation Fee would be $25,000 per ton of SO_2.

58. The proposed project will entail construction of two new flares and increased use of existing flares. These flares are subject to BACT for CO emissions and LAER for VOM emissions. However, the draft permit would not require BACT or LAER for flaring.

Original Response - The existing flares are not subject to BACT or LAER because they are not being physically modified and will not experience a change in the method of operation. This is because they will be in the same service, with the same process stream and function, as at present. Indeed, due to the requirements of the Consent Decree it is appropriate to anticipate that emissions of the existing process flares at the refinery will be declining. The issued permit includes additional requirements as part of BACT and LAER for the new flares in response to public comments.

Revised Response - The existing flares are not subject to BACT or LAER because they are not being physically modified and will not experience a change in the method of operation. This is because they will be in the same service, with the same process streams and functions as at present. Moreover, due to the requirements of the Consent Decree, it is appropriate to anticipate that emissions of the existing process flares at the refinery will be declining.

As already discussed, the issued permit appropriately establishes BACT and LAER for the new flares that are part of the CORE Project, requiring a collection of measures to prevent all routine flaring and minimize all non-routine flaring. The permit issued in July 2007 included additional requirements as part of the BACT and LAER determination for the new flares in response to public comments. These work practices have now been further enhanced as part of the Illinois EPA BACT analysis, particularly the partial remand of the July 2007 permit by the Appeals Board, as well as the recent adoption of the new NSPS for Petroleum Refineries, 40 CFR 60, Subpart Ja, by USEPA.

60. USEPA prohibits routine flaring and requires preventative measures to minimize SO_2 emissions from flaring. A USEPA Enforcement Alert[21] warns that frequent, routine flaring, which may cause excessive, uncontrolled SO_2 emissions, is not considered "Good Pollution Control Practice," and may violate federal regulations adopted pursuant to the Clean Air Act. Unfortunately, none of these requirements are met by the proposed project. The application failed to provide the necessary analysis on available methods, such as having sufficient compressor capacity to rigorously prevent and minimize entire flaring events and thus achieve maximum controls and lowest emissions from flaring. Such methods minimize emissions of all pollutants from flaring, and are used at other refineries.

Original Response - As already explained, the Wood River refinery is subject to requirements to minimize flaring as it contributes to SO_2 emissions. Incidentally,

[21] USEPA Enforcement Alert, Vol. 3, Number 9, October 2000 http://www.epa.gov/compliance/resources/newsletters/civil/enfalert/flaring.pdf

while expressing concerns about excessive flaring, the USEPA confirmed that the proper use of flaring is a good engineering practice, as flaring destroys hazardous and objectionable gases by burning those gases. Flaring also prevents injuries to employees, fires and explosions, and damage to equipment.

Revised Response - The BACT determination in the issued permit is based on an evaluation of available methods to prevent and minimize emissions from flaring. It requires that methods used at other refineries to prevent and minimize emissions from flaring be used for the new flares that are part of the CORE Project. This includes design and operation of the associated processing units for recovery of all vent gas during routine operation of these units.

As the Wood River refinery and the new flares are also subject to specific requirements to minimize flaring as it contributes to SO_2 emissions, those requirements generally act to reduce the occurrence of flaring. Accordingly, those requirements indirectly serve to also reduce the emissions of CO from flaring (as well as emissions of other pollutants besides SO_2). Incidentally, while the USEPA Enforcement Alert cited by this comment expressed concerns about excessive flaring, it also confirmed that the proper use of flaring is a good engineering practice, as flaring destroys hazardous and objectionable gases by burning those gases. Flaring also prevents injuries to employees, fires and explosions, and damage to equipment.

61. The application incorrectly states that there is no way to reduce CO emissions from flaring and at the same time control VOM emissions, assuming that either VOM waste gas must be flared or else directly emitted.[22] However, recovery of waste gas back to a refinery's fuel gas system acts to prevent both VOM and CO emissions from flaring.

Original Response - This statement was made in the context of the Wood River refinery, where measures to reduce hydrocarbon and thus VOM emissions from flaring by minimizing and eliminating such events are in place. Given that such measures are in place, the flaring events that actually do occur must generally be considered unavoidable, as indicated in the application. (Certainly, any further discussion about whether a particular flaring event was avoidable will occur after the event has occurred.)

Revised Response – The statement in the application cited by this comment was not relied upon for the CO BACT determination in the issued permit. The BACT determination recognizes that prevention and minimization of flaring reduce both the emissions of VOM from flaring and the emissions of CO, which would be produced if vent gas were flared instead of being recovered.

[22] "No process changes that would reduce the CO emissions exist. Since the flares serve as VOM control devices in an 8-hour ozone non-attainment area, their operation is necessary. Therefore, no CO control technologies exist for the new flares." Application, page 7-9

It is believed that this statement in the application by ConocoPhillips was made in the particular context of the existing Wood River refinery, where certain measures to reduce flaring as related to emissions of SO_2 and VOM are already in place pursuant to the Consent Decree. "Less flaring" is now occurring at the refinery than occurred before the Decree and certain flaring that previously occurred has been eliminated. However, this is not the same as having the "least flaring" from processing units, as is required for the new flares. Accordingly, the CO BACT determination did consider and does require further measures to reduce flaring from new processing units that are not present for existing process units. For example, the criteria for a significant flaring incident, for which a Root Cause Analysis must be performed, are more stringent than the criteria used to define a significant flaring incident at an existing flare.

62. CO emissions from flaring are related to combustion efficiency, which varies. If the combustion efficiency of a flare were 100%, there would be no CO emissions from the flare. Flare combustion efficiency varies according to the quality of the gases burned, the capacity of the flare, how well the flare mixes the fuels and air, flare exit velocity, wind conditions, etc. Combustion efficiency can vary from low, down to only 60% or less of VOM combusted to very high, over 99% efficiency. Regulators in Texas and California use destruction efficiencies down to 93% when calculating flare emissions when waste gas sent to a flare has a low Btu content instead of the 98% more commonly used in emission calculations. Many studies show that efficiency can be very low, down to even 30%. The ratios of emitted CO, CO_2, VOM, etc., also vary. Choosing USEPA's CO emission factor, which relates to average or typical conditions, for BACT for a flare would be unsound.

Original Response - It is common practice to conservatively calculate VOM emissions from flaring using a minimum level of destruction efficiency so as to overstate VOM emissions. This level of combustion efficiency is 98 percent, which USEPA indicates is the minimum level of destruction efficiency that will generally be achieved when a flare is operated to comply with 40 CFR 60.18, as is required for flares at the Wood River refinery. Similar approaches are taken for emissions of other pollutants from flaring that are affected by destruction or combustion efficiency of the flare. While the destruction efficiency for flaring that does not comply with 40 CFR 60.18 may be lower than 98%, as discussed by this comment, this is not relevant to the flares at the Wood River refinery. In addition, this comment does not identify a method by which the effect of normal variation in destruction efficiency of a flare and its effect on VOM emissions could be readily determined in practice or show that such a method is needed.

Revised Response - It is common practice in permitting to conservatively calculate VOM emissions from flares using the minimum level of destruction efficiency that will be achieved, i.e., 98 % destruction efficiency, rather than a higher value that reflects the average or expected destruction efficiency. This is consistent with common practice in permitting for estimating emissions, which considers the maximum emissions from units based on the minimum level of control efficiency

that is guaranteed or can otherwise be relied upon for a control device. For flares, USEPA indicates that the minimum level of destruction efficiency that will generally be achieved when a flare is operated to meet the relevant work practice standards in 40 CFR 60.18, as is required for both existing and new flares at the Wood River Refinery, is 98 %. A similar approach is also taken for emissions of CO from flaring, which are also affected by destruction or combustion efficiency of a flare. This approach has the general effect of overstating the actual emissions of VOM and CO from flares, as the actual destruction efficiency of flares will consistently be better than the minimum value of 98%.

Research conducted by USEPA does indicate that the heat content of the gas that is being flared is an important factor in the combustion efficiency of a flare.[23] Accordingly, the destruction efficiency of a flare that is not operated to meet the work practices in 40 CFR 60.18 may be lower than 98%, as discussed by this comment. However, this is not relevant to either the new or existing flares at the Wood River refinery, which must comply with the work practices for flares set forth in 40 CFR 60.18. This includes having sufficient heat content in the vent gas that is being flared to ensure efficient combustion of the gas by the flare, i.e., generally either 300 Btu/scf if the flare is not assisted, or 200 Btu/scf if the flare is steam or air-assisted.

The continued validity of this approach to flaring is confirmed by recent USEPA action. In evaluations that were conducted to support the recent adoption of 40 CFR 60, Subpart Ja, the new NSPS for petroleum refineries, USEPA also used its established emission factor for CO from its *Compilation of Air Pollutant Emission Factors*, AP-42, which is associated with achievements of at least 98% destruction of the VOM in the vent gas being flared.

It is also relevant that this comment does not identify a method by which normal variation in the destruction efficiency of a flare and its effect on VOM or CO emissions could be readily determined in practice. The comment also does not show that such a method is needed. For example, the comment does not identify a means by which operation of a flare to ensure 99% destruction efficiency could be distinguished as a practical matter from operation of a flare to provide only 98% efficiency. It also does not identify a means by which the operation of a flare that is complying with 40 CFR 60.18 could, as a practical matter, be adjusted or "better controlled" to increase the combustion or destruction efficiency of the flare. In fact, the approach taken to the destruction efficiency of flaring is the approach commonly taken to control devices for which quantitative emissions monitoring is not performed. That is, the operating parameters of the control device and associated emission unit are required to be operated in a manner that ensures that the demonstrated emission level and control efficiency are achieved.

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[23] **For example, testing of flares burning a gas stream containing less than 200 Btu/scf at other than a minimal flow rate showed combustion efficiencies ranging from 62 to 94 percent. *Flare Efficiency Study*, USEPA, EPA-600/2-83-052, July 1983.**

63. The flare associated with the new hydrogen plant would not be "assisted" with either introduction of air or steam. Steam or air-assisted flares are considered basic to provide good mixing in a flare and maintain combustion efficiency. Non-assisted flares should not be considered to meet BACT requirements.

Original Response - The waste gas from the hydrogen plant that would be flared, which should only occur during upsets or emergencies given the nature of hydrogen plants, is expected to be low-Btu gas, which is primarily CO and CO_2 and has a low VOM content. As the heat content of the waste gas is between 200 and 300 Btu per SCF, use of steam or air assist is not required for effective combustion, as reflected in USEPA's regulations for proper design and operation of flares.

Revised Response – Given the nature of the hydrogen-rich vent gas from the hydrogen plant, which should be readily combustible, steam or air-assist may not be needed on this flare to provide good combustion. However, the final design for the flare for the new Hydrogen Plant, includes steam assist. ConocoPhillips indicates that it decided to include steam assist on this flare to ensure "smokeless operation," as required by the NSPS, 40 CFR 60.18(c)(1).

64. There are many proven approaches for reducing the number of flaring episodes and the quantity of waste gas flared and thus reducing all flaring emissions. They include: 1) Having sufficient compressor capacity, including redundant compressor capacity to recycle waste gases to the refinery fuel gas system (especially important when the refinery is being expanded so that more waste gases may be produced); 2) Managing depressurization during unit shutdowns so that the gas recovery system is not overwhelmed; 3) Constructing stronger process vessels to increase working pressures to enable containment of process gases during shutdown rather than flaring; 4) Implementation of detailed procedures to diagnose and eliminate unnecessary flaring, and 5) Fixing equipment that repeatedly malfunctions and causes unnecessary "emergency" flaring. A plan for minimizing flaring and root cause analysis for flaring activity that does occur are keys to preventing unnecessary flaring. These approaches are used at existing refineries and have been shown to lower the number and magnitude of flaring events. An analysis of such approaches was not provided for the proposed project and the draft permit would only superficially address these approaches to reducing flaring and flaring emissions.

Original Response - As generally observed by this comment, there are many ways to reduce emissions from flaring. For the new process flare systems at the refinery, the various approaches to minimization of flaring and flaring emissions discussed in this comment are required as appropriate for the particular process units that are served by the flare system. This has been clarified in the conditions of the issued permit for flaring. The one exception is constructing stronger process vessels. This has not been identified as a reasonable or recommended approach to reducing flaring emissions. It would pose operational concerns as it would implicitly entail operation of process vessels at higher pressures. In addition, careful management of depressurization of vessels during unit shutdowns appears to be very effective in

minimizing and eliminating shutdowns as a contributor to flaring.

Revised Response - As generally observed by this comment, there are many ways to reduce emissions from flaring. For the new process flare systems at the refinery, the various approaches to minimization of flaring and flaring emissions discussed in this comment are generally required for the particular processing unit that are served by a flare system, with only one exception, construction of stronger process vessels. In particular, the issued permit requires the new processing units to be designed and operated for recovery of all vent gas during normal operation of the units. This includes use of an appropriately designed Flare Gas Recovery System for the Delayed Coker Unit where such a system is needed to recover vent gas. The issued permit also requires practices to prevent flaring, with the development and implementation of Flare Minimization Plans. One aspect of these Plans is the development of operating procedures for processing units that prevent flaring during the planned shutdown of units and procedures to prevent or minimize flaring during unplanned shutdowns. The issued permit also requires that the causes of emergency flaring that does occur be investigated. For significant flaring incidents, detailed Root Cause Analyses must be conducted to identify the Root Cause and contributing causes to the incident and to then evaluate and implement corrective actions to prevent or reduce the likelihood of similar incidents in the future. These are the measures that are in use elsewhere to control flaring, including the Bay Area and South Coast Air Quality Maintenance Districts. They are demonstrated approaches to prevent and minimize emissions from flaring and all of these approaches must be used for the new processing units that are part of the CORE project.

The construction of stronger process vessels has not generally been identified as a reasonable or recommended approach to reducing flaring emissions. Process vessels are designed for the intended maximum working pressures with an appropriate factor of safety, consistent with standard engineering design codes and practice. Likewise, the various components of the processing unit associated with the process vessel, including piping, valves, pumps, compressors, seals, ports and instrumentation systems, are also designed to operate safely at the design working pressures, consistent with experience accumulated over the years by the petroleum refining industry on the reliability and safe operation of these components. Design of process vessels for significantly higher operating pressures, as would be needed to reduce the occurrence of flaring, would pose unacceptable concerns for operational safety of equipment and personnel. This is because it would implicitly entail operation of process vessels <u>and their associated components</u> at higher pressures outside the regime in which safe operation of the processing unit "system" can be reasonably assured. In actual practice, the processing unit would be designed for failure, as the unit would at times be subjected to operating pressures at which the weakest component in the overall system would malfunction or fail. Moreover, proper operation of processing units, including careful management of the depressurization of vessels during unit shutdowns, appears to be very effective in minimizing and eliminating flaring. Accordingly, the Illinois EPA has not required

the use of stronger process vessels as an approach to controlling flaring.

65. The SCAQMD and the BAAQMD have both identified adequate compressor capacity for recovery of waste gas as being effective in minimizing flaring events and their associated emissions. This approach was not evaluated for the proposed project for BACT and LAER.

Original Response - The new flare system for the new Delayed Coker Unit will include redundant waste gas compressors, as currently used at the Shell, Martinez refinery. A condition has been included in the issued permit requiring this as an element of BACT and LAER for this new flare system. The flare for the new hydrogen plant does not handle a waste gas that is suitable for recovery for use in the refinery fuel gas system.

Revised Response – Adequate compressor capacity is one component of the BACT and LAER determination in the issued permit for the new Delayed Coker Unit. The presence of adequate compressor capacity, i.e., an appropriately designed Flare Gas Recovery System, is important for effective recovery of the process gas vented from the Delayed Coker Unit because of the nature of the vent gas from this Unit.[24] As discussed, the issued permit requires that the new Delayed Coker Unit be equipped and operated with a Flare Gas Recovery System that includes fully redundant vent gas compressors.[25] This system should be very effective in controlling the normal emissions of Delayed Coker Units, as shown by the experience with a similar system at the Shell refinery in Martinez, California.[26] Accordingly, the issued permit specifically requires that the new Delayed Coker Unit have a Flare Gas Recovery System with redundant compressor capacity. Further redundancy in the capacity of the compressor system, i.e., threefold capacity, would not meaningfully improve the performance of the Flare Gas Recovery System. This is because this system must be operated to divert or direct vent gas to the Fuel Gas Treatment System at the rate at which vent gas is produced by the Delayed Coker Unit. This can and must be able to be accomplished with a single compressor. The principal purpose of the second compressor is to cover the periods when one compressor is out of service for maintenance. At other times, when two compressors are "operating," one of the compressors will be operating on "idle" so as to be available if needed due to an

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[24.] **The vent gas from the Delayed Coker Unit contains significant concentrations of sulfur compounds. The vent gas must first be treated in a Fuel Gas Treatment System to remove sulfur compounds before it can be used as fuel at the refinery. A compressor is needed to divert or direct the vent gas from this Unit to the Fuel Gas Treatment System, supplying the suction to draw the vent gas away from the Unit and the pressure to duct the vent gas to the associated Fuel Gas Treatment System.**

[25] **The flare gas recovery system must have two compressors, each one sized to handle the normal flow of vent gas from this unit, so as to provide full redundant capacity. This design enables continuing recovery of the vent gas from this unit when one compressor is out of service, as must occur periodically for routine maintenance of a compressor, which is typically a scheduled activity.**

[26] **For its Martinez, California refinery, Shell Oil reported that the efficiency of the flare gas recovery system for the Delayed Coking Area (which has redundant compressors as is being required for the new delayed Coker Unit being constructed as part of the CORE Project) exceeded 99.90 percent for the non-emergency flaring, which is controlled by this system. [Shell Martinez Refinery, "Flare Minimization Plan." revised March 25, 2007, redacted version].**

unplanned outage of the "working" compressor. These circumstances are different from those at existing Flare Gas Recovery Systems that serve multiple processing units, have several "small" compressors, and were developed in phases, over time. When one of the compressors in such a system is out of service, the system may not have adequate capacity to handle the maximum flow of vent gas during normal operation of all the processing units now being served by the system.

While the SCAQMD and BAAQMD have broadly identified adequate flare gas recovery capacity as important for recovery of vent gas from petroleum refineries, those observations are not applicable to the proposed new Hydrogen Plant, given its specific design and operation. This is because a separate Flare Gas Recovery System, with adequate compressor capacity, is not needed for effective recovery of the vent gas normally generated by this Hydrogen Plant.[27] Accordingly, adequate compressor capacity is not a factor in the recovery and use of vent gas from this plant. As related to routine flaring of vent gas, the BACT and LAER determination for the new Hydrogen Plant can and does prohibit routine flaring of vent gas from this plant. However, it does not need to also set design and capacity requirements for a separate system that would be needed to comply with this prohibition, as was done for the new Delayed Coker Unit.

66. Without rigorous monitoring, adequate compressor capacity, process control, and appropriate permit conditions, significant flaring can be expected at the Wood River refinery with the proposed project.

Original Response - The extent of future flaring at the Wood River refinery is minimized by operational and economic incentives to maintain stable process operation with consistent product yields and to recover waste gas that is produced for use as fuel. ConocoPhillips also has a stated objective of minimizing its CO_2 emissions. Accordingly, it is unclear to what extent, if any, the permit must mandate particular action by ConocoPhillips to prevent significant flaring at the refinery in the future. Nevertheless, the issued permit mandates that ConocoPhillips take particular actions to minimize flaring, consistent with the actions that have been taken at and required of other refineries.

Revised Response – In addition to the legal requirements to reduce flaring under the Consent Decree, permit and applicable regulations, the extent of future flaring at the Wood River refinery will also be minimized by operational and economic

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[27] **The vent gas routinely generated by the Hydrogen Plant, i.e., the byproduct gas stream from the Pressure Swing (PS) Absorbers can normally be directly used as the fuel for the reformer furnace without first having to undergo de-sulfurization and without need for gas recovery compressors. This is because the sulfur content of the vent gas from the PS absorbers will be very low, as the catalyst used in the plant to produce hydrogen is poisoned by sulfur. Thus, a gas recovery compressor is not needed to redirect the vent gas through a fuel gas treatment to remove sulfur before it can be used as fuel. In addition, the operating pressure of the PS Absorbers is such that this vent gas can be sent directly to the nearby reformer furnace without the need for a compressor or compressors, each of which must be periodically taken out of service for preventative maintenance.**

incentives related to flaring. It is in ConocoPhillips' self-interest to maintain stable process operation with consistent product yields and to recover vent gas that is produced for use as fuel. ConocoPhillips also has a stated corporate objective of minimizing its CO_2 emissions. Accordingly, it is unclear to what extent, if any, particular actions by ConocoPhillips must be mandated to prevent and reduce <u>significant</u> flaring at this refinery in the future.

However, the purpose of the issued permit, with its determination of BACT and LAER for the new flares goes beyond merely preventing significant flaring. The purpose of BACT and LAER is to reduce the occurrence of flaring and flaring emissions to the lowest level that is achievable using available control techniques, including the techniques that have been effectively used at other refineries, to prevent and reduce flaring. This has resulted in a rigorous collection of control measures for the new flares that would be constructed as part of the CORE Project.

68. At the refineries in the Bay Area, flaring, including emergency flaring, was also further reduced after adoption of rules for flaring by the BAQMD, showing the feasibility of controlling flaring through prevention mechanisms. The principles and equipment used by refineries in the Bay Area must be applied with specificity to the proposed project.

Original Response - For the flare for the Delayed Coking Unit, for which BACT and LAER are required, the issued permit requires that ConocoPhillips implement the measures similar to that specified by the BAAQMD to reduce flaring. These are preparation of and operation pursuant to a Flare Minimization Plan and performance of "root cause analyses" for significant flaring incidents. In this regard, the BAAQMD's flaring rules put into place certain administrative requirements whose purpose is to lead to reduction in flaring and flaring emissions. The rules do not identify or prescribe specific measures that refineries must use to reduce flaring. Thus, while the Delayed Coking Unit will have a gas recovery system with redundant compressor capacity as already discussed, this is not a measure that is mandated by the BAAQMD rules.

The BAAQMD's rules for flaring at petroleum refineries do not address flaring at wastewater treatment plants. At wastewater treatment plants, flares serve as control devices for the emissions from certain units and do not handle waste gas streams as are potential present with the operation and upset of process units at a refinery.

Revised Response - For the new flares, the issued permit requires that ConocoPhillips implement the prevention measures specified by the BAAQMD to reduce flaring, which have been shown to be effective for existing processing units in the Greater San Francisco area, in which the BAAQMD is the air pollution control authority. These prevention measures include preparation of and operation pursuant to a Flare Minimization Plan and performance of Root Cause Analyses for significant flaring incidents. In this regard, the BAAQMD's flaring rules, like the Consent Decree, put into place certain procedural requirements whose purpose is to

lead to the reduction of flaring and flaring emissions. However, BAAQMD Rule 12-12 does not identify or prescribe specific types of equipments, devices or operational procedures that refineries must use to present and reduce flaring.

In addition, the issued permit goes beyond the BAAQMD rules as it sets an explicit restriction on the flaring by the new flares, as it requires that vent gas generated during routine operation of the associated processing units be recovered for use as fuel, rather than being flared. For the Delayed Coking Unit, for which certain equipment beyond the basis design of the processing unit will be needed to meet this requirement, i.e., the use of a Flare Gas Recovery System with redundant compressor capacity, this issued permit also requires such equipment. This is consistent with experience with refineries elsewhere that shows that the compressor capacity of Flare Gas Recovery Systems is an important factor when such systems are needed to recover vent gas from processing units.

69. A detailed evaluation[28] of the refineries in the Bay Area, which reviewed data reported by the refineries and their Flare Minimization Plans, found that the dirtiest refinery processes caused more flaring, with more emissions, than other refinery processes. This is directly applicable to the Wood River refinery, which is expanding its dirtiest refining processes.

Original Response - This evaluation found that certain refining processes had the <u>potential</u> to generate more emissions from flaring. Accordingly, it recommended that these particular processes be subject to especially thorough review with appropriate actions implemented to minimize flaring associated with these processes.

Revised Response - The evaluation cited in this comment found that certain refining processes had the <u>potential</u> to generate more emissions from flaring. Accordingly, it recommended that those particular processes be subject to especially thorough review with appropriate actions implemented to minimize flaring associated with those processes. The Illinois EPA has conducted a thorough and detailed review of measures that are available to prevent and minimize flaring associated with both the new Delayed Coking Unit, which some consider to involve a dirty refining process, and the new Hydrogen Plant. As already discussed, the resulting BACT and LAER determination contains a stringent collection of control measures to prevent and minimize emissions from flaring at both the new Delayed Coking Unit and the new Hydrogen Plant.

70. The application failed to evaluate LAER achieved in practice by refineries that rigorously implement approaches to minimize flaring. Shell has documented its approaches for minimizing flaring and achieving very low flaring emissions at its refinery in Martinez, California, in the Flare Minimization Plan for this refinery[29] required by BAAQMD rules.

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[28] "Flaring Prevention Measures," Communities for a Better Environment (CBE), Greg Karras, April 2007

[29] Shell's Flare Minimization Plan for the Martinez refinery indicates that "As the refinery already has very significant capital infrastructure for flare gas recovery in place, procedural modifications can be used to achieve

BACT and LAER for flaring at the Wood River refinery should be at least as stringent as the equipment and practices in place at the Shell Martinez refinery. Even before adoption of the BAAQMD rules, the Shell Martinez refinery did not have large flaring events compared to the large and routine flaring events, with substantial emissions, at other refineries in the Bay Area. The Shell Martinez refinery has continued to exhibit very low flaring emissions compared to other Bay Area refineries. The Flare Minimization Plan for the Shell Martinez refinery should be evaluated and the approaches applied to Wood River refinery in detail to satisfy BACT and LAER requirements.

Original Response - In response to this comment, the Flare Minimization Plan prepared by Shell Martinez has been closely reviewed. The issued permit requires a Flare Minimization Plans for the new coker flare being constructed as part of this project (coker flare) that address the various approaches that have been taken by Shell Martinez to reducing flaring, as presented in the Flare Minimization Plan for that refinery.

Revised Response - In response to this comment, the Flare Minimization Plan prepared by Shell for its Martinez refinery was closely reviewed. The BACT and LAER determination in the issued permit requires that ConocoPhillips develop and implement Flare Minimization Plans for the new Delayed Coking Unit and the new Hydrogen Plant that, in addition to other requirements, address the various approaches to minimizing flaring that have been found to be effective in minimizing flaring at the Shell Martinez refinery. In particular, as described in the Flare Minimization Plans prepared for that refinery, in addition to specific planning and evaluations to prevent and minimize flaring, flaring minimization must also be a consideration in the procedures for normal operation of processing units, the procedures for operation and maintenance of the fuel gas systems (so as to facilitate use of recovered vent gas), the procedures for preventative maintenance of units, the planning for major maintenance and turnarounds, and the coordination of the activities and efforts of the various individuals who are responsible for the day-to-day operation and maintenance of different units at a refinery.

71. Shell, Martinez, has two waste gas recovery compressors for dedicated use in its Delayed Coking Area, with each compressor having enough capacity to handle gases from this area when one of the compressors is out of service. ConocoPhillips should do the same.

Original Response - As previously discussed, the flare system for the new Delayed Coker Unit will include redundant waste gas compressors, like the system at the Shell Martinez refinery. In this regard, Shell Martinez, with its Delayed Coker Unit that was installed in the mid-1990's, also provides anecdotal evidence that operation

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much higher returns on a $/ton emissions reduction basis. New refinery procedures described in this Flare Minimization Plan address actions to further minimize flaring during process upsets and additional planning requirements for maintenance and turnaround activities. Careful planning of any activity with the potential for flaring is the most successful minimization approach that has been employed at SMR. Procedures for reporting and investigating all flaring provide means to learn from unanticipated events. The result of this work will be further reductions in flaring." Excerpt from the Shell Martinez Refinery, Flare Minimization Plan, Redacted Version, Revised March 25 2007, submitted to the Bay Area Air Quality Management District.

of a modern Delayed Coker Unit does not significantly contribute to flaring emissions, given Shell Martinez's excellent record on minimizing flaring emissions as cited in this comment.

Revised Response - As previously discussed, the Flare Gas Recovery System for the new Delayed Coker Unit must have redundant waste gas compressors, like the system at the Shell Martinez refinery. In this regard, Shell Martinez, with its Delayed Coker Unit that was installed in the mid-1990's, also provides anecdotal evidence that operation of a modern Delayed Coker Unit does not significantly contribute to flaring emissions, given Shell Martinez's excellent record on minimizing flaring emissions as cited in this comment.

72. The Shell Martinez Refinery Flare Minimization Plan emphasized the importance of thorough root cause analysis of flaring incidents to avoid similar events in the future and reduce emissions from flaring emissions. This measure is needed for the proposed project due both to the large increase in refinery capacity and the refinery's history of flaring.

Original Response - The issued permit requires that root-cause analyses be performed for the new flare for the Delayed Coking Unit for any significant flaring incident for hydrocarbons.

Revised Response – The issued permit requires that Root Cause Analyses be performed for the new flares for the new Delayed Coking Unit and the new Hydrogen Plant for any significant "hydrocarbons flaring incidents," as generally suggested by this comment.[30, 31] The criteria for a Hydrocarbon Flaring Incident set by the permit are a flaring event with VOM emissions of 50 pounds or more in a 24-hour period or flaring of 100,000 scf or more of vent gas in a 24-hour period. These criteria are derived from the criteria in Rule 12-12-405 of the Bay Area Air Quality Management District (BAAQMD) and Rule 1118 of the South Coast Air Quality Maintenance District (SCAQMD). The criteria from those rules have been tightened significantly. This has been done to set more stringent criteria, as should apply to new flares for a new processing units, rather than flares serving existing processing units or multi-unit flares generally serving an existing refinery, as

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[30] **Requirements for Root Cause Analysis for the new flares related to the SO_2 emissions from a flaring incident are established by the new NSPS for Petroleum Refineries, 40 CFR 60 Subpart Ja (40 CFR 60.103a(b)). Under the NSPS, the criterion for a flaring incident in terms of SO_2 emissions, which triggers the need to perform a Root Cause Analysis pursuant to the NSPS, is an incident that involves SO_2 emissions of 500 pounds or more per day.**

[31.] **The term "hydrocarbon flaring incident" is used in the permit to maintain consistency with the terminology used by the Consent Decree. In the Consent Decree, the term "Hydrocarbon Flaring Incident" is used to generally address the flaring of vent gas from a processing unit at a refinery and is not a characterization of the composition of the vent gas stream. The Consent Decree also addresses "Acid Gas Flaring" and "Tail Gas Flaring." Acid gas flaring is the flaring of a hydrogen sulfide-rich stream from regeneration of the amine solution in a fuel gas treatment system, which stream should be ducted to a Sulfur Recovery Plant, rather than flared. "Tail Gas Flaring" involves the flaring of the exhaust stream from a Sulfur Recovery Plant, which should only be combusted if the equivalent SO_2 concentration in the exhaust is less than 250 ppm.**

addressed by the BAAQMD and SCAQMD rules,[32] while still having criteria that address flaring incidents whose magnitude warrants Root Cause Analyses.

73. Operational monitoring for waste gas that is flared is important to provide accurate data for emissions from flaring and to provide a factual basis for evaluation of the number and nature of flaring events and their associated emissions and to perform root cause analyses for flaring. Monitoring devices are available to track the flow of gases to a flare. Monitoring for the concentration of VOM and sulfur compounds in waste gases, in combination with records for pilot and purge gas flow, is needed to provide good information on the waste gas burned by a flare and the accompanying emissions.

Original Response - The issued permit requires continuous monitoring to identify when waste gases are flared. This requirement is accompanied by requirements for monitoring or instrumentation to reasonably determine the amount of gas that is flared, requirements for sampling and analysis of waste gas or maintenance of records for the composition of the gas, and requirements for monitoring or records related to fuel usage for the pilot and venting of purge gas to the flare.

Revised Response - The issued permit requires that ConocoPhillips conduct monitoring for the new flares, as generally suggested by this comment, so that the substantive control measures for these flares can be readily implemented. For each new flare, continuous monitoring is required for the flow rate of vent gas that is flared. Such monitoring is now required by the new NSPS, 40 CFR 60.107a(e). The issued permit includes additional requirements for these monitoring systems beyond those found in the NSPS, including specific performance specifications for these systems and a requirement for annual verification of accuracy, as required by the BAAQMD's rules for flares at petroleum refineries. Separate monitoring systems are also required for the flow of pilot and purge gas to each flare. This will provide authoritative data for the amount of vent gas that is flared and generally support the determination of emissions.

Continuous monitoring is required for the sulfur content, as reduced sulfur compounds, of vent gas that is flared. Such monitoring is now required by the new NSPS, 40 CFR 60.107a(e), which includes detailed requirements for such monitoring systems. Accordingly, the permit relies on the provisions of the NSPS for such systems. This monitoring will provide authoritative data for determining the SO_2 emissions of the new flares.

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[32] **BAAQMD Rule 12-12-405 requires a "Determination and Reporting of Cause" or Root Cause Analysis if the volume of vent gas flared exceeds 500,000 standard cubic feet per calendar day. SCAQMD Rule 1118(c)(1)(D) requires that a "specific cause analysis" or Root Cause Analysis be conducted "…for any flare event, excluding planned shutdown, planned startup and turnarounds, with emissions exceeding either: (i) 100 pounds of VOC; (ii) 500 pounds of sulfur dioxide; (iii) 500,000 standard cubic feet of vent gas combusted." To address the flares for the new processing units that are part of the CORE Project, the VOM criterion was set at half the SCAQMD criterion. The flow criterion was set at one fifth of the SCAQMD criterion. A criterion for SO_2 was not set as it is not relevant for the emissions of CO and VOM from flaring, as are addressed by the BACT and LAER determination.**

The issued permit addresses the VOM content of the vent gas that is flared with requirements for regular sampling of the vent gas when flaring occurs, followed by appropriate analysis of the collected samples. Provisions are also included that accommodate use of continuous monitoring systems as an alternative to sampling and analysis of flared vent gas. This approach is consistent with the approach taken by the BAAQMD in its Rule 12-11-502. This flexibility is appropriate given the technical challenge of monitoring for VOM. Unlike SO_2 or CO, VOM is a mixture of different compounds so that it is difficult to obtain an accurate measurement for the collection of materials in a gas stream that is VOM. This challenge is not present with the laboratory analysis of a collected sample, for which standard analytical equipment is available to measure the concentration of individual VOM compounds present in a sample.

74. The draft permit would only superficially address monitoring for flaring. Despite readily available monitoring devices and a Consent Decree that addresses excessive flaring at the Wood River refinery in the past, it is surprising that the draft permit does not contain requirements for monitoring of flow or composition of waste gas going to the flare. BACT and LAER for flaring necessitate operational monitoring in order to minimize emissions. As monitoring of flaring has been successfully implemented pursuant to applicable regulations at many California refineries, this work provides a ready-made solution for deficiencies in the application for the proposed project, with proven methods that can be included directly into the permit.

In particular, rigorous operational monitoring should be required for flaring as specified by the rules of the SCAQMD and BAAQMD. The Flare Monitoring Rule, Regulation 12-11,[33] which was adopted by the BAAQMD in 2003, shows that issues related to operational monitoring for flaring have been worked out, including verification of gas flow and analysis for hydrocarbons and sulfur content of waste gas. This rule was adopted following input with manufacturers of monitors, refineries and the public. Each requirement of this rule should be incorporated into the permit for the proposed project. These measures are needed for the proposed project due both to the large increase in refinery capacity and the refinery's history of flaring. The Texas Commission on Environmental Quality also found that accurate emissions data must first be collected in order to then be able to identify and develop options for controlling refinery flaring, which emphasizes the importance of operational monitoring as part of flare emission control.[34] The Shell Martinez Refinery Flare Minimization Plan also emphasized the importance of monitoring.

Original Response - The issued permit includes an appropriate level of specificity for operational monitoring for flaring. As the fundamental objective for flaring is to minimize and eliminate flaring, it is not appropriate for the permit to include the detailed requirements for operational monitoring present in the BAAQMD's Flare Monitoring Rule. Given the very low level of flaring that should occur in the future

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[33] BAAQMD Regulation 12 Rule 11, http://www.baaqmd.gov/dst/regulations/rg1211.pdf

[34] TCEQ Master Control Strategy List, Point Sources, page 5, September 7, 2005 http://www.nctcog.org/trans/air/sip/future/lists/TCEQ-oint%20Source%20List.pdf

at the Wood River refinery, a simpler approach to operational monitoring at the refinery should be established, as compared to the circumstances of the refineries in California that led to the BAAQMD and SCAQMD adopting their Flare Monitoring rules several years ago. Accordingly, the issued permit sets the purposes that must be fulfilled for the operational monitoring for flaring, i.e., collection of data to identify when waste gases are flared and in what quantity. The permit does not prescribe what monitoring techniques must be used and how monitoring must be conducted.

Revised Response – The issued permit requires the necessary monitoring be conducted for the new flares to implement the control measures that are required for flaring by the permit and to determine emissions from flaring. As previously discussed, the issued permit requires that ConocoPhillips conduct rigorous operational monitoring for the new flares that is similar to operational monitoring that is required for flares at petroleum refineries by BAAQMD Rules 12-11-501 and 12-11-502 and SCAQMD Rule 1118(g). This includes use of collected data for the composition of flared vent gas to determine event-specific data for the higher heating value of the flared vent gas, as is addressed by the SCAQMD rules but not the BAAQMD rules.

The issued permit also includes other monitoring requirements to ensure that the new flare are operated in accordance with good air pollution practice, as is generally required by the NSPS for new or modified emission units that are subject to NSPS standards. For example, the issued permit requires operation of a video monitoring for each new flare. These requirements reflect similar requirements in SCAQMD Rule 1118(g)(7) and (h)(1) for such systems. Video monitoring will enable verification that flaring that does occur, occurs without excessive visible emissions or "smoking," which is limited by 40 CFR 60.18(c) to no more than 5 minutes in any consecutive two hour period.

For existing flares at the Wood River Refinery, the governing requirements for operational monitoring are generally established by the Consent Decree. Those requirements are less stringent than the requirements that are being set for the new flares that are part of the CORE Project. However, they reflect a specific determination of the operational monitoring that should accompany the associated substantive control requirements in the Consent Decree to prevent and reduce flaring by existing flares. Accordingly, they have not been revisited because existing flares are not being modified so that there is not are regulatory grounds also revisit the substantive control requirements of the Consent Decree for existing flares.

75. In 2006, the BAAQMD adopted additional requirements for reporting of flaring at refineries in its rules for Flares At Petroleum Refineries, Regulation 12-12. The provisions of this rule should also be included in the conditions of the permit for the

project.[35]

Original Response - The issued permit includes appropriate provisions for reporting related to flaring. Given the nature of the Illinois EPA's procedures for review of reports from sources, detailed reporting related to flaring associated with this project will be more efficiently and effectively handled if it occurs in conjunction with routine quarterly reporting, rather than as stand-alone reports for significant flaring events. Provisions for prompt reporting upon occurrence of certain flaring events are appropriately set in the Clean Air Act Permit Program (CAAPP) permit for the refinery.

Revised Response - The issued permit includes appropriate provisions for reporting related to the new flares associated with the CORE project. In particular, periodic compliance reports are required for each flare, with such reports to be submitted on the same schedule as other periodic reports generally required for emission units at the refinery, which is currently semi-annually. Given the nature of the Illinois EPA's procedures for review of reports from sources, routine reporting related to flaring by these flares will be more efficiently and effectively handled by the Illinois EPA if it occurs in conjunction with routine periodic reporting, rather than monthly reports that each address a relatively short period of time, as required by BAQMD Rule 12-11-401.

Comprehensive reports are required for each new flare on an annual basis to facilitate detailed evaluation of the overall performance of ConocoPhillips in the prevention and minimization of emissions. The permit also requires that ConocoPhillips review the Flare Minimization Plans for new flares on an annual basis, with appropriate revisions made as necessary to keep the plan current. This approach is believed to be more effective than an annual review of the plan by a refinery source, with submittal of a revised Flare Minimization Plan for review only if the plan is revised, as provided by BAAQMD Rule 12-12-404. A distinction should be made between the flare minimization plan, which is a means by which flaring is prevented and minimized, and the regular assessment of the actual effectiveness of the plan, which is addressed with annual performance reports. The issued permit addresses these two activities separately, which enables the permit to more effectively address the different aspects and required elements of these documents.

For the new flares, a report for each Root Cause Analysis must be submitted when

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[35] Reportable Flaring Event: Any flaring where more than 500,000 standard cubic feet per calendar day of vent gas is flared or where sulfur dioxide (SO_2) emissions are greater than 500 pounds per day. For flares that are operated as a backup, staged or cascade system, the volume is determined on a cumulative basis; the total volume equals the total of vent gas flared at each flare in the system. For flaring lasting more than one calendar day, each day of flaring constitutes a separate flaring event unless the owner or operator demonstrates to the satisfaction of the APCO that the cause of flaring is the same for two or more consecutive days. A reportable flaring event ends when it can be demonstrated by monitoring required in Section 12-12-501 that the integrity of the water seal has been maintained sufficiently to prevent vent gas to the flare tip. For flares without water seals or water seal monitors as required by Section 12-12-501, a reportable flaring event ends when the rate of flow of vent gas falls below 0.5 feet per second. http://www.baaqmd.gov/dst/regulations/rg1212.pdf

the analysis is completed, with interim reports must be submitted if the analysis takes longer than 45 days to complete. This accommodates careful and thorough evaluation of corrective actions if needed for a significant flaring incident. This is a more thoughtful approach to such reports than BAAQMD Rule 12-12-406, which simply provides that reports for reportable flaring incidents must be submitted within 60 days. In addition, there is not a significant benefit to immediate notification for significant flaring events after such event are completed, as required by BAAQMD Rule 12-12-405.[36] Since vent gas generated during a flaring incident is combusted by a flare, such incidents do not constitute malfunctions or breakdowns of the type that involve "inadequate control of emissions," for which immediate reporting is warranted. Information for any significant flaring incidents is appropriately submitted in the context of the reports for Root Cause Analyses, when detailed evaluation about particular incidents has been assembled and is available for review by the Illinois EPA and other interested parties.

For existing flares at the Wood River refinery, the governing requirements for reporting are established by the Consent Decree. Those requirements, which are less stringent than the requirements for the new flares, have not been revisited. They reflect a specific determination for reporting that should accompany the associated substantive control requirements in the Consent Decree for existing flares, which will not be modified.

76. The monitoring conditions in the draft permit for flaring, which only reiterate federal requirements for monitoring of flares and which were in place in the past when ConocoPhillips had excessive flaring, are vaguely stated.

Original Response - The monitoring requirements of the applicable federal rules for flaring are appropriately incorporated by the permit by reference to those rules. These requirements address proper operation of a flare for effective destruction of organic constituents in waste gas and effective combustion as related to generation of CO.

Revised Response - The monitoring requirements of the applicable federal rules for flaring were appropriately addressed by the draft permit and are appropriately addressed by the issued permit. The federal requirements for monitoring are identified, accompanied by a reference to relevant provision(s) of the Code of Federal Regulations (CFR). It is not necessary or appropriate for the permit to repeat verbatim the relevant provisions of the CFR. First, the provisions for monitoring in federal regulations are often highly technical, extensive and complex so that it is more efficient appropriate to directly rely on the regulatory provisions. Second, it keeps the permit current and accurate, as the technical updates to monitoring provisions that are occasionally made by USEPA are immediately applicable or available. Lastly, it

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[36] **BAAQMD Rule 12-12-405 requires a refinery source to submit a notification for a flaring incident (i.e., flaring of more than 500,000 standard cubic feet per calendar day) as soon as possible, consistent with safe operation of the refinery, which notification must include the start date and time and the <u>end date and time</u> of the incident.**

prevents unintentional transcription errors between the CFR and the test of the permit, which can result in consistencies or conflicts between the provisions of the permit and regulatory provisions.

78. The permit should require ConocoPhillips to develop and implement a flare minimization plan to capture waste gas for use as fuel, rather than flaring it, so that flaring emissions are reduced.

Original Response - Waste gas is routinely captured for use as fuel rather than being flared. For existing process units, requirements for minimization of flaring are established by the Consent Decree. The Decree requires ConocoPhillips to develop a plan that includes steps to correct the conditions that cause or contribute to excessive Acid Gas Flaring and Hydrocarbon Flaring.

As part of this project, ConocoPhillips will be installing redundant waste gas recovery compressors for the new Delayed Coker Unit, each of which is designed for 100 percent of routine gases from the unit. The issued construction permit also requires ConocoPhillips to develop and implement a Flare Minimization Plan for the new Coker Unit and the new Hydrogen Plant.

Revised Response - Waste gas is routinely captured for use as fuel rather than being flared. For existing process units at the refinery, which are not being modified, requirements for minimization of flaring are established by the Consent Decree. The Decree requires ConocoPhillips to develop and implement a plan that includes steps to correct the conditions that cause or contribute to excessive flaring.

For the new flares being installed as part of the CORE Project, (i.e., the new flares for the new Delayed Coker Unit and the new Hydrogen Plant) the issued permit requires ConocoPhillips to develop and implement Flare Minimization Plans, as recommended by this comment. This procedural requirement and associated requirements for performance of Root Cause Analyses complement other elements of the BACT determination for the new flares, notably the "equipment-based" requirement that these new processing units be designed and operated that all vent gas generated during routine operation of the units is recovered.

79. What monitoring devices with what detection limits are currently installed to measure flow and composition of waste gases for each existing flare at the refinery? What specific monitoring devices will be installed for the new flares?

Original Response - The existing flares must be operated to comply with the requirements of the New Source Performance Standards (NSPS) and/or National Emission Standards for Hazardous Air Pollutants (NESHAP) for flares. The NSPS and NESHAP require monitoring for a pilot flame be present in a flare at all times that waste gas may be sent to the flare, which ensures that any waste gases that are sent to the flare will be ignited and combusted. They do not require other monitoring. Under the Consent Decree, ConocoPhillips must be able to reasonably

determine flow and H_2S content of waste gas.

The issued permit requires that monitoring and recordkeeping be implemented for new flares to be able to determine flow and composition of waste gas. Use of specific monitoring devices is not required and can be addressed in the processing of a revised Title 5 permit (Clean Air Act Permit Program Permit) to address the proposed project.

Revised Response - The existing flares must be operated to comply with the requirements of the New Source Performance Standards (NSPS) and/or National Emission Standards for Hazardous Air Pollutants (NESHAP) for flares. The NSPS and NESHAP require monitoring for the pilot flame that must be present at a flare at all times when vent gas may be sent to the flare, which ensures that any vent gas that is sent to the flare will be ignited and combusted. These rules do not require other monitoring. Under the Consent Decree, ConocoPhillips must be able to reasonably determine flow rate and H_2S content of vent gas sent to existing flares.

The issued permit requires that monitoring be conducted for the new flares for the flow rate and sulfur content of vent gas that is being flared. These devices must be designed and operated to meet the relevant specifications in the NSPS and, in the case of the flow monitor, certain additional specifications set forth in Condition 4.7.8-1(c). The specific monitoring devices have not yet been selected by ConocoPhillips. ConocoPhillips must provide detailed information about the monitoring systems that have been selected, including the type, make and model of each monitoring device, in the Monitoring Procedures that must be prepared for each flare pursuant to Condition 4.7.8-1(h). A copy of these Procedures must be submitted to the Illinois EPA for review prior to startup of a new flare.

84. How much compressor capacity for recovering waste gases is being installed for each of the new flares for the project? What calculations were performed to ensure the compressor capacity will be sufficient to eliminate all routine flaring?

Original Response - Redundant compressors are being installed on the new coker flare. Each compressor is designed to route 100 percent of the projected flow of waste gas from the coke unit to the fuel gas recovery system.[37] The adequacy of the recovery system in practice will be addressed by the required Flaring Minimization Plan. Other flares which would handle gases from the existing flare gas recovery system are not affected by this project.

Revised Response – The Flare Gas Recovery System for the new Delayed Coker Unit must include redundant compressors. That is, this system must have two compressors, each designed to handle 100 percent of the projected flow of vent gas from the unit and direct it to the Fuel Gas Treatment System. The performance of

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[37] **ConocoPhillips indicates that the gas flow rates of process units were modeled at maximum design rates of units plus an engineering safety factor using computer simulation software for petroleum refining processes.**

the Flare Gas Recovery System in practice must be addressed by the required Flare Minimization Plan and will be verified on an ongoing basis by the recordkeeping and reporting related to flaring that is required by the issued permit.

For Additional Information

Questions about this matter should be directed to:

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ATTACHMENT 1:

LISTING OF SIGNIFICANT CHANGES BETWEEN THE DRAFT PERMIT AND THE ISSUED PERMIT

This listing identifies significant changes between the draft permit for the CORE Project released on March 23, 2007 and the permit issued for this project on August 5, 2008. For each significant change, this listing provides a description of the change and an explanation of the reason for the change, as required by 40 CFR 124.17(a)(1).

Heading (Revised): The caption for the issued permit is now "Construction Permit/PSD Approval" followed by "NESHAP Source - NSPS Source." *This change was made to more accurately describe the permit that is being issued, i.e., a construction permit and PSD approval, which addresses a project that includes certain emission units that are subject to the requirements of the federal NESHAP and NSPS regulations.*

Condition 3.2.3(b)(i) (Revised): This condition addresses the VOM emission offsets that must be obtained by ConocoPhillips for the CORE Project. The name of the source that will provide these offsets has been added. *This change was made because the agreement to purchase the offsets was completed.*

Condition 3.4.4(a) (New): This condition sets limits on the combined emissions of the new Hydrogen Plant that will be constructed as part of the CORE Project. In the draft permit, these limits were in Condition 4.7.6(a), which generally addressed emissions from the flare that would be constructed for the new Hydrogen Plant, as well as the flare for the new Delayed Coker Unit. The emission limits for the new Hydrogen Plant are now lower, as the limits for flaring at this plant are now based a revised scenario provided by ConocoPhillips that has included less emergency flaring. *The limits in this condition were revised to reflect the new scenario for flaring. This condition was moved to improve the organization of the permit for clarity, as it addresses overall emissions of a plant, including emissions from units other than the new flare, and is more appropriately placed with "source-wide" conditions for this project.*

Condition 4.5.6(b)(i)(B) (Revised): This condition provides that Fluidized Catalytic Cracking Units (FCC Units 1, 2, and 3) must each meet a particulate matter emission limit of 0.5 lbs per 1000 lbs coke burned. The revision shows that this condition is based on Paragraphs 77 and 81 of the Consent Decree. *This change was made to cite the correct paragraph for the limit for FCC Unit 3.*

Condition 4.7 (General): The term "vent gas," rather than "waste gas," is now generally used in the issued permit to refer to the gas generated by processing units, which gas may either be recovered and used as fuel or otherwise flared. *This change was made to more accurately label the gas generated by processing units that, when it is not recovered or productively used, results in emissions from the flare in which such gas is combusted. The use of the term "vent gas" also maintains consistency with the terminology in the BAAQMD and SCAQMD rules that are the origin for certain conditions in the issued permit that address flaring. The term "process gas,"*

as used in the NSPS, could not be used to refer to the gas generated by processing units. This is because the NSPS narrowly defines process gas to exclude "fuel gas" and "process upset gas," as is appropriate for the specific regulatory structure of NSPS regulations.

Condition 4.7.1 (Revised): This condition, which describes the new flares that will be constructed with the new Delayed Coker Unit and the new Hydrogen Plant, has been rewritten. The description now specifically addresses these new flares, rather than generically addressing flaring. The description also specifically addresses the various measures that are required to prevent, minimize and control emissions from these new flares. *This change was made to more accurately describe the new flares, so as to facilitate understanding of the conditions for the flares that follow.*

Condition 4.7.2 (Revised): This condition provides the tabular listing of emission units that are addressed by Condition 4.7, i.e., the two new flares. The flare for the new Hydrogen Plant is now shown as steam-assisted, rather than non-assisted. *This change was made to reflect a change in the design of this flare by ConocoPhillips that will facilitate "smokeless operation" of this flare.*

Condition 4.7.3(a)(ii) (New): This condition defines an "affected plant" for the purpose of Condition 4.7 as a plant served by a new flare, i.e., the new Delayed Coker Unit and the new Hydrogen Plant. *The term "affected plant" was defined to simplify subsequent conditions in Condition 4.7 that refer to or apply to the processing units served by the new flares. In these conditions, the term "affected plant" is now used to refer to the new Delayed Coker Unit and the new Hydrogen Plant.*

Condition 4.7.3(b) (Revised): This condition identifies the applicable requirements of the New Source Performance Standards (NSPS) for Petroleum Refineries that apply to the new flares. It has been changed to address the provisions of 40 CFR 60 Subpart Ja, as recently adopted by USEPA on June 24, 2008, rather than the provisions of 40 CFR 60 Subpart J, as addressed by the draft permit. *This change was made because USEPA has completed the adoption of "new" NSPS for certain new emission units at petroleum refineries, including flares, which are now regulated as flares, as well as a class of fuel gas combustion device.*

Condition 4.7.3(c) (Revised): This condition identifies the applicable requirements in the General Provisions of the NSPS that apply to flares that are subject to NSPS standards. A superfluous note in the draft permit is omitted from the issued permit. *This change was made to eliminate possible confusion that the note could have created.* (Other wording changes were also made to provisions to improve clarity.)

Condition 4.7.3(d)(ii) (Draft Condition 4.7.5(b)(ii)): Condition 4.7.5(d)(i) addresses 35 IAC 214.301, the generic state emission standard that generally limits the SO_2 emissions into the atmosphere from any process emission unit to no more than 2000 ppm. Condition 4.7.3(d)(ii), which was moved from draft Condition 4.7.5(b)(i), provides a limited authorization to violate this standard during malfunction and breakdown, as may be provided in a permit pursuant to 35 IAC 201.149 and 201.262. This authorization is provided because it was properly requested by ConocoPhillips. This authorization was further developed in the permit issued in July 2007, so

that Conditions 4.7.3(d)(ii)(A) through (E) more clearly explain the terms and conditions that accompany this limited authorization. Continued operation with excess emissions is only authorized as necessary to prevent hazard to persons or equipment (Condition 4.7.3(d)(ii)(A)). The Permittee must begin to reduce load and/or repair and remove equipment from operation as soon as practicable so that excess emissions cease (Condition 4.7.3(d)(ii)(B)). The Permittee must meet certain recordkeeping and reporting requirements related to any such incidents (Condition 4.7.3(d)(ii)(C)). The Permittee must follow any further instructions that the Illinois EPA may provide during the event (Condition 4.7.3(d)(ii)(D)). Finally, the Permittee continues to have an obligation to minimize its emissions during an event and the Permittee is cautioned that acting under this authorization does not preclude the Illinois EPA from taking enforcement action (Condition 4.7.3(d)(ii)(E)). *This condition was placed after Condition 4.7.3(d)(i), the condition addressing 35 IAC 214.301, for clarity. The provisions set forth the obligations that accompany this limited authorization, especially that such emissions must be justified by the circumstances and then kept to a minimum. In addition, any reliance on this authorization is subject to rigorous recordkeeping and reporting, as is needed to facilitate review by the Illinois EPA and other parties. Finally, ConocoPhillips is put on notice that it is provided with an affirmative defense, but is not shielded from enforcement. The actions taken to avoid malfunctions and reduce emissions in the event of a malfunction or breakdown are still subject to scrutiny by the Illinois EPA and USEPA as to whether the particular event was avoidable and good air pollution control practices were followed. In contrast, the federal NSPS provides that an otherwise applicable NSPS standard simply does not apply during malfunctions.*

Condition 4.7.3(e) (New): This new condition addresses 40 CFR 60.103a(b), a provision of the new NSPS, 40 CFR 60, Subpart Ja, that specifically applies to the new Delayed Coker Unit. It requires process vessels in delayed coking units to be depressurized to 5.0 psig with recovered exhaust gases being sent to the fuel gas system for combustion devices. *This provision of the NSPS is included in Condition 4.7, which addresses the new flares, as it requires certain vent gas from the Delayed Coker Unit to be recovered for use as fuel, rather than being flared.*

Condition 4.7.5-1(a)(ii) (Revised): This condition, which is part of the BACT and LAER determination for the new flares restricts the types and circumstances in which gas that may be sent to the new flares. This condition limits the flares to combusting process upset gas, as defined by the NSPS, 40 CFR 60.101a(a), and to combusting low-sulfur gaseous fuels for certain purposes and in certain circumstances. The use of the NSPS definition of process upset gas limits flaring of vent gases from the new Delayed Coker Unit to vent gases that are the result of process upsets and malfunctions. Flaring is only allowed during startup or shutdown of this unit to the extent that a process upset or malfunction occurs during these periods. The flaring of vent gas from the new Hydrogen Plant, which would qualify as low-sulfur fuel, is restricted as flaring of fuel gas is only allowed for certain purposes and in certain circumstances, e.g. when the composition of the gas is incompatible with its use as fuel. Routine flaring of the vent gas from the new Hydrogen Plant is not allowed. *These requirements are included in the BACT/LAER determination as they are restrictions on the occurrence of flaring that have been demonstrated to be achievable for new delayed coking units and new hydrogen plants.*

Condition 4.7.5-1(a)(iii) (New): This condition, which is part of the BACT and LAER determination for the new flares, requires the new Delayed Coker Unit to have a Flare Gas

Recovery system that includes two compressors, each with the capacity to handle 100 percent of the normal flow of vent gas from this unit. *This requirement is included in the BACT/LAER determination as it is a feature in the design of delayed coking units that has been demonstrated to prevent emissions from flaring of vent gas during routine operation, as is specifically required for the new Delayed Coker Unit by Condition 4.7.5-1(a)(ii).*

Condition 4.7.5-1(a)(iv) (New): This condition, which is part of the BACT and LAER determination for the new flares, requires process vessels in the new Delayed Coker Unit to be depressurized to 5.0 psig with exhaust gases recovered for use in the fuel gas system. This condition reflects the identical requirement of 40 CFR 60.103a(b), in the new NSPS, 40 CFR 60, Subpart Ja. *This requirement is included in the BACT/LAER determination as it is a demonstrated measure to minimize certain flaring that might otherwise occur from routine operation of the new Delayed Coker Unit, i.e., depressurization of process vessels.*

The condition is followed by a provision that notes that turnarounds of the new processing units that are part of the CORE Project are also subject to provisions of State rules that address turnarounds at refineries, 35 IAC 219.444, Process Unit Turnarounds. *This provision, which was added in the permit issued on July 19, 2008, is included to address another requirement related to depressurization of new processing units.*

Condition 4.7.5-1(a)(v) (New): This condition, which is part of the BACT and LAER determination for the new flares, requires the Permittee to develop and implement Flare Minimization Plans to prevent and minimize emissions from flaring. This condition requires the Permittee to undertake appropriate planning and actions to reasonably ensure that routine flaring does not occur in actual practice, as well as to reduce the likelihood that process upsets or malfunction occur that lead to flaring. Because of their extent, the detailed provisions for such plans are contained in a separate condition, new Condition 4.7.5-2. *This requirement is included in the BACT/LAER determination as development and implementation of Flare Minimization Plans is a demonstrated measure to prevent or minimize certain flaring that might otherwise occur, working to complement other measures that prevent and minimize flaring.*

Condition 4.7.5-1(a)(vi) (New): This condition, which is part of the BACT and LAER determination for the new flares, requires the Permittee to conduct Root Cause Analyses for significant flaring incidents that do occur to prevent and minimize the likelihood of similar incidents in the future, by identifying and eliminating the causes for such flaring as it is practical to do so. A significant flaring incident for which such action is required is stringently defined as the flaring of 100,000 scf or more of waste gas or results in VOM emission of 50 or more pounds in a 24 hour period. Because of their extent, the detailed provisions for such Root Cause Analyses are contained in a separate condition, new Condition 4.7.5-3. *This requirement is included in the BACT/LAER determination as performance of Root Cause Analyses for significant flaring incidents is a demonstrated measure to prevent or minimize certain flaring that might otherwise occur, complementing other measures that prevent and minimize flaring.*

Condition 4.7.5-1(a)(vii) (New): This condition, which is part of the BACT and LAER determination for the new flares, sets limits on the amount of pilot and purge flow to each flare. *This requirement is included in the BACT/LAER determination as these limits serve to restrict an*

aspect of the operation of the flare, i.e., combustion of pilot and purge gas, that contributes to a portion of the emissions from a flare.

Condition 4.7.5-1(a)(viii) (New): This condition, which is part of the BACT and LAER determination for the new flares, requires use of an automatic igniter device for the pilot flame. *This requirement is included in the BACT/LAER determination as it is a measure that serves to ensure proper operation for effective destruction of organic compounds and assists in minimizing the VOM emissions of a flare.*

Condition 4.7.5-1(a)(ix) (New): This condition, which is part of the BACT and LAER determination for the new flares, requires the performance of an annual leak survey for all pressure relief devices connected directly to a flare, rather than to the flare header before the liquid seal. *This requirement is included in the BACT/LAER determination as such surveys are a demonstrated measure to restrict another aspect of the operation of the flare that can contributes to the emissions from a flare, i.e., leakage of relief devices that directly connect to the flare.*

Condition 4.7.5-1(a)(x) (New): This condition, which is part of the BACT and LAER determination for the new flares, generally requires ConocoPhillips to continue to comply with the substantives requirements of the NSPS, 40 CFR 60 Subpart Ja, as adopted on June 24, 2008, if those requirements are subsequently remanded, stayed or relaxed. The condition also requires ConocoPhillips to implement the compliance procedures set forth in the NSPS or other alternative procedures approved by the Illinois EPA to verify compliance with those requirements. The condition also provides the Illinois EPA may determine that a substantive requirement of the NSPS subsequently adopted by USEPA for an aspect of flare operation is equivalent to or provides for more stringent control of emissions than the requirement for that aspect of flare operation adopted on June 24, 2008, so that compliance with the "original requirement" is superfluous. *This requirement is included in the permit at the request of ConocoPhillips to respond to public concerns about the continued effectiveness of this new NSPS, which may be revised, either voluntarily or as a result of an appeal, to address concerns that have been expressed by potentially affected sources.*[38] *Upon consideration of ConocoPhillips' request, the Illinois EPA has determined that the inclusion of this requirement in the BACT determination in the issued permit is supported by 40 CFR 52.21(j)(1), which requires a major project to meet "…each applicable emission standard and standard of performance under 40 CFR parts 60 and 61." In addition, this new NSPS reflects the "base-level" of control for the emissions from the new flares, serving to prevent and minimize their emissions.*

Condition 4.7.5-1(b) (New): This condition, which is part of the BACT and LAER determination for the new flares, requires the flares to comply with annual limits for CO emissions. The selected limits are the limits that are set for the potential or permitted CO emissions of the new flares, as established in Condition 4.7.6, which is referenced. The condition also establishes a specific method for calculating CO emissions for purposes of determining compliance with these limits, as it requires that CO emissions be calculated in accordance with Attachment 9.2. New Condition 4.7.5-1(b) replaces Condition 4.7.5(b) in the

[38] Indeed, the provisions of this new NSPS were temporarily stayed by USEPA for 90 days, until September 26 2008. (73 FR 43627, July 28, 2008).

draft permit, which is now Condition 4.7.5-1(c). *These limits are included in the BACT/LAER determination as these limits serve as secondary BACT limits that restrict or constrain the annual emissions of the flares in a quantitative manner.*

Condition 4.7.5-1(c) (Revised): This condition established a work practice to ensure compliance with 35 IAC 214.301, the generic state rule that limits SO_2 emissions of process emission units to no more than 2000 ppm. The condition is revised to correct the reference for limited authorization for violation of this rule during malfunction or breakdown, as now addressed by Condition 4.7.3(d)(ii) of the issued permit. *These changes were made to maintain consistency between this work practice required by the permit and the underlying emission standard that is the reason for this work practice.*

Condition 4.7.5-2 (New): This condition provides the detailed requirements and procedures for the required Flare Minimization Plans, which must be developed and implemented as part of the BACT and LAER determination for the new flares (Condition 4.7.5-1(a)(v)). Condition 4.7.5-2(a) sets forth the scope of the required Plan for each affected plant. This scope includes a description of the flare gas recovery system; a description of various procedures for operation and maintenance of the affected plant; an evaluation of preventative measures to reduce the occurrence and magnitude of flaring for the affected plant, including a schedule for the expeditious implementation of all feasible prevention measures to prevent flaring during startup, shutdown and planned maintenance activities, flaring due to issues of gas quantity and quality, and flaring caused by the recurrent failure of equipment or a process to operate in a normal manner; and a comparison with the practices for flare minimization and the levels of flaring achieved at other petroleum refineries. As operational experience is gained for an affected plant, the flare minimization plan must consider the plant's operating history and describe the measures that have been and will be implemented pursuant to the flare minimization planning process. Condition 4.7.5-2(b) sets forth the procedures that must accompany flare minimization planning. ConocoPhillips is generally required to maintain and implement flare minimization plans that are up-to-date, revising the plans as needed to address developments or events that have occurred. ConocoPhillips must also update a plan if required by the Illinois EPA to address apparent deficiencies in the plan. All copies of plans must be retained and be available for review by the Illinois EPA. To provide further oversight of such planning activities by the Illinois EPA, the initial plan for each new processing unit must be submitted to the Illinois EPA at least 90 days before the initial startup of the unit, which will enable the Illinois EPA to review and, if necessary, comment upon that plan. *These requirements are established for the flare minimization planning that is required by the BACT/LAER determination for the new flares, as they represent a thorough approach to flare minimization planning, as has been used elsewhere for existing flares. The procedural requirements accompanying such planning are appropriate for new flares and processing units, which do not have an operating history.*

Condition 4.7.5-3 (New): This condition sets forth the detailed requirements and procedures for the Root Cause Analyses that are required for flaring incidents as part of the BACT and LAER determination for the new flares (Condition 4.7.5-1(a)(vi)). The condition includes provisions to ensure that Root Cause Analyses involve a systematic investigation of a significant flaring incident to identifying and assess corrective measures that are available to prevent or reduce the likelihood of recurrence of a similar incident (including design, operation and maintenance

changes) (Condition 4.7.5-3(a)). Root Cause Analyses must also lead to the development of a program of interim and long-term corrective actions, if any, as are consistent with good engineering practice, to minimize the likelihood of a recurrence of the conditions that caused the incident, with a schedule for implementation of the measures that cannot immediately be implemented (Condition 4.7.5-3(a)). The performance of a Root Cause Analysis must be accompanied by the preparation of a detailed report for the Analysis (Condition 4.7.5-3(b) and this report shall be submitted within 45 days of the date of the incident (Condition 4.7.5-3(b)). Finally, the Root Cause Analyses for significant flaring incidents required by the BACT/LAER determination may be appropriately combined with other Root Cause Analyses that may be required for a flare (Condition 4.7.5-3(d)). *These requirement are established for the Root Cause Analyses that is required by the BACT/LAER determination for the new flares, as they represent a thorough approach to such analyses, as has been required for existing flares at the Wood River refinery by the Consent Decree.*

Condition 4.7.6 (Revised): This condition contains limits on the annual emissions of the new flares, setting the permitted emissions of the flares. It was revised to separately address emissions from combustion of pilot and purge gas by the flares and emissions from combustion of vent gas. For the new Delayed Coker Unit, a further limit is set on the SO_2 emissions that are associated with the startup, shutdown and scheduled maintenance of this unit. These limits reflect new data provided by ConocoPhillips for the emissions of the flares, which shows emissions that are lower than those in the original application. This data was submitted, at least in part, to respond to concerns expressed by certain members of the public about the permitted emission rates of the new flares. It reflects new scenarios for the non-routine flaring at each flare that are less cautious as they are based on fewer major malfunctions of the associated processing units occurring in any given year. *These changes were made to set separate limits for different aspects of operation of the flares, with separate limits for "routine" and "non-routine" emission for each flare, consistent with the BACT/LAER determination made for the flares. The changes were also made to set limits that more closely approach the emission levels that should typically occur each year, with less margin for the variability in the level of flaring that occur each year, as should be achievable with the measures that are required to prevent and minimize flaring. It should still be understood that the establishment of these limits for the permitted emissions is not intended to authorize emissions that are beyond the levels that are achieved with the operational restrictions and work practices that are required for the new flares, including the preparation and implementation of flare minimization plans.*

Condition 4.7.7(a) (Draft Condition 4.7.7(a) and (b)): This condition addresses certain testing that must be conducted by ConocoPhillips to verify compliance with particular requirements of 40 CFR 60.18. The issued permit no longer provides that testing must be conducted during "conditions which are representative of maximum emissions during normal operation." *This change was made because this qualification for testing is not applicable for the new flares, as these flares should only combust vent gas in non-routine and "non-normal" circumstances and is not intended that ConocoPhillips must ever simulate such conditions for the purpose of testing a new flare.* (The provision in the issued permit have also been consolidated and simplified to improve clarity.)

Condition 4.7.7(b) (New). This condition addresses certain sampling and analysis of process streams that must be conducted upon request by the Illinois EPA to obtain representative data for the composition of the stream, as could be needed to support evaluation of particular flaring events or certain categories of flaring events. The condition specifies that samples shall be analyzed for total hydrocarbons (i.e., each of the principal organic compounds in the sample, including methane and ethane) and hydrogen content by volume, total sulfur content (as H_2S) by weight, and higher heating value, rather than simply hydrocarbons and sulfur content, as provided by the draft permit. *This condition was added to identify the specific analyses that would likely be needed to support an evaluation of flaring events.*

Condition 4.7.7(c) (Draft Condition 4.7.9(d)): This condition addressed reports prepared and kept for the testing conducted pursuant to Conditions 4.7.7(a). This condition was moved and expanded to also address testing pursuant to Condition 4.7.7(b). *This change was made because preparation and retention of reports for testing is an essential aspect of testing, as the data and information collected during testing is relied upon to show compliance or for other relevant purposes.*

Condition 4.7.8-1 (Draft Condition 4.7.8): In the issued permit, Draft Condition 4.7.8 was replaced by Condition 4.7.8-1. New Condition 4.7.8-2 addresses required sampling and analysis, or alternatively continuous monitoring, for the composition of flared vent gas. New Condition 4.7.8-3 addresses continuous video imaging of the flare, with back-up provisions for human observation during any outage of video system *These changes were made to maintain to structure and organization in the issued permit with the detailed provisions that were added to address certain additional required monitoring.*

Condition 4.7.8-1(a) (Draft Condition 4.7.8(a) and (b)): This condition addresses requirements for continuous monitoring that apply to the new flares pursuant to the NSPS. The condition now addresses the monitoring requirements of 40 CFR 60, Subpart Ja, rather than Subpart J. *This change was made to address the NSPS requirements that will now be applicable to the flares. In addition, a simpler approach is used to address these requirements, with references to relevant provisions of the federal regulations, to maintain clarity in the permit, as the new provisions for monitoring are more extensive than the former provisions.*

Condition 4.7.8-1(b) (New): This condition establishes additional requirements for the required continuous monitoring systems for flow, including minimum performance specification for such systems, provisions that address the various time periods in which flow must be determined (e.g., average values of flow every 15 minutes), and a requirement for annual verification of accuracy. In addition, the Permittee must be able to obtain reliable estimates of flow from the operational parameters during any outages of the flow monitoring system. *This condition was added to enhance the quality and extent of flow data for the flares, beyond the level specified by the NSPS, by including specific performance specifications for such systems and requiring at least annual accuracy certifications, as required by SCAQMD Rule 1118 and BAAQMD Rule 12-12. The condition responds to public comments that requested flow monitoring to enable accurate determinations of the emissions of flares and to facilitate implementation of measures to prevent and minimize such emissions.*

Condition 4.7.8-1(c) (Draft Condition 4.7.8(c)): The condition, which addresses operational monitoring related to the presence of a pilot flame on a new flare pursuant to 40 CFR 60.18, has been reworded to refer to the relevant regulatory provision of the NSPS. *This change was made as this is a more appropriate approach to the drafting of a condition that addresses monitoring required by the NSPS. It also maintains consistency with the approach taken in Condition 4.7.8-1(a) for monitoring that is required by the NSPS.*

Condition 4.7.8-1(d) (New): This condition requires continuous monitoring for each new flare using an off-on flow indicator to identify flow of gases in the flare stack, other than purge gas. *This condition was added to provide back-up information on the occurrence of flaring, to facilitate the performance of maintenance on the required monitoring system for flow if needed and to generally assist in implementation of other requirements for the flares.*

Condition 4.7.8-1(e) (New): This condition requires continuous monitoring for each new flare for the usages or flows of pilot gas and purge gas by the flare. It reflects the requirements of SCAQMD Rule 1118. *This condition was added to enable compliance with the limit on the flow of pilot gas and purge gas to each flare to be verified. It also facilitates accurate determinations of the emissions from each flare as flow of pilot gas is not otherwise monitored and flow of purge gas may be more accurately measured with a separate, dedicated system than with the flow monitoring system for flared vent gas.*

Condition 4.7.8-1(f) (New): This condition requires continuous monitoring for the liquid in each new flare of the liquid level and pressure of the seal drum. It reflects the requirements of BAAQMD Rule 12-12-501. *This condition was added to facilitate proper operation of each flare for recovery of vent gas, as vent gas that passes through the liquid seal is no longer available for recovery and will be combusted in the flare.*

This requirement was added based on public comment. As noted in the public comment, operational monitoring for waste gas that is flared is important to provide accurate data for emissions from flaring and to provide a factual basis for evaluation of the number and nature of flaring events and their associated emissions and to perform root cause analyses for flaring.

Condition 4.7.8-1(g) (New): This condition addresses the recordkeeping that must accompany the monitoring conducted pursuant to Conditions 4.7.7(a) through (f). The data collected by the required monitoring systems must be automatically recorded. A file must be kept that contains the specification for each device and recommended operating procedures provided by the supplier. Operating records must be kept for each monitoring system identifying periods when the system is not in service and the performance of quality control activities and maintenance and repair of the system. Lastly, records must be kept that identify any deviations from applicable requirements, as measured by a monitoring system. *This condition was added because recordkeeping, as specified by this condition, is an essential aspect of monitoring. The specified records are needed to support the quality of data collected by required monitoring systems, verify that monitoring is properly conducted, and to "streamline" responses to deviations that are identified and support preparation of reports for deviations.*

Condition 4.7.8-1(h) (New): This condition requires the preparation and maintenance of Monitoring Procedures for each new flare describing both required monitoring systems and operational monitoring systems. The required contents of such plans reflect the required contents of the Flare Monitoring and Recording Plans required for flares at petroleum refineries by SCAQMD Rule 1118(f). *This condition was added because the preparation and maintenance of such plans will simplify oversight by the Illinois EPA of the collection of monitoring systems on each flare and facilitate collection of reliable data.*

Condition 4.7.8-2 (New): This condition requires sampling and analysis, or alternatively monitoring, of flared vent gas to determine its composition and higher heating value. The specified requirements reflect the requirements for the collection of such data in SCAQMD Rule 1118(g) and BAAQMD Rule 12-11-502. *This condition was added because it will increase the accuracy of emissions estimates for the flares and facilitate implementation of measures to prevent and minimize such emissions. It responds positively to certain public comments that requested such data be collected for these purposes. Analysis for methane and ethane content of collected sampled is required to enable data collected for the total hydrocarbons to be converted to data for VOM, determined as the difference between the total hydrocarbon content of vent gas and its methane and ethane content.*

Condition 4.7.8-3 (New): This condition requires visual imaging (video monitoring) of the new flares and flaring of vent gases with retention of collected minute-by-minute images at the refinery for at least 90 days. The specified requirements for such monitoring reflect the requirements in SCAQMD Rule 1118, including retention of collected images at a refinery for at least 90 days, as provided by SCAQMD Rule 1118(g)(5). *This condition is included in the permit as video imaging is a monitoring method that will facilitate and document proper operation of a flare, which is in use at a significant number of refineries in California, including certain refineries operated by ConocoPhillips. It responds positively to certain public comments that requested video monitoring be conducted for the new flares. The provisions in SCAQMD Rule 1118(g)(5) have been used to address retention of collected images as they provide for retention of a reasonable body of data and place the main burden for managing that data on ConocoPhillips, with data still being available to the Illinois EPA if requested.*

Condition 4.7.9(a) ("New"): This condition addresses recordkeeping requirements under the NSPS, 40 CFR 60 Subpart Ja, that apply to the new flares. Previous Condition 4.7.9(a) has been renumbered as Condition 4.7.9(b). *This change was made because USEPA has completed the adoption of a "new" NSPS, which includes new recordkeeping requirements that are not present in the old NSPS, 40 CFR 60, Subpart J.*

Condition 4.7.9(b) ("New"): This condition now addresses recordkeeping of design requirements related to the new flares, including the capacity of the Flare Gas Recovery System for the new Delayed Coker Unit and the automatic igniter devices required on each new flare. Draft Condition 4.7.9(b), which addressed recordkeeping for operation without a pilot flame, is now addressed by the recordkeeping required by Condition 4.7.8(g)(iii). *This condition was added to require documentation ensuring that design requirements for the new flares were met. The previous Condition 4.7.9(b) was relocated to improve the structure and clarity of the permit.*

Condition 4.7.9(c) ("New"): This condition addresses records for certain procedures that the Permittee will use to calculate emissions, including procedures for calculating emissions of pilot and purge gas, procedures for calculation of flows and composition of vent gas streams during outage of required monitoring systems, and procedures for determining the hydrogen content of vent gas streams from the new Hydrogen Plant, as may be relevant for calculating emissions form this plant. Draft Condition 4.7.9(c) is now Condition 4.7.9(d), as discussed below. *This condition was added to require the Permittee to commit itself to specific procedures for the specified aspects of emissions calculations and to enable the Illinois EPA to then review those procedures.*

Condition 4.7.9(d) (Draft Condition 4.7.9(c)): This condition, which addresses recordkeeping for exceedances, has been revised to address exceedances of standards and requirements, as well as exceedances of limits. *This change was made so that the provision would clearly address exceedances other than exceedances of emission limits.* (Draft Condition 4.7.9(d) is now Condition 4.7.7(c).)

Condition 4.7.9(e) (Revised): This condition addresses recordkeeping for emissions of each new flare. The draft permit required recordkeeping for VOM, NOx, SO_2 and CO emissions. Additional recordkeeping is now required related to emissions, including data for combustion of pilot and purge gas, detailed information describing and characterizing each flaring event, and information for the SO_2 emissions of the affected flare for the new Delayed Coker Unit during startup, shutdown, and scheduled maintenance. *This change was made to more fully address the emissions of the new flares and address compliance with the refined emission limits now established by Condition 4.7.6, including the specific limit for SO_2 emissions for the new Delayed Coker Unit during startup, shutdown, and scheduled maintenance.*

Draft Condition 4.7.9(f): This condition, which addressed certain recordkeeping requirements associated with continuous emissions monitoring, is now contained in Condition 4.7.8-1(g)(iii). *All requirements for recordkeeping associated with continuous monitoring are now included with the requirements for such monitoring in Conditions 4.7.8-1, 4.7.8-2 or 4.7.8-3. This improves the organization of Condition 4.7 in the issued permit.*
(As a result of this change, Draft Condition 4.7.9(g) is Condition 4.7.9(f) in the issued permit.)

Condition 4.7.10(a) (Revised): This condition addresses reporting requirements under the NSPS that apply to the new flares. It now addresses provisions of 40 CFR 60 Subpart Ja, rather than Subpart J. *This change was made because USEPA has completed the adoption of a "new" NSPS that includes the NSPS reporting requirements that are applicable to the new flares.*

Condition 4.7.10(b) (Revised): This condition, which addresses notification for deviations, now addresses all deviations, including deviations whose significance is such that notification can be provided with a periodic compliance report, rather than within 30 days. It also specifies the information that must be included with such notices, i.e., a description of the deviation, the probable cause of the deviation, any corrective actions and preventative measures taken, and any other information that is specified for the particular type of deviation. *These changes were made so that this condition fully addresses requirements for deviation notices for the new flares, including notifications for all classes of deviations and the contents of all deviation notices.*

Condition 4.7.10(c) (Revised): This condition addresses notification associated with exceedances of 35 IAC 214.301 (which limits SO_2 emissions to 2,000 ppm) for which the Permittee has limited authorization in Condition 4.7.3(d)(ii) for continued operation of the flare during malfunction or breakdown of equipment in the Delayed Coker Unit. The provision now refers to 35 IAC 214.301. The provisions for the timing of such reports are more stringent than those in the draft permit, e.g., the initial report is required within 24-hours, rather than 3-days. Information on the aggregate duration of such incidents is not required. *These changes were made to more appropriately address the reporting that should accompany such incidents, which should be uncommon and warrant quicker and closer reporting than would have been provided by the draft permit.*

Condition 4.7.10(d) (New): Periodic reporting related to the new flares is required, to accompany other periodic compliance reports that must routinely be submitted for various emission units at the refinery. These reports must include information about flaring that occurred during the reporting period, summary information about deviations during the reporting period, and certain further information specifically for any exceedances of 35 IAC 214.301 for which the Permittee relied on the limited authorization for violations during malfunction or breakdown pursuant to 35 IAC 201.262. *These reports are required to enable the Illinois EPA (and other interested parties) to conduct a brief review of activity involving each new flare during the reporting period, with the objective of identifying any event(s) for which further, specific investigation or other action is warranted, which action should occur expeditiously rather than in conjunction with the comprehensive annual review that is supported by the annual reports required by Condition 4.7.10(e), as discussed below. In addition, these reports are required to support closer supervision of a flare by the Illinois EPA if needed based on the flare's recent operating history.*

Condition 4.7.10(e) (New): Annual reporting related to each new flare is required. These reports must include a listing for all flaring events during the previous calendar year, combining the information for flaring events provided in individual periodic reports (Condition 4.7.10(e)(i).) This report must also include summary information about flaring events, including a summary of the causes of flaring events and their contribution to emissions, copies of the summaries for previous years, and an analysis of the overall amount of vent gas that was flared, as compared to being recovered (Conditions 4.7.10(e)(ii), (iii) and (iv)). Information is also required on actions that have been implemented to reduce flaring and future actions that are planned to reduce flaring (Conditions 4.7.10(e)(v) and (vi)). Descriptions of significant changes to the Flare Minimization Plan and Flare Monitoring Procedures are also required (Conditions 4.7.10(e)(vii) and (viii)). Finally, confirmation is required that certain actions that must be performed on an annual basis, the annual verification of the accuracy of flow monitoring systems and the annual leak survey for pressure relief devices vented directly to the flare, have been completed (Conditions 4.7.10(e)(ix) and (x)). *These annual reports were required to support comprehensive review by the Illinois EPA (and other interested parties) on an annual basis of flaring by the new flares. One particular focus for these reports is on ConocoPhillips' effectiveness in minimizing flaring events as supported by information on flaring during previous years or, alternatively, the actions taken by ConocoPhillips to respond to the level of flaring in a particular year, including corrective actions taken pursuant to Root Cause Analyses. The*

reports also provide a means to verify that actions required by the permit to prevent and minimize flaring were implemented.

Attachment 1 (Revised): This attachment provides a summary of emissions for the CORE project. The table in attachment 1 provides increases from the refinery, increases from the terminal, decreases that are part of the CORE project, and an overall net project change. Since the draft permit, changes to the BACT/LAER determination as well as new tighter emission standards under the NSPS have resulted in lower annual emission limits for the new flares. *These changes have been made because changes to the BACT/LAER determination resulted in different (lower) annual emissions. An update to this table is appropriate to maintain consistency with the new emission rates for flares as established by Conditions 4.7.6.*

Attachments 2a, 2b, 3, 4, 5, 6, 7, and 8 (Revised): These attachments summarize the netting analyses for different pollutants. Emissions associated with the Ultra Low Sulfur Diesel project have been revised in each attachment. *These changes have been made to accurately reflect emissions increases and decreases associated with that project. The changes did not change the determinations of PSD or Nonattainment Area New Source Review (NA NSR) applicability.*

Attachment 9.1 (Draft Attachment 9): This attachment provides a summary of the BACT/LAER Determinations for new and modified emission units that are part of the CORE Project. The summary now addresses the expanded BACT and LAER determination made for the new flares in the issued permit. *This change was made so that this summary accurately portrays the determination that was made for the new flares.*

Attachment 9.2 (New): A new attachment is included in the issued permit, "Procedures for Calculating CO and VOM Emissions from New Flares." The attachment sets forth the procedures that, together with relevant data from monitoring systems or other credible information, are to be used to calculate the emissions of VOM and CO from the new flares for two specific provisions of the permit. The first is determining VOM emissions from flaring events to determine whether significant flaring of a Hydrocarbon Flaring Incident has occurred relative to the VOM emission criterion. The second is determining CO emissions for the purposes of compliance with the annual limits on CO emissions that have been established as secondary BACT limits. *The procedure was adapted from SCAQMD Rule 1118, Appendix B. This procedure has been included in the permit to provide a standardized approach for calculating emissions of CO and VOM to enable consistent and efficient implementation of the cited provisions. The use of a standardized approach avoids potential differences in the CO and VOM emission factors that might otherwise be used for the implementation of these provisions, based on differing judgments as to the actual combustion efficiency or destruction efficiency achieved by a flare. The use of such emission factors would be inconsistent with the manner in which the provisions were developed and their underlying purpose, i.e., triggering Root Cause Analyses based on a criteria expressed in terms of VOM emission and constraining the amount of flaring that occurs annually with a limit expressed in terms of CO emissions.*