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*VIA E-MAIL: [pfine@aqmd.gov](mailto:pfine@aqmd.gov)*

September 20, 2017

Philip Fine, Ph.D  
Deputy Executive Officer  
Planning and Rules  
South Coast Air Quality Management District  
21865 Copley Drive  
Diamond Bar, CA 91765

**Re: Comments on South Coast Air Quality Management District's September 15, 2017 Presentation for the Proposed Rule 1410 Sixth Working Group Meeting**

Dear Dr. Fine,

Torrance Refining Company LLC ("TORC") is extremely disappointed and concerned with the release of the September 15, 2017 South Coast Air Quality Management District's (the "District") presentation for the sixth Working Group meeting on September 20, 2017 related to Proposed Rule 1410, Hydrogen Fluoride Storage and Use at Petroleum Refineries ("PR 1410"), which only impacts two of the five Southern California refineries – TORC's Torrance Refinery and Valero's Wilmington Refinery.

Unfortunately, this presentation repeats the premature inclusion of a phase-out of modified Hydrofluoric Acid ("MHF") as an alkylation technology in the South Coast Air Basin without any legitimate scientific or technical support. Before the District even completes its review of information TORC provided to the District on September 12<sup>th</sup> at staff's request and also in response to prior District Working Group presentations, the District has now seemingly picked out of thin air a phase-out deadline of 2025 or sooner, less than eight years from now, without any supporting evidence. This fails to meet regulatory requirements and is therefore unethical to release.

This is especially frustrating considering that TORC, Valero Energy Corporation ("Valero"), and other Working Group members have put into the record the following evidence and facts, which the District seems to ignore in its apparent rush to complete the PR 1410 rulemaking process:

1. A phase-out of MHF is not scientifically or technically justified.
2. The only other commercially viable Alkylation technology, Sulfuric Acid, is cost prohibitive, not safer than MHF, and will increase emissions.
3. As apparent from the presentations given by technology licensors at previous Working Group meetings, Alternative Alkylation technologies are not commercially viable, with no full scale units in the United States:
  - a. Are years away from being proven;

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- b. Will cost as much and perhaps more than a conventional new grassroots Sulfuric Acid Alkylation Unit; and
- c. These technologies' environmental impacts and process safety operations are unknown.

The District is forging ahead, apparently based on an agenda that does not seem to include basing its rulemaking process in science and technology as statutorily required.

Rather than properly evaluating the extensive and voluminous MHF testing, analyses, and modeling data provided by TORC in conjunction with the numerous and robust safety systems employed in the MHF Alkylation Unit and gaining a complete understanding of the MHF technology, District staff have chosen to ignore the scientific and technical data and move forward with a proposed phase-out of MHF alkylation. Without this understanding, the District appears to be substituting its ill-informed and unsupported judgment on a technology that has already been thoroughly analyzed, reviewed, and determined by an independent Court-appointed Safety Advisor and a well-respected and experienced Los Angeles Superior Court Judge under the City of Torrance Consent Decree to be as safe as or safer than Sulfuric Acid for a similarly sized alkylation unit at the Torrance Refinery.

This decision was reached after approximately a two-year review of voluminous MHF testing results, technical analyses, and modeling data. How can District staff conclude otherwise, after only six months of discussion regarding this technology, without reviewing the supplemental and clarifying technical and scientific data submitted by TORC to the District, or revisiting the corresponding records and files associated with both refineries' original permit applications, and CEQA documents?

Additionally, District staff are contradicting the District's previous, publicly-stated position on MHF technology. For example, in 2003, the District issued a press release announcing an "enforceable agreement" with Valero to replace the Wilmington Refinery's use of HF with MHF by 2006.

In the press release, the District states:

"Once this refinery stops using concentrated hydrogen fluoride, we will have virtually eliminated the potential for a catastrophic accidental release of this compound in our region," said Barry Wallerstein, executive officer of the South Coast Air Quality Management District."

"The agreement fulfils one of the 23 Environmental Justice goals adopted by AQMD's Governing Board last fall."

"Switching to modified HF will minimize the possibility of a catastrophic accidental release not only at the refinery, but along Southland transportation corridors, as the additive is added to the chemical before shipping."

*See Highly Toxic Chemical to be Phased Out at Valero Refinery: SCAQMD, Feb. 7, 2003.*

The District issued permits to the Torrance Refinery in 1997 and Valero Wilmington Refinery in 2004, after performing statutorily required California Environmental Quality Act ("CEQA") analyses

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for the MHF technology. The MHF technology is the same today as when the District originally permitted the Torrance MHF Alkylation Unit 20 years ago; in fact, MHF still represents the most recent, safest, commercially proven advance in Alkylation technology available to the global refining industry.

Neither of the MHF Alkylation technologies employed by TORC at its Torrance Refinery, nor, to TORC's knowledge, those employed by Valero at its Wilmington Refinery, have changed since the District approved these permits. The MHF technology is the same as when it was originally permitted at Torrance Refinery 20 years ago and Wilmington Refinery 10 years ago. However, MHF Alkylation catalyst performance, safety systems, training, and knowledge of the MHF Alkylation process and equipment have improved at the Torrance Refinery.

The Torrance Refinery MHF Alkylation Unit is even safer today than when the District permitted the process 20 years ago. Torrance has been using hydrofluoric acid ("HF") in the Alkylation Unit without any HF offsite release or impact since the unit was originally commissioned in 1966 through 1997. In 1997, the Refinery began using MHF to comply with the City of Torrance Consent Decree and the MHF Alkylation Unit has been operating since then without any MHF offsite impact, for a total of 51 years.

Accordingly, with facts, a performance record, voluminous information in hand, and technical analysis yet to be understood or completed, the District's decision to change its position, defies science, technology, and logic, especially when TORC is still providing clarifying information related to MHF testing and modeling data specific to Torrance Refinery's MHF Alkylation Unit operating conditions, mostly in response to questions raised by District staff or in response to District presentations.

Even if scientific and technical reality were suspended, a phase-out deadline of 2023 or even up to 2025 is infeasible and unrealistic, in part because no viable phase-out Alkylation Alternative exists today. In addition, the Torrance Refinery operates under a Consent Decree that is still in effect requiring MHF Alkylation. Moreover, as stated above, Sulfuric Acid, it is cost prohibitive, not safer than MHF, and will increase emissions.

Again, even if these realities were ignored, converting to, replacing with, and/or building a Sulfuric Acid Alkylation Unit or other Alternative Alkylation technology, once commercially viable, would require various permits from the District and other government entities or jurisdictions. In the case of the District, this new Refinery process unit would be subject to New Source Review ("NSR") and Prevention of Significant Deterioration ("PSD") requirements.

Under NSR, this new process unit would be subject to Best Available Control Technology ("BACT"), emission offsets, air dispersion modeling, toxics analysis, and would require a project-specific CEQA review. Going through the CEQA process, meeting BACT, obtaining offsets, completing air dispersion modeling and toxics analysis, obtaining right-of-ways if required, and permits from other government entities and jurisdictions, could take several years to complete before

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any construction could occur, without any guarantee that permits may ultimately be issued for conversions, replacements, and/or new units, considering community concerns that could be raised about Sulfuric Acid Alkylation; regeneration of sulfuric acid; trucking fresh and spent sulfuric acid; or unknown factors involving an as yet unidentified Alternative Alkylation technology through this process.

Moreover, a conversion, replacement, or new Alkylation unit would take a year and a half to two years to design and engineer. Once this is completed, because a conversion, replacement, or new Alkylation unit would not be an off-the-shelf or modular item, procuring, fabricating, and delivering equipment and piping for the unit could two or more years when long lead time equipment is involved.

Once delivered, the Refinery, in the case of PR 1410 – two refineries simultaneously, would then need an extended shutdown to connect the new unit to other Refinery process units and critical utility systems, which could take up to a year to complete.

Although the District indicates that it is accommodating turnaround schedules by allowing up to 2025 for a MHF phase-out, this is still not enough time for turnaround coordination considering the numerous Refinery process units and equipment that would be involved with a turnaround of this magnitude to replace the MHF Alkylation Unit. This could take more than one turnaround to complete.

Accordingly, there is no realistic or feasible way that a MHF phase-out could occur in a six to eight years' timeframe.

Lost in all of this is the cost-prohibitive nature of these technologies without any real or proven improvement in safety, reliability, or Alkylation performance, or understanding of the impacts to the Southern California consumer and local, regional, and state economies that the District's phase-out of MHF, a proven, safe Alkylation technology, would bring to address a hazards concern, where the probability and/or risk of a potential release is ignored, based on seemingly nothing more than fear and speculation, while ignoring decades of operating safely without any offsite HF or MHF release.

Ironically, by pairing a conflicting, scientifically and technically unsupported MHF phase-out with an unrealistic and infeasible phase-out deadline of 2023 or even up to 2025, the District is sabotaging the one aspect of the proposed PR Rule 1410 conceptual framework that could further enhance the already robust safety features of the Torrance and Valero Wilmington Refineries.

Despite the scope and scale of the Torrance Refinery's MHF Alkylation Unit safety and mitigation systems, TORC has repeatedly indicated a willingness to engage with the District and the American Petroleum Institute ("API") to discuss the potential inclusion of API's Recommended Practice 751 ("API-751") as a basis for enhancing mitigation measures on TORC's MHF Alkylation Unit. The API is recognized by the U.S. government and globally as the standards-setting organization for the

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petroleum industry. API-751 is a recommended practice for MHF/HF Alkylation Units that provides proven industry practices to support the safe operation of MHF/HF Alkylation Units.

However, before this engagement ever occurred; before the District could get input on cost, feasibility, and timing of potential enhanced interim control measures TORC's and Valero's MHF Alkylation Units, the District unilaterally selected numerous enhanced interim control measures as proposed requirements for PR 1410. A preliminary review of these potential enhanced safety requirements reveals they could cost millions of dollars to implement and take years to complete; plus many of them appear to be geared towards HF Alkylation. With the District proposing a MHF phase-out requirement of 2023 or even up to 2025, what incentive or justification does the District offer for TORC and Valero to invest and implement such enhanced mitigation measures if the District is going to require the units to be demolished in a few years? Again, there is no technical or scientific basis offered for the proposed interim control measures the District would require for a unit they are requiring to be shut down before the measures could be implemented.

If the District is sincere about having enhanced mitigation measures based on API-751 that could legitimately enhance safety in PR 1410, then the conflicting, scientifically and technically unsupported MHF phase-out deadline of 2023 or even up to 2025 must be eliminated from consideration. Otherwise, there is no scientific, technological, or logical reason to include enhanced mitigation measures in the PR 1410 conceptual rulemaking framework.

TORC offers the following detailed comments and responses to the following specific slides related to the District's September 15<sup>th</sup> PR 1410 Working Group Meeting #6 presentation, specifically to address the unsupported and premature nature of the inclusion of a MHF phase-out and phase-out deadline of 2023 or even up to 2025 in the District's PR 1410 conceptual framework at this time. These comments, along with TORC's prior written comments and Working Group meeting oral comments, must be considered and addressed before the District continues with its PR Rule 1410 conceptual rulemaking framework.

\* \* \*

In closing, TORC would like to see the District work more closely with TORC and other stakeholders, and thoroughly review and analyze all the technical and scientific data that has been provided District staff over the past several months, often at the District's request. As discussed above and in detail in Attachment A, TORC believes the District currently lacks a sound scientific or technical basis to include a MHF phase-out and particularly a phase-out by 2023 or even up to 2025.

The record shows District staff's latest inclusion of these concepts contradicts the District's historic position on the efficacy and environmental benefits of MHF, as outlined in the previously referenced February 7, 2003 news release that led to Valero investing hundreds of millions of dollars in an MHF Alkylation Unit, for their Wilmington Refinery. The scientific basis for transitioning to MHF at Wilmington is also repeated throughout the supporting documents that led to the phase-out of HF and

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replacement with MHF in what the District termed an “enforceable agreement.” With its latest proposal to phase-out MHF alkylation by 2023, the District is contradicting its own precedent without offering any scientific, technical, or logical basis for overturning its own decision.

With a full analysis of the MHF technology and the MHF Alkylation Unit's safety systems yet to be completed by the District, and a clear history of the District supporting MHF, TORC requests that the District withdraw its premature inclusion of a MHF phase-out, and particularly any phase-out deadline, in their PR 1410 conceptual rulemaking framework.

On September 12<sup>th</sup>, TORC submitted supplemental and clarifying information in response to the District's incorrect and faulty August 17<sup>th</sup> evaluation of MHF testing results and modeling data, and plans to submit shortly additional information related to the Rainout model results. Additionally, TORC is awaiting receipt of additional information from the MHF technology licensor, which TORC envisions disclosing to the District.

Moreover, the interests of Southern California, the state, and California consumers would be ill-served by a MHF phase-out, particularly based on an infeasible 2023 or even up to 2025 phase-out deadline, unless there is an inherently safer, environmentally responsible, economically viable, and commercially proven alternative. As attested to in prior Working Group meetings by licensors, such an Alternative Alkylation technology does not exist today – MHF is the most recent advance in Alkylation Catalyst technology.

Proposing a MHF phase-out by 2023 or even up to 2025 when the only known alternative, Sulfuric Acid Alkylation, is **not safer, will actually increase emissions, and is cost-prohibitive**, makes no sense. The District has prematurely proposed a PR 1410 conceptual rulemaking framework before receiving all relevant information on the efficacy of MHF at two refineries and clearly has not understood to date some of the information already provided by independent Alkylation industry experts with global experience. To be clear, the District, including the current Board Chair, hailed the implementation of MHF as an environmental justice initiative when the Wilmington Refinery adopted MHF as a safer and environmentally responsible alternative to HF.

Accordingly, we urge the District to take the additional time necessary to address TORC's and other stakeholders' comments, and withdraw both their premature inclusion of a MHF phase-out and unrealistic and infeasible phase-out deadline of 2023 or even up to 2025 as part of the PR 1410 conceptual framework at this time.

We look forward to working collaboratively and openly with the District to get the PR 1410 rulemaking back on a track, based on sound science and technology and the current state of Alkylation technologies.

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Please note that in submitting this letter, TORC reserves the right to supplement its responses and comments as it deems necessary, especially if additional or different information is made available to the public regarding the PR 1410 rulemaking process.

Sincerely,



Steve Steach  
Refinery Manager

Attachment (1)

cc: Wayne Nastri, via e-mail, without attachment  
Susan Nakamura, via e-mail and hand delivery, without attachment  
Mike Krause, via e-mail and hand delivery, without attachment  
Dr. William A. Burke – Governing Board Chairman, via overnight mail, without attachment  
Ben Benoit – Governing Board Vice-Chairman, via overnight mail, without attachment  
Marion Ashley – Governing Board Member, via overnight mail, without attachment  
Joe Buscaino - Governing Board Member, via overnight mail, without attachment  
Michael A. Cacciotti - Governing Board Member, via overnight mail, without attachment  
Sheila Kuehl – Governing Board Member, via overnight mail, without attachment  
Dr. Joseph K. Lyou - Governing Board Member, via overnight mail, without attachment  
Larry McCallon - Governing Board Member, via overnight mail, without attachment  
Judy Mitchell – Governing Board Member, via overnight mail, without attachment  
Shawn Nelson - Governing Board Member, via overnight mail, without attachment  
Dr. Clark E. Parker, Sr. - Governing Board Member, via overnight mail, without attachment  
Dwight Robinson – Governing Board Member, via overnight mail, without attachment  
Janice Rutherford - Governing Board Member, via overnight mail, without attachment

## Attachment A TORC's Comments and Responses

TORC offers the following detailed comments and responses to the following specific slides related to the District's September 15<sup>th</sup> PR 1410 Working Group Meeting #6 presentation to address the unsupported and premature nature of the inclusion of a MHF phase-out in the District's PR 1410 conceptual framework at this time<sup>1</sup>. These comments, along with TORC's written and verbal comments provided to the District on the dates and forums shown in the Table below, must be considered and addressed before the District continues with its current PR Rule 1410 conceptual rulemaking framework that includes any unsupported and premature inclusion of a MHF phase-out.

Forum	Dates
Meetings	May 4, June 7, June 28, July 26, and August 17, 2017
Refinery Tour	May 16, 2017
Written Comments	May 4, August 1, August 11, August 23, and September 12, 2017
Working Group Meetings	April 19, May 18, June 15, August 2, and August 23, 2017

### Slide 6 - Initial Concept and Framework for Discussion

In slide 6, the District shows a block flow diagram with its PR 1410 conceptual rulemaking structure, including a phase-out of MHF with Sulfuric Acid or Alternative Alkylation Catalysts.

As noted above, it is premature for the District to contemplate a MHF phase-out without providing a scientific or technical justification. Since 1997, the Torrance Refinery has been safely using MHF with no offsite impacts. Additionally, the Torrance Refinery used HF in the Alkylation Unit without any HF offsite release from 1966 when it was commissioned until 1997 when the unit was modified to use MHF, a 51-year performance record that is being ignored it what appears to be rush to phase-out MHF based on fear.

As has been explained to the District, extensive MHF testing was performed on a parametric basis to evaluate MHF efficacy on each operating condition for the Torrance Refinery's Alkylation Unit. Each individual parameter: i.e., temperature, pressure, and concentration, was tested at ranges that include current MHF Alkylation Unit operating conditions. Results of this testing were used to create and validate a "first principles thermodynamic model" that accurately predicts liquid rainout of HF across all the Refinery's MHF Alkylation Unit's operating conditions.

As presented to the District on several occasions, the Additive range of concentrations was tested at equal to or less than 20 percent by wt% in 1991, 1992, 1993, and 1994. These tests confirmed the Additive increases ARF even at low concentrations.<sup>2</sup>

<sup>1</sup> This now the third time the District has released such a presentation knowing that TORC is still answering the District's questions and providing additional information related to MHF.

<sup>2</sup> Specifically, the extensive testing that was completed by Mobil as presented in Document 8, DAN 95M-0874 – "MHF Airborne HF Reduction Estimates", disclosed to the District on May 4, 2017 under Trade Secrets/Confidential Business Information, clearly supports this.

"Mobil has performed small ... and large scale release tests ... to understand the effect of storage composition, temperature and pressure and release orifice size on the fraction of released HF that becomes airborne. A key finding



## **Attachment A**

### **TORC's Comments and Responses**

As the District has been informed, ARF is calculated as a function of HF concentration, Additive concentration, water concentration, and reactor temperature. The Rainout Model results for the Torrance MHF Alkylation Unit are consistent with ARF test results. Importantly, the supplemental MHF data and information TORC provided to the District on August 11<sup>th</sup> and September 12<sup>th</sup>, and discussed with District staff on August 17<sup>th</sup> validates this consistency and the efficacy of the Rainout Model, and in turn, the efficacy of MHF at current MHF Alkylation Unit current operating conditions.

To further help District staff understand this information, on August 11<sup>th</sup>, at the District's request TORC provided an Excel spreadsheet containing all testing data, complete with associated operating parameters, measured rainout, and predicted rainout. As TORC explained in its August 11<sup>th</sup> and September 12<sup>th</sup> letters, and discussed with District staff on August 17<sup>th</sup>, this data summarizes all 1990's MHF testing documents to which TORC had access at the time, showing the wide range of operating parameters parametrically tested. Each relevant case was then run on the Rainout Model - measured versus predicted values are shown. The following graph summarizes the experimental data results and correlates these results to the Rainout Model used as the foundation for the Safety Advisor's and Court's evaluation and approval of the use of MHF. Correlating the experimental data to the Rainout Model's results definitively shows that:

- a) Rainout Model calculations are valid.
- b) The stated safety improvements offered by MHF are valid.

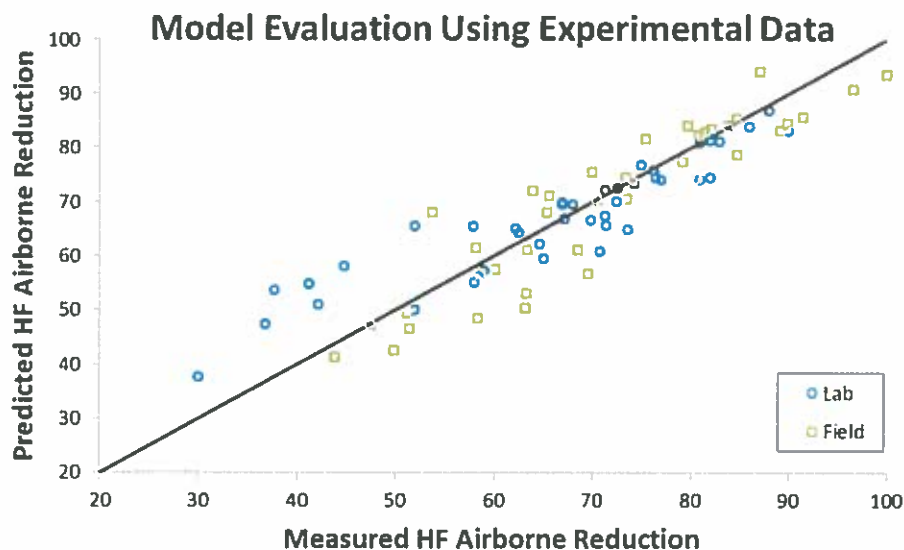
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of the experiments was that the addition of the additive causes a significant fraction of the released HF to fall on the ground as liquid rainout. The set of experiments ... showed that the presence of the additive eliminates flash atomization of the released jets. More specifically, no flash atomization was observed for compositions containing as much as 85 wt% HF up to 140° F.

Mobil has also developed an aerosol model ... to interpret the experimental data and to predict the airborne fraction of HF in releases with conditions outside the range of variables experimentally tested. The model predicts small and large scale release data in the subcooled and superheated regimes of interest."

(Internal references omitted.)

## Attachment A TORC's Comments and Responses



*Experimental results shown as measured Rainout versus model predicted rainout, validating the Rainout Model's strong predictive abilities at a wide range of HF and Additive percentages*

Also, at the District's request, TORC graphed each tested parameter separately to show any testing bias. The graphs show the delta between measured and predicted rainout separately for each measured operating parameter (i.e., pressures, temperatures, HF wt% concentrations, Additive wt% concentrations, including current MHF Alkylation Unit conditions). The accuracy of the Rainout Model at the full range for each condition, as well as its suitability in validating MHF safety margins, is clearly demonstrated for all key operating parameters.

Additionally, at the District's request TORC provided a comparison of the rainout at MHF Alkylation Unit operating conditions at 55 psig versus 225 psig as predicted by the Rainout Model.

As has been repeatedly explained to the District, the Rainout Model is a liquid spray model developed to predict the airborne fraction of MHF by Mobil engineers and scientists, based on extensive testing and technical analyses. The model calculates the evaporation of HF in a two-phase HF/additive jet discharging from an orifice. Given the release conditions (pressure, temperature, and composition) and release geometry (hole size, release orientation, and elevation of the orifice from the ground), the model calculates HF rainout, or capture, which is defined as the fraction of HF discharged from an orifice that falls to the ground as liquid.

The Rainout Model output at 55 psig versus 225 psig supports the premise that pressure has a relatively small impact on ARF as the release velocity is proportional to the square root of pressure. Even at higher pressures tested and small orifice sizes, the projected ARF remains above 50% for the Refinery's MHF Alkylation Unit operating conditions.

## Attachment A TORC's Comments and Responses

In summary, the supplemental analysis TORC provided to the District on August 11<sup>th</sup> and September 12<sup>th</sup>, then discussed with District staff on August 17<sup>th</sup>, and provided in this Attachment A, unequivocally shows that:

- Rainout Model calculations for current Torrance Refinery MHF Alkylation Unit operating conditions are within the range of model validity for Rainout.
- Experimental data points exist at the Torrance Refinery MHF Alkylation Unit's current operating temperature and composition.
  - Increasing operating pressure increases hydrodynamic forces with *no observable increase to the propensity of flash atomization*, thus the validity of the model is retained and reinforced
  - The Rainout Model has been proven to accurately predict release characteristics for all operating conditions within the hydrodynamic regime, hence the model is able to accurately predict rainout across the full range of unit operating pressures

Finally, TORC pointed out and explained to the District that the Rainout Model was derived from extensive release testing. In other words, the model was subsequently validated after development through additional experiments that proved the model's predictive ability across all MHF Alkylation Unit operating ranges. Validation tests were performed at representative unit operating conditions: i.e., lower Additive concentrations and higher temperatures. Importantly, the Rainout Model MHF validation data set was shown to be much more extensive than the models on which the District relied in their 2004 CEQA document for Valero's MHF ReVAP project.

In its 2004 CEQA document for Valero's MHF ReVAP Project, the District used Quest Laboratory's "Momentum Jet Dispersion Model" in the Hazard Analysis for the project to predict the dispersion of jet releases into ambient air in comparing releases of MHF to HF. In the supporting Quest documentation for the Hazards analysis, Quest explained that the model was validated using the following data points shown on Figure F-1, which is excerpted below:

## Attachment A TORC's Comments and Responses

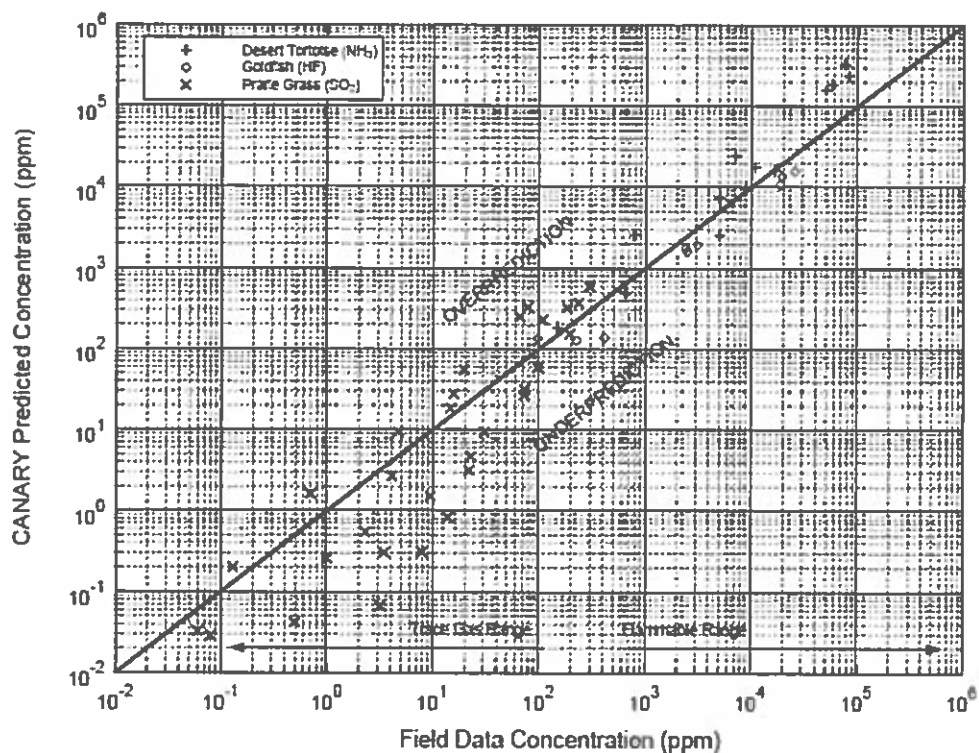


Figure F-1

As clearly shown in Figure F-1 above, this validation data set for HF releases provides fewer relevant data points than the data set used to validate the Rainout Model we submitted to the District.

Despite this information, District staff at the August 17<sup>th</sup> meeting presented for the first time its analysis of the supplemental MHF testing and modeling data provided by TORC on August 11<sup>th</sup>. Staff's analysis was inaccurate, failed to account for the testing data being hydrocarbon-free, and most importantly, ignores the fact that higher unit operating pressure relative to the tested data points has no observable increase to the propensity of flash atomization.

In response, TORC requested that the District allow TORC to provide further clarifying information to assist District staff in their analysis and correct their inaccurate assumptions, which TORC did on September 12<sup>th</sup>. TORC believes that after District staff understands this clarifying information, District staff will validate the efficacy of MHF at the range of operating conditions for the Torrance Refinery MHF Alkylation Unit and change the outcome of its current analysis to reflect these facts.

Unfortunately, before evaluating this additional clarifying information and obtaining a complete understanding of MHF technology as was the case in 2003 with the Valero "enforceable agreement," District staff continue moving forward with a phase-out of MHF as part of its PR 1410 conceptual rulemaking framework, and now has compounded by deciding on an unrealistic phase-out deadline of 2023 or even up to 2025, less than six to eight years from now. How can District staff legitimately consider phasing out MHF, particularly including a phase-out deadline of 2023 or even up to 2025,

## Attachment A TORC's Comments and Responses

when their review of the extensive and voluminous MHF testing, analyses, and modeling data provided by TORC is incomplete, and when the District still needs to begin / finalize the statutorily-required CEQA and Socioeconomic analyses for the rulemaking? In addition, District staff is completely ignoring their own precedent established in 2003 when the District entered into an "enforceable agreement" with Valero, praising the company for phasing out HF Alkylation at the Wilmington Refinery and moving to MHF technology at a cost of hundreds of millions of dollars. In the ten years since that unit became operational using MHF, there has been no offsite release.

As explained above, the totality of all MHF testing, analysis, modeling data, and other information TORC has provided to the District to date shows that MHF prevents flash atomization; prevents the formation of an airborne aerosol; and promotes rainout of liquid MHF at current Torrance Refinery MHF Alkylation Unit operating conditions. All these conclusions support the decision-making process applied in the 1990's that supported the acceptability of MHF alkylation by both the Court and the District.

This is further demonstrated by the fact that in 1997 the Refinery began using MHF to comply with the City of Torrance Consent Decree. Since then, the MHF Alkylation Unit has been operating without any MHF offsite impact. Importantly, Torrance Refinery used HF in the Alkylation Unit without any HF offsite release from 1966 until 1997, a period that includes both the Sylmar and Northridge earthquakes. In total, 51 years have passed since the unit went online, again, a performance record that appears to be ignored.

Accordingly, the District lacks a scientific or technical basis to include in its PR 1410 conceptual rulemaking framework a phase-out of MHF; prematurely concluding that "[b]ased on information received to date, insufficient evidence that a dense vapor cloud does not form (assumption in modeling and ARF calculation)". See District August 18, 2017 fifth Working Group meeting presentation entitled "PR 1410 Working Group Meeting #5".<sup>3</sup>

Moreover, such a premature conclusion contradicts the recommendation of an independent Court-appointed Safety Advisor and the decision of a well-respected Los Angeles Superior Court Judge that in 1995 under the City of Torrance Consent Decree approved the use of the MHF technology at the Torrance Refinery, finding it as safe as and possibly safer than sulfuric acid for a similarly-sized alkylation unit. Their decision was reached after a thorough, multi-year review of voluminous MHF testing results, technical analyses, and modeling data by the Safety Advisor and judge that has also been disclosed to the District with the consent of the technology licensor.

Additionally, staff's current offensive contradicts the District's precedential position on this technology that extends back to permitting the Torrance Refinery MHF Alkylation Unit. More publicly, in 2003, the District issued a press release announcing an "enforceable agreement" with Valero to phase-out the Wilmington Refinery's use of HF with MHF by 2006.

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<sup>3</sup> See District July 28, 2017 fourth Working Group meeting presentation entitled "PR 1410 Working Group Meeting #4", slides 4 and 5, respectively, where it states "[b]ased on information received to date, insufficient evidence that a dense vapor cloud does not form", and as a result, "[a] phase-out of the use of HF is a preemptive measure to prevent an air pollution episode"; see also TORC's letter dated August 1, 2017, "Comments on South Coast Air Quality Management District's July 28, 2017 Presentation for the Proposed Rule 1410 Fourth Working Group Meeting".

## Attachment A TORC's Comments and Responses

In the press release, the District publicizes and supports the use of MHF technology<sup>4</sup>:

“Once this refinery stops using concentrated hydrogen fluoride, we will have virtually eliminated the potential for a catastrophic accidental release of this compound in our region,” said Barry Wallerstein, executive officer of the South Coast Air Quality Management District.”

“The agreement fulfils one of the 23 Environmental Justice goals adopted by AQMD’s Governing Board last fall.”

“Switching to modified HF will minimize the possibility of a catastrophic accidental release not only at the refinery, but along Southland transportation corridors, as the additive is added to the chemical before shipping.”

By endorsing and permitting Valero Wilmington’s Reduced Volatility Alkylation Process (ReVAP) project to modify the Wilmington Refinery’s Alkylation Unit to use MHF under an “enforceable agreement” between Valero and the District, the District further reinforced the efficacy of MHF, while also stating in its California Environmental Quality Act (“CEQA”) Environmental Impact Report (“EIR”) for the project the following about the efficacy of MHF:

“ReVAP incorporates a suppressant in the HF that reduces volatility in the event of an accidental release with a concurrent reduction in safety risks (i.e., distance that the HF could travel and number of persons exposed) in the surrounding area. Use of this modified process meets the SCAQMD’s objectives with respect to elimination of concentrated HF.”

*See* District’s “Ultramar Inc. – Valero, Wilmington Refinery, Alkylation Improvement Project, Statement Of Findings, Statement Of Overriding Considerations, And Mitigation Monitoring Plan”, p. 3, (SCH #20030536, certified December 2004). Note that both the Wilmington and Torrance refineries use the same “suppressant”/Additive.

“An accidental release of HF could migrate off the Refinery property and expose individuals in the surrounding community. The proposed (MHF) project will substantially reduce the potential hazard impacts associated with an accidental release of HF.”

*Id.*, p. 9.

“The proprietary additive is a non-volatile, non-odorous, low toxicity material that is completely miscible in the acid phase. It has very limited affinity for other hydrocarbons, including the alkylate product and acid soluble oil (ASO) by-product, similar to the organic polymer produced in the current process. The unique physical properties of the additive substantially reduce the volatility of the acid at ambient conditions. This reduction in volatility proportionately reduces the amount of HF that can vaporize and subsequently disperse off-site from a given liquid release quantity. *The modified HF catalyst reduces acid vapor pressure sufficiently to suppress the usual flash atomization process of hydrofluoric*

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<sup>4</sup> See Highly Toxic Chemical to be Phased Out at Valero Refinery: SCAQMD, Feb. 7, 2003.

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*acid, causing most of the acid to fall to the ground as an easily controlled liquid and reduces the potential for off-site consequences of an accidental HF release."*

See District's "Ultramar Inc. – Valero, Wilmington Refinery, Alkylation Improvement Project, Final EIR", Chapter 2, p. 2-7, (SCH #20030536, certified December 16, 2004) (emphasis added).

This position for the Valero project is consistent with the District's previous supportive conclusion regarding the efficacy of MHF in its CEQA Addendum to the Torrance Refinery's MHF Alkylation Unit project, which specifically states:

*"The experimental testing indicated that the addition of the Mobil additive to HF was an effective method for reducing or elimination the amount of aerosol formed during a release. The additive is a water-soluble, thermally stable compound that is solid at ambient conditions. In addition, the health data indicate that the additive has very low toxicity and limited health impacts as compared to HF which has more severe health impacts."*

See District's "Addendum, Mitigated Negative Declaration, Mobil Modified Hydrogen Fluoride Conversion Project", p. 2, (July 9, 1997).

*"In summary, after review of the available test data and performing release/dispersion modeling, under similar release conditions, the addition of the Mobil additive to an HF alkylation unit was determined to result in a reduction of HF hazard zones for equivalent releases. The amount of reduction will be a function of the additive concentration, and will vary with many parameters which govern the release/dispersion process. In all cases, addition of the additive to the alkylation unit will reduce the distance traveled by HF in the event of a release. At any concentration of additive, the vapor pressure of the HF will be reduced, thus reducing the potential for public exposure to HF. Therefore, modification to the HF alkylation unit and the use of MHF at the Mobil Refinery are expected to have a beneficial impact on the environment by reducing the potential impacts associated with an accidental release from the alkylation unit."*

*Id.*, p. 4, (emphasis added).

Neither the MHF Alkylation technologies employed by TORC at its Torrance Refinery, nor, to TORC's knowledge, those employed by Valero at its Wilmington Refinery have changed since the District permitted both refineries' MHF Alkylation units. The MHF technology is the same today as when originally permitted 20 years ago. However, the safety systems, training, and knowledge of the MHF Alkylation process and equipment have improved related to MHF alkylation, which has been the case at the Torrance Refinery. Consequently, the Torrance Refinery MHF Alkylation Unit is even safer than when it was permitted 20 years ago.

Importantly and as previously noted, the District issued permits to the Torrance Refinery in 1997 and Valero Wilmington Refinery in 2004, after performing statutorily required CEQA analyses for the MHF technology. Fast forward to 2017 - how does current District staff justify their view that the MHF technology may no longer work when the District previously endorsed, permitted, and supported MHF technology? We also note for the record we are unaware of any MHF release that

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has gone offsite from the four operating alkylation units in the U.S. that safely and reliably utilize this technology.

In our view, the District appears to be ignoring its own research, reports, findings, conclusions, and permits. As a result the District is defying science, technology, and logic by changing its position on MHF technology without any supportive technical criteria, including testing or modeling, particularly when TORC is still in the process of providing the District with clarifying information related to testing data specific to Torrance Refinery's MHF Alkylation Unit operating conditions, how the Rainout Model works, and additional Rainout Model runs.

As noted above, TORC believes the District lacks a scientific or technical basis to reach such an unsupported and premature inclusion of a MHF phase-out, particularly any deadline for a phase-out such as 2023 or even up to 2025. As a result, TORC requests that the District refrain from premature determinations regarding a phase-out of MHF and withdraw this unsupported concept from the PR 1410 rulemaking. We urge the District to avoid rushing to judgment on the PR 1410 rulemaking and take the additional time necessary to continue its evaluation of the MHF technology, the information provided by TORC, and address TORC's and other stakeholders' comments.

Although not mentioned in the District's September 15<sup>th</sup> PR 1410 Working Group Meeting #6 presentation, TORC wishes to supplement its our August 23<sup>rd</sup> comments on the Districts August 18<sup>th</sup> PR 1410 Working Group Meeting #5 presentation related to barriers as TORC has discovered new information that further calls into question the District's position on barriers.

In slide 6 (Evaluating Impacts from MHF Technology) of its presentation entitled "PR 1410 Working Group Meeting #5" (dated August 18<sup>th</sup>) presented at the August 23<sup>rd</sup> fifth Working Group, the District makes several unclear and unsupported statements about the Torrance Refinery's reliance on barriers, specifically that District staff are concerned "existing mitigations would not provide adequate protection in the unplanned event such as a major accident or earthquake causing equipment failure".<sup>5</sup>

However, just like its current position on MHF technology, District staff appears to have failed to check its own files and is therefore contradicting the District's previous, publicly-stated position on barriers. For example, in its February 7, 2003, Governing Board Letter, Agenda No. 25, regarding the request that the Board "Authorize Executive Office to Execute MOU between AQMD and Valero Wilmington Refinery to Replace the Use of Concentrated Hydrogen Fluoride with Modified Hydrogen Fluoride", the Executive Officer stated the following about the MHF technology and barriers:

"MHF contains additives that reduce volatility and aerosol formation properties of HF. Currently, the refinery is *equipped with a mitigation system* that includes 26 HF leak detection devices, surveillance video cameras allowing operators to zoom into an area of concern within the unit, *a remote automated process isolation system, water curtain and cannon spray*

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<sup>5</sup> In slide 5 of this same presentation, the District further indicates that it has "[i]ssues with information provided by TORC", particularly "[r]eliance on functioning MHF vapor barriers (e.g., flange shrouds, settler pans, pump seals)".



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*equipment capable of delivering about 21,000 gallons per minutes, and 12 automated valves to deinventory HF from the process system. To further minimize public exposure to potential HF releases, the refinery is proposing to use modified HF in the alkylation process and upgrade its mitigation system to include deflector barriers for HF pumps and flanges. This proposed change meets the intent of the former Rule 1410 and will significantly reduce the potential for public exposure to this hazardous chemical in the event of an emergency release.*

(Emphasis added).

Fast forward to 2017 - how does current District staff justify their view that the TORC barriers, which are similar to Valero's barriers, are no longer reliable when the District previously enthusiastically endorsed them as part of Valero's replacement of HF with MHF in 2003? Again, nothing has changed regarding these barriers other than they have improved over time, making them safer today.

Below TORC addresses current issues associated with transitioning from a proven and safe Alkylation technology to Sulfuric Acid or so called emerging Alternative Alkylation technologies.

### Slide 7 - Potential Timelines for Phase-Out of MHF

In slide 7, the District presents the following table as a potential timeline for the phase-out of MHF.

	<b>Sulfuric Acid or Alternative Catalyst Technology</b>
<b>Start Date</b>	<b>2018</b>
Engineering	6 months
Design & CEQA (concurrent)	15 months
Permitting	9 months
Logistics	6 months
Order/Delivery/Installation	18 months
Testing	6 months
<b>Full Commissioning</b>	<b>2023 or even up to 2025 (up to 2025*)</b>

\* Consideration of turnaround schedule and recognizing that emerging technology may not fit into schedule.

As stated previously, the District is prematurely proposing a MHF phase-out, especially a phase-out deadline of 2023 or even up to 2025. There is no scientific or technical justification for including these concepts in the PR 1410 conceptual rulemaking framework. Again, since 1997, the Torrance Refinery has been safely using MHF and there has never been an offsite release. Additionally, the Torrance Refinery used HF in the Alkylation Unit without any HF offsite release from 1966 until 1997. Therefore, there is no basis for a potential timeline for the phase-out of MHF.

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Despite this, the District forges ahead and presents a potential phase-out timeline of less than six to eight years. The District provides no basis for such an unrealistic and infeasible deadline and has completely ignored all the prior input and comments received from TORC and Valero on this topic, as well as overlooking its own records on this matter that support the efficacy of MHF and barrier technology.

In slide 9 (Implementation Timeframe) of its presentation entitled "PR 1410 Working Group Meeting #5" (dated August 18<sup>th</sup>) presented at the August 23<sup>rd</sup> fifth Working Group, the District sought "input on implementation timeframe for ... phase-out of MHF" as part of its PR 1410 conceptual rulemaking framework.

Specifically regarding the MHF phase-out portion of this slide, the District requested input on:

- "Considerations needed for engineering, design, permitting/CEQA, logistics, removal, construction, delivery, installation, and performance testing
- Maturation of alternative emerging technologies needs to be a consideration"

TORC, Valero, and other Working Group members provided extensive comments on these topics, based on the proposed MHF phase-out deadline of 2023 or even up to 2025 which appear to have been ignored by the District.

TORC has specifically commented to the District on multiple occasions that use of Sulfuric Acid as a replacement for MHF presents its own challenges and impacts that run counter to the District's air quality goals, including increased emissions versus MHF, which have been previously documented to the District, and reiterated below:

- Replacing MHF Alkylation technology with Sulfuric Acid Alkylation technology would not be simple and cost prohibitive. Sulfuric Acid Alkylation introduces a different set of risks and impacts that are not yet fully evaluated by the District. These include direct and indirect increases in emissions of greenhouse gases and criteria pollutants, community risk, and state and local gasoline supply disruptions based on extensive outages required for demolition and construction.
- In comparison to sulfuric acid plants, MHF acid alkylation units "alkylate" a wider range of feedstocks such as propylene (C3=) and amylene (C5=). These streams increase acid consumption and lower alkylate product quality (octane) and yield when processed through Sulfuric Acid Alkylation units. TORC's MHF Alkylation Unit converts a high percentage of C3= into alkylate for blending into CARB gasoline.
- Due to Sulfuric Acid Alkylation's high consumption of acid, these units require acid regeneration external to the processing unit, while MHF Alkylation regenerates the acid within the existing unit. Plot space requirements for Sulfuric Acid Alkylation Units and regenerating facilities are significant; sufficient plot space may not be available at existing refineries and/or may require demolition of existing structures.

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- Sulfuric Acid units require as much as 200 times more catalyst than HF alkylation units. If there is insufficient plot space to construct an onsite acid regeneration plant, conversion of an MHF Alkylation unit to sulfuric acid alkylation would increase local truck traffic approximately 250 times compared to current MHF Alkylation Unit requirements, due to the delivery of fresh sulfuric acid and shipping spent acid for regeneration/re-use. Increased truck traffic would result in corresponding increases in mobile source emissions not accounted for in the study, as well as increased risks to the community along the transport route.
- If such additional truck traffic is not acceptable to the community due to mobile source emissions and increased transport risks, then the transport of fresh and spent sulfuric acid would have to be done via new pipelines to separate newly-built regeneration facilities and/or existing regeneration facilities, which would have to be upgraded to handle the increased acid for regeneration.
- Sulfuric Acid Alkylation units have higher energy demand, which correspond to higher emissions of criteria pollutants and greenhouse gases from equipment used to generate power. MHF Alkylation has lower power needs due to its unique design -- no refrigeration compressors, fewer pumps/mixers.
- Assuming permits would be granted for a new, grass-roots Sulfuric Acid Unit, to actually build a new unit would require extended refinery outages to complete.

See TORC letter to District Executive Officer Wayne Nastri, entitled, "Norton Engineering Alkylation Technology Study, related to the use of Hydrofluoric Acid in Refinery Alkylation Units" dated December 8, 2016.

As discussed with the District on July 26<sup>th</sup> and further emphasized in TORC's August 1<sup>st</sup> and August 23<sup>rd</sup> letters, and also detailed below, the cost of a new grass root Sulfuric Acid Alkylation Unit at the Torrance Refinery would be cost prohibitive, approximately between \$600MM to \$900MM depending on whether a new spent acid regeneration unit would be constructed on site or an existing, third party spent acid regeneration facility must be upgraded.

Importantly, there is no guarantee that all permits needed to build a new Sulfuric Acid Alkylation Unit would be issued by the various regulatory agencies and jurisdictions. Even if they could be obtained, going through the CEQA process, obtaining other governmental or jurisdictional permits, meeting the District's NSR and PSD requirements, could take many, many years before design or construction could commence.

The District should keep in mind that through the City of Torrance Consent Decree process, the Court determined that "the modified HF catalyst (including mitigation) presents no greater risk than a sulfuric acid alkylation plant producing a comparable amount of alkylate" only after it was proven to the Court-appointed independent Safety Advisor that "... the catalyst as modified would not form an aerosol or dense vapor cloud upon release". As a result, building a grass roots Sulfuric Acid Alkylation unit would contradict the Consent Decree and does NOT make environmental, process safety, or economic sense.

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Moreover, the District has already determined through CEQA that Sulfuric Acid Alkylation is not a feasible alternative when compared to MHF Alkylation:

### “ALTERNATIVES REJECTED AS INFEASIBLE”

**“Sulfuric Acid Alternative:** Sulfuric acid alkylation is an alternative to HF alkylation. Under this alternative, the Ultramar Inc. – Valero Wilmington Refinery would need to construct a completely new alkylation unit and eliminate the existing alkylation unit, because sulfuric acid alkylation is an entirely different processing using a different technology.”

The other option is to construct a sulfuric acid alkylation unit within the existing Refinery. To make space for this, the existing unit would have to be shutdown and demolished. This and construction of a new alkylation would require approximately one year. This shutdown would effectively eliminate the ability of the Refinery to produce fuels in compliance with California reformulated fuels requirements, eliminating it as a major source of gasoline for the California market. Current California refining capacity is barely adequate to meet the state's gasoline demands. Eliminating the Refinery's ability to produce California reformulated gasoline for one year would lead to potential spot shortages and adverse economic effects in the region.

*See District's "Ultramar Inc. – Valero, Wilmington Refinery, Alkylation Improvement Project, Final EIR", Chapter 6, pp. 6-1 – 6-2, (SCH #20030536, certified December 16, 2004).*

Fast forward to 2017 - how does current District staff justify their belief that Sulfuric Acid Alkylation Unit is now a feasible alternative? Again, nothing has changed since the District issued completed this CEQA analysis for the Valero ReVAP project in 2004 regarding the feasibility of Sulfuric Acid as a replacement for MHF.

As to the comparative risk of MHF versus Sulfuric Acid, a Quantitative Risk Analysis (“QRA”) following industry best practices was conducted as part of the City of Torrance Consent Decree process for the use of MHF at the Torrance Refinery. The independent Court-appointed Safety Advisor reviewed, confirmed, and validated the conclusion of the QRA that MHF was as safe or safer than Sulfuric Acid for a similarly sized Alkylation Unit<sup>6</sup>. This finding was included in the Safety Advisor's report to the Court, which approved the use of the MHF technology at the Torrance Refinery. Therefore, the MHF technology is a safer or safer than Sulfuric Acid. Therefore, if the District's is concern with the hazards associated with Alkylation technologies then forcing a phase-out to an Alternative that is not any safer is illogical.

Regarding Alternative Alkylation Technologies, as TORC noted in its August 1<sup>st</sup> letter, PBF has been evaluating Alternative Alkylation Technologies since announcing the acquisition of the Torrance Refinery in September 2015. PBF and TORC have met with experts from Honeywell/UOP, Stratco/DuPont, B&McD, KBR, and CB&I, as well as independent Alkylation experts to explore

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<sup>6</sup> See Documents 21 “Modified Hydrofluoric Acid Alkylation Process Assessment of the Off-Site Risk Impacts Associated with Modifications/Changes in the MHF Process” (March 1998) and 37A/B “Modified Hydrofluoric Acid Alkylation Risk Assessment” (October 1994) disclosed to the District on May 4, 2017 under Trade Secrets/Confidential Business Information.

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alternatives. To date the result of these technological evaluations, meetings, and discussions is that there is no commercially viable, cost-effective, or safer Alkylation technology. Nothing in the presentations presented by the licensors of exiting Sulfuric Acid and Alternative Alkylation technologies at the August 2<sup>nd</sup> fourth Working Group and August 23<sup>rd</sup> fifth Working Group meetings has changed this view.

For example, at the August 2<sup>nd</sup> fourth Working Group meeting, CB&I and Chevron presented on their alkylation technologies. TORC's take away from CB&I's presentation<sup>7</sup> regarding its CDAlky® and AlkyClean® technologies<sup>8</sup> follows:

- One small unit in a chemical plant in China - 2,700 barrels per day (“BPD”).
- CB&I confirmed there is **NO** commercial plant in the U.S.
- CB&I confirmed that AlkyClean technology is the first and only commercialized solid acid alkylation technology in the world.<sup>9</sup>
- Operating details, product quality, run length and turnaround interval, catalyst regeneration, and feedstocks are currently unknown.
- CB&I confirmed that all units on CB&I's Commercial Experience List are Sulfuric Acid Alkylation units.
- CB&I conceded that no pilot or demonstration units for an HF/MHF conversion exist.
- CB&I indicated that it may be able to design an HF/MHF conversion.
- CB&I conceded such a conversion would be a little more expensive than a conventional Sulfuric Acid conversion, but definitive cost information currently unknown.
- Testimony at April 1<sup>st</sup> District Hearing about European refinery converting to Solid Acid Catalyst (“SAC”) is inaccurate.
- One week later, on August 9<sup>th</sup> CBI announced the company had decided to sell the company's technology business, which is responsible for alkylation processes.

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<sup>7</sup> CB&I's Presentation – “Advanced Alkylation Technologies: CDAlky® and AlkyClean®” (August 2, 2017).

<sup>8</sup> Subsequently on August 9, 2017, CB&I announced its intent to sell its alkylation technology business. See <http://cbi2016ir.q4web.com/news/press-release-details/2017/CBI-Announces-Intent-to-Sell-Technology-Business/default.aspx>.

<sup>9</sup> During District “Refinery Committee Investigative Hearing” on April 1, 2017 in Torrance, California, the District's Consultant Mr. Jenkins of Bastleford Engineering and Consultancy claimed that an unnamed UK refinery had successfully converted an existing HF Alkylation Unit to Solid Acid Alkylation Technology. The CB&I presentation irrefutably contradicts this and TORC would like the District to correct the record so that it is clear to the public, elected officials, and the District Governing Board members that this never occurred so they are no longer misinformed on this important issue.

It should be noted that TORC understands that Bastleford Engineering and Consultancy has recently gone into receivership/bankruptcy and the domain name for the company is for sale.

## **Attachment A**

### **TORC's Comments and Responses**

- Based on the foregoing, TORC still is convinced there is no commercially viable, cost-effective, or safer SAC technology, including CB&I's technologies, currently available or expected to be available in the foreseeable future.

TORC's take away from Chevron's presentation ("Isoalky™ Technology: Next Generation Alkylate Gasoline Manufacturing Process Technology" (August 2, 2017)) regarding its Isoalky™ technology follows:

- Chevron stressed that its existing HF Alkylation Unit at its Salt Lake City Refinery has not had any safety issues, injuries, or offsite impacts associated with the unit's operation.
- Chevron technology is still only in its demonstration phase.
- Chevron plans to design and build a small 5,000 BPD unit at its Salt Lake City Refinery in 2020 – "Model No. 1, Serial No. 1".
- Chevron provided limited information regarding its proven capability to scale up to the size of the Torrance Refinery's MHF Alkylation Unit, and referred to the licensor, UOP, for this information.
- Chevron indicated that technology cost would likely be on par with conventional Sulfuric Acid Alkylation.
- Chevron clarified that although the technology is "commercially available," their representative confirmed the process has not been commercially proven and would not be commercially proven until the 5,000 BPD unit in Salt Lake City was built and operated for some indeterminate period of time. TORC believes that two turnarounds cycles are needed to determine if the technology is safe and reliable.
- Chevron conceded that a refinery would need additional plot space for the unit.
- Chevron indicated that although it believes its technology is safer than Sulfuric Acid Alkylation, the company has no plans to convert its two Sulfuric Acid Alkylation units in California using this technology.
- Based on the foregoing, TORC is convinced there is no commercially viable, cost-effective, or safer Ionic Liquid Acid technology, including Chevron's technology, currently available or expected to be available in the foreseeable future.

At the August 23<sup>rd</sup> fifth Working Group meeting, DuPont presented their ConvEx<sup>SM</sup> HF Alkylation Conversion Technology. TORC's take away from DuPont's presentation ("DuPont Clean Technologies" (August 23, 2017)) regarding this conversion technology follows:

- Merely a concept.
- They have only completed paper case studies. No pilot or field testing. No conversion has ever been undertaken.

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### **TORC's Comments and Responses**

- Cost estimate based on Gulf Coast pricing. Only an order of magnitude cost estimate, not based on detailed engineering.
- Cost estimate does not include scale-up or outside the battery limit (“OSBL”) costs for critical refinery systems such as electric power.
- Cost estimate does not include spent acid regeneration. A separate or third-party unit would be needed to regenerate sulfuric acid, process based on incineration.
- Additional plot space and metallurgy changes would be required.
- A lot of infrastructure required (i.e., cooling, utilities, etc.).
- Possibly need new refrigeration unit with large compressors.
- More than double the acid consumption of an HF/MHF unit. TORC feedstocks require higher acid consumption for similar amounts of alkylate product.
- Based on the foregoing, TORC still believes that there is no commercially viable, cost-effective, ConvEx<sup>SM</sup> technology currently available or expected to be available in the foreseeable future.

The ability to question CB&I and Chevron representatives at the August 2<sup>nd</sup> fourth Working Group meeting and DuPont representatives at the August 23<sup>rd</sup> fifth Working Group meeting about their respective emerging technologies was helpful, TORC concurs with Valero that the following information should be provided by CB&I, Chevron, and DuPont as well as other licensors of emerging Alternative Alkylation Catalyst technologies the District may be investigating, in order for the District and the impacted regulated entities – TORC and Valero – to understand the fundamental viability, status, impacts, and costs of these technologies:

1. Name of Licensor
2. Name of process technology
3. Date unit was put into operation
4. Location of existing alkylation unit
5. Regardless of definition, does the location have a parallel alkylation process of equal or greater size
6. Definition of unit -- demonstration unit, bench scale, pilot scale, intermediate scale, full scale, etc.
7. Olefin feed rate to unit
8. Iso-Butane (or other paraffin consumed) feed rate to unit
9. Alkylate product rate from unit
10. Type of acid catalyst used and supplier
11. Specific feed composition (C4= only, specific C4=, C3=, C5=, other limits)
12. Type of feed pre-treatment used
13. If no specific feed treatment is implemented what are the acceptable feed contaminant levels such as (water, sulfur, diolefins, other)

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14. Corrosion history of equipment
15. Special materials - construction requirements
16. Alkylate product quality: RON, MON, sulfur, EP, etc.
17. Special product treatment for any product streams such as propane, butane, alkylate
18. Does the unit include acid regeneration?
  - a. If so, how is that performed?
  - b. If not, how is the catalyst regenerated?
  - c. What is the cost of regeneration?
  - d. How often does the acid need to be replaced?
19. What is the plot space for the largest existing unit you have built?
20. What is the estimated plot space for a unit of approximately 30 MBPD of alkylate production, including any complementary regeneration facilities?
21. What are the results of any Process Hazard Analysis (PHA), QRA, and/or Societal Risk Index Analysis conducted on the unit?
22. Were environmental impact reviews performed in connection with permitting the unit? If so what were the results of that review?
23. What is the energy consumption associated with the unit (MMBTU/bbl alkylate or similar measure)?
24. What waste streams / material are generated from the unit
25. What has been the run length between required Maintenance and Inspection? Is this consistent with projected Turnaround cycles?
26. What would the estimated cost for a unit of approximately 30 MBPD of alkylate production be if the unit was built in Southern California using local regulatory requirements, as well as labor rates?

As TORC stated in its August 1<sup>st</sup> and August 23<sup>rd</sup> letters and re-emphasized here, before transitioning from MHF Alkylation to a catalyst other than Sulfuric Acid at the Torrance Refinery, the new, emergent technology has to be commercially viable in scope and scale to the Torrance Refinery's existing MHF Alkylation Unit and must be inherently safer than MHF Alkylation. At a minimum to be considered commercially viable, the emerging Alternative Alkylation Catalyst technologies need to be constructed at scale and run at California standards through two four-year turnaround cycles to establish baseline operating and reliability data before their commercial viability can be determined.

Even if scientific and technical reality were suspended, a phase-out deadline of 2023 or even up to 2025 is unrealistic, infeasible, and illogical. Putting aside the cost-prohibitive nature of a new grass roots Sulfuric Acid Alkylation unit or Alternative Alkylation technologies, the increased emissions from a Sulfuric Acid Alkylation unit; the fact that a Sulfuric Acid Unit is not any safer than a MHF Alkylation Unit; or that the emissions and safety issues associated with Alternative Alkylation technologies are unknown, TORC offers the following specific comments regarding the District's current proposed potential phase-out timeline of less than six to eight years:

- Design/Engineering – For a new Alkylation process unit of scope and size of TORC's current MHF Alkylation Unit, it could take 18 to 24 months to design and engineer.



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- CEQA – Project-specific CEQA analysis cannot begin until the project is defined. Accordingly, the Design/Engineering must be completed first. Because of the scope, complexity, and potential environmental impacts involved in new Alkylation process unit of scope and size of TORC's current MHF Alkylation Unit, the project would require an EIR. An EIR could take 18 to 24 months to complete, particularly if it becomes a controversial project, which is possible given the nature of the activist community in California. Case in point: Tesoro's recent Integration and Compliance Project (*see* District's Tesoro Los Angeles Refinery, Integration and Compliance Project Final Environmental Impact Report, SCH No. 2014091020 (May 2017)), which included a new Spent Sulfuric Acid Plan.

What will the District do if in the course of the CEQA project-specific analysis that MHF Alkylation is shown to be safer, or has fewer emissions, or less toxics than Sulfuric Acid Alkylation, or some other alternative technology (i.e., Environmentally Superior Alternative)? Will there be a predetermined outcome because of an ill-conceived, unsupported and illogical phase-out that is already in place due to a previously adopted Rule 1410?

- Permitting – The District cannot guarantee that permitting would only take nine months. As the District permit cannot be issued until the CEQA process has been completed. Additionally, historically it has taken the District much longer than nine months to review and approve complex refinery permits such as what would be required here. Importantly, the District is not the only government entity or jurisdiction that require, review, deny and/or issue permits for such a project. It is unknown what their timing might be.

For District permitting, Torrance and Wilmington are Title V facilities, and any permit would be subject to EPA review and public comment. Additionally, a new Alkylation process unit would trigger the District's NSR and a PSD review. Under NSR, a new Refinery process unit would be subject to BACT and emission offsets and air dispersion modeling. Also, under Rule 1401, a toxics analysis would need to be done.

A new Sulfuric Acid Alkylation Unit would trigger all of these. An Alternative technology may trigger some or all of these, but this is unknown because there no commercially viable/prove alternative technology is available today.

Going through the CEQA process, meeting the District's NSR, PSD, and BACT requirements, obtaining offsets, and conducting air dispersion modeling and toxics analysis could take several years to complete in order to obtain permits before any construction could occur. However, there is no guarantee that permits may ultimately be issued for conversions, replacements, and/or new units, considering the community concerns that could be raised about Sulfuric Acid or Alternative Alkylation technologies through this process.

Is the District going to allow the Torrance and Wilmington Refineries to receive an expedited permit without having to comply with BACT, emissions offsets, air dispersion modeling, and toxics analysis in order to meet an unsupported and unrealistic phase-out timeline?

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- **Procurement, Fabrication, and Delivery** – For a new process unit, a large majority of the piping, vessels, valves, pumps, motors, etc., would not be off the shelf items, but long-lead items that could take two or more years to procure, fabricate, and deliver. This would have to be coordinated with workloads of existing vendors that are capable of such a large project, as they would also be handling other projects for other clients
- **Logistics** – If the District means the time required to tie in the new process unit with the other Refinery process units and critical utility systems, it would take a major turnaround involving the entire Refinery that would take nine months to a year.
- **Testing / Prove Out** – If the District means one of the Alternative Alkylation technologies, as both TORC and Valero have previously informed the District, it would take a least two turnaround cycles to prove out, which would be eight years. This needs to be done before any of the previous steps above are initiated in order to prove the technology is commercially viable.
- **Turnaround** – Although the District indicates that it is accommodating turnaround schedules by allowing up to 2025 for a MHF phase-out, this is still not enough time for turnaround coordination of considering the numerous Refinery process units and equipment that would be involved with a turnaround of this magnitude to replace the MHF Alkylation Unit. This could take more than one turnaround to complete.

Before transitioning from MHF Alkylation to a catalyst other than Sulfuric Acid at the Torrance Refinery, the new technology has to be commercially viable in scope and scale to the Torrance Refinery's existing MHF Alkylation Unit and must be inherently safer than MHF Alkylation. TORC is confident the Torrance Refinery's MHF Alkylation Unit safety systems protect Refinery employees and the community while reliably producing CARB gasoline. Specifically, since using MHF in the Refinery's Alkylation Unit starting in 1997, there has not been an offsite release of HF at the Torrance Refinery. Additionally, the Torrance Refinery used HF in the Alkylation Unit without any HF offsite impact from 1966 when the unit was commissioned until 1997 when the unit was modified to us MHF.

As TORC has previously public stated, it will continue to evaluate emerging Alternative Alkylation Catalyst technologies.

### **Slides 11 – 15 - Enhanced Interim Control Measures**

As the District should be well aware, the Torrance Refinery's MHF Alkylation Unit already meets or exceeds all of API-751's passive and active mitigation measures. The Refinery's MHF Alkylation Unit has robust release prevention, monitoring, and response systems that protect Refinery employees and contractors and the community.

Despite the scope and scale of the Torrance Refinery's MHF Alkylation Unit safety and mitigation systems, TORC has repeatedly indicated that it is willing to engage with the District along with API

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to discuss the potential and timing for potential enhancement of safety systems. TORC also has stated that it looks forward to working with the District in potentially including in PR 1410 the API-751 as the framework for a MHF performance standard. API-751 is a recommended practice for MHF/HF Alkylation Units that provides proven industry practices to support the safe operation of MHF/HF Alkylation Units. The API is recognized by the U.S. government and globally as the standards-setting organization for the petroleum industry.

However, before this engagement has even occurred and the District can get input on the cost, feasibility, and timing of potential enhanced interim control measures, the District's includes numerous enhanced interim control measures as requirements of PR 1410. Below TORC provides detailed comments on each currently listed required enhanced interim control measure, particularly as to whether it already meets the requirement, and if not, to the extent information is currently available, on the cost, feasibility, and/or timing of the requirement.

In slide 11 (Point Sensors and Open Path HF Detectors), the District provides the following list of enhanced interim control measure requirements.

<b>Enhanced Mitigation Measures</b>	<b>District Proposed Requirements</b>	<b>TORC Comments</b>
Point HF sensors	<ul style="list-style-type: none"> <li>• Cover all areas handling high volume HF (e.g., fresh MHF storage and unloading, reactors, acid settlers, pumps, acid evacuation/transfer)</li> <li>• Operate over a range of 0–20 ppm</li> <li>• Minimal interference from humidity</li> <li>• Periodic check &amp; frequent calibration (every quarter)</li> <li>• Uninterruptible power supply</li> </ul>	The MHF Alkylation Unit's current point HF sensors are placed strategically both inside and outside unit battery limits to allow accurate detection of any potential release. These sensors are sensitive below 1 parts per million ("ppm") and are regularly checked and calibrated.
Point sensor alarm set points	<ul style="list-style-type: none"> <li>• 2 ppm – Internal notification</li> <li>• 6 ppm – Notification to District</li> </ul>	TORC already complies with these notification requirements.

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<b>Enhanced Mitigation Measures</b>	<b>District Proposed Requirements</b>	<b>TORC Comments</b>
Open path HF detectors	<ul style="list-style-type: none"> <li>• Open path HF detectors around the alkylolation unit perimeter</li> <li>• Various heights(low and high)</li> <li>• Minimal interference from steam plumes and fog</li> <li>• Not sensitive to adverse environmental conditions</li> <li>• Uninterruptible power supply</li> </ul>	The MHF Alkylolation Unit's open path detectors are placed and located at the optimal height around the unit perimeter. They are designed to accurately measure HF concentrations at less than 1 ppm and not to be affected by steam, fog, or other environmental conditions.

In slide 12 (Visual Detection: Video Camera), the District provides the following list of enhanced interim control measure requirements.

<b>Enhanced Mitigation Measures</b>	<b>District Proposed Requirements</b>	<b>TORC Comments</b>
Video Cameras	<ul style="list-style-type: none"> <li>• Full HD video quality with remote pan/zoom, record/playback</li> <li>• Keep one month's worth of recordings</li> <li>• Cover strategic portions of the unit (reactor, settlers, fresh MHF storage, and MHF unloading zone)</li> <li>• One or more dedicated camera to each portion of the unit (e.g., must cover areas where water cannons used)</li> <li>• Consider glare from the sun, thermal load, and moisture</li> <li>• Remote viewing in the control room</li> <li>• Several screens dedicated to the alkylolation unit</li> <li>• Minimum numbers of toggles per video</li> </ul>	TORC already complies with these proposed requirements.

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In slide 13 (Visual Detection: HF Sensitive Paint), the District provides the following list of enhanced interim control measure requirements.

<b>Enhanced Mitigation Measures</b>	<b>District Proposed Requirements</b>	<b>TORC Comments</b>
HF Sensitive Paint	<ul style="list-style-type: none"> <li>• All valves and flanges in MHF service area, threaded fittings, compression fittings, pump seals, leak repair clamps, sample transportation containers, HF-containing process connections, and vessels</li> <li>• Durable to heat and sunlight</li> <li>• Frequent reapplication</li> <li>• Frequent inspection</li> </ul>	TORC already complies with these proposed requirements. The paint used by TORC in the MHF Alkylation Unit is sensitive in the part per billion level, detecting HF at concentrations below which even gas detectors are able to detect.

In slide 14 (Water Mitigation), the District provides the following list of enhanced interim control measure requirements.

<b>Enhanced Mitigation Measures</b>	<b>District Proposed Requirements</b>	<b>TORC Comments</b>
Activation of water mitigation	<ul style="list-style-type: none"> <li>• Coverage to all areas that contain relatively high volume of MHF (e.g., the reaction loop, HF regeneration system, and fresh MHF storage and unloading)</li> <li>• Both active and passive mitigation</li> <li>• Uninterruptable water &amp; power supply</li> <li>• Weekly testing</li> </ul>	TORC already complies with these requirements.
Water curtains	<ul style="list-style-type: none"> <li>• Around alkylation unit and MHF unloading area</li> <li>• Passive mitigation</li> <li>• Automatic activation at 20 ppm HF on a point sensor or at 50 ppm HF per meter on an open path detector</li> <li>• Design consideration to achieve HF removal efficiency of 95%               <ul style="list-style-type: none"> <li>○ 50:1 volumetric ratio of water:HF</li> <li>○ Decreased space between spray nozzles</li> <li>○ Smaller water droplet size</li> </ul> </li> </ul>	Under the City of Torrance Consent Decree, based on the QRA that was reviewed and approved of by the independently Court-appointed Safety Advisor, a water curtain was deemed duplicative due to the presence of alternate water mitigations for each potential release area of the unit. Despite this, TORC is willing to evaluate the installation of

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<b>Enhanced Mitigation Measures</b>	<b>District Proposed Requirements</b>	<b>TORC Comments</b>
		<p>a water curtain as an additional layer of safety for the unit.</p> <p>Automatic activation based on a single point sensor or open path laser could potentially result in false water activations. Any automatic activation needs to be based on duplicate readings, whether on the same detection type or across technologies.</p>
Water cannons	<ul style="list-style-type: none"> <li>• Active mitigation with control room viewing</li> <li>• 50:1 volumetric ratio of water:HF</li> </ul>	TORC already complies with these proposed requirements.

In slide 15 (Safety Audit), the District provides the following list of enhanced interim control measure requirements.

<b>Enhanced Mitigation Measures</b>	<b>District Proposed Requirements</b>	<b>TORC Comments</b>
Safety audit	<ul style="list-style-type: none"> <li>• Annual third party audits</li> <li>• Copy of audit sent to District</li> <li>• Include status of equipment, specifically its safety and maintenance record, hazard risk potential, and overall operability of alkylation unit</li> <li>• Require checklist &amp; electronic documentation (e.g., video recording, etc.)</li> <li>• Require tracking and resolution of deficiencies pursuant to audit findings</li> </ul>	<p>TORC already complies with API-751, which requires an comprehensive audit of the MHF Alkylation Unit every three years. TORC uses a third-party to conduct these audits. Included in this audit are all the requirements listed as proposed enhanced mitigation measures by the District requirements.</p> <p>It is unclear why the District</p>

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<b>Enhanced Mitigation Measures</b>	<b>District Proposed Requirements</b>	<b>TORC Comments</b>
		<p>is proposing annual audits. Because of the coordination involved in such audits, taking into consideration turnarounds and other onsite activities, annual audits may have to be conducted in close timing with one another, resulting in virtually a continuous audit. Such a scenario could potentially result in a loss of detail that the current three-year audit includes.</p> <p>TORC already complies with the tracking and resolution of audit findings.</p>

Notably, however, for those required measures that TORC does not already comply with, it could cost millions of dollars to implement and take years to complete. With a currently proposed MHF phase-out of 2023 or even up to 2025, what incentive or justification is there for TORC and Valero to invest and implement such enhanced mitigation measures if there are going to be demolished in a few of years? Accordingly, the District is sabotaging the one aspect of its currently proposed PR 1410 conceptual rulemaking framework that could enhance safety and which TORC and Valero have been supportive.

The District cannot “have its cake and eat it too.” On the one hand, it cannot have a MHF phase-out deadline of less than six to eight years for Sulfuric Acid, which is cost prohibitive, not any safer, and increases emissions, or an Alternative Alkylation technology that is not commercially viable and on the other hand expect enhanced measures to be implemented over this same phase-out time period. The District cannot arbitrarily mandate a scientifically and technically unsupported MHF phase-out at two out of five refineries in the South Coast Air Basin, while also forcing these two refineries to implement safety systems that would only be in use for a very small period of time that the other three refineries are not required to have.

If the District is sincere about having enhanced mitigation measures based on API-751 that could legitimately enhance safety in PR 1410, then it must remove the conflicting and scientifically and technically unsupported MHF phase-out deadline. Otherwise, it makes no scientific, technological, and logical sense to include enhanced mitigation measures in the PR 1410 conceptual rulemaking framework.

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### **Slides 16 - 21 - CEQA**

In these series of slides, the District chronicles in detail the lengthy and complex CEQA process that will be required for the PR 1410 rulemaking effort. Accordingly, even if the District releases proposed rule language in September 2017 as indicated in slide 26, it is hard to imagine how the District can then draft and release for public review and comment the following statutorily required rulemaking by the currently schedule listed in slide 26.<sup>10</sup>

### **Slide 22 – SCAQMD's Socioeconomic Impact Assessment**

In this slide, the District chronicles the lengthy and complex Socioeconomic process that will be required for the PR 1410 rulemaking effort. Accordingly, even if the District releases proposed rule language in September 2017 as indicated in slide 26, it is hard to imagine how the District can then draft and release for public review and comment the following statutorily required rulemaking by the currently schedule listed in slide 26.

### **Slide 23 and 24 - Existing Economic and Cost Analyses**

In slide 23, the District indicates that “staff has reviewed existing reports and analyses on costs and economic impacts of potential compliance scenarios and other potentially relevant reports and analyses”. In the slide, the District provides a list of the reports and analyses it has purportedly reviewed to date. However, what is conspicuously missing from the list is the Burns & McDonnell (“B&McD”) “Report Brief Alkylation Study & Estimate” (July 2017) that TORC provided to the District on July 26<sup>th</sup>. Why was this omitted?

In order to determine the cost of a new grass roots Sulfuric Acid Alkylation Unit, TORC retained Burns & McDonnell (“B&McD”), a reputable engineering firm that has previously worked with DuPont to design and engineer Sulfuric Acid Alkylation Units to estimate the total installed cost (“TIC”) to build such a unit for the Torrance Refinery. As the District’s is aware, the B&McD’s Report Brief, concludes that the TIC to build such a unit at the Torrance Refinery would be approximately \$600MM.<sup>11</sup>

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<sup>10</sup> On slide 20, the District indicates that as part of the PR 1410 rulemaking process its CEQA analysis it will “Analyze alternatives –including no project alternative and least toxic alternative”. As previously noted above, the District has previously determined through CEQA that Sulfuric Acid is not a feasible alternative. *See* District’s “Ultramar Inc. – Valero, Wilmington Refinery, Alkylation Improvement Project, Final EIR”, Chapter 6, pp. 6-1 – 6-2, (SCH #20030536, certified December 16, 2004).

<sup>11</sup> The report specifically states:

“The total installed cost for the new alkylation unit and associated infrastructure (outside the battery limits - OSBL) is estimated at nominally \$600 MM, including an owner’s cost of \$50 MM provided by PBF. This cost is comprised of \$56 MM in direct bare equipment cost, \$270 MM in additional direct costs associated with labor and materials and \$226 MM in indirect costs. Indirect costs include engineering, construction management, escalation, contingency,



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As the District was informed on July 26<sup>th</sup> and also noted in TORC's August 1<sup>st</sup> and August 23<sup>rd</sup> letters, B&McD's Report Brief did not include the cost of spent sulfuric acid regeneration. However, TORC understands from discussions with an industry consultant that the cost of a new grass roots spent acid regeneration of sufficient capacity to serve a Sulfuric Acid Unit at the Torrance Refinery or upgrading an existing third-party spent acid regeneration facility could cost up to another \$300MM, making the total cost up to approximately \$900MM.

This report must be included in this list and considered by the District in its Socioeconomic analysis.

For some of the other reports and analyses listed in the slide, before the District considers them as part of its Socioeconomic analysis it must either update them or get support for them. For example, the "Norton Engineering Study" has been proven to significantly underestimate the cost of a replacement of a MHF Alkylation Unit with a Sulfuric Acid Alkylation Unit. This has not only been convincingly shown by the B&McD's Report Brief, which included a point-by-point assessment of the Norton study, but also by testimony given by DuPont at the August 23<sup>rd</sup> fifth Working Group meeting. At this meeting, DuPont informed the District, Working Group members, and the public that they provided the estimates used in Norton's study and that these estimates were based on Gulf Coast pricing and did not include scale up or outside the battery limit costs for critical refinery systems.

Similarly, in DuPont's presentation on their ConvEx<sup>SM</sup> HF Alkylation Conversion Technology at August 23<sup>rd</sup> fifth Working Group meeting, DuPont testified that the estimates for this technology were based on Gulf Coast pricing and did not include scale up or outside the battery limit costs for critical refinery systems. DuPont also noted that additional plot space and metallurgy changes would need to be considered for this technology, but had no cost estimate for this.

Regarding the RAND Study, the District should be aware that this study significantly underestimates the compliance cost and overstates the benefits associated with the proposed Process Safety Management and California Accidental Release Prevention regulations that RAND was hired by the California Department of Industrial Relations and California Environmental Protection Agency to review in late 2015 and early 2016.

According to Turner, Mason & Company, "RAND:

- Conducted the study with a team that lacked the necessary refining or process safety management experience or expertise;
- Employed a flawed survey methodology that contributed to inaccuracies in its subsequent analysis;

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and contractor fee. The contingency for this estimate was set at \$110.6 MM which represents 20% of the total project cost."

This cost information must be included and thoroughly considered as part of the District's PR 1410 CEQA and Socioeconomic analyses.

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- Failed to obtain, review and consider various publicly available industry safety metrics and discarded industry responses to RAND's own survey regarding this topic, all of which we found would counter RAND's fundamental assumption that the proposed GISO would significantly improve process safety at non-CCC refineries;
- *Misinterpreted and/or relied on selective cost data from the responses to its survey which led them to significantly underestimate the potential cost associated with compliance to the proposed GISO, as currently written; and,*
- *Over-stated the potential benefits associated with the proposed GISO and potentially discarded industry responses to its own survey which clearly demonstrated a consensus industry belief that the proposed GISO would neither improve safety performance nor provide material benefits."*

See Turner, Mason & Company "Evaluation of Rand Corporation Report, Cost-Benefit Analysis of Proposed California Oil and Gas Refinery Regulations, Prepared for the Western States Petroleum Association", (September 2016) pp. 3-4 (emphasis added). As a courtesy, TORC has attached a copy of the Turner, Mason & Company evaluation.

The District must take into consideration these serious flaws before relying on this study in its Socioeconomic analysis. Otherwise, its analysis will suffer the same underestimation of the compliance cost and overstate the benefits of PR 1410, especially if a MHF phase-out is part of the rule.

Finally, for Sally Hayati's "Surviving Without MHF", the purported costs and other economic impacts listed in this article are not based on any type of legitimate rigorous economic/engineering cost estimate or analysis, but appear to be based on internet searches, opinion, and speculation. Before the District relies on such information in its Socioeconomic analysis, it must ask for the documentation to support it.

In slide 24, the District indicates that as part of the socioeconomic impacts it is looking to address the following three main areas:

- **Compliance cost** of potential rule scenarios that require phasing out MHF/HF in alkylation process
- **Transportation fuels market effects** of a hypothetical refinery shutdown scenario, including gasoline price impacts, increasing imports of refined gasoline, and supply interruption
- **Regional economic impacts**, such as employment, economic output, household earnings that are related to refinery operations

As it relates to the first Socioeconomic main impact area, "Compliance cost" TORC has already provided the District as noted above with a detailed cost from a reputable engineering firm, B&McD, that the cost of a new grass roots Sulfuric Acid Alkylation Unit and a spent acid regeneration of sufficient capacity to serve a Sulfuric Acid Unit at the Torrance Refinery could have a total cost of up to approximately \$900MM.

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Also through the testimony provided by CB&I and Chevron at the August 2<sup>nd</sup> fourth Working Group meeting and DuPont at the August 23<sup>rd</sup> Working Group meeting, Alternative Alkylation technologies will be on par with or cost more than a conventional new grass roots Sulfuric Unit Alkylation Unit.

As it relates to the second Socioeconomic main impact area, "Transportation fuels market effects" TORC has again already provided the District, as detailed below, with a detailed economic impact analysis of the transportation fuel market effects related to a MHF phase out.

In addressing any implementation schedule associated with the District's current PR 1410 conceptual rulemaking structure, it is worth emphasizing that the Torrance Refinery's MHF Alkylation unit produces a critical blending component for making all grades of cleaner-burning CARB gasoline for Southern California and the State of California. Alkylate is required to meet stringent state-mandated gasoline specifications. The Torrance Refinery supplies approximately 20% of daily regional demand and approximately 10% statewide. When California refineries are offline, the state relies on imports to supply fuel, which typically results in price spikes.

Accordingly, any PR 1410 rulemaking effort resulting in a phase-out of MHF could have significant impacts to the two refineries targeted by the rule – TORC Torrance and Valero Wilmington – as well as California's petroleum fuels market. As TORC indicated in its August 1<sup>st</sup> and August 23<sup>rd</sup> letters, to understand the impact of a potential phase-out of MHF, TORC retained Stillwater Associates ("Stillwater") to conduct an economic study regarding the potential impacts of a MHF ban. Stillwater is a transportation fuels consulting firm specializing in downstream markets that are recognized by industry and government agencies as experts in the supply, demand, distribution, and price of energy related to downstream fuel markets.

Stillwater's economic study entitled "Impact of an HF Ban on Southern California Transportation Fuels Supply" (dated June 23, 2017), which was reviewed with the District on July 26<sup>th</sup>, concluded:

1. Alkylation is an important refining process. CARBOB cannot be produced by Southern California refineries without alkylate.
2. Should HF be banned, it appears unlikely that impacted refiners would replace current process units, due to the high cost.
3. The impacted refineries are unlikely to be viable without alkylation.
4. Should the impacted refineries cease operations, 25% of regional demand would have to be imported.
5. With only three fuels refiners left in Southern California, the market will have less competition.
6. Offshore refiners will produce the products and ship them half way around the world to the California market.
7. As a result, average spot prices could rise 25 cents per gallon or more, and ultimately the California consumer would pay the price.

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See Slide 42.

As the District is now well aware, the Stillwater study was reviewed by the California Energy Commission ("CEC") as part of its 2017 Integrated Energy Policy Report ("IEPR") process, which is required every two years and an update every other year by Senate Bill 1389 (SB 1389, Bowen and Sher, Chapter 568, Statutes of 2002)<sup>12</sup>.

CEC at its July 6, 2017, 2017 IEPR Commissioner Workshop on Transportation Energy Supply Trends stated the following regarding a potential ban on MHF:

- If an HF ban were compelled it is uncertain if either or both companies would elect to make such changes to their facilities
  - Alkylation process unit projects are extremely expensive
    - A recent project approved for the Valero Houston refinery is estimated to cost \$300 million for an alkylation unit with a capacity of 13,000 barrel per calendar day
    - Capacity of the alkylation units at Valero Wilmington and PBF Torrance are 22,000 and 24,200 barrels per day capacity, respectively
    - These alkylation unit capacities are each nearly twice the capacity, meaning the potential costs for such projects at the two California refineries could, at a minimum, easily approach or exceed \$500 million *per facility*
  - These estimated costs for such a replacement project could be at or near the value of the refinery when one considers that ExxonMobil sold the entire Torrance refinery to PBF Energy for \$537.5 million
    - It would therefore be uncertain as to whether such an expenditure could be justified by either or both companies should an HF alkylation ban ultimately be approved by the SCAQMD

See Slide 11, CEC's "Transportation Fuel Issues".

Accordingly, as concluded by the Stillwater study and recognized by the CEC, any phase-out of MHF would have substantial economic impacts to TORC, Valero, and the California's petroleum fuels

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<sup>12</sup> Senate Bill 1389 requires the CEC to:

"[C]onduct assessments and forecasts of all aspects of energy industry supply, production, transportation, delivery and distribution, demand, and prices. The Energy Commission shall use these assessments and forecasts to develop energy policies that conserve resources, protect the environment, ensure energy reliability, enhance the state's economy, and protect public health and safety."

See CA Pub. Res. Code § 25301(a) (emphasis added).

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market, particularly to the California consumers who rely on clean-burning fuels produced by TORC and Valero, which meet the strictest fuel standards in the world, to meet their daily needs.<sup>13</sup>

These economic studies must be included considered by the District in its Socioeconomic analysis.

As it relates to the third Socioeconomic main impact area, "Regional economic impacts", TORC has again already provided the District as detailed below with a regional economic impact analysis to the local, regional, and state economies of a MHF phase-out. To understand the impact of a potential phase-out of MHF, TORC retained Capital Matrix Consulting ("CMC") to conduct an economic study regarding the potential impacts of a MHF ban. CMC is Sacramento firm that provides consulting services on a wide range of California economic, taxation, and state-and-local government budget issues.

On August 30<sup>th</sup>, TORC provided to the District CMC's study entitled "Economic Impacts of the Torrance Refining Company LLC Torrance Refinery" (dated August 2017), which concluded:

"In addition to its crucial role of supplying a significant share of gasoline and related refined transportation fuels and petroleum products to the California market, operations of the Torrance Refinery directly and indirectly support over \$7 billion in annual sales, 11,000 jobs, and \$1 billion in wages in the California economy each year. The great majority of these impacts are in the Southern California region consisting of Los Angeles, Orange, and Kern counties, where most of its workers and suppliers reside. The Refinery also pays \$30 million in utility, property, and sales taxes, as well as hundreds of thousands of dollars to support civic and community activities to benefit the general public. Beyond these totals, state and local governments benefit from multiple millions of dollars in taxes and fees paid by the Refinery's workers and suppliers each year. All of these economic and fiscal benefits would be at risk if the Refinery's operations were curtailed or shut down."

See *Id.*, p. 11.

This economic study must be included and considered by the District in its Socioeconomic analysis.

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<sup>13</sup> The District has previously recognized some of the compliance and market impacts with the replacement of MHF with Sulfuric Acid. The District in the context of its CEQA Alternatives analysis of Valero's ReVAP project acknowledged the following:

*"The other option is to construct a sulfuric acid alkylation unit within the existing Refinery. To make space for this, the existing unit would have to be shutdown and demolished. This and construction of a new alkylation would require approximately one year. This shutdown would effectively eliminate the ability of the Refinery to produce fuels in compliance with California reformulated fuels requirements, eliminating it as a major source of gasoline for the California market. Current California refining capacity is barely adequate to meet the state's gasoline demands. Eliminating the Refinery's ability to produce California reformulated gasoline for one year would lead to potential spot shortages and adverse economic effects in the region."*

See District's "Ultramar Inc. – Valero, Wilmington Refinery, Alkylation Improvement Project, Final EIR", Chapter 6, pp. 6-1 – 6-2, (SCH #20030536, certified December 16, 2004) (emphasis added).

These costs and economic impacts must be included in the District's Socioeconomic Analysis.

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TORC believes that if the District, as statutorily mandated, legitimately considers and includes the aforementioned cost and economic reports, studies, and information in the Socioeconomic analysis for PR 1410, it will conclude that a phase-out of MHF, particularly by 2023 or even up to 2025, is not cost-effective, cost-prohibitive, and the significant economic impacts imposed on the consumer and the local, regional, state, and out of state economies far outweigh any supposed hazards reduction associated with a scientifically and technologically unsupported phase-out.

### Slide 25 - Upcoming SCAQMD Activities and Slide 25 - Schedule

In these two slides, the District provides its currently anticipated schedule related to PR 1410 rulemaking efforts. For example, slide 25 provides:

- Preparing draft rule language
- Preparing preliminary draft staff report
- Seeking any other available detailed conversion cost data and any other cost information
- Working on CEQA and Socioeconomic Analysis

Additionally, slide 26 provides:

Activity	Current Target Date
Working Group Meeting #7	October 2017
Release of CEQA Notice of Preparation / Initial Study	October 2017
Public Workshops / CEQA Scoping Meeting	November 2017
SCAQMD Refinery Committee Meeting	November / December 2017
Release of CEQA Draft EIR	December 2017 / January 2018
Governing Board consideration of PR 1410	First Quarter 2018

For all the reasons discussed previously, TORC requests a delay in releasing any proposed rule language in September or by the next Working Group meeting in October 2017 that prematurely includes a MHF phase-out, particularly by 2023 or even up to 2025. TORC has just recently provided the District on September 12<sup>th</sup> supplemental and clarifying MHF testing and modeling data requested by District staff, which will further substantiate the efficacy of MHF and that a release of MHF would not form a “dense vapor cloud” as alleged by the District. Additionally, the District will need time to review:

- B&McD cost report associated with building a new grass roots Sulfuric Acid Alkylation Unit at the Torrance Refinery provided to the District by TORC on July 26<sup>th</sup>;

## **Attachment A TORC's Comments and Responses**

- Stillwater's study on the economic impacts to refineries and the California petroleum markets associated with a phase-out of MHF provided to the District by TORC on July 26<sup>th</sup>;
- CEC's analysis of the Transportation Energy Supply impacts associated with a phase-out of MHF;
- CMC's study on the economic impacts to the local, regional, and state economies associated with a phase-out of MHF provided to the District by TORC on August 30<sup>th</sup>; and
- Licensors' information regarding emerging Alternative Alkylation Catalyst technologies that has been previously presented by CB&I, Chevron, and DuPont, and any other licensor information the District is currently reviewing.

Even if the District releases proposed rule language in September or by the next Working Group meeting in October 2017, it is hard to imagine how the District can then draft and release for public review and comment the following statutorily required rulemaking by the current schedule listed above:

- CEQA Notice of Preparation/Initial Study;
- Draft Staff Report;
- Draft EIR;
- Draft Socioeconomic Report; and
- Revised rule language.

Considering the complexity of the type of CEQA EIR and Socioeconomic Report that needs to be done to address the District's current PR 1410 conceptual rulemaking structure, this does not seem feasible.

**TURNER, MASON & COMPANY EVALUATION OF  
RAND CORPORATION REPORT**

***“Cost-Benefit Analysis of Proposed California Oil and  
Gas Refinery Regulations”***

*Prepared for the*

**WESTERN STATES PETROLEUM ASSOCIATION**



by

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September 6, 2016

John R. Auers, P.E.  
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VI.	Appendix Figures 1-14 and Appendix Table I	

## I. Introduction

Turner, Mason & Company (“TM&C”) was engaged by the Western States Petroleum Association (“WSPA”) to evaluate the Cost-Benefit Analysis of Proposed California Oil and Gas Refinery Regulations prepared by RAND Corporation on behalf of the California Department of Industrial Relations and the California Environmental Protection Agency. The findings by RAND were utilized by these two agencies as economic justification for a proposed widening of state regulations dealing with process safety at petroleum refineries operating within the state. Most of these refineries are WSPA members, and it was their collective desire that WSPA engage a third party to review and perform an independent assessment of the analysis and conclusions presented in the RAND Report. As part of our evaluation, TM&C took the following steps:

- Reviewed the RAND Report, released March 23, 2016;
- Reviewed the proposed California General Industrial Safety Order (the “GISO”);
- Reviewed the Contra Costa County (“CCC”) industrial safety ordinance upon which the state modeled its GISO;
- Obtained and reviewed RAND survey responses provided by the 10 WSPA-member refineries that participated in the survey;
- Interviewed the individuals responsible for responding to the RAND survey;
- Obtained and reviewed numerous refinery safety performance metrics that RAND did not incorporate in its analysis;
- Analyzed the cost analysis RAND performed; and,
- Analyzed the benefit analysis RAND performed.

As a result of our review and analysis, we conclude that RAND:

- Conducted the study with a team that lacked the necessary refining or process safety management experience or expertise;
- Employed a flawed survey methodology that contributed to inaccuracies in its subsequent analysis;
- Failed to obtain, review and consider various publicly available industry safety metrics and discarded industry responses to RAND’s own survey regarding this topic, all of which we found would counter RAND’s fundamental assumption that the proposed GISO would significantly improve process safety at non-CCC refineries;
- Misinterpreted and/or relied on selective cost data from the responses to its survey which led them to significantly underestimate the potential cost associated with compliance to the proposed GISO, as currently written; and,

- Over-stated the potential benefits associated with the proposed GISO and potentially discarded industry responses to its own survey which clearly demonstrated a consensus industry belief that the proposed GISO would neither improve safety performance nor provide material benefits.

A more detailed summation of our findings can be found in the following four sections of this report. Additional safety metrics that we relied upon are found in the Appendix.

## II. Evaluation of RAND's Survey Methodology

As part of its analysis, RAND conducted a survey of California refineries which featured a written questionnaire directed to process safety personnel, held interview sessions with those same individuals and collected follow-up information regarding the expected costs and perceived benefits associated with the proposed GISO. In fact, much of the cost data RAND relied upon was gleaned from this survey of the 12 California refineries that would be affected by the proposed order. As a part of our engagement with WSPA, we obtained WSPA member survey responses, which represented 10 of the total 12 refineries, and held short telephone interviews with the same process safety personnel that participated in the RAND survey. Our own conclusions regarding the information provided to RAND differed in a number of important ways compared with what RAND suggests in its Report:

- *Below Average Confidence in the Data:* RAND states in its Report that it generally believes the data it collected to be of reasonably good quality and quite consistent. Our review suggests the opposite. Almost all respondents stated a below-average confidence level in the cost data they provided, primarily due to the compressed timeframe to respond. Only one refiner, a CCC facility, stated above-average confidence, but importantly, it qualified the answer with the assumption that the state GISO would be written and enforced in a similar fashion as it has by CCC regulators, i.e., in a “performance-based” manner, with a consideration of individual refinery and situational circumstances. Based on our knowledge of how other California state refinery regulations have been handled, we believe it likely that a more stringent “command-and-control” or “compliance-based” approach will be employed, leading to higher cost for implementation than in CCC.
- *Highly Inconsistent Responses:* Further, we also found the reported cost data to be highly inconsistent, with some questions not being answered quantitatively and many respondents qualifying their answers in a variety of ways. As a result, we believe the data was not sufficiently consistent to support the cost estimates and analysis arrived at by RAND.
- *Omitted Concerns:* Several respondents reported that they clearly communicated to RAND that the cost data they supplied omitted capital expenditures associated with recommendations spawned by the new and modified studies called for by the GISO. The RAND Report fails to mention significant sets of concern, instead, it concludes that the potential for reported costs to be inflated since the data was provided by entities (petroleum refiners) that would, in RAND's opinion, seek to minimize further regulatory burden.
- *Discarded Relevant Data:* Oddly, RAND chose not to include in its survey a request for data from California refiners regarding their numbers of past incidents that would have been characterized as a Tier 1 or Tier 2 incident under API Recommended Practice (RP) 754. While the RAND Report suggests that the available data would not be statistically significant, the omitted data would have been both relevant and no less statistically significant than the list of incidents that RAND relied upon for its analysis.
- *Inappropriate Assumptions and Directions:* Despite RAND's assertion in the opening of its Structured Interview Questions that the responses address proposed changes to both the GISO and the Accidental Release Program (“CalARP”) only the proposed changes to the GISO were available to refiners at the time of the survey and the respondents had no understanding of what changes, and their associated costs, were being proposed to the CalARP rules. We were told by the respondents that RAND directed them to assume the CalARP rules would “mirror” the GISO; however, that direction turned out to be wrong. In

fact, the proposed CalARP rule includes many distinct and costly requirements that are not reflected in the GISO. For example, in addition to including requirements relating to performance indicators that are not discussed by RAND, the proposed CalARP rule would provide that any local unified program agency (“UPA”) can “perform an independent Process Safety Culture Assessment, Incident Investigation, evaluation of the ARP management system, or Human Factors Analysis” at its own discretion and that the refiner “shall pay the costs.” As a direct result, none of the survey responses adequately addressed the additional cost associated with newly proposed CalARP requirements that are different from, or go beyond the new requirement, found in the GISO.

- *Unclear Benefits:* There was a clear consensus among the 10 responses that the proposed GISO, as written, would not significantly improve safety nor would it provide any benefit beyond current industry efforts directed at incident reduction.

### **Survey Procedural Errors**

We also believe the questionnaire, timing and approach employed by RAND led to much of the inconsistency and overall underreporting of costs for the following reasons:

- a) *Lack of Requisite Expertise:* The RAND team’s lack of necessary expertise in petroleum refinery operations, refinery design, or process safety led to a flawed survey methodology that failed to fully capture all of the potential costs associated with the proposed regulations as currently written, especially considering the broad interpretations available under the rules to regulatory enforcement groups.
- b) *Inappropriately Directed Questions:* RAND directed the survey to “process safety and cost” experts and worded many of the survey questions in a way that emphasized only the most circumscribed, known, and direct cost of expanded regulatory compliance. Direct costs of compliance will likely represent only the “tip of the iceberg” when it comes to the total potential cost of compliance associated with the proposed rule amendments as they are currently written.
- c) *Insufficient Response Time:* RAND allowed approximately 30 days for refiners to respond to the survey. During this time, refiners were expected to analyze the regulatory language, evaluate actions required to comply, estimate capital and expense costs for initial compliance, and determine ongoing costs. This compressed schedule most likely prevented the PSM experts, to which the survey was directed, from having adequate time to fully engage in-house technical and engineering experts that could better, i) consider all of the ramifications associated with the order, ii) fully examine all areas of potential costs, both direct and indirect, and iii) consider various estimates of cost associated with the wide range of potential interpretations available to regulatory enforcement groups.
- d) *Insufficient Time for Follow-Up and Clarification:* The 30-day schedule was further limited in the fact that RAND allowed only two weeks following face-to-face clarification sessions after which refiners were required to submit their answers. Thus, the schedule in effect precluded a careful review of the proposed regulations and reasonable degree of analysis of its potential cost. This, in turn, led to a dramatic underreporting of indirect compliance costs by most respondents. Had more time been allotted and if RAND’s questions placed appropriate emphasis on all costs, we believe the reported data would have reflected much larger upfront costs, similar to those reported by one refinery that did just this and whose data was “rejected” by RAND as an “outlier.” Because RAND lacks expertise in the industry, it likely was unable to evaluate a substantive basis for determining whether to reject the majority of

the data or the data point that showed higher costs. It was inappropriate to reject input simply because it was higher than other costs, as any credible analysis should have looked behind the numbers to determine which values to include in the analysis.

- e) *Inappropriate Alteration of Survey Questions During Response Period:* Based upon our conversations with WSPA members responsible for preparing the survey responses, RAND altered its survey during the response period and evidently accepted multiple versions of the survey. The survey presented in its Report appears to be the “final” version. In reviewing the survey responses submitted by WSPA members to RAND, it appears that some survey questions were introduced mid-way through the survey, such that not all respondents had the opportunity to respond to all the questions included in the final version. Our review suggests certain cost data cited by RAND were based on a much smaller subset of California refineries, undermining the representativeness of the data and the validity of the conclusions.
  
- f) *Guidelines Versus Legal Compliance Obligations:* With respect to “Recognized And Generally Accepted Good Engineering Practices” (RAGAGEP) in particular, the structured survey fails to highlight that there is a material difference between simply following a recommended practice and what actions refiners will likely take and what additional costs they will incur once RAGAGEP has been given the “force of law.” It is our opinion once new RAGAGEP requirements are given the “force of law,” refiners will be compelled to exceed RAGAGEP (i.e., to create a compliance margin) at some additional cost with no offsetting benefit. We doubt any compliance margin costs associated with following RAGAGEP under the proposed regulations versus existing voluntary compliance were included. Further, our discussions with WSPA members and our review of survey responses suggests that the questions associated with RAGAGEP were mid-survey additions and were not answered by a number of respondents.

### III. Important Safety Statistics & Metrics Omitted From The Rand Report

The Federal Occupational Safety and Health Administration (“OSHA”), via its 300 Log, tracks occupational safety performance in the workplace. Performance results include total recordable incident rates (“TRIR”) and fatalities and days away from work rate (“Fat/DAW”) that occur annually in each refinery. Both of the rates measure performance per 200,000 man-hours worked and are reported for facility personnel (i.e., company employees) and contractors. As a service to its member companies, the American Fuels & Petrochemical Manufacturers (“AFPM”) compiles this information and publishes annual safety reports. While these metrics cannot be considered direct measurements of process safety performance, they do reflect the level of attention given by and importance of safe operation at a refinery than the data selected by RAND. The AFPM data is collected on a national level. By virtue of having a larger, more robust, and geographically diverse sample size, AFPM’s data is inherently more comprehensive, reliable, and statistically significant. RAND uses Major Refinery Incidents (“MRIs”) and refinery worker fatalities as its predominant metrics. Although potentially impactful, these are low probability events. In contrast, the AFPM dataset encompasses both major and minor incidents, including those with both process and personal safety causes. Accordingly, the AFPM dataset provides more information regarding an employer’s overall safety performance. Further, we believe they are much more statistically significant than the sparse data RAND relies upon and can serve as better proxies for comparing the overall safety culture and process safety performance of petroleum refineries. For our analysis, we generally sought to utilize the aggregate of facility and contractor safety performance; however, we also utilized facility only performance when we found the reported data to be as consistent as that for the aggregated version. Our findings from this review suggest there is little, if any, material difference between CCC refineries and their United States (“U.S.”) industry peers. We also found only small differences (and occasionally no differences) between the three CCC refineries and their California and corporate peers.

Additionally, since 2010 the American Petroleum Institute (“API”) has collected incident data from participating refineries, under its recommended practice API RP 754. Under API RP754 various incidents are categorized for reporting using common definitions. Well-defined Tier 1 and Tier 2 process safety incidents more accurately represent process safety performance. We obtained from all 10 WSPA California refineries their 2011-2015 API Tier 1 and Tier 2 incident rates. The information from these reports was reviewed by TM&C as part of this engagement. We believe these additional safety performance metrics should also be utilized to determine if there is a significant difference in safety performance by CCC refineries that the RAND Report claims. While not as statistically significant as the OSHA 300 Log metrics discussed above, the available API data are nonetheless instructive, in our opinion, and they should have been part of RAND’s analysis.

Collectively, the safety metrics we reviewed, including the incident lists compiled by RAND and presented in its Report, do not justify RAND’s assertion that it was seven times more likely for an incident to occur at a non-CCC refinery. This is especially true given the paucity of the RAND data and its reliance of the results of probability analysis that was based on an inadequate data set. Of particular note, we found:

- **The U.S. refining industry has significantly improved the safety of its operations over the past 15 years *without additional regulation.***
  - The U.S. refining industry has steadily reduced its average TRIR by 70% over the past 15 years as shown in Appendix Figure 1. This performance mirrors the reduction achieved by the three CCC refineries, but was achieved in the absence of the more stringent process safety rules applied by Contra Costa County. Figure 1 also demonstrates that the TRIR



performance of the three CCC refineries was not materially different than their U.S. peers on a collective basis.

- The U.S. refining industry has steadily reduced its average Fat/DAW rate by 85% over the same 15-year period, as shown in Appendix Figure 2. Once again, this performance mirrors the reduction achieved by the three CCC refineries, but was achieved in the absence of the CCC ordinance. Figure 2 also demonstrates that the Fat/DAW performance of the three CCC refineries was not materially different than their U.S. peers.
- Appendix Figures 3 and 4 show similar declines in TRIR and Fat/DAW, respectively, when limiting the data to just facility personnel. While the facility data suggests the three CCC refineries somewhat outperformed their U.S. peers in the Fat/DAW category between 2004 and 2012, recent performance was no different. The opposite appears true for TRIR, where the average U.S. refinery outperformed the three CCC facilities until recently.
- **Despite RAND’s prediction of a seven-fold improvement in safety, refineries subject to the CCC ordinance did not clearly outperform other U.S. refineries.**
  - Appendix Figures 5 and 6 show TRIR and Fat/DAW, respectively, for individual CCC refineries and the U.S. average since 2003. If one assumes that the CCC ordinance has had the significant positive impact on process safety performance, the RAND Report suggests the individual CCC refineries should have consistently outperformed their U.S. peers since the ordinance went into effect; however, that was not the case for either TRIR or Fat/DAW. As both figures clearly demonstrate, the safety performance of a CCC refinery in any given year can be either better or worse than the U.S. average with respect to these two important safety metrics.
  - Appendix Figures 7 and 8 show TRIR and Fat/DAW, respectively, of these same refineries when the data is limited to just facility personnel since 2000. As Figure 7 clearly demonstrates, the TRIR for CCC refineries in any given year can be either better or worse than the U.S. average. Figure 8 suggests the Fat/DAW is somewhat better for the CCC refineries relative to the U.S. average, but not on the consistent basis one would expect if it were the ordinance that was actually producing a significant improvement in safety performance.
  - Because individual company culture can influence safety performance differently from company to company, we also examined each CCC refinery’s performance relative to its non-CCC company peers. If the CCC ordinance was actually the main driver for improved safety performance, then one would expect the CCC refineries to clearly outperform their respective non-CCC refineries owned and operated by the same company. Appendix Figures 9 and Figure 10 show TRIR and Fat/DAW, respectively, for Refiner A’s CCC facility, all of Refiner A’s facilities and the U.S. average since 2006. While Refiner A’s CCC site clearly outperformed all of Refiner A’s facilities in TRIR over this period, this may have been due to the fact that Refiner A performed poorly relative to its U.S. peers, making it easier for its CCC site to look better by simply achieving average U.S. performance. That was not the case with respect to Fat/DAW, as shown in Figure 10, where there was little difference in the CCC site’s performance and its company and U.S. peers.



- Appendix Figures 11 and 12 show TRIR and Fat/DAW, respectively, for Refiner B's CCC site, all of Refiner B's facilities and the U.S. average since 2006. While Refiner B's CCC site outperformed the average performance of all of Refiner B's facilities during most years, the differences were not significant, and its CCC refinery's performance was not better on a consistent basis.
- Appendix Figures 13 and 14 show the TRIR and Fat/DAW, respectively, for Refiner C's CCC site, all of Refiner C's facilities and the U.S. average since 2006. Up until 2012, the average of Refiner C's facilities outperformed its CCC site in both categories. Recent performance appears to be similar.
- As the safety metrics found in Appendix Figures 9 through 14 demonstrate, there were no clear distinctions in safety performance between CCC refineries and their non-CCC company peers. Nor were there clear distinctions relative to the average performance of the U.S. refining industry.
- Average Tier 1 incident rates at CCC refineries do appear approximately one third lower than their non-CCC California peers, as shown in Appendix Table 1 (following Appendix Figure 14); however, on a year-to-year basis, non-CCC California refineries outperformed CCC facilities in two of the five years shown.
- Average Tier 2 incident rates at CCC refineries are also lower than those at their non-CCC California peers, also shown in Appendix Table 1 (following Appendix Figure 14); however, the average difference has significantly narrowed over the past few years and non-CCC California refineries outperformed CCC facilities in 2015.
- Since the same dramatic improvement in safety performance took place nationwide in the absence of the more stringent process safety rules applied to Contra Costa County refineries, we conclude the similar improvement in refinery process safety performance at the three CCC refineries would have occurred *regardless* of the ordinance and that the ordinance itself was not the sole reason for any perceived reduction in major refinery incident rates. At a minimum, we can state that the RAND Report offers no clear evidence of any cause and effect relationship between the ordinance and any differences in process safety performance.

## IV. Evaluation of RAND's Estimate of Costs

As discussed above, the data utilized by RAND to estimate the cost associated with the proposed GISO was obtained from its survey of California refineries. Despite the many shortcomings of the survey results and the process employed, the RAND Report authors also state that they believe the data collected was of good quality, quite consistent and potentially inflated since the data was provided by refiners motivated toward minimizing further regulatory burden. As noted above, our review of the same data led us to completely different conclusions. Our analysis shows that RAND grossly underestimated the GISO's potential cost to industry, ignored selected responses to its own survey and omitted from its Report certain survey data and feedback that would have called into question numerous aspects of its analysis and conclusions. Specifically, our analysis found:

- **The RAND Report excluded important cost data and related data caveats.**
  - All but one WSPA member reportedly qualified its cost data by clearly stating to RAND that, a) their responses excluded significant costs associated with implementing modifications triggered by the added safety reviews and criteria imposed by the proposed GISO and/or, b) reported costs assumed the proposed GISO would be substantially similar to and enforced like the CCC ordinance. We found nothing in RAND's analysis of cost to suggest they recognized or considered these important qualifications.
  - None of the refiners could have known or understood the cost impact of the regulatory amendments being considered to CalARP since these proposed changes were unknown at the time of the survey. As a result, the cost data RAND relied upon would not have contained any cost associated with differences in CalARP relative to the GISO.
  - While the RAND Report clearly states its objective "was to assess the cost and benefits of the proposed California PSM [GISO] and California Accidental Release Program regulations," we did not find (within the Report) any cost data, analysis or provisions for cost associated with the proposed changes to CalARP that are different from or in addition to the proposed changes to the GISO.
- **The Rand survey directed respondents to make inappropriate assumptions regarding the proposed rule and its enforcement that biased the results.**
  - We understand from our conversations with WSPA members that RAND emphasized during the survey process that refiners should assume the proposed modifications to the GISO and CalARP would look like and be enforced in a manner similar to the CCC safety ordinance. Thus, we believe RAND assumed that the CCC refineries should have very little new cost of compliance and the other California refineries' cost would be no more than what their CCC counterparts previously incurred. Such an assumption would have created a bias for and/or an expectation of low costs
  - Two of the three CCC refiners qualified their cost data as estimates that assumed the proposed amendments would be written and enforced in a cost-effective, collaborative manner similar to what was done in Contra Costa County. Our review suggests that there are numerous differences in the proposed regulations from the CCC ordinance, such that the potential for more costly enforcement is quite high.
  - While RAND cites significant confidence in the cost data they presented in the Report, only one of the 10 WSPA member refineries expressed above average confidence in the data

they provided. Further, that single refinery was a CCC refiner who qualified their confidence by stating it was based upon the assumption that the proposed order would be written and enforced in a manner similar to what was currently being done in Contra Costa County.

- **The RAND Report failed to adequately evaluate the valid reasons for the higher cost estimates before discarding them.**
  - The refineries that reported the highest costs also tended to be the ones that either had data upon which to rely or were able to obtain feedback and involvement from technical and engineering groups compared to those that did not have such access due primarily to the abbreviated survey schedule.
  - The “high cost” data point RAND chose to discard as an “outlier” was from one of the few refineries whose cost estimate included implementation costs and was not subject to caveats and qualifications, suggesting that it should have been included rather than discarded. We also learned during the interview process that this refiner believed it had a reasonable cost database on which it based its estimate. Our analysis suggests that this refiner’s estimate was not an “outlier,” especially given the number of qualified responses that cited substantial, but unquantified, costs it failed to include.
- **Lack of relevant technical expertise may have led the RAND authors to make invalid assumptions**
  - Our analysis of the RAND Report suggests that it relied on partial and qualified responses for its cost analysis rather, than evaluating the refiner’s full estimated cost of compliance.
  - While it is possible that RAND’s lack of familiarity with the refining industry and process safety management may have caused them to believe the terms “significant” and “substantial” mean something less, we recognize, and also confirmed with WSPA members, that a refiner’s use of these terms means “tens or hundreds of millions of dollars.”
  - We believe RAND, and perhaps some refineries, failed to consider the likelihood of additional costs that will be incurred when RAGAGEP imposed the “force of law.” Even if refiners are complying with RAGAGEP, when a standard, specification or best practice becomes “the law,” refiners generally respond by self-imposing some form of compliance margin. Typically, that compliance margin carries with it some form of cost and/or lost opportunity. A comparable example is when EPA made various ASTM and state RVP specifications the legal maximums for the summer VOC-control period. Immediately, refiners and blenders imposed a 0.3 psi compliance margin which for the past five years (2011-2015) directly cost the refining industry \$560 million annually.

On the whole, we believe RAND utilized, for its cost analysis, a selected group of incomplete cost data to predict an unrealistically low cost of compliance that failed to fully consider the total cost required to implement all of the changes to refinery processes and equipment that will be generated by new mandates created by the proposed changes to the GISO and CalARP.

## V. Evaluation of RAND's Estimate of Benefits

The RAND Report's estimation of the benefits that refiners and the California public will realize from the implementation of the proposed GISO suffers from several significant deficiencies that undermine its validity. These unrealistic simplifications and flaws contribute to RAND grossly overstating any likely benefits that may eventually be attributable to the amended regulations. Further, after reviewing the same data RAND received and speaking with the refinery personnel responsible for completing the survey, we find that RAND omitted from its Report key survey data and responses that would have called into question certain aspects of its benefit estimates and the resulting cost/benefit analysis and conclusions.

Our analysis of the study's major flaws with respect to the estimate of benefits show:

- **RAND's conclusions are not supported by a full analysis of the data:**

- The foundation to RAND's estimation of benefits accruing from the proposed GISO is the assumption that the GISO will materially reduce deaths and major incidents at California refineries. To support this hypothesis, they cite the supposed superior safety performance of the three CCC refineries that have operated for more than a decade under what RAND calls a similar industrial safety order; however, the assumption that these refineries have superior safety performance relative to other California refineries is not supported by either the list of incidents RAND cites or the additional safety metrics we provide in our evaluation.
- RAND admits in its Report that the limited safety statistics they do cite are not statistically significant and then go on to rely upon questionable probability analysis to assert a non-CCC refinery is seven times more likely to have a major incident compared with a CCC refinery, an assumption not supported by any of the additional safety metrics we reviewed and have presented in our evaluation.
- Assuming there was a statistically significant difference between the process safety performance at CCC refineries and their U.S. and non-CCC California peers; something we did not find, RAND presents no evidence of a cause and effect relationship created by the CCC industrial safety ordinance.
- WSPA member refineries unanimously told RAND via its survey that they expected no significant improvement in safety performance and that no economic benefit would be derived from implementation of the GISO, input completely counter to RAND's fundamental benefit assumption. One WSPA member did state its belief that the additional rigor imposed by the DMR provisions would lead to improvements in this particular aspect of process safety.
- Even if the proposed GISO should improve the safety performance at all California refineries, the magnitude of safety improvement and the reduction in frequency of major incidents attributable to the GISO (and CalARP) will be nowhere near as dramatic as the RAND Report suggests. As we demonstrated earlier, the additional safety metrics show no gap in performance between CCC and other U.S. refineries and no more than a small gap relative to non-CCC California facilities. This clearly suggests, in our opinion, that if any benefits attributable to the proposed GISO do occur, they will be a fraction of the amount RAND estimates.

- **The RAND Report relies in part on outdated and inaccurate avoided cost estimates, and fails to consider offsetting cost factors, such as insurance.**
  - RAND’s analysis of three major refinery incidents in California over the 1999-2015 timeframe leads them to erroneously conclude a major incident will cost a refiner \$220 million. With respect to actual out-of-pocket costs for repairs, fines and other associated payments, RAND cites values between \$16 million and \$44 million for the two oldest incidents. It presented no data regarding the most recent (2015) incident. It went on to estimate the “opportunity cost” of lost refinery production, which by its measure would average \$180-\$200 million for future incidents; however, its estimation assumed a typical California refinery product slate was valued at \$4 per gallon, and the refinery would realize about 7 percent of that amount as “profit” had it operated. While we could quibble with their methodology, they blatantly overestimated the product slate value. We project a typical product slate would consist of 10 percent premium CARBOB, 45 percent regular CARBOB, 30 percent CARB diesel, 5 percent jet fuel, 5 percent heavy fuel oil and propane and 5 percent fuel grade petroleum coke. When applying historical West Coast spot petroleum prices to this hypothetical slate, we found the average value to vary from a low of \$1.20 per gallon (year to date 2016) and a high of \$2.90 per gallon (2012). The average value over the 2006-2015 timeframe was \$2.33 per gallon. Thus, RAND’s assumption of \$4 per gallon grossly overstates the average “opportunity cost” associated with these incidents by approximately \$80 million or 36 percent. Given RAND appears to utilize a 13-fold factor for converting direct costs into total California GSP, that suggests they overstated the total GSP “hit” of the Exxon Torrance incident by 36 percent, an amount equal to \$2.5 billion of their \$7 billion estimated amount.
  - RAND implies by its inclusion of “Caveats” listed on page 77 that their estimated avoided costs excludes a number of costs that would increase their estimated benefit of the GISO to industry. Items such as liability, injury and gross negligence claims, while possible, are far less likely to be real, much less material, costs. The final three items cited by RAND cannot be costs under RAND’s own methodology since these items would be reflected in the impact to California gasoline prices which RAND has already counted. More importantly, RAND has excluded or overlooked the fact that refineries carry insurance for property damage, liability claims, and in most cases, business interruption. While there is always the potential for annual insurance premiums to rise following a major incident, payment of insurance claims would certainly limit the actual cost to industry of these infrequent incidents. Had RAND included the impact of insurance coverage in its calculations, it would have significantly lowered the estimated benefits of the proposed GISO.
  - RAND continues to cite the potential for avoided deaths as a benefit from the proposed GISO despite the lack of statistical relevance of the three CCC refineries they cite. As we have previously shown in our evaluation of RAND’s analysis of the relative safety performance of CCC and other California refineries, depending upon the data set selected for examination, non-CCC California facilities can have lower fatality rates than the CCC group, and it would take only a single fatality at any of the three CCC refineries within a 10-year time span to exceed the average U.S. refining fatality rate since 2011.
  - RAND calculates the collective GSP “hit” from the three incidents of \$12.8 billion spread out over the 16-year period results in an \$800 million per year loss due to incidents of this type. As we clearly demonstrated in a previous bullet point, assuming RAND’s GSP analysis methodology is even reasonable (a separate evaluation outside our expertise and scope to be made by others), their calculated values are overstated by at least 36 percent due to the flawed output value assumption. RAND goes on to argue it will take a mere 7 percent reduction in risk of a major incident to breakeven with their estimated annual compliance cost

of \$58 million per year; however if the real avoided costs were only \$200 million due to lower values of the refinery average product slate and lower multipliers associated with GSP and coupled with costs of compliance similar to RAND's upper range (values we believe to be much more likely), then the breakeven risk reduction becomes an unrealistic 90 percent.

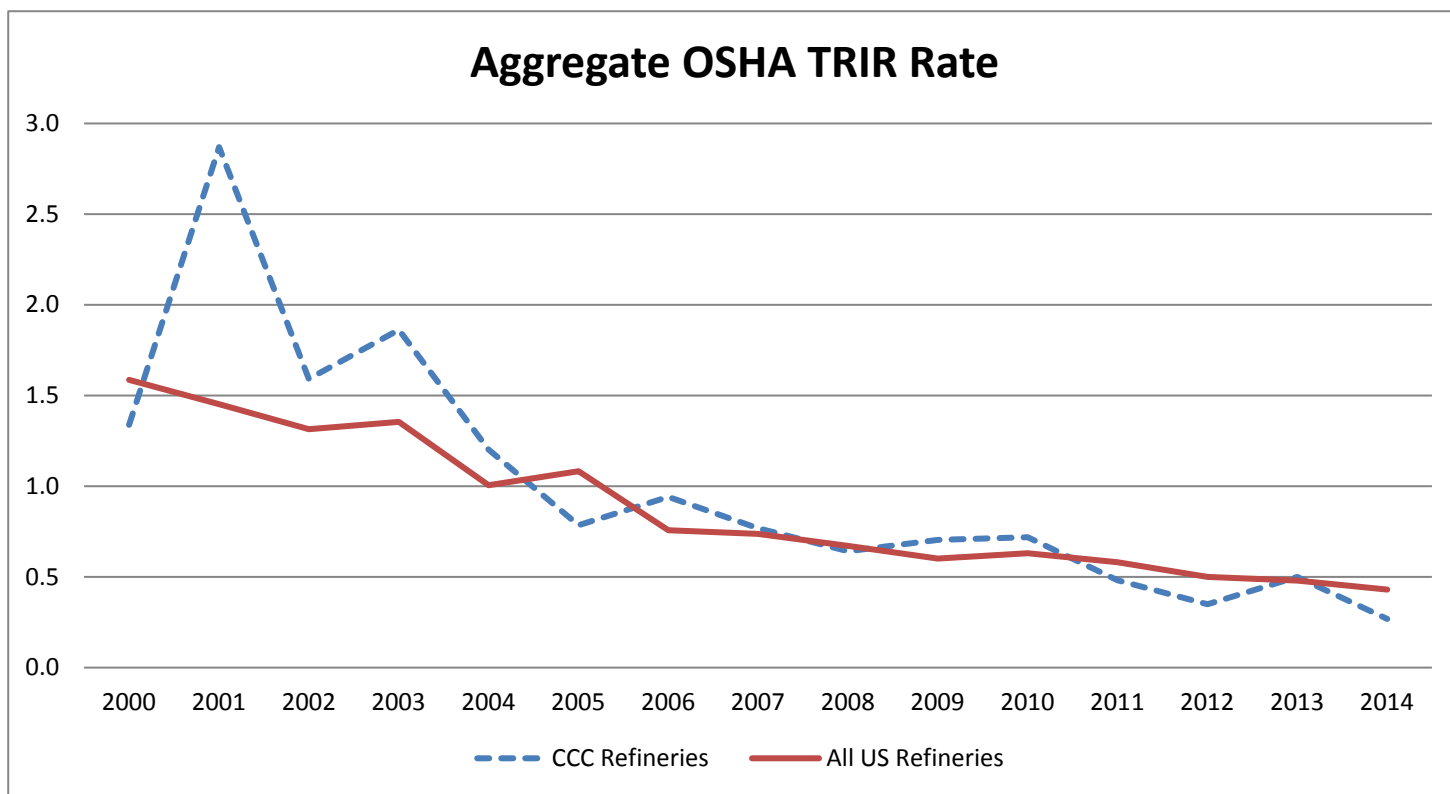
- **RAND fails to consider impact of proposed rule on refinery viability.**
  - RAND also fails to acknowledge the very real potential for this new economic burden becoming the “final” straw in a decision to close a refinery. This ultimate example of an unintended consequence would reverse all of the major economic benefits RAND associates with implementation of the proposed GISO. The combination of, a) new MARPOL specifications lowering the sulfur level of residual bunker fuel sometime between 2020 and 2025, b) the unwillingness of state and local entities to permit construction of facilities to accommodate use of domestic crudes at selected California locations and c) the overall difficulty of permitting and economically modifying California refineries to respond to the MARPOL changes make it conceivable that at least one California refinery may close. Adding even more onerous and costly regulation like the proposed GISO, as it is currently written, will elevate the likelihood of a major California refinery closure to 50/50, in our opinion. Should a California refinery close because of the proposed GISO, the impact to fuel supplies, loss of jobs, and “hit” to GSP will be equal to the impact of a major refinery incident, but will be experienced continually. RAND's analysis suggests an annual “benefit” from the GISO of approximately 10% of the average economic consequence of a major incident being avoided. Thus, it would take no more than a 10% probability that the GISO would trigger the shutdown of a major California refinery to drive RAND's calculated net benefit to zero.
  - Even though RAND's Structured Interview Questions asked respondents if they were currently performing the various reviews being required by the GISO and the responses RAND received showed that anywhere from half to almost all respondents (depending upon the particular review – i.e., DMR, HHCA, SPA, RCA, etc.) were already conducting *some form* of each review (most likely on higher risk processes, equipment and piping), we found nothing in RAND's benefit analysis or its Report where this was considered. This leads us to believe much of the intended benefits from the main provisions of the GISO are already being realized and helps explain why WSPA members see little, if any, added benefit from the proposed GISO.

Overall, we find RAND's use of statistically insignificant data and probability analysis to be insufficient for justifying costly and potentially burdensome regulations. This is especially true in view of evidence that, i) safety performance at all U.S. refineries continues to improve in the absence of new layers of costly industrial safety regulation, ii) safety performance at the three CCC refineries is not materially better than the average performance at less regulated U.S. refineries according to a number of safety metrics, and iii) most California refineries are already conducting their own versions of the new process safety reviews being proposed by the GISO.

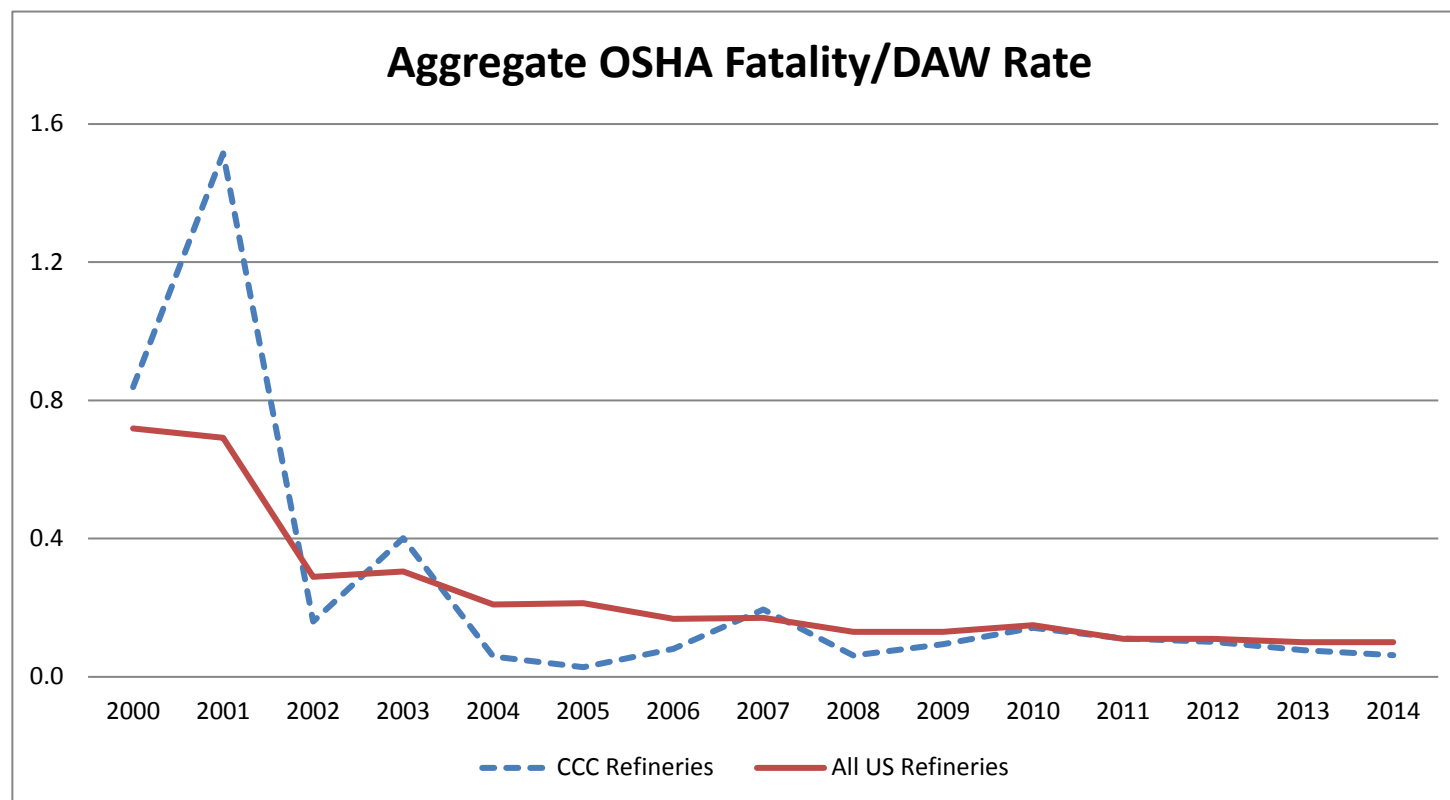
**SECTION VI**  
**APPENDIX**



APPENDIX FIGURE 1

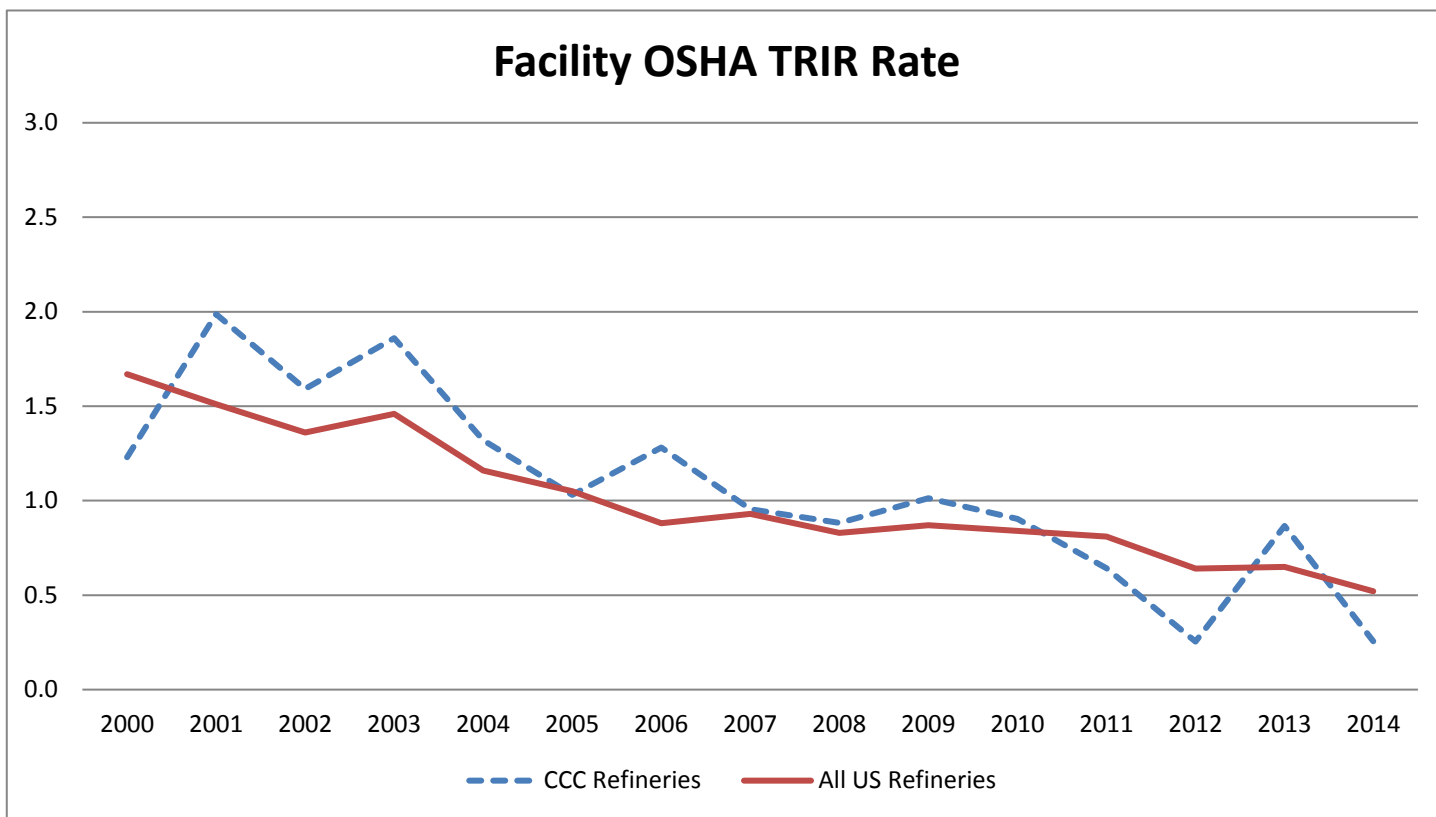


APPENDIX FIGURE 2

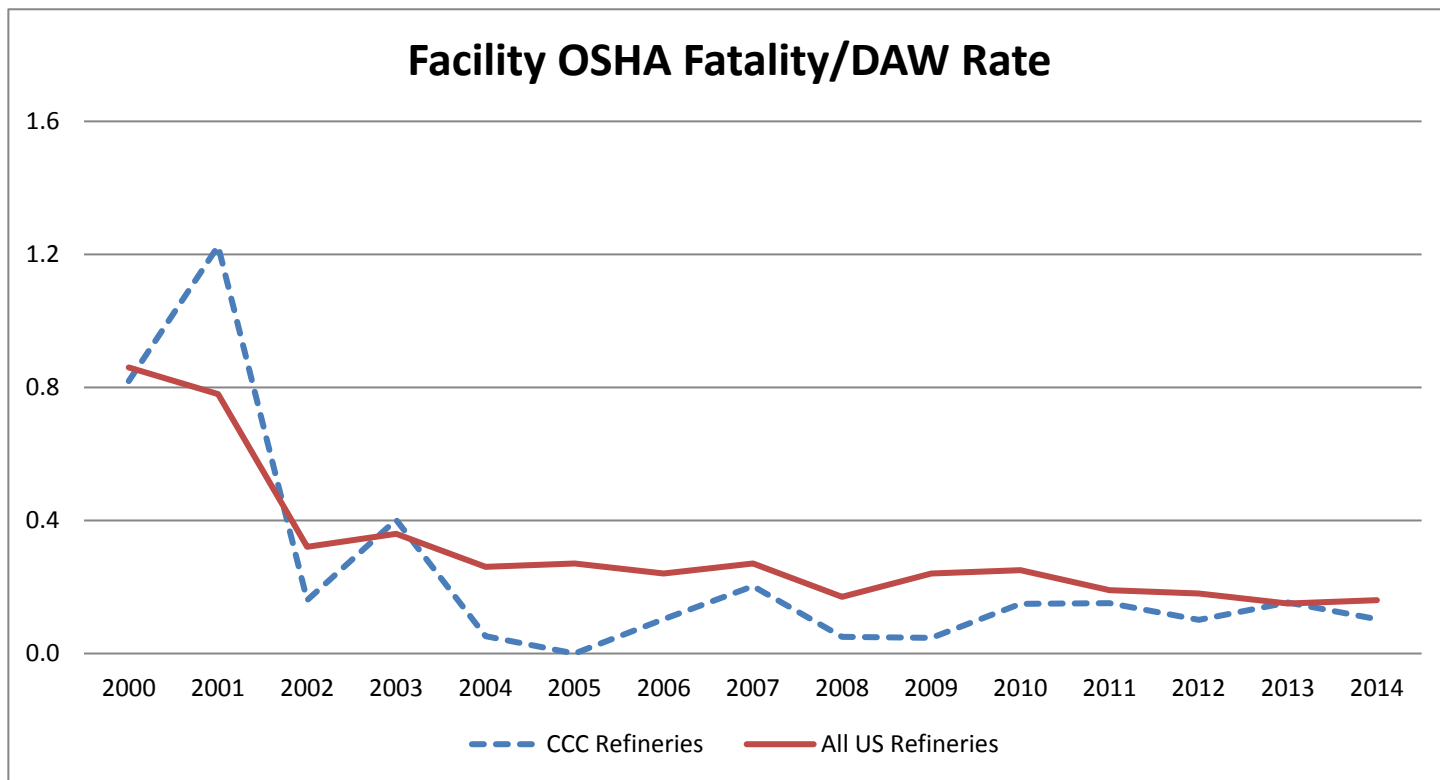




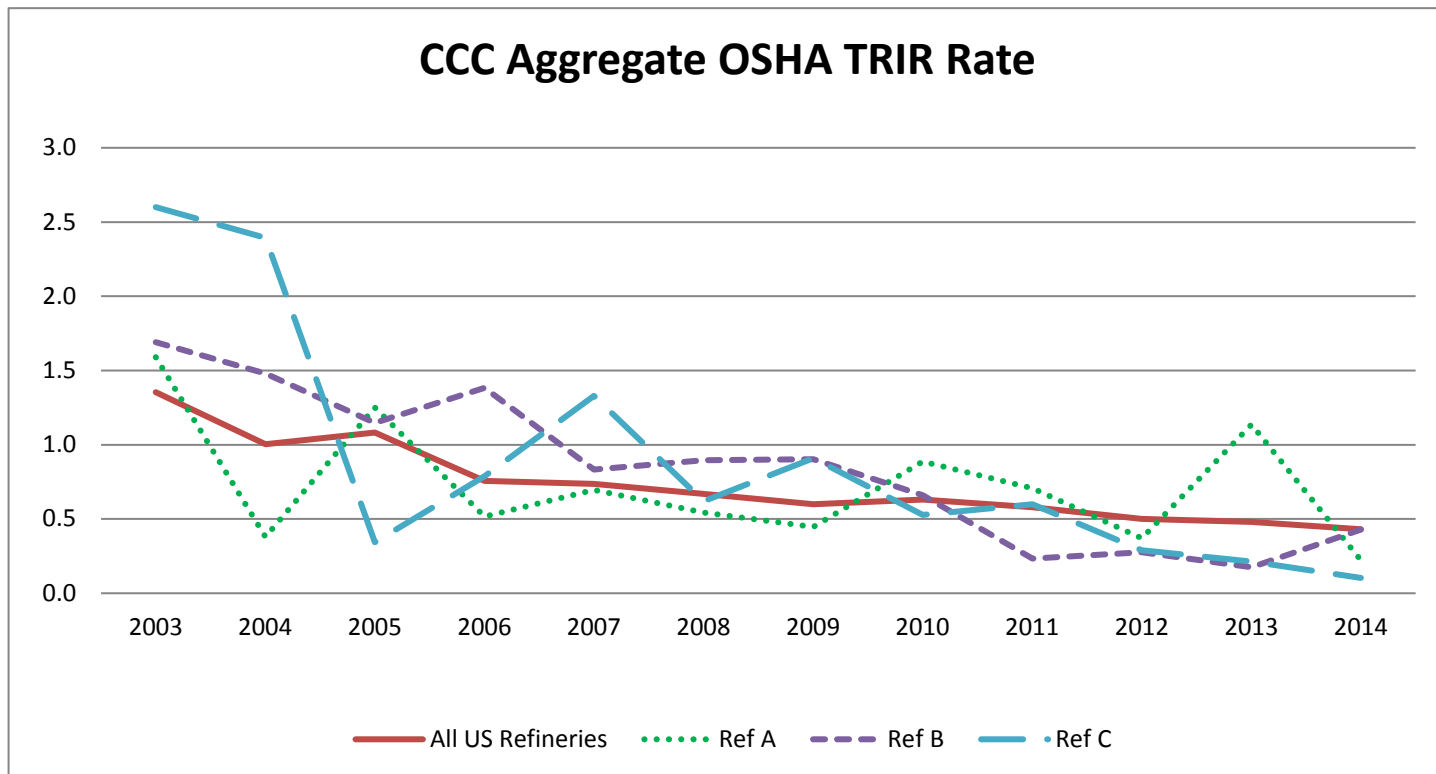
APPENDIX FIGURE 3



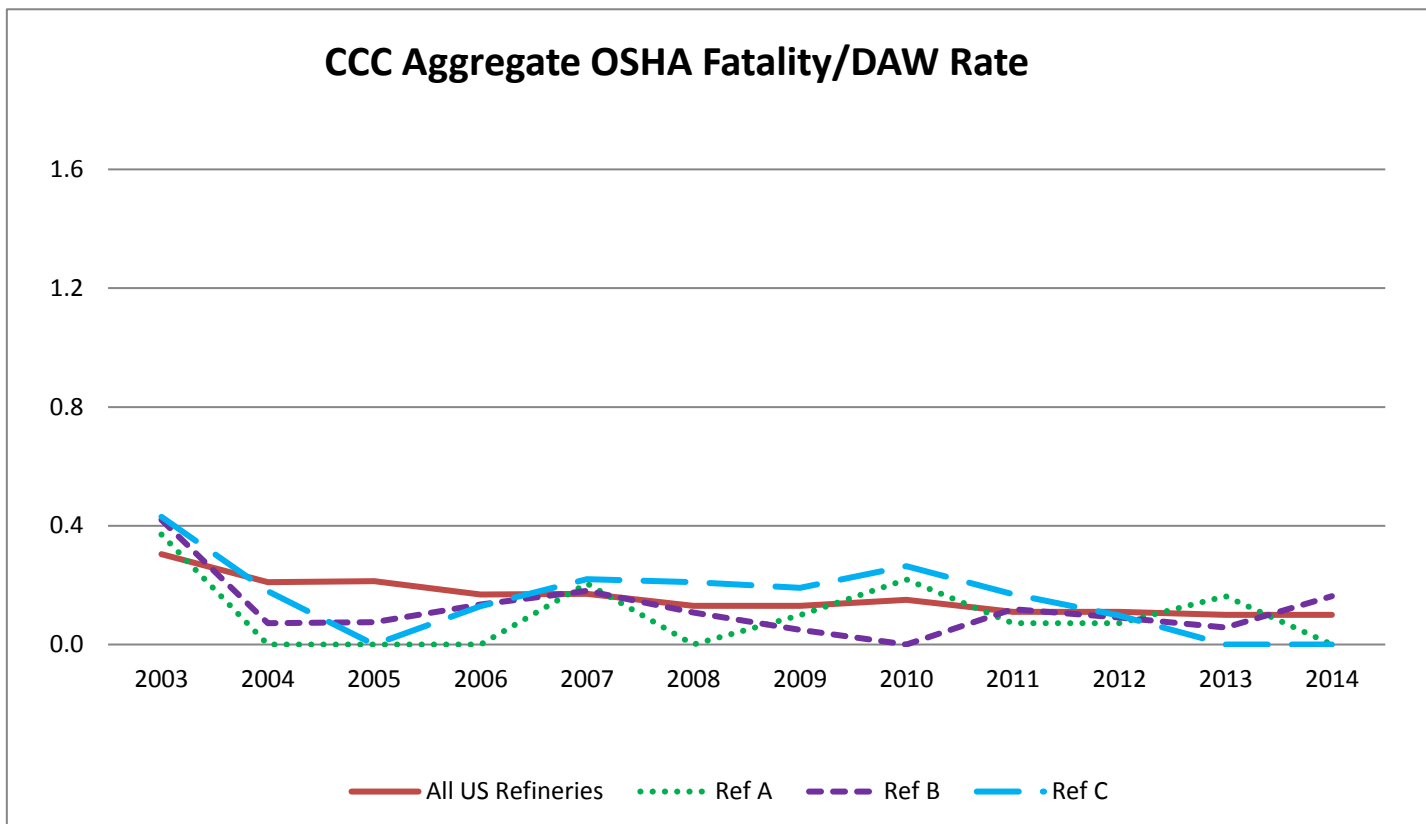
APPENDIX FIGURE 4



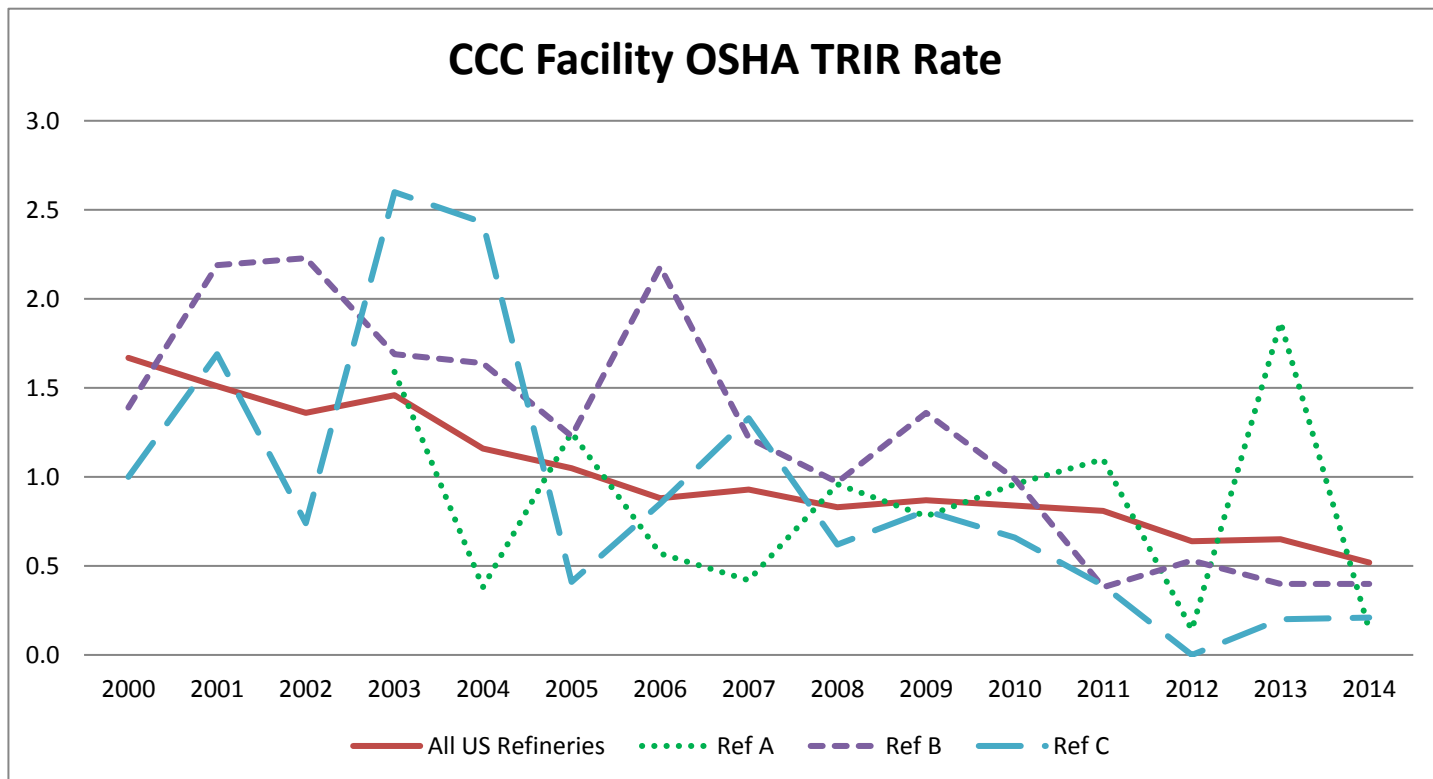
APPENDIX FIGURE 5



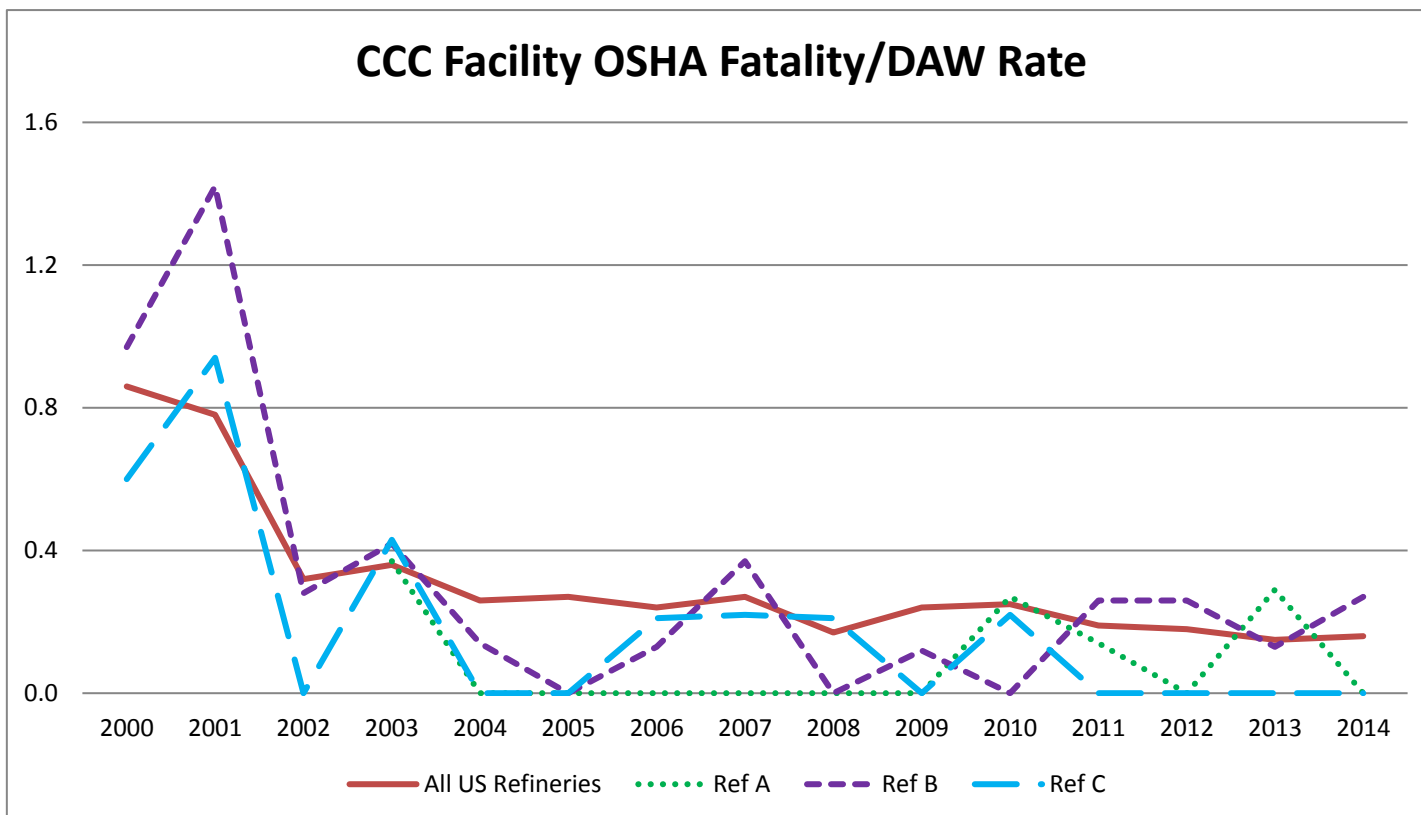
APPENDIX FIGURE 6



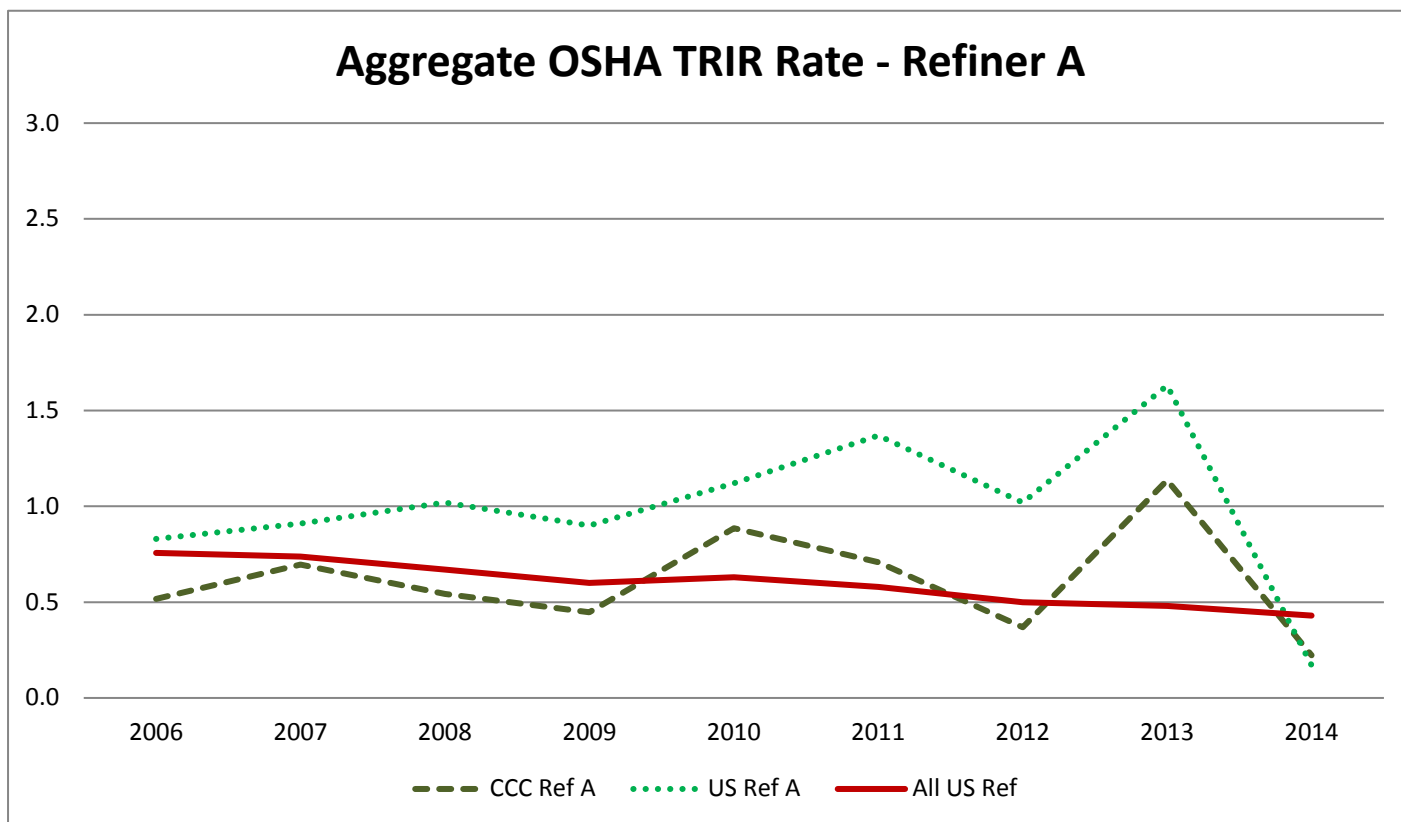
APPENDIX FIGURE 7



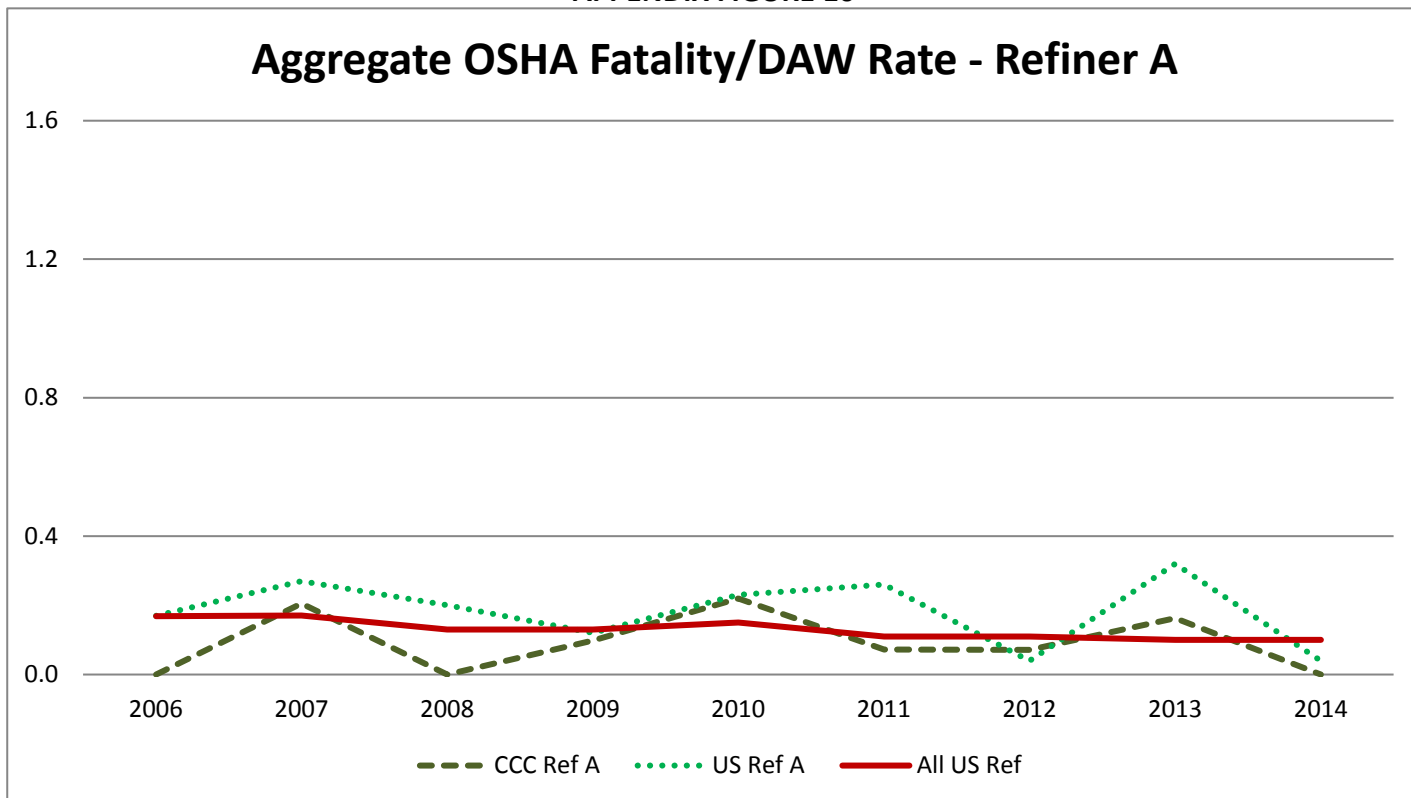
APPENDIX FIGURE 8



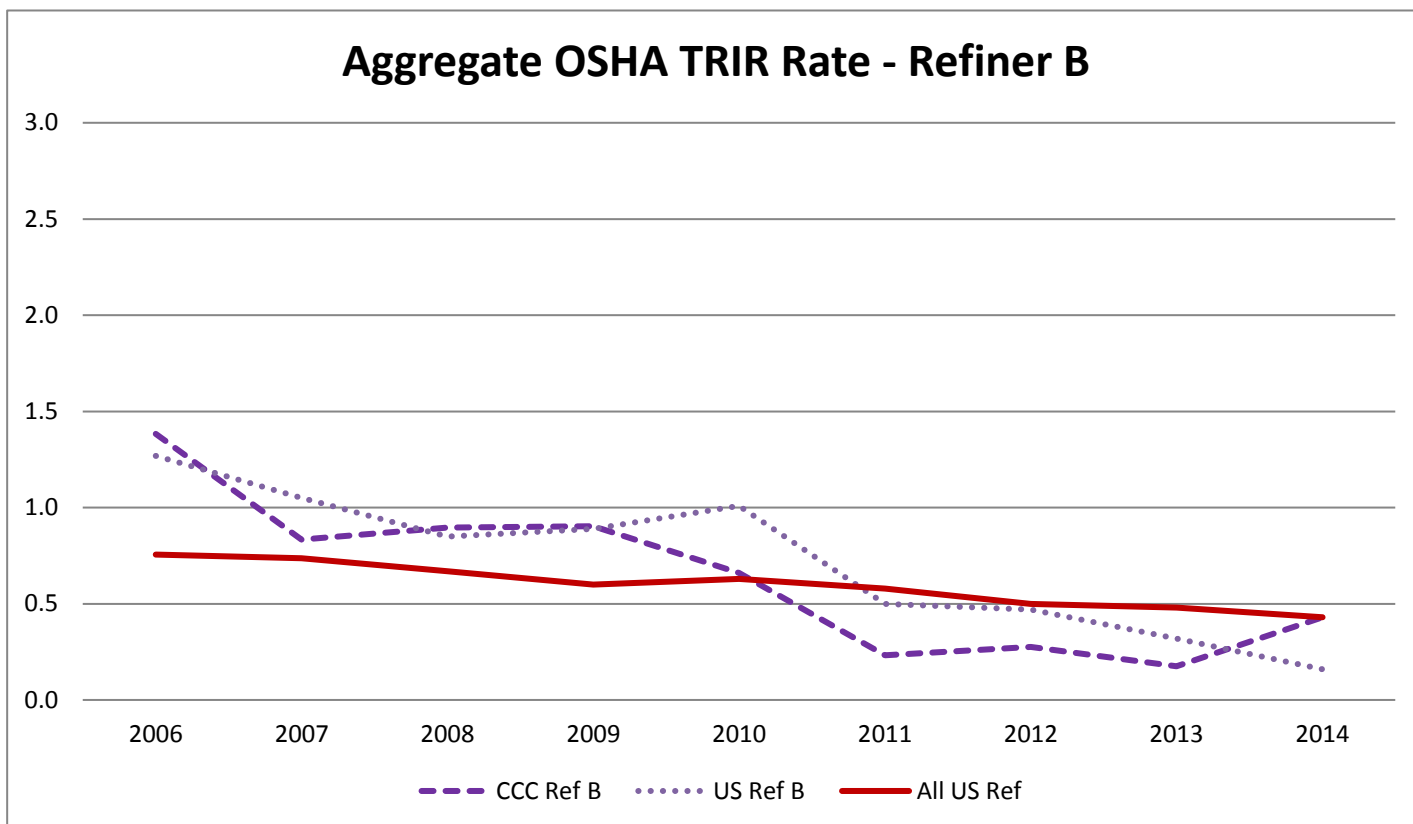
APPENDIX FIGURE 9



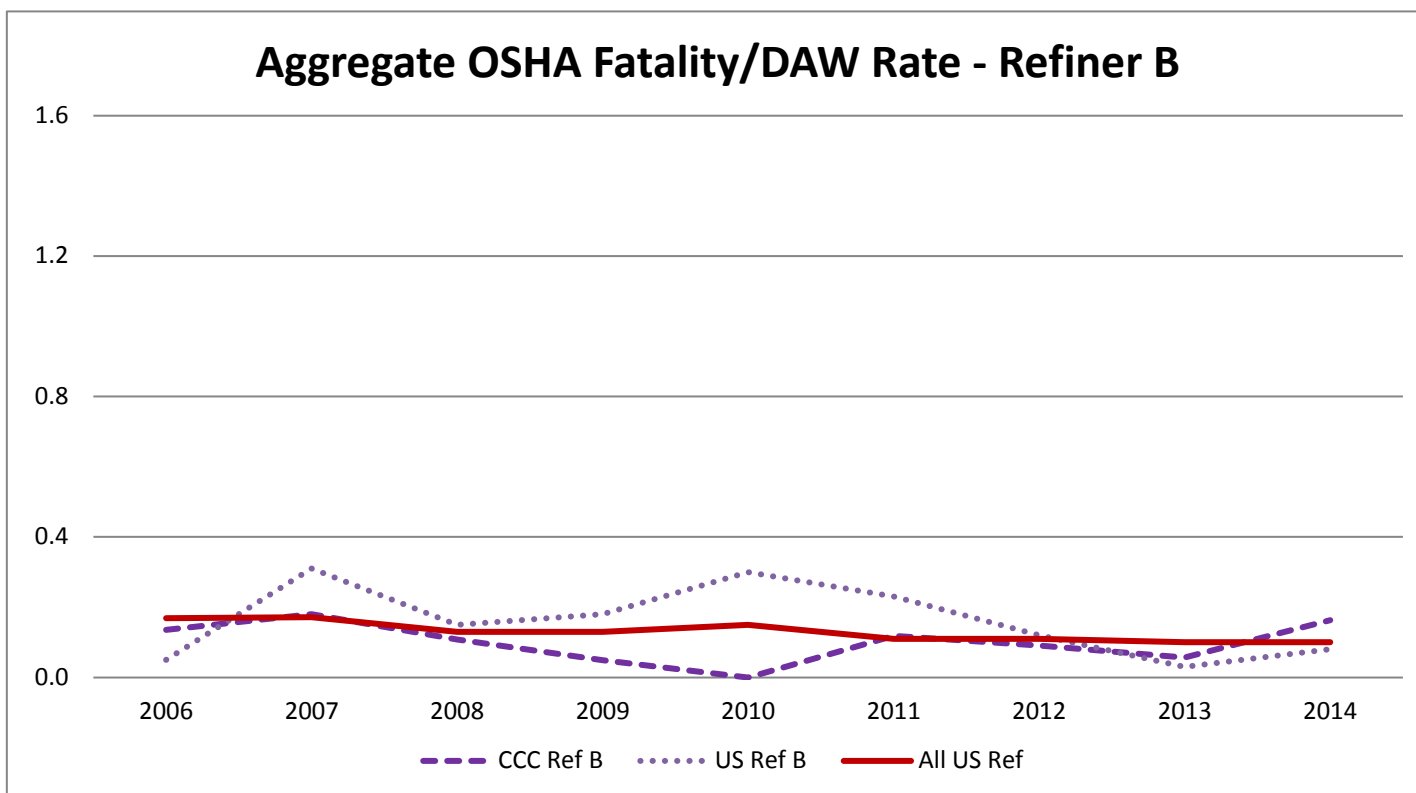
APPENDIX FIGURE 10



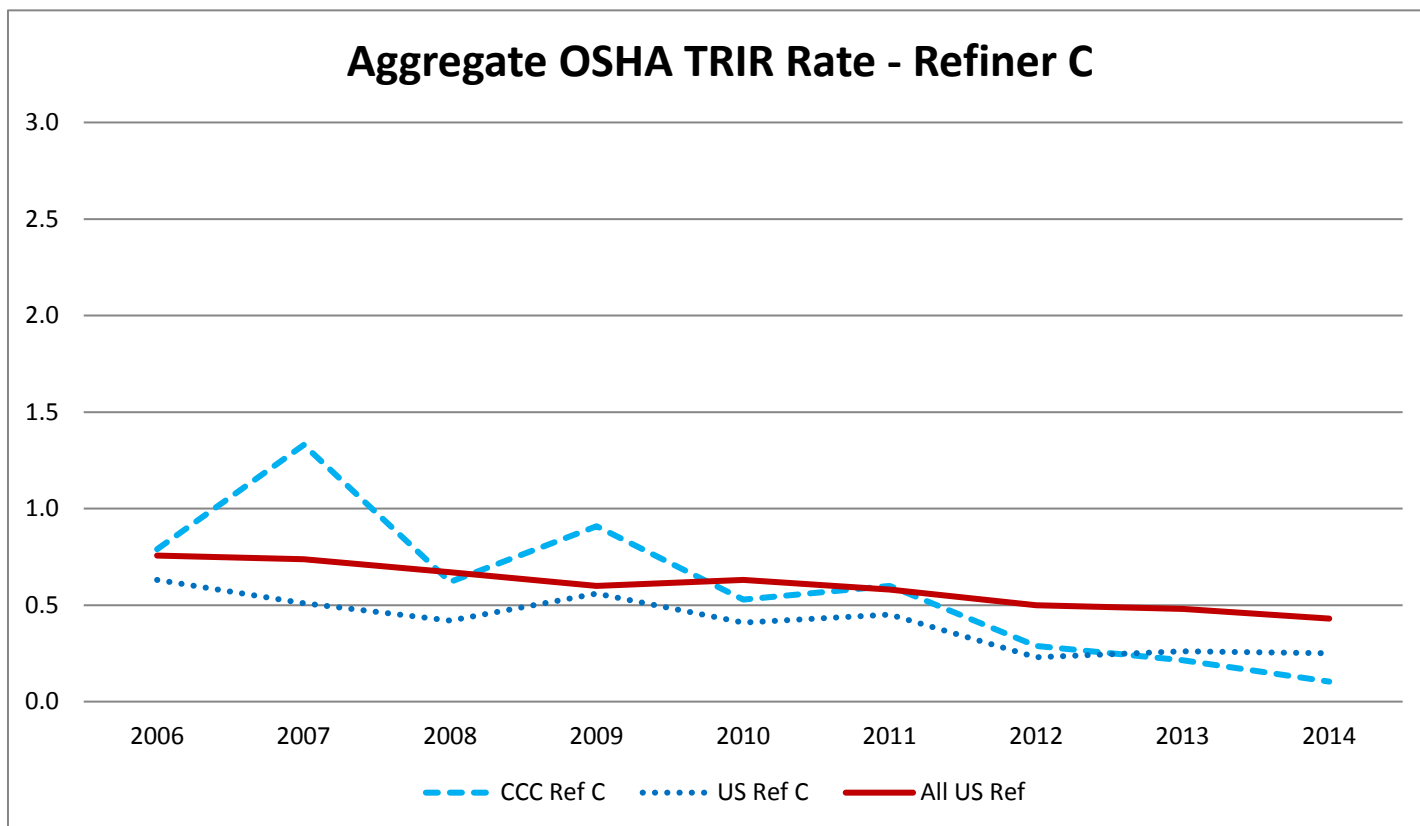
APPENDIX FIGURE 11



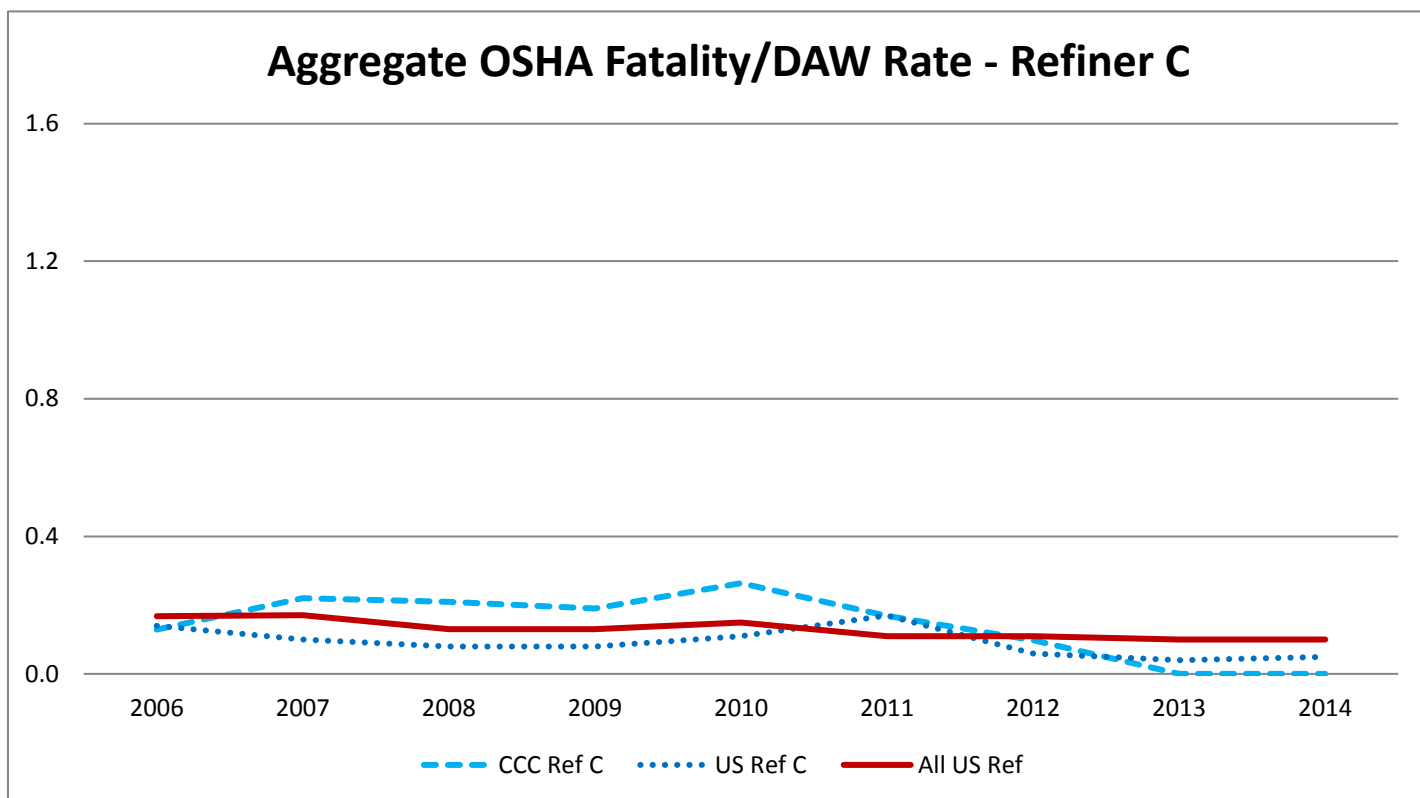
APPENDIX FIGURE 12



APPENDIX FIGURE 13



APPENDIX FIGURE 14



**APPENDIX TABLE 1**  
**WSPA MEMBER API 754 INCIDENTS**

	<u>CCC</u>	<u>Non-CCC</u>
<b><u>Tier 1 Incidents</u></b>		
2011	1.00	2.43
2012	1.33	1.00
2013	0.33	1.00
2014	0.33	1.00
2015	1.33	1.14
2011-15	0.87	1.31
2013-15	0.67	1.05
<b><u>Tier 2 Incidents</u></b>		
2011	2.67	3.71
2012	1.33	4.14
2013	2.67	4.57
2014	2.67	4.57
2015	3.67	3.00
2011-15	2.60	4.00
2013-15	3.00	3.62