Comments

on

Final Environmental Impact Report

for the

Santa Maria Rail Spur Project

Nipomo, California

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SUMMARY AND CONCLUSIONS

I previously filed comments on the Draft Environmental Impact Report (DEIR)[1] (Fox DEIR Comments[2]) and the Recirculated Draft Environmental Impact Report (RDEIR) [3] (Fox RDEIR Comments[4]) for the Phillips 66 ("Applicant") Rail Spur Extension and Crude Unloading Project ("Project" or "Rail Spur Project") at its Santa Maria Refinery (SMR) in Nipomo, California. These three documents (DEIR, RDEIR, FEIR) are referred to collectively in these comments as "the EIR".

I was asked by SAFER to review the Final Environmental Impact Report (FEIR or Rail Spur FEIR)[1], Responses to Comments (RTCs) on the RDEIR, and the Applicant's February 1, 2016 Letter to the County,[5] which proposes adoption of the Reduced Rail Deliveries Alternative, which was analyzed as one of the alternatives to the Project in the Final EIR. My review indicates that the Final EIR and the responses to my comments on the DEIR and the RDEIR have not resolved the issues that I raised in my comments, which stand unrebutted in the record. Thus, I reincorporate my prior comments on the DEIR and RDEIR, which are summarized below. My comments on

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[1] San Luis Obispo County, Phillips 66 Company Rail Spur Extension and Crude Unloading Project Draft Environmental Impact Report and Vertical Coastal Access Project Assessment, October 2014 [Removed from SLOC's website as of February 23, 2016].

[2] Phyllis Fox, Comments on [Draft] Environmental Impact Report for the Phillips 66 Rail Spur Extension Project, Santa Maria, California, Prepared for Sierra Club, San Francisco, CA, January 27, 2014; Available at pdf 50 in: http://www.slocounty.ca.gov/Assets/PL/Santa+Maria+Refinery+Rail+Project/Comments+on+the+Draft+EIR/Organizations+and+Schools/Communities+For+A+Better+Environment-$!23+Comments+Only.pdf.

[3] San Luis Obispo County, Phillips 66 Company Rail Spur Extension and Crude Unloading Project Revised Public Draft Environmental Impact Report and Vertical Coastal Access Project Assessment, October 2014; Available at: http://www.slocounty.ca.gov/Assets/PL/Santa+Maria+Refinery+Rail+Project/Phillips+66+Company+Rail+Spur+Extension+Project+(Oct+2014)/Phillips+SMR+Rail+Project+Public+Draft+EIR.pdf.

[4] Phyllis Fox, Comments on Revised Draft Environmental Impact Report for the Phillips 66 Rail Spur Extension Project, Santa Maria, California, Prepared for CBE, et al; Available at: http://www.slocounty.ca.gov/Assets/PL/Santa+Maria+Refinery+Rail+Project/FEIR+Phillips+Rail+Spur+Project+Dec+2015/Response+To+Comments/3_Organizations+and+Schools/Communities+for+a+Better+Environment/Attachment+C1+Fox+Comments+and+Responses.pdf.

[5] Jocelyn Thompson, Allston & Bird, Letter to Members of the Planning Commission, San Luis Obispo County, Re: Phillips 66 Rail Spur Extension Project, February 1, 2016 (Exhibit 3A), with 22 attachments (Exhibit 3B).

the FEIR were prepared with assistance from Ian Goodman[6] on fugitive railcar reactive organic gases (ROG) emissions, hazards mitigation, and piecemealing.

First, the FEIR fails to evaluate all of the impacts of the Project. The Project involves replacing up to 97% of the Santa Maria Refinery's crude slate with tar sands crudes that have no history in the refining industry. These new crudes have higher levels of toxic heavy metals, higher levels of toxic and malodorous sulfur compounds, emit more greenhouse gases, and are more corrosive than conventionally refined crudes. These differences are hidden in the FEIR by cherry-picking two potential tar sands crudes and arguing they fall within the range of current crude sources, even though they exceed levels in the "typical crude blend."[7] This ignores increases in the average crude properties, or "creep", which has led to catastrophic accidents elsewhere. Thus, the EIR has failed to evaluate an entire class of impacts.

Second, the FEIR's estimate of railcar fugitive ROG emissions is significantly underestimated due to numerous errors and omissions. I revised the FEIR's analysis, correcting these errors and omissions. My revised analysis indicates that railcar fugitive ROG emissions exceed CEQA daily and annual ROG significance thresholds for on-site rail operations and in every air district through which the unit trains travel for both the 5 trains per week (the Project) and 3 train per week alternative, with the exception of Placer County APCD for daily emissions and San Luis Obispo County APCD for annual emissions (when on-site ROG emissions are excluded). The EIR does not include any mitigation for these significant impacts. Feasible mitigation is available and must be required.

Third, on-site accidents due to corrosion of refinery equipment could result in significant off-site impacts.

Fourth, the new facilities (unloading rack, new pipeline, extended rail spur with unit train full of crude oil) will result in increased risk of fire and explosion at the refinery that cause significant off-site impacts. The analyses demonstrating these significant impacts are buried in a highly technical appendix, while the EIR text argues

[6] Ian Goodman is President of The Goodman Group, Ltd. http://www.thegoodman.com/; his resume is available at: http://www.thegoodman.com/pdf/TGG20160122IanGoodmanCV.pdf.

[7] Rail Spur FEIR, Table 2.7.

that the impacts are not significant by relying on an accident scenario that is not supported in the FEIR.

Fifth, the FEIR concludes that the risk of unit train accidents is significant. The risk is primarily driven by the Los Angeles Area, Bay Area, and Sacramento areas, which have high population densities in close proximity to long stretches of track, which increase the risk of larger numbers of injuries and fatalities. But the FEIR declines to require any mitigation. Safer railcars are available and have been proposed for other projects. Tesoro, which is proposing a crude-by-rail terminal in Washington, has proposed to use DOT-120 pressure tank cars, which reduces the consequence of an accident and also fugitive ROG emissions. FEIR Mitigation Measure HM-2a should be amended to require higher standard DOT-120 or DOT-114 pressure tank cars that include the following safety features over and above those included on the Tesoro DOT-120 cars: (1) 11/16" minimum tank shell thickness; (2) minimum 300 psi test pressure; and (3) electronically controlled pneumatic brakes.

Sixth, the Rail Spur Project is just one of four related projects that were designed together and should have been evaluated as one project under CEQA. The responses to comments on piecemealing are inaccurate, misleading and fail to address my comments.

I. IMPACTS DUE TO CHANGES IN CRUDE SLATE WERE NOT EVALUATED

I previously commented that the Rail Spur Project would replace 97% of the baseline crude slate with up to 100% tar sands crudes. I noted that these new crudes have many chemical and physical properties that distinguish them from the baseline crude slate and that will result in impacts that were not evaluated in the Rail Spur Project RDEIR. I cited comments that I had previously made, which were attached to CBE's comments on the Rail Spur Project in Exhibits 2 and 3 (CBE-116). The responses to CBE-116 to CBE-120 assert that it examined changes in emissions associated with a change in crude slate as part of Impact AQ.2, assuming 100% tar sands crudes. My review of this analysis indicates that the FEIR did not evaluate changes in emissions associated with a change in crude slate, as I demonstrate below. The subject change in crude slate quality will result in significant on-site impacts that have not been disclosed to the public.

I.A Emission Changes Due to Changes in Flue Gas Composition

The tar sands dilbits proposed for import are rich in propane and butane. The RTC argues that any additional propane and butane in imported tar sands dilbits would be partitioned into the fuel gas due to their low boiling points.[8] In Comment CBE-117, I commented that if the increased amounts of propane and butane are partitioned into the refinery fuel gas, emissions would increase from heaters and boilers at the SMR.

First, I commented that the increased amount of propane and butane in the refinery fuel gas would increase combustion temperatures in all heaters and boilers because they burn with a hotter flame than natural gas. *Second*, I commented that propane and butane have higher GHG global warming potentials than other components in refinery fuel gas, which would result in elevated GHG emissions from all heaters and boilers. *Third*, I commented that increased propane and butane would increase the fuel gas heat content, potentially requiring modification or replacement of existing heater and boiler burners. None of these impacts were addressed in the RDEIR. None are addressed in the RTCs. Rather, these issues are sidestepped.

The response to Comment CBE-117directs to RTCs CBE-84, -85, and -111. These responses argue that the amount of propane and butane in "potential crude by rail sources" for two tar sands crudes (0.73% to 0.89%) are within the range of crudes currently refined at SMR (0% to 1.0%). This is misleading, as discussed elsewhere in these comments. *First*, the reported propane and butane in these two potential tar sands crudes are 5-year averages. Propane and butane in tar sands crudes vary depending on the season, increasing significantly in winter months. *Second*, maximum reported values for these two crudes are much higher the 5-year averages. Third, there are many other similar tar sands crudes with much higher propane and butane contents. *See* Table 7.

These responses also argue that most of the propane and butane is created during refining and that only 10% arrives in the crude oil. However, this is based on conventional crude oils, not tar sands dilbits, which are blends of bitumen and diluent. Diluents contain very high concentrations of propane and butane. Further, RTCs CBE-84 and CBE-85 address the Rodeo Refinery, not the Santa Maria Refinery; these two refineries operate on very different crude slates. If one assumes 10% is correct, tar sands dilbits could increase the amount of propane/butane arriving in the crude oil by factor of 2.5. If one-quarter of the refinery fuel gas were propane and butane, the

[8] RTC CBE-109.

impacts I identify in my comments would certainly be realized and would cause or contribute to significant air quality impacts.

I.A.1 Increased Combustion Emissions from Tar Sands Bitumens Not Evaluated

In Comment CBE-118, I commented that tar sands bitumens are composed of higher molecular weight chemicals and are deficient in hydrogen compared to conventional heavy crudes. This means more energy will be required and more combustion emissions (*e.g.*, NOx, ROG, GHG) will be produced to convert these crudes into the same slate of semi-refined and refined products as the current crude slate. More energy will be required to add hydrogen and break the bonds of the larger molecules. As the Rail Spur Project allows up to 97% of Santa Maria Refinery's crude slate to be replaced by tar sands crudes, emissions of criteria pollutants and greenhouse gases will increase from most fired sources as more heat will be required to break the bonds of these larger molecules.

The response to CBE-118 is not relevant at all. This response addresses the potential impact of increased amounts of propane and butane on fugitive emissions, *e.g.*, from pumps, valves, and connectors, not combustion sources. It does not even mention the impact of hydrogen deficiency and higher-molecular weight bitumen on emissions from fired sources. Thus, I reassert my original Comment CBE-118 and supporting information in attachments 2 and 3 to CBE's letter on the RDEIR.

In Comment CBE-119, I elaborated on the differences between the current crude slate and tar sands crudes, noting that Canadian tar sands bitumens are distinguished from conventional petroleum by the abundance of high-molecular weight polymeric material.[9] Canadian tar sands crudes have larger, more complex molecules such as asphaltenes and resins,[10] some with molecular weights above 15,000[11] that are not found in SMR's current crude slate. These heavy fractions have a marked effect on refining and result in the deposition of high amounts of coke during thermal processing in the

[9] O.P. Strausz, The Chemistry of the Alberta Oil Sand Bitumen, Available at: http://web.anl.gov/PCS/acsfuel/preprint%20archive/Files/22_3_MONTREAL_06-77_0171.pdf.

[10] Asphaltenes are nonvolatile fractions of petroleum that contain the highest proportions of heteroatoms, i.e., sulfur, nitrogen, oxygen. The asphalt fraction is that portion of material that is precipitated when a large excess of a low-boiling liquid hydrocarbon such as pentane is added. They are dark brown to black amorphous solids that do not melt prior to decomposition and are soluble in benzene and aromatic naphthas.

[11] O.P. Strausz, The Chemistry of the Alberta Oil Sand Bitumen, Available at: http://web.anl.gov/PCS/acsfuel/preprint%20archive/Files/22_3_MONTREAL_06-77_0171.pdf.

coker, which would occur at Santa Maria. They also require more intense processing in the coker to break them down into lighter products.

I further noted that these differences are not reflected in any of the lumper parameters (API gravity, vacuum residual ("resid") percentage, sulfur, TAN) presented in the FEIR and RDEIR.[12] These differences mean that the coker at Santa Maria will have to work harder to convert vacuum bottoms from distilling tar sand crude into gas oil, which will increase combustion emissions — NO_x, SO_x, CO, VOCs, PM10, PM2.5, and GHGs — as well as the amount of coke. These increases in emissions were not included in the emission inventory.

The response to CBE-119 concludes that "it is not anticipated that additional energy or coking requirements will be needed…" because the gravity and resid content of the crude is similar to the current crude slate, ignoring my comment that these lumper parameters do not address this issue.

First, the table comparing current and potential crude properties[13] does not include the resid content, one of the two factors the response relies upon.[14] Thus, there is no basis for half of RTC CBE-119's argument.

Second, the response cites an Argonne National Laboratory study as concluding "processing oil sands-derived crudes (syncrudes) does not impact the energy efficiencies of refineries." However, this study actually says:

> *Currently, Argonne's methodology pushes all the burden of oil sands processing to the upstream recovery steps. In the currently used methodology, processing oil sands-derived crudes (syncrudes) does not impact the energy efficiencies of refineries. Argonne will evaluate the existing arguments for separating the extra energy burdens of processing syncrudes between the oil sands recovery steps and the refinery processing.*[15]

In other words, this study didn't actually evaluate the impact of refining tar sands crudes on the energy efficiency of the refinery. Further, this study focused on SCO/syncrudes. A syncrude is the output from a bitumen/extra heavy oil upgrader

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[12] Rail Spur RDEIR, Table 4.3-13 and p. 4.3-70; Rail Spur FEIR, Table 2.7 and p. 2-34.

[13] Rail Spur FEIR, Table 2.7.

[14] The RDEIR included "vacuum resid" information, but it was removed from the FEIR. (RDEIR, Table 4.3-13). The FEIR data appears not to be representative as it was based on "Vacuum Resid percentages based upon *available* distillation curves." [*emphasis* added].

[15] Ignasi Palou-Rivera, Jeongwoo Han, and Michael Wang, Updates to Petroleum Refining and Upstream Emissions, October 2011, p. 7. (Exhibit 8)

facility and is an upgraded crude. It does not contain diluent, the source of LPG in tar sands dilbits. Thus, the Argonne study is of questionable relevance. This study just assigned the reduced efficiency to upstream tar sands processing. There are other studies, published in referred journals, which demonstrate that refining tar sands requires more energy than refining conventional crudes.[16]

Third, although API gravity is widely used as an indicator of the performance of a refinery on a given crude, it is well known in the industry that API gravity is not a good indicator for the refining qualities of tar sands crudes at issue here.[17]

Fourth, the response quotes the following sentence from the Argonne report: "Refineries consume more energy when processing heavier crudes. Heavier crudes have a larger vacuum residue fraction that needs to be upgraded in order to maintain a commercially viable product slate." As noted in my first point above, the RTCs and the FEIR fail to report resid fractions for the currently refined crude slate and tar sands crudes.

Fifth, API gravity data are unsupported. The summary table reports a typical API gravity of 18.6° and a range for major crude sources of 12.2° to 21.0°.[18] Neither the responses nor the FEIR provide the supporting data for this information. The footnotes to the summary table disclose that the typical blend is based on a 3-year average and the range is for "major sources of current crudes" that "include a number of OCS and local offshore sources." However, this is not sufficient to evaluate the relevance of this data. The following information must be supplied to evaluate its relevance: (1) the identification of the three years to determine if they are part of the baseline; (2) the specific crudes and their fraction of the total slate; (3) the range in the crude slate blend charged to the refinery; (4) other chemical and physical data including vacuum resid

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[16] G. Karras, Combustion Emissions from Refining Lower Quality Oil: What is the Global Warming Potential? *Environmental Science & Technology*, v. 44, no. 24, pp. 9584-9589, 2010 (Exhibit 19); Bredeson et al., Factors Driving Refinery CO2 Intensity, with Allocation into Products, *International Journal of Life Cycle Assessment*, v. 15, pp. 817-826, 2010 (Exhibit 20); J. J. P. Abella and J.A. Bergerson, Model to Investigate Energy and Greenhouse Gas Emissions Implications of Refining Petroleum: Impacts of Crude Quality and Refinery Configuration, Environmental Science & Technology, 2012 (Exhibit 21)

[17] Samuel A. Van Vactor, Pricing Royalty Crude Oil, Economic Insights, Inc., January 29, 2000, p. 8 ("Why are refiners willing to pay more for ANS than most California crude oils? In most instances it may simply be superior refining qualities (many of which are not explained by API gravity differences)."; p. 16 ("API gravity is a reasonable predictor of crude oil quality within a field, but not across fields."); Available at: http://econ.com/apijan00.pdf; Thomas Garrett and others, The Challenges of Crude Blending, Digital Refining Article 1001216, PTQ A1 2016 (Exhibit 4).

[18] Rail Spur FEIR, Table 2.7.

percentage, sulfur, and TAN. Further, a table must be supplied that lists each crude, the date sampled for all of the parameters reported in FEIR Table 2-7, the measured value, and the test method.

Finally, I commented that the differences between tar sands crudes and the current SMR crude slate are due to the nature of the high molecular fraction of the crudes. I specifically commented that these chemical differences are not reflected in any of the lumper parameters (API gravity, vacuum resid percentage, sulfur, TAN) reported in the Rail Spur RDEIR. In particular, I noted that these differences could result in more coke (and hence more coke trucks) and higher emissions of NOx, SOx, CO, ROG, PM10, PM2.5, and GHGs from fired sources. The response does not address this portion of my comment. Thus, I reassert it.

Therefore, I conclude that the Final EIR still fails to evaluate the impact of changes in crude slate chemistry on increases in emissions from refining tar sands bitumen.

I.B Emissions Changes Due to Increased Metals Content in Tar Sands Crudes

I commented in CBE-120 that tar sands crudes have higher metal content than the baseline crude slate, citing a U.S. Geological Survey ("USGS") report that found that "natural bitumen," the source of all Canadian tar sands-derived oils, contains 102 times more copper, 21 times more vanadium, 11 times more sulfur, six times more nitrogen, 11 times more nickel, and 5 times more lead than conventional heavy crude oil, such as those currently refined from local sources.[19]

The Rail Spur RDEIR[20] and FEIR[21] report vanadium and nickel concentrations in a current "typical crude blend" compared to two potential tar sands crudes. However, no information is reported for other heavy metals known to be enriched in tar sands crude, *e.g.*, mercury, copper, nickel, and lead. Further, no support is provided for the vanadium and nickel concentrations that are reported (*e.g.*, number of samples, dates collected, analytical reports, etc.).

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[19] R.F. Meyer, E.D. Attanasi, and P.A. Freeman, Heavy Oil and Natural Bitumen Resources in Geological Basins of the World, U.S. Geological Survey Open-File Report 2007-1084, 2007, p. 14, Table 1, Available at http://pubs.usgs.gov/of/2007/1084/OF2007-1084v1.pdf.

[20] Rail Spur RDEIR, Table 4.3-13.

[21] Rail Spur FEIR, Table 2.7.

I further commented that these metals end up in the coke and thus will be present in coke dust and coke pile runoff/seepage. The DEIR indicated that "[m]etals that are present in coke have been detected in groundwater at concentrations above the California Department of Health maximum contamination levels (MCL) in the area around the coke pile runoff area…" DEIR, p. 4.7-39/40. This statement vanished from the RDEIR after my comment with no explanation and is also not in the FEIR. A switch to tar sands crude could contribute to this existing significant impact from the coke pile as toxic heavy metals (*e.g.*, lead, mercury) may increase in the coke. This was not disclosed in the FEIR.

I also commented that the metal content of fugitive dust from the coke pile could increase to dangerous levels. The California Air Resources Board (CARB), for example, has classified lead as a pollutant with no safe threshold level of exposure below which there are no adverse health effects. Thus, just the increase in lead from switching to tar sands crude is a potentially significant on-site impact that is not disclosed in the FEIR and would not be mitigated by the three train alternative. Accordingly, accurate information on crude quality is critical for a thorough evaluation of the impacts of a crude switch, such as facilitated by rail import.

First, the response to CBE-120 incorrectly asserts that "… metals will remain in the coke and be transported by rail from the SMR for other uses."[22] I agree the metals will remain in the coke and that the coke will be transported by rail from the SMR. However, significant fugitive dust emissions occur between coke production in the cokers and rail transport from the facility. The coke is first dumped out of the bottom of two cokers into pits, transferred on a conveyor belt to a coke storage pile, and managed with front-end bucket loaders and bulldozers, which load the coke into trucks and railcars.[23] All of these operations generate significant amounts of coke dust, which is emitted into the air. The switch from local crudes to tar sands crudes may elevate the metal content of this dust, potentially resulting in significant public health and other impacts.

The new unloading facility and the railroad are located adjacent to the coke storage area on entering and leaving the Refinery. The proposed rail spur would traverse the coke fields.[24] In fact, the unloading facility would be located at the end of

[22] RTC CBE-120.

[23] Throughput Increase FEIR, p. 2-13.

[24] Rail Spur FEIR, Figure ES-2, 1-2, 2-3, 2-4.

the existing coke storage area.[25] Google Earth shows the coke handling area contains a large area covered with black coke. *See* Figure 1. Coke dust in these storage areas will be disturbed by passing unit trains, entering and leaving the facility. This would increase coke dust emissions compared to baseline conditions. This dust could also deposit on railcars, which would subsequently be released along the rail tracks on leaving the facility.

Figure 1: Santa Maria Refinery Coke Storage Area[26]

Coke dust emission problems are legendary in the refining industry and were not evaluated in the FEIR. I personally have worked on many. As a result, many coke storage piles are enclosed.[27] The Santa Maria coke piles are not enclosed. Dust is only controlled using water sprays, which allows significant coke dust emissions, especially

[25] Rail Spur FEIR, p. 1-1.

[26] Laurance Shinderman, Comments on Recirculated EIR, October 22, 2014; Available at: http://www.slocounty.ca.gov/Assets/PL/Santa+Maria+Refinery+Rail+Project/FEIR+Phillips+Rail+Spur+Project+Dec+2015/Response+To+Comments/4_General+Public/Shinderman+Laurance.pdf.

[27] Sarah Kramer, Extension Denied: Pet Coke Piles Must be Covered by June 2016, Medill Reports Chicago, February 17, 2015; Available at: http://news.medill.northwestern.edu/chicago/extension-denied-pet-coke-piles-must-be-covered-by-june-2016/; Sandra Murillo, Port of L.A. Covers Its Petroleum Coke, May 17, 2002, Los Angeles Times; Available at: http://articles.latimes.com/2002/may/17/local/me-coke17.

during the frequent high-wind events in the area. Thus, elevated levels of metals present in the tar sands crude will be present in emitted coke dusts, resulting in potentially significant environmental problems, as described in my comments on the RDEIR, but not addressed in the FEIR.

Second, the response to CBE-120 asserts that "emissions from the coke piles have not been found to contribute to dust emissions on the Mesa." However, the cited study only investigated a known high PM10 anomaly on the Nipomo Mesa, which is not near the coke pile. The affected receptors would include residential areas to the north and agricultural lands to the south of the coke handling operations. The FEIR did not evaluate the impacts of unit train traffic on coke dust emissions, increased metals in coke particulate matter on public health, or the impact of these metals on locally grown crops or their uptake through the food chain.

Third, as to the impacts of increased metals in coke dust on the groundwater contamination in the vicinity of the coke pile, the response to CBE-120 asserts that because the Regional Water Quality Control Board (RWQCB) was not concerned about this issue in Throughput EIR discussions, it is not an issue here either. However, the Throughput EIR is not relevant as it did not consider the existing groundwater contamination issue disclosed in the Rail Spur DEIR, which was inexplicably deleted in the Rail Spur RDEIR. Further, even if it had, any conclusions in that case would be irrelevant here as the Throughput FEIR did not involve a crude slate switch to tars sands crudes with elevated metals that are partitioned to the coke or a new rail spur and unit trains that could generate dust.

In sum, none of the issues I raised as to elevated levels of metals in coke were addressed in the RTC. I thus re-assert my prior comments.

II. RAILCAR FUGITIVE ROG EMISSIONS ARE SIGNIFICANT

I commented that railcars emit ROG and TACs from their point of origin through unloading as railcars are not vapor-tight. I presented an estimate of railcar fugitive ROG emissions based on the lower end of the reported crude shrinkage range (0.5% loss during transit). My estimate of ROG emissions within the SLOCAPCD (2,200 lb/day) exceeded the SLOCAPCD ROG+NOx significance threshold of 25 lb/day by two orders of magnitude, requiring additional mitigation.[28] The response to this comment asserts that the EIR included railcar fugitive emissions and that they are nominal, totaling only

[28] Comment CBE-122.

about 0.02 lbs per round trip within SLO County, based on fugitive leaks from tank car components.[29]

In response, I reviewed the FEIR's estimate of railcar fugitives. The FEIR substantially underestimated these emissions due to numerous errors and omissions in its calculations. When these errors and omissions are remedied, railcar fugitive ROG emissions from on-site operations and within all air districts through which the trains pass, are highly significant, exceeding both daily and annual CEQA significance thresholds, except Placer County APCD (for daily ROG) and SLOCAPCD (for annual ROG+NOx).

Railcar fugitive emissions arise from leaking valves, fittings, and closures on the railcars[30]. They were estimated in the FEIR using stationary source fugitive emission factors for oil and gas production facilities, in kilograms per hour per component (kg/hr/comp), assuming one flange per rail car; one pressure relief valve (PRV) on only one-quarter of the railcars (i.e., 20 on an 80 car unit train); and one open-ended line, open for only 5 minutes per tank car during unloading.[31]

There are many errors and omissions in the FEIR's calculations, summarized below. I recalculated railcar fugitive emissions, using the FEIR's fugitive component approach, but modified to correct errors and omissions. My calculations indicate railcar fugitive ROG emissions are 8.6 pounds per mile traveled per day (lb/mile-day) and 1.1 tons per mile traveled per day (ton/mile-yr), based on the FEIR's calculation method, but correcting errors and omissions.

Before starting, I note that the response to this comment stated that railcar fugitive emissions are 0.02 lb/round trip per train within SLO County.[32] However, the FEIR reports 0.14 lb/day for one train roundtrip.[33] The cited emissions of 0.02 lb/roundtrip appear to be only the emissions from the tank car top valve during unloading.

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[29] RTC CBE-122.

[30] Watco Compliance Services, Securement of Hinged and Bolted Manway's and Service Equipment Inspection --Potential Leak Paths; Available at: https://www.fra.dot.gov/Elib/Document/3301.

[31] Rail Spur FEIR, p. B-17.

[32] RTC CBE-122.

[33] Rail Spur FEIR, p. B.1-7.

II.A Fugitive Emission Factors

The FEIR's railcar fugitive emission calculations are based on emission factors for fugitive components (valves, connectors, open-ended lines) in oil and gas production facilities, which are stationary sources.[34] These are not representative of railcar components (PRVs, pressure relief vents,[35] manways, bottom and top fittings) on unit trains travelling at up to 50 miles per hour (mph) over mountainous terrain and in terminal and switching operations.

In railcars, particularly when travelling in mountainous terrain or in railyard and switchyard operations in which impacts occur, the contents are sloshed about, outgassing ROG and creating pressure surges which can push headspace gases out of tiny openings in connectors, valves, vents, PRVs, and other fugitive components. These high-pressure surges created by sloshing are often great enough to exceed the pressure relief vent pressure, resulting in a release. Or if equipped with a disc, pressures are high enough to burst the disc, leaving the vent open for the remainder of the trip.

These are well known problems in rail transportation that have been studied but not eliminated.[36] Many tank cars are still equipped with these valves. Further, as the transported crude oil warms up, it expands, and the internal pressure of the tank car increases. Pressure relief valves are used to periodically relieve this pressure to ensure the internal pressure does not increase to dangerous levels, damaging the car shell. Sloshing and elevated temperature can result in direct releases to the environment of much larger amounts of ROG than would be released from a PRV at an oil and gas production facility. The emission factors that the FEIR used do not consider these enhanced leak mechanisms, as they are based on stationary sources.

II.B Number and Type of Fittings

The FEIR assumed each railcar is equipped with 1 flange and a top valve that is open for only 5 minutes, presumably during unloading. The FEIR also assumed that

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[34] CARB, Mass Emissions of Fugitive Hydrocarbon Leaks at Petroleum Facilities, Table IV-2c, 1999; Available at: http://www.arb.ca.gov/fugitive/impl_doc.pdf.

[35] A pressure relief vent, designed to prevent or forestall over-pressuring the tank in event of exposure to fire, uses a frangible (breakable) disk that bursts at its rated pressure and remains open until replaced. They are distinguishable from pressure relief valves (PRVs), which self closes after a release.

[36] M.R. Saat, C.P.L. Barkan, and T.T. Treichel, Statistical Approach to Estimating Surge Pressure Reduction Devices' Performance, Railway Supply Institute Report R-974, November 2005; Available at: https://www.aar.org/Documents/NAR/RA_05-01_SPRD_Peformance_Saa_Nov_05.pdf.

one quarter of the railcars in a unit train, or 20 out of 80, also would have a PRV.[37] This is a gross underestimate of the number of components on railcars that routinely leak while in transit. Another recent EIR for a similar rail terminal, the Recirculated Draft Environmental Impact Report (RDEIR) and Final Environmental Impact Report (FEIR)[38] for the Valero Refinery[39] (referred to in these comments as the Valero RDEIR, as this is where the railcar fugitive emission calculations are found) assumed that each tank car would have 2 PRVs, 1 liquid valve, 3 gas valves, 9 gas connectors, and 2 liquid connectors.[40] The Santa Maria FEIR does not disclose any authority for the very small number of fugitive components on railcars assumed in its calculations. This small number is clearly wrong, as discussed below, thus substantially underestimating railcar fugitive ROG emissions. Further, assuming only one quarter of the railcars has a PRV is inconsistent with the description of the tank car models that may be used by the Project, which show that all are equipped with a "reclosing pressure relief device."[41]

Industry literature identifies many more sources of fugitive leaks from railcars that fall into the general classes of closures,[42] fittings,[43] and valves[44]. They include the fill hole cover, manway cover, stuffing box for bottom outlet valve, bottom outlet, loading/unloading valves, air inlet valve, vapor line, vacuum release valve, liquid line flange, gauging devices, sample lines, thermometer wells, heater coils, washout nozzle/plate and sump, leaks in liquid lines, and leaks at welds. Pressure relief devices, *i.e.*, rupture discs or safety vents, may also be present.[45] These remain open for

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[37] Rail Spur FEIR, p. B.1-7.

[38] City of Benicia, Valero Benicia Crude by Rail Project, Final Environmental Impact Report, SCH # 2013052074, Use Permit Application 12PLN-00063, January 2016; Available at: http://www.ci.benicia.ca.us/index.asp?SEC=%7BFDE9A332-542E-44C1-BBD0-A94C288675FD%7D.

[39] City of Benicia, Valero Benicia Crude by Rail Project, Revised Draft Environmental Impact Report, SCH # 2013052074, Use Permit Application 12PLN-00063, August 2015; Available at : http://www.ci.benicia.ca.us/vertical/Sites/%7B3436CBED-6A58-4FEF-BFDF-5F9331215932%7D/uploads/Valero_Benicia_Crude_by_Rail_RDEIR_Complete_Version.pdf.

[40] Valero RDEIR, pp. A-11/14.

[41] Rail Spur FEIR, Table 2.

[42] A closure is a device that closes an opening, such as blind flanges and pipe plugs.

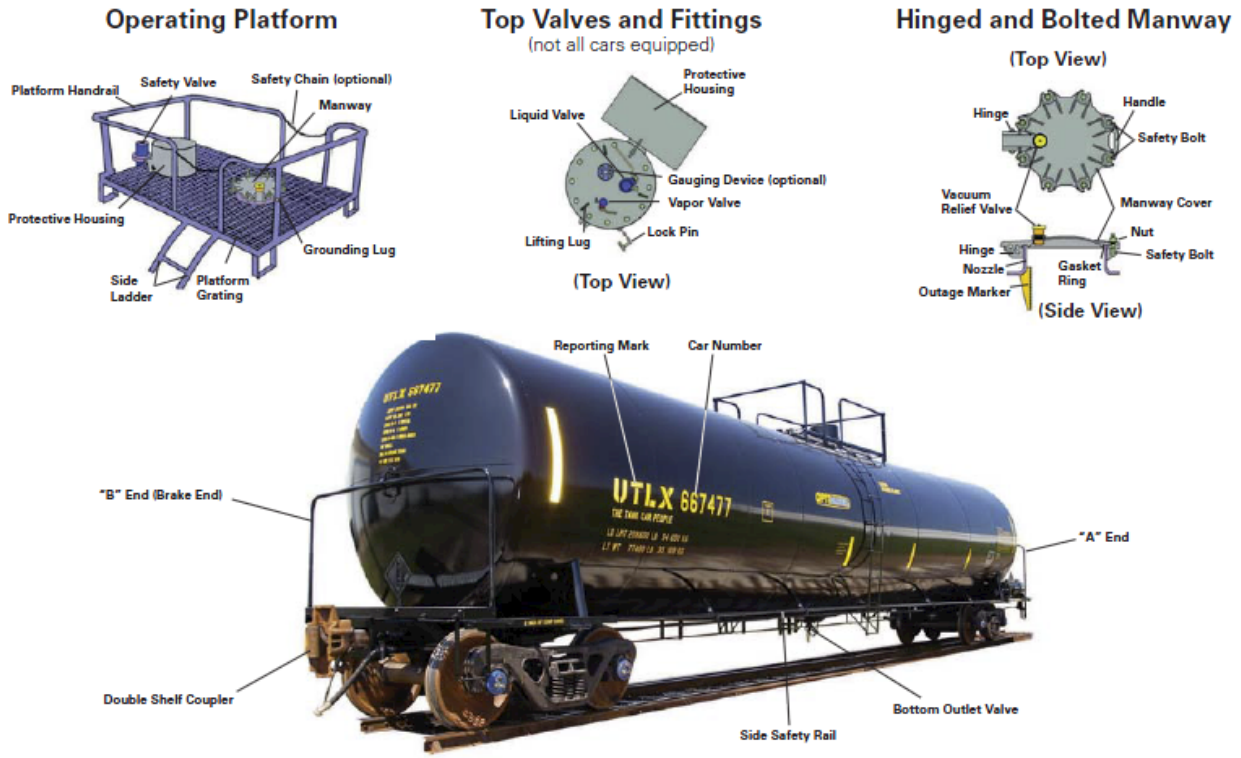
[43] A fitting is a device that joins two or more devices or couplings.

[44] A valve is a device designed to direct, start, stop, mix, or regulate the flow, pressure, or temperature of a process fluid.

[45] *See*, for example, Charles J. Wright, Assessing Tank Car Damage, Union Pacific Railroad, Participant's Manual: Tank Car Safety Course, July 2007; Available at: http://www.iafc.org/associations/4685/files/haz09_spkr410-assessingTankCarDamage.pdf; Association of American Railroads, Field Guide to Tank Cars, 2010; Available at: http://www.bnsfhazmat.com/wp-content/uploads/2015/06/4185_Field_Guide_To_Tank_Cars1-
(cont'd)

the duration of the trip if triggered by pressure surges, which are likely due to sloshing in the mountainous California terrain. In contrast, a pressure relief valve or PRV is spring-loaded and recloses after excessive pressure in the tank. Diagrams of some of these fitting are shown in Figure 2. Photographs of each can be found in the technical literature.[46] Each area of the railcar that includes leak points is further discussed below.

Figure 2: Tank Car Fittings[47]



opt.pdf; Tank Car Loading and Unloading, May 8, 2014; Available at: https://www.youtube.com/watch?v=1PzNbQlvgDw; TransQuip USA, General Service Car Fittings 101; Available at: www.fra.dot.gov/Elib/Document/3441; Watco Compliance Services, Securement of Hinged and Bolted Manway's and Service Equipment Inspection – Potential Leak Paths; Available at: https://www.fra.dot.gov/Elib/Document/3301.

[46] *See*: TransQuip USA, General Service Car Fittings 101; Available at: www.fra.dot.gov/Elib/Document/3441; Watco Compliance Services, Examination Before Shipping: Best Practices for Loading and Off-Loading Tank Cars Based on AAR Pamphlet 34; Available at https://www.fra.dot.gov/Elib/Document/3447.

[47] BP, General Purpose Tank Car, Available at: http://www.bp.com/content/dam/bp-bitumen/en_us/documents/bp-tank-car-poster.pdf.

Manway Seals and Top Fittings: The manway is typically an 18 inch or 20 inch cylinder with a hinged lid that allows access into the railcar from above for maintenance and cleaning. There are usually 6 to 8 eye bolts that secure the manway when not in use. The manway area may also include top fittings: loading/unloading vales, an air inlet valve, a vacuum release valve, and a gauging device. Each of these may emit fugitive ROG.

Bottom Fittings and Liquid Lines: The main railcar bottom fitting is generally a 4-inch valve located at the center bottom used to unload the car. Most of these valves have a handle located on the exterior of the tank, while some have a shaft running to the top of the tank to allow operation from the top. The bottom fitting may also include liquid lines required to fill or empty the railcar and washout nozzles used in car cleaning. Each of these may emit fugitive ROG.

Tank Shell and Safety Head: The railcar shell is a cylindrical tank and tank heads, curved at the ends. These tank car structures are joined by welding. Cracking due to fatigue or sudden impact is most likely to occur in the vicinity of welds. Any cracks would emit fugitive ROG.

Each of these components may release ROG into the atmosphere even if the components or associated gaskets are properly sealed. They release substantially more if not properly sealed. The major source of non-accident releases is the manway (*e.g.*, loose bolts, deteriorated gasket, misaligned gasket), followed by the liquid line (*e.g.*, threaded valve loose) and fill hole (*e.g.*, loose bolts, misaligned or deteriorate gasket, misaligned cover). These major leaking components were not included in the FEIR's railcar calculations.

Leak Detection and Repair (LDAR) programs at stationary sources use VOC detectors to find leaks so they can be repaired. LDAR programs are not used for railcars, allowing leaks to go undetected.

In my revised calculations, I used the number and type of fittings assumed in the Valero FEIR. The Valero fugitive component count is also an underestimate, based on industry literature. However, there is currently inadequate information in the record to support a different estimate. Applicants who propose rail terminals should be required by the lead agency to inventory fugitive components on the railcars they propose to use and the assumed number should be verified by an enforceable condition that requires post-project inventorying and reporting.

II.C Fugitive Component Leak Rate

The FEIR used the Screening Value Range Method (Leak/No Leak Method) from a 1999 CARB report[48] to estimate ROG emissions from railcar fugitive components. This method reports two sets of emissions factors. The first set, the "no leak" factors, is applied to components that are known to have a leak rate of less than (<) 10,000 parts per million (ppm), based on actual measurements. The second set, the "leak" factors, are applied to components that are known to leak at greater than or equal to (≥) 10,000 ppm. This method presumes the presence of a Leak Detection and Repair (LDAR)[49] program in which VOC emissions from fugitive components are regularly measured, so leak data are available that allow classification of the components into "leak" and "no leak" groups.[50] The FEIR relied on this leak/no leak method for oil and gas production facilities.[51] The FEIR's railcar fugitive emissions used the lower end of the range, for no-leak components, assuming all fugitive components leak at <10,000 ppm, without any data to support this choice.

I am not aware of any fugitive leak rate emission factors for railcars. However, the no leak factors are not applicable in this case and substantially underestimate ROG emissions for several reasons. *First*, railcars do not have to comply with a LDAR program, which keeps leak rates low by routinely measuring VOC emissions at the component face and fixing leaks as they occur. *Second*, the fugitive components are present on a mobile source, subject to acceleration, deceleration, and sloshing, which affect the integrity of the connections and increase leak rates. *Third*, the Federal Railroad Administration (FRA) has reported an increasing number of incidents involving damage to tank cars in crude oil service in the form of severe corrosion of the internal surface of the tank, manway covers, and valves and fittings.[52] This corrosion would significantly increase the leak rate. *Fourth*, PRVs can vent during transit, which is not considered at all in the CARB emission factors. Venting could result, for example, from high ambient temperatures. *Fifth*, on-site preparation of railcars for unloading

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[48] CARB, California Implementation Guidelines for Estimating Mass Emissions of Fugitive Hydrocarbon Leaks at Petroleum Facilities, February 1999, Available at: http://www.arb.ca.gov/fugitive/impl_doc.pdf.

[49] A LDAR program identifies leaks using an Organic Vapor Analyzer (OVA). Any identified leaks are repaired on line within a time certain.

[50] CARB 1999, pp. 11-12.

[51] CARB 1999, Table IV-2c.

[52] Letter from Thomas J. Herrman, Acting Director, Office of Safety Assurance and Compliance, to Jack Gerard, American Petroleum Institute, July 29, 2013; Available at: https://www.fra.dot.gov/eLib/details/L04717.

releases emissions from many fugitive components that must be opened for access, including gauges, manways, top and bottom values, hatches, and connectors. *Sixth*, as noted elsewhere, railcars are typically underfilled, which results in significant sloshing in California's mountainous terrain and outgassing of vapors from the crude oil cargo, which create pressure that pushes headspace gases through openings in the fugitive components.

Thus, the higher leak rate emission factors should be used for railcars. The upper-bound leak-rate (≥10,000 ppm) emission factors are 3,700 (light crude oil valve) to 10,800 (light crude oil flange) times greater than the lower bound (<10,000 ppm) emission factors at oil and gas production facilities used in the FEIR. In my revised emission calculations, I used the upper bound oil and gas production emission factors.

II.D Service Type

The service type is the material in contact with the fugitive component. Where available, the CARB emission factors are reported for three "service types": (1) gas/light liquid; (2) light crude oil; and (3) heavy crude oil. Fugitive components at the bottom of railcars would be in crude oil service while those at the top would be in gas service. Components in gas service generally have the highest emission factors. The FEIR estimated fugitive emissions assuming all components were in light crude oil service.[53] This is a reasonable choice for components in contact with oil, at the bottom of the car, when the crude oil is tar sands dilbits,[54] as they have API gravities of 20°+ and given the limit of 30° API in mitigation measure HM-2d.[55]

However, rail cars are not topped off, so components at the top of the railcar would be in gas service. Regulations require that railcars be underfilled by 1% but railcars are typically underfilled by a much larger amount.[56] Thus, components on the

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[53] Rail Spur FEIR, p. B.1-7.

[54] Rail Spur FEIR p. 4.3-47 ("The EPA AP-42 emission factor for light crude oil was used as a conservative estimate for crude oils that are medium API (over API20").

[55] Rail Spur FEIR, p. 4.7-88.

[56] U.S. Department of Transportation, Final Regulatory Analysis, Docket No. PHMSA-2012-0082, Hazardous Materials: Enhanced Tank Car Standards and Operational Controls for High-Hazard Flammable Trains, Final Rule, May 2015, pp 159-160 ("Surprisingly, most, if not all, shippers of crude oil do not know the unit weight of the lading in each tank car at a reference temperature (115°F) so they short load the tank. Based an audit of loading facilities in the Bakken, most offerors require a minimum of 3-5% outage after the tank has been loaded. Additionally, based on information obtained during Operation Classification, it was learned that the actual outage in tank car ranges from 3-9%. Short loading ensures a shipper that the tank car is in compliance with current regulations.")
(cont'd)

top of the car are in contact with vapors that outgas from the crude oil. Components in contact with gases generally have much higher leak rates than those in contact with oils. Further, the tar sands crudes are not a homogenous mixture. After several days of delivery time, layering occurs with water and sediment on the bottom and light products on top,[57] where they may outgas and leak at fugitive components. The 1999 CARB report does not include any emission factors for heavy crude oil for any facility type, with the exception of open-ended lines at oil and gas production facilities. The heavy crude oil emission factor in that case (7.11E-02 kg/hr/comp) is more than 3 times higher than the light crude oil factor (2.22E-02 kg/hr/comp).[58] Thus, in my revised fugitive emission calculations, I use the light crude oil factors for components in contact with oil and the gas/light liquid factors for components in contact with headspace gases, following the protocol used in the Valero EIR.[59]

II.E Valves

Each railcar has **at least** two valves – an inlet/outlet valve and a pressure relief valve (PRV). These valves are located either on the top center of the car or, less frequently, on the bottom center.[60]

II.E.1 Conventional Valves

The FEIR assumed each rail car would be equipped with a tank car top valve, represented by an open-ended line that would be open for only 5 minutes per tank car during unloading, resulting in ROG emissions of 0.0205 lb/day. I was unable to verify this calculation. Further, this value (0.0205 lb/day) was inserted as a value into the live spreadsheets provided by the County, without any supporting calculations. Thus, it is unsupported in the record.

The emission factor for an open-ended line at an oil and gas production facility for light crude oil is 1.8E-5 kg/hr/comp. Based on the footnote to the fugitive emission

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http://www.regulations.gov/contentStreamer?documentId=PHMSA-2012-0082-3442&attachmentNumber=1&disposition=attachment&contentType=pdf.

[57] Gary Weimer, Irving Oil, Crude by Rail Quality Issues, June 6, 2013, pdf 16; Available at: http://www.coqa-inc.org/docs/default-source/meeting-presentations/20130606_weimer.pdf?sfvrsn=2.

[58] CARB 1999, Table IV-2c.

[59] Valero RDEIR, Appx. B.

[60] Greg Johnson, Where Valves Are Used: Tank Cars, Valve Magazine, April 17, 2014, Available at: http://www.valvemagazine.com/index.php/magazine/sections/where-valves-are-used/5827-tank-cars.

table in Appendix B.1[61], the ROG emissions should be 0.00635 lb/day.[62] Thus, there is either an error in the calculation, or a failure to explain the methodology.

In addition to its failure to support the open valve calculation, the FEIR also failed to include leakage when the valve is closed. Valves leak in the closed position, not just when open. The FEIR does not include any emissions from the valve in a closed position. In my revised emission calculations, I included emissions from the valve in its closed position, based on the oil and gas production upper bound valve emission factor for light crude oil.

II.E.2 Pressure Relief Valves

The FEIR estimated ROG emissions from pressure relief valves (PRVs) using a light crude oil generic conventional "valve" emission factor in oil and gas production, assuming a leak rate of <10,000 ppmv.[63] A conventional valve and a pressure relief valve emit different amounts of ROG, especially on railcars. Pressure relief valves would have much higher emissions than a conventional valve.

Other tables in the CARB report relied on in the FEIR indicate that emissions from PRVs are 6[64] to 75[65] times higher than from conventional valves at stationary sources and would be even higher for moving railcars, due to sloshing and periodic releases. In my revised railcar fugitive emission calculations, I used the lower end of this range (6 × normal valve) to adjust the "oil and gas" ≥ conventional valve emission factor to a PRV basis.[66]

Further, as noted above, the FEIR also assumed that only one-quarter of the railcars would have PRVs. This is wrong. Each railcar must have at least one PRV to meet regulations and a top or bottom unloading valve. Thus, in my revised calculations, I followed the procedure in the Valero FEIR, and assume two PRVs per railcar.

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[61] Footnote: "Tank car top valve based on open ended lines for 5 minutes per tank car during unloading."

[62] Tank car top valve = (1.8E-5 kg/hr)(5 min/60min/hr)(2.204 lb/kg)(80 cars)(24 hr/day) = 6.35E-3 lb/day.

[63] The PRV emission factor reported in FEIR, p. B.1-7 is 1.90E-05 kg/hr/comp. CARB 1999, Table IV-2c indicates that this emission factor is for a light crude oil valve with a leak rate <10,000 ppm.

[64] CARB 1999, Table IV-2a (refinery screening: 1.691/0.2626 = 6.44).

[65] CARB 1999, p. 12 (3 refinery heaters: 4.47E-2/6.0E-4= 74.5).

[66] Adjusted PRV emission factor: (7.07E-2 kg/hr/comp)(6) = 0.42 kg/hr/comp.

II.F Flanges

The FEIR estimated emissions from flanges using a <10,000 ppmv emission factor of 2.4E-5 kg/hr/comp (light crude oil). The corresponding ≥10,000 ppmv emission factor is 2.6E-1 kg/hr/comp (gas),[67] or 10,800 times higher.[68] Measurements on threaded pipe connections and quick connect couplers on stationary railcars at a loading terminal indicate that ROG emission factors range from 0.0025 to 0.0097 kg/hr/comp[69], or factors of 104 to 404 times higher than the <10,000 ppm factor used in the FEIR's calculations. I used the ≥10,000 ppm emission factor for the oil and gas production section relied on in the FEIR in my revised calculations.

II.G Empty Railcars

The FEIR did not distinguish between full and empty railcars. Some crude oil would be present in the unloaded railcars as deposits on the railcar walls and within piping and fugitive components (referred to as "clingage"). This residual oil would outgas into the railcar interior and be emitted from the fugitive components, propelled by changes in temperature, wind shear across rail car surface, railcar movement, from open hatches, gaging losses, and connect and disconnect losses.

Unloaded railcar emissions presumably would be lower than loaded railcar emissions. Similar calculations in the Valero FEIR assumed a 5% "dilution factor," based on filling the empty railcars with air. Estimates by others suggest 5% underestimates these emissions.[70] I used the 5% dilution factor to assure a conservative estimate.

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[67] CARB 1999, Table IV-2c and FEIR, p. B.1-7.

[68] ((2.4E-5 kg/hr/comp)/(2.1E-1 kg/hr/comp) = 10,833.3.

[69] Albert Hendler and others, Measurement of VOC Emissions f rom Pressurized Railcar Loading Arm Fittings, July 31, 2006; Available at: http://files.harc.edu/Projects/AirQuality/Projects/H051A/H51AFinalReport.pdf.

[70] An estimate made by Ohio EPA reported purging emissions from railcars that previously contained crude oil of 132 pounds per rail car during railcar cleaning. In addition, each unloaded railcar would have residual crude oil that clings to the inside of the railcar and fittings and can outgas ROG during transit, replenishing any lost vapors during transit. The Ohio permit evaluation estimated 0.1 bbl/1000 ft^2 based on AP-42, Table 7.1. An EPA study found that the volume removed in cleaning tank cars that transported petroleum and coal products averaged 128 gallons. *See, e.g.,* OhioEPA, Draft Air Pollution Permit-to-Install and Operate, January 16, 2014, pdf 5 - 6; Available at: http://wwwapp.epa.ohio.gov/dapc/permits_issued/1103115.pdf and EPA, Final Development Document for Effluent Limitations Guidelines and Standards for the Transportation Equipment Cleaning Category, Report EPA-821-R-00-012, June 2000, Table 4-3; Available at:
(cont'd)

II.H Revised Railcar Fugitive ROG Emissions

I corrected most of these errors and omissions and recalculated fugitive railcar ROG emissions, otherwise using the FEIR's method based on oil and gas production emission factors. I prepared calculations for two cases: (1) railcars on site and (2) for railcars in transit in air districts from the California border to the site. These calculations are in Exhibit 1 and summarized in Tables 1 and 2. I assumed the following in these calculations:

- Rail car service (gas or crude oil), equipment count, and 5% dilution factor for empty railcars were based on Valero RDEIR, Appx. A, pp. A-11/14;
- Emission factors from CARB 1999, Table IV-2e, for oil and gas production, upper bound screening factors (≥10,000 ppmv);
- Hours on site from FEIR, Table 2.5 (11.5 hours per unit train visit);
- PRV emission factor is 6 times that for a conventional valve;
- Departing rail car emissions calculated assuming 5% dilution factor;
- VOC emissions are assumed to be 100% ROG, based on crudemonitor.ca; and
- Average train speed of 26 mph.

II.H.1 On-Site Railcar Fugitive ROG Emissions

The revised on-site railcar fugitive emissions are 2,587 lbs per unit train visit, assuming oil and gas production emission factors.[71] Assuming 5 unit trains per week, this works out to 336 ton/yr.[72] Assuming 3 unit trains per week, this works out to 202 ton/yr.[73] These emissions exceed the SLOCAPCD ROG+NOx CEQA significance thresholds of 25 lb/day and 25 ton/yr.[74] Thus, ROG emission from on-site railcar

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http://www.epa.gov/sites/production/files/2014-03/documents/tec_development_doc_final_2000.pdf.

[71] Exhibit 1, Tab: OnSite, Cell: G31.

[72] Annual railcar ROG emissions for 5 unit trains per week, using oil & gas production emission factors = [2,587 lb/train x 5 trains/week x 52 weeks/yr]/2000 lb/ton = 336 ton/yr.

[73] Annual railcar ROG emissions for 3 unit trains per week, using oil & gas production emission factors = [2,587 lb/train x 3 trains/week x 52 weeks/yr]/2000 lb/ton = 202 ton/yr.

[74] Rail Spur FEIR, Table 4.3-9.

fugitive leaks alone are a significant, on-site unmitigated operational air quality impact that was not disclosed in the FEIR.

If marketing terminal emission factors are used, as assumed in the Valero calculations, but otherwise using the assumptions above, the on-site, per-unit-train ROG emissions drop to 790 lb per unit train visit[75] or 45 ton/yr for the 5 unit train case[76] and to 62 ton/yr for the 3 unit train case.[77] The CEQA ROG+NOx significance thresholds for the SLOCAPCD are 25 lb/day and 25 ton/yr.[78] Thus, both daily and annual ROG emissions are significant for both the 5 and 3 train per week cases. Further, these emissions bound those I calculated in my Comment CBE-122 using the lower end of the crude shrinkage range, or 2,200 lb/day.

I also commented in CBE-122 that these ROG emissions contain substantial amounts of toxic air comments (TACs), up to 7% benzene by weight. The RTC did not respond to this comment. Assuming 7% benzene in the ROG emissions, benzene emissions could be up to 181 pounds per unit train visit to the SMR[79] or 24 ton/yr for the 5-car per week case[80] and 14 ton/yr for the 3-unit train per week case.

II.H.2 Off-Site Railcar Fugitive ROG Emissions

I next calculated railcar fugitive ROG emissions for each air district along the three routes that unit trains would take from the California border to the Project site: (1) northern route via Oakland; (2) northern route via Altamont; and (3) southern route. ROG emissions were estimated using emission factors in pounds of ROG emitted per mile traveled per day (lb/mi-day) and in tons of ROG emitted per mile traveled per day (ton/mi-yr), calculated using the procedure developed in the Valero RDEIR.[81] The average ROG emission factors are 8.6 lb/mi-day and 1.1 ton/mi-yr.[82]

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[75] Exhibit 1, Tab: OnSite, cell: J31.

[76] Annual railcar ROG emissions for 5 unit trains per week, using marketing terminal emission factors = [790 lb/train × 5 trains/week x 52 weeks/yr]/2000 lb/ton = 103 ton/yr.

[77] Annual railcar ROG emissions for 3 unit trains per week, using marketing terminal emission factors = [790 lb/train × 3 trains/week x 52 weeks/yr]/2000 lb/ton = 62 ton/yr.

[78] Rail Spur FEIR, Table 4.3-9.

[79] Benzene in ROG emissions = 0.07(2587 lb ROG/visit) = **181.1 lb/visit**.

[80] Benzene emissions for 5 trains/wk = (336 ton/yr ROG/visit)(0.07) = **23.5 ton/yr** benzene; benzene emissions for 3 trains/wk = (202 ton/yr ROG/visit)(0.07) = **14.1 ton/yr** benzene.

[81] Valero RDEIR, Appx. A.

[82] Exhibit 1, Tab: LbMiDay, Cells: H15 & K15.

These calculations require the use of train speed in miles per hour (mph), a variable not used in the FEIR's railcar fugitive ROG emissions. However, in its locomotive calculations, the FEIR relies on a train speed of 40 mph with the exception of the distance between the San Luis Obispo County line to the SMR, over Cuesta Grade, where an average train speed of 20 mph is assumed.[83] These are very high for the terrain that will be traversed because:

a) some of the routing is mountainous where trains will move slower and pause to add/drop helper engines;

b) some of the routing is in urban areas where speeds may be lower, *e.g.*, Bay Area, Sacramento and Los Angeles;

c) crude unit trains are long and heavy; and

d) there may be congestion and delays, especially in areas with lots of rail traffic and passenger trains that have priority (such as Roseville-through the Bay Area and around Los Angeles).

The Surface Transportation Board (STB) requires weekly data collection, including average rail speed for various commodities. The Union Pacific reported a system-wide average train speed for crude shipments of 23 to 26 mph.[84]

Alternatively, in a recent DOT rulemaking, it was assumed that unit trains travel 220 miles per day and make 16 round trips per year.[85] Assuming a 3,000-mile roundtrip and 1 day loading and 1 day unloading yields 11.6 linehaul days, which works out to an average speed of 11 mph.[86] Thus, a more reasonable range for unit train speed is 11 to 26 mph. I used the upper end of this range, or 26 mph in my revised calculations to be conservative. However, a much lower speed is justified for much of the terrain the

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[83] Rail Spur FEIR, p. B.1-9, 'Locomotive Emissions.' *See*: "Average Line Haul Speed, mph" and "SM to LO time (20 mph)".

[84] Calculated by dividing train-miles by total hours from origin to destination, less intermediate terminal time. Excludes the following train categories: yard, local, passenger, foreign, and maintenance of way. *See*: http://www.up.com/cs/groups/public/@uprr/@newsinfo/documents/up_pdf_nativedocs/ep724-stb-data-spreadsheet.pdf.pdf.

[85] Final Regulatory Impact Analysis, DOT Final Rule for High-Hazard Flammable Trains, May 2015, pp. 150, 153, 233; Available at: http://www.regulations.gov/contentStreamer?documentId=PHMSA-2012-0082-3442&attachmentNumber=1&disposition=attachment&contentType=pdf.

[86] The average speed, assuming a 3,000 mile roundtrip, 1 day loading, and 1 day unloading: (3000 mi/220 mi/day) - 1 day loading – 1 day unloading = 11.6 line haul days. The average speed then is: 3000/(11.6×24)=10.8 mph.

Santa Maria trains would traverse within California, which would significantly increase fugitive ROG emissions beyond the levels I estimated.

Regardless, high speeds may actually increase leakage from rail cars, beyond levels assumed in these calculations. This was not considered in these calculations. Thus, railcars either leak a lot per hour at lower speeds (including when parked at railyard and at the Santa Maria Refinery) or they leak even more per hour at the higher speeds assumed in the RDEIR's calculations.

The lb/mi-day and ton/mi-yr emission factors were then used with roundtrip distances traversed in each district as estimated in the FEIR[87] to calculate daily and annual railcar ROG emissions in each traversed air district from the stateline to the Roseville or Colton Railyard and from the railyards, to the Project site. These emissions were compared to CEQA ROG significance thresholds as summarized in the FEIR.[88] The Roseville/Colton to Project site daily analysis is summarized in Table 1 and shows that railcar fugitive ROG emissions are significant in every traversed air district for all routes, except Placer County APCD, when the methodological errors made in the FEIR are corrected. The stateline to Roseville/Colton analysis is reported in Exhibit 1, Tab: ByDistrict and also shows that daily ROG emissions are significant in every traversed air district for all routes, including Placer County APCD. The emissions in the Placer County APCD and SCAQMD are underestimated as they do not include emissions during the time the railcars spend at the Roseville and Colton Railyards. These results are consistent with those in my comments on the RDEIR, Comment CBE-122, calculated assuming 0.5% product loss.

[87] Rail Spur FEIR, p. B.1-2 and B.1-9 for Roseville to site and p. B.1-11 for stateline to Roseville.

[88] The CEQA significance thresholds are from FEIR, p. B.1-247.

Table 1:
Daily Railcar Fugitive ROG Emissions,
Roseville/Colton to Site

	Roundtrip (miles)	**Emissions** (lb/day)	**Significance Threshold** (lb/day)	**Significant?**
Northern Route via Oakland				
Placer County APCD	1.8	15	82	No
Sacramento Metro APCD	30.8	265	65	Yes
Yolo Solano APCD	64.2	552	-	-
Bay Area AQMD	276.9	2,381	80	Yes
Monterey Bay Unified AQMD	226.8	1,950	137	Yes
San Luis Obispo County APCD	134.1	1,153	25	Yes
Northern Route via Altamont				
Placer County APCD	1.8	15	25	No
Sacramento Metro APCD	75.8	652	65	Yes
San Joaquin Valley APCD	100.3	863	-	-
Bay Area AQMD	179.6	1,545	80	Yes
Monterey Bay Unified AQMD	226.8	1,950	137	Yes
San Luis Obispo County APCD	134.1	1,153	25	Yes
Southern Route				
San Luis Obispo County APCD	9.5	81	25	Yes
Santa Barbara County APCD	216.4	1,839	55	Yes
Ventura County APCD	115.6	983	25	Yes
South Coast AQMD	176.2	1,498	55	Yes

In addition to these exceedances of daily significance thresholds, several of the air districts through which the trains would pass have annual CEQA significance thresholds. The annual ROG emissions for Roseville to the site (Table 2) and the stateline to Roseville (Exhibit 1, Tab:ByDistrict) exceed the annual CEQA significance thresholds for all districts with annual thresholds, everywhere but in San Luis Obispo County APCD for both the Project (5 trains per week) and the 3 train per week alternative.

Table 2:
Annual Railcar Fugitive ROG Emissions
for 5 and 3 Trains Per Week,
Roseville/Colton to Site

	Roundtrip (miles)	**Emissions 5/3 Trains/wk** (ton/yr)	**Significance Threshold** (ton/yr)	**Significant?**
Northern Route via Oakland				
Placer County APCD	1.8	2	-	
Sacramento Metro APCD	30.8	34/20	-	
Yolo Solano APCD	64.2	71/43	10	Yes
Bay Area AQMD	276.9	305/183	15	Yes
Monterey Bay Unified AQMD	226.8	249/140	-	
San Luis Obispo County APCD	134.1	148/89	25	Yes
Northern Route via Altamont				
Placer County APCD	1.8	21.2	-	
Sacramento Metro APCD	75.8	83/50	-	
Yolo Solano APCD	100.3	110/66	10	Yes
Bay Area AQMD	179.6	198/119	15	Yes
Monterey Bay Unified AQMD	226.8	249/149	-	
San Luis Obispo County APCD	134.1	148/89	25	Yes
Southern Route				
San Luis Obispo County APCD	9.5	10/6	25	(1)
Santa Barbara County APCD	216.4	238/143	10	
Ventura County APCD	115.6	127/76	-	
South Coast AQMD	176.2	1,515/909	-	

(1) Significant when on-site emissions are included.

In sum, daily ROG emissions from railcar fugitive emissions are significant in every air district through which they pass, except Placer County, where emissions are underestimated due to failure to include Roseville operations. Further, annual ROG emissions are significant in every air district through which they pass that has an annual CEQA significance threshold. Thus, all feasible mitigation is required for railcar fugitive ROG emissions. I recommend several feasible air quality mitigation measures not identified in the FEIR below.

II.I Mitigation for Railcar Fugitive ROG Emissions

The significant railcar fugitive ROG emissions can be mitigated by requiring the following:

- Emission Reduction Credits (ERCs);
- Actual reductions in emissions at the Santa Maria Refinery, including at the Santa Maria Pump Station, tanker truck fleet, and storage tanks;
- Voluntary Emission Reduction Agreements (VERAs);
- Follow recommended industry practices to minimize railcar releases including pre-loading inspection of all railcar fugitive components, *e.g.*, PRVs, rupture discs, manway; adherence to change-out procedures; preventative maintenance; and tank car operator training;[89]
- Replace all non-closing pressure relief devices, such as rupture discs, rupture pins, or other one-time-use pressure relief device with standard PRVs;
- All tank car hatches should be closed and sealed during loading operations;[90]
- Require the use of oxidation catalysts on existing heaters and boilers at the Santa Maria Refinery to offset increases in ROG emissions;
- Require the use of pressure tank cars, such as the Tesoro DOT-120 design (*see* Comment IV.B);[91]

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[89] *See* Wright 2007, footnote 22; Tank Car Loading and Unloading, May 8, 2014; Available at: https://www.youtube.com/watch?v=1PzNbQlvgDw; and AAR/CMA North American Non-Accident Release Reduction Committee, Improving Securement in Hazardous Materials Tank Car Shipment. Recommended Industry Practices, October 1999; Available at: https://www.aar.org/Documents/NAR/Improving_Securement_in_Hazardous_Materials.pdf; Watco Compliance Services, Examination Before Shipping: Best Practices for Loading and Off-Loading Tank Cars Based on AAR Pamphlet 34; Available at https://www.fra.dot.gov/Elib/Document/3447.

[90] MBUAPCD Title V Operating Permit TV 34-01 Evaluation Report, ExxonMobil, March 9, 2005; Available at: http://yosemite.epa.gov/R9/air/EPSS.NSF/735056a63c1390e08825657e0075d180/e1e0cc5cd519261f88256fc0006c09f0/$FILE/TV34-01evl.pdf.

[91] The Tesoro DOT-120 design (with a shell thickness of 9/16") has a rated test pressure of 200 psi, but other DOT-120 and DOT-114 designs (with a shell thickness of 11/16") have rated test pressures of 300, 400, or 500 psi.

- If pressure tank cars are not selected, require that railcars be operated with an inert gas headspace, such as nitrogen rather than ambient air;[92]
- Require the use of zero-leak fugitive components at the rail terminal and on the pipeline connecting the rail terminal and storage tanks;
- Implement LDAR program for all on-site railcars during railyard idling and unloading.

These mitigation measures are not preempted because they do not manage or govern rail operations. Further, they control pollutants that are emitted from the railcars, which are owned (or leased) by Phillips 66, who is not a rail carrier. And railcar ROG fugitive emissions, once released, are part of the ambient air and, thus, are part of the "commons" subject to regulation and control by local agencies.

In addition, ROG is twice removed from its source. The significance criteria for ROG are based on the fact that they are ozone precursors. Ozone is the pollutant of concern. Ozone is not emitted by railcars, but rather, it is formed in the atmosphere from precursor compounds, primarily NOx and ROG. The amount of ozone that forms depends on the level of other pollutants present in the air where it is emitted.[93] .

III. ON-SITE HAZARDS ARE SIGNIFICANT

Accidents caused by the change in crude slate and the new unloading facilities could endanger the refinery, refinery workers, and the surrounding community. These impacts were not evaluated in the FEIR.

III.A Hazards Due to Changes in Crude Slate at Existing Refinery

The FEIR includes a brief discussion of the impact of changes in crude slate on hazards at the Refinery, designated as Impact #HM.3.[94] This discussion touches on naphthenic acid corrosion, pointing to various inspection programs and ultimately dismissing corrosion-related accidents at the SMR from refining tar sands crudes because "… the expected range of sulfur and TAN [total acid number] would be within

[92] The Valero RDEIR railcar fugitive ROG emissions assumed a 95% ROG control efficiency for using an ambient air headspace on the return-trip railcars. Valero RDEIR, Appx. A, pp. A-3 (5% dilution factor), A-14.

[93] D.J. Rasmussen, J. Hu and others, The Ozone-Climate Penalty: Past, Present, and Future, Environmental Science & Technology, v. 47, no. 24, 2013, pp. 14258–14266 (Exhibit 5).

[94] Rail Spur FEIR pp. 4.7-92/94.

the range of the crudes that are currently being processed at the SMR. Therefore, the change in crude slate would not be expected to change the sulfur or TAN levels compared to the crude sources that are currently being processed at the SMR."[95] In Comment CBE-123, I explained why this is an inadequate discussion of corrosion-induced accidents and why the conclusion is wrong.

The response to Comment CBE-123 does not address any of the points that I raised, but rather simply restates the unsupported assertion that I challenged and expanded its discussion of various programs designed to protect against corrosion. The response to Comment CBE-123 states:

> "A review of the data in the RDEIR Table 4.7-14 [FEIR Table 2.7] shows that the expected range of sulfur and TAN would be within the range of the crudes that are currently being processed at the SMR. Therefore, the change in crude slate would not be expected to change the sulfur or TAN levels compared to the crude sources that are currently being processed at the SMR. It is possible that the TAN could increase when compared to the typical crude blend. However, with the program and management systems, discussed above, in place, this potential increase would not be expected to increase the hazards or likelihood of a release at the SMR. Therefore, the impact would be less than significant."[96]

This just repeats the unsupported assumption that I challenged in Comment CBE-123, without responding to any of my comments on corrosion-induced accidents.

First, to frame this issue, it is important to recognize that the Rail Spur Project is proposing to replace the **majority** of the current crude slate of 38,100 barrels per day (bbl/day) with up to 100% tar sands crudes. The Project proposes to import 37,142 bbl/day of cost-advantaged crudes by rail.[97] Thus, the Project would replace 97% of the baseline crude slate with up to 100% tar sands crude. The SMR Throughput Increase Project will increase the crude permit level to 48,950 bbl/day.[98] Thus, at full buildout, up to 76% of the crude slate could be different crude(s) than in the baseline, potentially 100% tar sands crudes. Therefore, the SMR is not tweaking its crude slate by blending tar sands crude, but embarking on a complete remake of its crude slate, using a crude or crudes that are new to the refinery and the refining industry. This wholesale

[95] Rail Spur FEIR, Table 4.7.18 and p. 4.7-94.

[96] RTC CBE-123.

[97] Rail Spur FEIR, p. 2-23.

[98] Rail Spur FEIR, p. 1-1.

remake requires more than asserting, without analytical support or mitigation for what are obvious significant impacts, that everything will be okay because the refinery would follow the formal Management of Feedstock Change Process.[99]

Second, the response assumes that if sulfur levels and TAN of the crude slate stay within the reported range, corrosion and hence corrosion-induced accidents are not an issue. This ignores the possibility of gradual creep in both sulfur and TAN levels, while remaining within the usual range, which could still be significant enough to cause an accident.

The SMR Rail Spur Project FEIR, for example, concedes that the new crude slate would increase sulfur levels by 0.8%.[100] From a corrosion standpoint, this is a significant increase. The SMR Rail Spur Project RDEIR did not discuss the impact of a 0.8% increase in sulfur on corrosion-induced accidents at the SMR.

The FEIR also relies on the Total Acid Number (TAN) to assure that corrosion will not result from the proposed crude slate switch. The TAN is a measure of total organic acids, some of which are corrosive, some not. This test does not disclose the specific acids that actually are present and thus can be misleading. The corrosivity of a given crude depends on the specific chemicals in the mix. Thus, TAN by itself is not an adequate indicator of whether a crude will cause corrosion.

As a rule-of-thumb, crude oils with a TAN number greater than 0.5 milligrams of potassium hydroxide per gram (mg KOH/g) are considered to be potentially corrosive and indicates a level of concern. A TAN number greater than 1.0 mg KOH/g is considered to be very high.[101] The "typical crude blend" at the SMR is reported as 1.0 mg KOH/g.[102]

Canadian tar sands crudes are very high TAN and sulfur crudes. The TAN of dilbits, for example, range from 0.98 to 2.42 mg KOH/g.[103] The Project is proposing to import crudes at the upper end of the sulfur range (5.0 vs. 5.2%) and TAN range (2.5 vs.

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[99] Rail Spur FEIR, p. 2-35/36.

[100] Rail Spur FEIR, p. 4.3-49.

[101] Margaret Sheridan, California Crude Oil Production and Imports, Staff Paper, California Energy Commission, April 2006, p. 6; Available at: http://www.energy.ca.gov/2006publications/CEC-600-2006-006/CEC-600-2006-006.PDF.

[102] Rail Spur FEIR, Table 4.7-18.

[103] www.crudemonitor.ca.

4.0 mg KOH/g).[104] The upper end of the TAN range is far above the level of concern and far above the "typical crude blend" refined at SMR in the baseline.[105] As up to 97% of the current crude slate will be replaced by these tar sands dilbits, the TAN of the "typical crude blend" will increase above the current level of 1.0 mg/KOH/g.

For example, if 97% Peace Heavy River were refined, the typical TAN would increase to 2.5 mg KOH/g (0.03 × 1.0 + 2.5 × 0.97 = 2.45). Similarly, if 97% Peace Heavy River were refined, the typical sulfur content would increase from 4.2% to 4.98% (4.2 × 0.03 + 0.97 × 5.0 = 4.98). These are substantial increases when considering corrosion and indicate a very significant potential for catastrophic releases cause by corrosion-induced accidents. The RTC did not respond to my comments on this issue, instead asserting that various "accepted industry practices" would eliminate this risk and the new crudes would fall within the range of the current crudes. However, this does not address an alarming increase in the average.

In sum, the fact that the TAN and sulfur of the proposed tar sands dilbits falls within the range of crudes previously refined at SMR is irrelevant because the average will creep up. Thus, the RDEIR should have included a detailed analysis of the corrosion potential of the proposed crude slate, concluded it was significant and required mitigation, similar to that required in the Chevron EIR.

Sulfur and TAN creep are very important to consider because they are known to result in catastrophic accidents due to corrosion. A catastrophic blowout due to sulfur creep recently occurred at the Chevron Richmond Refinery. This refinery gradually changed crude slates, while staying within its established crude unit design basis for total weight percent sulfur of the blended feed to the crude unit,[106] the same reason used in the FEIR to justify that these impacts are not significant. This change increased the corrosion rate in the 4-sidecut line, which led to a catastrophic pipe failure in the #4 Crude Unit on August 6, 2012. This accident sent 15,000 people from the surrounding area for medical treatment due to the release and resulting fire that created huge black

[104] Rail Spur FEIR, Table 4.7.18.

[105] Rail Spur FEIR, Table 4.7-18.

[106] US Chemical Safety and Hazard Investigation Board, Chevron Richmond Refinery Pipe Rupture and Fire, August 6, 2012, p.34 ("While Chevron stayed under its established crude unit design basis for total wt. % sulfur of the blended feed to the crude unit, the sulfur composition significantly increased over time. This increase in sulfur composition likely increased corrosion rates in the 4-sidecut line.").

clouds of pollution billowing over the surrounding community and across the San Francisco Bay.[107]

The SMR has a similar crude unit, identified as the "crude tower" in the SMR Rail Spur Project FEIR Figure 2-10. These types of accidents can be reasonably expected to result from incorporating tar sands crudes into the SMR crude slate, even if the range of sulfur and TAN of the crudes remain the same, unless significant upgrades in metallurgy are required. This is the case as these crudes have significant concentrations of sulfur in the heavy components of the crude coupled with high total acid numbers (TAN) and high solids that aggravate corrosion. A crude slate change could result in corrosion from, for example, the particular suite of sulfur compounds or naphthenic acid content even if the crude slate is within the current design slate basis. This is the case due to chemical differences, not reflected in the lumper parameters of total sulfur and TAN, *e.g.*, different sulfur compounds and different corrosive acids. The gas oil and vacuum resid piping, for example, may not be able to withstand naphthenic acid or sulfidation corrosion from refining 76% to 97% tar sands crudes, potentially leading to catastrophic releases.[108]

Elevated levels of TAN and sulfur can cause accidents that result in catastrophic releases of air pollution. Such releases were not considered in the FEIR. Rather, the FEIR relies on the SMR's existing Process Safety Management program, including the Management of Change (MOC) and Mechanical Integrity (MI) programs, to prevent corrosion.[109] However, these programs were also in place at the Chevron Richmond Refinery (and many other similarly afflicted refineries) at the time of the August 2012 accident discussed above. They did not prevent a catastrophic accident caused by sulfur (or TAN) creep from changes in the crude slate that fell within the normal range. The recent Chevron Refinery Modernization Project FEIR incorporated many additional mitigation measures to improve these programs,[110] which should be required for the

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[107] U.S. Chemical Safety and Hazard Investigation Board, Interim Investigation Report, Chevron Richmond Refinery Fire, Chevron Richmond Refinery, Richmond, California, August 6, 2012, Draft for Public Release, April 15, 2013, Available at; http://www.csb.gov/chevron-refinery-fire/.

[108] *See*, for example, K. Turini, J. Turner, A. Chu, and S. Vaidyanathan, Processing Heavy Crudes in Existing Refineries. In: Proceedings of the AIChE Spring Meeting, Chicago, IL, American Institute of Chemical Engineers; New York, NY, Available at: http://www.aiche-fpd.org/listing/112.pdf.

[109] Rail Spur FEIR, pp. 4.7-93/94.

[110] *See*, for example, Chevron Refinery Modernization Project, Revisions to Draft EIR Volumes 1 and 2, p. 4-40, Mitigation Measure 4.13-7h, Available at: http://chevronmodernization.com/project-documents/.

Santa Maria Refinery to mitigate the changes in amount and composition of sulfur and TAN in crudes imported by the Rail Spur Project.

Third, I commented that sulfidation corrosion (due to elevated sulfur levels) is an issue for the SMR because of the age of the facility, built in 1955. The response asserts that SMR follows industry guidelines to monitor, mitigate and prevent sulfidation corrosion.[111] However, following industry guidelines does not mitigate impacts if the piping is not adequate, as demonstrated by the Chevron accident. Refineries built before current American Petroleum Institute (API) standards were developed to control corrosion and before piping manufacturers began producing carbon steel in compliance with current metallurgical codes, are at significant risk of sulfidation corrosion induced accidents unless the piping is replaced to meet current metallurgical codes. The response to Comment CBE-123 does not disclose any information about the metallurgy of the SMR, which was built in 1955 before the codes were developed.

The early construction date suggests the metallurgy used throughout much of the SMR may not be adequate to handle the unique chemical composition of tar sands crudes without significant upgrades. There is no assurance that required metallurgical upgrades would occur if tar sands crudes dominate the crude slate, as they are very expensive and are not required by any regulatory framework. Experience with changes in crude slate at the Chevron Refinery in Richmond in the San Francisco Bay Area suggest required metallurgical upgrades are often ignored and may lead to catastrophic accidents.[112]

Sulfidation corrosion generally occurs above about 500°F for carbon steel pipe and above about 600°F for 5 Cr low-alloy steel. Some sulfide species are more corrosive than others, including mercaptans, hydrogen sulfide, and disulfides, all of which occur at elevated levels in tar sands crudes. Sulfidation corrosion manifests as uniform thinning and thus cannot be detected from visual inspections. Low silicon carbon steel can corrode 2 to 10 times faster than higher silicon carbon steel.[113]

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[111] RTC CBE-123.

[112] U.S. Chemical Safety and Hazard Investigation Board, Interim Investigation Report, Chevron Richmond Refinery Fire, Chevron Richmond Refinery, Richmond, California, August 6, 2012, Draft for Public Release, April 15, 2013; Available at: http://www.csb.gov/chevron-refinery-fire/.

[113] E.H. Niccolls, J.M. Stankiewicz, J.E. McLaughlin, and K. Yamamoto, High Temperature Sulfidation Corrosion in Refining, September 2008, 17th International Corrosion Congress, Corrosion Control in the Service of Society, Vol. 1 of 5, as cited in: Interim Investigation Report, Chevron Richmond Refinery Fire, August 6, 2012; Available at: http://www.csb.gov/assets/1/19/Chevron_Interim_Report_Final_2013-04-17.pdf.

How much low silicon carbon steel piping is present at SMR? What impact will an admitted 0.8% increase in sulfur have on this piping? What sulfur compounds are present in the 0.8% increase in sulfur? Could sulfur increase more than 0.8%? The SMR Rail Spur Project FEIR and the response to Comment CBE-123 did not disclose either the specific suite of sulfur compounds in the proposed imports or the metallurgy and operating conditions in the units potentially susceptible to sulfidation corrosion, even though I raised both of these issues. Thus, the FEIR fails as an informational document under CEQA.

Refinery emissions released in upsets and malfunctions can, in some cases, be greater than total operational emissions recorded in formal inventories. For example, a recent investigation of 18 Texas oil refineries between 2003 and 2008 found that "upset events" were frequent, with some single upset events producing more toxic air pollution than what was reported to the federal Toxics Release Inventory database for the entire year.[114]

Catastrophic releases of air pollution from these types of corrosion-caused accidents were not considered in the FEIR and are significant. They could adversely impact on-site and off-site workers and other nearby sensitive receptors. Mitigation should be imposed, including at least the following:

- All mitigation measures required in the Chevron Refinery Modernization Project FEIR;
- 100% component inspection of all carbon steel piping systems susceptible to sulfidation corrosion; and
- Modification of work processes for review of damage mechanisms for processes covered by the Process Safety Management standard to conform with the American Petroleum Institute Recommended Practice 571, Damage Mechanisms Affecting Fixed Equipment in the Refining Industry. The revised work processes shall require consideration of damage mechanism reviews as part of the Process Hazard Analysis process.[115]

[114] J. Ozymy and M.L. Jarrell, Upset over Air Pollution: Analyzing Upset Event Emissions at Petroleum Refineries, Review of Policy Research, v. 28, no. 4, 2011. (Exhibit 16)

[115] Terms and Conditions of Probation, People v. Chevron U.S.A. Inc., Superior Court of the State of California, County of Contra Costa, Case No. 1-162745-4. (Exhibit 17)

III.B Hazards Due to New Facilities

Section 4.7 of the DEIR contains the "hazards and hazardous materials" impact analyses, sometimes called the risk of upset analysis. This section evaluates the consequences of fire and explosion hazards from the new unloading facility, new aboveground pipeline, and the presence of railcars on the new rail spur. Two separate impacts were evaluated: (1) on-site accidents from crude oil unloading through pipeline transport to storage tanks at the SMR and (2) on-site train accidents. Impact HM.1 (Risk of Accidents at Unloading Facility) is designated as "less than significant"[116] or "Class III"[117] and no mitigation is proposed. The supporting material includes extensive discussion of the applicable regulatory framework and general methods used to analyze these types of impacts, but no discussion of how the impact conclusion was reached. It is simply stated.

The conclusion — that the maximum hazard zones are within the boundaries of the SMR and thus not significant — appears magically[118], without any support or explanation of how this conclusion was reached, beyond pointing at 75 pages of technical information in Appendix H.3. The supporting analyses in Appendix H.3 are impenetrable to all but subject area experts. Appendix H.3 indicates that the FEIR's analysis in Section 4.7 is misleading and fatally flawed. Offsite impacts from on-site accidents involving the unloading facility and on-site trains are highly significant and unmitigated.

The FEIR evaluated three types of on-site crude release accidents: (1) on-site crude railcar accident pool fires; (2) on-site crude railcar accident Boiling Liquid Expanding Vapor Explosions (BLEVES); and (3) on-site crude pipeline accident pool fires.[119] The FEIR asserts none of these accident scenarios result in significant impacts.

However, the FEIR buries the supporting analyses in dense appendices, presented in metric units, which are not accessible to the typical reviewer. The FEIR fails to explain how to translate the results of these analyses into impact conclusions that can be understood by non-subject-matter experts, thus preventing meaningful public review of the impacts. The FEIR further incorrectly summarizes the results of

[116] Rail Spur FEIR, p. IST-43.

[117] Rail Spur FEIR, p. 4.7-40.

[118] Rail Spur FEIR, Table 4.7.8 and Figure 4.7-4.

[119] Rail Spur FEIR, pp. H.3-2/17.

these analyses in the text as insignificant, when, in fact, they are highly significant. The FEIR thus fails as an informational document.

The FEIR explains that several crude oil spill scenarios were modeled to evaluate worst-case thermal radiation hazards associated with a large crude oil fire, ranging from small releases from a tank car, full tank car releases, and full pipeline releases, citing Appendix H.3. The FEIR then presents a table summarizing what it calls the "worst case onsite thermal radiation hazard zones."[120] This worst-case scenario is asserted to be a spill of nearly the entire pipeline, assumed to drain onto the ground in the area between the unloading facility and refinery storage tanks."[121] The summary table presents the distance from the accident site at various wind speeds to two thermal radiation intensities endpoints. These thermal radiation endpoints are the significance criteria used to evaluate impacts. The FEIR explains:

> "Exposure to a thermal radiation level of 10 kW/m^2 [kilowatt per square meter] could result in a serious injury (at least second-degree burns) if exposed for less than 1 minute, and it was, therefore, assumed that all persons exposed to 10 kW/m^2 would suffer serious injuries. Serious injuries would start to be realized at and above 5 kW/m^2. Exposure to thermal radiation levels in excess of 10 kW/m^2 would likely begin to generate fatalities in less than 1 minute. All persons exposed to thermal radiation within the flame area were assumed to suffer fatalities regardless of exposure duration."[122]

The FEIR then summarizes this information on a map of the site with the 5 and 10 kW/m^2 hazard zones superimposed.[123] This figure shows that none of the flammable hazard zones have the potential for off-site impacts. However, this analysis is inconsistent with the information in Appendix H.3, which includes several on-site accident scenarios that result in significant off-site impacts. The FEIR is silent on why these other accident scenarios are not discussed in Section 4.7. They are discussed below.

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[120] Rail Spur FEIR, Table 4.7.8.

[121] Rail Spur FEIR, p. 4.7-44.

[122] Rail Spur FEIR, p. H.1-14. *See* also discussion on p. H.1-13.

[123] Rail Spur FEIR, Figure 4.7-4.

III.B.1 Worker Impacts Excluded

The FEIR fails to evaluate the impacts of accidents on workers, arguing in the odor impact section that "OSHA related worker issues are outside the scope of the EIR."[124] The FEIR specifically excludes workers from its risk of upset significance criteria, arguing they do not apply to occupational safety, *viz.*, "Occupational risk, which is governed by state and federal OSHAs is considered to be more voluntary and is generally judged according to more lenient standards of significance than those used for involuntary exposure".[125]

However, neither state nor federal OSHA nor other regulations cover the types of involuntary risks imposed by unit train accidents and exploding pipelines and tanks on workers in the vicinity of these facilities. A death is a death and it should not matter whether it is an on-site worker, off-site worker, or other member of the public. A worker is a member of society at large and is protected by CEQA. None of the federal and state laws reviewed in FEIR Section 4.7.2 include any measures to protect any workers, on-site or off-site, from train, pipeline, and tank farm accidents.

Regardless, CEQA is not a gap-filling regulatory program. CEQA covers all impacts to all media — the public, air, water, land, biological resources — regardless of how they may be classified, i.e., on-site workers, off-site workers, residents, threatened and endangered species, etc. These types of catastrophic events are entirely outside of the jurisdiction of OSHA or any other federal or state regulatory program and must be evaluated in the FEIR. The FEIR must be revised to address on-site worker impacts and be recirculated.

III.B.2 Coke Storage Area

The rail spur and unloading facility are adjacent to the coke storage area. Coke is a combustible material and could be engulfed in a major fire triggered by accidents within the unloading facility. A fire in the coke storage area would release metals associated with coke. Metals are present at elevated concentrations in all cokes[126] compared to crustal materials. Many are elevated even more compared to conventional crudes. This was not considered in any of the analyses and would result in far more significant impacts than disclosed in the FEIR.

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[124] Rail Spur FEIR, p. 4.3-80.

[125] Rail Spur FEIR, p. 4.7-38.

[126] Table A-7 CFB Trace Compounds, Las Brisas Energy Center, LLC (Exhibit 18).

III.B.3 Tank Farm Accidents Are Significant

The FEIR states that imported crude would be sent through a 3,525-foot long pipeline to existing refinery storage tanks, concluding: "Therefore, crude oil storage would not result in any increase in fire and explosion risk at the refinery."[127] The FEIR does not contain any analysis to support this assertion. *See*, for example, Appendix H.3, which does not include a storage tank accident scenario, but rather only rail car and pipeline accident scenarios. The tank farm is important to evaluate as it is close to off-site receptors.[128] However, as noted below, one of the pipeline scenarios appears to engulf the tank farm.

This unsupported assertion is incorrect because it assumes no change in the properties of stored crude. The Project would change the composition of the crude slate. As noted elsewhere, up to 97% of the crude slate would transition from local heavy crude oils to much lighter and more corrosive tar sands dilbits. These crudes would increase the risk of fire and explosion, compared to the baseline crude slate, impacting not only workers, but also off-site parties. Further, tar sands crudes are more corrosive than the current crude slate and deposit large amounts of solids in storage tanks.

The FEIR only acknowledges the existing tank farm, but doesn't analyze hazard impacts resulting from storing a new crude oil. Rather, it concludes with no analysis at all:

> "Thermal radiation impacts from crude oil tank fires could cause injury 220 feet away. The closest population to the crude oil tanks at the Refinery is an industrial area 425 feet northeast of the crude oil storage facilities. The closest residence to the crude oil tanks, which is located within the industrial area, is 1,200 feet northeast of the tank storage area. The gas processing equipment and piping are at least 1,700 feet from the property fence line. Given the limited population and significant distance between these receptors and the SMR, there would not be a significant risk level"[129]

The FEIR does not contain any analysis for the tank farm. Thus, there is no support for the 220-foot impact distance.

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[127] Rail Spur FEIR, p. 4.7-43.

[128] Rail Spur FEIR, Figure 2-3.

[129] Rail Spur FEIR, pp. 9-49, with similar language at pp. 4.7-15/97.

However, the analyses supporting the claimed 220-foot injury distance is not included in the FEIR and likely is based on the crude slate currently processed at the Santa Maria Refinery. Further, the nature of the "injury" is not disclosed. Regardless, a switch from current crude to tar sand dilbits or North American light crudes with an API gravity up to 30° would significantly increase the injury distance, likely far in excess of the 425-foot distance to the nearest receptor if the contents of the tanks were involved in a pool fire or a BLEVE. Thus, accidental releases from the tank farm were not analyzed in the FEIR and are likely highly significant.

III.B.4 Pipeline Accidents Are Significant

The FEIR includes a crude oil pipeline accident analysis for a pool fire, assuming a spill of 692,000 barrels of crude oil for wind speeds of 1 meter per second (m/s) (about 2 miles per hour (mi/hr) and 20 m/s (about 45 mi/hr).[130] The FEIR does not further describe this accident scenario. The volume spilled suggests it is the worst case accident that engulfs the entire tank farm[131] plus the full contents of a unit train. Regardless, the analysis is included in the FEIR as supporting the conclusion that pool fire accidents involving the pipeline would not result in significant off-site impacts.

The supporting analyses in Appendix H.3 are presented in a format that is not accessible to the average reviewer. Thus, they are extracted and summarized in Table 3.

Table 3:
Summary of
Crude Pipeline Accident Pool Fire[132]

	Heat Flux (kW/m^2) **at Impact Distance** (ft)		
Wind Speed (m/s)	**5**	**10**	**12.5**
1	1,647	889	764
20	2,641	1,555	1,273

The impact metric in these analyses is "heat flux" expressed as kilowatts per square meters (kW/m^2). Heat flux is thermal radiation intensity, the measure used in the FEIR to determine the resulting injury to exposed parties.

[130] Rail Spur FEIR, pp. H.3-14/16.

[131] Rail Spur FEIR, Table 2-6.

[132] Rail Spur FEIR, pp. H.3-14/17.

The interpretation of these data (and other similar data extracted from Appendix H.3 and summarized in these comments) requires a map that shows the location of potentially exposed populations relative to the accident sites (anywhere along the rail line within the Refinery boundary, at the unloading rack, along the new pipeline, at the new pipelines junction with existing storage tanks). It is common to include such a map in an EIR to locate the sensitive receptors. However, the FEIR fails to include a sensitive receptor map that locates all nearby residential and industrial properties and is thus deficient.

Any population located between the accident site(s) up to the reported impact distance, *e.g.*, as far away as 2,641 feet in Table 3, would experience significant impacts. At a heat flux of 5 kW/m^2, 10% injury would be experienced in the exposed population up to 2,641 feet from the accident if the wind were blowing at 20 m/s during the accident. Up to 1,555 feet from the accident, 100% of the exposed population would be injured, including second-degree burns in 14 seconds and 10% fatality at 60 seconds. And up to 1,273 feet from the accident, significant fatalities would occur. Significant impacts would also occur at a wind speed of 1 m/s up to 1,647 feet from the accident site.[133]

A pool fire pipeline accident could occur anywhere along the pipeline route, which could result in fires and BLEVES that would impact railcars and the tank farm. Assuming the pipeline accident modeled in the FEIR under calm wind conditions (1 m/s or about 2 mi/hr) engulfs the tank farm, significant impacts would occur up to 1,647 feet from the accident site under calm wind conditions (1 m/s). The impacted area includes an industrial area 425 feet northeast of the tank farm and a residence within the industrial area at 1,200 feet.[134] At a wind speed of 20 m/s (about 45 mi/hr), all persons up to 2,641 feet away would be seriously impacted and within a radius of 1,273 feet from the accident site, they would all be killed.

Thus, an accident along the new pipeline connecting the rail spur unloading facility and the existing tank farm that engulfs the tank farm has the potential to result in significant off-site (as well as even more significant on-site worker) impacts that were not disclosed in the text of the FEIR and incorrectly classified in Impact HM.1 as insignificant (Class III).[135] The actual modeling in Appendix H.3 indicates that off-site

[133] *See* Rail Spur FEIR, Appendix H.1, Table 3 for thermal radiation serious injury impact thresholds.

[134] Rail Spur FEIR, pp. 9-49, 4.7-97.

[135] Rail Spur FEIR, p. 4.7-40.

parties would be killed by on-site accidents. This is a significant impact that was not disclosed in the FEIR, but rather buried in an appendix that requires expert interpretation.

III.B.5 On-Site Train Accidents Are Significant

The FEIR also included on-site crude rail car accident scenarios, ranging from small releases from a railcar to the complete instantaneous loss of containment of a railcar contents, resulting in both pool fires and Boiling Liquid Expanding Vapor Explosions or "BLEVEs" for wind speeds ranging from 1 m/s to 20 m/s. Railcars can be exposed to pool fires and thermal tears with the initiating event being pipeline spills and fires as opposed to railcar accidents themselves, which are unlikely due to low speeds, except on entrance to the facility from the north.

The FEIR asserts, based on the analyses buried in Appendix H, that "potential hazards associated with the unloading facility are considered less than significant" and "[h]azards associated with the onsite portion of the Rail Spur Project would be less than significant since the worst case hazard zones do not extend outside of the boundaries of the SMR."[136]

However, my analysis of the railcar accident modeling in Appendix H.3 indicates that the risks from train accidents within the Refinery boundary result in significant on-site and off-site impacts for both pool fires and BLEVEs.

III.B.5.i Pool Fires

The FEIR analyzed pool fires resulting from an on-site crude railcar accident in which 54,440 barrels of crude (i.e., the entire contents of a unit train) are released for wind speeds ranging from 1 m/s to 20 m/s (2 mi/hr to 45 mi/hr).[137] These analyses report "heat flux" in kW/m^2 as a function of distance from the release, for distances of 100 to 1,000 meters (328 to 3,281 feet). An accident could occur anywhere within the Refinery boundary along the rail tracks shown on Figure 2-3. The results of the FEIR's railcar pool fire analyses are buried in Appendix H.3 in a format not accessible to the average reviewer. Thus, they are summarized in Table 4.

[136] Rail Spur FEIR, p. 4.7-44.

[137] Rail Spur FEIR, pp. H.3-2/9.

Table 4:
Summary of On-Site
Crude Railcar Accident Analysis[138]
of Pool Fires

Wind Speed (m/s)	**Heat Flux** (kW/m^2) **at Impact Distance** (ft) **5**	**10**	**12.5**
1	775	407	331
5	876	495	410
10	928	541	446
20	1,404	958	810

The boundaries of the Refinery are shown in FEIR Figure 2-3. This figure and Google Earth maps indicate that the northeastern boundary of the Refinery where the rail line enters from north abuts industrial and residential property to the east and north and recreational areas in the Coastal Zone to the west. Sensitive receptors are located in these areas, for example, residences along Monadella Street and in areas to the north and south of Highway 1 (Willow Road) and users of the Oceano Dunes State Vehicular Recreation Area and Oso Flaco Lake and Dunes to the west.

The results of the railcar accident modeling summarized in Table 4 indicate that both on-site and off-site impacts are significant. When the wind speed is 20 m/s (45 mi/hr), the heat flux is 5 kW/m^2 at up to 1,404 feet from the accident site and 12.5 kW/m^2 at up to 810 feet from the accident site. FEIR Figure 2-3 indicates that if the accident occurred along the rail line near where it enters the refinery from the north, off-site sensitive receptors would be located within 1,404 feet of the accident site. Accidents are likely at this point due to the presence of various switches and a mix of trains.[139] Further, the maximally exposed individual resident (MEIR) in the cancer risk assessment is located in this area and is only about 1,300 feet from the rail line.[140] Thus, significant off-site impacts would occur from an accident within the Refinery boundary.

Further, refinery workers would be present throughout the Refinery and at the unloading facility. These workers would be the most highly exposed populations and would experience significant mortality.

[138] Rail Spur FEIR, pp. H.3-2/9.

[139] Rail Spur FEIR, p. 4.7-2 (Caselton ND CBR accident).

[140] Rail Spur FEIR, Figure 4.3-6.

Thus, railcar accidents within the Refinery boundary would result in significant impacts to both on-site and off-site populations. These impacts were not disclosed in the FEIR, but rather buried in a maze of tables that are not explained or analyzed.

III.B.5.ii Boiling Liquid Expanding Vapor Explosions (BLEVEs)

The FEIR also evaluated the radiant heat exposure and explosion over pressures resulting from an on-site railcar accident involving a Boiling Liquid Expanding Vapor Explosion or "BLEVEs." However, the FEIR fails to discuss the results of this analysis, which is buried in FEIR Appendix H.3 in a format not accessible to the average reviewer. Thus, they are summarized in Table 5.

Heat flux for the BLEVE analysis is reported in the FEIR in units of kilojoules per square meter (kJ/m^2), which is just another measure of heat density, similar to kW/m^2 used to evaluate pool fires, but just expressed in different units. The FEIR does not explain how to interpret heat flux. However, the DEIR did. At a heat of 40 kJ/m^2, 10% injury will result, at 150 kJ/m^2, 100% injury will result, and at 250 kJ/m^2, 1% fatalities will occur.[141]

Table 5:
Results of
Radiation Exposure Analysis from
On-Site Railcar Accident BLEVE[142]

Impact Distance (ft)	Radiant Heat Significance Threshold (kJ/m2)
1,690	40
1,194	80
1,066	100
859	150
830	160
643	250

Table 5 shows that significant impacts, 20% injury, will occur at up to 1,690 feet from the accident site. As discussed above, if the accident occurs, within the Refinery boundary, significant impacts will result outside of the Refinery, in industrial/residential areas to the east and in the Coastal Zone areas to the west.

[141] Rail Spur DEIR, Table 4.7.4.

[142] Rail Spur FEIR, pp. H.3-10/13.

Further, workers within 1,690 feet of the accident would also experience significant impacts, and those within 643 feet of the accident may die. These are significant impacts that were not disclosed in the FEIR.

III.B.6 The FEIR's Analysis Is Not Supported

The FEIR asserts that the "worst-case spill" would be about 90,800 gallons (2,162 bbl) of crude oil.[143] The information reviewed above from the supporting Appendix H.3 indicates that this is not correct. The FEIR identified much larger accidents. The accident that the FEIR claims is the worst case does not appear to be included in supporting Appendix H.3 or elsewhere in the record.

The FEIR then presents what it characterizes as the "worst-case thermal radiation hazards associated" with this worst case accident, summarized in Table 4.7-8 and Figure 4.7-4.[144] This information suggests that the significant impact zone remains fully contained on site, contrary to the accident scenarios in Appendix H.3. However, Figure 4.7-4 does not support this conclusion.

Figure 4.7-4 shows isopleths of flammable hazard zones. The center of these isopleths are at the location where the new pipeline turns 90 degrees, roughly midway between the unloading facility and the tank farm, compared with Figure 2-3. However, the FEIR states "The worst case spill occurs just north of the unloading facility where nearly the entire pipeline would drain onto the ground due to the slope of the area between the unloading facility and refinery storage tanks."[145]

Figure 2-3 shows that the unloading facility and storage tanks extend over a large distance to the east and south of the center of the circles in Figure 4.7-4. In a real worst case, such as where a pipeline fire would result in fire engulfing the unloading facility and adjacent storage tracks, as evaluated in scenarios in Appendix H.3, there would be chain events of fire and BLEVEs over a large area to the east and south. Some of this area is proximate to off-site receptors, such as along the refinery boundary southeast of the tank farm. Further, the eastern end of the storage tracks is proximate to Highway 1 on the eastern boundary of the refinery.

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[143] Rail Spur FEIR, p. 4.7-43.

[144] Rail Spur FEIR, pp. 4.7-43/45.

[145] Rail Spur FEIR, p. 4.7-44.

IV. OFF-SITE HAZARDS: MAINLINE RAIL ACCIDENTS, SPILLS, FIRE, AND EXPLOSIONS

Mainline rail accidents, spills, fires, and explosions associated with the Project were found to have significant and unavoidable (Class I) impacts in regard to the following four issue areas:

- Hazards and Hazardous Materials (Impact HM.2),
- Public Services and Utilities (Impact PS.4),
- Water Resources (Impact WR.3), and
- Agricultural Resources (Impact AR.5).

In addition to the Project, a number of other crude by rail projects have been proposed or undertaken within California. The Project, together with other crude by rail projects, was found to have significant and unavoidable cumulative impacts from mainline rail accidents and spills, in regard to these same four issue areas.[146]

IV.A Hazards and Hazardous Materials (Significant Impact HM.2)

The main hazards associated with the Project are potential accidents along the Union Pacific Railroad (UPRR) mainline that could result in oil spills, fires, and explosions.[147] The FEIR used a Quantitative Risk Analysis (QRA) to determine the significance of mainline rail accidents and spills associated with the Project. Specifically, the QRA was used to determine the level of risk associated with the movement of trains from the SMR to the Roseville and Colton rail yards as well as to the California Border. The risk was found to be significant in the event of a release of crude oil that resulted in a fire or explosion in the vicinity of a populated area:

> "For the UPRR mainline tracks a quantitative risk assessment (QRA) was conducted to determine the level of risk associated with the movement of trains from the SMR to the Roseville and Colton rail yards as well as to the California Border. The risk for the full length of all three of the routes evaluated was found to be significant (Class I) in the event of a release of

[146] Hazards and Hazardous Materials, Public Services and Utilities, Water Resources, and Agricultural Resources.

[147] Rail Spur FEIR, p. ES-12.

crude oil that resulted in a fire or explosion in the vicinity of a populated area."[148]

[…]

"**The risk is primarily driven by the HTUA (Los Angeles Area, Bay Area, and Sacramento**)[149] […] **These are areas with high population densities in close proximity to long stretches of track, which increase the risk of larger numbers of injuries and facilities**."[150]

As confirmed by the QRA, mainline rail accidents, spills, fire, and explosions associated with the Project could result in large numbers of injuries and fatalities. Given the location of SMR, and the configuration of the rail network, crude trains would travel long distances through highly populated areas. These high populated areas include long stretches in the Los Angeles Area, Bay Area, and Sacramento, but they also include shorter stretches in cities throughout the state.[151]

Mainline rail accidents, spills, fire, and explosions associated with the Project were found to have impacts that were significant and unavoidable (Class I) in regard to Hazards and Hazardous Materials (Impact HM.2).

IV.B All Feasible Mitigation Not Required for Significant Impact HM.2

As more fully explained below, the FEIR does not adequately consider and recommend feasible options to mitigate hazards (Significant Impact HM.2). FEIR Mitigation Measure HM-2a should be amended to require higher standard DOT-120 or DOT-114 pressure tank cars.

Phillips 66 would own or lease all of the tank cars servicing the SMR as part of either a unit or manifest train. Phillips 66 proposes to use CPC-1232 tank cars, which are much less protective than other available tank cars.[152] Phillips 66 is not a rail carrier.

The FEIR recommends Mitigation Measure HM-2a requiring use of Option 1 tank cars in the Project:

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[148] Rail Spur FEIR, p. ES-12.

[149] Rail Spur FEIR, p. 4.7-60, emphasis added; see FEIR Appendix H.6 for a list of High Threat Urban Areas (HTUAs).

[150] Rail Spur FEIR, p. 4.7-88, emphasis added.

[151] *See* Rail Spur FEIR, pp. 2-25, 4.7-16-4.7-17, 4.7-62-4.7-87.

[152] Rail Spur FEIR, p. 1-4, 2-22.

> "Only rail cars designed to FRA, July 23, 2014 Proposed Rulemaking Option 1: PHMSA and FRA Designed Tank Car as listed in Table 4.7.6, shall be allowed to unload crude oil at the Santa Maria Refinery." [153]

The FEIR concludes that use of Option 1 tank cars would result in substantially lower risk, but the hazards associated with the Project would still be significant:

> "Implementation of HM-2a would reduce the probability of a release from a rail car by about 74 percent over the rail car design that is currently proposed by the Applicant. […]
>
> Even with this reduction in release probability, the hazards associated with the Rail Spur Project risk along the UPRR right-of-way would still be potentially significant (Class I) in the event of a release of crude oil that resulted in a fire or explosion."[154]

The FEIR does not adequately consider and recommend feasible options to mitigate hazards. In terms of tank car designs, the FEIR has apparently only considered options from the DOT rulemaking.[155] Mitigation Measure HM-2a requires use of tank cars designed to Option 1, which is identified as "the safest tank car design that was part of the […] DOT […] rulemaking".[156]

As more fully explained below, Option 1 is <u>not</u> the safest tank car design that is available and permitted for transporting crude. There are higher standard pressure tank cars that would provide an additional safety benefit. These cars, which are designed to minimize leaks, would also provide feasible mitigation of one of the Project's significant air quality impacts, namely railcar fugitive ROG emissions along the entire route in California as well as on-site.

The tank car designs that were part of the recent DOT rulemaking are all general service (non-pressure) tank cars.[157] Crude oil has most commonly been transported in non-pressure tank cars, but DOT regulations specify that pressure tank cars can also be

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[153] Rail Spur FEIR, p. 4.7-88; see FEIR, pp 4.7-24-4.7-27, for information on Option 1 tank cars.

[154] Rail Spur FEIR, p. 4.7-88. *See* also FEIR, p. ES-12-ES-13.

[155] Rail Spur FEIR, pp. 4.7-24-4.7-27 (USDOT Proposed Rulemaking for High-Hazard Flammable Trains (HHFT)).

[156] Rail Spur FEIR, p. ES-12.

[157] Rail Spur FEIR, pp. 4.7-24-4.7-27.

used for crude oil and other flammable liquids.[158] Pressure tank cars are used to transport higher hazard materials to minimize leaks and prevent releases when accidents occur.[159] They are designed to minimize leaks of toxic materials such as chlorine and can be retrofitted with enhanced fittings packages specifically designed to minimize leaks.[160]

Tesoro[161] has recently upgraded its crude by rail fleet with DOT-120 pressure tank cars that exceed the new DOT-117 non-pressure tank car standard.[162] Figure 3 provides the Tesoro Fact Sheet on the DOT-120 tank cars.

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[158] Crude and other flammable liquids are permitted to be transported in pressure tank cars including DOT-105, 109, 112, 114, and 120. *See* USDOT Final Rule, Table 6 (80 FR 26653 (May 8, 2015)).

[159] Field Guide to Tank Cars, AAR Transportation Technology Center Bureau of Explosives, revised edition January 30, 2012, pp. 47-48 (Classes DOT-105, 109, 112, 114, and 120 are pressure tank cars used to transport liquefied compressed gases, poison/toxic inhalation hazard (PIH/TIH) materials, reactive materials, and/or corrosive materials requiring the additional protection afforded by a stronger car. Pressure tank cars are used to transport highly flammable LPG (liquefied petroleum gases, such as propane and butane), as well as very high hazard TIH chemicals such as chlorine gas and anhydrous ammonia.); Available at: https://drive.google.com/file/d/0B2FxPRhLGkEmTlZORm5YSVpTOGc/view?pref=2&pli=1.

[160] *See*: Midland Pressure Cars (Exhibit 6).

[161] Tesoro is a large independent refiner, with six refineries in the western US, including two in California. http://tsocorp.com/. Tesoro is extensively involved in crude by rail. *See* Rail Spur FEIR, p. 3-8; Valero RDEIR, p. 2-146; http://phx.corporate-ir.net/External.File?item=UGFyZW50SUQ9NTcwOTEyfENoaWxkSUQ9MjcyMDYxfFR5cGU9MQ==&t=1;

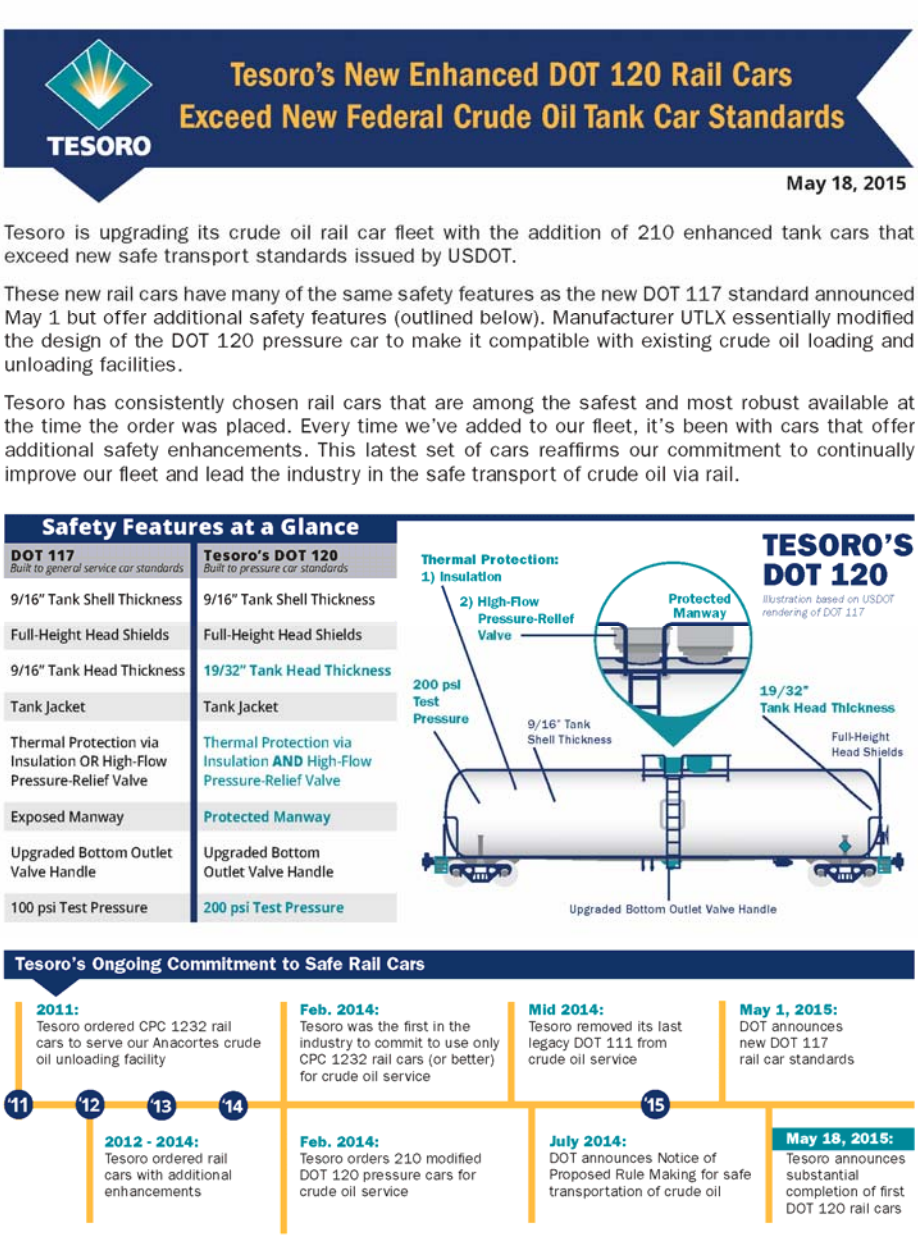
http://phx.corporate-ir.net/phoenix.zhtml?c=79122&p=irol-newsArticle&ID=2128049;

http://www.reuters.com/article/tesoro-rail-crude-idUSL2N0IS13N20131107.

http://www.efsec.wa.gov/Tesoro-Savage.shtml.

[162] Tesoro May 18, 2015 Press Release http://phx.corporate-ir.net/phoenix.zhtml?c=79122&p=irol-newsArticle&ID=2049329; for information regarding the new DOT-117 standard, see FEIR Section 4.7.5, USDOT Final for High-Hazard Flammable Trains (HHFT), and USDOT Final Rule: Enhanced Tank Car Standards and Operational Controls for High-Hazard Flammable Trains (80 FR 26644-26750 (May 8, 2015)).

Figure 3: Tesoro DOT-120 Tank Cars[163]



The Tesoro DOT-120 tank cars exceed the DOT-117 standard and also exceed the Option 1 tank car design required in FEIR Mitigation Measure HM-2a. The DOT-120 cars have most of the same safety features as the Option 1 design, but also have some additional safety features:

- a thicker tank head (19/32" vs. 9/16"); and

[163] https://tsocorpsite.files.wordpress.com/2015/05/tesoro-dot-120-fact-sheet.pdf.

- two times the rated tank test pressure (200 psi [pounds per square inch] vs. 100 psi).[164]

Compared with the Option 1 design required in FEIR Mitigation Measure HM-2a, the Tesoro DOT-120 tank car design would improve safety.[165] But the Tesoro DOT-120 design is not the only available option for railcars safer than the Option 1 design; other higher standard tank car designs could provide significant additional mitigation of Significant Impact HM.2.

The Tesoro DOT-120 tank car design has a minimum tank shell thickness of 9/16", as does the Option 1 design.[166] Other DOT-120 and DOT-114 pressure tank car designs have a minimum tank shell thickness of 11/16".[167] Additional tank shell thickness can provide a substantial safety benefit.[168]

The DOT-120 and DOT-114 designs with additional shell thickness also have higher rated tank pressure (300-500 psi, vs. 200 psi for the Tesoro DOT-120 design).[169] This would provide an additional safety benefit, as well as mitigate one of the Project's significant air quality impacts, on-site and off-site railcar fugitive ROG emissions. Comment IV.B.

The railcars leak ROG emissions from numerous closures, fittings, and valves on the railcars, both while in transit to the site and while on-site. For the five train per week option, fugitive ROG emitted from on-site railcars are 2,587 lbs/day per unit train visit and 336 ton/yr. For the three train per week option, daily emissions are the same and annual emissions are 202 ton/yr. Both the annual and daily ROG emissions for both of these cases exceed the SLOCAPCD ROG+NOx CEQA significance thresholds of 25 lb/day and 25 ton/yr. Thus, ROG emissions from on-site railcar fugitive leaks are a

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[164] Option 1 is similar to the new DOT-117 standard (Option 2 design in the DOT rulemaking), except that Option 1 incorporates a more damage-resistant top fittings design. The Tesoro DOT-120 cars include a protective housing for the manway. FEIR, p. 4.7-27; 4.7-96; Appendix H.2, p. 7.

[165] The QRA did not evaluate the Tesoro DOT-120 tank car design, and there do not now seem to be any publically available safety studies for this car design. Compared with Option 1, the Tesoro 120 tank car design has additional safety features, but it is uncertain how much this will improve safety. https://www.sightline.org/2015/12/15/tesoros-new-oil-train-cars-too-few-and-still-too-dangerous/

[166] The DOT-117 (Option 2) design also has a minimum tank shell thickness of 9/16". Other non-pressure tank car designs used for crude rail (including DOT-117R/Option 3, and some CPC-1232 and DOT-111) have a minimum tank shell thickness of 7/16".

[167] *See* footnote 169.

[168] *See* http://www.ntsb.gov/investigations/AccidentReports/Reports/RAR1201.pdf pp. 58, 76-77.

[169] *See* footnote 169.

highly significant, unmitigated operational air quality impact that was not disclosed in the FEIR.

In addition, daily and annual railcar ROG emissions are significant in every air district through which they pass, except Placer County, where emissions are underestimated due to the failure to include Roseville Yard operations. Further, annual ROG emissions are significant in every air district through which they pass that has an annual CEQA significance threshold, except SLOCAPCD.

Absent additional mitigation, the Project will use non-pressure tank cars. Option 1, CPC-1232, and DOT-117 designs are non-pressure tank cars, with a rated test pressure of 100 psi. If the Project uses pressure tank cars, this may mitigate air quality impacts from fugitive railcar ROG. The Tesoro DOT-120 design (with a shell thickness of 9/16") has a rated test pressure of 200 psi, but other DOT-120 and DOT-114 designs (with a shell thickness of 11/16") have rated test pressures of 300, 400, or 500 psi. *See* footnote 169.

Therefore, the FEIR failed to incorporate all feasible mitigation measures to reduce significant impacts, as required under CEQA. FEIR Mitigation Measure HM-2a should be amended to require DOT 120 or DOT 114 pressure tank cars that include all of the following safety features: [170]

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[170] DOT-114 and DOT-120 pressure tank car designs are permitted to have bottom outlets and can be configured to be compatible with crude by rail loading and unloading facilities. The Tesoro DOT-120 tank cars meet all the requirements of DOT Specification 120J200W, except that the manway area (cover thickness and insulation) has been modified to be compatible with crude by rail facilities. Tank cars similar to the Tesoro DOT-120 tank cars, but with a 11/16" minimum Tank Shell Thickness, would be modified versions of one of the following DOT Specifications:

- 120J300W (11/16" minimum Tank Shell Thickness, Jacketed, 300 psi Test Pressure),
- 120J400W (11/16" minimum Tank Shell Thickness, Jacketed, 400 psi Test Pressure),
- 120J500W (11/16" minimum Tank Shell Thickness, Jacketed, 500 psi Test Pressure).

Under the DOT specifications for DOT-114 tank cars, insulation is optional. Jacketed DOT-114 tank cars for crude service would have one of the following DOT Specifications:

- 114J340W (11/16" minimum Tank Shell Thickness, Jacketed, 340 psi Test Pressure),
- 114J400W (11/16" minimum Tank Shell Thickness, Jacketed, 400 psi Test Pressure).

See Figure 3, Tesoro DOT-120 Cars, in these Comments; Field Guild to Tank Car (footnote 158) pp. 5-10, 47-48; 49 CFR 79.101-1; 49 CFR 79.22; USDOT Final Rule, Table 6 (80 FR 26653 (May 8, 2015)); DOT Special Permit for Tesoro DOT 120 Tank Cars: 80 FR 9307 (February 20, 2015); DOT Special Permit DOT-SP 16188, January 7, 2015, pp. 1-2 www.phmsa.dot.gov/staticfiles/PHMSA/SPA_App/OfferDocuments/SP16188_2014060840.pdf.

> This special permit authorizes the manufacture […] of non-DOT specification tank cars […] for transportation of Class 3 flammable and combustible liquids […] meeting the

(cont'd)

- 11/16" minimum Tank Shell Thickness
- Full-Height Head Shields
- Tank Jacket
- Thermal Protection
- High-Flow Pressure-Relief Valve
- Protected Manway/TIH Top fittings protection system/nozzle
- Upgraded Bottom Outlet Valve Handle
- Minimum 300 psi Test Pressure
- Electronically controlled pneumatic (ECP) Brakes.

IV.C Hazard Impacts to Other Resource Areas

The Project was also found to have significant impacts from accidents, spills, fires, and explosions, in regard to:

- Public Services and Utilities (Significant Impact PS.4);
- Water Resources (Significant Impact WR.3);
- Agricultural Resources (Significant Impact (AR.5).

The impact to fire protection and emergency services along the UPRR mainline was found to be significant in the event of a fire or explosion.[171] Accidental oil spills along the UPRR mainline tracks were found to be significant in the event that a spill occurs where it could impact water resources,[172] and agricultural resources.[173]

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requirements of […] DOT120J200W specification tank cars except that the hinged and bolted manway cover does not meet the minimum thickness required in §179.100-12(b), and the tank does not have insulation around the manway in accordance with the requirements of §179.100-4.

[171] Rail Spur FEIR, pp. ES-14 and 4.11-24-4.11-28.

[172] Rail Spur FEIR, pp. ES-15 and 4.13-25-4.13-27.

[173] Rail Spur FEIR, pp. ES-9, 4.2-38/39.

IV.C.1 All Feasible Mitigation Not Required for Significant Impacts PS.4, WR.3, and AR.5

Mainline rail accidents and spills associated with the Project were found to have impacts that were significant and unavoidable (Class I) in regard to public services and utilities (Impact PS.4),[174] water resources (Impact WR.3),[175] and agricultural resources (Impact AR.5).[176]

The FEIR recommends Mitigation Measure PS-4b, which is identical to Mitigation Measure HM.2a, requiring use of Option 1 tank cars in the Project:

> "Only rail cars designed to FRA, July 23, 2014 Proposed Rulemaking Option 1: PHMSA and FRA Designed Tank Car as listed in Table 4.7.6, shall be allowed to unload crude oil at the Santa Maria Refinery." [177]

Likewise, the FEIR recommends Mitigation Measures WR-3 and AR-5, which require implementation of Mitigation Measure PS-4b (which is identical to Mitigation Measure HM.2a):

> "Implement mitigation measures BIO-11 and PS-4a through PS-4c."[178]

The FEIR failed to incorporate all feasible mitigation measures to reduce the Project's significant impacts, as required under CEQA.

V. THE FEIR LACKS ENFORCEABLE CONDITIONS

The conclusion that the three-train alternative would not result in any significant on-site impacts is based on many tacit assumptions that affect emissions and hazard impacts that are not backed up by enforceable conditions. These include:

(1) The decrease in imported crude from reducing train trips from 5 per week to 3 per week would not be made up by importing an equivalent amount of non-local, North American crude oil by truck at the Santa Maria Pump Station;

(2) The imported crude would only be heated once per year;[179]

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[174] Rail Spur FEIR, p. 4.11-29.

[175] Rail Spur FEIR, p. 4.13-27-4.13-28.

[176] Rail Spur FEIR, p. 4.2-39-4.2-40.

[177] Rail Spur FEIR, p. 4.11-28.

[178] Rail Spur FEIR, p. 4.7-88.

(3) The refinery will not accept or unload any crude oil with an API gravity of 30° or greater;[180]

(4) Rail spur access roads will be paved;[181]

(5) The corrosivity of imported crudes would not increase above the historic range;[182]

(6) The sulfur, benzene, toluene, ethylbenzene, and xylene (BTEX), and metal content of imported crudes would not increase above the historic range;[183]

(7) The locomotives will travel at an average speed of 40 mph with the exception of the distance between the San Luis Obispo County line to the SMR over the Cuesta Grade, where an average train speed of 20 mph is assumed[184] and an on-site switching speed of 3 mph;[185]

(8) The details of on-site locomotive operations, which determine on-site diesel particulate, NOx, ROG, and PM10 emissions[186]; and

(9) The new pipeline would be routed along an existing internal dirt road which "accommodates periodic on-site traffic only associated with refinery personnel travelling at low speed."[187]

Likewise, Mitigation Measure PS-4b (which is identical to Mitigation Measure HM.2), should be amended to require higher standard DOT-120 or DOT-114 pressure tank cars with additional safety features.

VI. THE PROJECT IS PIECEMEALED

The Phillips 66 San Francisco Refinery (SFR) consists of two facilities linked by a 200-mile pipeline. The Santa Maria Refinery (SMR) is located in Arroyo Grande in San Luis Obispo County, while the Rodeo Refinery is located in Rodeo in the San Francisco Bay Area. The Santa Maria Refinery mainly processes heavy, high sulfur

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[179] Rail Spur FEIR, pp. 2-15, 2-30.

[180] Rail Spur FEIR, mitigation measure HM-2d, pp. IST-51, 4.7-88.

[181] Rail Spur FEIR, p. 2-17.

[182] Rail Spur FEIR, p. 2-34.

[183] Rail Spur FEIR, p. 2-34.

[184] Rail Spur FEIR, p. B.1-9.

[185] Rail Spur FEIR, Table 2.5, Note 5.

[186] Rail Spur FEIR, Table 2.5.

[187] Rail Spur FEIR, pp. 4.7-43/44.

crude oil and sends semi-refined liquid products, *e.g.,* gas oil and naphtha (pressure distillates),[188] to the Rodeo Refinery for converting into finished products. Propane and butane would be recovered from these semi-refined products during refining at the Rodeo refinery and sold as liquefied petroleum gas (LPG). As the two facilities are linked by a pipeline and have a formal name that subsumes both, it is a rebuttable presumption that changes at one will cause and/or contribute to changes at the other.

Phillips 66 is planning to replace a significant portion of its baseline crude slate with North American cost-advantaged crudes[189] delivered to its California refineries by rail and ship (Santa Maria, Rodeo, and Los Angeles). There are currently four related projects at the San Francisco Refinery (comprising the Santa Maria and Rodeo Refineries) that seek to facilitate a baseline crude switch that have recently been permitted or that are currently in the process of being permitted and that are inextricably linked and should have been evaluated as a single project under CEQA. Three of these are related to the Santa Maria Refinery and thus are discussed in these comments, one at the Rodeo end of the pipeline and two at the Santa Maria end of the pipeline. These projects are:

1. Rodeo Refinery Propane Recovery Project;[190]

2. Santa Maria Refinery Throughput Project;[191]

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[188] The permits to operate for the Santa Maria Refinery and various pump stations along the pipeline indicate that the materials sent from Santa Maria to Rodeo are gas oil and "pressure distillates." The "pressure distillates" are referred to as "naphtha" in the subject RDEIRs. However, there are different types of naphtha, depending upon the boiling range. Full range naphtha, which is presumably what "pressure distillate" is intended to capture, is the fraction of hydrocarbons boiling between 30°C and 200°C. It consists of a complex mixture of hydrocarbons generally having between 5 and 12 carbon atoms and comprises 15% to 30% of the crude oil by weight. Light naphtha is the fraction boiling between 30°C and 90°C and consists of molecules with 5 to 6 carbon atoms. *See, e.g.*, http://en.wikipedia.org/wiki/Naphtha. The material sent from Santa Maria to Rodeo is not classically defined "naphtha" but rather "pressure distillate." To be consistent with the various EIRs, which refer to it incorrectly as "naphtha," I shall refer to it as "naphtha" in these comments, with the understanding that it is actually "pressure distillate" or "full range naphtha."

[189] Cost-advantaged crude is broadly defined in the McCabe declaration (2/1/16 Thompson Letter, Attach. 21) as any crude that costs less based on the "landed" price than the cost of the global benchmark crude, North Sea Brent.

[190] Contra Costa County, Phillips 66 Propane Recovery Project Recirculated Final Environmental Impact Report (RFEIR), January 2015; Available at: https://ca-contracostacounty2.civicplus.com/DocumentCenter/View/35130.

[191] Marine Research Specialists, Phillips 66 Santa Maria Refinery Throughput Increase Project, Final Environmental Impact Report, October 2012 (Throughput FEIR), Available at: http://slocleanair.org/phillips66feir.

3. Santa Maria Refinery Rail Spur Project.[192]

A timeline showing the interrelationship of these three projects is shown in Table 6. I previously commented on the relationship between the Santa Maria Refinery Throughput Project, the Santa Maria Refinery Rail Spur Project,[193] and the Rodeo Refinery Propane Recovery Project.[194] These comments are in the record.

The Santa Maria projects would increase the amount of propane and butane that is recoverable at Rodeo in two ways. First, the increase in crude throughput would increase the amount of gas oil and naphtha recovered at Santa Maria and sent to Rodeo in direct proportion to the increase in throughput, or by about 10% based on permit limits, assuming no change in crude slate. Second, the change in composition of the rail-imported crudes, compared to the baseline crude slate, would additionally increase the amount of propane and butane in the naphtha sent to Rodeo. These issues are discussed below in two sections: (1) Piecemealing of the Rail Spur and Propane Recovery Project and (2) Piecemealing of the Throughput Increase Project and Rail Spur Project.

VI.A Piecemealing: Rail Spur and Propane Recovery Project

In response to comments, the following sections demonstrate: (1) that there was not sufficient liquefied petroleum gas (LPG) in Rodeo's fuel gas to meet the Propane Recovery Project design basis of 14,500 bbl/day; (2) that the Throughput Increase Project would increase LPG in the semi-refined products sent to Rodeo; (3) that the Rail Spur Project would increase LPG in the semi-refined products sent to Rodeo; and (4) that vapor pressure limits on the Junction Station tanks would not limit the amount of LPG sent from Santa Maria to Rodeo.

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[192] San Luis Obispo County, Phillips 66 Company Rail Spur Extension and Crude Unloading Project Revised Public Draft Environmental Impact Report and Vertical Coastal Access Project Assessment, October 2014, SCH # 2013071028; Available at: http://www.slocounty.ca.gov/Assets/PL/Santa+Maria+Refinery+Rail+Project/Phillips+66+Company+Rail+Spur+Extension+Project+(Oct+2014)/Phillips+SMR+Rail+Project+Public+Draft+EIR.pdf.

[193] Fox Comments, Rail Spur DEIR; Fox Comments, Rail Spur RDEIR.

[194] Phyllis Fox, Comments on Environmental Impact Report for the Phillips 66 Propane Recovery Project, Prepared for Shute, Mihaly & Weinberger LLP on behalf of Rodeo Citizens Association, November 15, 2013; Available at: http://crgna.org/blog/wp-content/uploads/2013/11/Fox-Report-FINAL.pdf and Phyllis Fox & Petra Pless, Comments on Recirculated Draft Environmental Impact Report for the Phillips 66 Propane Recovery Project, Rodeo California, Prepared for Adams Broadwell Joseph & Cardozo, February 2, 2015. (Exhibit 9A)

VI.A.1 Recoverable LPG in the Rodeo Baseline

The Propane Recovery Project at the Rodeo Refinery is designed to recover 14,500 barrel per day (bbl/day) of LPG from Rodeo fuel gas. The Propane Recovery FEIR asserts that there is adequate LPG available under Rodeo baseline conditions to recover this amount of LPG without any changes in the amount of LPG from Santa Maria.[195]

However, my analysis indicates that in order to reach this design target, day in and day out, the Rodeo Refinery requires additional amounts of LPG precursors from the Santa Maria Throughput and Rail Spur projects. The increased amounts of LPG precursors would come from semi-refined products from (1) increased crude throughput at the Santa Maria Refinery and (2) modifying the Santa Maria Refinery crude slate makeup by refining tar sands dilbits that include more naphtha, which is a source of LPG. These two projects, then, would provide additional LPG to make up the shortfall in LPG destined to be recovered by the Propane Recovery Project.

Response to comment ABJC-30 argues "The equipment design is a limiting factor on the amount of propane and butane that can be captured and stored, regardless of how much propane and butane can be produced by the SFR in the future or what type of crude oil is processed." The issue is not the upper bound, or design basis, but rather, the amount of LPG available to be recovered.

The equipment design is irrelevant for assessing piecemealing if the amount of propane and butane required to fill the design capacity is not available and must be supplied by other projects. The response to comment ABJC-30 is beside the point, and akin to arguing that a car can be driven 200 miles because it has an engine that gets 20 miles to a gallon and has a gas tank that can hold 10 gallons of gasoline, if the gas tank is only partially full. The impacts of supplying the additional LPG (or gasoline) required to reach the design basis of 14,500 bbl/day should be included with the project's direct impacts.

The amount of recoverable propane and butane in the baseline Rodeo Refinery fuel gas is overstated (<13,970 bbl/day).[196] As the supporting analytical data have never been produced, and the sampling point(s) have not been disclosed, the asserted amount does not constitute substantial evidence of recoverable butane/propane as

[195] Propane Recovery FEIR, p. 3.2-252. *See* also RTC ABJC 30 ("Data regarding actual LPG content of the RFG is consistent with the design basis for the project.").

[196] Fox/Pless Comments on Propane Recovery RDEIR, p. 12. (Exhibit 9A)

claimed in RTC ABJ-30. There are at least five reasons to question the asserted amount of baseline recoverable LPG.

First, Phillips 66 **adds** butane to the Rodeo fuel gas to control its specific gravity.[197] Butane levels must be high enough to assure efficient combustion in heaters, boilers, turbines, and other combustion sources. Thus, Phillips 66 cannot recover all of the butane it asserts is recoverable without compromising the performance of Rodeo combustion units.

Second, the Rodeo Refinery fuel gas system is very complex, comprising two separate fuel gas systems, which collect gases from a number of different refining units.[198] Some of these streams will be routed to the Propane Recovery Unit while others will not, *e.g.*, natural gas, U-240, D-301.[199] The "summary" data collected in 2011 and 2013 and reported as recoverable propane and butane[200] is for all gas streams lumped together, rather than just those from which propane and butane would be recovered. A major portion of the U-233 gas, on the other hand, is natural gas, which can contain significant amounts of propane and butane. This propane and butane would not be recovered, but is included in Phillips 66's "summary" measurements of propane and butane available for recovery. It is not possible to back out this contribution and figure out the actual recoverable amounts of LPG based on the record as the composition of the natural gas (and other sub-streams that would not be sent to the RFG Propane Recovery) are not in the record.

Third, the August 2011 sample suggests substantially less propane and butane are available for recovery at the Rodeo Refinery. The fuel gas sampling measured only 10,576 bbl/day from Refinery Fuel Gas systems U233 and A, which is 3,924 bbl/day shy of the 14,500 bbl/day design basis. The RDEIR then adds 4,898 bbl/day to this measured total, characterized as "butane currently recovered for sale."[201] However, the block flow diagram for the Rodeo Refinery shows that the butane that is currently recovered is not recovered from either sampled fuel gas system, but rather from the U-215 fuel gas treating system.[202] Thus, this added butane appears to have been double-counted. The August 2011 sample suggests there is a significant shortfall of

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[197] Propane Recovery RDEIR, Appx. E, pdf 205: Flare Minimization Plan, Attach. M, p. 1.

[198] Propane Recovery RDEIR, Fig. 3-5.

[199] Compare Figures 3-4 and 3-5 in Propane Recovery RDEIR.

[200] Propane Recovery RDEIR, p. 3-33 & Figures 3-7 & 3-8.

[201] Propane Recovery RDEIR, Figure 3-7.

[202] Propane Recovery RDEIR Figure 3-5.

recoverable propane and butane. Thus, the fuel gas sampling in August 2011, while the Throughput Increase Project was being designed and permitted (Table 6), demonstrates that the Propane Recovery Project needed both the Throughput Increase Project and the Rail Spur Project to meet its design basis.

Fourth, supporting data for the 2011 sampling event were attached to the BAAQMD permit application. My analysis of these data indicate that Phillips 66 estimated recoverable butane/propane based on maximum flow rates, rather than average daily values, on a single day in August 2011.[203] Thus, recoverable propane/butane may be much less than claimed, and the Rail Spur and Throughput Increase Projects may supply a much larger portion of the shortfall.

Fifth, at the time the August 2011 sample was collected, the Rodeo refinery was apparently running a unique crude oil, a very light Russian Bakken-lookalike.[204] The record contains no information on the makeup of the crude slate at the time the 2013 samples were collected. It is possible, for example, that the refinery was also running a uniquely light crude slate to evaluate the recoverable LPG.

In sum, the Rail Spur Project, together with the predecessor Throughput Increase Project will increase the amount of recoverable propane and butane in the naphtha sent to Rodeo. As demonstrated below, it will contribute significantly to making up for the current shortfall in recoverable propane and butane at the Rodeo Refinery.

VI.A.2 Santa Maria Refinery Throughput Increase Project Would Increase Recoverable LPG at Rodeo Refinery

The Santa Maria Refinery Throughput Increase Project allows a 10% increase in crude throughput at Santa Maria, from 44,500 bbl/day[205] to 48,950 bbl/day.[206] Assuming no change in the typical crude slate[207], this increase would be refined at Santa Maria to produce roughly 10% more naphtha (pressure distillate) and gas oil. This 10% increase in naphtha and gas oil would be sent to Rodeo where it would be refined into gasoline, diesel, and jet fuel, producing up to 10% more propane and butane. This increase in propane and butane would be recovered by the Propane Recovery Project, thus making up part of the shortfall in feedstock for the Propane Recovery Project.[208] The CEQA findings for the Santa Maria Throughput Project explicitly recognize that the increase in throughput at the Santa Maria Refinery would result in "[a]n increased

[203] Fox/Pless Comments on Propane Recovery RDEIR, February 2, 2015, pp. 10-11. (Exhibit 9A)

[204] Karras Report, February 2, 2015 (Exhibit 7).

volume of products leaving the SMF for the Rodeo Refinery via pipeline."[209] This 10% increase is independent of other increases (due to changes in crude slate quality) discussed below.

VI.A.3 Santa Maria Refinery Rail Spur Project Would Increase Recoverable LPG at Rodeo Refinery

The Project proposes to import Canadian tar sands "dilbits," which are a mixture of tar sands bitumen and diluent. The bitumen is too viscous to be readily transported by pipeline or rail.[210] Thus, the bitumen is blended with 25% to 30% diluent to facilitate transport. The blended crude is known as a "dilbit." The diluent is typically natural gas condensate, pentanes, or naphtha.[211] Other materials can be blended with the bitumen, to produce dilsynbits and other mixtures.

The Rail Spur Project will increase the amount of LPG sent to Rodeo. These blended tar sands crudes contain more LPG than the baseline Santa Maria crude slate, and they yield more naphtha when refined.

VI.A.3.i Tar Sands Crudes Have More LPG than Baseline Crudes

The diluents used in these dilbits have high concentrations of propane/butane that can be partitioned into semi-refined products (naphtha) at SMR and recovered as propane and butane at Rodeo. The Rail Spur FEIR and RTC CBE-111 reported the five-year average "LPG Percentage" for two dilbits as 0.73% and 0.89%. These were compared to the current "typical crude blend" refined at the SMR of 0.9%, ranging from

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[205] Throughput Increase FEIR, p. 2-24 (Department of Planning and Building permit limit).

[206] Throughput Increase FEIR, p. 2-24.

[207] Rail Spur FEIR, Table 2.7.

[208] *See* discussion in CBE-86 and -87.

[209] County of San Luis Obispo, Department of Planning and Building, Staff Report, December 13, 2012, Exhibit C – CEQA Findings, p. 2-24; Available at: http://slocounty.granicus.com/MetaViewer.php?view_id=10&clip_id=1401&meta_id=255988.

[210] Bitumen can be transported in heated pipelines and railcars. The Santa Maria facility would use a steam heating system once per year to facilitate unloading in cold weather. FEIR, p. 2-15.

[211] Rail Spur FEIR, p. 2-34. *See* also: Gary R. Brierley, Visnja A. Gembicki, and Tim M. Cowan, Changing Refinery Configurations for Heavy and Synthetic Crude Processing, Available at: https://www.edockets.state.mn.us/EFiling/edockets/searchDocuments.do?method=showPoup&documentId=%7BA07DE342-E9B1-402A-83F7-36B18DC3DD05%7D&documentTitle=5639138.

0% to 1.0%,[212] suggesting there would be no change in LPG content and thus no connection between the two projects. There are three problems with this comparison.

First, the supporting data for the Santa Maria crudes to demonstrate that these values represent the CEQA baseline crude composition are missing from the record. The footnotes to Rail Spur FEIR Table 2.7 indicate a "range of major crudes represent the major source of current crudes to the refinery and include a number of OCS, local onshore, and trucked crude sources" and "current SMR operations data from Phillips 66, 2015."[213] However, the period of record for these crudes, the specific crudes and the amounts of each, the number of samples, the analytical method(s) used to measure LPG, and the actual measured data used to calculate the average and range are critical to assess its accuracy and representativeness of the baseline crude slate. This information is missing from the record.

Second, the amount of diluent blended with the bitumen is adjusted by season and is higher in winter to control viscosity due to lower temperatures at the loading point and during transit. Thus, an annual average for dilbit and other tar sands mixtures will substantially understate peak values.

Third, the FEIR's comparison is selective and misleading. There are many other tar sands crudes with much higher LPG content that could be refined at Santa Maria and that would meet the new API gravity limit in mitigation measure HM-2d. The crudemonitor.ca site that the FEIR relied on for dilbit composition data for Access Western Blend and Peace River Heavy includes LPG data for eight similar blended tar sands crudes.[214] Four of these are compared with the typical SMR crude blend below in Table 7. Any dilbit (or other similar blended tar sands crude) could be selected as the FEIR does not limit the specific crudes that could be imported.

[212] Rail Spur FEIR, Table 2.7, "LPG Percentage".

[213] RTC CBE-111; Rail Spur FEIR, Table 2.7.

[214] Access Western Blend, Borealis Heavy, Christina Dilbit Blend, Cold Lake, Peace River Heavy, Albanian Heavy Synthetic (dilsynbit), Western Canadian Select (conventional & bitumen blends).

Table 7:
LPG Percentage (vol. %) in Tar Sands Crudes[215]
Compared to SMR Typical Crude Blend

Tar Sands Crude	Average	Maximum
Borealis Heavy	1.22	1.79
Cold Lake	1.08	1.85
Western Canadian Select	2.12	2.44
Albanian Heavy Synthetic	1.68	2.18
SMR Typical Crude Blend	**0.9**	**1.0**

This table shows that there are similar tar sands blended crudes that could be imported by rail that contain much more LPG than the Santa Maria typical blend, up to 2.4 times more. Further, even the two dilbits included in the FEIR's comparison can have more LPG than the 5-year averages reported in FEIR Table 2.7 (0.73% and 0.89%). A July 2015 sample of Access Western Blend contained 1.15% LPG[216] and a December 2012 sample of Peace River Heavy contained 1.06% LPG[217].

Thus, changing the crude slate at Santa Maria by refining tar sands blends could increase the amount of recoverable LPG at Rodeo, contributing to the Rodeo LPG shortfall. This is confirmed by three lines of evidence: (1) the reported distillation yield of naphtha[218] from tar sands dilbits, is higher than in typical SMR crude;[219] (2) the percentage of propane and butane in tar sands dilbits and other similar tar sands blends is higher than in a typical SMR crude (Table 7); and (3) vapor pressure limits on Junction Station tanks were increased.[220] The increase in LPG sent to Rodeo is in addition to the 10% increase due to the Throughput Increase Project. The ways in which this could occur are discussed in RDEIR Comments CBE-86 to -88 (Karras) and CBE-110 to -115 (Fox).

VI.A.3.ii Tar Sands Crudes Yield More Naphtha When Refined

The refining of these and other similar tar sands crudes at Santa Maria will increase the amount of LPG, mostly butane, sent to Rodeo in semi-refined products, thus reducing Rodeo's LPG shortfall. Dilbits and other similar blended tar sands crudes contain more LPG than Santa Maria's typical crude blend, as demonstrated below.

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[215] http://www.crudemonitor.ca/home.php.

[216] http://www.crudemonitor.ca/crude.php?acr=AWB.

[217] http://www.crudemonitor.ca/crude.php?acr=PH.

[218] Naphtha is a light hydrocarbon mixture with a boiling point up to 190°C.

[219] Rail Spur FEIR, Table 2-11.

[220] Junction Station Tanks vapor pressure increase to 11 psia (Exhibit 22)

The RTC asserts that the FEIR's distillation yield figure "shows that the amount of naphtha, distillate, gas oil, and resid for the two dilbit crudes… are very similar to the typical composition of crude that is currently processed at the SMR."[221] This assertion is wrong for two reasons.

First, the distillation yield figure in the FEIR[222] shows a higher yield of naphtha (18%), where the propane and butane would be found, compared the "typical SMR" crude (11%). This is confirmed by similar distillation yield curves for tar sands crudes in my comments on the Rail Spur RDEIR, Figures 1 and 2 (CBE-111). And as demonstrated by the data in Table 7, the two tar sands crudes that the FEIR selected to make its case fall at the lower end of the propane/butane range. There are many tar sands crudes that yield much more LPG than Access Western Blend or Peace River Heavy, as seen in Table 7 above.[223]

Second, the distillation yield bar for "typical SMR" crude oil, footnoted as "Phillips 66-Average values for 2014 and part of 2015,"[224] is unsupported. The record does not disclose the number of samples included in the averages, the analytical method(s) used to develop the distillation yield curve, or the supporting laboratory reports, preventing review and confirmation of the reported distillation yields of naphtha and gas oil. Further, the County "has no records in its possession or control" that supports the "typical SMR" bar.[225] Finally, 2014 and 2015 are not the baseline years. The SMR was already refining 2% to 7% tar sands dilbits in these years.[226]

The FEIR includes a new mitigation measure (HM-2d) that prohibits the unloading of crudes with an API gravity of 30° or greater.[227] The FEIR is not otherwise proposing to limit the crudes that can be imported by rail. The proposed limit on API gravity would not prevent the unloading of most tar sands crudes and specifically, the four tar sands crudes I identified in Table 7, all of which have significantly more propane/butane than the typical Santa Maria crude. All of these crudes have

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[221] RTC CBE-111.

[222] Rail Spur FEIR, Figure 2-11.

[223] *See* Fox Rail Spur RDEIR Comments, Figures 1, 2.

[224] RTC ABJC-32 and Rail Spur FEIR, Figure 2-11.

[225] Letter from Rita L. Neal, County Counsel, to Laura Horton, Adams Broadwell Joseph & Cardozo, Re: Public Records Act Requests Dated January 12 and 14, 2016, re: Phillips 66 Company Rail Spur Extension Project, January 21, 2016. (Exhibit 13)

[226] 2/1/16 Thompson Letter (Exhibit 3A), In the attachments to this letter (Exhibit 3B), see Exhibit 21, McCabe Declaration.

[227] RTC CBE-110 and FEIR, p. 4.7-88.

API gravities lower than 30°.[228] Further, there are many other tar sands crudes with elevated amounts of propane/butane and lower API gravities, such as Lloyd Blend (LPG = 3.05%)[229], Lloyd Kerrobert (LPG = 3.34%)[230], and Wabasca Heavy (LPG = 2.29%),[231] among many others. Thus, the proposed limit on API gravity does not prevent increased amounts of propane and butane from being present in the naphtha sent to Rodeo. Further, the FEIR is silent on how the API gravity limit would be enforced.

In sum, tar sands crudes could be selected to increase the amount LPG that is ultimately recoverable at Rodeo, reducing the Rodeo LPG shortfall. Thus, it is reasonable to expect that the Rail Spur Project will increase the amount of LPG in semi-refined products sent to Rodeo, consistent with Phillips 66's late 2012 increase in the Junction Station tank vapor pressure limits.

VI.A.3.iii Partitioning of Crude Oil LPG During Refining at SMR

In another line of argument against partitioning, the FEIR and RTCs assert that most of the propane and butane in Santa Maria crude ends up in the Santa Maria refinery fuel gas and thus would not be present in the semi-refined products sent to Rodeo.[232] This claim is only supported by a table that shows the "composition of refinery fuel gas at the SMR."[233] The table is unsupported. The sampling point(s), test method, underlying analytical data, number of samples, and period of record are not indicated, so the relevance of these data is unknown.

Regardless, the composition of refinery fuel gas, taken alone, does not prove that most of the propane and butane end up in the fuel gas. It says nothing about how much propane and butane goes elsewhere, such as into the naphtha. A refinery material balance is required to determine how propane and butane are partitioned within the refinery. The FEIR does not include a refinery material balance and thus fails to provide the public with information required to support the claim that all of the propane and butane ends up in the refinery fuel gas.

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[228] http://www.crudemonitor.ca/crude.php?acr=PH.

[229] http://www.crudemonitor.ca/crude.php?acr=LLB.

[230] http://www.crudemonitor.ca/crude.php?acr=LLK.

[231] http://www.crudemonitor.ca/crude.php?acr=WH.

[232] Rail Spur FEIR, p. 2-31 and RTC CBE-84/85.

[233] RTC CBE-84/85.

The Rail Spur FEIR includes a block flow diagram for the Santa Maria Refinery.[234] This figure suggests that all of the propane and butane are partitioned into the naphtha at the front end of the refinery. The refinery fuel gas originates from the coker, at the tail end of the refinery.

The block flow diagram shows raw crude is first routed to the Pre-Flash Drum, where volatiles are separated. Propane and butane would be separated here due to their very low initial boiling points. The overheads from this unit, where the propane and butane would be found, are sent to the Crude Tower. The Crude Tower overheads are straight run naphtha, which would include the propane and butane. The block flow diagram does not show any fuel gas generated in these units where the crude is separated into various fractions based on boiling points. Rather, the block flow diagram shows that the refinery fuel gas originates from the coker, which is downstream from the Crude Tower.

As the block flow diagram indicates that no refinery fuel gas is produced at the front end of the refinery, the propane and butane arriving in the crude oil is distilled into naphtha which is sent to the Rodeo Refinery. The SMR block flow diagram does not support the RTC's claim that the propane and butane are partitioned into the fuel gas. Thus, the butane and other lighter components arriving in the tar sands dilbits would most likely be partitioned into the naphtha, accounting for the increased naphtha yield shown in the distillation figure (FEIR, Figure 2-11).

Very little, if any of the propane or butane in tar sands crudes would be partitioned into the gas oil at the SMR because gas oil is a much heavier material with a very low vapor pressure. This is confirmed by the distillation yield chart in the FEIR, Figure 2-11, which shows that the two candidate tar sands dilbits would produce more naphtha and about the same amount of gas oil as the current crude slate. The current crude slate yields about 11% naphtha, the light, butane-rich, semi-refined product sent to Rodeo, while the two tar sands dilbits yield about 18% naphtha,[235] consistent with the LPG information presented elsewhere.[236]

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[234] Rail Spur FEIR, Figure 2-10. *See* also Throughput Increase DEIR, Figure 2-6 (*See* upper left, Unit D-1, Crude Tower, top arrow: "straight run naphtha". The only fuel gas line originates from the cokers.) This same figure is in the Throughput Increase DEIR, Figure 2-6.

[235] Rail Spur FEIR, Figure 2-11.

[236] Rail Spur FEIR, Table 2.7.

VI.A.4 Increased Amount of LPG in Santa Maria Naphtha and Gas Oil Would Not Exceed Santa Maria Refinery or Junction Station Tank Vapor Pressure Limits

The response to comments asserts that vapor pressure limits on various tanks, first at Santa Maria, then at the Junction Station, would prohibit an increase in the amount of LPG sent to Rodeo.

VI.A.4.i Santa Maria Refinery Tanks

In response to comments that the Rail Spur Project would increase the amount of LPG in semi-refined products sent to Rodeo in the DEIR, the RDEIR[237] asserted that permit limits on the vapor pressure of the "naphtha"[238] and gas oil tanks at the SMR restrict the amount of propane and butane that could be contained in the naphtha and gas oils sent to the Rodeo Refinery via pipeline. Thus, it claimed that more propane and butane in the naphtha and gas oil could not be sent to Rodeo without violating tank vapor pressure limits at the Santa Maria Refinery.

This claim was asserted without providing any supporting permits or vapor pressure measurements, information readily available to the applicant. I obtained the subject permits and vapor pressure data for the Santa Maria Refinery tanks. My review of this information indicated the RDEIR's claims are wrong as to vapor pressure constraints at the Santa Maria Refinery tanks. There are either no vapor pressure limits on the subject tanks, the stored naphtha and gas oil have vapor pressures far below the tank permit limits, or the naphtha tanks were covered and vented to a control device.[239]

The RTC on the Rail Spur RDEIR did not refute this information, and, in fact, conceded the Santa Maria Refinery vapor pressure issue[240] and changed the FEIR text to remove the alleged SMR tank vapor pressure constraint.[241]

However, the RTC shifted its vapor pressure constraint argument from tanks at the Santa Maria Refinery to tanks at the Junction Station, which is located in the San Joaquin Valley Air Pollution Control District (SJVAPCD), along the pipeline that connects the Santa Maria Refinery with the Rodeo Refinery.

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[237] Rail Spur RDEIR, p. 2-31.

[238] The "naphtha" sent to Rodeo is actually "pressure distillate," which is the sum of naphtha and distillate and comprises about 31% of the whole crude.

[239] CBE-101 to -108 and RTC CBE-100 to -108.

[240] RTC CBE-100 to 108.

[241] Rail Spur FEIR, p. 2-31.

VI.A.4.ii Junction Station Tanks

The RTC on the Rail Spur RDEIR newly asserts that "[p]ermits issued by the San Joaquin Valley Air Pollution Control District effectively prevent a substantial increase in the LPG content of the material transported via the pipeline from the SMR to the SFR."[242] This claim is unsupported and wrong.

First, there is no evidence in the record that the semi-refined products are routinely off-loaded into tanks at the Junction Station. The normal practice when I worked at this facility was to push them straight through to Rodeo. These tanks are for emergencies and throughput management, not routine storage. Storage, when necessary, is provided by the tanks at the Santa Maria Refinery.

Second, the RTC asserts the semi-refined products are blended with crude oils. If true, this blending would reduce the vapor pressure of the mixture stored in the tank, as San Joaquin Valley crudes have very low vapor pressures. This would offset increases in vapor pressure due to increased LPG.

Third, information I gathered indicate that a substantial increase in LPG could occur if the naphtha were stored in Junction Station tanks, without exceeding vapor pressure limits.

The vapor pressure claim is followed by a table that lists the subject tanks at the Junction Station and their vapor pressure limits, reproduced below for reference:

Table 8:
SJVAPCD Permits for Junction Station Tanks (RTC CBE-100/108)

Tank #	Permit #[243]	Product	True Vapor Pressure Limit (psia)
40010	(S-1518-8-3)	Naphtha	11.00
80018	(S-1518-1-4)	Naphtha	10.99
110020	(S-1518-7-3)	Gas Oil	11.00
110022	(S-1518-2-2)	San Joaquin Valley Heavy Crude	11.00
110024	(S-1518-5-3)	Elk Hills Crude	11.00
1100026	(S-1518-31-2)	San Joaquin Valley Heavy Crude	11.00

[242] RTC CBE-86 and CBE-100 to -108.

[243] Junction Station Tank Permits (Exhibit 2).

The supporting permits and vapor pressure data again were not provided to support this table. Thus, we filed public records act requests to obtain the cited permits and vapor pressure data. This information indicates that the RTC's claims with respect to vapor pressure constraints limiting the amount of LPG sent to Rodeo are misleading and wrong for a second time for two reasons. First, the vapor pressure limits are not enforceable as a practical matter. Second, the increase in LPG from refining tar sands dilbits is not high enough to exceed the limits.

VI.A.4.ii.a The Junction Station Permits Would Not Limit the Amount of LPG in Santa Maria Semi-Refined Products

Response to Comment CBE-100/108 asserts that the Junction Station permits "prevent a substantial increase in the LPG content of the material transported via the pipeline from the SMR to the SFR." However, my review of these permits indicate the vapor pressure limits in these permits are not enforceable for three reasons.

First, these permits (Exhibit 2) do not require any vapor pressure monitoring or reporting, except when the materials stored in the tanks are changed:

> "Permittee shall conduct true vapor pressure (TVP) testing of the organic liquid whenever there is a change in the source or type of organic liquid stored in this tank. [District Rule 2520,9.3.2] Federally Enforceable Through Title V Permit."

These permits would allow 100% LPG to be stored in the Junction Station tanks, so long as there is no change in stored material. As long as the material stored in the tanks does not change, Phillips 66 is under no obligation to test or report the vapor pressure.

Second, all routine vapor pressure determinations in the Junction Station tank permits are made using standard industry nomograms, none of which apply to the gas oils and pressure distillates unique to the semi-refined products from tar sands crudes.[244] Thus, high vapor pressure material could be stored in these tanks, but not discovered as no measurements are required.

Third, the permits do not restrict the type of material that can be stored in the tanks. Thus, as a practical matter, the asserted vapor pressure constraints will not prevent higher vapor pressure material from being stored in tanks at the Junction Station than presently.

[244] SJVAPCD Permits S-1518-8-5; S-1518-1-6; S-1518-7-6; S-1518-2-5; S-1518-5-7; and S-1518-31-6. (Exhibit 2)

Therefore, the vapor pressure limits this comment relies on are not enforceable as a practical matter. They cannot be relied upon to restrict the amount of propane and butane in shipped gas oil and naphtha.

VI.A.4.ii.b The Junction Station Permits Anticipated More LPG in Santa Maria Semi-Refined Products

The RTC tank table reproduced above in Table 8 shows that the six tanks at the Junction Station have true vapor pressure (TVP) limits of 11 psia. These vapor pressure limits were increased during the time the Rail Spur Project was being planned to allow higher vapor pressure material, such as higher vapor pressure semi-refined products from Santa Maria, to be stored, which is consistent with fact that ConocoPhillips knew that higher vapor pressure material was planned for transport to Rodeo.

The vapor pressure limits for tanks 110022, 110024, and 110026 in Table 8 were raised[245] in late 2012,[246] around the time Phillips 66 was planning the Rail Spur Project, as evidenced by on-going paleontological, biological, and noise studies for the Rail Spur Project (Table 6).[247] While these three tanks are identified as storing various crude oils in the RTC, the permits indicate that they can store any organic liquid. If semi-refined products are offloaded into these tanks enroute to Rodeo and blended with semi-refined products, as suggested in RTC CBE-100/108, the vapor pressure would be significantly reduced.

Table 9:
True Vapor Pressure (psia)
Reported in RTC CBE-108/110
Compared to Cited Permit

	Tank 110022	**Tank 110024**	**Tank 1100026**
RTC CBE-100/108	11.00	11.00	11.00
Cited Permit	10	5.35	9.5

[245] The most recent version of these permits, which expire 5/31/2019, are: S-1518-2-5; S-1518-5-7; and S-1518-31-6. The last digit in these permit numbers is the version. These current permits are all two versions removed from the permits cited in the RTC and confirm the reported 11 psia vapor pressure limits.

[246] Notice of Preliminary Decision – ATC/Certificate of Conformity, Facility #S-1518, Project #S-1122222, November 9, 2012; Available at: https://www.valleyair.org/notices/Docs/2012/11-09-12%20(S-1122222)/Public%20Notice%20Packet.pdf.

[247] Phillips 66, Land Use Application, Santa Maria Refinery Rail Project, June 2013, Available at: http://www.slocounty.ca.gov/Assets/PL/Santa+Maria+Refinery+Rail+Project/phillipslanduse.pdf.

Thus, given that Phillips 66 applied to raise the vapor pressure limits on three of these tanks while the Rail Spur Project was being planned, it is reasonable to assume that Phillips 66 anticipated an increase in the vapor pressure of material stored in these tanks.[248] This increase in tank vapor pressure limits is consistent with refining Bakken crude (which was to be imported via the Rail Spur Project as proposed in 2012), dilbits, and other similar tar sands crude blends at Santa Maria and sending more volatile semi-refined products with more LPG to Rodeo. As demonstrated below, these crudes contain more volatile components than present in the "typical crude blend" refined at Santa Maria in the baseline.[249] The increased amount of volatile material allowed by these vapor pressure limit increases would contribute to recoverable LPG at the Rodeo Refinery, making up for part of the LPG shortfall discussed below. The balance of the shortfall would be made up by the 10% increase in throughput allowed by the Throughput Increase Project.

VI.A.4.ii.c The Increase in Vapor Pressure of Semi-Refined Products Will Not Exceed 11 psia

Response to Comment CBE-100/108 asserts that "a very small amount of additional LPGs in the products coming from the SMR could cause a substantial increase in true vapor pressure of the material stored in the tanks at the Junction Station, resulting in an exceedance of the vapor pressure limit." This response goes on to claim: "LPGs are highly volatile compounds with a vapor pressure that ranges from 30 to 120 psi at 68 F and 50 to 190 psi at 100 F." An authority is not cited for these vapor pressure ranges, but they appear to be for various propane/butane mixtures varying from 100% butane to 100% propane at various temperatures. This response is misleading because it fails to disclose that the very high vapor pressures are for propane, which is a minor component of LPG in tar sands dilbits.

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[248] From RTC-86: "Although these tanks were historically used to store heavy crudes, the RTC indicates: "all semi-refined products from the SMR are delivered into large above ground storage tanks until they can be sent in batches to the SFR. In addition, select materials from the SMR are blended with crude oil coming from oil production fields to the south, and the blending occurs in the above ground storage tanks at the Junction Station…" Further, the permits on these tanks allow any organic material to be stored.

[249] Rail Spur FEIR, Table 2.7.

Available data summarized in Table 10 indicate that baseline vapor pressures are much less than the permitted vapor pressure limits of 11 psia. Thus, the vapor pressure of gas oil and naphtha can increase considerably before exceeding the respective tank vapor pressure limits.

Table 10: True Vapor Pressure (psia)[250] of Naphtha and Gas Oil in Junction Station Tanks

Year	2010	2011	2012	2013	2014	2015	Avg
Naphtha	5.54/6.16	6.84	5.76/5.79	6.68	-	5.26/4.08	**5.76**
Gas Oil	-	0.09	-	0.06	0.01	0.094	**0.06**

The very high vapor pressures cited in RTC CBE-100/108 are for propane. However, the majority of the LPG in tar sands dilbits is butane, which is much less volatile. Table 11 summarizes propane and butane (LPG) content of tar sands dilbits and other tar sands blends. This table shows that on average, a typical tar sands dilbit has about 95% butane and only 5% propane. Other types of tar sands crudes have even less propane, as they are not blended with diluent. Thus, a dilbit serves as a worst case for evaluating the hypothetical vapor pressure constraint.

Table 11: LPG Percentage (vol. %) in Tar Sands Crudes[251] Compared to SMR Typical Crude Blend

Tar Sands Crude	Propane	Butane	% Butane
Access Western Blend	0.05	0.70	**93**
Peace River Heavy	0.06	0.83	**93**
Kearl Lake	0.02	0.88	**98**
Borealis Heavy	0.01	1.21	**99**
Cold Lake	0.05	0.78	**94**
Western Canadian Select	0.06	2.06	**97**
Albanian Heavy Synthetic	0.11	1.54	**93**
AVERAGE			**95**

A mixture of 5% propane and 95% butane at 100 F would have a true vapor pressure of 45 psia.[252] The same mixture at 70 F would have a true vapor pressure of

[250] The vapor pressure data for 2010 – 2012 is from Annual Inspection Reports and from 2013 – 2015 from analytical lab reports, based on measurements of samples. (Exhibit 14) The origin of the vapor pressure data in the Annual Inspection Reports is unknown and may be from various standard industry nomograms or default values from the EPA TANKS program.

[251] http://www.crudemonitor.ca/home.php.

[252] Vapor pressure of mixture of 5% propane and 95% butane at 100 F = (0.05)(177) + (0.95)(38) = 44.95 psia. *See*: http://www.engineeringtoolbox.com/propane-butane-mix-d_1043.html.

22 psia.[253] Thus, at 100 F, 12% of the naphtha could be LPG without exceeding a vapor pressure limit of 11 psia.[254] At 70 F, 23% of the naphtha could be LPG without exceeding a vapor pressure limit of psia.[255] The baseline LPG content in a typical crude blend is 0.9%[256] and 18% of the crude distills to naphtha.[257] Therefore, baseline naphtha contains about 5% LPG[258]. The actual amount is likely lower as the naphtha fraction includes some pressure distillate. Thus, the amount of LPG sent to Rodeo could increase by factors of two (12/5=2.4) to five (23/5=4.6) without exceeding the vapor pressure limit of 11 psia.

VI.A.5 Increase in Recoverable LPG at Rodeo from SMR Semi-Refined Products

Based on the analysis below, it is clear that the amount of LPG sent from Santa Maria to Rodeo would increase as a result of the Rail Spur Project. My calculations indicate that the increase in recoverable LPG at the Rodeo Refinery, as a result of the Santa Maria Rail Spur Project, would range from 275[259] to 900 bbl/day.[260] The Throughput Increase Project would further increase this by up to 10% relative to permitted throughput (302 to 990 bbl/day).

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[253] Vapor pressure of mixture of 5% propane and 95% butane at 70 F = (0.05)(110) + (0.95)(17) = 21.65 psia *See*: http://www.engineeringtoolbox.com/propane-butane-mix-d_1043.html.

[254] Solving the equation, 5.76 + x(45) =11, for x, the fraction LPG, yields 12%.

[255] Solving the equation, 5.76 + x(22) =11, for x, the fraction LPG, yields 23%.

[256] Rail Spur FEIR, Table 2.7.

[257] Rail Spur FEIR, Figure 2-11.

[258] The amount of LPG in naphtha: (0.9/18)x100 = 5%.

[259] The Santa Maria Rail Spur Project would import 35,478 to 38,237 bbl/day of tar sands crude by rail. FEIR, p. ES-6. The increase in recoverable LPG, relative to the typical crude blend:
(1) assuming 35,478 bbl/day of tar sands crudes are delivered by unit trains (FEIR, p. ES-6) = (35,478 bbl/day)*(0.0244-0.01) = **511 bbl/day**; (2) assuming 38,237 bbl/day are delivered by unit trains: (38,237 bbl/day)(0.0244-0.01) = **551 bbl/day**. Average = [511+551]/2 = 275 bbl/day. The fraction LPG is the maximum reported LPG (Western Canadian Select) for tar sands blends from Table – minus the maximum in the baseline from FEIR Table 2.7.

[260] The increase in recoverable LPG, relative to the typical crude blend: (1) assuming 35,478 bbl/day of tar sands crudes are delivered by unit trains (FEIR, p. ES-6) = (35,478 bbl/day)*(0.0244) = **866 bbl/day**; (2) assuming 38,237 bbl/day are delivered by unit trains: (38,237 bbl/day)(0.0244) = **933 bbl/day**. Average = [866+933]/2 = **900 bbl/day.** The fraction LPG is the maximum reported LPG (Western Canadian Select) for sands blends from Table – minus the minimum (0%) in the baseline from FEIR Table 2.7.

The January to December 2013 fuel gas sampling at the Rodeo Refinery[261] measured an annual average daily value of 13,970 bbl/day[262] of LPG in the refinery fuel gas, compared to the design basis of 14,500 bbl/day[263], or a shortfall of an annual average daily value of **530 bbl/day**. As the daily recoverable LPG at Rodeo varies substantially from month to month, ranging from about 10,800 bbl/day to 16,800 bbl/day,[264] the shortfall on any given day could exceed 3,700 bbl/day (14,500 – 10,800 = 3,700), based on a monthly average.

Thus, increases allowed by both the Throughput Increase and Rail Spur projects are required to reach the design target of 14,500 bbl/day. This calculation reveals a deficit that could be filled by importing tar sands crudes with more LPG or importing light crudes, such as Bakken, by marine tanker under its existing operating permit. Significantly more LPG, for example, could be supplied to Rodeo by the Rail Spur Project than estimated here by importing tar sands crudes with a higher LPG content, such as Lloyd Kerrobert, which contains up to 1.6[265] times more LPG than assumed in this calculation.

VI.A.6 Increase in Recoverable LPG at Rodeo from Imports Via Santa Maria

The RTC asserts that "[n]o changes in the crude delivery system, type of crude or operations at the SMR are needed in order to fully utilize the propane recovery unit in Rodeo" with reference to the LPG samples collected in 2013.[266]

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[261] The August 2011 sample is not a reasonable basis to estimate baseline propane/butane recovery because it is for a single month, based on limited sampling, and significant concerns have been documented about the accuracy and representativeness of this data that have not been addressed. *See* Fox/Pless Comments on Propane Recovery RDEIR, February 2, 2015, pp. 9-11 (Exhibit 9A) and Greg Karras Expert Report Re: Phillips 66 Propane Recovery Project RDEIR, December 5, 2014. (Exhibit 9B),

[262] Propane Recovery RDEIR, p. 3-33. This value may be higher than the true baseline because in 2013, the Santa Maria Refinery was refining 2% to 7% Kearl Lake dilbit. Rail Spur RDEIR, pp. ES-14, 4.13-27, 2-31, 2-33, 5-3. Further, the supporting data for the 2013 sampling has never been produced. My analysis of the 2011 supporting data, which was included in the BAAQMD application, indicates that recoverable LPG was based on maximum daily fuel gas flow rates, not the average, thus overstating recoverable amounts, which are based on daily averages. *See* Fox/Pless Comments on Propane Recovery RDEIR, February 2, 2015, pp. 10-11 (Exhibit 9A).

[263] Propane Recovery RFEIR, pp. 2-3, 2-6, 2-7, 3.1-28; BAAQMD, Authorities to Construct for Permit Application No. 25199, Plant No. 21359, Condition 2, March 18, 2015. (Exhibit 15)

[264] RTC ABJC-31, Exhibit A, Refinery Propane + Butane Production.

[265] The increment for WCS over typical SMR blend is 1.44% and for Lloyd Kerrobert over Typical Blend is 2.34%. Thus, Lloyd Kerrobert would yield 1.6 times more LPG than assumed in the above calculations.

[266] RTC CBE-84/85.

First, 2013 is not a baseline year. The only sample collected in the baseline years is the 2011 sample. From April through August 2011, when the 2011 LPG sample was collected, the Rodeo refinery received about 1.5 million barrels of 40° API gravity, 0.6% sulfur crude oil from Russia, with properties very similar to Bakken crude. The refinery did not normally run this highly volatile crude.[267] Thus, at the time of the August 2011 sample, the refinery was processing a lighter feedstock, similar to the then-proposed Bakken imports via the Rail Spur Project, which had more recoverable LPG than the baseline crude slate. This would have jacked up the amount of recoverable LPG in Rodeo fuel gas and thus biased the August 2011 sample high compared to the baseline.

Second, the record contains no data to support this claim. To support this claim, the FEIR would have to present complete crude slate composition data in the baseline and before and after the 2011 and 2013 LPG samples were collected.

VI.B PIECEMEALING: THROUGHPUT INCREASE PROJECT AND RAIL SPUR PROJECT

In response to comments, the following sections demonstrate that the Throughput Increase Project and the Rail Spur Project are inextricably linked for the following reasons:

- They were designed and planned together (Table 6);
- Local crude supplies were in serious decline and inadequate to satisfy the pre-Throughput Project permitted level (44,500 bbl/day), let alone the proposed increase;
- Local crude supplies were not cost competitive compared to North American cost-advantaged crudes available to ConocoPhillips;
- The truck unloading capacity at the SMPS was not adequate to accommodate both the increased throughput and making up for the throughput shortfall;
- The Throughput Increase Project could not be realized without a means to economically import the crude, which was fulfilled by the Rail Spur Project;

[267] Karras Report, February 2, 2015 (Exhibit 7).

- ConocoPhillips/Phillips 66 was actively developing North American cost-advantaged crude sources, which it planned to market to its existing refineries, including SMR, thus replacing higher priced local production.

VI.B.1 Designed and Planned Together

The Santa Maria Throughput Increase Project, the Santa Maria Rail Spur Project, and the Rodeo Propane Recovery Project were all on the drawing board at the same time (Table 6), planned to support each other. *See* Rail Spur RDEIR Comments ABJC-04 (Horton); ABJC-31 (Pless); CBE-100 (Fox); and Rail Spur DEIR Comments (Fox). The Rail Spur DEIR attempted to head off a piecemealing argument by pointing out that the Throughput Increase FEIR was certified about two months before the application for the Rail Spur Project was submitted to the County.

However, the timeline in Table 6 indicates that studies that became part of the application to the County were under way; design drawings had been prepared for the Rail Spur Project EIR well before the Throughput Increase FEIR was certified; and permit modifications had been filed to remove system vapor pressure constraints to facilitate these projects in early 2012. Thus, all three projects were being simultaneously planned. *See* Table 6. The FEIR attempts to downplay this connection by arguing the studies were not known to the County.[268] However, what was known to the County is not relevant, but rather, what was known to the applicant, who was obligated to disclose the full project.

The Rail Spur FEIR[269] and RTC[270] argue that the Throughput Increase and Rail Spur projects are not related because the Santa Maria Pump Station has sufficient capacity to unload crude oil from trucks and move it via pipeline to the Refinery. They further argue that they need only demonstrate that adequate infrastructure exists to deliver crude. However, crude and the infrastructure to deliver it are inextricably linked. The infrastructure/capacity to import sufficient crude to support the throughput increase does not prove that these projects are not dependent on one another. The missing "crucial element" is crude to supply the increase. Physical infrastructure with adequate capacity without sufficient crude oil to fill it does not demonstrate the projects are independent. An empty glass does not provide a drink of water. The RTC and FEIR also argue that cost is not a CEQA factor. But here, where

[268] Rail Spur FEIR, p. ES-27.

[269] Rail Spur FEIR, pp. ES-26/27.

[270] RTC ABJC-31.

slim operating margins and the high cost of local crudes renders an alternative infeasible, cost is an important factor to determine the interdependency of projects.

VI.B.2 Local Crude Supply in Decline

The Santa Maria Refinery was designed to refine local crudes. It is located in the middle of the Santa Maria Basin oil field and connected to production sites by a web of local pipelines. It is landlocked and has no access to marine deliveries. At the time that the Throughput Increase Project was first formally proposed, in 2007, there was not sufficient local competitively priced crude oil to supply either the refinery's permitted capacity (48,500 bbl/day) or the requested 10% increase in throughput to 48,950 bbl/day. Further, the applicant, ConocoPhillips, an integrated oil company with ownership of both production and refining, was aggressively developing North American, out-of-state, cost-advantaged sources of crude that it planned to deliver to its refineries in California, including Santa Maria.[271] Increasing the capacity of its refineries to accept more of these cost-advantaged crudes made good business sense.

The availability of crude oil is the "crucial element," *i.e.,* the "integral part" of the Throughput Increase Project that was not present in 2007[272]. The Project doesn't have "independent utility" without an adequate crude supply. Local supplies that had sustained the refinery for decades were in serious decline at the time the Throughput Increase Project was being planned. The decline has been well documented and admitted by Phillips 66 as a justification for the Rail Spur Project in its presentation to the San Luis Obispo Planning Commission on February 8, 2016:[273]

"California Crude Oil Production Decline

- The decline of California crude oils is very well documented
- Production along the Central Coast drastically reduced
- Competition for barrels"

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[271] Phillips 66, Barclays CEO Energy-Power Conference, p. 11, September 3, 2014, New York; Available at: http://s1.q4cdn.com/175206842/files/doc_presentations/2014/BarclaysEnergyConf2014slides_ad.pdf.

[272] *National Parks & Conservation Ass'n v. County of Riverside* (1996) 42 Cal.App.4th 15505, 1519.

[273] Jocelyn Thompson, Phillips 66 Santa Maria Refinery Rail Spur Extension Project, Slides (Exhibit 12), pdf 25, Why This Project?, February 8, 2016; Available at: http://www.slocounty.ca.gov/Assets/PL/Santa+Maria+Refinery+Rail+Project/Phillips+66+Planning+Commission+Hearings/February+4$!2c+2016/Presentations+February+4$!2c+2016/Phillips+66+Applicant+Planning+Commission+Presentation.pdf.

Further, the locally available crudes were not cost-competitive with other crudes then flooding the market. ConocoPhillips had been developing out-of-state sources of North American cost-advantaged crudes that could not be cost effectively accessed with the local infrastructure. The access to crude oil required to supply the shortfall and 10% increase was supplied by the Rail Spur project, which was on the drawing board at the same time that the Throughput Increase Project was being permitted. The Rail Spur Project is a reasonably foreseeable consequence of the Throughput Increase Project because without available, cost-competitive crude oil, an increase in throughput would not be feasible. Further, the Throughput Increase DEIR identified increased rail transport as one of seven alternatives to the project, but did not evaluate it.[274] The impact of the two projects combined is much great that the impact of the Throughput Increase Project alone.[275]

The Rail Spur DEIR and FEIR admit these fundamental facts in their alternatives analysis when they explain: "The reduced rail delivery alternative would meet most of the objectives of the Rail Spur Project. However, it may not allow the SMR to operate at its permitted throughput capacity since less crude oil could be available to the refinery."[276] Further, the no project alternative analysis in the Rail Spur FEIR assumed 100% truck import from out-of-state,[277] confirming the intent to abandon local crude sources and import 100% of the crude from out-of-state sources owned by ConocoPhillips. Without the ability to import out-of-state sources, the refinery could not continue to operate at permitted levels in the future. The import of out-of-state sources requires the Rail Spur Project.

This was driven home recently by the May 19, 2015 Refugio pipeline rupture off the Santa Barbara County coast, which led to shutting down Exxon-Mobil Las Flores, PXP/Freeport McMoRan Point Arguello, and Venoco Ellwood off-shore production. The ruptured pipeline supplies connector pipelines that supply the Santa Maria Refinery.[278] The loss of this supply resulted in idling one of its two refining trains. The

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[274] Throughput Increase DEIR, p. ES-6.

[275] Rail Spur FEIR, Table 3.1.

[276] Rail Spur DEIR, pp. ES-12 & 5-35; Rail Spur FEIR, pp. 5-3/4 and 5-69.

[277] Rail Spur FEIR, Sec. 5.1.1.

[278] Stillwater Associates, Bubble Map Update: How the Oil Spill Impacts the California Supply Chain, June 27, 2015; Available at: http://stillwaterassociates.com/bubble-map-update-how-the-oil-spill-impacts-the-california-supply-chain/; Freeport-McMoRan Reports Third-Quarter and Nine-Month 2015 Results, October 22, 2015, p. 17; Available at http://www.fcx.com/news/2015/10222015.pdf; Venoco, Inc. Temporary Crude Oil Trucking Project Description;, Revised August 6, 2015; http://www.cityofgoleta.org/home/showdocument?id=9903.

pipeline shutdown is long term, projected to take 5 years to get back on line.[279] Alternate crude supplies are so far not available at the Santa Maria Refinery to replace this lost production.[280] The Rail Spur Project is now being justified as required to replace this lost supply, demonstrating that local supplies are limited and not adequate to fill permitted limits.[281]

Finally, in February 1, 2016 comments submitted to the Planning Commission, Phillips 66 asserted that refining rates permitted in the Throughput Increase Project could be achieved without the Rail Spur Project because "the approved processing rates have been achieved already."[282] This was based on an expert declaration in attachments to this letter in which Mr. Schroll declared: "In March 2015, after the County conducted a full environmental review, the County provided Phillips 66 with Notice to Proceed on its prior-approved project to increase the throughput limit at the Refinery by 10%. Since then, the Refinery has achieved processing rates that reach that new throughput limit."[283] No further detail is provided.

New equipment and throughput limits are commonly tested on startup to identify operational issues and repair them before routine operation starts. A short-term test, for example, at maximum permitted daily throughput could be demonstrated by using crude stored in on-site tanks. Unless the maximum permitted throughput has been achieved over an extended period of time, a short-term, shake-down test would prove nothing.

Further, the Throughput Increase Project increased two crude throughput limits by 10%. The maximum daily limit was increased from 44,500 to 48,950 bbl/day, and the 12-month rolling average limit was increased from 16,220,600 to 17,866,750 bbl/day.[284] As the Notice to Proceed was not issued until March 2015, sufficient time has not elapsed to demonstrate that the 12-month rolling average limit in

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[279] Alex Kacik, Refugio Oil Spill Pipeline Might Take Five Years to Get Back On Line, Pacific Coast Business Times, November 5, 2015; Available at: http://www.pacbiztimes.com/2015/11/05/refugio-oil-spill-pipeline-might-take-five-years-to-get-back-online/.

[280] Alex Kacik, Oil Company Wants to Expand Orcutt Drilling Despite Pipe Closures, September 4, 2015, Pacific Coast Business Times; Available at: http://www.pacbiztimes.com/2015/09/04/oil-company-wants-to-expand-orcutt-drilling-despite-pipe-closures/.

[281] 2/8/16 Thompson Slides (Exhibit 12), pdf 25.

[282] 2/1/16 Thompson Letter (Exhibit 3A), pp. 36-37.

[283] 2/1/16 Thompson Letter (Exhibit 3A), In the attachment to this letter (Exhibit 3B) see Attachment 31, Schroll Declaration, Parag. 13, pdf 353.

[284] Throughput Increase FEIR, p. 2-24.

the Throughput FEIR has been achieved. Further, the applicant has not provided any data to demonstrate that even the maximum daily limit can be achieved on a routine basis. A one-time test at the maximum daily limit would prove nothing as to crude supply over the long term as this amount of crude could be accumulated in on-site storage tanks in preparation for a shakedown test.

In addition, the application to SLOAPCD to increase the throughput limits to the levels evaluated in the FEIR was amended twice, each time lowering the 12-month rolling average limit, in recognition of the fact that "the refinery cannot realistically reach the maximum limit specified in the EIR." An amendment to the SLOAPCD application on November 12, 2014 lowered the 17,866,750 bbl/yr request to 17,340,000 bbl/yr. A December 18, 2014 amendment lowered the request to 16,860,000 bbl/yr due to inadequate offsets.[285]

Finally, over the period during which the Throughput Project was being permitted, the SMR throughput never reached the pre-Throughput Project permit limit (Table 12), indicating that the then-existing local crude supply was not adequate. The proposed increase under the Throughput Increase Project would have required an augmentation in crude supply.

Table 12:
Crude Throughput Compared to Permit Limits[286]

Year	**Annual Total** (MMbbl/yr)	**Daily Average** (bbl/day)
2009	13,081	35,838
2010	13,725	37,603
2011	14,126	38,701
2012	13,829	37,888
2013	15,197	41,636
Pre-Throughput Limit	**16,220**	**44,500**
Post-Throughput Limit	**16,860**	**48,950**

At the time the Throughput Increase Project was being planned (Table 6 shows that the application for the air permit was filed in 2007 and the Land Use Application in 2008), the Santa Maria Refinery received crude oil for processing from various sources,

[285] SLOAPCD, Authority to Construct Engineering Evaluation, Appl. No. 6015, January 29, 2014 (Exhibit 11).

[286] Email from D.G. Carlson to Phyllis Fox, November 20, 2014 (Exhibit 10).

including: (1) by pipeline from the Outer Continental Shelf (Exxon-Mobil Las Flores and PXP/Freeport McMoRan Point Arguello, 69%), Point Pedernales (18%), and the Orcutt Pump Station (6%) and (2) by truck deliveries to the Santa Maria Pump Station (7%).[287] Crude oil from some local onshore areas is delivered by truck to the Santa Maria Pump Station and then pumped into a dedicated pipeline that carries crude oil to the SMR.[288] Thus, most of Santa Maria Refinery's supply came from offshore Santa Barbara (69% + 18% = 87%) and most of this was federal Outer Continental Shelf. The Rail Spur FEIR explains:

> *"Production from offshore Santa Barbara County (OCS crude) has been in decline for a number of years. Oil production in Santa Barbara County (both onshore and offshore) peaked at about 188,000 barrels in 1995 (County of Santa Barbara Energy Division website) and currently production is around 61,000 barrels per day for both onshore and offshore oil fields (BOEM Pacific Region and Drilling Edge websites)."* [289]

Elsewhere, the FEIR explains:

> *"California production of crude oil per year has been in decline since 1986, when production peaked at slightly over 400 million barrels. The decline has averaged about 1.7% per year since 1995. More recently, the decline has averaged over 3% annually since the year 2000."* [290]

Santa Maria's main source of crude is Santa Barbara County, where oil production (including both onshore and offshore oil processed in the County) had dropped by 2/3, from 188,000 bbl/day in 1995 to 61,000 bbl/day by 2009.[291] The SMR would need to use most of this to meet its permitted throughput limit. However, SMR does not have ready access to all of the Santa Barbara production, as some is in the eastern part of the County, including offshore, and moves on pipelines into Ventura County.

SMR receives most of its crude supply via pipeline from three federal Outer Continental Shelf (OCS) projects: Exxon-Mobil Las Flores, PXP/Freeport McMoRan

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[287] Throughput Increase DEIR & FEIR, p. 2-7.

[288] Throughput Increase DEIR & FEIR, Table 2-4.

[289] Rail Spur RDEIR, p. 2-36.

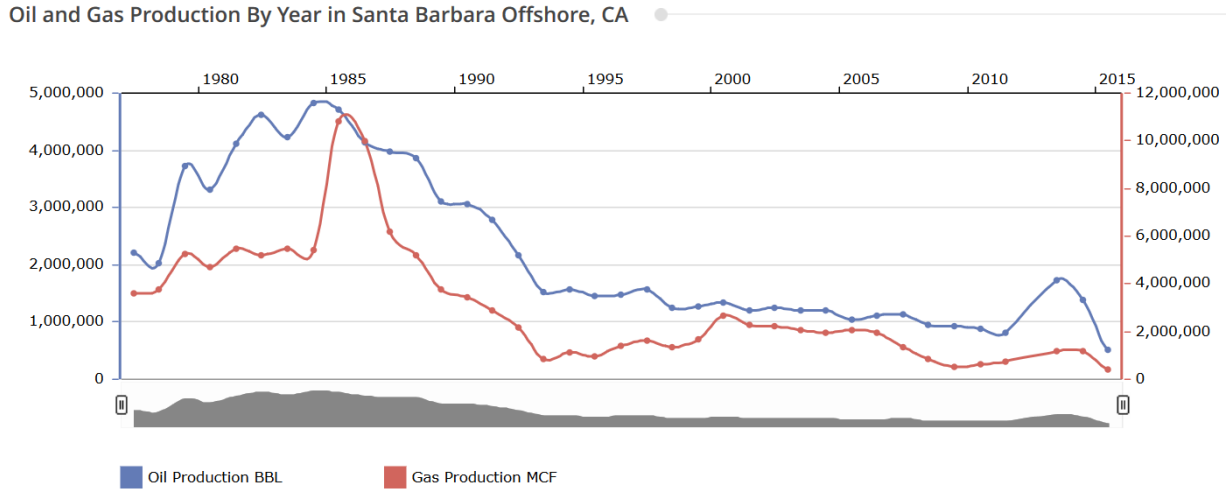
[290] Rail Spur FEIR, p. 6-3.

[291] http://www.sbcountyplanning.org/energy/information/oilGasProduction.asp; http://sbcountyplanning.org/energy/who/oil_gasMap.asp; DOGGR, Oil and Gas Statistics, pp. 58, 68-69, Offshore Oil And Gas Fields - 2009; Available at: ftp://ftp.consrv.ca.gov/pub/oil/annual_reports/2009/PR06_Annual_2009.pdf.

Point Arguello, and Point Pedernales. Production at these Federal OCS projects was over 166,000 bbl/day in 1995 and dropped to about 46,000 bbl/day by 2009 or by about three quarters.[292]

The decline in local sources of crude that the Santa Maria Refinery has relied upon is confirmed by other information, including as shown in Figures 4 and 5. Figure 4 shows the decline in Santa Barbara County in state water (but excludes federal OCS).

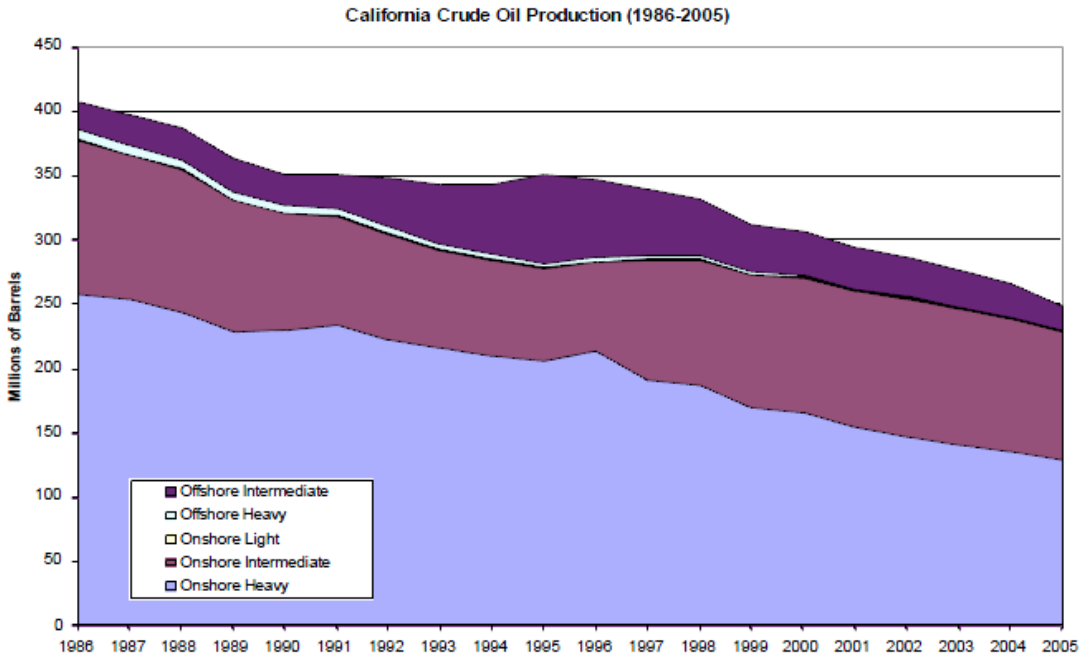
Figure 4:[293]



[292] *See* footnote 290.

[293] DrillingEdge, Oil & Gas Production in Santa Barbara Offshore, CA; Available at: http://www.drillingedge.com/california/santa-barbara-offshore.

Figure 5:[294]



Point Pedernales (part of the Offshore Heavy line in the above graph), supplied 18% of SMR's crude oil. It was ranked by DOGGR as one of ten oil fields in the entire state with the largest production decrease between 2006 and 2007.[295] Historical production from Point Pedernales peaked at close to 25,000 bbl/day of dry oil in 1987 and 1989 and declined to about 7,000 bbl/day by 2005.[296] As of 2008, production was projected to cease as soon as 2010 to 2012.[297] This oil could only go to the Santa Maria Refinery due to the pipeline configuration. Plains Exploration & Production Co. (PXP) proposed to increase offshore production from this field at Tranquillon Ridge prior to

[294] Margaret Sheridan, California Crude Oil Production and Imports, CEC Staff Paper, Report CEC-600-2006-006, April 2006, Available at: http://www.energy.ca.gov/2006publications/CEC-600-2006-006/CEC-600-2006-006.PDF.

[295] DOGGR, Oil and Gas Statistics, p. 65, Ten Oil Fields with Largest Production Decreases (bbl) – 2006 to 2007, 2007; Available at: ftp://ftp.consrv.ca.gov/pub/oil/annual_reports/2007/0102stats_07.pdf.

[296] Aspen, Final Environmental Impact Report, Tranquillon Ridge Oil and Gas Development Project, April 2008, p. 2-15, Available at: http://www.sbcountyplanning.org/energy/documents/projects/TranqRidgeFinalEIR/index.htm.

[297] Aspen 2008, p. 2-13.

2005,[298] which was justified to offset this production decline, but the project was rejected by the State Lands Commission in January 2009.[299]

Thus, ConocoPhillips certainly knew that it had a crude supply problem at Santa Maria.

Further, between 2007, when ConocoPhillips filed its permit application with SLOCAPCD, and the release of the Throughput DEIR in 2011, crude throughput at the Santa Maria Refinery declined from a high of 43,321 bbl/day to a low of 35,838 bbl/day in 2009.[300] The Throughput Increase FEIR estimated the increase in throughput relative to 2009 throughput of 35,838.[301] Thus, the refinery was operating at 8,712 bbl/day below its permitted capacity (44,500 - 35,838 = 8,712), at the same time it was asking for an increase in permitted throughput. The Throughput Increase FEIR assumed the shortfall and 10% increase could be supplied by local sources of crude, trucked into SMPA, mostly from Arroyo Grande and San Ardo,[302] in spite of significant declines in these fields at that time, prior to 2007. There is no evidence in the record that the identified local fields could supply the assumed increases.

Local crude trucked into SMPS actually declined from 4,090 bbl/day in 2007 to 3,036 bbl/day in 2009.[303] But the Throughput Increase FEIR assumed that supply from local crude sources could more than double to 8,219 bbl/day, an increase of 5,183 bb/day compared with actual 2009 supply. The Throughput FEIR assumed that local crude sources could supply almost triple what it actually supplied to SMR in 2009.[304]

Arroyo Grande was actually a small and declining crude source, with production down from 1,501 bbl/day in 2007 to 1,237 bbl/day in 2009, of which only 863 bbl/day

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[298] County of Santa Barbara Planning and Development, Notice of Preparation of a Draft Environmental Impact Report, Tranquillon Ridge Development Project, February 8, 2006, pdf 47 citing a January 6, 2005 APCD letter under Sec. 7.0: Previous Environmental Documents; Available at: http://www.sbcountyplanning.org/energy/documents/projects/TranqRidgeFinalEIR/Vol2/App%20K.pdf.

[299] Sonia Fernandez, State Lands Commission Rejects Offshore Drilling Plant, NoozHawk, January 29, 2009; Available at: http://www.noozhawk.com/article/0129_state_lands_commission_rejects_offshore_drilling_plan.

[300] Rail Spur DEIR, Table 2.7.

[301] Throughput Increase FEIR, pp. A-5/6.

[302] Throughput Increase FEIR, pp. A-2/3.

[303] Throughput Increase FEIR, pp. 2-7, 9; A-2/3.

[304] (3036+5183)/3036 = 2.7.

went to SMR.[305] San Ardo is further away (96 miles from SMPS), and sends most of its crude elsewhere.[306] Most San Ardo production is by Exxon Mobil/Shell and is typically sent by unit train for refining in the Los Angeles area.[307] When Santa Maria trains use the southern route, this results in cumulative impacts with the San Ardo trains that was not considered in the FEIR.

Thus, ConocoPhillips knew competitively priced local crude could not supply the increase in throughput sought at the time of the Throughput Increase Project or continue to supply its original permitted throughput of 44,500 bbl/day. As noted in Comment ABJC-31, "[t]here would be no reason to apply for an increase in the face of declining local production without a plan to supply the increase and offset known anticipated declines."

As the refinery was operating below its permitted throughput, there would not be any need for a throughput increase unless there were plans to replace the then existing deficit with crudes from somewhere else. Instead, it is much more likely that ConocoPhillips' goal was to replace its local crude shortfall up to the throughput permit limit with North American cost-advantaged crudes that it was developing outside of California and that required rail to reach the refinery.

The current potential availability of new sources of local crude, as listed in RTC ABJC-31 to rebut the crude decline argument is immaterial because "the success and amount of additional production" are admittedly "speculative."[308] Further, these currently proposed projects were unknown and unknowable when the Throughput Increase Project was being permitted, so they are irrelevant as to what was known in the 2007 to 2012 timeframe.

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[305] Throughput Increase FEIR, pp. 2-7; A-2/3; DOGGR, 2007 and 2009 Annual Oil and Gas Reports; Available at: http://www.conservation.ca.gov/dog/pubs_stats/annual_reports/Pages/annual_reports.aspx.

[306] *See* footnote 304.

[307] Most San Ardo production is by Aera Energy, which is jointly owned by Exxon Mobil and Shell. The unit train is operated by Union Pacific for Exxon Mobil. The crude unit trains shuttling between San Ardo and the Los Angeles area use the UPRR line south through San Luis Obispo County and thus the routing of these unit trains coincide with the southern routing of unit trains from the Rail Spur Project. *See*: Rail Spur FEIR, p. 4.7-2; http://www.aeraenergy.com/; http://www.exxonmobil.com/Images/EMPCo/West_Coast2.pdf; http://www.up.com/customers/chemical/crude/origin_facilities/index.htm; and http://yosemite.epa.gov/R9/air/EPSS.NSF/735056a63c1390e08825657e0075d180/e1e0cc5cd519261f88256fc0006c09f0/$FILE/TV34-01evl.pdf.

[308] Rail Spur RDEIR, p. 2-36.

During the period these piecemealed projects were being developed, ConocoPhillips, an integrated oil company, was developing North American cost-advantaged crudes to market to its West Coast refineries to improve it profit margin. The production side and refining side of the company would have had access to the same information. More crude via the Throughput Increase Project means more profits.

In April 2012, Clayton Reasor, ConocoPhillip's Vice President, Corporate and Investor Relations, stated at an investor conference:

> *"We think that there's opportunities to capture more feed stock advantaged crudes. We can drive our clean product yields, increase our export capability. 1% improvement in clean product yield gives us about $100 million to $150 million of net income improvement. If we can capture $1 a barrel of WTI/Brent differential, it's worth about $90 million of net income. There is powerful economic incentives to capture these margin improvements….*
>
> *We think we have the ability to capture an advantaged feed stocks. It's a key part of our plan to improve margins in our R&M [refining and marketing] segment. I think having the system capability and the flexibility to capture crude advantage has helped us capitalize on the recent WTI [West Texas Intermediate] differentials we've seen. We plan to increase our exposure to heavy, to high acid, to WTI, WTS [West Texas Sour]. In 2012 we'll move that to over 60%. We think by 2015 we can move to over 65% without significant capital expenditure….*
>
> *We'll work to increase our infrastructure capability to get advantaged feeds into the refineries. We'll also work on export infrastructure around our West Coast and our Gulf Coast facilities.*
>
> *In the R&M segment, just look at the opportunities to add capacity. They don't seem to make a lot of sense to me at this point in time. We'll spend some incremental capital, that are going to be 25%- and 30%-type return projects around grabbing some of this advantaged crude, and pushing margins and yields*
>
> *Near term, we want to run more shale oil through our refineries. We have the kit today to run about 460,000 barrels a day of shale type crudes. As this new production comes online, as we debottleneck infrastructure, we'll work to bring that into the refineries. We also have some projects that we can pursue. At Billings we can go from 2% to 3% sulfur. We can go from 75% heavy to 100% heavy. This investment, it's less than $200 million. It will save us $3 to $4 a barrel. We'll work to increase our infrastructure*

capability to get advantaged feeds into the refineries. We'll also work on export infrastructure around our West Coast and our Gulf Coast facilities.[309]

In a September 2012 presentation, after Phillips 66 had split from Conoco Phillips (May 1, 2012), remarks by Greg Garland, CEO and Chairman of Phillips 66, continues the cost-advantaged crude theme:

"A big source of competitive advantage we think we can have in our business is the access to advantaged crudes. It's 75% of our cost structure, a lot of work going across the Company in accessing these advantaged crudes….

You will see us invest capital around infrastructure, to put advantaged crude to the front end of the refineries or export infrastructure to export product out of the back end of the refineries…

Talk about capturing advantaged feedstock. As I said, this is about 75% of the cost structure in our refining business. It's the single biggest lever that we have to create value in the base refining business. $1 a barrel across our system is worth about $500 million of net income to us. So it is significant. Today, PSX is the largest importer of Canadian heavy crude in the US. In July, we ran about 130,000 barrels a day of shale oils. We ultimately plan to take that to 460,000 barrels a day.

We think it'll take us a couple years to accomplish that. We announced the acquisition of about 2,000 railcars. That gets us about 120,000 barrels a day of additional capacity for shale. Probably that's going to go east and west to our refineries on the West Coast and East Coast. So far, we've had about a half a percent ROCE improvement with this. We think we can drive 2% to 3% ROCE [Return on Capital Employed] improvement with the shale crude…

We believe as we capture advantaged crude that we will drive margin improvement in our base.[310]

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[309] Phillips 66 Investor Update, Thomson Reuters Streetevents Edited Transcript, COP – Phillips 66 Analyst Update, April 9, 2012, pp. 4, 6, 8; Available at: http://s1.q4cdn.com/175206842/files/events/2012/April%202012%20PSX%20Investor%20Update%20Transcript.pdf.

[310] Phillips 66 2012 Barclays CEO Energy-Power Conference, September 5, 2012, pp. 2, 4, 6; Available at: http://s1.q4cdn.com/175206842/files/events/2012/Phillips66_Barclays_CEO_Energy-Power_Conference_080512_FINAL.pdf.

In a September 2013 investor conference call, Clayton Reasor, Phillips 66's Senior Vice President of IR, Strategy and Corporate Affairs, discussed the role of Bakken and other light crude in Phillips 66's profit strategy:

> *"The positive $3.69 per barrel adjustment for feedstocks stems from running certain crudes and other feedstock that are priced lower than our benchmark crudes. For example, our feedstock advantage this quarter was primarily related to running foreign heavy sour crudes at our Gulf Coast refineries, and Canadian crudes in our refineries in the Central Corridor. In addition, our crude slate has increased to include more shale crudes, primarily Bakken and Eagle.*
>
> *Slide 12 shows the percentage of advantaged crude runs at our refineries, as well as clean product yields for 2011 and 2012. Many of our refineries have the complexity to run price-advantaged Canadian, Bakken and Eagle Ford crudes. Shale crudes are being run in all four of our refinery regions. And in addition, we have access to multiple transportation systems to reliably deliver these crudes to our US refineries, providing an overall competitive advantage….*
>
> *So as you think about this, it was originally envisioned as a Bakken play to go east and west, without question. Where we are investing in infrastructure is at our refineries for unloading, if you will. And we are using third-party access in the Bakken itself. I don't think we see the need to invest in terms of loading facilities in the Bakken at this point in time…*
>
> *And frankly, the nice thing about the railcars is they can move over time as the opportunity moves. But our view is that the next five-year window, Bakken crudes will probably move a lot of it by rail going east and west."*[311]

At the May 2013 Annual Meeting of Stockholders, the CEO of Phillips 66 stated:

> *"We increased our advantaged crude runs from 52% in 2011 to 62% in 2012. In the first quarter we announced that we are at 68% advantaged crude. Our plan is to get our refineries on a 100% advantaged crude. And we're going to do that by using trucks and rail and barges and ocean going vessels and pipelines. We're going to use every means available to us to put these advantaged crudes to the front of the refineries.*
>
> *The first and most significant lever that we have in creating value in refining is to capture advantaged crudes and put those crudes to the front of our refineries. We're well*

[311] Phillips 66 Fourth-Quarter Earnings Conference Call, January 1, 2013, pp. 5, 14; Available at: http://s1.q4cdn.com/175206842/files/events/2013/PSX_Transcript_2013_01_30T.pdf.

positioned. When you look at where the legacy assets are, where our refineries are, they're right around the emerging areas of production. Across our system $1 a barrel translates to $450 million of net income, so just $1 move and a $1 value capture is very significant for us. We increased our advantaged crude runs from 52% in 2011 to 62% in 2012. …"[312]

There are many similar investor and other presentations on the Phillips 66 website, under: "Investors", "Events and Presentations"[313] that make clear that ConocoPhillip's and Phillips 66's business strategy was to increase its profit margin by importing cost-advantaged crudes into its refineries, including those on California west coast and specifically, its Santa Maria Refinery.

VI.B.3 Alternate Sources of Crude

ConocoPhillips must have had a backup plan in 2007 when it submitted its application to SLOC (*see* Table 6) to replace the declining crude supplies and to meet the throughput increase. That backup plan was the Rail Spur Project to import North American cost-advantaged crudes that ConocoPhillips itself was actively developing. The timeline in Table 6 shows that planning for the Rail Spur Project, to replace declining crude supplies and to allow an increase in permitted throughput, started well before the Throughput Increase FEIR was certified.

ConocoPhillips was at this time an integrated oil company with both refining and crude production under common ownership. With local sources of crude in decline at the time the Throughput Increase Project was being permitted, available local sources were among the most expensive to produce.[314] Given increases in the supply of cost-advantaged crudes available outside of the local area, from ConocoPhillips' own reserves, it is obvious that ConocoPhillips was planning to import cost-advantages crudes from its own tar sand and light crude reserves.

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[312] Phillips 66 Annual Meeting of Stockholders, May 8, 2013, p. 8; Available at: http://s1.q4cdn.com/175206842/files/events/2013/2013_PSX_Stockholder_MeetingTranscript.pdf.

[313] Phillips 66, Investors, Available at: http://investor.phillips66.com/investors/overview/default.aspx.

[314] As discussed in the previous section of these Comments ("Local Crude Supply in Decline"), crude production near Santa Maria and throughout California was in steep decline from 1995 onward. It was not feasible and profitable to expand local production, or even to maintain it at existing levels. Production costs in California tend to be high, due to the prevalence of mature fields and heavy crudes, which require widespread use of enhanced oil recovery. Further, off-shore drilling, which has been a major source of crude to SMR, is more expensive to produce than other crudes.

During this time, Conoco Phillips itself was very involved in developing various North American cost-advantaged crudes, including tar sands and light shale crudes.[315] It was a 50% owner (together with TransCanada) of the Keystone Pipeline (including KXL).[316] Further, by 2007, ConocoPhillips was also producing Bakken crudes and other light tight sands crudes including Barnett, Eagle Ford, Niobrara, and Permian.[317] And by 2014, it had become the tenth largest producer of Bakken crudes, in partnership with Burlington Resources Oil & Gas Company. Thus, ConocoPhillips was very interested in moving tar sands and light shale crudes to its refineries. These plans are evident in modifications that it made to tank vapor pressures in its pipeline system supplying the Rodeo and Santa Maria refineries.

In 2012, when ConocoPhillips was widely reporting its strong position in North American cost-advantaged light shale crude,[318] it applied to increase the vapor pressure on its Santa Maria Pump Station (SMPS) temporary storage tank from 7.5 to 11 psia. This is the pump station the RTC alleges could accommodate the proposed throughput. The 11 psia limit would allow ConocoPhillips to import light shale crudes, such as Bakken, by truck. This tank currently holds crudes transported by truck from local oil fields. The local oil fields that historically supplied crude to the Santa Maria Pump Station do not produce significant amounts of light crude oils with a vapor pressure of 11 psia, as witnessed by the vapor pressure limit on the Santa Maria Pump Station tank before it was raised (7.5 psia) in anticipated of importing Bakken crude. In fact, the Santa Maria Pump Station is equipped with two steam boilers and heat exchanges that are used to heat the heavy, high-viscosity crudes produced locally to lower their viscosity so they can be pumped via pipeline to the refinery.

So why increase the vapor pressure limit on the Santa Maria Pump Station tank that would be used to enable the proposed 10% increase in crude throughput, assumed to be local crudes in the Throughput Increase FEIR[319], when the refinery was operating below its then-permitted limit and local crudes have much lower vapor pressures, less than the then permit limit of 7.5 psia?

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[316] 2007 Form 10-K, p. 25 ("In December 2007, we acquired a 50 percent equity interest in the Keystone Oil Pipeline (Keystone) to form a 50/50 joint venture with TransCanada Corporation.").

[317] http://www.conocophillipsuslower48.com/where-we-operate/Pages/bakken.aspx.

[318] http://investor.phillips66.com/investors/events-and-presentations/2012/default.aspx.

[319] Throughput Increase FEIR, pp. A-1, A-2.

Certainly not to handle the local heavy crudes that have traditionally been imported at SMPS. *First*, there is no reason to increase throughput when the local crude supply is inadequate to supply the permitted throughput before the increase. *Second*, there is no reason to increase the use of more expensive local crudes, even if they were available, when North American cost-advantaged crudes that ConocoPhillips was heavily invested in were available. It is most likely that ConocoPhillips was planning a crude switch, to cost-advantaged crudes that it was developing elsewhere. This crude switch was disclosed in the Rail Spur DEIR, but was not disclosed in the Throughput FEIR, even though it was on the drawing board. *See* Table 6.

This vapor pressure increase gave ConocoPhillips the option to truck in Bakken and other light crudes, while waiting for the new rail spur to come online. However, due to cost and environmental constraints, discussed below, trucks would not be used all the way from these alternate crude production sites. Instead, pending completion of the Rail Spur facility at the Santa Maria Refinery, light crudes could be temporarily railed to an existing terminal, most likely in the Bakersfield area, and trucked to the Santa Maria Pump Station, while securing the permits for its own on-site rail unloading facility. This arrangement was already used for heavy tar sands via the Paloma Terminal.[320] The Rail Spur FEIR identifies Bakersfield-area rail terminal-to-truck-to-SMPS as possible.[321] However, beyond this brief mention, neither FEIR evaluates this alternative. The Rail Spur FEIR only evaluated truck transport from distant, out-of-state locations rather than local terminals.

The rail-to-truck option would only be feasible on an interim basis due to its high cost, double that of rail import, while waiting for the Rail Spur Terminal to come on line. Thus, raising the vapor pressure on the SMPS tank presages the true intent, which was to import enough North American cost advantaged crude to the Santa Maria Refinery by rail to make up both the crude shortfall and the 10% throughput increase. In fact, Phillips 66 proposed this as the No Project Alternative for the Rail Spur Project, *viz.*, "Under the No Project Alternative it is likely that additional out of state crudes would be brought to various rail unloading terminals in California and transferred to trucks for delivery to the SMPS."[322]

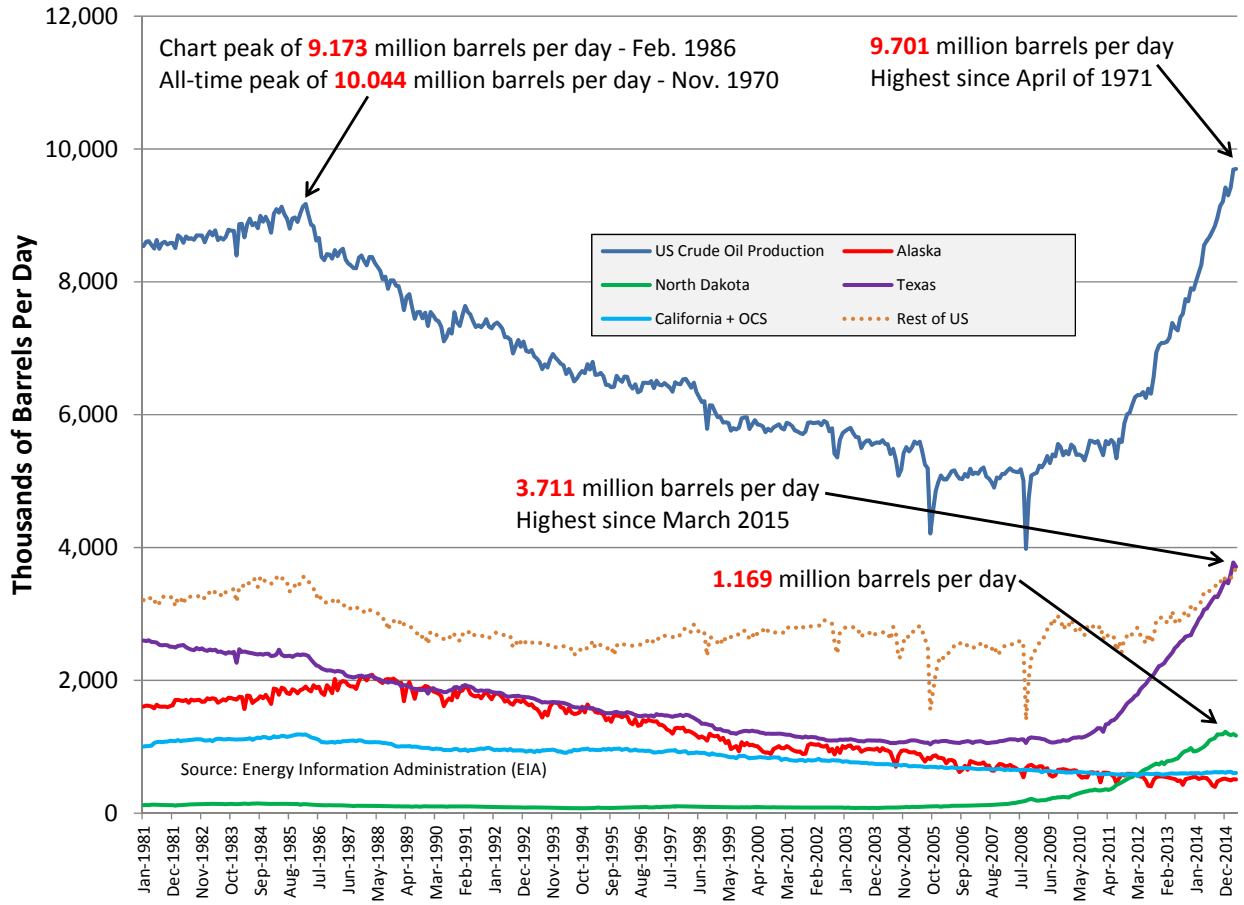
[320] Rail Spur FEIR, p. 5-3.

[321] Rail Spur FEIR, p. 5-4.

[322] Rail Spur FEIR, pp. 5-3/5.

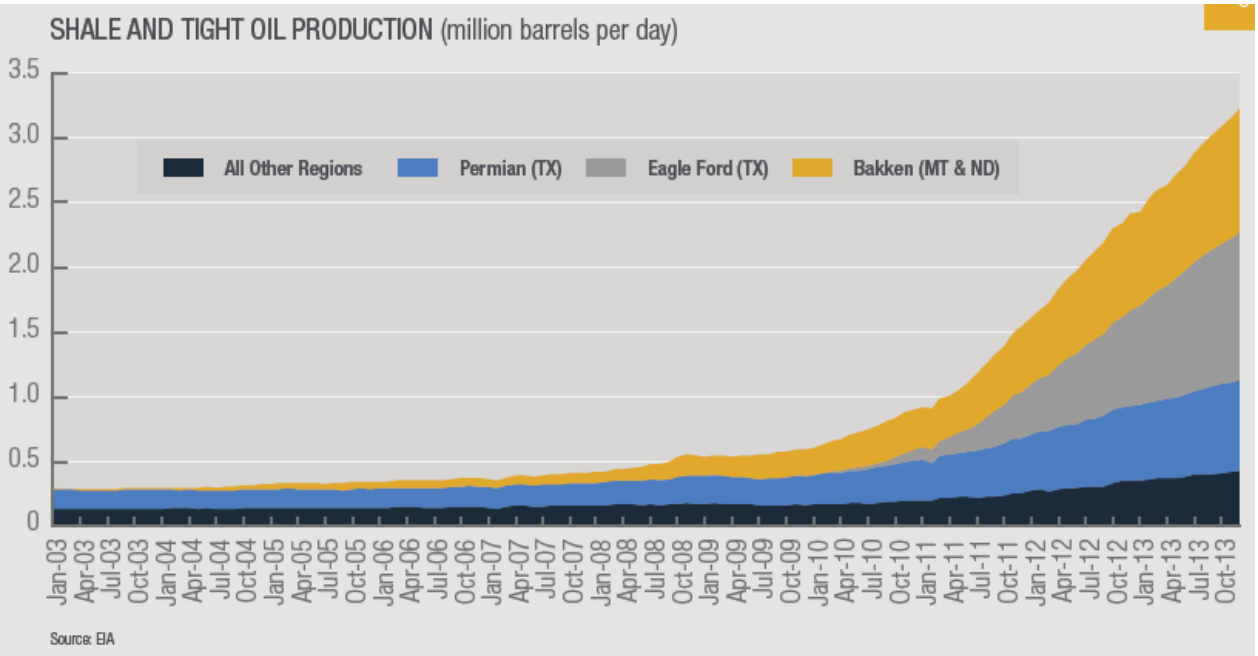
Thus, when the Throughput Increase Project was being permitted, ConocoPhillips was planning (i.e., it applied for permits) to make up its deficit and supply the throughput increase by importing Bakken and other similar light, domestic, cost-advantaged crudes that were flooding the market at the time and in which ConocoPhillips had a major stake. Figure 6 shows that at the time the Throughput Increase Project was being planned, between 2007 and 2012, California on-shore and off-shore crudes (light blue) were in decline while North Dakota (Bakken) crude (green) and other similar light crudes, not shown on this figure, were rapidly increasing.

Figure 6:[323]
Crude Oil Trends (1991-2014)



[323] Gordon Schremp, California Energy Commission, Crude Oil Overview & Changing Trends, Presentation at IEPR Commissioner Workshop − Trends in Crude Oil Market and Transportation, July 20, 2015, p. 16; Available at: http://docketpublic.energy.ca.gov/PublicDocuments/15-IEPR-13/TN205401_20150720T084540_Crued_Oil_Overview__Changing_Trends.pptx.

Figure 7:[324]
Shale and Tight Oil Production



Further, ConocoPhillips, under its subsidiary name Burlington Resources, operated Conoco's Eagle Ford Shale and Bakken properties, where exploration and development were well under way by 2007,[325] when the Throughput Project was being planned. Bakken (and other light shale crude) production took off in 2007[326] and was likely the initial target of the Throughput Increase Project, as it was of the Rail Spur Project, because ConocoPhillips was aggressively developing its Bakken resources.[327]

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[324] API. Understanding Crude Oil and Product Markets, pdf 9, 2008; Available at: http://www.api.org/~/media/Files/Oil-and-Natural-Gas/Crude-Oil-Product-Markets/Crude-Oil-Primer/Understanding-Crude-Oil-and-Product-Markets-Primer-Low.pdf.

[325] Dale Wetzel, Bigger Plans in Store for Bakken, The Bismarck Tribune, June 20, 2007; Available at: http://bismarcktribune.com/news/state-and-regional/bigger-plans-in-store-for-bakken/article_1dafc6c3-722c-5e37-842f-7dfa2bc13821.html; ConocoPhillips-Burlington Resources; Available at: http://eaglefordshale.com/companies/conocophillips-burlington-resources/.

[326] The Bakken Formation: How Much Will It Help?, The Oil Drum, April 26, 2008, Available at: http://www.theoildrum.com/node/3868.

[327] R.T. Dukes, ConocoPhillips Increases Bakken Spending in its 2014 Budget, December 9, 2013, Available at: http://bakkenshale.com/news/conocophillips-increases-bakken-spending-2014-budget/; Top 50 North Dakota Bakken Oil Producers, March 2013; Available at:
(cont'd)

Figure 7 confirms the Bakken trend and shows that other light shale crudes were also entering the market around the time the Throughput Increase Project and Rail Spur projects were being planned.

The DEIR for the Rail Spur Project, for example, specifically identified Bakken crude as one of the crudes that would be imported. Tanks that store Bakken crudes are typically permitted at 11 psia. This plan to import Bakken crude is consistent with remarks made by the CEO of Phillips 66 at its December 2012 Annual Analyst Meeting:

> "*California is a challenging operating environment from a regulatory standpoint, we do not see that changing over the midterm. And so* ***our opportunity to improve performance in California is really around getting advantage crudes to the front end of the California refineries, it's rail****, it's ship, it's working on optimization of the cost structure and the export capabilities of those refineries. And we'll improve them to the extent that we can."*[328]

Taken alone, the Throughput Increase Project could not access these distant North American cost-advantaged crudes, since there was no cost-effective way to get them to the refinery. The Santa Maria Pump Station was certainly considered, thus the change in vapor pressure. However, this would require significant, long-distance truck transport, which has many disadvantages over rail. The Rail Spur RDEIR admitted this, stating:

> "This declining production coupled with the lack of ability of the refinery to source competitively priced crude oil from outside the local area generates the need for the Rail Spur Project. The need for the project is not related to the permitted capacity of the refinery."[329]

This same statement was true in 2007, when ConocoPhillips started applying for permits for the Throughput Project. However, the Rail Spur FEIR eliminated this sentence and replaced it with:

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http://www.petroleumnews.com/petroleumnewsbakken/charts/ND50_130602.pdf; ConocoPhillips, http://www.conocophillipsuslower48.com/where-we-operate/Pages/bakken.aspx.

[328] Thomson Reuters Streetevents, Edited Transcript, PSX - Phillips 66 First Annual Analyst Meeting, Event Date/Time: December 13, 2012; Available at: http://investor.phillips66.com/files/events/2012/PSX_Investor_Transcript_12_13.pdf.

[329] Rail Spur DEIR, p. 2-30.

> "In the long-term, the need for the SMR rail project could be driven by declines in local production of crude oil that can be delivered by pipeline."[330]

This change is misleading because it suggests that declining local production that would require the Rail Spur Project would only occur in the future. In fact, declining production was the status quo when the Throughput Increase Project was proposed. The Rail Spur Project provided the means to economically deliver the replacement crude, which otherwise was not available.

The fact that declining production in Santa Barbara County and offshore areas would affect the ability of the refinery to source competitively priced crudes cannot be erased by removing text from the RDEIR and FEIR. In fact, ConocoPhillips was planning to import tar sands and Bakken crudes to replace declining local production at the time the throughput Increase Project was proposed.

In April 2008, the Executive Vice President of ConocoPhillips for Exploration and Production explained to the Select Committee on Energy Independent and Global Warming of the U.S. House of Representatives in April 2008 that:

> "*The Canadian oil sands are projected to become an increasingly important source of oil for the United States, particularly considering recent declines in heavy oil production in* Mexico, Venezuela and *California*. The Canadian oil sands are projected to approach 20 percent of U.S. oil supplies by 2020."[331]

Further, as Mr. Lowe testified, ConocoPhillips had made significant investments in North American cost-advantaged tar sands crudes:

> *ConocoPhillips has a leading land position in the Canadian Athabasca oil sands and is actively investing to produce this oil, and then transport it to the United States for processing at our refineries. We have access to over 15 billion barrels of net potential oil resources, and plans are in place to increase our net production to about 400,000 barrels per day over the next decade. In 2008 alone, we are spending $900 million in development capital on the Canadian oil sands.*[332]

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[330] Rail Spur FEIR, p. 2-38.

[331] Testimony of John E. Lowe, Executive Vice President, Exploration and Production, ConocoPhillips, Before the Select Committee on Energy Independence and Global Warming, U.S. House of Representatives on Tuesday, April 1, 2008, p. 15, *emphasis* added, internal citations omitted; http://www.phillips66.com/EN/newsroom/other_resources/Documents/Markey_Testimony_written.pdf.

[332] *Ibid.*

This tar sands crude supply was under development before permit applications were filed for the Throughput Increase Project.

A 2014 presentation made by Greg Garland, Chairman and Chief Executive Officer of Phillips 66, includes a figure showing Phillips 66's West Coast transportation plan, Figure 8, which shows tar sands crude going to Santa Maria. Mr. Garland testified: "We're disappointed in the progress to permit our Santa Maria rail rack 40,000 a day, but we have – we're optimistic that we'll get that done."[333] The cited rail unloading capacity is much greater than revealed in the Rail Spur FEIR, which reports a range of 35,478 to 38,237 bbl/day.[334]

Figure 8:
Phillips 66 Advantaged Crude
West Coast Transportation Plan[335]

[333] Barclays CEO Energy-Power Conference, p. 5, September 3, 2014, Transcript; Available at: http://s1.q4cdn.com/175206842/files/doc_presentations/2014/PSX-BarclaysCEOConfTransSept2014.pdf.

[334] Rail Spur FEIR, p. ES-6.

[335] Barclays CEO Energy-Power Conference, September 3, 2014, p. 10; Available at: http://s1.q4cdn.com/175206842/files/doc_presentations/2014/BarclaysEnergyConf2014slides_ad.pdf.

VI.B.4 Trucks Would Not Be a Long-Term Solution

The RTC argues that the increase in throughput could be delivered by truck to the Santa Maria Pump Station and then on to the Refinery by pipeline.[336] Crude oil is currently delivered by truck to the Santa Maria Pump Station, where it is off-loaded into a temporary storage tank and then shipped by dedicated pipeline to the Santa Maria Refinery. The RTC asserts that the current permitted limit on crude truck unloading at the SMPS is 26,000 bbl/day and the current truck unloading rate is about 6,800 bbl/day, leaving an untapped capacity of 19,200 bbl/day (26,000 - 6,800 = 19,200).[337] There are several problems with this line of reasoning.

First, the asserted "current" truck unloading rate of 6,800 bbl/day is not defined. What year is it? Is it the baseline? The record does not contain any historic truck delivery data, which is required to assess whether 6,800 bbl/day is a reasonable basis to estimate available future truck unloading capacity. Further, "current", assuming it is a recent year, is not a reasonable basis for determining available truck unloading capacity. The available unused truck unloading capacity should be based on the maximum truck unloading rate in the baseline years to demonstrate that sufficient excess capacity was available to accommodate changes in local supplies and upsets in downstream facilities. For example, the recent Refugio pipeline spill, which cut off a major oil supply to the Santa Maria Refinery, probably resulted in a significant increase in trucking crude to the Santa Maria Pump Station. The current 2015 truck unloading rate is not in the record, but is likely much greater than 6,800 bbl/day due to the Refugio pipeline spill.

Second, the untapped truck loading capacity is wrong. ConocoPhillips filed an application with the Santa Barbara County Air Pollution Control District (SBCAPCD) in June 2012 to increase the vapor pressure limit on the temporary storage tank at the Santa Maria Pump Station from 7.5 to 11 psia. To avoid increasing VOC emissions, tank throughput was reduced from 26,000 bbl/day to 21,859 bbl/day. This permit was granted in March 2013.[338] Thus, the RTC is wrong as to the amount of excess truck import capacity, which was 15,059 bbl/day (21,859 - 6,800 = 15,059). Further, it makes no sense to reduce the truck loading capacity while simultaneously applying for an increase in throughput if the increase in crude is coming by truck to the Santa Maria

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[336] RTC ABJC-31.

[337] Rail Spur FEIR, p. ES-26.

[338] SLOCAPCD, Authority to Construct Engineering Evaluation, Appl. No. 6015, January 29, 2014 (Exhibit 11).

Pump Station, when the refinery is operating below its permitted throughput unless an alternative mode to supply crude is planned.

Third, at the time of the Throughput Increase Project, the Santa Maria Refinery was operating at up to **8,662 bbl/day** below its existing permit limit of 44,500 bbl/day.[339] The Throughput Project allowed a 10% increase in permitted maximum daily crude throughput, from 44,500 bbl/day[340] to 48,950 bbl/day or by **4,450 bbl/day**.[341] Thus, at the time that the Throughput Increase Project was proposed, the total shortfall in crude, assuming the refinery could operate at its then design throughput, was 4,450 + 8,662 = **13,112 bbl/day**.

In comparison, at the time the Throughput Increase Project was proposed, the available excess truck import capacity was 15,059 bbl/day. This leaves little margin (15,059 - 13,112 = 1,947 bbl/day) to accommodate changes in local crude supply, such as the 2015 Refugio Beach pipeline spill,[342] which reduced crude supply through the Santa Maria pump station by about 7,200 bbl/day.[343] As Phillips 66 indicated to the Planning Commission, this pipeline shutdown resulted in the "… pipeline from Las Flores Canyon to Sisquoc out of service indefinitely."[344] Phillips 66 President Tim Taylor stated that "until we get that pipe back in service, or an alternate, it's harder to get the full volume that we need."[345] In its 4th quarter earnings report, Greg Garland indicated

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[339] Crude shortfall before Throughput Increase Project: 44,500-35,838 = **8,662 bbl/day**. The lowest reported crude throughput was 35,838 bbl/day (Rail Spur DEIR, Table 2.7).

[340] Throughput Increase FEIR, p. 2-24 (Department of Planning and Building permit limit).

[341] Throughput Increase FEIR, p. 2-24.

[342] InterAct, Emergency Permit Application for Emergency Trucking Activity to De-Inventory LFC Crude Storage Tanks – ExxonMobil Santa Ynez Unit Las Flores Canyon Facility, January 4, 2016 (1/4/16 ExxonMobil Application); Available at: http://www.sbcountyplanning.org/energy/projects/Exxon/ExxonMobil%20Emergency%20Temporary%20Trucking%20De-inventory%20Application.pdf.

[343] 1/4/16 ExxonMobil Application, pdf 61 ("P66 personnel stated that currently the P66 Station is operating at one-third of its capacity. Before the PAAPL shutdown, the Station handled about 100 trucks/day, currently they handle about 130 trucks/day. The facility is not limited by permits to a specific number of trucks it can receive. The single storage tank is limited to 21,859 bbls/day (approximately 145 truckloads/day) oil throughput by the Santa Barbara County Air Pollution District Permit to Operate (APCD PT"). Each truck carries about 21,859 bbl/day/145 trucks/day = 151 bbl/truck. Thus, before the spill, 100 trucks/day of crude were moving through the SMPS or about 100 × 151 = 15,100 bbl/day. After the spill, this decreased to 1/3(145) × 151 = 7,300 bbl/day. Thus, the spill reduced crude supply by 15,100 – 7,300 = **7,800 bbl/day.**

[344] Jocelyn Thompson, Phillips 66 Santa Maria Refinery Rail Spur Extension Project, Slides, February 4, 2016, pdf 25, Why This Project? (Exhibit 12).

[345] Kristen Hays, Phillips 66 Says California Rail Project Critical to Crude Supply, Reuters, February 4, 2016; Available at: http://www.reuters.com/article/us-phillips-66-crude-railways-idUSKCN0VD2P7.

that only about half of the loss could be made up by trucks: "We've probably cut that in half with trucks, and then we made up the volumetrics on process inputs at Rodeo.."[346]

Thus, as the excess truck unloading capacity was very close to the permitted truck throughput, within about 10%, there was very little margin to accommodate shifts in crude supply, such as the 2015 Refugio Beach pipeline spill.

Fourth, by the time the Notice to Proceed with the Throughput Increase Project was issued in March 2015, the available truck unloading capacity had declined significantly, from 15,059 bbl/day at the time the FEIR was issue, to 6,759 bbl/day.[347] Thus, at startup of the Throughput Increase Project, there was not adequate excess truck unloading capacity at the Santa Maria Pump Station to serve the project, confirming the need for an alternate delivery mode. The only alternate method in view is the Rail Spur Project.

Fifth, the calculation of untapped truck unloading capacity should be based on the maximum historic truck import. The record does not contain any historic truck import data, for years prior to 2007 when the application was submitted to SLOAPCD through the present, 2015.

Sixth, importing Bakken and other North American crudes by truck from their point of origin to the Santa Maria Pump Station would be neither economic nor environmentally feasible, as the Rail Spur FEIR itself concluded in its alternatives analysis.

Costs rise with distance for all modes of transport, but trucks cost more per ton-mile than rail. Thus, trucking becomes very expensive and non-competitive for long hauls. Trucking can be competitive for short hauls if there is no rail or pipeline access, as they are flexible and don't require lots of fixed costs. As noted by the CEO of the Canadian pipeline firm Enbridge, "You don't truck if you can rail and you don't rail if you can pipeline."[348] While cost-advantaged crudes could be railed to a local terminal and trucked from there to the Santa Maria Pump Station, this alternative was not

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[346] Phillips 66 Q4 2015 Earnings Call Transcript, January 29, 2016; Available at: http://s1.q4cdn.com/175206842/files/doc_presentations/2016/feb/PSXtranscript2015Q4-2.pdf.

[347] Available truck unloading capacity at the Santa Maria Pump Station in 2015, based on 1/4/16 ExxonMobil Application, pdf 61: Permitted throughput – 2015 throughput prior to spill = 21,859 – (100 trucks/day)(151 bbl/truck)= **6,759 bbl/day.**

[348] David Sheppard and Bruce Nichols, Insight: Oil Convoy Blues: Trucking Game Foils Crude Traders, Reuters, October 14, 2011; Available at: http://www.reuters.com/article/2011/10/14/us-cushing-trucks-idUSTRE79D0OP20111014.

identified or evaluated in either the Throughput Increase FEIR or the Rail Spur FEIR's alternatives analysis and would not be cost effective on a long-term basis. As the Rail Spur FEIR purports to analyze "reasonable alternatives" and to be based on the "rule of reason,"[349] this option can be eliminated as unreasonable. Likewise, the Throughput FEIR's alternatives analysis, which was also based on the "rule of reason," did not include a rail terminal-to-truck-to-SMPS alternative.[350]

Trucks are the least preferred method of transporting oil in terms of safety, air quality, expense, and other factors.[351] The Rail Spur FEIR evaluated a truck import alternative and eliminated it on environmental grounds.[352] Trucks would not be the method of choice to deliver 13,112 bbl/day of crude oil to the Santa Maria Refinery from distant sources in North Dakota and other areas producing North American crudes, because trucks are the most expensive crude oil delivery method. As a general rule of thumb, it costs about $20 per barrel to move crude oil by truck, $10 per barrel by rail and $5 per barrel by pipeline, although the cost varies by geography.[353] Trucks are generally used in situations where it would be illogical or impossible to use railcars, pipelines, and tanker ships.[354] The Rail Spur Project is clear evidence that rail delivery is possible. Further, Figure 9 shows that at a cost of $20 per barrel, truck import would eliminate most to all of the crude oil discount from importing North American cost-advantaged crudes.

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[349] Rail Spur FEIR, Sec. 5.1.

[350] Throughput Increase FEIR, Sec. 5.0; Available at: http://slocleanair.org/images/cms/upload/files/5_0_Alternatives.pdf.

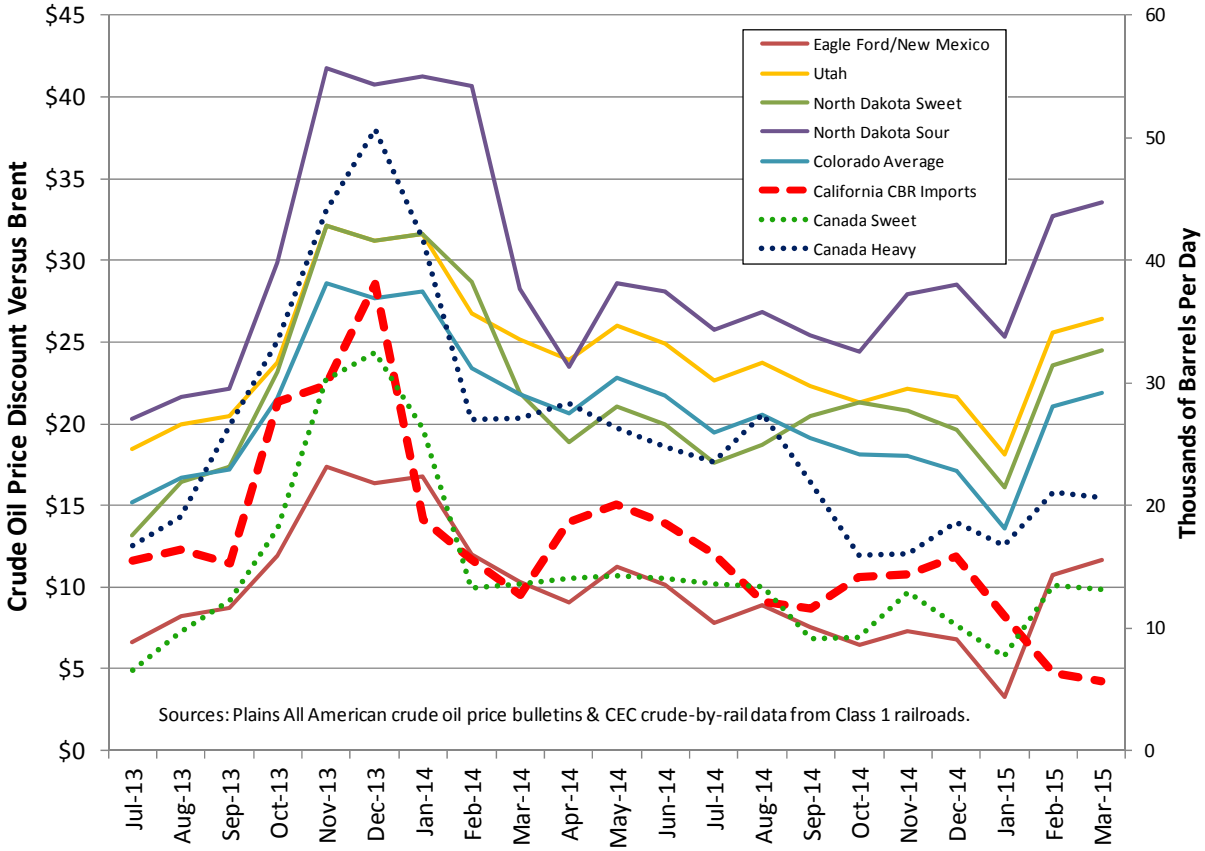
[351] How to Transport Oil More Safely, Wall Street Journal, September 23, 2015; Available at: http://www.wsj.com/articles/how-to-transport-oil-more-safely-1442197722.

[352] Rail Spur FEIR, Sec. 5.1.2.1 and 5.2.1.

[353]Brian Westenhaus, Trucks, Trains, or Pipelines – The Best Way to Transport Petroleum, OilPrice.com, August 13, 2013; Available at: http://oilprice.com/Energy/Energy-General/Trucks-Trains-or-Pipelines-The-Best-Way-to-Transport-Petroleum.html; Jennifer Hiller, Crude oil will continue rolling by train, July 28, 2013, Fuel Fix; Available at: http://fuelfix.com/blog/2013/07/28/crude-oil-will-continue-rolling-by-train/#14419101=0.

[354] Petroleum Transport, Wikipedia; Available at: https://en.wikipedia.org/wiki/Petroleum_transport.

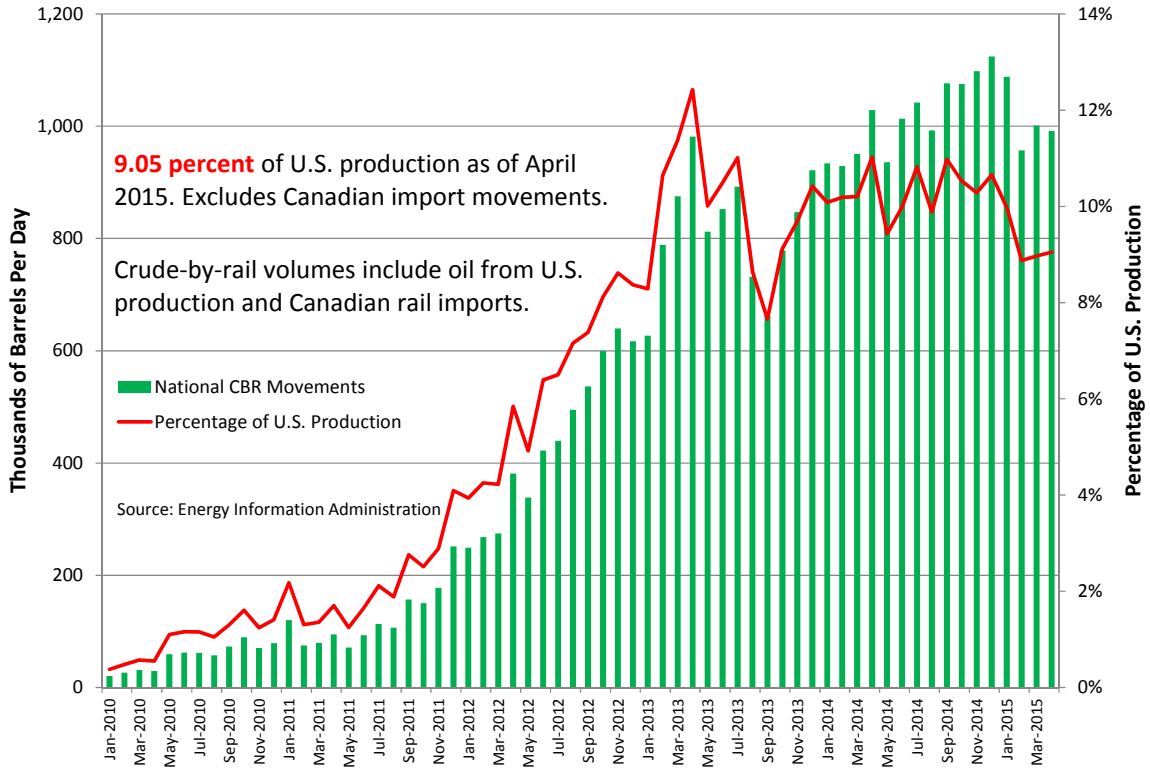
Figure 9:
Crude Oil Price Discount Versus Brent
[355]



Seventh, at the time the Throughput Increase Project was being planned, crude-by-rail was rapidly developing as the method of choice to deliver the cost-advantaged, mid-continent crudes, as shown in Figure 10.

[355] Schremp 2015, p. 34.

Figure 10:
Crude by Rail Trends (Jan 2010 – March 2015)[356]



In fact, the Throughput Increase DEIR identified seven alternatives to the Project, including increased rail transport, but failed to evaluate it.[357] Further, Phillips 66 announced its intent to purchase 2,000 new railcars in June 2012 to participate in this trend stating:

> *"The initial goal is to increase delivery of shale crudes to Phillips refineries by 100,000 to 150,000 bpd within two years using railroad unit trains, he [Garland] said"*[358]

Greg Garland, the CEO of Phillips 66, also told the Financial Times that:

> *"the company was planning to buy the cars for a total price of about $200m, to enable it to carry up to 120,000 barrels per day of cheaper crude available in the central US…*

[356] Schremp 2015, p. 29.

[357] Throughput Increase DEIR, p. ES-6.

[358] Phillips 66 to Buy 2,000 Rail Cars to Transport Oil, Reuters, June 8,; Available at: http://www.reuters.com/article/us-phillips-oil-rail-idUSBRE85713A20120608.

Phillips believes it will be more cost-effective for its refineries in California to transport oil more than 1,500 miles by rail than to buy it on international markets…

the financial performance of refineries in the central US with access to oil from North Dakota and Canada has been "just outstanding," Mr. Garland said, but refineries on the east and west coasts that use international crudes had been "struggling"…

Moving oil by rail is generally more expensive than using a pipeline, but Phillips thinks that for the foreseeable future there will be no pipes built to connect North Dakota to its refineries in California…and the crude price gap is likely to persist."[359]

In sum, the Throughput Increase Project and the Rail Spur Project are inextricably linked with each other and with the Propane Recovery Project for the following reasons:

- They were planned together (Table 6);
- Local crude supplies were in serious decline and inadequate to satisfy the pre-Throughput Project permit level (44,500 bbl/day), let alone the proposed increase;
- Local crude supplies were not cost-competitive compared to North American cost-advantaged crudes available to ConocoPhillips/Phillips 66;
- The truck unloading capacity at the SMPS was not adequate to accommodate both the increased throughput and the throughput shortfall;
- The Throughput Increase Project could not be realized without a means to economically import the crude, which was fulfilled by the Rail Spur Project;
- ConocoPhillips/Phillips 66 was actively developing North American cost-advantaged crude sources, which it planned to market to its existing refineries, including SMR, thus replacing higher priced local production; and
- The Throughput Project and the Rail Spur Project combined would supply the shortfall in LPG that would be recovered at the Rodeo Refinery.

[359] Ed Crooks, Phillips 66 to Boost Rail Capacity for Oil, Financial Times, June 7, 2012; Available at: http://www.ft.com/cms/s/0/9331b14e-b0b6-11e1-a2a6-00144feabdc0.html#axzz3y7qYdcE8.