Expert Report of Greg Karras
Communities for a Better Environment (CBE)
2 February 2015

Regarding the

Phillips 66 Company Propane Recovery Project
Recirculated Final Environmental Impact Report (RFEIR)
Released in January 2015 by the Contra Costa County
Department of Conservation and Development
State Clearinghouse #2012072046
County File #LP12-2073

I, Greg Karras, declare and say:

1. I reside in unincorporated Marin County and am employed as a Senior Scientist for Communities for a Better Environment (CBE). My duties for CBE include technical research, analysis, and review of information regarding industrial health and safety investigation, pollution prevention engineering, pollutant releases into the environment, and potential effects of environmental pollutant accumulation and exposure. My qualifications, curriculum vitae, and publications list were provided with my previous reports on the project and its draft and recirculated draft Environmental Impact Report (DEIR, and RDEIR, respectively).[1]

2. I have reviewed the Phillips 66 Company 'Propane Recovery Project' (project) Recirculated Final Environmental Impact Report (RFEIR) and reassert my previous comments as they remain valid and have not been addressed in the RFEIR. In its attempt to rationalize its decision not to analyze or even disclose the changes in oil feedstock that will be necessary to implement the project, and despite the potential pollution and hazard impacts from those feedstock changes, the RFEIR repeats the unsupported assertion that sufficient propane and butane (LPG) is recoverable in the project baseline. The RFEIR does not include any publicly verifiable data supporting this assertion, or consider evidence provided by the public indicating that a change in the refinery's oil feedstock

[1] *See* esp. my reports dated 4 September 2013 report (Karras Rodeo Report-1) and 5 December 2014 (Karras Rodeo Report-2). *See* also my 7 January 2014 Supplemental Evidence–B (CBE Supp-B), 14 January 2014 Supp. Evidence–C (CBE Supp-C), 20 January 2014 Supp. Evidence–D (CBE Supp-D; co-authored with Roger Lin), and 24 November 2014 report regarding the 'Rail Spur Extension and Crude Unloading Project' (Karras Rail Spur Report). Each of these documents and its attachments was provided to Contra Costa County and is incorporated herein.

will be necessary to provide enough LPG for the proposed project.[2] However, the RFEIR does more specifically delimit the *type* of measurements it purports to rely upon for its LPG baseline estimate. My review of the project and RFEIR reported herein focuses on the adequacy of its project description and analysis of potential environmental impacts with respect to this new information on the type of measurements that the RFEIR relies upon for that baseline analysis. My opinions on these matters and the basis for these opinions are stated in this report.

3. According to the RFEIR, the type of data it used to estimate LPG recoverable in the project baseline was limited to project design data. It relies on measurements during August 2011 that Phillips 66 used as the project "design basis" for its conclusion that "the existing Refinery baseline condition had and has sufficient propane and butane feedstocks to support the extraction rates of propane and butane sought by Phillips 66 for the proposed Project." (RFEIR at 2-3, 2-5, 2-6.) The RFEIR mentions other data, but in response to CBE's previous comment that the RDEIR was wrong to include those 2013 data in the baseline and the refinery had already begun to change its feedstock by then (RFEIR at 3.2-77), the RFEIR confirms this reliance on the 2011 design basis data:

> "[T]he actual sampling and measurements of propane and butane in the refinery fuel gas (RFG) at the Refinery that was used as the basis for the design and permit limit of 14,500 barrels per day (BPD) occurred in 2011, not 2013 as the commenter appears to suggest. The sampling data for year 2013 is presented in the RDEIR for informational purposes and does not represent the baseline for the proposed Project … ." (RFEIR at 3.2-128; RTC B9-25; emphasis added.)

4. 'Design basis' means the conditions that are taken into account when designing a facility or product.[3] Those include anticipated post-project conditions. 'Project baseline' means existing conditions, not post-project conditions. Equating data representing design basis conditions with those representing current baseline conditions is a logical fallacy, but the RFEIR does exactly that. This is a clear error in its project description.

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[2] *See* Karras Rodeo Report-1; CBE Supp-C; CBE Supp-D; Karras Rodeo Report-2; Karras Rail Spur Report; and the comments and reports of Drs. Fox and Pless in this matter.
[3] *See* Black's Law Dictionary (http://thelawdictionary.org/design-basis/#ixzz3QRYQrkhw).

5. Future conditions that are taken into account when designing facilities to make refined products include, among others, potential post-construction changes in operation, production, and environmental health and safety due to changes in facility oil feedstock.[4]

6. The refinery's oil feedstock will almost certainly change during the proposed project's operating term. This is shown by processing data, dwindling current crude supplies, the company's plans to replace them with 'advantaged crudes' that include diluent/bitumen ('dilbit') blends from Canada and shale oils from the Bakken region, and its current wharf and throughput expansion and rail spur proposals that would enable those plans.[5] Indeed, while it errs in disputing the relevance of this change in feedstock, the RFEIR does not dispute the *potential* for this oil switch.

7. Phillips 66 has a strong incentive to design its project based on measurements taken when it was processing samples of feedstock blends similar to those it could process during the project's operating life. Not to do so would risk capital on a potentially underproductive or stranded asset. For example, LPG yields from delayed coking—a major producer of LPG in this refinery—vary greatly when coker feedstock is derived from different crude oils.[6] Even when detailed composition data are available for each oil in a new feedstock blend, predictions about the behavior of the *blend* during actual conversion processing remain limited and uncertain until the complex interactions of blend-specific components are tested directly in practice.[7]

8. The volume and country of origin of each oil shipment imported and processed by each refinery in the U.S. each month, as well as the density and sulfur content of each such shipment that is crude oil, is reported publicly by the U.S. Energy Information Administration (EIA). These EIA data for the period from 1 January 2006 through 30 November 2014 are appended hereto as Attachment K3-1.

9. During the five months through August 2011, when the RFEIR states that Phillips 66 took the measurements of the refinery that were used as the design basis for the

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[4] *See* Meyers, 1986; Speight, 1991; Karras, 2010; Bredeson et al., 2010; UCS, 2011; Abella and Bergerson, 2012; Brandt, 2012; API, 2009; CSB, 2013 *in* Karras Rodeo Report-1 attachments.
[5] CBE and others provided abundant evidence for each of these points: *see* Karras Rodeo Report-1; Karras Rodeo Report-2; Karras Rail Spur Report, and the comments of Drs. Fox and Pless.
[6] *See* Meyers, 1986 *in* Karras Rodeo Report-1 and attachments thereto. *See* esp. Karras Rodeo Report-1 at Table 2, page 7 and Meyers tables 7.1-2 and 7.1-6.
[7] Speight, 1991 at 301-305 *in* Karras Rodeo Report-1 attachments.

project (April–August), the refinery received ≈ 1.5 million barrels of 40.1 ºAPI gravity, 0.61 wt. % sulfur crude oil from Russia for processing in four consecutive shipments. (Att. K3-1.) The refinery did not normally run this particular crude oil. This 1.5 million barrels from April–August 2011 represents only the second time the refinery received this particular crude for processing,[8] the largest volume of that crude it ever processed in a year, and the lowest average API gravity (lightest) foreign crude imports it received in any five-months, during 2006 through November 2014. (*Id.*)

10. A report by Sandu and Wright entitled 'Innovative Solutions for Processing Shale Oils' that was published in *Hydrocarbon Processing* during 2013 is appended hereto as Attachment K3-2, and EIA's May 2014 report entitled *U.S. Crude Oil Production Forecast–Analysis of Crude Types* is appended hereto as Attachments K3-3. These reports suggest Bakken crude oil averages ≈ 0.3 wt. % sulfur and 40.8 ºAPI (Att. K3-2) with the density of most Bakken crude oils ranging from ≈ 40–45 ºAPI (Att. K3-3). The 40.8 ºAPI and 0.3 wt. % sulfur averages for Bakken compare to the density (40.1 ºAPI) and sulfur content (0.6 wt. %) of the Russian crude received by Phillips' San Francisco Refinery while it was collecting the measurements it used as the design basis for the project. In terms of these bulk properties, the Russian crude processed by the refinery could be called a 'Bakken look-alike' crude.

11. Bay Area Air Quality Management District (BAAQMD) Application No. 25608 by Phillips 66, dated 31 July 2013, for 'Phase III' of its proposed expansion of wharf capacity to replace dwindling San Joaquin Valley Pipeline (SJVP) crude deliveries to the refinery with waterborne oils from different sources is appended hereto as Attachment K3-4. A chart in this application indicates that the monthly average sulfur content of the refinery crude slate during normal operation from 2004–August 2011 ranged from ≈ 1.8–2.7 wt. %. (Att. K3-4.) The 1.5 million barrels of 0.6 wt. % sulfur crude that the refinery imported from Russia when it was taking the measurements for its project design basis was substantially lower in sulfur than its current crude slate as reported by Phillips 66. At 40.1 ºAPI, this import crude also was substantially lighter than the average density of the refinery's crude slate (≈ 23 ºAPI) estimated during 2008 by previously work.[9] Lighter crude oils, such as this 40.1 ºAPI imported crude and Bakken crude, can be

[8] The only other time during 2006–Nov 2014 was when the San Francisco Refinery received two shipments of Russian crude with these properties in June and July 2010 (Att. K3-1), possibly for a pre-test or previous test run, in the same season a year earlier.

[9] *See* Karras Rodeo Report-1 at 8 (average density in 2008 ≈ 915–918 kg/m^3).

expected to yield substantially more LPG per barrel from distillation, on average, than heavy crude oils, such as those processed at the refinery in the project baseline.

12. Data reported by the industry for dilbit crude streams that are produced in Canada and available for U.S. import are appended hereto as Attachment K3-5. For whole crude, the most recent five-year average densities and sulfur contents reported for these Canadian dilbits ranged from 923–929 kg/m^3 (21.8–20.8 ºAPI) and from 3.5–3.9 wt. %, respectively. (Att. K3-5.) Individual shipments of these dilbits could be expected to range somewhat more widely than these five-year averages.

13. During 2011, the refinery received for processing 153,000 barrels of Canadian crude with a density *and* sulfur content similar to those reported for the Canadian dilbits or denser diluent/bitumen blends (< 24 ºAPI *and* ≥ 2.5 wt. % sulfur). (Att. K3-1.) This 2011 shipment represents a much larger volume of Canadian crude with that range of density and sulfur than the refinery reported receiving and processing in any shipment or any year during January 2006 through November 2014, the first shipment of such crude the refinery reported processing since at least 2005, and the only time since then when the refinery reported processing that crude in this period until 2013. (*Id.*) The only other year since at least 2005 when the refinery received dilbit for processing was 2013 (*Id.*), when, the RFEIR states, Phillips took additional measurements to confirm its project design.

14. Refinery distillation of LPG-rich diluent and cracking of bitumen contained in dilbits can result in LPG yields substantially greater than those from processing the refinery's current baseline crude slate.[10]

15. The refinery has multiple oil storage tanks among which it transfers oils before processing them.[11] Like other refiners, Phillips 66 uses this interconnected storage capacity to advance its processing and business objectives by storing the oils it has received and controlling the timing and amount of each oil it blends into the total feedstock stream processed at the refinery. Thus, the company could have stored the crude it imported from Russia during April–August 2011 for processing in August, when the RFEIR states that the company took the measurements supporting its design basis for the project. Moreover, like other oil companies, Phillips 66 could be expected to measure

[10] *See* my previous comments and expert reports and those of Drs. Fox and Pless.
[11] *See* Attachment K3-4; *see* also BAAQMD 2013 *in* Karras Rodeo Report-1 attachments.

many 'test' oil blends before committing to a major capital project such as this project.[12] In fact, not to do so could risk an unproductive capital investment due to complex and unpredictable interactions of constituents in the new oil blends during future processing, and, from a process design or business perspective, might be considered irresponsible. However, such tests of new oil feedstock blends that appear necessary to establish a valid design basis for the project do not, by definition, represent the typical current baseline feedstock processing conditions.

16. The County could have chosen to estimate the amounts of propane and butane that are recoverable during typical current (2010–2012) conditions based on valid, publicly reported, independently verifiable data. Had it chosen to do so, the County could have required that Phillips 66:

- report each discrete process stream from which LPG would be recovered;
- demonstrate the amounts of LPG it is feasible to recover from each such stream;
- report each discrete measurement of oil feedstock, fuel gas production, and LPG stream quality and quantity in the baseline, including date and time of sampling;
- demonstrate that measurements taken when oil feedstock, processing, or both deviated from typical current baseline conditions (such as in tests done to design the project) are not lumped in with and will not skew the baseline sample data;
- compare the resultant validated baseline data with the proposed project design basis data to support its analysis of potential project impacts, and
- report the supporting data for that comparison and analysis in the EIR.

Unfortunately, the County has not done so, and its the RFEIR has not included, or otherwise provided the public access to, any of these data.

17. Excerpts from a 2014 CEQA review by the City of Richmond for the Chevron Richmond Refinery 'Modernization' Project are appended hereto as Attachment K3-6. The City's EIR for that project included data for baseline as well as anticipated post-project crude and gas oil feedstock density, sulfur content, distillation properties, and feedstock processing rates for processes in the Richmond refinery. (Att. K3-6.) Further, the City of Richmond's CEQA process provided for public access to detailed data, including but not limited to sample analysis results for discrete measurements of various toxic metals in the crude feedstock blends processed by the Richmond refinery as well as the gas oil streams processed by Richmond refinery conversion processing units. (*Id.*)

[12] Those test samples may have included domestically produced Bakken and bitumen, which would not be reported by EIA as foreign imports.

This evidence suggests that the County could choose to include the data necessary to support independently verifiable analysis of project changes in oil feedstock quality, oil feedstock quantity, and process rates, in the EIR for this Phillips 66 project.

18. An 'Incomplete Letter' issued on 22 August 2014 by the Bay Area Air Quality Management District (BAAQMD) to Phillips 66 regarding its 'Phase III' wharf expansion proposal is appended hereto as Attachment K3-7. Among other outstanding questions regarding Phillips' proposal, BAAQMD found that its application to replace additional current SJVP crude supplies to the refinery with waterborne crude oils from different sources was incomplete because "detailed crude oil information pre and post project" is needed. (Att. K3-7.) This evidence further suggests that the County could choose to include baseline and anticipated post-project oil feedstock quality data in the EIR.

19. In my opinion: Phillips 66 has both motive and opportunity to measure samples of the new oil feedstock the company plans to, proposes to, and is investing capital to process at the refinery while the proposed project would be operational. The conclusion in the RFEIR that this 'design basis' data represents current baseline conditions is illogical and its failure to disclose or analyze the baseline, post-project, and design basis feedstock data renders its illogical conclusion unsupported by any evidence. These clear errors in the RFEIR's project description ignore the reasonable potential, documented in previous comments, that significant feedstock-driven impacts on environmental health, safety, and climate protection could result from the project.

20. I have given my opinions on these matters based on my knowledge, experience and expertise and the data, information and analysis discussed in this report.

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I declare under penalty of perjury that the foregoing is true of my own knowledge, except as to those matters stated on information and belief, and as to those matters, I believe them to be true.

Executed this **_2nd_** day of February 2015 at Oakland, California

Greg Karras