South Coast
Air Quality Management District
21865 Copley Drive, Diamond Bar, CA 91765-4182
(909) 396-2000 • www.aqmd.gov

E-Mailed: November 25, 2014 November 25, 2014
p66-railspur-comments@co.slo.ca.us
mwilson@co.slo.ca.us

Mr. Murry Wilson
San Luis Obispo County Department of Planning and Building
976 Osos St., Rm 200,
San Luis Obispo, CA93408-2040

Review of the Recirculated Draft Environmental Impact Report
For the Phillips 66 Company Rail Spur Extension Project

The South Coast Air Quality Management District (SCAQMD) staff appreciates the opportunity to comment on the above-mentioned document. The following comments are meant as guidance for the Lead Agency and should be incorporated into the Final Environmental Impact Report (Final EIR) as appropriate.

The proposed Project will modify the existing rail spur currently on the southwest side of the Santa Maria Refinery (SMR) and build and operate a crude oil rail unloading facility. The Project would include an eastward extension of the existing rail spur, a railcar crude oil unloading facility, and associated above-ground pipelines. Trains would deliver crude oil to the SMR for processing. The unloaded material would be transferred from the proposed unloading facility to existing crude-oil storage tanks via a new on-site above-ground pipeline. The proposed tracks and unloading facilities would be designed to accommodate unit trains and manifest trains. Trains traveling to the Refinery could come from the north or the south using the Union Pacific Rail Road (UPRR) coastal track. From the south, the trains would travel into California and then to the Colton railyard where they would then proceed to the Project site.

Based on our review, SCAQMD staff has concerns with the analysis and the mitigation measures contained in the Recirculated Draft Environmental Impact Report (RDEIR).

Availability of RDEIR for SCAQMD Staff Review

1. Although a portion of the mainline that will be used by trains serving this Project will travel through the SCAQMD's jurisdiction, the CEQA documents for this Project were not provided to SCAQMD staff for review. SCAQMD staff only became aware of the RDEIR on November 19, three business days before the written comments were due. In the future, CEQA documents for all Projects which will result in emissions of criteria pollutants or toxic air contaminants within SCAQMD jurisdiction should be provided to SCAQMD staff in a timely manner to allow for our review and comment. SCAQMD-01

2. Electronic versions of all air quality modeling and health risk assessment files were not made available to the public for review. The RDEIR contained emissions calculations, and a health risk assessment with modeled impacts. However, without electronic input files and supporting air quality documentation, SCAQMD staff was unable to complete our review of the air quality analysis. SCAQMD-02

Project's Emissions within the South Coast Air Basin (SCAB)

3. In Chapter 4, the Project's rail emissions are broken up into mainline rail emissions (Table 4.3.18) and mainline rail emissions past the Roseville and Colton railyards (Table 4.3.19). By breaking up the Project's emissions into two tables, the RDEIR is misleading as to the actual total impacts of the Project in each Air District. The Final EIR should include a table which adds the impacts from Tables 4.3.18 and 4.3.19 for each Air District and compare those emissions to the appropriate thresholds. SCAQMD-03

4. The SCAQMD has also developed both regional and localized significance thresholds. In the RDEIR, the Lead Agency has correctly identified the SCAQMD's regional significance thresholds, however, the RDEIR did not include an analysis of the Project's localized impacts in the SCAB. The SCAQMD staff recommends calculating localized air quality impacts and comparing the results to localized significance thresholds (LSTs). SCAQMD staff recommends that the lead agency perform a localized analysis utilizing dispersion modeling in the Final EIR. Guidance for performing a localized air quality analysis can be found at: http://www.aqmd.gov/home/regulations/ceqa/air-quality-analysis-handbook/localized-significance-thresholds. SCAQMD-04

Mitigated Project Emissions

5. A comparison of the unmitigated and mitigated Project emissions shows that a 90% reduction was applied to the unmitigated emissions. It is unclear how the 90% emission reduction from the unmitigated emission scenario was achieved. SCAQMD staff recommends that the Lead Agency include more information regarding the Project's commitments to ensure that the 90% emission reduction will be achieved. SCAQMD-05

6. In the RDEIR, the Lead Agency states that "EPA has estimated that by 2041 the average nationwide emission factors for mainline locomotives would meet the Tier 4 standards" and that "use of all Tier 4 locomotives would provide about a 92 percent and 96 percent reduction in switching ROG+NOx and DPM emissions, respectively." According to the Project description and construction schedule, the Project will be operational as early as 2016. Therefore, given the exceedance of regional CEQA thresholds, the Project should include mitigation measures which will reduce impacts between 2016 and 2041. Furthermore, the Project cannot take credit for the emissions reduction which will occur as a result of existing regulations and the emissions reductions should be described in detail to show the emissions reductions as a result of Project mitigation measures and those anticipated by current regulations. SCAQMD-06

Mitigation Measures

7. In AQ-2b, the Lead Agency proposes to limit on-site idling to no more than 15 minutes. It is unclear if this idling restriction is the same as the California Air Resources Board (CARB) idling rule or how this mitigation measure is more stringent than the existing regulation. Since the Project cannot consider compliance with existing rules as Project mitigation, the Lead Agency should include more information on this mitigation measure to show that it is more stringent than current requirements and provide more information on what scenarios would qualify as "safety purposes", when this idling limit would not apply. SCAQMD-07

8. Given that trains serving this Project will be travelling from the Colton railyard to the Project site, this mitigation measure should be expanded to include off-site idling at other railyard locations. SCAQMD-08

9. In AQ-3, the Lead Agency states that "if the mainline rail emissions of ROG+NOx and DPM with the above mitigations still exceed the applicable Air District thresholds, the Applicant shall secure emission reductions in ROG + NOx and DPM emissions within each applicable Air District". Given that this Project will affect multiple Air Districts, more information needs to be provided, such as how the emissions will be estimated, will the Air Districts be consulted to review the emissions estimates, and what are the Air District thresholds which will be used. The Lead Agency should include this information in the Final EIR. SCAQMD-09

10. SCAQMD staff recommends that initially, the Project applicant should attempt to reduce the Project's impacts at the source of emissions. If the Project applicant has exhausted all possible source-specific mitigation measures, then mitigation measures to reduce impacts in the vicinity of the Project can be applied. The use of emission reduction credits are a final alternative, after exhausting all other mitigation possibilities. The limitation of emission reduction credits is that although the Project's regional impacts are reduced, the Project's localized impacts might not. Therefore, it is important for the Project applicant to demonstrate that the Project's regional and localized impacts will be mitigated. SCAQMD-10

Health Risk Assessment (HRA) and Diesel Particulate Matter (DPM)

11. The HRA prepared for the Project did not include health risks from DPM emissions along the mainline. The Final EIR should include a HRA which addresses the health risks to sensitive receptors located along the mainline rail which will be used by the Project. SCAQMD-11

12. Currently, SCAQMD does not have emission reduction credits for DPM. Therefore, additional mitigation measures, such as a limit on locomotive idling should be applied to trains during their travel time in the SCAB. SCAQMD-12

13. According to the CARB's Railyard HRA for the Colton yard, the cancer risk to residents in the area is 150 per million. The Project will increase the number of SCAQMD-13

trains through the Colton railyard and the increased health risks from those DPM emissions. The Final EIR should contain a HRA disclosing the increased health risks caused by the Project. SCAQMD-13 cont

Pursuant to Public Resources Code Section 21092.5, SCAQMD staff requests that the Lead Agency provide the SCAQMD with written responses to all comments contained herein prior to the adoption of the Final EIR. All electronic files used in emissions calculations and the HRA in the Final EIR should also be provided to SCAQMD staff. Further, staff is available to work with the Lead Agency to address these issues and any other questions that may arise. Please contact me at (909) 396-3176, if you have any questions regarding the enclosed comments. SCAQMD-14

Sincerely,

Jillian Baker

Jillian Baker, Ph.D.
Program Supervisor
Planning, Rule Development & Area Sources

SLO141119-02
Control Number

SN:JB

SCAQMD-01	A notice of availability of the RDEIR was sent to Mr. Barry R. Wallerstein, Executive Director, 21865 Copley Drive, Diamond Bar, CA 91765 on October 10, 2014.
SCAQMD-02	The technical appendices contained all of the emissions calculations and air modeling files. All the electronic versions of the air emission spreadsheets and modeling files were available from the County by request as part of the administrative record.
SCAQMD-03	As described in the EIR section 2, Project Description, section 2.5.1, that train activities beyond these rail yard locations were determined to be speculative since the trains could travel a number of different routes. However, the RDEIR did evaluate the air quality impacts beyond these rail yards, including the addition of the health risk of significant impacts in Table 4.3.22. Health risks were updated to include all emissions in the SCAQMD, even those that would occur beyond the Colton rail yard. Note that the health risks assume that all rail activity would take the prescribed routes. In practice, some trains would go north and some south, thereby reducing the health risks in each district due to fewer actual trains. Impacts were found to be significant.
SCAQMD-04	The only emissions that would occur within the SCAQMD are emissions from train locomotives, or mobile sources. All sources that occur as stationary or onsite sources occur within SLO County and would not impact the SCAQMD. As per the SCAQMD localized guidance, "The LST methodology and associated mass rates are not designed to evaluate localized impacts from mobile sources traveling over the roadways" (page - preface), and "Off-site mobile emissions from the project should NOT be included in the emissions compared to the LSTs". Mobile emissions would pass by a receptor quickly, with a mile long train traveling past a receptor in less than 90 seconds, which is a very short duration exposure. OEHHA exposure averaging time for acute RELs is 1 hour. Impact AQ.5 (see Section 4.3, Air Quality and Greenhouse Gases) presents an analysis of the impacts for cancer with 250 trains per year visiting the SMR.
SCAQMD-05	The use of Tier 4 locomotives provides for a large reduction in emissions, as discussed in Impact AQ.2 (see Section 4.3, Air Quality and Greenhouse Gases) "Use of all Tier 4 locomotives would provide about a 92 percent and 96 percent reduction in switching ROG+NO_x and DPM emissions, respectively". The air quality appendix provides the UPRR average tier mix emission factors as well as the tier 4 emission factors, as available from the EPA.
SCAQMD-06	The current regulations for locomotives require a reduction in emissions and a phasing in of the Tier locomotives over time. As locomotives are infrequently rebuilt or replaced, the EPA estimates that it would take until 2041 for most locomotives to be operating at a Tier 4 level. For current emissions estimates for criteria pollutants, the EIR assumes that the emissions are occurring as per the UPRR current mix of locomotives and does not use the phase-in values over

	the project life. No credit is taken for future reductions for criteria pollutants. The same is applied for acute and chronic impacts associated with the health risk assessment. Current locomotive emission factors are used for chronic and acute impacts. However, for cancer impacts, the phase-in of the higher tier locomotives is included as it is a regulatory certainty, similar to how automobile emissions are calculated within EMFAC and the CalEEMod model. The EIR uses the same approach for locomotive cancer risks. For mitigation, the EIR assumes the application of Tier 4 locomotives in 2015. Project emissions and mitigated emissions are quantified in the air quality appendix.
SCAQMD-07	The CARB agreement through the Statewide Rail Yard Agreement between CARB, UPRR, and BNSF is not a regulatory requirement and hence there is no certainty that it will be implemented. Longer term regulations by the EPA would have idling restrictions, but the mitigation in the EIR attempts to accelerate the implementation of these measures in order to reduce emissions on a faster timescale.
SCAQMD-08	The unit trains would not be switched or broken apart at other rail yards and therefore idling restrictions in other areas would not be applicable.
SCAQMD-09	Additional requirements have been added to mitigation measure AQ.3 (see Section 4.3, Air Quality and Greenhouse Gases) to require a mitigation plan by the Applicant providing information to ensure that credits or offsets are available on an annual basis and providing emissions estimates based on actual activity and locomotive types for each year.
SCAQMD-10	Mitigation measures related to AQ.2 and AQ.3 (see Section 4.3, Air Quality and Greenhouse Gases) state that "If emissions of ROG+NO_x and DPM with the above mitigations [onsite or Tier 4 locomotives] still exceed the thresholds..." indicating that the preference is for the use of onsite or Tier 4 locomotives over credits.
SCAQMD-11	Impact AQ.5 (see Section 4.3, Air Quality and Greenhouse Gases) includes an analysis of DPM cancer risks along the mainline based on train speed and distance from the mainline tracks. See Appendix B.2. An HRA for all communities along the entire potential routes would be prohibitively complex and would not render additional information that could mitigate or lessen the significant and unavoidable impacts and was therefore not conducted.
SCAQMD-12	Emission reduction credits for DPM have been removed from the mitigation measures under impact AQ.2 (see Section 4.3, Air Quality and Greenhouse Gases), although it has been left in for AQ.3 as some Districts may have programs that could be used to reduce DPM emissions in the area. Note that DPM impacts are determined to be significant and unavoidable for SLOC, which has thresholds for DPM emissions.
SCAQMD-13	Impact AQ.5 (see Section 4.3, Air Quality and Greenhouse Gases) includes an

	analysis of DPM cancer risks along the mainline based on train speed and distance from the mainline tracks. The unit trains would not be utilizing the Colton rail yard for switching or train movements and would therefore not contribute to cancer risks beyond those identified under impact AQ.5.
SCAQMD-14	The County will provide written responses to the SCAQMD comments consistent with the requirements of Public Resources Code Section 21092.5. The County will provide the electronic files for the air emission calculations and HRA modeling to the SCAQMD along with a CD of the FEIR and responses to all the comments.

From: Amy Million [mailto:AMillion@ci.benicia.ca.us]
Sent: Monday, September 15, 2014 10:19 AM
To: Bailey, Diane
Cc: Petra Pless (petra.pless@gmail.com); Phyllis Fox
Subject: Re: Public Information Request: HRA supporting files

Hi Diane,

The City does not have a copy. According to the applicant (Valero), the modeling files that accompanied the BAAQMD ATC Application were large, so they were provided to the BAAQMD via CD.

I think the quickest way for you to obtain a copy of the original modeling files would be via records request from the BAAQMD.

Regards,

Amy

Amy E. Million
City of Benicia, Community Development Department
250 East L Street
Benicia, CA 94510
phone 707. 746.4372| fax 707.747.1637 | email amillion@ci.benicia.ca.us
www.ci.benicia.ca.us

>>> "Bailey, Diane" <dbailey@nrdc.org> 9/10/2014 11:04 AM >>>

Hi Amy. I hope this message finds you well.

Several months ago, we sent you some information requests on the Valero CBR project. You turned around info for us really fast, which was very much appreciated. It looks like some files may be missing (or maybe you don't have them). Would you mind glancing over the note below and checking to see if you have the additional air quality dispersion modeling and health risk assessment files for non-Fairfield locations per the note below?

Thanks for your help!

Best,
Diane

From: Petra Pless [mailto:petra.pless@gmail.com]
Sent: Wednesday, September 10, 2014 10:59 AM
To: Bailey, Diane; Rachael E. Koss
Cc: Phyllis Fox
Subject: HRA supporting files missing

Diane, Rachael,

The CD we received titled "Valero ERM Model" only contains the additional modeling files to support the updated modeling described in Appx.E.6 for Fairfield (DPM cancer, chronic and PM2.5 concentrations) as well as for some communities along the way IDixon, Placer, and Sacramento and PM2.5 concentrations at the refinery.

Did you receive the modeling files for the original modeling submitted as part of the BAAQMD Permit Application in November 2013? If not, could you please request those files.

Specifically, what we are missing are modeling files supporting the cancer risk, chronic, and acute risk for all non-Fairfield receptor locations in Draft EIR, Table 4.1-9, p. 4.1-25, including the MEIW and Maximum Sensitive Receptor. These locations are affected by both DPM and TAC emissions from fugitive equipment leaks, for which we (I) currently have no support.

Thanks for looking into this.
Petra

~~~~~~~~~~~~~~~~~~~~~~~~
Petra Pless, D.Env.
Pless Environmental, Inc.
440 Nova Albion Way, Suite 2
San Rafael, CA 94903
(415) 492-2131 voice
(815) 572-8600 fax
~~~~~~~~~~~~~~~~~~~~~~~~

ADAMS BROADWELL JOSEPH & CARDOZO
A PROFESSIONAL CORPORATION
ATTORNEYS AT LAW
601 GATEWAY BOULEVARD, SUITE 1000
SOUTH SAN FRANCISCO, CA 94080-7037
TEL: (650) 589-1660
FAX: (650) 589-5062
rkoss@adamsbroadwell.com

DANIEL L. CARDOZO
THOMAS A. ENSLOW
TANYA A. GULESSERIAN
MARC D. JOSEPH
ELIZABETH KLEBANER
RACHAEL E. KOSS
JAMIE L. MAULDIN
MEGHAN A. QUINN
ELLEN L. TRESCOTT

SACRAMENTO OFFICE
520 CAPITOL MALL, SUITE 350
SACRAMENTO, CA 95814-4721
TEL: (916) 444-6201
FAX: (916) 444-6209

September 1, 2015

VIA U.S. AND FACSIMILE

Brad Kilger, City Manager
City of Benicia
250 East L Street
Benicia, CA 94510
Fax: (707) 747-8120

Lisa Wolf, City Clerk
City of Benicia
250 East L Street
Benicia, CA 94510
Fax: (707) 747-8120

Amy Million, Principal Planner
City of Benicia
250 East L Street
Benicia, CA 94510
Fax: (707) 747-1637

Re: Request for Documents Referenced or Relied Upon in the Valero Benicia Crude by Rail Project Revised Draft Environmental Impact Report (SCH # 2013052074)

Dear Mr. Kilger, Ms. Wolf and Ms. Million:

We are writing on behalf of Safe Fuels and Energy Resources California to request immediate access to all documents referenced or relied upon in the Revised Draft Environmental Impact Report ("RDEIR") for the Valero Benicia Crude by Rule Project ("Project'). Our request includes, but is not limited to, the AERMOD modeling results and spreadsheets with health risk calculations (in electronic native format, if possible) which support the findings of the quantitative health risk assessments in the RDEIR Appendices B and C. Without the modeling results,

printed on recycled paper

Appendices B and C are incomplete and the public cannot evaluate the results of the health risk assessments.

This request is made pursuant to the California Environmental Quality Act ("CEQA"), which requires that all documents referenced in an environmental review document be made available to the public for the entire comment period.[1]

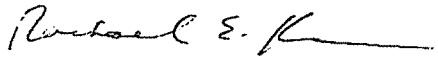
If any of the requested items are available on the Internet, we request that the City direct us to the appropriate site for accessing the documents. Pursuant to Government Code section 6253.9, if the requested documents are in electronic format and are 10 MB or less (or can be easily broken into chunks of 10 MB or less), please email them as attachments.

Please use the following contact information for all correspondence regarding these requests:

Rachael Koss
Adams Broadwell Joseph & Cardozo
601 Gateway Boulevard, Ste. 1000
South San Francisco, CA 94080
rkoss@adamsbroadwell.com
Phone: (650) 589-1660

Thank you for your assistance with this matter.

Sincerely,



Rachael E. Koss

REK:ric

[1] See Pub. Resources Code, § 21092, subd. (b)(1); 14 Cal. Code Reg. § 15072, subd.(g)(4).

File - Pub Rec Req/ CBR

THE CITY OF BENICIA CALIFORNIA
A SESQUICENTENNIAL CITY 1847 ★ 1997

CITY HALL • 250 EAST L STREET • BENICIA, CA 94510 • (707) 746-4200 • FAX (707) 747-8120

RECEIVED
SEP - 2 2015
CITY ATTORNEY'S OFFICE
CITY OF BENICIA

September 2, 2015

Rachael Koss
Adams Broadwell Joseph & Cardozo
601 Gateway Boulevard, Ste. 1000
South San Francisco, CA 94080

Re: Public Records Act Request Dated September 1, 2015

Dear Ms. Koss:

This is in response to your request submitted pursuant to the California Public Records Act ("CPRA") dated September 1, 2015 and received by the City on September 1, 2015. Your requests sees "the AERMOD modeling results and spreadsheets with health risk calculations (in electronic native format, if possible) which support the findings of the quantitative health risk assessments in the RDEIR Appendices B and C."

You have also stated that you prefer we direct you to the Internet if the documents are available there. The reference documents for the Revised Draft Environmental Impact Report (RDEIR) are posted on the City's website. The reference documents are the last item on the list under the RDEIR heading. Other than this information, we do not have the raw modeling data.

You request specifically includes the AERMOD modeling results and spreadsheets with health risk calculations (in their native format) that underlie the reports provided in Appendices B and C. Please note that ERM prepared the report in Appendix B under contract to Valero. ESA's environmental experts independently reviewed ERM's report on the City's behalf to assure its adequacy and accuracy for the intended purpose.

The following should take you to the City's webpage with the RDEIR information: http://www.ci.benicia.ca.us/index.asp?SEC={CA5CAF51-2ABC-4E34-A195-C894F062FED7}&Type=B_BASIC&persistdesign=none

As a courtesy, we would be pleased to mail you a CD that contains the referenced materials.

ELIZABETH PATTERSON, *Mayor*
Members of the City Council
MARK C. HUGHES, *Vice Mayor* . ALAN M. SCHWARTZMAN . TOM CAMPBELL . CHRISTINA STRAWBRIDGE

BRAD KILGER, *City Manager*
KENNETH C. PAULK, *City Treasurer*
LISA WOLFE, *City Clerk*

Recycled Paper

This response on behalf of the City Clerk and City Manager and me is being provided in accordance with the requirements of the CPRA and the Open Government Ordinance of the City of Benicia contained in Title 4 of the Benicia Municipal Code.

If you have any questions or can offer controlling legal authority that you believe requires different conclusions from those discussed above, please feel free to contact me. Please also let me know if you need additional information. Thank you!

Sincerely,

Amy Million
Principal Planner

cc: City Clerk
City Manager
City Attorney
Community Development Director

From: Amy Million [mailto:AMillion@ci.benicia.ca.us]
Sent: Tuesday, September 29, 2015 11:47 AM
To: Rachael E. Koss
Subject: AERMOD Data

Rachael,

Thank you for the voicemail. I will call you shortly. The DVD should have two folders:

1. Project Uprail
2. Updated Refinery

I have attached all the files for the "Project Uprail" folder. The "Updated Refinery" files are too large to email so I will mail them again. If you are planning on attending the Planning Commission meeting this evening I can also make it available to you then.

Amy E. Million, Principal Planner
City of Benicia
250 East L Street
Benicia, CA 94510
phone 707. 746.4372 | fax 707.747.1637 | email amillion@benicia.org

www.ci.benicia.ca.us

---

8 attachments

aub1_aermod_6yrs_OTHER.LST
1790K

AUB2.LST
3762K

CEQA Risk and PM25-UpdatedOEHHA_June2015.xlsx
44K

Chico.LST
1843K

Fairfield_6yrs_OTHER.LST
315K

Marysville.LST
2926K

redding.LST
1669K

Truckee.LST
1830K

ADAMS BROADWELL JOSEPH & CARDOZO
A PROFESSIONAL CORPORATION
ATTORNEYS AT LAW
601 GATEWAY BOULEVARD, SUITE 1000
SOUTH SAN FRANCISCO, CA 94080-7037
TEL: (650) 589-1660
FAX: (650) 589-5062
rkoss@adamsbroadwell.com

DANIEL L. CARDOZO
CHRISTINA M. CARO
THOMAS A. ENSLOW
TANYA A. GULESSERIAN
LAURA E. HORTON
MARC D. JOSEPH
RACHAEL E. KOSS
JAMIE L. MAULDIN
ELLEN L. WEHR

SACRAMENTO OFFICE
520 CAPITOL MALL, SUITE 350
SACRAMENTO, CA 95814-4721
TEL: (916) 444-6201
FAX: (916) 444-6209

January 11, 2016

VIA U.S. AND FACSIMILE

RECEIVED
JAN 11 2016
CITY CLERK'S OFFICE
BENICIA, CA

Brad Kilger, City Manager
City of Benicia
250 East L Street
Benicia, CA 94510
Fax: (707) 747-8120

Lisa Wolf, City Clerk
City of Benicia
250 East L Street
Benicia, CA 94510
Fax: (707) 747-8120

Amy Million, Principal Planner
City of Benicia
250 East L Street
Benicia, CA 94510
Fax: (707) 747-1637

Re: Request for Documents Related to the Valero Benicia Crude by Rail Project (SCH # 2013052074)

Dear Mr. Kilger, Ms. Wolf and Ms. Million:

We are writing on behalf of Safe Fuels and Energy Resources California to request ***immediate access*** to all documents related to Valero Benicia Crude by Rail Project generated or received by the City of Benicia *since the date of our last request on September 1, 2015.* This request includes the AERMOD modeling input files which support the findings of the quantitative health risk assessments in the Recirculated Draft Environmental Impact Report Appendices B and C.[1]

[1] In response to our September 1, 2015 request, we received the modeling *results* but not the modeling *input files*. Without the input files, it is impossible for the public to verify the City's conclusions regarding the Project's health risks.

Printed on recycled paper

This request is made pursuant to the California Public Records Act, Government Code Section 6250 et seq. We request ***immediate access*** to review the above documents pursuant to section 6253(a) of the Public Records Act, which requires public records to be "open to inspection at all times during the office hours of the state or local agency" and provides that "every person has a right to inspect any public record."[2] This request seeks access to the above documents for inspection under Section 6253(a) only, and does not request that the City provide copies of these documents. Therefore, the ten day response period applicable to a "request for a copy of records" under Section 6253(c) does not apply to this request.

In responding to this request, any exemptions from disclosure the City may believe to be applicable are to be narrowly construed.[3] If the City declines to produce any of the requested documents on the grounds of an exemption, the Public Records Act imposes a duty on the City to distinguish between the exempt and the non-exempt portion of any such records, and to attempt in good faith to redact the exempt portion and to disclose the balance of such documents.[4] Further, should the City choose to withhold any document from disclosure, the City has a duty under Government Code section 6255, subd. (a) to "justify withholding any record by demonstrating that the record in question is exempt under express provisions" of the Public Records Act or that "the public interest served by not disclosing the record clearly outweighs the public interest served by disclosure of the record."[5]

If any of the requested items are available on the Internet, we request that the City direct us to the appropriate URL web address or other site for accessing the documents. Pursuant to Government Code section 6253.9, if the requested documents are in electronic format and are 10 MB or less (or can be easily broken into chunks of 10 MB or less), please email them as attachments. We request access to the above documents, including any electronic documents, in their original form, as maintained by the City.[6] We reserve the right to have a copy service make copies of any and all of the requested documents depending on the volume.

---

[2] Govt. Code § 6253(a).
[3] *Marken v. Santa Monica-Malibu Unif. Sch. Dist.* (2012) 202 Cal. App. 4th 1250,1262; *Citizens for Ceres v. Super. Ct.* (2013) 217 Cal.App.4th 889, 913 (the common interest doctrine cannot apply to communications between a developer and a reviewing public agency made before project approval).
[4] Gov. Code § 6253(a).
[5] *Id.*
[6] Gov. Code § 6253.9(a)(1); *see Sierra Club v. Super. Ct.* (2013) 57 Cal. 4th 157, 161.

Printed on recycled paper

Once you have located the requested documents, please contact me to arrange a date and time for inspection and/or copying. Please use the following contact information for all correspondence regarding this request:

Rachael Koss
Adams Broadwell Joseph & Cardozo
601 Gateway Boulevard, Ste. 1000
South San Francisco, CA 94080
rkoss@adamsbroadwell.com
Phone: (650) 589-1660

Thank you for your assistance with this matter.

Sincerely,

Rachael Koss

REK:ric

3111-010rc

printed on recycled paper

ADAMS BROADWELL JOSEPH & CARDOZO

FAX TRANSMITTAL

NOTICE – PRIVILEGED AND CONFIDENTIAL INFORMATION
This message is for addressee only. Review, distribution or copy by others is strictly prohibited. Notify us immediately by telephone if you received this message in error and return the original.

TO:	Brad Kilger, City Manager	**FAX NO:**	(707) 747-8120
	Lisa Wolf, City Clerk		
	Amy Million, Principal Planner		(707) 747-1637
FROM:	Rachael Koss	**DATE:**	January 11, 2016

ENCLOSURE: Request for Documents Related to the Valero Benicia Crude by Rail Project (SCH # 2013052074)

PAGES, including cover: 4

See attached.

601 Gateway Boulevard, Suite 1000
South San Francisco, California 94080-7037
Telephone: (650) 589-1660
Facsimile: (650) 589-5062
E-mail: chavezr@adamsbroadwell.com

THE CITY OF BENICIA CALIFORNIA
A SESQUICENTENNIAL CITY 1847 ★ 1997

CITY HALL • 250 EAST L STREET • BENICIA, CA 94510 • (707) 746-4216 • FAX (707) 746-1196

CITY ATTORNEY'S OFFICE
HEATHER C. Mc LAUGHLIN
City Attorney

January 20, 2016

VIA EMAIL AND MAIL

Rachel Koss
Adams Broadwell Joseph & Cardozo
601 Gateway Boulevard, Suite 1000
South San Francisco, CA 94080
rkoss@adamsbroadwell.com

Re: Public Records Act Request Dated January 11, 2016

Dear Ms. Koss:

This is the second response in response to your request submitted pursuant to the California Public Records Act ("CPRA") dated January 11, 2016 and received by the City on January 11, 2016. Your request is for "***immediate access*** to all documents related to Valero Benicia Crude by Rail Project generated or received by the City of Benicia *since the date of [your] last request on September 1, 2015* [including] the AERMOD modeling input files which support the findings of the quantitative health risk assessments in the Recirculated Draft Environmental Impact Report Appendices B and C."

Your request has been made pursuant to the California Records Act, Government Code Section 6253(a) which requires public records to be "open to inspection at all times during the office hours of the state or local agency" and provides that "every person has a right to inspect any public record. Your request specifies that you are not requesting copies of these documents at this time, but reserve the right to do so.

The City of Benicia has the following documents available for public review at the City Attorney's Office during all open office hours, 8:00 a.m. - 12:00 p.m., 1:00 p.m. – 5:00 p.m., Monday-Friday. These documents have been available prior to the date of your request:

- Email correspondence generated by the City from the beginning of the project to November 6, 2014
- Mailed correspondence that is not available on the website
- Public records requests and responses (Note: most requests and responses were made via email and are thus contained in the email

ELIZABETH PATTERSON, *Mayor*
Members of the City Council
MARK C. HUGHES, *Vice Mayor* . ALAN M. SCHWARTZMAN . TOM CAMPBELL . CHRISTINA STRAWBRIDGE

BRAD KILGER, *City Manager*
KENNETH C. PAULK, *City Treasurer*
LISA WOLFE, *City Clerk*

Recycled Paper

correspondence files, requests received as mailed letters are available separately)

- In addition,
  - all public comments, versions of the Environmental Impact Report in its stages of review and supplemental materials are available on the City's Valero Crude by Rail webpage at: http://www.ci.benicia.ca.us/index.asp?Type=B_BASIC&SEC={FDE9A332-542E-44C1-BBD0-A94C288675FD},
  - Planning Commission Meeting agendas and minutes are available on the City's webpage at: http://www.ci.benicia.ca.us/index.asp?Type=B_BASIC&SEC={7852828E-F72B-42A3-83D6-F1C06E273ED0},
  - City Council Meeting agendas and minutes are available on the City's webpage at: http://www.ci.benicia.ca.us/index.asp?Type=B_BASIC&SEC={FDE9A332-542E-44C1-BBD0-A94C288675FD}

Some of the above files are available electronically in the City's system and some are available in hard copy for review. Due to the volume of the documents generated and the size of the files, we are not able to send them via email. However, upon request, we will gladly send the files on a CD or provide them in electronic files for a copy service or personal flash drive. Arrangements for paper copies may also be made if desired. The City's standard copy charges apply, $1.00 per disc or 20¢ per page for paper copies.

In addition to the documents listed above, the City Attorney's Office is in the process of reviewing:

- Administrative project records from the Planning Department
- Email correspondence generated by the City from November 6, 2014 to September 14, 2015
- Emails generated by the City related to the project between the dates of September 14, 2015 – January 11, 2016.

These documents are not yet available for immediate review as there are a vast number of documents and they contain documents for which there may be exemptions from disclosure and as such must be reviewed by the City Attorney before releasing to the public. We hope to have the first two items available for you on Monday January 25, 2016 and the third item as soon as possible. You will be notified as soon as these documents are available for public review.

As a courtesy, we are providing a copy of all documents that are available for public review as of January 11, 2016 on the enclosed discs. Much of this information predates the period for which you are requesting information, however, we would like to disclose all public information in the interest of open evaluation in regards to this project.

The first response to your request from Amy Million, Principal Planner, via email dated January 15, 2016 provided a list of public comments for inclusion in the Planning Commission staff report for February 8th as well as a PDF of all comments not already on the City's website described as:

1. Use permit or general project comments (not on the EIR); and
2. EIR comments after the close of the EIR comment period.

The response further stated, "The City Attorney's Office is working on compiling the emails associated with this project. I will also let you know as soon as I hear from Valero on the AERMOD data." The City has not yet heard from Valero in regards to our request for access to the data. Please note, as stated in our response dated September 24, 2015, the City is not obligated under the Public Records Act to produce documents that are not public records in the City's possession, and there is no basis to suggest that a project applicant's consultant's files are within the City's "possession".

This response on behalf of the City of Benicia is being provided in accordance with the requirements of the CPRA and the Open Government Ordinance of the City of Benicia contained in Title 4 of the Benicia Municipal Code.

If you have any questions or can offer controlling legal authority that you believe requires different conclusions from those discussed above, please feel free to contact me. Please also let me know if you need any additional information.

Sincerely,

Heather C. Mc Laughlin
City Attorney

Enclosures

cc: City Clerk (without enclosures)
City Manager (without enclosures)
Community Development Director (without enclosures)
Principal Planner (without enclosures)

Memorandum

RECEIVED
SEP 23 2015
CITY OF BENICIA
COMMUNITY DEVELOPMENT

To: File

From: Tim Rimpo

Date: July 20, 2015

Re: Confidence Check on Valero Crude by Rail Project Calculations

---

This memo summarizes calculations used to verify ERM's health risk estimates for the Valero Crude by Rail Project. This evaluation was conducted because the AERMOD files used to estimate health risks were not provided to ESA. This memo focuses on results included in the ERM 15 June 2015 Memorandum: *Updated Methodology for Assessment of Health Risk and PM2.5 Concentrations at the Refinery and at Receptors near Location Tracks in Fairfield (11 June 2014) Amended 15 June 2015.*

Fairfield

Calculation of Cancer Risk

Fairfield Rail Source Locations, Figure 2, shows a maximum PM2.5 concentration of 0.004 ug/m3, a maximum residential chronic hazard index of 0.008 ug/m3, and a maximum residential cancer risk of 4.0 in a million. All concentrations were recorded at the same location shown in Figure 2 of ERM report.

Using the maximum residential chronic hazard index multiplied by 5 results in a maximum PM10 concentration of 0.04 (0.08 x 5) ug PM10/m3. This is the same value as the max PM2.5 concentration, which means ERM assumes PM10 and PM2.5 are equivalent. The California Air Resources Board's HARP2 risk assessment standalone tool (dated 15071) was used to calculate 70-year health risks using the PM10 concentration of 0.04 ug/m3. The estimated cancer risk using this tool equals: 3.94E-6 or 3.9 in a million. Consequently, the ERM value is slightly higher and more conservative than the calculation using ARB's tool.

Conclusion – ERM's health risk calculations to convert PM10 concentrations to cancer risk are slightly more conservative than the risk calculations programmed into ARB's HARP 2 Risk Assessment Standalone Tool.

Dispersion Modeling

I used AERMOD to estimate concentrations for the Fairfield site. AERMOD output is attached. I also used the following inputs for AERMOD:
Emission rate 2.65E-4 grams DPM per second
Source Type – line source
Meteorological data: Travis Air Force Base 2009 – 2013
Annual PM10 average concentrations
Receptor locations: approximate locations of residences included in ERM report.

The resulting maximum modeled that I obtained was 3.96E-3 ug/m3, which is similar to but slightly less than ERM calculation. This is about as close as could be expected given that the AERMOD files were not provided by ERM.

Dixon

Calculation of Cancer Risk

The Dixon rail Source locations in Figure 3 of the ERM memo show a maximum PM2.5 concentration of 0.0021 ug/m3, a maximum residential chronic hazard index of 0.004 ug/m3 and a maximum residential cancer risk of 2.2 in a million. All concentrations recorded at the same location as shown in Figure 3.

Using the maximum residential chronic value, HI (0.004) x 5 = 0.02 ug PM10/m3. The California Air Resources Board's HARP2 risk assessment standalone tool (dated 15071) was used to calculate 70-year health risks using the 0.02 ug/m3 value. Using 0.02, HARP2 estimates the following cancer risk: 1.97E-6 or 1.97 in a million. ERM's value is slightly higher (more conservative) than the calculation using ARB's tool.

Conclusion – ERM's health risk calculations to convert PM10 concentrations to cancer risk are slightly more conservative than the risk calculations programmed into ARB's HARP 2 Risk Assessment Standalone Tool.

AERMOD output file

```
 *** AERMOD - VERSION  12060 ***    *** C:\Lakes\AERMODView\Valero\
7/19/15
                                   ***
12:00:56                                                                                                                  ***

PAGE   1
 **MODELOPTs:  RegDFAULT CONC
                                                                                                   ELEV

                                          ***     MODEL SETUP OPTIONS SUMMARY        ***
 - - -
```

```
        Model Outputs Tables of PERIOD Averages by Receptor
        Model Outputs External File(s) of High Values for Plotting (PLOTFILE Keyword)
        Model Outputs Separate Summary File of High Ranked Values (SUMMFILE Keyword)

 **NOTE:  The Following Flags May Appear Following CONC Values:  c for Calm Hours
                                                                 m for Missing Hours
                                                                 b for Both Calm and Missing Hours

 **Misc. Inputs:  Base Elev. for Pot. Temp. Profile (m MSL) =    10.00 ;  Decay Coef. =    0.000     ;  Rot. Angle =
0.0
                  Emission Units = GRAMS/SEC                                ;  Emission Rate Unit Factor =
0.10000E+07
                  Output Units   = MICROGRAMS/M**3

 **Approximate Storage Requirements of Model =      3.6 MB of RAM.

 **Detailed Error/Message File:   Valero.err
 **File for Summary of Results:  Valero.sum
```

```
 *** AERMOD - VERSION  12060 ***    *** C:\Lakes\AERMODView\Valero\***
07/19/15
                                   ***                                                                    ***
12:00:56

PAGE   2
 **MODELOPTs:  RegDFAULT CONC                                                    ELEV

                                   *** METEOROLOGICAL DAYS SELECTED FOR PROCESSING ***
                                                (1=YES; 0=NO)

          1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1
          1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 11 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1
          1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1
          1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 11 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1
          1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1
          1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
          1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1
          1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1

                METEOROLOGICAL DATA PROCESSED BETWEEN START DATE: 2009   1  1  1
                                                     AND END DATE: 2013  12 31 24

            NOTE:  METEOROLOGICAL DATA ACTUALLY PROCESSED WILL ALSO DEPEND ON WHAT IS INCLUDED IN THE DATA FILE.


                                   *** UPPER BOUND OF FIRST THROUGH FIFTH WIND SPEED CATEGORIES ***
                                                (METERS/SEC)

                                          1.54,   3.09,   5.14,   8.23,  1080,
```

```
 *** AERMOD - VERSION  12060 ***    *** C:\Lakes\AERMODView\Valero\***
07/19/15
                                   ***                                                                    ***
12:00:56

PAGE   3
 **MODELOPTs:  RegDFAULT CONC                                                    ELEV

                                   *** UP TO THE FIRST 24 HOURS OF METEOROLOGICAL DATA ***

   Surface file:   745160.SFC                                                                    Me version:
14134
   Profile file:   745160.PFL
   Surface format: FREE
   Profile format: FREE
   Surface station no.:    23202                    Upper air station no.:    23230
                 Name: UNKNOWN                                     Name: OAKLAND/WSO_AP
                 Year:   2009                                       Year:   2009

 First 24 hours of scalar data
 YR MO DY JDY HR     H0     U*     W*  DT/DZ ZICNV ZIMCH  MO LEN    Z0  BOWEN ALBEDO  REF WS  WD     HT  REF TA
HT
- - - -
```

09	01	01	1	08	-999.0	-9.000	-9.000	-9.000	-999.	-999.	-99999.0	0.26	0.92	1.00	0.00	0.	10.0	278.1	2.0
09	01	01	1	09	-999.0	-9.000	-9.000	-9.000	-999.	-999.	-99999.0	0.26	0.92	0.42	0.00	0.	10.0	278.1	2.0
09	01	01	1	10	5.6	0.226	0.239	0.015	88.	258.	-187.2	0.38	0.92	0.29	1.76	111.	10.0	278.1	2.0
09	01	01	1	11	14.2	0.371	0.401	0.014	165.	543.	-328.7	0.24	0.92	0.24	3.36	24.	10.0	278.4	2.0
09	01	01	1	12	18.9	0.297	0.492	0.016	230.	392.	-126.7	0.17	0.92	0.23	2.86	356.	10.0	278.2	2.0
09	01	01	1	13	19.6	0.274	0.534	0.016	281.	345.	-95.6	0.24	0.92	0.23	2.36	3.	10.0	278.1	2.0
09	01	01	1	14	16.4	0.239	0.523	0.015	317.	281.	-75.6	0.38	0.92	0.24	1.76	99.	10.0	278.1	2.0
09	01	01	1	15	9.2	-9.000	-9.000	-9.000	336.	-999.	-99999.0	0.26	0.92	0.27	0.00	0.	10.0	278.1	2.0
09	01	01	1	16	-999.0	-9.000	-9.000	-9.000	-999.	-999.	-99999.0	0.26	0.92	0.35	0.00	0.	10.0	279.1	2.0
09	01	01	1	17	-999.0	-9.000	-9.000	-9.000	-999.	-999.	-99999.0	0.26	0.92	0.60	0.00	0.	10.0	279.1	2.0
09	01	01	1	18	-999.0	-9.000	-9.000	-9.000	-999.	-999.	-99999.0	0.26	0.92	1.00	0.00	0.	10.0	279.0	2.0
09	01	01	1	19	-19.7	0.344	-9.000	-9.000	-999.	484.	187.1	0.47	0.92	1.00	2.86	154.	10.0	279.2	2.0
09	01	01	1	20	-13.2	0.230	-9.000	-9.000	-999.	272.	83.6	0.47	0.92	1.00	2.10	127	10.0	279.1	2.0
09	01	01	1	21	-13.2	0.230	-9.000	-9.000	-999.	265.	83.6	0.47	0.92	1.00	2.10	130.	10.0	279.1	2.0
09	01	01	1	22	-21.7	0.378	-9.000	-9.000	-999.	559.	226.5	0.47	0.92	1.00	3.10	132.	10.0	279.1	2.0
09	01	01	1	23	-13.2	0.230	-9.000	-9.000	-999.	280.	83.6	0.47	0.92	1.00	2.10	130.	10.0	279.1	2.0
09	01	01	1	24	-23.7	0.415	-9.000	-9.000	-999.	641.	272.2	0.47	0.92	1.00	3.36	150.	10.0	279.5	2.0

First hour of profile data

YR	MO	DY	HR	HEIGHT	F	WDIR	WSPD	AMB_TMP	sigmaA	sigmaW	sigmaV
09	01	01	01	10.0	1	121.	1.76	278.4	99.0	-99.00	-99.00

F indicates top of profile (=1) or below (=0)

```
 *** AERMOD - VERSION  12060 ***    *** C:\Lakes\AERMODView\Valero\ ***
07/19/15
                                   ***
12:00:56                                                                                                  ***

PAGE   4
 **MODELOPTs:  RegDFAULT CONC                                                          ELEV

                                  *** THE SUMMARY OF MAXIMUM PERIOD ( 43824 HRS) RESULTS ***

                                 ** CONC OF PM_10     IN MICROGRAMS/M**3                                **

GROUP ID                          AVERAGE CONC                 RECEPTOR  (XR, YR, ZELEV, ZHILL, ZFLAG OF TYPE  NETWORK
- - - -
```

```
 *** AERMOD - VERSION  12060 ***    *** C:\Lakes\AERMODView\Valero\***
07/19/15
                                   ***                                                                    ***
12:00:56

PAGE   5
 **MODELOPTs:  RegDFAULT CONC                                          ELEV


 *** Message Summary : AERMOD Model Execution ***

  --------- Summary of Total Messages --------

 A Total of            0 Fatal Error Message(s)
 A Total of            0 Warning Message(s)
 A Total of         5308 Informational Message(s)

 A Total of        43824 Hours Were Processed

 A Total of         3689 Calm Hours Identified

 A Total of         1619 Missing Hours Identified (  3.69 Percent)


    ******** FATAL ERROR MESSAGES ********
              ***  NONE  ***


    ********   WARNING MESSAGES   ********
              ***  NONE  ***
```

NOSSAMAN LLP

ATTORNEYS AT LAW

18101 Von Karman Avenue
Suite 1800
Irvine, CA 92612
T 949.833.7800
F 949.833.7878

John J. Flynn III
D 949.477.7634
jflynn@nossaman.com

Refer To File #: 290396-0017

February 1, 2016

Bradley R. Hogin, Esq.
Woodruff, Spradlin & Smart
555 Anton Blvd., Suite 1200
Costa Mesa, CA 92626-7670

Re: Comment on Risk Values presented in Appendix E.6 of the RDEIR, Valero Benicia Crude by Rail Project (SCH #2013052074); Use Permit Application 12PLN-00063

Dear Mr. Hogin:

This letter provides updates to risk values presented in Appendix E.6 of the RDEIR (memo date 15 June 2015), upon review related to Comment response J6-9 in the FEIR.

The commenter questioned the risk reported for the maximum exposed individual worker (MEIW) and referred to a dispersion factor at a location for the MEIW in the modeling files referenced by the RDEIR. The MEIW location was verified to have been incorrectly reported in the RDEIR modeling files, due to a shift of coordinates in the basemap used to plot the receptors for the results reported in the RDEIR, Appendix E.6. That MEIW in the RDEIR modeling files is not located at a commercial building where a worker would be present, but rather in the landscaping near a driveway of a commercial property. It is not appropriate to report risk values for a worker receptor at a location where a worker would not be present on an annual basis. The original modeling for the 2014 DEIR used the basemap that is included in the file set with this memo. This basemap shows the correct placement of sources relative to the aerial photograph. In this basemap, the MEIW is located at receptor UTM 576,044E, 4,214,245N, which coincides with a commercial building. Note that the basemap is in the NAD27 Zone 10 projection.

The modeling results affected by the basemap shift are those in Table 1 of the RDEIR, Appendix E.6 memorandum dated 15 June 2015. A revision to Table 1 is presented as an attachment to this letter with values in bold italics that are updated from the 15 June 2015 memorandum. Only the MEIW risk, MEIW Chronic Hazard Index, and the MEIW PM2.5 concentration values of Table 1 were slightly affected. There was no effect on the risk modeling results for the MEIR, MSR, or uprail locations.

The updated health risk calculations using accurate basemap coordinates are shown as an attachment to this letter. Figure 1 shows the location of the MEIW. Table 1 modeling results will be provided in a separate file.

Thank you very much for the opportunity to provide this clarification.

Very truly yours,

John J. Flynn III
of Nossaman LLP

JJF:rrg

Attachment

Table 1 Maximum Cancer and Non-Cancer Risk

Type of Estimated Health Impact	**Cancer Risk per million (Receptor Location)**	**Chronic Hazard Index (Receptor Location)**	**Acute Hazard Index (Receptor Location)**	**$PM_{2.5}$ Annual Concentration ($\mu g/m^3$) (Receptor Location)**
Maximum Exposed Individual Residential (MEIR)	4.0 Worst case risk at 90 feet northwest of train tracks in Fairfield (585145E, 4234384N)	0.004 Worst case risk at 90 feet northwest of train tracks in Fairfield (585145E, 4234384N)	0.0024 Near E. 5th Street, Benicia (575444E, 4212595N)	0.004 Worst case risk at 90 feet northwest of train tracks in Fairfield (585145E, 4234384N)
Maximum Exposed Individual Worker (MEIW)	~~***7.4***~~ ***7.6*** (576044E***, 4214245N)***	~~***0.014***~~ ***0.017*** (576044E***, 4214245N)***	0.048 (576144E, 4213045N)	~~***0.075***~~ ***0.077*** (576044E***, 4214245N)***
Maximum Sensitive Receptor (MSR)	0.25 Day-Care Center (574594E, 4212895N)	0.0003 Elementary School (574900E, 4212500N)	0.001 Elementary School (574900E, 4212500N)	0.001 Elementary School (574900E, 4212500N)

Attachment 1

Updates to Health Risk Calculations

Population	UTM X (m)	UTM Y (m)	Source	Chemical	Emission Rate (g/s)	Dispersion Factor	Concentration	Age bin	ED	DBR	EF	CF	FAH	ASF	AT	Cancer Potency Factor	Cancer Risk
Worker	576044	4214245	Line Haul	DPM	2.82E-03	1.77906	5.02E-03	16-70	40	230	0.68	0.000001	1	1	70	1.1	4.93E-07
Worker	576044	4214245	Switching	DPM	5.18E-03	8.08052	4.18E-02	16-70	40	230	0.68	0.000001	1	1	70	1.1	4.11E-06
Worker	576044	4214245	Idling	DPM	6.49E-04	46.872	3.04E-02	16-70	40	230	0.68	0.000001	1	1	70	1.1	2.99E-06
Worker	576044	4214245	Fugitive	Benzene	3.24E-04	7.33891	2.38E-03	16-70	40	230	0.68	0.000001	1	1	70	0.1	2.13E-08
Worker	576044	4214245	Fugitive	Ethylbenzene	2.16E-04	7.33891	1.59E-03	16-70	40	230	0.68	0.000001	1	1	70	0.0087	1.23E-09
Worker	**Overall Cancer Risk**																**7.6E-06**

Worker	576044	4214245	Line Haul	DPM	2.82E-03	1.77906	5.02E-03	5	0.001004
Worker	576044	4214245	Switching	DPM	5.18E-03	8.08052	4.18E-02	5	0.008365
Worker	576044	4214245	Idling	DPM	6.49E-04	46.872	3.04E-02	5	0.006081
Worker	576044	4214245	Fugitive	Benzene	3.24E-04	7.33891	2.38E-03	3	0.000793
Worker	576044	4214245	Fugitive	Ethylbenzene	2.16E-04	7.33891	1.59E-03	2000	7.93E-07
Worker	576044	4214245	Fugitive	Hexane	2.16E-04	7.33891	1.59E-03	7000	2.26E-07
Worker	576044	4214245	Fugitive	Hydrogen Sulfide	5.40E-04	7.33891	3.96E-03	10	0.000396
Worker	576044	4214245	Fugitive	Toluene	5.40E-04	7.33891	3.96E-03	300	1.32E-05
Worker	576044	4214245	Fugitive	Xylene	7.56E-04	7.33891	5.55E-03	700	7.93E-06
Worker	**Chronic Hazard Index**								**0.017**

Worker	576044	4214245	Line Haul	DPM	2.82E-03	1.77906	5.02E-03
Worker	576044	4214245	Switching	DPM	5.18E-03	8.08052	4.18E-02
Worker	576044	4214245	Idling	DPM	6.49E-04	46.872	3.04E-02
Worker	**PM2.5 Concentration**						**7.7E-02**

Attachment 2

Figure 1

Figure 1
MEIW Locations
Valero - Crude by Rail Project
Benicia, California

From: Amy Million [mailto:AMillion@ci.benicia.ca.us]
Sent: Tuesday, February 02, 2016 1:24 PM
To: Rachael E. Koss
Cc: Heather McLaughlin
Subject: Modeling Files for Valero CBR - Adams Broadwell Request

Hi Rachael,

Per my previous email, below is a link to the AERMOD files you have requested. I have also attached a letter from Valero which provides clarification on the risk values presented in Appendix E.6 of the RDEIR. If you have any problems accessing the file, let me know.

Some files have been sent to you via the **YouSendIt** File Delivery Service.

Download the file - AerialNad27.tfw; AerialNad27.tif; RefineryNad27.tfw; RefineryNad27.tif; Updated Refinery HRA Calculation Jan 2016.xlsx; Valero ceqa chronic_5yrs_CAN_RISK.DTA; Valero ceqa chronic_5yrs_CAN_RISK.LST; Valero ceqa switching.dta; Valero ceqa switching.LST

Your files will expire after 7 days.

Attached are:

1. AerialNad27.tif and .tfw – "zoomed out" or long-range base map view

2. RefineryNad27.tif and .tfw – close-in base map view

3. Valero ceqa chronic 5 yrs CAN RISK.DTA and .LST – Input and output files for near-refinery line-haul locomotives and fugitives

4. Valero ceqa switching.dta and .lst – Input and output files for near-refinery switch engines

5. Updated Refinery HRA Calculation Jan 2016 – excel file version of the attachment in the memo showing the MEIW risk calculations.

Amy E. Million, Principal Planner
City of Benicia
250 East L Street
Benicia, CA 94510
phone 707. 746.4372 | fax 707.747.1637 | email amillion@benicia.org

www.ci.benicia.ca.us

Valero Ltr 020116 Risk Values.pdf
306K

CEQA Guidelines
- Updated CEQA Guidelines
- CEQA Comment Letters
- Tools & Methodology
- Meetings
- Upcoming Training

Air Quality Standards
CARE Program
Climate Protection Program
Emission Inventory
Particulate Matter
Plans
Commuter Benefits Program
Research and Modeling
Rule Development
Rules and Regulations
Smart Growth

Bay Area Images

Napa County

Air Quality Fact

It is the Air District's job to adopt rules and policies that are fair and equitable to all residents of the Bay Area and to ensure that community-level air pollution problems are not eclipsed by larger-scale policy issues.

Give Us Your Feedback

Name:

Email:

Select a Topic...

Comments or questions:

(500 character limit)

I would like a response.
(Allow 5-7 business days)

CEQA Guidelines

UPDATED 1/16/2014

UPDATE: January 16, 2014: On June 2, 2010, the Bay Area Air Quality Management District's Board of Directors unanimously adopted thresholds of significance to assist in the review of projects under the California Environmental Quality Act. These Thresholds are designed to establish the level at which the District believed air pollution emissions would cause significant environmental impacts under CEQA and were posted on the Air District's website and included in the Air District's updated CEQA Guidelines (updated May 2012).

On March 5, 2012 the Alameda County Superior Court issued a judgment finding that the Air District had failed to comply with CEQA when it adopted the Thresholds. The court did not determine whether the Thresholds were valid on the merits, but found that the adoption of the Thresholds was a project under CEQA. The court issued a writ of mandate ordering the District to set aside the Thresholds and cease dissemination of them until the Air District had complied with CEQA. The Air District has appealed the Alameda County Superior Court's decision. The Court of Appeal of the State of California, First Appellate District, reversed the trial court's decision. The Court of Appeal's decision was appealed to the California Supreme Court, which granted limited review, and the matter is currently pending there.

In view of the trial court's order which remains in place pending final resolution of the case, the Air District is no longer recommending that the Thresholds be used as a generally applicable measure of a project's significant air quality impacts. Lead agencies will need to determine appropriate air quality thresholds of significance based on substantial evidence in the record. Although lead agencies may rely on the Air District's updated CEQA Guidelines (updated May 2012) for assistance in calculating air pollution emissions, obtaining information regarding the health impacts of air pollutants, and identifying potential mitigation measures, the Air District has been ordered to set aside the Thresholds and is no longer recommending that these Thresholds be used as a general measure of project's significant air quality impacts. Lead agencies may continue to rely on the Air District's 1999 Thresholds of Significance and they may continue to make determinations regarding the significance of an individual project's air quality impacts based on the substantial evidence in the record for that project.

Various tools and resources are available on this website to assist local jurisdictions in applying the Air District's CEQA Guidelines.

For more information, please contact Sigalle Michael, Senior Environmental Planner at smichael@baaqmd.gov or 415-749-4683.

Learn more about the updated CEQA Guidelines.

View the District's 1999 CEQA Guidelines.

To view the State CEQA Guidelines and related materials visit the California Resources Agency.

California Air Districts Launch Greenhouse Gas Exchange

Update: January 2, 2014

The California Air Pollution Control Officers Association (CAPCOA), representing California's 35 local air districts, has launched the CAPCOA *Greenhouse Gas Exchange*. The *Exchange* provides a reliable, low-cost, secure platform to encourage locally generated, high quality GHG emission reduction credits that can be used to meet CEQA or other compliance requirements.

CalEEMod Release

Update: August 5, 2013

On July 31, 2013, the California Air Pollution Control Officers Association (CAPCOA) released CalEEMod 2013.2. This land use model can be downloaded from www.caleemod.com. From this point forward, the BAAQMD will no longer support the use of Urbemis. Please perform all future analyses using CalEEmod. For more information or to ask questions, please contact Alison Kirk, Senior Environmental Planner at akirk@baaqmd.gov or 415-749-5169.

Utility Buttons

Share

Wood Burning Status

Friday, 1/24
No Spare the Air Alert in Effect

SATURDAY, 1/25
WINTER SPARE THE AIR ALERT
IN EFFECT

ILLEGAL TO BURN

winter spare the air alert

Air Quality Widgets | BAAQMD

Participate

BAAQMD Webcasts

Recent Webcasts

1/21/2014 CAPCOA GHG Reduction Exchange Public Workshop
More Information:
Agenda
(63 kb PDF, 1 pg)

12/18/2013 Regular Board Meeting
More Information:
Agenda
(3 Mb PDF, 178 pgs)

Board Archives:

Agendas, Minutes and Media

Webcast Support
System & player requirements, RSS feeds & mobile alternatives.

BAAQMD on iTunes

iTunes Audio Podcasts
iTunes Video Podcasts

Contacts

VALERO

Benicia Refinery • Valero Refining Company - California
3400 East Second Street • Benicia, California 94510-1097 • Telephone (707) 745-7011 • Facsimile (707) 745-7432

April 2, 2013

Crude by Rail Project
Response to ESA Data Request No. 2
Valero Refining Company – California

Mr. Tim Morgan
Project Manager
ESA
1425 N. McDowell Boulevard, Suite 200
Petaluma, CA 94954

Dear Mr. Morgan:

Enclosed is Valero's response to ESA's questions in Data Request No. 2, associated with Valero's Crude by Rail project at the Valero Refinery in Benicia, California. This request was submitted by ESA to Valero by email on March 15, 2013.

Please contact me at 707-745-7203 if you have any questions or need additional information.

Sincerely,

Susan K Gustofson

Susan K. Gustofson, P.E.
Staff Environmental Engineer

SKG/

Enclosures

cc: (w/enclosures)
Mr. Charlie Knox, City of Benicia
Mr. Corey Barringhaus, ESA
Mr. Chuck Bennett, ESA
Mr. Matthew Fagundes, ESA

ecc: (w/enclosures)
Ms. Lynn McGuire, ERM

Document # 23691

VALERO RESPONSES TO:

VALERO CRUDE BY RAIL PROJECT
DATA REQUEST NUMBER 2
April 2, 2013

REVIEW OF CRUDE BY RAIL AIR PERMIT APPLICATION

ESA has reviewed Valero's Crude by Rail (CBR) Project Air Permit Application relative to the City's CEQA review for the project and has the following comments, questions, and requests.

1. **Potential Decline in Crude Oil Feed Stocks by Pipeline**
   a. Contra Costa County recently approved a crude tank project for another Bay Area refinery (Shell Martinez). The project allows the refinery to maintain current production levels by increasing marine vessel deliveries, necessary because it was projected that San Joaquin Valley (SJV) crude oil feed stocks now received by pipeline would continue to diminish. While the CBR has not been proposed for this reason, the air permit application and other documentation are silent on whether crude oil supply delivered by pipeline would decline and be replaced by crude oil delivered by rail.
   b. Also, we note that the second to last paragraph on application page 10 indicates that the proposed crude oil throughput at tank S-97 (Tank 1776) would be offset by a corresponding decrease in throughput at the facility's other crude oil storage tanks that are currently served by ship <u>and by pipeline</u>, which suggests the possibility that some of the oil delivered by rail could offset oil now delivered by pipeline. Please clarify.
   c. How can the City be sure that the CBR project crude will not replace crude shipments by pipeline?

Responses 1-a, 1-b, 1-c, 2-b. *Valero does not anticipate a change in the amount of crudes received by pipeline. This project was implemented to take advantage of land-locked North American crudes that have recently become available. Valero plans to continue to receive crude at the Benicia refinery via pipeline, and does not anticipate a change in the volume of crudes received by pipeline as a result of this project. The North American sourced crudes proposed to be received by railcar are similar to crudes currently supplied by marine vessel from the Alaskan North Slope (ANS look-alikes).*

Pipeline-supplied crudes have different crude characteristics than the ANS look-alikes. The crudes supplied by pipeline require storage in a heated tank. The existing crude storage tanks are located in the crude storage tank field and are configured only to receive crude by pipeline and by marine vessel. These tanks are not configured to receive crude from the proposed railcar unloading rack. The North American sourced crudes proposed by this project will be transported in unheated railcars and will be stored in an unheated storage tank that is in the vicinity of the unloading rack and in a different location than the existing crude storage tank field.

The Benicia refinery processes a mixture of crudes from throughout California, the United States and the world. These crudes are blended together at the refinery to assure safe and compliant

processing utilizing current refinery hardware and within permitted limits. Because there will be no change to the process units as a result of the proposed method of crude receipt, the refinery's 'diet' of crudes processed must also remain within existing parameters.

We understand that there has been discussion that the California crudes received via pipeline may decline in the future. Crude availability from <u>any</u> source is driven by factors that are outside of Valero control. Because only a portion of the crude supply to the Benicia Refinery is by pipeline, we anticipate that this crude conveyance will remain an available and viable source of supply in the foreseeable future.

The BAAQMD has the jurisdiction to regulate air emissions in the San Francisco Bay Area. Valero's VIP project was a fully-offset emissions reduction project (no net emissions increase) permitted by the BAAQMD. A provision of the VIP permit included a limit on ship emissions from waterborne materials receipts. Valero currently operates well within this permit limit. The VIP permit also included a provision allowing Valero to amend this emission limit if, for example, crude supplied to the Benicia refinery via pipeline were to decline. To maintain marine deliveries of crude at levels allowed in the VIP permit, that provision provided a process to increase waterborne crude receipts provided there were no net emissions increase (fully offset). This means that emissions increases from waterborne receipts would require emissions reductions elsewhere at this facility. If the availability of pipeline crude were to decline today, the Title V permit allows an increase in waterborne crude up to the limits of the current permit. Valero does not, however, anticipate a change in the amount of crudes received by pipeline.

2. **Marine Baseline Emissions Assumptions and Air Permit Limits**
   a. The BAAQMD permit application analysis includes baseline marine vessel emissions calculated starting from the sea buoy (approximately 11 nautical miles west of the Golden Gate Bridge) and ending at the Refinery Wharf. Other CEQA lead agencies (e.g., Contra Costa County and California State Lands Commission) recently have used lower distance assumptions to estimate marine vessel emissions associated with refinery marine terminal projects in the Bay Area. For the Shell Crude Tank Replacement Project (2012), Contra Costa County used vessel travel emissions starting at Golden Gate Bridge. For the NuStar Shore Marine Oil Terminal Lease Project (2012), State Lands used a marine vessel transit distance from the nearest ship lane in the bay to the marine terminal. Clearly the distance affects the CBR project baseline emissions, and the assumption that emissions begin to be counted at the sea buoy represents the least conservative option for marine vessel travel distance. What is the justification for using the sea buoy rather than another location, such as the Golden Gate Bridge, for the marine vessel start locations?
   b. The last sentence on page 13 indicates that no changes are proposed related to the existing air permit limits associated with existing ship and barge delivery emissions estimates. This gives the City no assurance that the proposed crude oil shipments by rail would actually result in a decline in marine vessel deliveries. What mechanism do you propose to assure the City that the CBR project would actually reduce marine vessel deliveries and emissions?

Response 2a. *The sea buoy was used to estimate marine vessel travel distances based on feedback from BAAQMD and amended BAAQMD Regulation 2-2. Prior to estimating marine vessel emissions, ERM contacted Ms. Alison Kirk, a CEQA planner at BAAQMD, to determine if there were any BAAQMD guidelines that specified the distance over which marine vessel emissions should be estimated. Ms. Kirk stated BAAQMD did not have such guidelines, but recommended including the distance up to the sea buoy (also known as the point where the bar pilot boards the ship), which is approximately 11 nautical miles west of Golden Gate Bridge, to estimate marine vessel emissions. This distance is consistent with amended BAAQMD Regulation 2-2 (adopted December 19, 2012), which specifies in Section 610 that emissions from cargo carriers operating within California Coastal Waters up to 11 nautical miles from the Golden Gate Bridge should be included as part of the source's emissions for the purposes of estimating offset requirements.*

Response 2b. *As indicated previously, the refinery's total crude processing capacity is limited by its BAAQMD Permit to Operate, so that any increase in volumes of crude received by rail will necessarily result in a corresponding decrease in volumes received by marine vessel. Valero proposes that the existing constraints on processing capacity in the BAAQMD Permit to Operate are sufficient to ensure that the CBR project will result in reducing marine vessel deliveries and emissions.*

3. Storage Tank Baseline Emissions

Given that there would be no change in product produced at the refinery under the CBR project, we assume that the jet fuel now stored at tank S-97, but displaced by crude brought in by rail, would be stored at other existing refinery product tanks that currently operate below their permitted limits. Under this assumption, the jet fuel fugitive POC and TAC baseline emissions should not be subtracted from the project emissions for the CEQA analysis because they would continue to be emitted at the Refinery. Is this correct? If not, please explain why not?

Response 3. *Yes, your comment is correct. POC and TAC baseline emissions from the products currently stored in S-97 should not be subtracted from the project emissions for CEQA analysis because they could continue to be emitted from other existing sources within the facility that are currently permitted for storage and service of those materials.*

4. Other Miscellaneous Requests

a. Please provide the estimated project-related increase in daily electricity usage (i.e., kilowatt-hours) as well as the associated indirect GHG emissions estimates.
b. Please provide a health risk assessment that includes the tank-related benzene emissions as well as diesel particulate matter that would be associated with the proposed train deliveries.

Response 4a. *The increase in electric consumption for this project is offset by a proportionate decrease in electric energy consumption from a reduction of waterborne crude deliveries. For this project alone, electric use would be incurred from two crude oil unloading pumps and the unloading rack utility lighting. At approximately 3,100 gallons per minute crude unloading rate (196 Hp each), each pump would operate up to 7.9 hours per day to unload up to the daily permitted quantity of crude oil. The annual electricity consumption by the pumps is estimated to be 870 MWh. Unloading rack utility lighting with an estimated power rating of 20 kW would operate for approximately 12 hours a day. The annual electricity consumption from light fixtures is estimated to be approximately 88 MWh. Based on the total peak electric use of 958 MWh per year, the GHG emissions are estimated to be 198 tons of carbon dioxide equivalents per year (0.54 ton CO_2e per day). An emission factor of 412 pounds per MWh is used to estimate carbon dioxide emissions. This emission factor is obtained from the CPUC GHG Calculator for Pacific Gas and Electric (PG&E) Company for the year 2014. The calculator provides an independent forecast of PG&E's emission factors as part of a model on how the electricity sector would reduce emissions under AB 32. Emission factors for methane and nitrous oxide are obtained from The Climate Registry's 2013 Default Emission Factors (Released January 2013) for CAMX/WECC California eGRID subregion.*

Response 4b. *Results of a screening-level health risk assessment (HRA) performed by ERM for the BAAQMD permit submittal are provided in Table 1 below. This includes risk analysis for toxics listed in BAAQMD Reg. 2-5, and includes Benzene and Particulate Matter (PM), as well as Ethylbenzene, Toluene, Xylenes, and Hexane. As shown in Table 1, the cancer risk at the maximum exposed individual residential (MEIR) receptor, maximum exposed individual worker (MEIW) receptor, and maximum sensitive receptor (MSR) is below 10 in a million. The chronic hazard index and the acute hazard index, at the MEIR, MEIW and MSR, are also below 1.0.*

Table 1: Maximum Cancer and Non-cancer Risk

Type of Estimated Health Impact	Cancer Risk (per million), (Receptor Location)	Chronic Hazard Index, (Receptor Location)	Acute Hazard Index, (Receptor Location)
Maximum Exposed Individual Residential (MEIR) – Hypothetical residential receptors assumed at ≥ 40 m from the train tracks.	2.27 Worst case risk at 150 m west of train tracks (578686E, 4215678N)	0.009 Worst case risk at 150 m west of train tracks (578686E, 4215678N)	0.0002 (575494E, 4212545N)
Maximum Exposed Individual Worker (MEIW)	4.46 (576144E, 4214145N)	0.014 (576144E, 4214145N)	0.0021 (575944E, 4214395N)
Maximum Sensitive Receptor – Day Care Center	0.29 (574594E, 4212895N)	0.0005 (574594E, 4212895N)	0.0001 (574594E, 4212895N)

The following sources were modeled for the HRA using the ISCST3 air dispersion model:

1. *Locomotive idling – as point source;*
2. *Locomotive transit – as a line of volume sources;*
3. *Locomotive switching – as a line of volume sources;*
4. *Tank-1776 – as circular area source; and*
5. *Fugitive equipment leak – as rectangular area source*

Locomotive emissions during transit mode were modeled over a track length of 4 miles out from the unloading rack. Locomotive emissions during switching mode were modeled over an approximate two train–lengths (3300 feet) from the unloading rack. As a portion of the track within the facility would be used for both switching and transit, emissions from the two activities were added and assigned to the common volume sources. Five years of meteorological data from the BAAQMD meteorological site "Valero Admin" (Site Id 8704) was used. These data can be downloaded from the BAAQMD website. The NAD 27 UTM coordinate system was used to identify source, receptor and building/structure locations. Digital Elevation Model (DEM) files were used to obtain the elevations for sources, receptors, and buildings/structures.

Risk was directly modeled in ISCST3 using the unit risk factors (URFs) for cancer risk and reference exposure levels (RELs) for non-cancer risk, as the exposure pathway for all the toxic air contaminants (TACs) emitted from the above sources is inhalation only. The risk input to the ISCST3 model, for each source, was calculated as shown below. As a result, the ISCST3 model output is residential cancer risk in terms of risk per million and non-cancer risk in terms of hazard index.

$$Cancer\ Risk\ Modeled_j = \sum_i ER_i\ x\ URF_i\ x\ 10^6$$

$$Non - Cancer\ Risk\ Modeled_j = \sum_i \frac{ER_i}{REL_i}\ x\ 10^6$$

Where:

j	=	*Emissions source modeled*
i	=	*Toxic air contaminant*
ER	=	*Emission rate of toxic air contaminant i in g/s from source j*
URF	=	*Unit risk factor of toxic air contaminant i*
REL	=	*Reference exposure level of toxic air contaminant i*

Cancer risk at the MEIR was estimated as modeled residential risk multiplied by the BAAQMD-recommended age specific factor of 1.7. It must be noted that there are no residences along the 4 miles of modeled train route. However, there are residences as close as 40 meters from the train route in Fairfield, CA which falls within the BAAQMD jurisdiction. Since the modeling domain did not extend all the way to Fairfield, additional hypothetical residential receptors were

assumed, in polar coordinate system at spacing of 10 degrees and radial distance of 30m through 150 m from the locomotive volume source farthest from the facility, to account for the exposure to nearby residences as the train passes through Fairfield. Residences in Benicia near the refinery are much further away from the locomotive activity than 40 meters. Therefore, for TAC exposure from locomotive idling, Tank-1776, and fugitives, the estimated MEIR risk shown below is very conservative.

Cancer risk at the MEIW was estimated as modeled residential risk multiplied by 0.2199, which is the average OEHHA adjustment factor to convert inhalation based cancer risk estimates for a residential receptor to a worker receptor, based on the difference in the length of time of exposure.

The sensitive receptor with highest modeled residential risk is a day care center (The Learning Patch Benicia). Cancer risk at this day-care was estimated as shown below:

$$\text{Cancer Risk at Day Care} = \frac{\text{Modeled Residential Risk } x\ ED_C x\ ASF}{ED_R}$$

Where:

ED_C	=	*Exposure duration for children at school = 9 years*
ASF	=	*Age sensitivity factor for children at school = 3*
ED_R	=	*Exposure duration for residential receptor = 70 years*

Factors listed above are standard factors used in the calculation.

Bay Area Air Quality Management District

939 Ellis Street
San Francisco, CA 94109
(415) 771-6000

Final

MAJOR FACILITY REVIEW PERMIT

Issued To:

Valero Refining Co. - California
Facility #B2626

Facility Address:
3400 East Second Street
Benicia, CA 94510-1097

Mailing Address:
3400 East Second Street
Benicia, CA 94510-1097

Responsible Official
John Hill,
Vice President and General Manager
(707) 745-7011

Facility Contact
Donald W. Cuffel,
Environmental Manager
(707) 745-7545

Type of Facility: Petroleum Refining
Primary SIC: 2911
Product: Petroleum Refining

BAAQMD Engineering Division Contact:
Thu H. Bui

ISSUED BY THE BAY AREA AIR QUALITY MANAGEMENT DISTRICT

Signed by Jim Karas
Jim Karas, P.E., Director of Engineering

April 10, 2015
Date

IV. Permit Conditions

CARGO CARRIER and DOCK

23.

Ship and barge emissions associated with the import of crude and gas oil across the plant's main Benicia crude dock, combined with the ship emissions associated with the export of product coke across the Plant's Benicia coke dock, will not exceed the following annual calendar year limits: [Basis Cumulative Increase, Offsets]

Pollutant		Base Line	VIP Increase	Total Annual (tons)
Nox	96.14	39.98	136.12	
SOx	32.87	16.19	49.06	
NMOC	7.34	3.22	10.56	
PM10	5.43	2.39	7.82	
CO	13.83	5.88	19.71	

24. To accommodate any unforeseen changes in shipping requirements, the above total annual limits for each pollutant may be further increased to accommodate a shift in crude imports from pipeline to ships. All increases in combustion emissions from ships will need to be offset through contemporaneous emissions reductions. The VOC contingency has been provided as part of Application #5846. The emission reduction credits (ERC's) for the other pollutants will be provided by a corresponding reduction in the FCCU/CKR Scrubber stack annual emission limit (Part 63). However, in no event shall the Owner/Operator allow the total additional increase for the contingency to exceed the contingency allowance presented below. [Basis: Cumulative Increase, Offsets]

Pollutant (tons)		Base Line plus	Contingency VIP Increase	Total Annual
NOx	136.12	32.95	169.07	
SOx	49.06	15.76	64.82	
NMOC	10.56	3.10	13.66	
PM10	7.82	2.06	9.88	
CO	19.71	5.21	24.92	

25. The Owner/Operator shall use the following emission factors for determining compliance with parts 23 and 24. [Basis: Compliance Verification]

Crude and Gas Oil Ship Receipts at Main Benicia Crude Dock in pounds per 1000 BBL (lb/kBBL):
5.1 NOx, 1.8 SOx, 0.29 PM10, 0.42 NMOC, 0.76 CO.

Crude and Gas Oil Barge Receipts at Main Benicia Crude Dock in lb/kbbl:
12.78 NOx, 0.16 SOx, 0.56 PM10, 0.29 NMOC, 1.27 CO.

IV. Permit Conditions

2,400 tons per day, daily maximum
876 ktons per year

49. The Owner/Operator shall maintain the daily material throughput at the coke silos, S-8, in a District approved log. The Owner/Operator shall keep these records and make them available for District inspection for a period of at least 5 years from the date on which a record is made.
[Basis: Recordkeeping]

50. The Owner/Operator shall not operate the S-9 Crude Blow down system or the S-1006 Pipestill Unit beyond the following crude throughput limits: [Basis: Cumulative Increase]

180 kbbl per day, daily maximum
165 kbbl per day, annual average

51. The Owner/Operator shall maintain the daily crude throughput at the S-9 Crude blow down system and the S-1006 pipestill unit in a District approved log. The Owner/Operator shall keep these records on site and make them available for District inspection for a period of at least 5 years from the date on which a record is made.

Note: Condition #815, part 2 covers the recordkeeping and reporting requirement for S-1006. This condition will be deleted when the VIP project is started up.

52. To demonstrate compliance with the throughput limit specified in part 50, the Owner/Operator shall submit a report to the District's Compliance and Enforcement Division and Engineering Division on a monthly basis. The Owner/Operator shall forward the report to the District no later than 30 days after the close of each month. [Basis: Recordkeeping]

53. For the feed drums and the hydrocracker unit, S-51, S-52 and S-1003, the Owner/Operator shall not operate the source beyond the following throughput limits: [Basis: Cumulative Increase]

44 kbbl per day, daily maximum
40 kbbl per day, annual average

54. The Owner/Operator shall maintain the daily material throughput at the feed drums and the hydrocracker unit, S-51, S-52 and S-1003, in a District approved log. The Owner/Operator shall keep these records on site and make them available for District inspection for a period of at least 5 years from the date on which a record is made. [Basis: Recordkeeping]

55. For the powerformer unit, S-1004, the Owner/Operator shall not operate the source

Technical Highlights

Emission Factors for Locomotives

The Environmental Protection Agency (EPA) has established emission standards for oxides of nitrogen (NOx), hydrocarbons (HC), carbon monoxide (CO), particulate matter (PM) and smoke for newly manufactured and remanufactured locomotives. These standards, which are codified at 40 CFR part 1033, include several sets of emission standards with applicability dependent on the date a locomotive is first manufactured. The first set of standards (Tier 0) applies to most locomotives originally manufactured before 2001. The most stringent set of standards (Tier 4) applies to locomotives originally manufactured in 2015 and later. This fact sheet describes EPA's estimates of the typical in-use emission rates for locomotives subject to these standards, as well as the previous standards.

It is important to emphasize that this fact sheet relies on many simplifying assumptions. Thus emission rates calculated as described in this fact sheet should be considered as approximations.

Estimated Locomotive Emission Rates by Tier

EPA has estimated average emission rates, given in grams per brake horsepower-hour (g/bhp-hr), for uncontrolled locomotives and those required to meet the various emission standards. Emissions were estimated for two different types of operation: a low power cycle representing operation in a switch yard, and a higher power cycle representative of general line-haul operation. These estimates are shown in Tables 1 and 2. Note that plus signs in the table indicate that a given tier of standards was revised in a 2008 rulemaking (73 FR 37096, June 30, 2008). For example, locomotives originally manufactured in years 2002-2004 were initially subject to the original Tier 1 standards, but will be required to meet revised Tier 1 standards (also known as Tier 1+ standards) when remanufactured. See the regulatory text for a more precise explanation of which standards apply to which locomotives.

United States Environmental Protection Agency

Office of Transportation and Air Quality
EPA-420-F-09-025
April 2009

It is important to note that there can be significant variability in in-use emission rates, especially for uncontrolled locomotives. Also, a single locomotive's emission rate can vary throughout its life as the engine ages and as ambient conditions change. Thus the values presented here are intended to reflect the average emission rates. It is also worth noting that these emission estimates were developed in the context of adopting new emission standards. This is especially important for the CO emission factors. Because EPA's CO emission standards were intended to cap CO emissions at pre-control levels (which were relatively low), we have not projected any reductions in CO emission factors. However, recent testing indicates that emission controls designed to reduce PM and HC emissions are also reducing CO emissions. Thus the CO emission rates presented here may be too high and should be used with some caution. A similar effect may also apply for HC emissions from Tier 0 and Tier 1 locomotives (but not the Tier 0+ and Tier 1+ locomotives).

Table 1 - Line-Haul Emission Factors (g/bhp-hr)

	PM_{10}	HC	NO_x	CO
UNCONTROLLED	0.32	0.48	13.00	1.28
TIER 0	0.32	0.48	8.60	1.28
TIER 0+	0.20	0.30	7.20	1.28
TIER 1	0.32	0.47	6.70	1.28
TIER 1+	0.20	0.29	6.70	1.28
TIER2	0.18	0.26	4.95	1.28
TIER 2+ & TIER 3	0.08	0.13	4.95	1.28
TIER 4	0.015	0.04	1.00	1.28
+ INDICATES THAT THESE ARE THE REVISED STANDARDS IN 40 CFR PART 1033				

Table 2 - Switch Emission Factors (g/bhp-hr)

	PM_{10}	HC	NO_x	CO
UNCONTROLLED	0.44	1.01	17.40	1.83
TIER 0	0.44	1.01	12.60	1.83
TIER 0+	0.23	0.57	10.60	1.83
TIER 1	0.43	1.01	9.90	1.83
TIER 1+	0.23	0.57	9.90	1.83
TIER2	0.19	0.51	7.30	1.83
TIER 2+	0.11	0.26	7.30	1.83
TIER 3	0.08	0.26	4.50	1.83
TIER 4	0.015	0.08	1.00	1.83
+ INDICATES THAT THESE ARE THE REVISED STANDARDS IN 40 CFR PART 1033				

Conversion to Gram per Gallon Emission Factors

It is often useful to express emission rates as grams of pollutant emitted per gallon of fuel consumed (g/gal). This can be done by multiplying the emission rates in Table 1 or 2 by a conversion factor relating the fuel consumption (gal/hr) and the usable power (bhp) of the engine. EPA has estimated different conversion factors for different types of locomotive service as shown in Table 3. The two primary reasons for the differences are variations in locomotive age and duty cycle. Fuel efficiency tends to be worse for older locomotive designs and for locomotives used in low power applications such as switching. Note that the g/gal emission factors presented at the end of this fact sheet can be converted back to g/bhp-hr by dividing them by the conversion factors shown here.

Table 3
Conversion Factors (bhp-hr/gal)

Locomotive Application	Conversion Factor (bhp-hr/gal)
Large Line-Haul and Passenger	20.8
Small Line-Haul	18.2
Switching	15.2

Conversion to Gram per Ton-Mile Emission Factors

In some cases, it can be helpful to express emission factors as grams emitted per ton-mile of freight hauled. However, this can also be very problematic because the amount of engine work required for each ton-mile varies significantly with a variety of factors. For example, it takes more work to haul freight through mountainous terrain than across flat areas. Since EPA does not have detailed information about these variations, we cannot provide accurate g/ton-mile emission rates. However, very approximate national average values can be calculated based on data collected by the Association of American Railroads for revenue ton-miles and fuel consumption, which show that about one gallon of fuel is consumed by the railroads to haul 400 tons-miles of freight. Thus dividing g/gal emission rates by 400 ton-miles/gal gives approximate g/ton-mile emission rates.

Emission Inventory Estimation

Total emissions can be calculated by multiplying the emission factors (in g/gal) by the fuel consumption rates (in million-gal/yr) to give annual emission rates (in metric tons per year). Multiplying this metric estimate by 1.102 gives standard U.S. tons (or short tons) per year.

EPA has estimated that locomotives consume approximately 4 billion gallons of diesel fuel each year. This includes national/regional freight service, switching, local freight service, and passenger service. The relative amounts of fuel used in the United States for these four different types of operation are shown in Table 4. The great majority of fuel consumed by locomotives each year is used in line-haul freight service by the largest railroads. Smaller amounts are also used in

switching and passenger service, and by very small railroads. For the purpose of this fact sheet, we are aggregating the largest railroads with smaller railroads that are fully subject to EPA's emission requirements. This includes regional railroads as well as other railroads such as those that are owned by large businesses. The local freight category includes only those railroads that meet our regulatory definition of "small railroad" (40 CFR 1033.901) to qualify for small business allowances under our regulations. These railroads are included in this fact sheet as local whether or not they are truly local in nature. The passenger category includes local commuter railroads and AMTRAK.

Table 4 - Locomotive Fuel Consumption by Service Category	
National and Regional Freight Line-haul	88%
National Freight Switching	7%
Local Freight	<2%
Passenger	3%

Other Pollutants

The preceding emission factors include those pollutants for which EPA has set emission standards. However, other pollutants may also be of interest.

The broad category of volatile organic compounds (VOC) is a slightly different way of aggregating the organic pollutants controlled by our HC emission standards. In our rulemaking analysis (http://www.epa.gov/otaq/regs/nonroad/420r08001a.pdf), we estimated that VOC emissions can be assumed to be equal to 1.053 times the HC emissions. Similarly, PM emissions can be expressed as PM_{10} (which includes all particles up to 10 microns in diameter) or $PM_{2.5}$ (which includes only those particles up to 2.5 microns in diameter). $PM_{2.5}$ emissions can be estimated as 0.97 times the PM_{10} emissions, meaning that nearly all of the PM is less than 2.5 microns in diameter.

Gram per gallon emissions of sulfur dioxide (SO_2) and carbon dioxide (CO_2) are largely independent of engine parameters and are primarily dependent on fuel properties. Locomotive-specific emission rates are not presented here. Instead, SO_2 and CO_2 emission rates should be calculated based on the properties of the specific fuel being used by the locomotives. These emission rates can also be assumed to be the same as for other diesel engines operating on similar fuel. Note that special caution should be used when estimating SO_2 emission rates since the sulfur content of diesel fuel varies much more than the carbon content. Also, while the vast majority of sulfur in the fuel is typically converted to SO_2, up to 5 percent of the sulfur is oxidized further to sulfate (and forms particulate matter), so that the fraction of fuel sulfur emitted as SO_2 may be as low as 95 percent. Examples of these calculations are shown below based on inputs described in the NONROAD technical document NR-009c (http://www.epa.gov/otaq/models/nonrdmdl/nonrdmdl2004/420p04009.pdf).

SO_2 (g/gal) = (fuel density) × (conversion factor) × (64 g SO_2/32 g S) × (S content of fuel)

Consider the example where the density of diesel fuel is 3200 g/gal, the fraction of fuel sulfur converted to SO_2 is 97.8 percent, and the sulfur content of the fuel is 300 ppm.

SO_2 (g/gal) = (3200) × (0.978) × (2.00) × (300 x 10^{-6}) = 1.88 g/gal

CO_2 (g/gal) = (fuel density) × (44 g CO_2/12 g C) × (C content of fuel)

Consider the example where the density of diesel fuel is 3200 g/gal and the carbon content of the fuel is 87 percent by mass.

CO_2 (g/gal) = (3200) × (3.67) × (0.87) = 10,217 g/gal

Other trace pollutants such as N_2O, methane, and many air toxics are more dependent on engine parameters. At this time, however, EPA does not have detailed emission rates for these pollutants from locomotives. Where estimates are needed for N_2O or methane, you may assume that emissions of these pollutants from locomotives are similar to those of other diesel engines with similar technology. For N_2O, you may assume the emissions are proportional to total NOx. For methane, you may assume the emissions are proportional to total hydrocarbons. Note however, that the presence of catalyzed components in the exhaust can significantly affect these ratios. So it is best to compare emissions from uncatalyzed locomotives to emissions from other uncatalyzed diesel engines. While this same approach could be used for air toxics (assuming that air toxic emissions are proportional to total hydrocarbons), EPA has estimated air toxic emissions from locomotives. These estimates are described in the National Emission Inventory documentation (see ftp://ftp.epa.gov/EmisInventory/2002finalnei/documentation/mobile/2002nei_mobile_nonroad_methods.pdf - appendix C).

Projected Future Emission Factors

Tables 5-7 give the expected fleet average NOx, PM_{10}, and HC emission factors by calendar year for the four categories of locomotives (the same four categories as are shown in Table 4). The steady decline in these emission factors reflects the penetration of the various tiers of locomotives into the fleet over time. More detail regarding the assumptions on which these projections were based can be found in the Regulatory Impact Analysis for the 2008 rulemaking (http://www.epa.gov/otaq/regs/nonroad/420r08001a.pdf)

For More Information

You can access the rule and related documents on EPA's Office of Transportation and Air Quality (OTAQ) Web site at: www.epa.gov/otaq/locomotives.htm.

For more information on this rule, please contact the Assessment and Standards Division information line at:

U.S. Environmental Protection Agency
Office of Transportation and Air Quality
2000 Traverwood Drive
Ann Arbor, MI 48105
Voicemail: (734) 214-4636
E-mail: asdinfo@epa.gov

Table 5 – NOx Emission Factors (g/gal)

Calendar Year	Large Line-haul	Large Switch	Small Railroads	Passenger/Commuter	Overall Average
2006	180	250	242	244	188
2007	175	249	242	229	183
2008	169	243	242	214	177
2009	165	241	242	200	172
2010	157	236	242	183	165
2011	149	235	242	167	157
2012	144	227	242	157	152
2013	139	225	242	147	147
2014	135	217	242	138	143
2015	129	215	240	131	137
2016	121	208	239	119	129
2017	114	206	237	112	122
2018	108	202	236	105	117
2019	103	200	233	98	112
2020	99	187	231	93	107
2021	94	185	228	88	102
2022	89	177	225	83	97
2023	84	172	223	78	92
2024	79	162	220	73	87
2025	74	150	217	68	81
2026	69	144	215	64	77
2027	65	138	212	60	72
2028	61	132	209	56	68
2029	57	126	206	52	64
2030	53	119	203	49	60
2031	49	112	200	46	56
2032	46	105	197	42	52
2033	43	98	193	39	49
2034	40	91	190	36	46
2035	37	84	187	33	43
2036	35	77	184	30	40
2037	33	71	180	28	38
2038	31	67	177	26	36
2039	29	63	174	24	34
2040	28	60	171	23	32

Table 6 – PM_{10} Emission Factors (g/gal)

Calendar Year	Large Line-haul	Large Switch	Small Railroads	Passenger/Commuter	Overall Average
2006	6.4	6.5	6.5	6.5	6.4
2007	6.3	6.5	6.5	6.4	6.3
2008	5.1	5.5	5.7	5.1	5.1
2009	4.9	5.5	5.7	5.0	4.9
2010	4.7	5.4	5.7	4.8	4.7
2011	4.4	5.3	5.7	4.5	4.5
2012	4.1	5.1	5.7	4.2	4.2
2013	3.8	5.0	5.6	3.9	3.9
2014	3.6	4.8	5.6	3.6	3.7
2015	3.4	4.8	5.5	3.4	3.5
2016	3.1	4.6	5.5	3.1	3.3
2017	2.9	4.5	5.4	2.8	3.0
2018	2.7	4.4	5.4	2.6	2.8
2019	2.5	4.4	5.4	2.3	2.6
2020	2.3	4.1	5.3	2.1	2.5
2021	2.2	4.0	5.3	2.0	2.4
2022	2.0	3.9	5.3	1.8	2.2
2023	1.9	3.7	5.2	1.7	2.1
2024	1.7	3.5	5.2	1.5	1.9
2025	1.6	3.2	5.1	1.4	1.8
2026	1.5	3.1	5.1	1.2	1.6
2027	1.4	3.0	5.1	1.1	1.5
2028	1.3	2.8	5.0	1.0	1.4
2029	1.1	2.7	5.0	0.9	1.3
2030	1.0	2.5	4.9	0.8	1.2
2031	1.0	2.4	4.8	0.7	1.1
2032	0.9	2.2	4.8	0.7	1.0
2033	0.8	2.1	4.7	0.6	0.9
2034	0.7	1.9	4.6	0.6	0.9
2035	0.7	1.7	4.6	0.5	0.8
2036	0.6	1.6	4.5	0.5	0.7
2037	0.6	1.5	4.4	0.4	0.7
2038	0.5	1.4	4.4	0.4	0.6
2039	0.5	1.3	4.3	0.4	0.6
2040	0.4	1.2	4.2	0.3	0.5

Table 7 - HC Emission Factors (g/gal)

Calendar Year	Large Line-haul	Large Switch	Small Railroads	Passenger/Commuter	Overall Average
2006	9.5	15.0	11.7	9.7	10.0
2007	9.3	15.0	11.7	9.5	9.8
2008	9.0	14.5	11.7	9.3	9.5
2009	8.7	14.5	11.7	9.1	9.1
2010	8.3	14.1	11.7	8.6	8.8
2011	7.7	14.0	11.7	8.1	8.2
2012	7.1	13.3	11.7	7.5	7.6
2013	6.5	13.3	11.7	6.9	7.1
2014	6.1	12.7	11.7	6.3	6.7
2015	5.7	12.6	11.7	5.8	6.3
2016	5.1	12.0	11.7	5.2	5.7
2017	4.6	11.8	11.7	4.6	5.2
2018	4.2	11.5	11.7	4.1	4.8
2019	3.9	11.4	11.7	3.5	4.5
2020	3.6	10.5	11.7	3.1	4.2
2021	3.4	10.4	11.7	2.9	4.0
2022	3.2	9.8	11.7	2.7	3.8
2023	3.0	9.5	11.7	2.4	3.6
2024	2.8	8.9	11.7	2.2	3.4
2025	2.6	8.0	11.7	2.0	3.1
2026	2.5	7.6	11.7	1.8	2.9
2027	2.3	7.3	11.7	1.6	2.8
2028	2.1	6.9	11.7	1.5	2.6
2029	2.0	6.5	11.7	1.3	2.4
2030	1.9	6.2	11.7	1.2	2.3
2031	1.7	5.8	11.7	1.1	2.2
2032	1.6	5.5	11.7	1.0	2.0
2033	1.5	5.1	11.7	0.9	1.9
2034	1.4	4.7	11.7	0.8	1.8
2035	1.3	4.4	11.7	0.7	1.7
2036	1.2	4.0	11.7	0.7	1.6
2037	1.2	3.7	11.7	0.6	1.5
2038	1.1	3.6	11.7	0.6	1.4
2039	1.1	3.4	11.7	0.5	1.4
2040	1.0	3.2	11.7	0.5	1.3

United States
Environmental Protection
Agency

Air and Radiation

EPA420-R-92-009
December 1992

Procedures for Emission Inventory Preparation

Volume IV: Mobile Sources

Printed on Recycled Paper

6.0 EMISSIONS FROM LOCOMOTIVES

This chapter illustrates how a state or local agency can calculate emissions from locomotives within an inventory area.[249] Railroad locomotives used in the United States are primarily of two types: electric and diesel-electric.[250] Electric locomotives are powered by electricity generated at stationary power plants and distributed by either a third rail or overhead catenary system. Emissions are produced only at the electrical generation plant, which is considered a point source and therefore not of interest here. Diesel-electric locomotives, on the other hand, use a diesel engine and an alternator or generator to produce the electricity required to power its traction motors. Emissions produced by these diesel engines are of interest in emission inventory development. Emissions for hydrocarbons (HC), carbon monoxide (CO), oxides of nitrogen (NOx), sulfur dioxide (SO_2), and particulate matter (PM) from this source are covered in this chapter.

This chapter is a complete revision of the corresponding chapter in the previous edition of this document. In addition, this chapter also updates the emission factor information that appears in Compilation Of Air Pollutant Emission Factors, Fourth Edition And Supplements, AP-42. Subsequent to the publication of this document, AP-42 will be formally updated.

Other sources of emissions from railroad operations include the small gasoline and diesel engines used on refrigerated and heated rail cars. These engines are thermostatically controlled, working independently of train motive power, and fall in the category of off-highway equipment which are addressed elsewhere in this document. (See Section 3.3 of Volume IV.)

Railroads can be separated into three classes based on size: Class I , Class II, and Class III. Class I railroads[251] represent the largest railroad systems in the country. (See Appendix 6-1 for a complete list.) Because of their size, Class I railroads operate over a large geographic area. Also, they carry most of the interstate freight[252] and carry most of the passenger service. They are required to keep detailed records of their operations and to report yearly to the Interstate Commerce Commission (ICC).

---

[249] The term inventory area can be quite diverse and may refer to an area as large as a multi-state CMSA or an area as small as a county, or part of a county, within a state.

[250] A third type, steam locomotives, is used in very localized operations, primarily as tourist attractions, and emissions from these locomotives are insignificant. In addition, the particulate emissions from operating steam locomotives is so large that nearly all of it falls to the surface within 50 meters.

[251] Class I railroads are classified by the Interstate Commerce Commission as having annual revenues greater than $93.5 million.

[252] Class I railroads carried 93 percent of total freight revenues in 1989.

Class II[253] and III[254] railroads represent the remainder of the rail transportation system and generally operate within smaller, localized areas.[255] These smaller railroads are not subject to the same reporting requirements, and their recordkeeping may be less extensive. Also, their fleet of locomotives tends to be older, with the Class I railroads buying almost all of the new locomotives.

Locomotives within each of the Classes can perform two different types of operations: line haul[256] and yard (or switch). Line haul locomotives, which perform the line haul operations, generally travel between distant locations, such as from one city to another. Yard locomotives, which perform yard operations, are primarily responsible for moving railcars within a particular railway yard.

This chapter of the guidance document will be divided into six sections plus eight appendices. Section 6.1 will be an overview of the recommended methodology. Section 6.2 will specifically describe the recommended methods for calculating the emissions from various types of rail service based on generic or national operating characteristics. Section 6.3 will present procedures for tailoring the recommended methods to more closely reflect local operating conditions. Section 6.4 will introduce alternative methods which are not fully discussed in this chapter. Section 6.5 will discuss "remotored" locomotives; locomotives which have had their original diesel engines replaced by newer, more efficient power plants. Section 6.6 will illustrate the conversion factor method recommended for converting total hydrocarbons (THC) to volatile organic compound (VOC) emissions.

All correspondence pertaining to this chapter of the guidance document should be directed to:

Emission Planning and Strategies Division
U.S. EPA
2565 Plymouth Road
Ann Arbor, MI 48105
(313) 668-4200

---

[253] Class II railroads are classified by the Interstate Commerce Commission as having annual revenues greater than $18.7 million but less than $93.5 million.

[254] Class III railroads are classified by the Interstate Commerce Commission as having annual revenues less than $18.7 million.

[255] A "smaller" area can still be an area as large as a state. The term "smaller" is used in contrast with the large interstate areas which are covered by Class I railroads.

[256] In this chapter, line haul operations include intermodal freight service, mixed freight service, and passenger service.

6.1 OVERVIEW OF RECOMMENDED INVENTORY METHODOLOGY

Three steps are necessary in order to assess locomotive emissions within an inventory area. First, railroad operations are separated into three distinct categories: Class I line haul, Class II and Class III line haul, and yard. Second, emissions for each pollutant are calculated for each of the three categories using either the recommended methods described in Section 6.2 or, if circumstances explained later occur, the alternative methods described in Sections 6.3 or 6.4. Third, the total locomotive emissions in the inventory area are calculated by summing the quantities of each pollutant for each of the three categories.

The methods illustrated in this chapter are based on annual inventories and annual data. Developing inventories for shorter time periods is straight forward because railroad traffic is relatively constant throughout the year and therefore, less than annual calculations can be done by simple apportionment. In addition, the recommended methods described in Section 6.2 are based on a national locomotive fleet mix and average fuel consumption figures.

6.2 RECOMMENDED METHODS

The recommended methods for each of the three categories, as follows: Class I line haul, Class II and Class III line haul, and yard, are discussed separately below.

6.2.1 Class I Line Haul Locomotives

For Class I line haul locomotives, emissions are calculated by multiplying the amount of fuel consumed in the inventory area by the appropriate emission factors.

Inventory Area Emissions = Fuel Consumption x Emission Factors

6.2.1.1 Fuel Consumption

If Class I line haul locomotives only traveled within the inventory area, fuel consumption could be determined directly from the amount of fuel dispensed into the units. However, these line haul locomotives travel predominantly interstate. Hence, they do not necessarily burn the fuel in the same location where the fuel was pumped, making it impossible to determine fuel consumption in the area of interest in this manner.

In order to determine inventory area fuel consumption, it is necessary to allocate the total amount of fuel consumed "systemwide" for Class I railroads to the inventory area. This is done by dividing the traffic density (expressed in Gross Ton Miles or GTM) for each Class I railroad track segment within the inventory area by the systemwide fuel consumption index (expressed in Gross Ton Miles per gallon or GTM/gal) for that railroad. This process is repeated for each railroad.

In any given area, there will be only a few active Class I railroads, and the railroad company staff should be able to perform this step and provide the amount of fuel consumed within the inventory area on request. In addition, EPA has included a detailed explanation of how this step is performed based on published data and information which is generally available from each railroad.

Fuel consumption, for each Class I railroad within an inventory area, is therefore specifically calculated using the following formula:

Fuel Consumption = Traffic Density (GTM) / Fuel Consumption Index (GTM/gal)

The inventory area traffic density and the fuel consumption index are described separately below.

Traffic Density

For every track segment within a state, each Class I railroad maintains information on traffic density (GTM), length (miles), direction, and geographic location. Therefore, it is possible to calculate the traffic density for an inventory area by summing the traffic densities for each track segment or portion thereof within the inventory area.

This information can be obtained, for each area, either directly from the individual railroads or from the Association of American Railroads in Washington, D.C. The information should contain enough detail so that track segments or portions thereof can be assigned to the inventory area. However, if the agency is unable to perform this task, it may become necessary to obtain assistance from the Class I railroad in order to determine where the inventory area boundary intersects the track segment.

The gross ton mile information may be supplied in one of two ways. The first way is <u>without</u> the weight of the locomotives included. The second way is <u>with</u> the weight of the locomotives included. This distinction is important when calculating the fuel consumption index.

Fuel Consumption Index

The fuel consumption index (GTM/gal), for each Class I railroad within an inventory area, should be calculated by dividing the systemwide gross ton miles (GTM) by the systemwide fuel consumption (gal). See the following formula:

Fuel Consumption Index (GTM/gal) = System Gross Ton Miles/System Fuel Consumption

Each Class I railroad is required to report these statistics each year to the ICC in an annual report entitled "R-1." The R-1 report should be used, for each carrier, to obtain information on annual fuel consumption (Schedule 750: line 1), total gross ton miles including locomotives (Schedule 755: line 104), and, when needed, total gross ton miles excluding locomotives (Schedule 755: line 104 minus line 98). An example of these schedules is included in Appendix 6-2.

The fuel consumption index will vary depending on whether the weight of the locomotives is included in the calculation.[257] Also, calculating fuel consumption within the inventory area requires the multiplication of traffic density by fuel consumption index; therefore, it is important to match the units of each of these components. If traffic density is supplied without the weight of the locomotives included, then the fuel consumption index should be determined without the weight of the locomotives included in the calculation. If traffic density is supplied with the weight of the locomotives included, then the fuel consumption index should be determined with the weight of the locomotives included in the calculation.

The fuel consumption index, with locomotives, is calculated by dividing total gross ton miles with locomotives, Schedule 755: line 104, by the total fuel consumed, Schedule 750: line 1. The fuel consumption index, without locomotives, is calculated by dividing total gross ton miles without locomotives, Schedule 755: line 104 minus line 98, by the total fuel consumed, Schedule 750: line 1. Examples of these calculations are shown in Appendix 6-3.

6.2.1.2 Emission Factors

Now that fuel consumption has been calculated, inventory area emissions are determined by multiplying that value by the fleet average emission factors for each pollutant (expressed in pounds per gallon of fuel burned (lbs/gal). The recommended default emission factors for all line haul locomotives are shown in Table 6-1.

Table 6-1. Line Haul Locomotive Emission Factors[258]

Pollutant	Emission Factor (lbs/gal)
HC	0.0211
CO	0.0626
NOx	0.4931
SO_2*	0.0360
PM	0.0116

* SO_2 calculated based on a fuel sulfur content of 0.25 percent by weight.

Appendix 6-3 gives a full example of how to calculate emissions from the Class I line haul locomotives in an inventory area, using the Santa Fe railroad in the State of Illinois.

6.2.2 Class II and III Line Haul Locomotives

---

[257] The fuel consumption rate will be less if the weights of the locomotives are not included in the calculation.

[258] Locomotive Emission Factors for Inventory Guidance Document, Office of Mobile Sources, U.S. EPA, June 1991.

Therefore, the annual emissions per yard locomotive, Table 6-2, were determined by multiplying the fuel consumption estimate (85,410 gal/year) by each emission factor in Table 6-3.

6.3 TAILORING METHODS

EPA recognizes that railroad operations may vary significantly from the national average and that some state and local air quality agencies may have access to more detailed information regarding the locomotive activity in their inventory area. Because of this, EPA has included two additional methodologies to allow these agencies to tailor the emissions calculations based on actual locomotive fleet, or roster, data and local operational characteristics. Using these tailoring methods is not required, but they have been included here should a state or local agency decide that a more precise calculation is desirable.

As explained in Section 6.2, the recommended method for calculating total emissions in an inventory area requires multiplying a fleet averaged emission factor by fuel consumption. An implicit element of the composite emission factor is the locomotive roster. If the actual roster for an inventory area is different from the one used in the recommended method, then the composite emission factor, calculated using the recommended method for the inventory area, could be different than if the composite emission factor were calculated using the actual locomotive roster.

Another element implicit in both the composite emission factor and the estimate of fuel consumption is the duty cycle which an engine goes through during operation. If the actual duty cycle in an inventory area is different from that assumed in the recommended method, then the values used in the recommended method for the inventory area could be different than if the values were calculated using the actual duty cycle for that area.

6.3.1 Locomotive Roster Tailoring Method

The roster tailoring method requires the development of an area specific roster, and subsequently the calculation of new fleet average emission factors. These new emission factors will then be substituted for the national fleet average emission factors in Section 6.2, and subsequently, will be multiplied by the fuel consumption figure to give the emissions for the inventory area. The tailoring method for both line haul and yard locomotives will be the same, but, the new tailored rosters should be calculated separately. The roster tailoring method is composed of the following steps:

6.3.1.1 Identify the locomotives in the area

The first step in the roster tailoring method is to identify all of the locomotives within an inventory area. Identification should be made based on make and model number (EMD GP9 for example).

NCFRP

REPORT 4

NATIONAL COOPERATIVE FREIGHT RESEARCH PROGRAM

Sponsored by the Research and Innovative Technology Administration

Representing Freight in Air Quality and Greenhouse Gas Models

TRANSPORTATION RESEARCH BOARD
OF THE NATIONAL ACADEMIES

ologies combine fuel-based emission factors with measured or calculated fuel consumption to determine total emissions. However, as data availability varies over different geographic scales, different methodologies are required.

Independently of the geographic scale, rail operations are typically categorized in switch and line-haul due to different activity patterns and equipment configurations. Line-haul operations refer to the movement over long distances, generally with newer and more powerful locomotives than switch operations, and tend to idle less. Switch activities refer to the assembling and disassembling of trains at railyards, sorting of rail cars, and delivery of empty rail cars to terminals. Switch operations involve short-distance movements, significant idling, and older equipment.

Most rail methodologies rely on fuel consumption data to determine emissions. Detailed fuel consumption data are typically considered sensitive information by railroads. However, nationwide aggregate fuel consumption data, which are based on 100% reporting for Class I railroads, are available from industry or government agencies (i.e., Association of American Railroads, Energy Information Administration, state agencies, private companies via surveys). When fuel consumption data are not available for the region of interest, it must be estimated either by apportioning fuel consumption from a larger geographic area (top-down) or by aggregating fuel consumption from individual rail movements (bottom-up). Both methods require measurements of rail activity.

Because the rail sector has fewer metrics of activity when compared to other modes, methods for calculating emissions tend to be overly simplified or overly complex, with the attendant uncertainties and inaccuracy. Streamlined, or top-down, methods determine emissions based on publicly available data on fuel consumption at the state or national level, and apportion emissions to the state or county level using an available activity metric, such as traffic density or mileage of active track. Detailed, or bottom-up, methods calculate fuel consumption either by measuring freight movements or surveying individual railroad companies. Both approaches are discussed in this section. Exhibit 3-25 includes the summary of methods to calculate rail emissions.

3.4.1 Evaluation of Emission Models

The calculation of rail emissions does not typically rely on a specific emission model. In some isolated cases, train simulation software also can be used to estimate fuel consumption on a given rail line. The best well-known train simulation software in the United States is possibly the Train Energy Model (TEM) developed by the Transportation Technology Center for the Association of American Railroads. It is a single train simulator for long-haul trains along specific routes, and was designed to calculate journey time and fuel use. Simulation model outputs are typically compared against real-world scenarios in order to calibrate the model and adjust the coefficients. Like most train simulation models, TEM relies on a set of train resistance equations originally developed by W. J. Davis in 1926. (*72*) These equations quantify train resistance based on train weight, speed, number of axles, train composition, track curvature, and grade. Fuel consumption can be derived from train resistance. Since then, the equations have been adapted to more recent standards, accounting for updated rail equipment and operational requirements. The use of train simulation software enables the most accurate results, but requires activity data at a level that is not typically available to most agencies.

3.4.2 Evaluation of Regional Methods

Typically, there is little or no published information on railroad activity available for a specific region. Thus, state and regional air quality agencies must obtain railroad activity data directly from the railroad companies. Railroad companies often are reluctant to provide detailed fuel consumption or activity data due to concerns over distributing sensitive information. Even when these data are provided, they often are not reported with a high level of detail, due in part to the railroad company procedures for maintaining such data.

Exhibit 3-25. Rail methods.

Method	Geographic Scale	Pollutants
EPA GHG Inventory	National	GHG
Locomotive National Emissions Inventory (NEI)	National	CAP and toxics
Line-Haul Emissions by Traffic Density	Regional/Local	All
Line-Haul Emissions by Active Track	Regional/Local	All
Switch Emissions by Number of Switchers or Hours	Regional/Local	All
Line-Haul/Switch Emissions by Employees	Regional/Local	All
Line-Haul/Switch Emissions by Time in Mode	Local	All
Line-Haul Emissions at Marine Terminals	Local	All

Methods to quantify regional rail emissions can be divided in the following types: (1) line-haul emissions by traffic density, (2) line-haul emissions by active track, (3) switch emissions by number of switchers or hours of operation, and (4) line-haul/switch emissions by number of employees.

Line-Haul Emissions by Traffic Density

EPA's guidance for regional inventory preparation provides an approach that estimates line-haul rail fuel consumption by means of traffic density. (*73*) In the National Emission Inventory (NEI), previously described in Section 3.2.3, EIA's estimates of national rail fuel consumption are multiplied by EPA's national locomotive emission factors. (*74–75*) National rail emissions can be apportioned to individual counties based on their share of traffic density (gross ton-miles). County traffic density is obtained from the National Transportation Atlas Database (NTAD), which includes traffic density data for each track in the United States. (*76*) To maintain the confidentiality of railroad data, the NTAD does not contain actual traffic density, but six ranges of traffic density, of which the medians are used for emission calculations. (*77*)

A similar method relies on statewide data, which can be used in place of national data. Each freight railroad that operates in a state/region is asked to report gross ton-miles (GTM) by county, as well as total fuel consumption in the state. If a railroad is able to provide this information, the statewide line-haul fuel use is apportioned to counties in direct proportion to the GTM. Sometimes the railroads perform this fuel use allocation using their own estimate of fuel use per GTM.

Another variation of the same method relies on more project-level data. According to the formula in Equation 4, fuel consumption is determined by dividing traffic density (in GTV) by the systemwide fuel consumption index, measured in gross ton-miles per gallon.

$$\text{Fuel Consumption (gallons)} = \frac{\text{Rail Traffic Density (gross ton-miles)}}{\text{Fuel Consumption Index (gross ton-miles per gallon)}} \qquad \text{(Equation 4)}$$

A systemwide fuel consumption index can be determined for each individual railroad by dividing its annual traffic density by its annual fuel consumption, and these two parameters can be obtained from published Surface Transportation Board (STB) data. This method also is based on the apportionment of fuel use by GTM, but it relies on more specific data, which can be obtained from each of the participating railroads.

The fuel use estimates for each railroad are summed, with the result being an estimate of total railroad fuel use by county. Emission factors (in grams/gallon) are applied to the fuel use figures to estimate annual emissions.

Using a constant fuel consumption index, which is equivalent to apportioning fuel use by GTM, is an inaccurate method for most regional and project-level emission applications because it ignores key local factors such as grade, equipment type (which influences aerodynamic coefficients, and payload to tare ratios), and possibly congestion. All of these factors can have a substantial effect on fuel consumption per ton-mile, as indicated in a recent study from FRA. (*71*) Correction factors for grade and commodity group can be used to minimize the uncertainty associated with the use of a single measure of fuel efficiency. There have also been questions about the accuracy of county-level GTM data reported by railroads.

As indicated by a previous study, a good example of the potential shortcomings of such an approach is its application in California. (*77*) The two Class I railroads that operate in California, Union Pacific and Burlington Northern Santa Fe, primarily offer intermodal service over relatively hilly terrain in the Sierra Nevada Mountains. Their national operations however, are dominated by coal trains operating at relatively level terrain. Because coal trains are much more fuel efficient than intermodal trains, system fuel consumption index is a very poor indicator of regional fuel consumption index in California.

The FRA study and other analyses have estimated measures of rail fuel efficiency for different types of trains, lanes, and commodities, so it is possible to determine a range of variation in terms of fuel consumption index (Exhibit 3-26).

Correction factors to adjust the systemwide fuel consumption index in EPA's guidance were developed by Sierra Research. (*78*) Such correction factors adjust for the steepness of terrain as well as the proportion of bulk rail traffic. Although these factors account for the effects of the most important parameters on rail fuel efficiency, there are concerns about the validity of such factors given that they were estimated based on outdated data from a single study. Additionally, it is uncertain to what extent such correction factors are used in emissions studies.

The use of fuel consumption indexes that are specific to a given lane, train type, and commodity, such as those included in the FRA study, provide a more accurate measure of train fuel efficiency.

Exhibit 3-26. Range of rail fuel efficiency (gross ton-miles/gallon).

Rail Equipment	Min	Max
Double-Stack	523	849
Mixed	367	691
Auto Rack	542	620

Environmental Science & Technology

ARTICLE

pubs.acs.org/est

Spatial Assignment of Emissions Using a New Locomotive Emissions Model

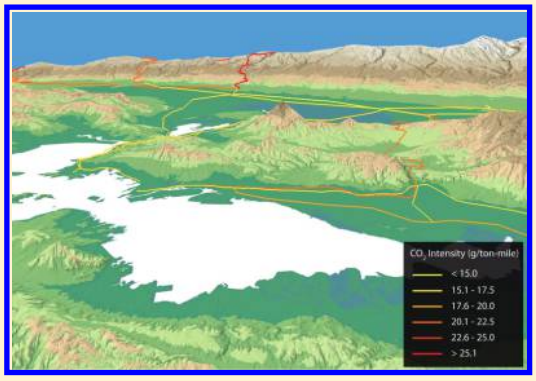
Gregory M. Gould[†,*] and Deb A. Niemeier

Department of Civil and Environmental Engineering, University of California, One Shields Avenue, Davis, California 95616, United States

S Supporting Information

ABSTRACT: Estimates of fuel use and air pollutant emissions from freight rail currently rely highly on aggregate methods and largely obsolete data which offer little insight into contemporary air quality problems. Because the freight industry is for the most part privately held and data are closely guarded for competitive reasons, the challenge is to produce robust estimates using current reporting requirements, while accurately portraying the spatial nature of freight rail impacts.

This research presents a new spatially resolved model for estimating air pollutant emissions (hydrocarbons, carbon monoxide, nitrogen oxides, particulate matter less than 10 μm in diameter, sulfur dioxide, and carbon dioxide) from locomotives. Emission estimates are based on track segment level data including track grade, type of train traffic (bulk, intermodal, or manifest) and the local locomotive fleet (EPA tier certification level and fuel efficiency). We model the California Class I freight rail system and compare our results to regional estimates from the California Air Resources Board and to estimates following U.S. Environmental Protection Agency guidance. We find that our results vary considerably from the other methods depending on the region or corridor analyzed. We also find large differences in fuel and emission intensity for individual rail corridors.



INTRODUCTION

Historically, traffic congestion and air quality problems from transportation have been addressed with strategies targeting passenger vehicles[1,2] resulting in a significant reduction of light-duty vehicle air pollutant emissions even while vehicle miles traveled (VMT) increased. For example, emissions of carbon monoxide (CO), nitrogen oxides (NO_x), and particulate matter less than 10 μm in diameter (PM_{10}) from cars in the United States have decreased by approximately 80% between 1970 and 2005 while VMT has increased by 86%.[3] To inform policy decisions and monitor progress relatively sophisticated light-duty vehicle emission models (e.g., the MOBILE6, EMFAC, and MOVES models) and travel demand models (e.g., the four-step model)[4] were created.

With increasing levels of goods movement driven by growth in imports, lower density development and lean distribution networks,[5] goods movement is receiving more attention from federal[6] and state agencies.[7,8] However, the legacy of planning and modeling for passenger transportation has left some critical gaps in our ability to effectively plan for goods movement.

One of these gaps is a relatively sparse toolbox of methods for evaluating locomotive air pollutant emissions. Locomotives emit a small share of U.S. mobile source air pollutants, for example 9% of NO_x and 5% of PM_{10} according to EPA's 2005 national emission inventory. However, even with an expected decline in locomotive emission rates,[9] along heavily used rail corridors locomotives can be a significant source of air pollutants. Locomotive activity will rise along many rail corridors[10] as the volume of imports grow and government policies encourage more goods to move by rail rather than highway.[11] A larger freight rail mode share is often assumed to produce environmental benefits, but could cause local emission hotspots. Existing locomotive emission models limit our ability to fully understand and quantify these potential costs and benefits.

Generally, only rough or outdated estimates for large geographic areas are available while contemporary policy questions require more accurate and spatially resolved estimates. For example, a policy that aims to improve air quality and reduce carbon emissions by increasing the use of freight rail over trucking requires a more detailed analysis. Shifting goods movement from highways to railways may improve regional air quality, but air pollutant emissions will increase along railways. Local emission hotspots and environmental justice concerns could be identified by a model that estimates emissions for a particular rail corridor. Understanding the carbon dioxide (CO_2) emission reduction potential of a particular mode shift to freight rail also requires a spatially detailed analysis. A recent study for the Federal Railroad

Received: October 29, 2010
Accepted: May 13, 2011
Revised: May 12, 2011
Published: May 24, 2011

ACS Publications © 2011 American Chemical Society

Administration (FRA) found that the ratio of train to truck fuel efficiency ranged from 1.9 to 5.5 depending on the route and type of shipment.[12] The FRA study indicates that freight rail's CO_2 mitigation potential requires a more detailed analysis.

Existing methods to estimate locomotive emission inventories developed by the California Air Resources Board (CARB) and the U.S. Environmental Protection Agency (EPA) are unreliable or have limited spatial detail.[13] CARB's current locomotive emission inventory is produced by applying various growth and correction factors[14] to an inventory developed in the late 1980s[15] because the railroads currently operating in California have been unwilling to provide data to produce a new inventory following the original method. While the original inventory had relatively fine spatial detail, growth factors are now applied uniformly to the entire state and are based on largely unsupported assumptions.[16] Over time the original spatial detail and accuracy will be lost. The EPA's regional inventory method[17] requires far less confidential railroad data; however, it has relatively little spatial detail.

Our locomotive emission model builds on the strengths of EPA's regional inventory method and similar methods.[18,19] Like the EPA's method, fuel consumption is estimated by dividing traffic density, gross ton-miles (GTM), by an estimate of fuel efficiency, GTM per gallon diesel fuel consumed (GTM/gal). Air pollutant emissions (HC, CO, NO_x, PM, sulfur dioxide (SO_2), and CO_2) are calculated by multiplying the fuel consumption estimate by fuel based emission factors. Our new framework departs from EPA's method by estimating fuel efficiency for individual track segments based on local factors that impact fuel consumption: type of train (intermodal, bulk, manifest, etc.), track grade and locomotive fleet.[20,21] The EPA's current method uses system-wide average fuel efficiency estimates for each railroad. Just seven railroads moved 87% of U.S. railcar loads during 2009,[22] and each of these railroad's systems typically span halfway across the country. A railroad company's average fuel efficiency clearly does not reflect regional operating conditions.

Creating a practical tool to inform public policy was a critical objective. More detailed methods exist for estimating freight train fuel consumption. Train energy models are used by railroad's to simulate the movement of trains over their networks. These models produce detailed estimates of fuel consumption but are proprietary and require confidential railroad company data that are typically unavailable. Some studies have made use of limited confidential railroad company data for a particular route,[23] estimating locomotive air pollutant emissions using a method similar to CARB's original 1987 inventory.[15] While these studies produce detailed estimates for the particular case studied, data are not available to extend the analysis to other cases. Additional studies have estimated locomotive emissions as part of a larger study. Forkenbrock[24] estimates the total social cost of moving goods by freight rail; however, the locomotive air pollutant emissions are based on the results of a previous study[23] that used confidential data to estimate emissions for a particular route. Facanha[25] constructs a life cycle analysis of freight rail air pollutant emissions. The tailpipe emission method has little spatial resolution since the key parameters are fuel efficiency derived from national statistics and EPA's national average emission factors.[26] Our modeling framework attempts to balance the need for greater spatial resolution with the limitations posed by public data availability.

DATA

We use two data sets provided by California's Class I railroads, the Union Pacific (UP) and Burlington Northern Santa Fe (BNSF), that describe their operations during 2006 and 2007.

The first data set is used to develop the model and contains one year of detailed train operating information for nine major California rail subdivisions. The rail information provided by one railroad was more complete than the other, so only those data are used to develop the model. These data include aggregate route specific throttle profiles (cumulative amount of time a locomotive operates in each throttle position) for each type of train (intermodal, unit/bulk, manifest, auto, other) with the corresponding traffic density, average consist size (number of locomotives per train), annual number of train trips and locomotive fleet inventory (model and EPA certification level). One limitation of these data is the inability to assess variability. Average values were provided for each route and train type pair, but no other summary statistics. A complete discussion of data limitations and a table of summary statistics (Table S1) for the railroad company data are included in the Supporting Information (SI).

The second data set contains annual traffic density for all UP and BNSF operations in California. The traffic density data are provided for travel in each direction for each track segment. Track segment lengths ranged from 25 miles to less than a tenth of a mile, providing good spatial resolution.

All data are stored in Microsoft Access and linked to the U.S. Department of Transportation's National Transportation Atlas Database rail network using ESRI's ArcMap program. The open source statistical and mathematical programming language R was used for all data processing and model calculations. The model is available from CARB.

MODEL DEVELOPMENT

Air pollutant emissions are estimated with a statistical model that determines fuel efficiency from track grade and train type. The model estimates fuel consumption for any track segment with data that are generally observable or available, accounting for important spatial factors. Emissions are calculated by multiplying the fuel consumption estimates with fuel based emissions factors. Estimating fuel efficiency directly for every track segment would require detailed train operating data for each track segment, but these data are generally not available. The railroads generally consider their operating data confidential and it can be time-consuming for the railroads to collect and process. The statistical model is developed to address these data limitations and is created with the limited amount of detailed data that were made available by the railroads for this research.

Fuel Efficiency Relationship. We estimate fuel efficiency by regressing track grade and train type on fuel intensity which is calculated from the detailed train operating data provided by UP. The choice of independent variables is based on the theory of train/rail dynamics and available data. That is, locomotive fuel consumption is proportional to the amount of work performed, and the amount of work performed is largely determined by the weight of the train being moved, the distance being covered, speed, track grade and the aerodynamic profile of the rail cars.[13,20,21]

Fuel intensity is the amount of fuel used to move a unit weight a unit distance, in our case gallons per gross ton-mile. Fuel intensity is therefore largely a function of train speed, the aerodynamic profile of the rail cars and track grade. Track grade can be estimated with a geographic information system, and the aerodynamic profile of rail cars depends on the type of train (intermodal, unit/bulk, manifest, etc.). Train speed is generally unknown or unavailable but it largely depends on train type and

track geometry which is correlated with track grade.[7,20] We can specify a regression model to capture the influence of these observable factors on fuel intensity (eq 1). The model coefficients are estimated through ordinary least-squares regression.

$$\mathrm{FI} = \alpha + \beta_1 G_\mathrm{p} + \beta_2 G_\mathrm{n} + \beta_3 I + \beta_4 M + e \qquad (1)$$

where

FI is the fuel intensity for route and train type combination (gal/GTM)

G_p is the positive grade factor for route and train type combination

G_n is the negative grade factor for route and train type combination

I is the dummy variable for intermodal and auto train types

M is the dummy variable for manifest and other train types

e is the error term

Graphical analysis indicated that fuel intensity (gal/GTM) is normally distributed and that there are no outliers or heteroskedasticity, suggesting that fuel intensity can be explained by a linear combination of variables that affect train resistance as shown in eq 1. Note that a unit increase in resistance will cause a unit increase in fuel intensity, but a less than proportional increase in fuel efficiency. Therefore, we use fuel intensity rather than fuel efficiency in eq 1. With respect to the independent variables, our analysis indicated that auto trains were similar in fuel intensity to intermodal trains, so auto trains were grouped with intermodal trains. Bulk train fuel intensity is represented by the constant term. The effect of track grade is captured by positive and negative grade factors.

The grade factors are defined as the total route elevation gain or loss, respectively, divided by the total route distance. Grade factors are superior to regressing on average route grade which tends to be close to zero since most routes have similar amounts of positive and negative grade. This is an important consideration since the greater fuel consumption incurred on positive grades is not completely compensated for by fuel savings on negative grades. Route elevation gain and loss were calculated by overlaying the NTAD rail network on the U.S. Geological Survey's digital elevation model in ESRI's ArcMap software.

Train speed does not directly enter eq 1. We assume that speed is partially captured by the train type and track grade variables, but there are some factors that affect speed that remain unaccounted for. For example, we assume that track grade is correlated with track geometry (curvature), but there will be some places with sharp curves in flatter terrain. Train speed is also dependent on the physical condition of the tracks, network congestion, availability of adequate locomotive power, and weather conditions (especially cross winds).

Fuel intensity is calculated from the data provided by UP for nine major rail corridors in California. Fuel consumption for each route (corridor and travel direction) and train type pair is estimated by eq 2.

$$\mathrm{FC}_{jk} = N_{jk} \cdot C_{jk} \sum_l P_{jlk} \sum_n \mathrm{FR}_{nl} \cdot T_{jnk} \qquad (2)$$

where

FC_{jk} is the annual fuel consumption (gallons) for train type j for route k

N_{jk} is the annual number of trains traveling route k of type j

C_{jk} is the average consist size for train type j traveling route k

Table 1. Regression Results

variable	coefficient	std. error	P value
α intercept	9.42×10^{-4}	1.51×10^{-4}	<0.001
G_p positive grade factor	3.13×10^{-1}	1.96×10^{-2}	<0.001
G_n negative grade factor	4.76×10^{-2}	2.10×10^{-2}	0.028
I dummy for intermodal trains	4.85×10^{-4}	1.52×10^{-2}	0.003
M dummy for manifest and other trains	3.15×10^{-4}	1.60×10^{-2}	0.055
number of observations	47		
adjusted R^2	0.86		

P_{jlk} is the fleet proportion of locomotive make and model l for route k for train type j

FR_{nl} is the fuel consumption rate (gallons/hour) for throttle position n for locomotive make and model l

T_{jnk} is the average time (hours) in notch n for travel across route k for train type j

Fuel intensity is calculated by dividing fuel consumption by the corresponding route and train type traffic density (eq 3).

$$\mathrm{FI}_{jk} = \frac{\mathrm{FC}_{jk}}{\mathrm{TD}_{jk}} \qquad (3)$$

where

FI_{jk} is the fuel intensity (gal/GTM) for train type j for route k

TD_{jk} is the annual traffic density (GTM) for train type j for route k

Equation 2 estimates fuel consumption by calculating the time that each locomotive, pulling each train, operates in each throttle position. The cumulative time that each locomotive make and model spends in each throttle position is then matched with each locomotive's make and model fuel consumption rate data, available from existing, published locomotive engine exhaust tests.[27−31]

The regression results shown in Table 1 indicate that the statistical model explains about 86% of the variation in locomotive fuel intensity and, as expected, track grade and train type are significant factors.

The model results produce a range of fuel efficiencies: 239 to 1536 GTM/gal for bulk trains, 214 to 880 GTM/gal for intermodal and auto trains, and 222 to 1035 GTM/gal for manifest trains for the range of track grades and train types observed in California. These estimates are in line with previous estimates of freight train fuel efficiency. System wide fuel efficiency of 757 GTM/gal and 793 GTM/gal reported by BNSF and UP respectively fall around the median of the model results. Additionally, a recent study for the Federal Railroad Administration[12] used a train energy model to estimate a range of train fuel efficiencies from 375 GTM/gal to 850 GTM/gal for 23 truck competitive rail routes using a train energy model. These results are very similar to the range of our intermodal results. The large range of our fuel efficiency estimates is a result of the spatially detailed approach, capturing steep up and down grades as well as exceptionally flat regions.

Specifically, the regression results indicate that, on average, in California, the estimated fuel efficiency for bulk trains is 1061 GTM/gal, intermodal trains 700 GTM/gal and manifest trains 795 GTM/gal on level tracks. These results are consistent with what is expected: bulk trains are most efficient, intermodal trains are least efficient and manifest trains fall somewhere in between.[13]

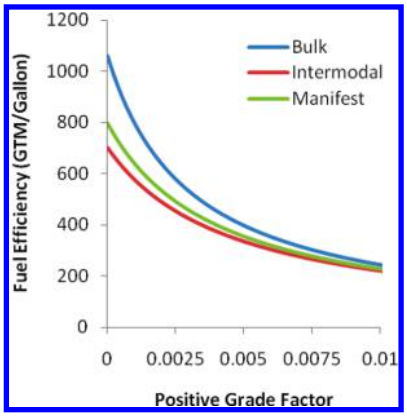


Figure 1. Modeled relationship between positive grade factor and fuel efficiency.

The relationship between the positive grade factor and fuel efficiency is shown in Figure 1 for each train type (see SI Figure S1 for a comparison of positive and negative grade factors). The results indicate, for example, that a 0.005 positive grade factor (the median of observed positive grade factors) decreases the fuel efficiency of an intermodal train by 52% over level tracks (increases fuel consumption by 110%). Similarly, a 0.005 positive grade factor decreases bulk and manifest train fuel efficiency by 62% and 55%, respectively (a 166% and 125% increase in fuel consumption).

Adjust Fuel Intensity for Locomotive Efficiency. The fuel efficiency values estimated above may also be adjusted for various and evolving locomotive fleets; for example, the introduction of new technology such as hybrid locomotives. A relatively simple method is developed where fuel efficiency is adjusted if additional locomotive fleet information is available (or needed for forecasting purposes). The approach requires the energy efficiency, brake horsepower per gallon (bhp/gal), of locomotives that are added to the base locomotive fleet (which is defined in the full model documentation) and the corresponding fleet proportion of the additional locomotives. Following eq 4, an adjustment factor (the relative increase in fleet efficiency due to the additional locomotives) can be estimated for each track segment.

$$A_i = \frac{\left(\sum_s \mathrm{EEF}_{is} \cdot P_{is} + \mathrm{EEFb} \cdot \left(1 - \sum_s P_{is}\right)\right) - \mathrm{EEFb}}{\mathrm{EEFb}} \quad (4)$$

where

A_i is the adjustment factor

EEF_{is} is the locomotive energy efficiency of additional locomotives of type s on track segment i (bhp/gal)

P_{is} is the fleet proportion of additional locomotives of type s on track segment i

EEFb is the base locomotive fleet energy efficiency (bhp/gal)

Fuel efficiency is adjusted for each track segment by applying the adjustment factor to each track's fuel efficiency estimate using eq 5.

$$\mathrm{FE}^*_{id} = \mathrm{FE}_{id}(1 + A_i) \quad (5)$$

where

FE_{id} is the base fuel efficiency (GTM/gallon) for track segment i for travel in direction d calculated from the statistical model

FE^*_{id} is the adjusted fuel efficiency (GTM/gallon) for track segment i for travel in direction d

Rail lubrication, improved aerodynamics, and optimized scheduling may also increase fuel efficiency. However little data are available to estimate the effects of these factors or predict future advances. Periodic updates of the base fuel efficiency could take account of these and other omitted factors over time, but our model does not allow for explicit modeling of them.

Estimate Track Segment Fuel Consumption. Fuel consumption, FC_i, is calculated for each track segment, i, using the traffic density data supplied by UP and BNSF, TD_{id}, and the adjusted fuel efficiency following eq 6.

$$\mathrm{FC}_i = \sum_d \frac{\mathrm{TD}_{id}}{\mathrm{FI}^*_{id}} \quad (6)$$

Calculate Fleet Weighted Emission Factors. Fuel based emission factors, gram per gallon (g/gal), for HC, CO, NO_X, and PM_{10}, are developed for each track segment. These emissions vary by each locomotive's make and model and EPA emission certification level. However, the limited test data, often a single test on a single locomotive for each model (e.g., see refs 27−29,32,33 which describe most of the available test data), do not provide sufficient information to justify creating separate categories.

In absence of reliable locomotive test data, emission factors are based on the EPA emission standard certification level of the locomotive fleet. EPA provides emission factors for locomotives meeting each of its emission standards.[9] These emission factors account for deterioration in emission control performance, variability among individual locomotives and manufacturer compliance margins that are typically 10% of EPA emission standards.[34] Emission factors for each track segment are created by weighting each EPA emission factor by the proportion of locomotives that meet each certification level. PM_{10} emission factors are also adjusted for the current in-use diesel fuel sulfur concentration (see the SI for more information).

Calculate Annual Emissions. Emission estimates, E_i, are made for each track segment, i, by multiplying together the fuel consumption estimates, FC_i, and emission factors, EF_i (g/gal), for HC, CO, NO_X, and PM_{10} (eq 7).

$$E_i = \mathrm{FC}_i \cdot \mathrm{EF}_i \quad (7)$$

Emissions of CO_2 and SO_2 are assumed to be only a function of fuel consumption (and fuel type) since no emission standards for these pollutants exists. CO_2 and SO_2 emissions are estimated from each track segment's fuel consumption estimate, FC_i, following methods described by the EPA.[9]

MODEL RESULTS AND DISCUSSION

We used our model (labeled "UCD") to estimate locomotive air pollutant emissions for all Class I freight rail traffic in California for the year 2007 and compared the results to those produced following EPA guidance (labeled "EPA")[17] and with CARB's emission inventory (labeled "CARB") (Table 2). With the exception of PM_{10} emissions, the UCD model produced higher emission estimates than the EPA method and, with the exception of SO_2 and CO_2 emissions, the UCD model estimates were lower than CARB's.

The differences between the UCD and EPA estimates are created by differences in fuel efficiency estimates and emission

Table 2. Comparison with EPA and CARB Line-Haul Model Results for California

inventory method	FE[a] GTM/gal	FC[b] mgal[c]	HC tons/yr	CO tons/yr	NO_X tons/yr	PM_{10} tons/yr	SO_2 tons/yr	CO_2 tons/yr
UCD[d]	488	286	2420	7870	43 600	1,210	671	3 180 000
EPA[e]	777	180	1840	5430	34 700	1250	422	2 020 000
CARB[f]	–[g]	–	3227	11 652	44 510	1439	280	2 945 039

[a] Average fuel efficiency. [b] Fuel consumption. [c] Million gallons. [d] The model developed by the authors at the University of California, Davis described in this paper (for year 2007). [e] Results estimated following the procedures recommended by EPA[17] with EPA emission factors[9] for the year 2007. [f] 2007 inventory data provided by CARB. [g] No data available.

Table 3. Comparison of Average UCD Model Emission Factors with EPA's Emission Factors

method	HC g/gal	CO g/gal	NO_X g/gal	PM_{10} g/gal
UCD[a]	7.7	25.0	138	3.8
EPA[b]	9.3	27.4	175	6.3

[a] The model developed by the authors at the University of California, Davis described in this paper. [b] EPA emission factors[9] for the year 2007.

factors. The UCD model calculates fuel efficiency estimates for each track segment resulting in a range of values from 224 GTM/gal to 990 GTM/gal with an average of 488 GTM/gal (the maps in SI Figures S2 and S3 show the distribution of fuel efficiency, PM_{10} and NO_x across the state, the spatial patterns for HC, CO, SO_2, and CO_2 are similar). The EPA method uses railroad company averages of 757 GTM/gal for the BNSF and 793 GTM/gal for the UP; estimated from each railroad's system-wide annual tonnage and fuel consumption. The UCD model also estimates emission factors for each track segment depending on the local locomotive fleet. In this case we did not have local locomotive fleet information for every track segment so we used each railroad's fleet mix. For the EPA method we used EPA's locomotive emission factors for 2007.[9] Table 3 compares average UCD model emission factors with EPA's emission factors.

The UCD model results indicate that on average, BNSF's and UP's freight rail operations in California are more fuel intensive than their system-wide average's and that their locomotive fleets are cleaner than the national fleet assumed in EPA's emission factors. While these two factors tend to reduce the differences between the estimates, the much larger fuel intensity estimated by the UCD model results in a larger statewide emission inventory. The greater fuel intensity of California freight rail operations make sense given that most major rail corridors in the state transect high mountain passes and the large amount of fuel intensive intermodal traffic.

A precise explanation for the differences between the UCD and CARB statewide inventory is difficult since CARB's inventory is based on a forecast of its 1987 inventory. This means that there is no information available from which to compare fuel efficiency estimates or emission factors. However, the differences likely stem from reliance on outdated data and the weakness of using a forecasting method on an old inventory. CARB's 1987 inventory made detailed emission calculations for regions of the state that at the time had poor air quality.[15] In a follow up report,[35] a statewide county by county inventory was prepared with average locomotive emission rates from the original inventory to estimate emissions for the remaining routes in the state; for these routes, differences in topography were not considered. Additional uncertainty and errors were likely introduced by using national economic growth data to estimate freight rail activity rather than actual freight rail tonnage data. For example, CARB's inventory estimates emissions for counties in which there are currently no railroad operations. This occurs because railroads that were operating during 1987 have since shutdown, but the forecasting method has no way to account for this and no new railroad activity data is used.

For a particular county, the model that produces the highest or lowest emission inventory varies as does the differences between the inventories (see SI Table S2). Differences in fuel efficiency are the cause. In more mountainous counties and those dominated by more fuel intensive intermodal traffic, the UCD model estimates lower fuel efficiencies while in flatter counties and those dominated by fuel efficient bulk traffic, the UCD model estimates higher fuel efficiencies. In contrast, the EPA method assumes constant fuel efficiencies based on BNSF's and UP's system wide average. Again, the differences between the UCD and CARB estimates stem from CARB's forecasting method and reliance on out dated data.

While the UCD model can estimate more accurate statewide and regional air pollutant emission inventories, the most significant improvement is the ability to estimate emissions, fuel consumption and fuel efficiency for particular rail corridors or segments. We used the UCD model and EPA method to estimate fuel consumption and emissions from moving 1 million gross tons by freight rail across three of California's busiest rail corridors (Table 4).

The results of the corridor analysis indicate that using constant, system wide, fuel efficiency values and national average locomotive emission factors can lead to large errors in fuel consumption and air pollutant emission estimates. On the more hilly corridors (1 and 2), the UCD model estimates almost twice the fuel consumption as the EPA method while on the flatter corridor (3) the estimates are similar. Since emissions are derived using fuel consumption, the UCD emissions estimates are also higher for the hilly corridors, but by a smaller margin due to the larger EPA emission factors (Table 3). For the flatter corridor, the UCD and EPA estimates are closer given the similar fuel consumption estimates, but vary due to differences in the emission factors.

The results of the corridor analysis also point to the importance of considering particular rail routes when estimating the potential benefits of goods movement by freight rail over trucking or other modes. For example, the average fuel efficiency of moving goods by freight rail over corridors 1 or 2 is 43% less than moving those goods over corridor 3. The carbon intensity (CO_2/GTM) of moving goods over corridors 1 or 2 is 76% greater than moving them over corridor 3. Similarly, if BNSF and UP system wide fuel efficiency values were used to estimate the carbon intensity of corridor 1, carbon intensity would be underestimated by 72%. Estimates of other air pollutants would be similarly underestimated.

Besides improving the accuracy and spatial resolution of air pollutant emission inventories, the new modeling method provides for analysis of rail energy intensity. The model can estimate the energy intensity, fuel consumption and CO_2 emissions of each train

Table 4. Comparison of Average UCD Model Emission Factors with EPA's Emission Factors

method	FC[a] gal	HC tons	CO tons	NO_X tons	PM_{10} tons	SO_2 tons	CO_2 tons	FE[b] GTM/gal
Corridor 1: Oakland, CA to CA/NV Board near Reno, NV								
UCD[c]	1 022 800	7.56	28.1	137	3.64	2.40	11 390	436
EPA[d]	560 000	5.21	15.3	98	3.53	1.31	6240	791
Corridor 2: Los Angeles, CA to Needles, CA								
UCD	1 464 400	13.72	40.3	246	7.06	3.44	16 300	435
EPA	833 800	7.75	22.9	146	5.25	1.96	9280	764
Corridor 3: Bakersfield, CA to Stockton, CA								
UCD	717 800	5.30	19.8	96	2.55	1.68	7990	769
EPA	696 100	6.47	19.1	122	4.39	1.63	7750	793

[a] Fuel consumption. [b] Fuel efficiency. [c] The model developed by the authors at the University of California, Davis described in this paper. [d] Results estimated following the procedures recommended by EPA[17] with EPA emission factors[9] for the year 2007.

route under various assumptions of in-use and future locomotive fleets, efficiency and traffic type. This is an important capability given the recent focus on improving the flow of goods movement and reducing its environmental and climate impacts, potentially by encouraging greater use of freight rail over trucking. Similar analysis of criteria air pollutant emissions can also be made. The impacts of shifting freight from road to rail can be analyzed in terms of potential benefits of reduced energy consumption and air pollutant emissions for a region at the expense of increased levels of local air pollutants from increased rail traffic.

While the new model is a substantial improvement over existing methods, it would benefit from additional research. Future work could include a new method for estimating the proportion of traffic type based on data that is publicly available (or at least available to government agencies), our data was provided directly by the railroads. Relating information from the Surface Transportation Board's Carload Waybill Sample to train types is a promising possibility. Additionally, methods for forecasting freight traffic and future locomotive fleets could also be improved. The quality of existing locomotive test data is also problematic. Most of the available data is out-dated, was created with test procedures unlikely to achieve real world emission rates[36] and have never been validated with any sort of in-use testing as has been the case with on-road vehicles.

ASSOCIATED CONTENT

Supporting Information. Tables S1 and S2; Figures S1, S2, and S3; an extended discussion of data limitations; and PM_{10} emission factor fuel sulfur correction method. This material is available free of charge via the Internet at http://pubs.acs.org.

AUTHOR INFORMATION

Corresponding Author

*Phone: (310) 434-2300; fax: (310) 434-2399; e-mail: ggould@nrdc.org.

Present Addresses

†Natural Resources Defense Council, 1314 Second Street, Santa Monica, CA 90401, phone (310) 434−2300, fax (310) 434−2399, e-mail ggould@nrdc.org.

ACKNOWLEDGMENT

This research was performed for and funded by the California Air Resources Board. The statements and conclusions in this article are those of the authors and not necessarily those of the California Air Resources Board. The mention of commercial products, their source, or their use in connection with material reported herein is not to be construed or implied endorsement of such products. We also thank UP and BNSF for providing data used in this research.

REFERENCES

(1) Weiner, E. *Urban Transportation Planning in the United States: An Historical Overview*; Praeger Publishers: Westport, CT, 1999.

(2) Woudsma, C. Understanding the movement of goods, not people: Issues, evidence and potential. *Urban Stud.* **2001**, *38* (13), 2439–2455.

(3) Davis, S.; Diegel, S; Boundy, R. *Transportation Energy Data Book*, 29th ed.; Oak Ridge National Laboratory: Oak Ridge, TN, 2010.

(4) Ortuzar, J. d. D.; Willumsen, L. G. *Modeling Transport*, 3rd ed.; John Wiley & Sons Ltd.: Chichester, U.K., 2001.

(5) Bertram, K.; Santini, D.; Vyas, A. *Analysis of major trends in US commercial trucking*, 1977−2002; ANL/ESD/09−3; Argonne National Laboratory: Argon, IL, 2009; http://www.transportation.anl.gov/pdfs/TA/581.pdf

(6) *Freight Transportation, National Policy and Strategies Can Help Improve Freight Mobility*; GAO-08−287; United States Government Accountability Office: Washington, DC, 2008; http://www.gao.gov/new.items/d08287.pdf.

(7) *Transportation: Invest in America, Freight Rail Bottom Line Report*; American Association of State Highway and Transportation Officials: Washington, DC, 2002.

(8) *Goods Movement Action Plan Phase I: Foundations*; Buisness, Transportation and Housing Agency and California Environmental Protection Agency: Sacramento, CA, 2005; http://www.arb.ca.gov/gmp/docs/finalgmpplan090205.pdf.

(9) *Emission Factors for Locomotives*; EPA-420-F-09-025;United States Environmental Protection Agency: Washington, DC, 2009; http://www.epa.gov/otaq/regs/nonroad/locomotv/420f09025.pdf

(10) Cambridge Systematics, Inc. *National Freight Infrastrcuture Capacity and Investment Study*; Prepared for the Association of American Railroads: Washington, D.C., 2007.

(11) Bryan, J.; Weisbrod, G.; Martland, C. D. *Rail Freight Solutions to Roadway Congestion—Final Report and Guidebook*; NCHRP Report 586; Transportation Research Board: Washington, DC, 2007; http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_586.pdf.

(12) ICF International. *Comparative Evaluation of Rail and Truck Fuel Efficiency on Competitive Corridors*; Prepared for the Federal Railroad Administration: Washington, DC, 2009; http://www.fra.dot.gov/Downloads/Comparative_Evaluation_Rail_Truck_Fuel_Efficiency.pdf.

(13) Gould, G.; Niemeier, D. A review of regional locomotive emission modeling and the constraints posed by activity data. *Transport. Res. Rec*. **2009**, *2117*, 24–32.

(14) Wong, W. *OFFROAD Modeling Change Technical Memo*; California Air Resources Board: Sacramento, CA, 2008; http://www.arb.ca.gov/msei/onroad/downloads/docs/Locomotive_Memo.doc.

(15) Booz-Allen and Hamilton, Inc. *Locomotive Emission Study*; Prepared for the California Air Resources Board: Sacramento, CA, 1991.

(16) Gould, G.; Niemeier, D. *Report on the Development of a GIS Enabled Locomotive Emission Model for California*; Prepared for the California Air Resources Board: Sacramento, CA, 2010.

(17) *Procedures for Emission Inventory Preparation, Vol. IV: Mobile Sources*; EPA420-R-92-009; United States Environmental Protection Agency: Washington, DC, 1992. http://tmip.fhwa.dot.gov/resources/clearinghouse/docs/procedures/procedures.pdf.

(18) Sierra Research Inc.; Caretto, L. *Development of Railroad Emission Inventory Methodologies*; Prepared for Southeastern States Air Resource Mangers, Inc.: Forest Park, GA, 2004; http://www.metro4-sesarm.org/pubs/railroad/FinalMethodologies.pdf.

(19) Billings, R.; Chang, R.; Perez, H. *Memorandum: Texas Railroad Emission Inventory Model (TREIM) and Results*; ERG: Lexington, MA, 2006; http://files.harc.edu/Projects/AirQuality/Projects/H018A.2004.T1/H18A-2004-T1FinalReport.pdf.

(20) Hay, W. W. *Railroad Engineering*, 2nd ed.; John Wiley and Sons, Inc.: New York, NY, 1982.

(21) Davis, W. J., Jr. Tractive resistance of electric locomotives and cars. *Gen. Electr. Rev.* **1926**, *29*, 685–708.

(22) *Railroad Statistics*; Associate of American Railroads: Washington, DC, 2010; http://www.aar.org/~/media/aar/Industry%20Info/AAR%20Stats%202010%201123.ashx.

(23) Barth, M.; Tadi, R. Emissions comparison between truck and rail: Case study of California I-40. *Transp. Res. Rec*. **1996**, *1520*, 44–52.

(24) Forkenbrock, D. J. Comparison of external costs of rail and truck freight transportation. *Transp. Res. A* **2001**, *35* (4), 321–337.

(25) Facanha, C.; Horvath, A. Evaluation of life-cycle air emission factors of freight transportation. *Environ. Sci. Technol*. **2007**, *41* (20), 7138–7144.

(26) Facanha, C.; Horvath, A. Environmental assessment of freight transportation in the U.S. *Int. J. Life Cycle Assess*. **2006**, *11* (4), 229–239.

(27) Fritz, S. G. *Emission Measurements—Locomotives, Final Report*, SRI-08−5374-024; Southwest Research Institute: San Antonio, TX, 1995.

(28) Smith, B.; Sneed, B.; Fritz, S. *AAR Locomotive Emissions Testing 2005 Final Report*; OAR-2003-0190-0363.1; Transportation Technology Center, Inc.: Pueblo, CO, 2006.

(29) Fritz, S. *Diesel Fuel Effects on Locomotive Exhaust Emissions, Final Report*; Prepared for the California Air Resources Board: Sacramento, CA, 2000.

(30) Fritz, S. G. Exhaust emissions from two intercity passenger locomotives. *J. Eng. Gas Turbines Power* **2004**, *116* (1), 774–783.

(31) *Locomotive Emission Standards, Regulatory Support Document*; United States Environmental Protection Agency: Washington, DC,1998; http://www.epa.gov/otaq/regs/nonroad/locomotv/frm/locorsd.pdf.

(32) Booz-Allen and Hamilton, Inc. *Locomotive Emission Study*, Appendices; Prepared for the California Air Resources Board: Sacramento, CA,1991.

(33) *Locomotive Emission Factors for Inventory Guidance Document*; United States Environmental Protection Agency: Washington, DC, 1991.

(34) *Regulatory Impact Analysis: Control of Emissions of Air Pollution from Locomotive Engines and Marine Compression Ignition Engines Less than 30 Liters Per Cylinder*; EPA420-R-08-001; United States Environmental Protection Agency: Washington, DC, 2008; http://www.epa.gov/oms/regs/nonroad/420r08001a.pdf.

(35) Booz-Allen and Hamilton, Inc. *Report on Locomotive Emission Inventory: Locomotive Emissions by County*; Prepared for the California Air Resources Board: Sacramento, CA,1992.

(36) Yanowitz, J. Particulate matter emissions during transient locomotive operation: Preliminary study. *J. Air Waste Manage. Assoc*. **2003**, *53* (10), 1241–1247.

Spatial Assignment of Emissions Using a New Locomotive Emissions Model

Supporting Information

Gregory M. Gould[1] and Deb A. Niemeier*

Department of Civil and Environmental Engineering, University of California, One Shields Avenue, Davis, CA 95616

* Corresponding author e-mail: ggould@nrdc.org; phone: (310) 434-2300; fax: (310) 434-2399.

[1]Current affiliation and contact information: Natural Resources Defense Council, 1314 Second Street, Santa Monica, CA 90401, phone (310) 434-2300, fax (310) 434-2399 e-mail ggould@nrdc.org

Number of Pages: 8

Number of Figures: 3

Number of Tables: 2

Extended Discussion of Data and Data Limitations

The data provided by the railroads include for each route and train type combination: average throttle profile during 2007, average consist size during 2007, total traffic density for 2007, train trips made during 2007, and relative frequency of each locomotive type (model and EPA certification level) used during 2007. The average values are based on over 25,000 train trips over 18 different routes that cover all regions of the state. These data were used to calculate FI_{jk} using equations 1 and 2.

One major limitation are that annually averaged values were provided by the railroads rather than the actual data on individual train trips. The railroads considered the more detailed data too sensitive to share with CARB and UC Davis. The averaged data provide useful information; however, information was not provided on the distribution of the data (i.e., the railroads refused to provide basic summary statistics such as the standard deviation or range). This presents a unique problem when estimating equation 1.

Fuel intensity estimates are computed using the mean train gross weight, consist size, time-in-notch (duty cycle) and proportions of locomotive types, all of which were provided by UP. There are three main considerations that must be weighed in using these data. First, each mean value is computed from a sample of data whose size varies considerably with route and train type as shown in Table S1. In general, means computed from larger samples of a population are more reliable (i.e., are expected to have a smaller variance) than those estimated from smaller samples. We requested, but were not provided information on the variance and distribution of the data. Second, we requested but were not provided information on the sampling method (e.g., do the data include every train trip that occurred over a given year or do the data represent a subset

of trips from trains equipped with data recording devices?). We assume that the sampled data are unbiased based on our understanding that they include every train trip that occurred during 2007. However, we were not able to independently verify how the data were collected. If the sampled data are not representative of the population of train trips, the resulting means could be biased. Third, the mean values provided by UP represent only one year of train operations. Without providing greater temporal detail, or the individual data points, potential outliers (e.g., unusual events, such as a recent fire which destroyed a heavily used UP bridge in Northern California) and temporal trends (e.g., increased traffic during preholiday months) will not be detected and accounted for.

To increase the generalizability of our approach and results, we excluded routes with fewer than 20 observations (annual train trips) from the data set used to fit the regression equation (equation 1). The value of 20 eliminates routes with infrequent traffic (less than two trips per month) classified as "local" or "other" by UP and represents a break in the data were most routes have a much smaller or higher number of observations. UP was unable to define what these other train types were, but they could be a different railroads traffic operating on UP's system or an indication of incomplete or erroneous data.

Additionally, the data supplied by BNSF were not used in the regression because the data on bulk and manifest trains were grouped together and no data were provided on the makeup of the locomotive fleet. Without information on the specific locomotives used on each route, there was no reliable way to estimate fuel intensity.

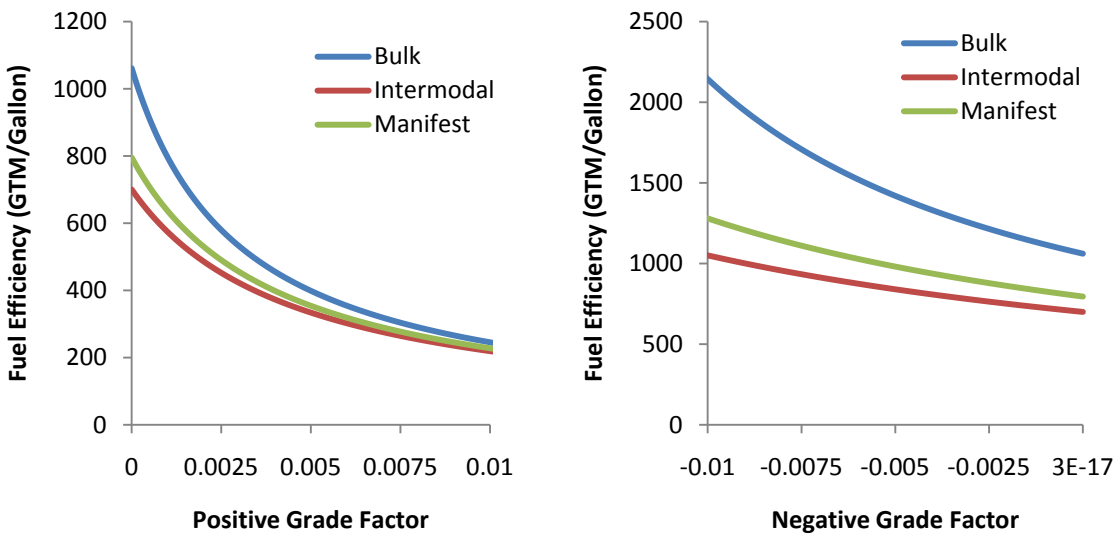
We are confident that our modeling approach provides a significant improvement over existing methods that have their own data limitations as discussed in main text. Nonetheless, it is

important to recognize that there could be limitations to the results based on the considerations described above.

Table S1 Summary statistics for variables used in equation 1

Type	**FI·10^{3}**[a] *mean (sd)*[d] *[range]*	**G_p·10^{3}**[b] *mean (sd) [range]*	
Auto	2.41 (1.01) [1.62 – 4.41]	3.68 (3.61) [0.62 – 10.2]	
Bulk	1.85 (1.33) [0.48 – 4.44]	3.38 (3.53) [0.24 – 10.2]	
Intermodal	2.16 (0.81) [1.27 – 4.74]	2.66 (2.83) [0.14 – 10.2]	
Manifest	2.04 (0.97) [0.73 – 4.25]	2.91 (2.83) [0.14 – 10.2]	
	G_n·10^{3}[c] *mean (sd) [range]*	**Trips per Sample** *mean (sd) [range]*	**Sample Size**
Auto	-3.30 (3.88) [-10.2 – -0.34]	152 (123) [21 – 344]	6
Bulk	-3.24 (3.58) [-10.2 – -0.14]	97 (106) [25 – 319]	8
Intermodal	-2.20 (1.91) [-5.49 – -0.14]	635 (964) [21 – 2,876]	17
Manifest	-2.75 (2.87) [-10.2 – -0.14]	799 (361) [155 – 1,549]	16

[a] Fuel intensity divided by 1,000
[b] Positive grade factor divided by 1,000
[c] Negative grade factor divided by 1,000
[d] Standard deviation



(a) (b)

Figure S1 Modeled relationships between positive grade factor (a) and negative grade factor (b) and fuel efficiency

Adjusting PM10 Emission Factors for In-Use Diesel Fuel Sulfur Concentration

The EPA's PM_{10} emission factors assume different diesel fuel sulfur concentrations. A sulfur concentration of 3,000ppm is assumed for Pre-Control, Tier 0, 1 and 2 PM_{10} emission factors and 15ppm for the remainder.[S1] California regulations (13 CCR 2299, 2281) and an agreement with UP and BNSF[S2] require the use of ultra low sulfur diesel (15ppm sulfur concentration) when locomotives are refueled in California and federal regulations currently require railroads to use low sulfur diesel fuel (500ppm sulfur concentration) and ultra low sulfur diesel starting in 2012 (40 CFR 80.510). The EPA's PM_{10} emission factors are adjusted to account for the current sulfur concentration of locomotive fuel used by locomotives operating in California using a method developed by the EPA.[S3] The average sulfur concentration was assumed to be 340ppm based on a recent series of rail yard toxic air contaminant mitigation plans submitted to CARB by BNSF.[S4]

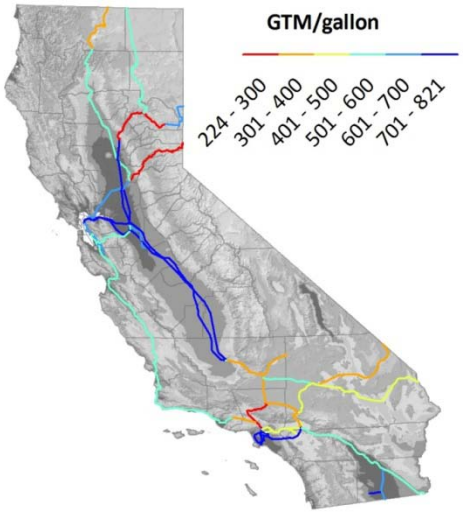


Figure S2 Estimated track segment fuel efficiency

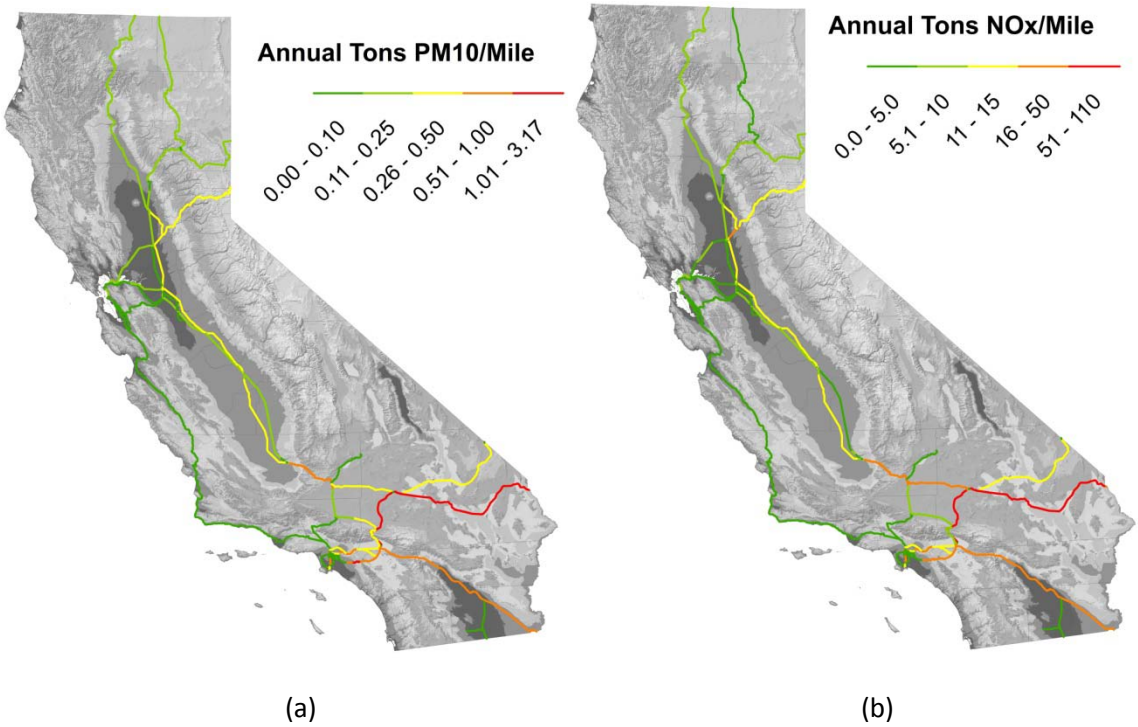


Figure S3 Estimated annual PM10 (a) and NO_X (b) ton/mile emission rates

Table S2 Comparison with EPA and CARB line-haul fuel consumption, NO_X and PM_{10} estimates for 10 counties with the greatest amount of freight rail traffic

	Fuel Consumption		**NO_x Emissions**			**PM_{10} Emissions**		
	UCD[a]	**EPA**[b]	**UCD**	**EPA**	**CARB**[c]	**UCD**	**EPA**	**CARB**
County	***mgal***[d]***/yr***	***mgal/yr***	***tons/yr***	***tons/yr***	***tons/yr***	***tons/yr***	***tons/yr***	***tons/yr***
San Bernardino	119	66	19,900	12,690	10,200	568	457	344
Riverside	23	14	3,250	2,790	2,920	88	101	98
Kern	23	14	3,350	2,690	3,500	91	97	115
Imperial	15	10	2,060	1,830	1,930	55	66	66
Los Angeles	15	11	2,030	2,180	4,770	55	78	155
San Joaquin	6	5	850	1,030	1,260	23	37	39
Placer	10	5	1,300	887	866	35	32	26
Sacramento	5	4	605	809	1,100	16	29	32
Plumas	6	4	859	773	762	23	28	23
Merced	4	4	684	782	604	19	28	18

[a] The model developed by the authors at the University of California, Davis described in this paper.
[b] Results estimated following the procedures recommended by EPA[S5] with EPA emission factors.[S6]
[c] Data provided by CARB
[d] Million gallons

References

S1. *Regulatory Impact Analysis: Control of Emissions of Air Pollution from Locomotive Engines and Marine Compression Ignition Engines Less than 30 Liters Per Cylinder*; EPA420-R-08-001; United States Environmental Protection Agency: Washington, DC, 2008; http://www.epa.gov/oms/regs/nonroad/420r08001a.pdf.

S2. *ARB/Railroad Statewide Agreement*; California Air Resources Board: Sacramento, CA, 2005; http://www.arb.ca.gov/railyard/ryagreement/083005mouexecuted.pdf.

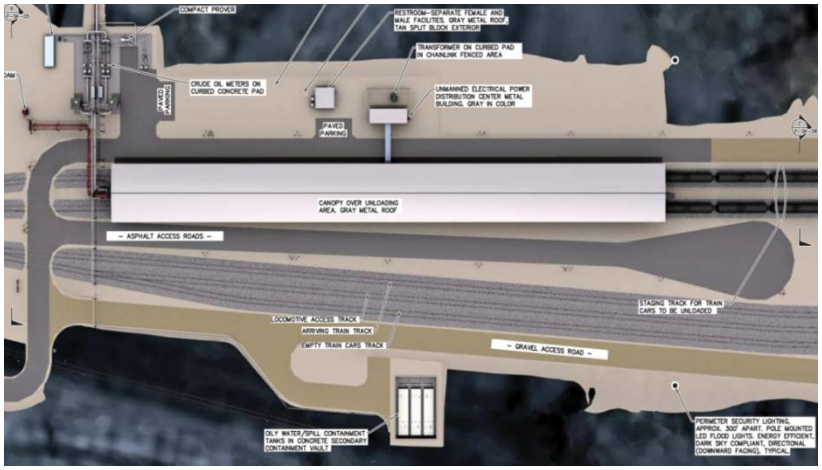
S3. *Final Regulatory Analysis: Control of Emissions from Nonroad Diesel Engines*; EPA420-R-04-007; United States Environmental Protection Agency: Washington, DC, 2004; http://www.epa.gov/nonroaddiesel/2004fr/420r04007a.pdf.

S4. *Railyard Health Risk Assessments and Mitigation Measures* Website; http://www.arb.ca.gov/railyard/hra/hra.htm.

S5. *Procedures for Emission Inventory Preparation, Volume IV: Mobile Sources*; EPA420-R-92-009; United States Environmental Protection Agency: Washington, DC, 1992. http://tmip.fhwa.dot.gov/resources/clearinghouse/docs/procedures/procedures.pdf.

S6. *Emission Factors for Locomotives*; EPA-420-F-09-025;United States Environmental Protection Agency: Washington, DC, 2009; http://www.epa.gov/otaq/regs/nonroad/locomotv/420f09025.pdf

Phillips 66 Company Rail Spur Extension And Crude Unloading Project Final Environmental Impact Report And Vertical Coastal Access Project Assessment



Prepared For:
San Luis Obispo County

Prepared By:
mrs
Marine Research Specialists

December 2015
SCH # 2013071028

CLASS I Impacts – Rail Spur Project

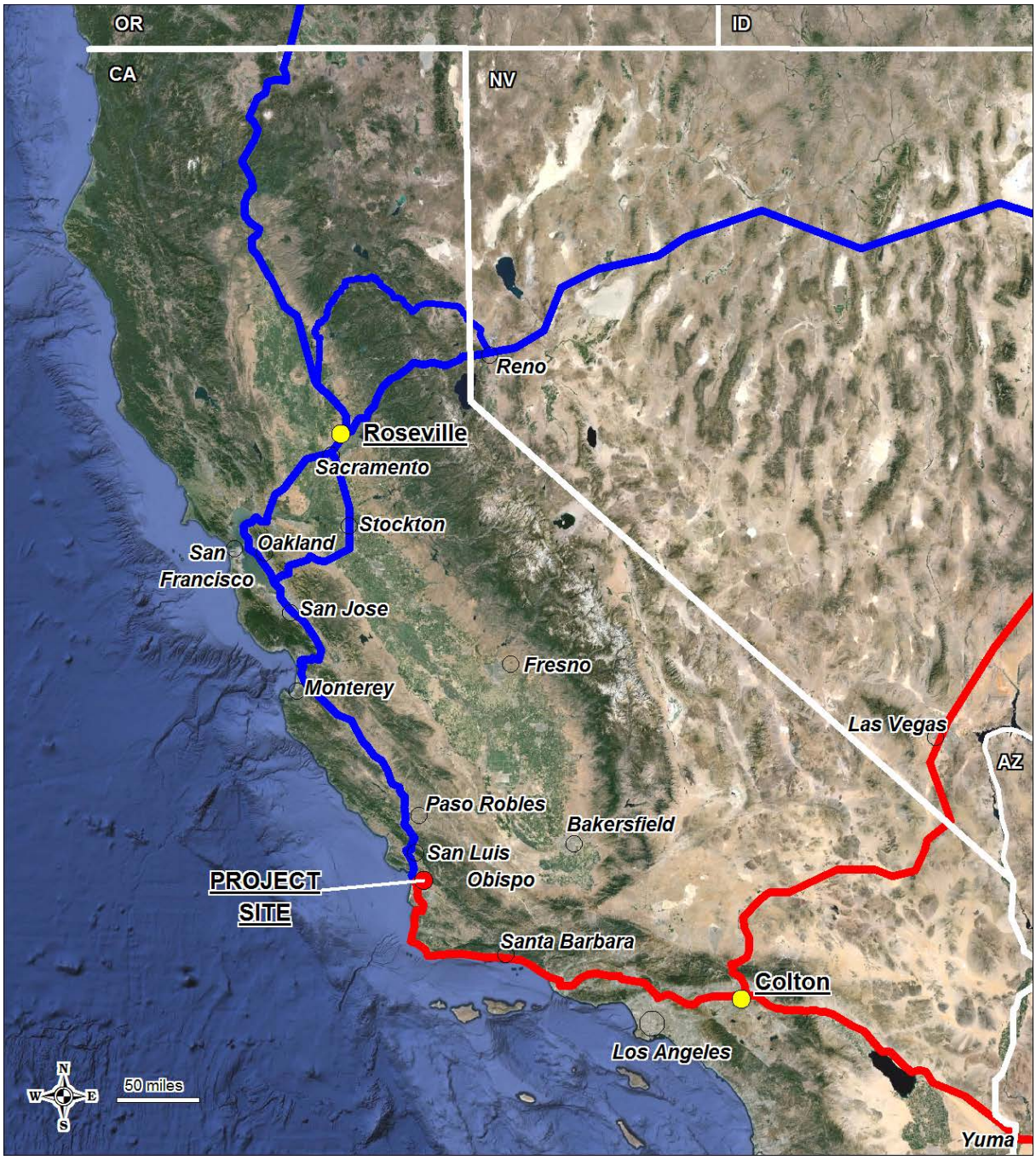
Impacts That May Not Be Fully Mitigated To Less Than Significant Levels

(Impacts that must be addressed in a "statement of overriding consideration" if the project is approved in accordance with Sections 15091 and 15093 of the State CEQA Guidelines)

Impact #	Description of Impact	Phase	Mitigation Measure		Residual Impact
				approve any required ROG+NOx emission reductions.	
			AQ-2b	Prior to issuance of Notice to Proceed, the Applicant shall implement a program, including training and procedures, to limit all locomotive onsite idling to no more than 15 consecutive minutes except when idling is required for safety purposes. Locomotive idling records shall be maintained and provided to the SLOCAPCD on an annual basis, along with training materials and training records.	
AQ.3	Operational activities of trains along the mainline rail route outside of SLOC associated with the Rail Spur Project would generate criteria pollutant emissions that exceed thresholds.	Operations	AQ-3	Prior to issuance of the Notice to Proceed, the Applicant shall provide a mitigation, monitoring and reporting plan. The plan shall investigate methods for reducing the locomotive emissions through contracting arrangements that require the use of Tier 4 locomotives or equivalent emission levels. The plan shall indicate that, on an annual basis, if the mainline rail emissions of ROG+NOx with the above mitigations still exceed the applicable Air District thresholds, the Applicant shall secure emission reductions in ROG + NOx emissions or contribute to new or existing programs within each applicable Air District, similar to the emission reduction program utilized by the SLOCAPCD, to ensure that the main line rail ROG + NOx emissions do not exceed the Air District thresholds for the life of the project. The Applicant shall provide documentation from each Air District to the San Luis Obispo County Planning and Building Department that emissions reductions have been secured for the life of the project prior to issuance of the Notice to Proceed.	Significant and Unavoidable
AQ.4	Operational activities at the Refinery associated with the Rail Spur Project would generate toxic emissions that exceed SLOCAPCD thresholds.	Operations	AQ-4a	Implement measures AQ-2a and AQ-2b.	Significant and Unavoidable
			AQ-4b	All trucks under contract to the SMR for moving coke and sulfur shall meet EPA 2010 model year NOx and PM emission requirements and a preference for the use of rail over trucks for the transportation of coke shall be implemented to the extent feasible in order to reduce offsite emissions. Annual truck trips associated with refinery operations and their associated model year and emissions shall be submitted to the SLOCAPCD annually.	
			AQ-4c	If mitigation measure AQ-2a (the use of Tier 4 locomotives only) is not implemented, then crude oil train unloading and switching activities at the SMR shall be limited to the period of 7 a.m. to 7 p.m. to reduce the emissions during periods of calm meteorological conditions. Reports shall be submitted to the County and APCD indicating the time of arrival, the start and end time of train switching break-apart and unloading and departure time. These time limits do not apply to pull-in of the unit trains from the mainline. When a unit train is pulled in between 7 p.m. and 7 a.m., the locomotives shall shut down until the allowed unloading time starting at 7 a.m. No switching or breaking apart of trains or any other locomotive activity is allowed between 7 p.m.	

software tool that provides assistance to all Class I railroads in the routing of hazmat shipments to meet federal requirements. The RCRMS is the result of thorough analysis and prioritization of 27 risk factors identified by the Transportation Security Administration to be accounted for in all hazmat rail route planning. RCRMS undergoes modifications and updates based on continuing analysis of rail hazmat transportation data.

Figure 2-9 Mainline Rail Routes to the Santa Maria Refinery



Source: Adapted by MRS from UPRR maps.

2.5.2 Train Unloading Sequence

The tracks and unloading rack would be designed to allow for the safe and efficient movement of multiple trains and cars in and out of the facility while minimizing the required space. Figure 2-4 provides a line diagram of the track layout. The unloading sequence described below would be for a unit train (a train with three locomotives, two buffer cars, and 80 tanker cars). The sequence would be similar for rail cars delivered via a manifest train, but the number of railcars handled would be substantially less. The train arriving at the refinery would be assembled and delivered to the site by UPRR. The final configuration of the train would be determined by UPRR. Based upon discussions with Phillips 66 and UPRR, a possible unit train configuration would be two locomotives at the front of the train, followed by two buffer cars, 80 tanker cars, with the third locomotive at the end of the train. This is the train configuration that has been used in the EIR to evaluate the impacts of the unloading operations.

The rail spur has been designed to allow for unit trains to arrive at the refinery from the north or the south on UPRR's main line track. The trains would enter the existing refinery spur from the north after having pulled off onto the UPRR siding track. Once the unit train was at the refinery the unloading sequence would begin.

Once the train is on the refinery site, operation of the train would be turned over to Phillips 66 and it would follow the following typical sequence.

1. ***Position Train on Tracks 1 and 2 –*** The train would pull into the facility down Track 2, which has one of the two unloading racks (unloading rack #2). The 80th tanker car would be positioned at the first rail car unloading line. This would position the last ten tanker cars at unloading Rack #2. The third engine, which would be at the back of the train, would be decoupled and would move to the end of Track 764 and shutdown. The train would be uncoupled between tanker car 40 and 41. The two engines at the front of the train would pull the remaining section of the train past the intersection of Tracks 1 and 2 in an easterly direction. At this time two locomotives would be positioned on the Tail Track. The train would then be pushed up Track 1 till the 40th car is positioned at the front loading line of unloading Rack #1. The engines would then decouple from the train and then move back down to the Tail Track and then move back up Track 4, which is the runaround track, to the area nearest the refinery. The engines would be decoupled and one engine would move on to Track 2, one engine would move on to Track 1. These two engines would be used in the unloading operations as discussed below.

2. ***Train Unloading –*** Unloading would occur at two racks, and each rack would be capable of unloading 10 cars. At each rack the first unloading would be connected to the first car and the pump started. Then the second unloading line would be connected and the pump started. This process would continue till all 10 cars on each rack were unloaded. After each car is unloaded, the unloading line would be disconnected. It is estimated that it would take about two hours to unload a set of 20 cars (10 at each of the two racks) including moving, switching and decoupling. Once the first set of ten tanker cars at each unloading rack is unloaded, one of the engines would pull the train forward (in a westerly direction) by 10 cars, thereby lining up the next ten tanker cars for unloading. The empty tanker cars would be moved to Track 5, the empty car holding track. This process would repeat three times until

In March 2008, EPA finalized a three part program that will dramatically reduce emissions from diesel locomotives of all types -- line-haul, switch, and passenger rail. The rule will cut PM emissions from these engines by as much as 90 percent and NOx emissions by as much as 80 percent when fully implemented. The standards are based on the application of high-efficiency catalytic after treatment technology for locomotives built in 2015 and later.

EPA standards also apply for existing locomotives when they are remanufactured. Requirements are also in place to reduce idling for new and remanufactured locomotives. EPA has estimated that by 2041 the average nationwide emission factors for mainline locomotives would meet the Tier 4 standards (EPA 2009). This means that even if the County is preempted by Federal law from implementing the Tier 4 mitigation measure as part of the project, that over time the locomotive emissions will achieve this level due to the EPA emission control requirements for locomotives.

Since AQ-3a may not be implemented due to Federal preemption, and it is uncertain if the other Air Districts could require emission reduction credits, the impacts associated with the mainline rail operation would remain *significant and unavoidable (Class I).*

Health Impacts of Significant and Unavoidable Emissions

As discussed under impact AQ.3, emissions of NO_x would remain above the significance thresholds within all Air Districts except Yolo/Solano. As these emissions would remain above the thresholds even after mitigation, an analysis is presented below to clarify the potential health impacts of these emissions. NO_x is a criteria pollutant that reacts in the atmosphere, along with ROGs, to produce ozone. Ozone has a number of health impacts including loss of pulmonary function. Increases in NO_x and ROG emissions associated with the proposed project could cause incremental increases in the ozone concentrations which could cause an increase in the ppm concentrations and the number of days per year exceeding the ambient air quality standards. NO_x emissions from the proposed project would be emitted in a number of Air Districts (see Table 4.3.18), contributing to the pollutants measured at basin-wide monitoring stations. Ozone formation is a complex and complicated phenomena where emissions from one area could contribute to increased ozone levels at different locations depending on meteorology and atmospheric chemistry. The respective Districts have established thresholds of pollutant emissions from new projects that are based on modeling of the projected emissions basin-wide and the resulting impact on pollutant concentrations at the monitoring stations. The Districts, through their respective Management Plans, are pursuing actions that can be implemented over the next few years to work towards meeting the 8-hour ozone standards.

In order to estimate the potential health effects of the proposed projects mainline emissions on the population, the projects emissions are compared to the district-wide emissions and are assumed to generate an equivalent amount of ozone on a tons/year basis (a linear relationship in ozone generation to emissions). District-wide emissions of NO_x and VOC/ROG are shown in Table 4.3.22. The proposed project total NO_x+ROG emissions would total a small percentage of the total daily emissions within each district. This level would cause an increase in the ozone concentration of up to 0.05 ppb (for districts in non-attainment) and would not produce a change in the number of days of exceedance annually in the applicable Districts air quality standards.

Table 4.3.22 Health Impacts of Significant Emissions

Air District	Thresholds of Significance						Incremental Increase in ozone, ppb	Mortality per 1,000 persons	Morbidity per 1,000 persons
	NO_X		VOC/ROG		Significant?*				
	Daily (lbs)	Annual (tons)	Daily (lbs)	Annual (tons)	NOx	ROG /VOC			
SCAQMD	55		55		Y/N	N/N	0.00	0.01	0.01
VCAPCD	25		25		Y/Y	N/N	0.01	0.03	0.05
SBCAPCD	240	-	240	-	Y/N	N/N	0.04	0.13	0.15
SLOAPCD	25	25	25	25	Y/N	Y/N	0.02	0.06	0.06
MBUAPCD	137		137		Y/N	N/N	0.02	0.06	0.08
SMAQMD	65		65		Y/N	N/N	0.01	0.02	0.03
SJVAPCD		10		10	Y/N	N/N	0.00	0.01	0.01
YSAQMD		10		10	N/N	N/N	0.06	0.18	0.23
BAAQMD	80	15	80	15	Y/N	N/N	0.01	0.02	0.02
PCAPCD	82		82		Y/N	N/N	0.05	0.17	0.19
N. Sierra	25 .		25 .		Y/N	N/N	0.02	0.08	0.08
Feather R	25 .		25 .		Y/N	N/N	0.00	0.01	0.01
Butte	25 .		25 .		Y/N	N/N	0.03	0.17	0.13
Tehama	25 .		25 .		Y/N	N/N	0.05	0.26	0.21
Shasta	25 .		25 .		Y/Y	Y/N	0.04	0.20	0.17
Siskiyou	25 .		25 .		Y/Y	Y/N	0.09	0.46	0.36
Mojave	137 .	25	137 .	25	Y/N	N/N	0.04	0.13	0.17

* for unmitigated/mitigated emissions. Incremental ozone and mortality/morbidity based on unmitigated emissions. Mitigated emissions include the use of Tier 4 locomotives.
SCAQMD-South Coast Air Quality Management District ;VCAPCD-Ventura County Air Pollution Control District; SBCAPCD-Santa Barbara County Air Pollution Control District; SLOAPCD-San Luis Obispo County Air Pollution Control District; MBUAPCD-Monterey Bay Unified Air Pollution Control District; SMAQMD –Sacramento Metropolitan Air Quality Management District; SJVAPCD-San Joaquin Valley Air Pollution Control District; Yolo-Solano Air Quality Management District; BAAQMD-Bay Area Air Quality Management District; PCAPCD-Placer County Air Quality Management District.

The California Air Resources Board (CARB) evaluated potential health impacts associated with incremental differences in ozone concentrations (CARB, 2005). Most of the epidemiologic studies used in this EIR have used a log-linear model to represent the relationship between ozone exposure and the health endpoint. In this case, the relationship between ozone levels and the natural logarithm of the health effect is estimated by a linear regression. This regression model generates a beta coefficient that relates the percent change in the health outcome to a unit increase in ozone. Existing studies have reported either a beta coefficient for a unit change in exposure or a relative risk (RR) for a specified change in ozone concentrations, such as 10 ppb 1-hour maximum. The RR is defined as the ratio of the health effect predicted from the higher exposure relative to some baseline exposure. Health effect estimates presented in a given study as RR for a specified change in ozone, Δ O3, were converted into an estimated beta using the equation:

$$\beta = \ln (RR) / \Delta O3$$

The daily change in ozone at each monitoring site i.e., the difference between current ozone and the standard (= ΔO3) was used to calculate RR:

$$RR = \exp(\beta \Delta O3)$$

Then, the RR estimates were used to determine the population attributable risk (PAR), which represents the proportion of the health effects in the whole population that may be prevented if the cause (ozone pollution in our case) is reduced by a given amount. Specifically,

$PAR = (RR - 1) / RR$

Ultimately, the estimated impact on the health outcome is calculated as follows:

$\Delta y = PAR \times y0 \times pop$

where:

Δy = changes in the incidence of a health endpoint corresponding to a particular change in ozone,

y0 = baseline incidence rate/person within a defined at-risk subgroup, and

pop = population size of the group exposed.

The parameters in the functions differ depending on the study. In order to establish potential changes in mortality rates, data from the World Health Organization (WHO), as presented in CARB (2005) was used to establish the beta coefficient for a unit change in exposure or a relative risk for a specified change in ozone concentrations, such as 10 ppb 1-hour maximum. The WHO focused on 15 European time-series studies using all ages. Their meta-estimates indicate a relative risk of 1.003 (95% CI = 1.001 – 1.004) for a 10 μg/m3 change in 8-hour ozone. The WHO estimate implies a 0.44% change in daily mortality (95% CI = 0.15 – 0.59%) per 10 ppb change in 1-hour maximum ozone. Making the conversions, the WHO estimate implies a 1.13% change (95% CI = 0.38 - 1.51) in daily mortality per 10 ppb change in 24-hour ozone. The WHO also provided an estimate correcting for possible publication bias using a trim and fill technique. Under an assumption that bias was present, the adjusted estimate is 0.75 % (95% CI = 0.19 – 1.32) per 10-ppb change in 24-hour ozone. Potential changes in potential morbidity rates were based on the CARB (2005) study where Anderson et al. (1997) reported a relative risk of 1.04 (95% CI= 1.02-1.07) for hospital admissions for Chronic Obstructive Pulmonary Disease for all ages for a 50 μ/m3 change in ozone. This converts to 2.05% per 10 ppb change in 1-hour maximum ozone.

Following the methodology described by the CARB (2005), project-related ozone increases are shown in Table 4.3.22. Adverse human health impacts that are likely to result from the proposed project's air quality impacts include an increase in ozone, morbidity, and mortality.

Impact #	Impact Description	Phase	Impact Classification
AQ.4	Operational activities at the Refinery associated with the Rail Spur Project would generate toxic emissions that exceed SLOCAPCD thresholds.	Operations	Class I

Operational activities would produce emissions of toxic materials from fugitive emissions sources containing Benzene, Toluene, etc, and from the diesel combustion used for the

Appendix B.1
Air Emission Calculations

Section **Page**
Emissions Summary B.1-1
Fugitive Dust from Road Operations B.1-6
Fugitive Emissions B.1-7
Canister ROG Emissions Calculations B.1-8
Locomotive Emissions B.1-9
Locomotive Emissions to the State Line B.1-11
Locomotive Timing Calculations B.1-12
Offsite Emissions Operations B.1-13
Emissions Summary Mitigated B.1-14
Locomotive Timing Calculations Mitigated B.1-19
Locomotive Emissions Mitigated B.1-18
Miscellaneous Calculations B.1-20
Construction Truck Traffic B.1-22
CalEEMod Summary of Results B.1-24
CalEEMod Construction Emissions Peak Day B.1-28
CalEEMod Construction Emissions Annual B.1-112
CalEEMod Coastal Access Construction Peak Day B.1-201
CalEEMod Coastal Access Construction Annual B.1-221
Ozone Impacts: Mortality/Morbidity B.1-246

SUMMARY OF OPERATIONAL EMISSIONS
Phillips 66 Santa Maria Rail Project

Source	Peak Day Emissions, lbs/day						
	ROG	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	DPM
Fugitive Dust	-	-	-	-	1.32	0.20	-
Fugitives	4.00	-	-	-	-	-	-
Canister Emissions	2.24	-	-	-	-	-	-
Locomotives Onsite	24.18	21.18	214.05	2.92	8.15	7.90	8.15
Locomotives Offsite	28.00	34.13	346.64	1.60	16.00	15.52	0.00
Vehicles (autos & trucks)	0.12	1.65	2.11	0.00	0.07	0.07	0.07
Total Emissions at the Refinery	*30.43*	*21.18*	*214.05*	*2.92*	*9.47*	*8.10*	*8.15*
Total Emissions within SLOC	***58.55***	***56.97***	***562.80***	***4.52***	***25.54***	***23.68***	***8.22***

Source	Annual Emissions, tons/year						
	ROG	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	DPM
Fugitive Dust	-	-	-	-	0.17	0.03	-
Fugitives	0.73	-	-	-	-	-	-
Canister Emissions	0.28	-	-	-	-	-	-
Locomotives Onsite	1.30	2.65	20.25	0.36	0.56	0.54	0.56
Locomotives Offsite	1.30	4.27	28.26	0.20	0.87	0.84	0.00
Vehicles (autos & trucks)	0.01	0.19	0.15	0.00	0.01	0.00	0.01
Total Emissions at the Refinery	*2.31*	*2.65*	*20.25*	*0.36*	*0.73*	*0.56*	*0.56*
Total Emissions within SLOC	***3.63***	***7.10***	***48.66***	***0.56***	***1.60***	***1.41***	***0.56***

SUMMARY OF OPERATIONAL MAINLINE RAIL EMISSIONS
Phillips 66 Santa Maria Rail Project

Route/Air District	Miles	Peak Day Emissions, lbs/day					
		ROG	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$
Northern Route Via Oakland							
Placer	1.8	0.38	0.46	4.65	0.02	0.21	0.21
Sacramento Metro	30.8	6.44	7.85	79.69	0.37	3.68	3.57
Yolo Solano	64.2	13.41	16.35	166.05	0.77	7.66	7.43
Bay Area	276.9	57.82	70.49	715.87	3.30	33.04	32.05
Monterrey Bay	226.8	47.37	57.74	586.43	2.71	27.07	26.25
San Luis Obispo	134.1	28.00	34.13	346.64	1.60	16.00	15.52
Total	***734.6***	***153.41***	***187.01***	***1,899.34***	***8.77***	***87.66***	***85.03***
Total outside of SLOC	***600.5***	***125.4***	***152.9***	***1552.7***	***7.2***	***71.7***	***69.5***
Northern Route Via Altamont							
Placer	1.8	0.38	0.46	4.65	0.02	0.21	0.21
Sacramento Metro	75.8	15.83	19.29	195.94	0.90	9.04	8.77
San Joaquin Valley	100.3	20.95	25.54	259.34	1.20	11.97	11.61
Bay Area	179.6	37.50	45.72	464.34	2.14	21.43	20.79
Monterrey Bay	226.8	47.37	57.74	586.43	2.71	27.07	26.25
San Luis Obispo	134.1	28.00	34.13	346.64	1.60	16.00	15.52
Total	***718.3***	***150.02***	***182.88***	***1,857.35***	***8.57***	***85.72***	***83.15***
Total outside of SLOC	***584.3***	***122.0***	***148.7***	***1510.7***	***7.0***	***69.7***	***67.6***
Southern Route							
San Luis Obispo	9.5	1.99	2.43	24.67	0.11	1.14	1.10
Santa Barbara	216.4	45.19	55.09	559.54	2.58	25.83	25.05
Ventura	115.6	24.13	29.42	298.80	1.38	13.79	13.38
South Coast	176.2	36.79	44.85	455.55	2.10	21.03	20.39
Total	***517.7***	***108.11***	***131.80***	***1,338.56***	***6.18***	***61.78***	***59.93***
Total outside of SLOC	***508.1***	***106.1***	***129.4***	***1313.9***	***6.1***	***60.6***	***58.8***

Source	Miles	Annual Emissions, tons/year					
		ROG	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$
Northern Route Via Oakland							
Placer	1.8	0.02	0.06	0.38	0.00	0.01	0.01
Sacramento Metro	30.8	0.30	0.98	6.50	0.05	0.20	0.19
Yolo Solano	64.2	0.62	2.04	13.54	0.10	0.42	0.40
Bay Area	276.9	2.68	8.81	58.37	0.41	1.79	1.74
Monterrey Bay	226.8	2.20	7.22	47.82	0.34	1.47	1.42
San Luis Obispo	134.1	1.30	4.27	28.26	0.20	0.87	0.84
Total	***734.6***	***7.12***	***23.38***	***154.87***	***1.10***	***4.75***	***4.61***
Total outside of SLOC	***600.5***	***5.8***	***19.1***	***126.6***	***0.9***	***3.9***	***3.8***
Northern Route Via Altamont							
Placer	1.8	0.02	0.06	0.38	0.00	0.01	0.01
Sacramento Metro	75.8	0.73	2.41	15.98	0.11	0.49	0.48
San Joaquin Valley	100.3	0.97	3.19	21.15	0.15	0.65	0.63
Bay Area	179.6	1.74	5.71	37.86	0.27	1.16	1.13
Monterrey Bay	226.8	2.20	7.22	47.82	0.34	1.47	1.42
San Luis Obispo	134.1	1.30	4.27	28.26	0.20	0.87	0.84
Total	***718.3***	***6.97***	***22.86***	***151.45***	***1.07***	***4.64***	***4.50***
Total outside of SLOC	***584.3***	***5.7***	***18.6***	***123.2***	***0.9***	***3.8***	***3.7***
Southern Route							
San Luis Obispo	9.5	0.09	0.30	2.01	0.01	0.06	0.06
Santa Barbara	216.4	2.10	6.89	45.62	0.32	1.40	1.36
Ventura	115.6	1.12	3.68	24.36	0.17	0.75	0.72
South Coast	176.2	1.71	5.61	37.14	0.26	1.14	1.10
Total	***517.7***	***5.02***	***16.47***	***109.14***	***0.77***	***3.35***	***3.25***
Total outside of SLOC	***508.1***	***4.9***	***16.2***	***107.1***	***0.8***	***3.3***	***3.2***

SUMMARY OF CONSTRUCTION EMISSIONS
Phillips 66 Santa Maria Rail Project

Source	Peak Day Emissions, lbs/day					
	ROG	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$
Onsite: Construction Equipment	15.85	103.49	186.08	0.16	7.87	7.24
Onsite: Fugitive Dust	-	-	-	-	15.62	8.34
Offsite: Vehicles	3.11	32.68	35.62	0.07	0.63	0.58
Offsite: Fugitive Dust	0.00	0.00	0.00	0.00	3.16	0.00
Total	***18.95***	***136.18***	***221.69***	***0.23***	***27.28***	***16.15***
Source	**Peak Quarter Emissions, tons**					
	ROG	**CO**	**NO_x**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**
Onsite: Fugitive Dust	0.00	0.00	0.00	0.00	0.45	0.24
Onsite: Construction Equipment	0.41	2.72	4.82	0.03	0.20	0.19
Offsite: Fugitive Dust	0.00	0.00	0.00	0.00	0.03	0.03
Offsite: Vehicles	0.03	0.31	0.26	0.03	0.03	0.03
Total	***0.44***	***3.04***	***5.07***	***0.05***	***0.70***	***0.48***

Note: Peak quarter based on Grading, Soil Transportation and Rail Activities

SUMMARY OF GHG EMISSIONS WITHIN SLOC
Phillips 66 Santa Maria Rail Project

Source	CO_2 (MT)	CH_4 (MT)	N_2O (MT)	$MTCO_2E$
Construction Amortized	38.4	0.0	0.0	38.6
Fugitives	0.0	0.0	0.0	0.3
Locomotives onsite	800.1	0.1	0.0	807.7
Locomotives mainline within SLOC	1,472.0	0.1	0.0	1,486.0
Electricity	676.2	0.0	0.0	678.9
Vehicals (Cars and Trucks and sulfu	44.7	0.0	0.0	45.1
Project Total within SLOC	*3,031.3*	*0.2*	*0.1*	*3,056.6*
Project Total at the Refinery	*1,514.68*	*0.12*	*0.03*	*1,525.46*

Notes:

Trains per year	*250*	
Average 24-hour electrical load for lights and other equipment, kW	*50*	
Average electrical load during unlaoding operations, kW	*900*	*as per Applicant submittals*
Electrical Load during rail car heating (MWh/year)	*105*	
CO2 Intensity	*641.34*	*lbs/MWh*
CH4 Intensity	*0.029*	*lbs/MWh*
N2O Intensity	*0.006*	*lbs/MWh*

Intensity factors taken from CalEEMod2013 for PG&E

As per CARB speciation profile 297, methane is 0.088 fraction of crude oil TOG fugitives

SUMMARY OF MAINLINE GHG EMISSIONS
Phillips 66 Santa Maria Rail Project

Route	CO_2 (MT)	CH_4 (MT)	N_2O (MT)	$MTCO_2E$
Northern Route - via Oakland	8,504.6	0.7	0.2	8,585.7
Northern Route - via Altamont	8,326.3	0.7	0.2	8,405.7
Southern Route	6,123.3	0.5	0.2	6,181.7
Within California	15,009.5	1.2	0.4	15,152.7

Within California assumes the use of the northern route via Oakland to Washington State Border since this would provide the longest route within t

SUMMARY OF TOTAL GHG EMISSIONS
Phillips 66 Santa Maria Rail Project

Route	CO_2 (MT)	CH_4 (MT)	N_2O (MT)	$MTCO_2E$
Northern Route - via Oakland	10,063.9	0.8	0.2	10,156.3
Northern Route - via Altamont	9,885.6	0.8	0.2	9,976.3
Southern Route	7,682.6	0.6	0.2	7,752.3
Within California	16,568.9	1.3	0.4	16,723.3
Within United States	66,248.5	5.2	1.7	66,880.7

Within California assumes the use of the northern route via Oakland since this would provide the longest route within the State.

Within United States assumes route via the north to the Canadian border.

SLOAPCD Operational Thresholds for Emissions within SLOC

Pollutant	Daily	Annual	Project Daily	Project Annual
ROG + NOx	25 pounds	25 tons	621.3	52.3
Diesel Particulate Matter	1.25 pounds	-	24.2	-
Fugitive Dust Particulate Matter (PM_{10})	25 pounds	25 tons	1.32	0.17
CO	550 pounds	-	57.0	-

SLOAPCD Construction Thresholds

Pollutant	Daily	Quarterly Tier 1	Quarterly Tier 2	Project Daily	Project Quarterly
ROG + NOx	137 pounds	2.5 tons	6.3 tons	240.6	5.5
Diesel Particulate Matter	7 pounds	0.13 tons	0.32 tons	8.5	0.23
Fugitive Dust Particulate Matter (PM_{10})	-	2.5 tons	-	-	0.47

SLOAPCD Construction Thresholds Mitigated

Pollutant	Daily	Quarterly Tier 1	Quarterly Tier 2	Project Daily	Project Quarterly
ROG + NOx	137 pounds	2.5 tons	6.3 tons	153.3	3.0
Diesel Particulate Matter	7 pounds	0.13 tons	0.32 tons	4.9	0.12
Fugitive Dust Particulate Matter (PM_{10})	-	2.5 tons	-	-	0.20

Fugitive Dust from Road Operations
Phillips 66 Santa Maria Rail Project

ROAD INFORMATION	
Material Silt Content (%)	4.3
Material Moisture Content (%)	0.5
particle size multiplier, PM10, k	0.35
particle size multiplier, PM2.5, k	0.053
P, number of "wet" days per year (> 0.01 " rain)	0

VEHICLE INFORMATION	
Duration per Use (hr)	1
Use per week, days	5
Weeks per year	52
Mean Vehicle Speed (mph)	15

Pollutant	Dust Emission Factor (lbs/miles)	Emissions	
		Daily (lbs/day)	Annual (tons/yr)
PM10	0.088	1.3	0.172
PM2.5	0.013	0.2	0.025

Notes
Equation based on CalEEMod 2013 Appendix A: Calculation Details for CalEEMod
Assumes no precipitation during vehicle use
Material silt content default from URBEMIS
Materials moisture content default from URBEMIS
Assume use of rail road once per train arrival
15 mph assumed as a reasonable slow speed

FUGITIVE EMISSIONS
Phillips 66 Santa Maria Rail Project

Process/ System	Source Unit		No. of Proposed Components	Emission Factor (kg/hr/comp)	Daily Emission Rate (lb/day)	Annual Emission Rate (tons/yr)
Unit Train Cars	Flanges (ANSI 16.5-1988)		80	2.40E-05	1.01E-01	
	Pressure Relief Valves		20	1.90E-05	2.01E-02	
	Tank Car top Valve				2.05E-02	
		Total Emissions:			0.14	0.026
Train Cars Offloading Lines	Pumps -Double Mechanical Seals or Equivalent		20	2.65E-04	2.80E-01	
	Flanges (ANSI 16.5-1988)		820	2.40E-05	1.04E+00	
	Pressure Relief Valves		20	1.90E-05	2.01E-02	
	Process Drains with P-Trap or Seal Pot		20	1.31E-04	1.38E-01	
	Other (including fittings, hatches, sight-glasses, and		200	1.31E-04	1.38E+00	
		Total Emissions:			2.86	0.52
Offloading Collection Headers & Meters	Pumps -Double Mechanical Seals or Equivalent		2	2.65E-04	2.80E-02	
	Flanges (ANSI 16.5-1988)		380	2.40E-05	4.82E-01	
	Pressure Relief Valves		10	1.90E-05	1.00E-02	
	Process Drains with P-Trap or Seal Pot		20	1.31E-04	1.38E-01	
	Other (including fittings, hatches, sight-glasses, and		30	1.31E-04	2.08E-01	
		Total Emissions:			0.87	0.16
Drain & Crude Drain	Flanges (ANSI 16.5-1988)		83	2.40E-05	1.05E-01	
	Pressure Relief Valves		3	1.90E-05	3.01E-03	
		Total Emissions:			0.11	0.020
Delivery to Tank Farm	Flanges (ANSI 16.5-1988)		21	2.40E-05	2.66E-02	
	Pressure Relief Valves		1	1.90E-05	1.00E-03	
		Total Emissions:			0.03	0.0050
Unloading Carbon Canisters			1		2.24	0.28
TOTAL FUGITIVE EMISSIONS					6.24	1.01

Notes
Component counts based on Applicant submittals
Carbon canister calculation based on 1% vapor entrainment during pumping and flash calculations. See separate spreadsheet
Source:
California Air Pollution Control Officers Association. California Implementation Guidelines for Estimating Mass Emissions of Fugitive Hydrocarbon Leaks at Petroleum Facilities. February 1999.

Tank car top valve based on open ended lines for 5 minutes per tank car during unloading
Modeling emission rate based on area source of 1000ft2, g/m2-s 0.00023

Canister ROG Emissions
based on SPEC Services calcualtions and Canister Manufactures Information

Crude Vaporization During Pumping Flowrate

Total Crude Flow	8,000	gpm
Entrained Vapor @ 0.0 PSIG	1%	
Total Vapor	80	gpm
Amount Released at 120 PSIG	10.91%	
	8.73	gpm
	1.17	SCFM

Air Entrainment

Total Air Removed/Railcar	15	ft3
Total Air Removed/Train	1200	ft3
Time to Connect 20 Railcars	50	min
Pump off Time/20 Railcars	60	min
Total Time	440	min
Air Flow Rate, avg per unit train	2.727	SCFM
Air Density	0.076	lb/ft3
Mass Flow, avg per unit car	0.209	lb/min

Crude Vaporization and Air Entrainment

Maximum, Instantaneous, estimated	500	SCFM
Normal	3.89	SCFM
Operating Time	7.3	hours/train
Crude vapor + air	1713	SCF/train

Normal Pressure	14.7	PSIA
Temperature, High, Dry Bulb	87	F
Temperature, High, Wet Bulb	64	F
Temperature, Low	32	F
Relative Humidity	50%	
Operating Temperature	68-104	F

Crude Vapor Mass Flow

MW	62.45	lb/lbmole
Density	0.1603	lb/ft3
Mass Flow (estimated)	0.19	lb/min

Mass Fraction by component, mass fraction based on crude flash modeling
Mass Fraction in the crude vapor. Crude vapor estimated at 500ppm total

Component	Mass Fraction in Crude Vapor	PPMV in Vapor to Canisters
Propane	0.0821	40.7
i-Butane	0.067	33.2
n-Butane	0.2046	101.4
i-Pentane	0.2602	128.9
n-Pentane	0.2187	108.4
n-Hexane	0.0847	42.0
n-Heptane	0.0149	7.4
n-Octane	0.0023	1.1
n-Nonane	0.0002	0.1
Benzene	0.0037	1.8
Toluene	0.0027	1.3
E-Benzene	0.0004	0.2
o-Xylene	0.0001	0.0
Cyclopentane	0.0128	6.3
Mcyclopentan	0.013	6.4
Cyclohexane	0.0206	10.2
Mcyclohexane	0.0115	5.7
H2S	0.0096	4.8

Emissions

Total ROG vapors, lbs/unit train	44.90
Canister fraction reduction eff	0.95
Total emissions, lbs/unit train	2.24

Total ROG vapors based on crude vapor mass flow and pumpoff time for 80 cars

LOCOMOTIVE EMISSIONS
Phillips 66 Santa Maria Rail Project

LOCOMOTIVE/TRIP INFORMATION			
Units/week	5	Total time onsite, hrs	11.5
Weeks per year	50	Switching time per engine unloading (hr)	2.58
Line Haul # engines/unit	3	Idling time per engine unloading (hr)	8.92
Line Haul Engine power (HP)	4300	Switching number of engines	2
Roundtrip Distance to SLOC Line (mi)	134	Switching power (hp)	4300
RT Distance SLOC Line to CA Border (mi)	1193	Switching load Factor	0.206
Average Line haul Speed, mph	40	Fraction Tier 0 Engines	0.9
Roundtrip Duration to SLOC Line (hr)	3.4	Fraction Tier 1 Engines	0.1
Roundtrip SLOC Line to CA Border (hr)	29.8	Idling number of engines, non-switching	1
Line Haul Load Factor	0.28	Idling time per engine, non-switching	1.08
SM to SLO Extra Engines Number	2	Switching time per engine, non-switching	0.69
SM to SLO Distance, RT miles	30	Idling fuel use, gal/hr	3.3
SM to SLO Time (20 mph), hrs	1.5	Fraction of switching emissions onsite	0.85
SM to SLO Load	0.18		

Source	Emission Factor (g/bhp-hr/engine)								
	ROG	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O
Line Haul, Uncontr.	1.05	1.28	13.00	0.060	0.60	0.58	490.7	0.0385	0.0125
Line Haul, UP Avg	0.39	1.28	8.48	0.060	0.26	0.25	490.7	0.0385	0.0125
Switching, Uncontr.	2.21	1.83	17.40	0.060	0.72	0.70	671.5	0.0526	0.0171
Switching, UP Avg	0.80	1.83	12.06	0.060	0.34	0.33	671.5	0.0526	0.0171
	Emission Factor (g/hr/engine)								
	ROG	CO	NOx	SO2	PM10	PM25	CO_2	CH_4	N_2O
Idling	63	80	1064	56	27	26	33866	2.6544	0.8627

Source		Peak Day Emissions, lbs/day						Annual Emissions, tons/year or MT/yr for GHG									
		ROG	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	ROG	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	$MTCO_2E$
Within SLOC																	
Line Haul		28.01	34.14	346.74	1.60	16.00	15.52	1.30	4.27	28.27	0.20	0.87	0.84	1,472.40	0.12	0.04	1,486.45
Line Haul SM/SLO		5.34	6.51	66.12	0.31	3.05	2.96	0.25	0.81	5.39	0.04	0.17	0.16	439.20	0.03	0.01	443.39
Switching		25.23	20.89	198.66	0.69	8.22	7.97	1.14	2.61	17.21	0.09	0.49	0.47	761.30	0.06	0.02	768.56
Idling		2.62	3.33	44.33	2.33	1.12	1.09	0.33	0.42	5.54	0.29	0.14	0.14	149.67	0.01	0.00	151.09
Total		*61.20*	*64.88*	*655.85*	*4.92*	*28.40*	*27.55*	*3.02*	*8.11*	*56.42*	*0.62*	*1.66*	*1.61*	*2,822.56*	*0.22*	*0.07*	*2,849.50*
Onsite Rail		24.18	21.18	214.05	2.92	8.15	7.90	1.30	2.65	20.25	0.36	0.56	0.54	800.08	0.06	0.02	807.72
By District to Switch Yards																	
Northern Route - via Oakland	***Miles RT***																
Placer	1.8	0.38	0.46	4.65	0.02	0.21	0.21	0.02	0.06	0.38	0.00	0.01	0.01	19.76	0.00	0.00	19.95
Sacramento Metro	30.8	6.44	7.85	79.69	0.37	3.68	3.57	0.30	0.98	6.50	0.05	0.20	0.19	338.40	0.03	0.01	341.63
Yolo Solano	64.2	13.41	16.35	166.05	0.77	7.66	7.43	0.62	2.04	13.54	0.10	0.42	0.40	705.13	0.06	0.02	711.86
Bay Area	276.9	57.82	70.49	715.87	3.30	33.04	32.05	2.68	8.81	58.37	0.41	1.79	1.74	3,039.89	0.24	0.08	3,068.90
Monterrey Bay	226.8	47.37	57.74	586.43	2.71	27.07	26.25	2.20	7.22	47.82	0.34	1.47	1.42	2,490.24	0.20	0.06	2,514.00
San Luis Obispo	134.1	28.00	34.13	346.64	1.60	16.00	15.52	1.30	4.27	28.26	0.20	0.87	0.84	1,471.96	0.12	0.04	1,486.01
Total	*734.6*	*153.41*	*187.01*	*1,899.34*	*8.77*	*87.66*	*85.03*	*7.12*	*23.38*	*154.87*	*1.10*	*4.75*	*4.61*	*8,065.39*	*0.63*	*0.21*	*8,142.35*
Total outside of SLOC	*600.5*	*125.4*	*152.9*	*1552.7*	*7.2*	*71.7*	*69.5*	*5.8*	*19.1*	*126.6*	*0.9*	*3.9*	*3.8*	*6593.4*	*0.5*	*0.2*	*6,656.34*
Northern Route - via Altamont	***Miles RT***																
Placer	1.8	0.38	0.46	4.65	0.02	0.21	0.21	0.02	0.06	0.38	0.00	0.01	0.01	19.76	0.00	0.00	19.95
Sacramento Metro	75.8	15.83	19.29	195.94	0.90	9.04	8.77	0.73	2.41	15.98	0.11	0.49	0.48	832.06	0.07	0.02	840.00
San Joaquin Valley	100.3	20.95	25.54	259.34	1.20	11.97	11.61	0.97	3.19	21.15	0.15	0.65	0.63	1,101.28	0.09	0.03	1,111.79
Bay Area	179.6	37.50	45.72	464.34	2.14	21.43	20.79	1.74	5.71	37.86	0.27	1.16	1.13	1,971.77	0.15	0.05	1,990.58
Monterrey Bay	226.8	47.37	57.74	586.43	2.71	27.07	26.25	2.20	7.22	47.82	0.34	1.47	1.42	2,490.24	0.20	0.06	2,514.00
San Luis Obispo	134.1	28.00	34.13	346.64	1.60	16.00	15.52	1.30	4.27	28.26	0.20	0.87	0.84	1,471.96	0.12	0.04	1,486.01
Total	*718.3*	*150.02*	*182.88*	*1,857.35*	*8.57*	*85.72*	*83.15*	*6.97*	*22.86*	*151.45*	*1.07*	*4.64*	*4.50*	*7,887.07*	*0.62*	*0.20*	*7,962.34*
Total outside of SLOC	*584.3*	*122.0*	*148.7*	*1510.7*	*7.0*	*69.7*	*67.6*	*5.7*	*18.6*	*123.2*	*0.9*	*3.8*	*3.7*	*6415.1*	*0.5*	*0.2*	*6,476.33*
Southern Route	***Miles RT***																
San Luis Obispo	9.5	1.99	2.43	24.67	0.11	1.14	1.10	0.09	0.30	2.01	0.01	0.06	0.06	104.75	0.01	0.00	105.75
Santa Barbara	216.4	45.19	55.09	559.54	2.58	25.83	25.05	2.10	6.89	45.62	0.32	1.40	1.36	2,376.05	0.19	0.06	2,398.72
Ventura	115.6	24.13	29.42	298.80	1.38	13.79	13.38	1.12	3.68	24.36	0.17	0.75	0.72	1,268.84	0.10	0.03	1,280.94
South Coast	176.2	36.79	44.85	455.55	2.10	21.03	20.39	1.71	5.61	37.14	0.26	1.14	1.10	1,934.44	0.15	0.05	1,952.90
Total	*517.7*	*108.11*	*131.80*	*1,338.56*	*6.18*	*61.78*	*59.93*	*5.02*	*16.47*	*109.14*	*0.77*	*3.35*	*3.25*	*5,684.07*	*0.45*	*0.14*	*5,738.31*
Total outside of SLOC	*508.1*	*106.1*	*129.4*	*1313.9*	*6.1*	*60.6*	*58.8*	*4.9*	*16.2*	*107.1*	*0.8*	*3.3*	*3.2*	*5579.3*	*0.4*	*0.1*	*5,632.56*
Within California																	
Mainline Rail		282.48	344.35	3,497.32	16.14	161.41	156.57	13.11	43.04	285.17	2.02	8.74	8.48	15,009.51	1.18	0.38	15,152.74
Project Total		310.33	368.58	3,740.31	19.16	170.76	165.63	14.58	46.07	307.92	2.39	9.37	9.09	15,920.47	1.25	0.41	16,072.40
Mainline Rail Outside SLO County		249.13	303.70	3,084.46	14.24	142.36	138.09	11.57	37.96	251.50	1.78	7.71	7.48	13,097.91	1.03	0.33	13,222.90

Locomotive Emissions Notes

Notes:

Peak day assumes worst emissions from Tier0 or Tier1 engines, plus Line haul SM/SLO, plus worst case of Tier0 or Tier1 Switching, plus idling.
Duration used in the evaluation is the total time of train travel from the project site to the SLO boundary at the given speed.
Locomotives assumed to use the higher sulfur diesel as they come from out of state.
Peak day is assumed to be all 3 locomotive are uncontrolled. UP data indicates 25% of their locomotive fleet is uncontrolled (in 2009).
Annual emissions assume an fleet mix average based on UP fleet mix and EPA 2009 factors.
Emission factors for peak day are the worst of the EPA uncontrolled factor (EPA 2009) or the Carl Moyer Tier 0 factors from 1998 (adjusted to higher sulfur diesel).
The worst factors are from EPA data for NOx and Carl Moyer adjusted for PM and ROG.
CO emission factors based on EPA 2009.
Idling emission factors and fuel use based on CARB Preliminary Draft Locomotive Inventory Memo and the BAH 1992 report for a 16-710G3 engine.
PM2.5/PM10 ratio based on 0.97 from EPA study, 2009.
SO2 factor based on combined ULSD and out-of-state diesel (350ppm) as per Port of LA Calculations, 2011.
Emission factors for GHG based on kg/gallon. Conversion based on EPA 2009 (20.8 for line haul, 15.2 switching - bhp-hr/gal and 10.2065 CO2 kg/gallon).
The 10.2065 CO2 kg/gallon conversion is derived from the CARB mandatory reporting rule for diesel #2.
GHG Emissions tabulated in metric tonnes.
Locomotive load factor based on POLA 2011, and POS 2011.
Locomotive speed based on POLB 2008 of 40 mph.
Estimated switching locomotive fuel use of --> 1585 gallons per week, using EPA 2009 factor of 15.2 bhp-hr/gallon.
Rail distance based on UP rail line maps and data provided by UPRR.
Total round trip distance within CA for the UP northern route (through Reno) is longer than the Southern Route (through Yuma) by about only 2 miles.
Switching time based on information provided in Project Description.
Line Haul SM/SLO are the additional engines required between Santa Margarita and SLO for the Cuesta Grade.
SM to SLO Grade would add 2 engines, operating under dynamic braking (2.1% load) coming downhill (11.7miles), standard 28% load uphill (3.3 miles) and a standard 28% load returning (15 miles) for an average of 18% load.
Switching load factor based on EPA 1998 for switching, with idling portion removed.
Some switching emissions occur offsite along the mainline track siding.

Sources:

Booz-Allen Hamilton, 1992 Report on Locomotive Emission Inventory: Locomotive Emissions by County. August 1992.
EPA 2009, United States Environmental Protection Agency. Emission Factors for Locomotives. Office of Transportation and Air Quality. EPA-420-F-09-025.April 2009.
EPA 1998, Locomotive Emission Standards-Regulatory Support Doucment, EPA, April 1998 (EPA-420-R-98-101)
CARB, Carl Moyer Program Guidelines 2011 for Locomotives
POS 20011, Carbon Footprint Study for the Asia to North America Intermodal Trade, Port of Seattle (POS), June, 2011
POLA 2011, Port of Los Angeles Inventory of Air Emissions 2010, Port of Los Angeles, July 2011
POLB 2008, Port of Long Beach
CARB Preliminary Draft, Locomotive Emission Inventory, http://www.arb.ca.gov/msei/offroad/techmemo/locomotive_memo_2.pdf

Rail Emissions to the State Line

			Peak Day Emissions, lbs/day						Annual Emissions, tons/year or MT/yr for GHG									
Air District	County	One-way Distance	ROG	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	ROG	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	$MTCO_2E$
Colton to Nevada																		
SCAQMD	San Bernardino	21.2	8.9	10.8	109.8	0.5	5.1	4.9	0.4	1.4	9.0	0.1	0.3	0.3	466	0.04	0.01	471
Mojave	San Bernardino	200.8	83.9	102.2	1038.4	4.8	47.9	46.5	3.9	12.8	84.7	0.6	2.6	2.5	4410	0.35	0.11	4,452
Total		222.0	92.7	113.1	1148.3	5.3	53.0	51.4	4.3	14.1	93.6	0.7	2.9	2.8	4876	0.38	0.12	4,922
Roseville to Nevada																		
Placer	Placer	88.3	36.9	45.0	456.6	2.1	21.1	20.4	1.7	5.6	37.2	0.3	1.1	1.1	1939	0.15	0.05	1,958
Nevada	Nevada	29.5	12.3	15.0	152.6	0.7	7.0	6.8	0.6	1.9	12.4	0.1	0.4	0.4	648	0.05	0.02	654
Total		117.8	49.2	60.0	609.2	2.8	28.1	27.3	2.3	7.5	49.7	0.4	1.5	1.5	2587	0.20	0.07	2,612
Roseville to Oregon																		
Placer	Placer	22.3	9.3	11.4	115.4	0.5	5.3	5.2	0.4	1.4	9.4	0.1	0.3	0.3	490	0.04	0.01	495
Feather River	Sutter	10.5	4.4	5.3	54.0	0.2	2.5	2.4	0.2	0.7	4.4	0.0	0.1	0.1	229	0.02	0.01	232
	Yuba	15.9	6.6	8.1	82.2	0.4	3.8	3.7	0.3	1.0	6.7	0.0	0.2	0.2	349	0.03	0.01	352
Butte	Butte	45.7	19.1	23.3	236.2	1.1	10.9	10.6	0.9	2.9	19.3	0.1	0.6	0.6	1003	0.08	0.03	1,012
Tehama	Tehama	40.6	16.9	20.7	209.8	1.0	9.7	9.4	0.8	2.6	17.1	0.1	0.5	0.5	891	0.07	0.02	899
Shasta	Shasta	71.9	30.0	36.6	371.9	1.7	17.2	16.7	1.4	4.6	30.3	0.2	0.9	0.9	1579	0.12	0.04	1,594
Siskiyou	Siskiyou	89.4	37.3	45.5	462.1	2.1	21.3	20.7	1.7	5.7	37.7	0.3	1.2	1.1	1962	0.15	0.05	1,981
Total		296.2	123.7	150.8	1531.7	7.1	70.7	68.6	5.7	18.9	124.9	0.9	3.8	3.7	6504	0.51	0.17	6,566

Locomotive Timing Calculations

engine hours: based on Rail Sequencing spreadsheet rev6, Option A

Total Engine-hours	Activity/location
0.28	Arrival-mainline:switching (1 engine)
0.57	Arrival-east of rack;switching (2 engine)
0.48	Arrival-west of rack:switching (3 engines)
0.85	Positioning -east of rack: switching (2 engines)
1.14	Positioning-east of rack: idle (2 engines)
0.21	Postioning-west of rack:switching (2 engines)
0.26	Positioning-west of rack: idle (2 engines)
1.17	Unloading-rack 1: switch (all west of rack)
6.83	Unloading-rack 1: idle (all west of rack)
0.00	Unloading-rack 1:off (all west of rack)
1.17	Unloading-rack 2: switch (all west of rack)
6.83	Unloading-rack 2: idle (all west of rack)
0.00	Unloading-rack 2:off (all west of rack)
0.00	3rd engine-switching east of rack
0.08	3rd engine-switiching west of rack
1.08	3rd engine-idle west of rack
9.73	3rd engine-off west of rack
2.77	Pre-Departure-idling (all west of rack)(2 engines)
0.00	Pre-Departure-off (all west of rack)(2 engines)
0.57	Departure-running switching (2 engines)
0.00	Departure-switching east of rack (1 engine)
0.48	Departure-switching west of rack (3 engines)
0.15	Fraction Switching offsite
0.85	Fraction Switching onsite
0.85	Total Offsite Switching
5.00	Total Onsite Switching
18.92	Total idling
9.73	Total off
34.50	Total
0.28	Fraction of onsite switching east of rack
0.06	Fraction of idling east of rack
0.24	Fraction of all switching east of rack
0.06	Fraction of idling east of rack
2.58	Engine 1 & 2 switching, per engine
8.92	Engine 1 & 2 idling, per engine
0.69	Engine 3 switching
1.08	Engine 3 idling

OFFSITE EMISSIONS OPERATIONS
Phillips 66 Santa Maria Rail Project

						Emission Factors (g/mile)								
Phase Name	Vehicle Code	Peak Day Trip Number	Daily Trip Number	Distance, Miles, RT	Days of Activity	ROG	CO	NO_x	SO_X	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O
Operations														
Autos	LDA-g	12	12	26	260	0.067	1.820	0.202	0.000	0.002	0.002	292.2	0.023	0.012
Trucks	T7tc-d55	1	0.38	26	260	0.443	2.354	11.493	0.000	0.426	0.392	1584.4	0.026	0.024
Sulfur trucks	T7tc-d55	2	1.19	26	260	0.443	2.354	11.493	0.000	0.426	0.392	1584.4	0.026	0.024
Total														

	Peak Day Emissions (lbs/day)						Total Emissions (tons)									
Phase Name	ROG	CO	NO_x	SO_X	PM_{10}	$PM_{2.5}$	ROG	CO	NO_x	SO_X	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O	$MTCO_2E$
Operations																
Autos	0.05	1.25	0.14	0.00	0.00	0.00	0.01	0.16	0.02	0.00	0.00	0.00	26.1	0.0021	0.0011	26.5
Trucks	0.03	0.13	0.66	0.00	0.02	0.02	0.00	0.01	0.03	0.00	0.00	0.00	4.5	7E-05	7E-05	4.6
Sulfur Trucks	0.05	0.27	1.32	0.00	0.05	0.04	0.00	0.02	0.10	0.00	0.00	0.00	14.0	0.0002	0.0002	14.1
Total	0.12	1.65	2.11	0.00	0.07	0.07	0.01	0.19	0.15	0.00	0.01	0.00	44.66	0.00	0.00	45.15

Notes
Emission factors from EMFAC2011 for aggregate year 2013
Peak number of trips based on Applicant submittals
Distance based on CalEEMod 2013 for SLO County rural
Days of activity based on Applicant submittals along with CalEEMod 22 work days per month
Operations trucks based on 2 per week for 50 weeks

SUMMARY OF MITIGATED OPERATIONAL EMISSIONS
Phillips 66 Santa Maria Rail Project

Source	Peak Day Emissions, lbs/day						
	ROG	CO	NOx	SO2	PM10	PM25	DPM
Fugitive Dust	-	-	-	-	1.32	0.20	-
Fugitives	4.00	-	-	-	-	-	-
Canister Emissions	2.24	-	-	-	-	-	-
Locomotives Onsite	2.37	19.13	29.67	1.48	0.72	0.70	0.72
Locomotives Offsite	3.73	40.00	34.66	1.60	0.80	0.78	0.00
Vehicles (autos & trucks)	0.12	1.65	2.11	0.00	0.07	0.07	0.07
Total Emissions at the SMR	8.62	19.13	29.67	1.48	2.05	0.90	0.72
Total Emissions within SLOC	***12.47***	***60.78***	***66.45***	***3.08***	***2.92***	***1.74***	***0.80***

Source	Annual Emissions, tons/year						
	ROG	CO	NOx	SO2	PM10	PM25	DPM
Fugitive Dust	-	-	-	-	0.17	0.03	-
Fugitives	0.73	-	-	-	-	-	-
Canister Emissions	0.28	-	-	-	-	-	-
Locomotives Onsite	0.22	2.39	3.34	0.18	0.07	0.07	0.07
Locomotives Offsite	0.13	4.27	3.33	0.20	0.05	0.05	0.00
Vehicles (autos & trucks)	0.01	0.19	0.15	0.00	0.01	0.00	0.01
Total Emissions at the SMR	1.23	2.39	3.34	0.18	0.24	0.10	0.07
Total Emissions within SLOC	***1.38***	***6.85***	***6.83***	***0.38***	***0.30***	***0.15***	***0.08***

Note: DPM emissions at the SMR without Tier 4 locomotives = 7.45 lbs/day

SUMMARY OF MITIGATED OPERATIONAL MAINLINE RAIL EMISSIONS
Phillips 66 Santa Maria Rail Project

Route/Air District	Miles	Peak Day Emissions, lbs/day					
		ROG	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$
Northern Route Via Oakland							
Placer	1.8	0.05	0.54	0.47	0.02	0.01	0.01
Sacramento Metro	30.8	0.86	9.20	7.97	0.37	0.18	0.18
Yolo Solano	64.2	1.79	19.16	16.61	0.77	0.38	0.37
Bay Area	276.9	7.71	82.60	71.59	3.30	1.65	1.60
Monterrey Bay	226.8	6.32	67.67	58.64	2.71	1.35	1.31
San Luis Obispo	134.1	3.73	40.00	34.66	1.60	0.80	0.78
Total	***734.6***	***20.45***	***219.15***	***189.93***	***8.77***	***4.38***	***4.25***
Total outside SLOC	***600.5***	***16.72***	***179.16***	***155.27***	***7.17***	***3.58***	***3.48***
Northern Route Via Altamont							
Placer	1.8	0.05	0.54	0.47	0.02	0.01	0.01
Sacramento Metro	75.8	2.11	22.61	19.59	0.90	0.45	0.44
San Joaquin Valley	100.3	2.79	29.92	25.93	1.20	0.60	0.58
Bay Area	179.6	5.00	53.58	46.43	2.14	1.07	1.04
Monterrey Bay	226.8	6.32	67.67	58.64	2.71	1.35	1.31
San Luis Obispo	134.1	3.73	40.00	34.66	1.60	0.80	0.78
Total	***718.3***	***20.00***	***214.31***	***185.73***	***8.57***	***4.29***	***4.16***
Total outside SLOC	***584.3***	***16.27***	***174.31***	***151.07***	***6.97***	***3.49***	***3.38***
Southern Route							
San Luis Obispo	9.5	0.27	2.85	2.47	0.11	0.06	0.06
Santa Barbara	216.4	6.03	64.56	55.95	2.58	1.29	1.25
Ventura	115.6	3.22	34.48	29.88	1.38	0.69	0.67
South Coast	176.2	4.91	52.56	45.55	2.10	1.05	1.02
Total	***517.7***	***14.42***	***154.45***	***133.86***	***6.18***	***3.09***	***3.00***
Total outside SLOC	***508.1***	***14.15***	***151.60***	***131.39***	***6.06***	***3.03***	***2.94***

Source	Miles	Annual Emissions, tons/year					
		ROG	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$
Northern Route Via Oakland							
Placer	1.8	0.00	0.06	0.04	0.00	0.00	0.00
Sacramento Metro	30.8	0.03	0.98	0.77	0.05	0.01	0.01
Yolo Solano	64.2	0.06	2.04	1.60	0.10	0.02	0.02
Bay Area	276.9	0.28	8.81	6.88	0.41	0.10	0.10
Monterrey Bay	226.8	0.23	7.22	5.64	0.34	0.08	0.08
San Luis Obispo	134.1	0.13	4.27	3.33	0.20	0.05	0.05
Total	***734.6***	***0.73***	***23.38***	***18.26***	***1.10***	***0.27***	***0.27***
Total outside SLOC	***600.5***	***0.60***	***19.11***	***14.93***	***0.90***	***0.22***	***0.22***
Northern Route Via Altamont							
Placer	1.8	0.00	0.06	0.04	0.00	0.00	0.00
Sacramento Metro	75.8	0.08	2.41	1.88	0.11	0.03	0.03
San Joaquin Valley	100.3	0.10	3.19	2.49	0.15	0.04	0.04
Bay Area	179.6	0.18	5.71	4.46	0.27	0.07	0.06
Monterrey Bay	226.8	0.23	7.22	5.64	0.34	0.08	0.08
San Luis Obispo	134.1	0.13	4.27	3.33	0.20	0.05	0.05
Total	***718.3***	***0.71***	***22.86***	***17.86***	***1.07***	***0.27***	***0.26***
Total outside SLOC	***584.3***	***0.58***	***18.59***	***14.53***	***0.87***	***0.22***	***0.21***
Southern Route							
San Luis Obispo	9.5	0.01	0.30	0.24	0.01	0.00	0.00
Santa Barbara	216.4	0.22	6.89	5.38	0.32	0.08	0.08
Ventura	115.6	0.11	3.68	2.87	0.17	0.04	0.04
South Coast	176.2	0.18	5.61	4.38	0.26	0.07	0.06
Total	***517.7***	***0.51***	***16.47***	***12.87***	***0.77***	***0.19***	***0.19***
Total outside SLOC	***508.1***	***0.51***	***16.17***	***12.63***	***0.76***	***0.19***	***0.18***

SUMMARY OF MITIGATED CONSTRUCTION EMISSIONS
Phillips 66 Santa Maria Rail Project

Source	Peak Day Emissions, lbs/day					
	ROG	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$
Onsite: Construction Equipment	15.85	103.49	186.08	0.16	7.87	7.24
Onsite: Fugitive Dust	-	-	-	-	15.62	8.34
Offsite: Vehicles	3.11	32.68	35.62	0.07	0.63	0.58
Offsite: Fugitive Dust	0.00	0.00	0.00	0.00	3.16	0.00
Total	18.95	136.18	221.69	0.23	27.28	16.15
Source	Peak Quarter Emissions, tons					
	ROG	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$
Onsite: Fugitive Dust	0.00	0.00	0.00	0.00	0.45	0.24
Onsite: Construction Equipment	0.41	2.72	4.82	0.03	0.20	0.19
Offsite: Fugitive Dust	0.00	0.00	0.00	0.00	0.03	0.03
Offsite: Vehicles	0.03	0.31	0.26	0.03	0.03	0.03
Total	0.44	3.04	5.07	0.05	0.70	0.48

Note: Peak quarter based on Grading, Soil Transportation and Rail Activities

SUMMARY OF MITIGATED GHG EMISSIONS WITH THE REFINERY
(excludes mainline rail emissions)
Phillips 66 Santa Maria Rail Project

Source	CO_2 (MT)	CH_4 (MT)	N_2O (MT)	$MTCO_2E$
Construction Amortized	38.40	0.01	0.00	38.61
Fugitives	0.00	0.01	0.00	0.28
Locomotives onsite	800.08	0.06	0.02	807.72
Locomotives offsite	2,022.48	0.16	0.05	2,041.78
Electricity	676.20	0.03	0.01	678.86
Offsite	44.66	0.00	0.00	45.15
Project Total at the Refinery	*1,559.34*	*0.12*	*0.03*	*1,570.60*

Notes:

Trains per year	*250*	
Average 24-hour electrical load for lights and other equipment, kW	*50*	
Average electrical load during unlaoding operations, kW	*900*	*as per Applicant submittals*
Electrical Load during rail car heating (MWh/year)	*105*	
CO2 Intensity	*641.34*	*lbs/MWh*
CH4 Intensity	*0.029*	*lbs/MWh*
N2O Intensity	*0.006*	*lbs/MWh*

Intensity factors taken from CalEEMod2013 for PG&E
As per CARB speciation profile 297, methane is 0.088 fraction of crude oil TOG fugitives

SUMMARY OF MITIGATED MAINLINE GHG EMISSIONS
Phillips 66 Santa Maria Rail Project

Route	CO_2 (MT)	CH_4 (MT)	N_2O (MT)	$MTCO_2E$
Northern Route - via Oakland	8,504.58	0.67	0.22	8,585.74
Northern Route - via Altamont	8,326.27	0.65	0.21	8,405.73
Southern Route	6,123.26	0.45	0.14	5,738.31
Within California	15,009.51	1.18	0.38	15,152.74

Within California assumes the use of the northern route via Oakland to Washington State Border since this would provide the longest route with

SUMMARY OF TOTAL GHG EMISSIONS
Phillips 66 Santa Maria Rail Project

Route	CO_2 (MT)	CH_4 (MT)	N_2O (MT)	$MTCO_2E$
Northern Route - via Oakland	10,063.9	0.8	0.2	10,156.3
Northern Route - via Altamont	9,885.6	0.8	0.2	9,976.3
Southern Route	7,682.6	0.6	0.2	7,752.3
Within California	16,568.9	1.3	0.4	16,723.3
Within United States	66,248.5	5.2	1.7	66,880.7

Within California assumes the use of the northern route via Oakland since this would provide the longest route within the State.
Within United States assumes route via the north to the Canadian border.

SLOAPCD Operational Thresholds

Pollutant	Daily	Annual	Project Daily	Project Annual
ROG + NOx	25 pounds	25 tons	78.9	8.2
Diesel Particulate Matter	1.25 pounds	-	1.60	-
Fugitive Dust Particulate Matter (PM_{10})	25 pounds	25 tons	1.32	0.17
CO	550 pounds	-	60.8	-

SLOAPCD Construction Thresholds

Pollutant	Daily	Quarterly Tier 1	Quarterly Tier 2	Project Daily	Project Quarterly
ROG + NOx	137 pounds	2.5 tons	6.3 tons	240.64	5.51
Diesel Particulate Matter	7 pounds	0.13 tons	0.32 tons	8.5	0.23
Fugitive Dust Particulate Matter (PM_{10})	-	2.5 tons	-	-	0.47

SLOAPCD Construction Thresholds Mitigated

Pollutant	Daily	Quarterly Tier 1	Quarterly Tier 2	Project Daily	Project Quarterly
ROG + NOx	137 pounds	2.5 tons	6.3 tons	153.33	2.96
Diesel Particulate Matter	7 pounds	0.13 tons	0.32 tons	4.9	0.12
Fugitive Dust Particulate Matter (PM_{10})	-	2.5 tons	-	-	0.20

Locomotive Timing Calculations (Mitigated)

engine hours: based on Rail Sequencing spreadsheet rev6, Option A
Assumes limiting idle time to no more than 15 minutes.

Total Engine-hours	Activity/location
0.28	Arrival-mainline:switching (1 engine)
0.57	Arrival-east of rack;switching (2 engine)
0.48	Arrival-west of rack:switching (3 engines)
0.85	Positioning -east of rack: switching (2 engines)
1.14	Positioning-east of rack: idle (2 engines)
0.21	Postioning-west of rack:switching (2 engines)
0.26	Positioning-west of rack: idle (2 engines)
1.17	Unloading-rack 1: switch (all west of rack)
1.00	Unloading-rack 1: idle (all west of rack)
5.83	Unloading-rack 1:off (all west of rack)
1.17	Unloading-rack 2: switch (all west of rack)
1.00	Unloading-rack 2: idle (all west of rack)
5.83	Unloading-rack 2:off (all west of rack)
0.00	3rd engine-switching east of rack
0.08	3rd engine-switiching west of rack
1.08	3rd engine-idle west of rack
9.73	3rd engine-off west of rack
2.77	Pre-Departure-idling (all west of rack)(2 engines)
0.00	Pre-Departure-off (all west of rack)(2 engines)
0.57	Departure-running switching (2 engines)
0.00	Departure-switching east of rack (1 engine)
0.48	Departure-switching west of rack (3 engines)
0.15	Fraction Switching offsite
0.85	Fraction Switching onsite
0.85	Total Offsite Switching
5.00	Total Onsite Switching
7.25	Total idling
21.40	Total off
34.50	Total
0.28	Fraction of onsite switching east of rack
0.16	Fraction of idling east of rack
0.24	Fraction of all switching east of rack
0.16	Fraction of idling east of rack
2.58	Engine 1 & 2 switching, per engine
3.08	Engine 1 & 2 idling, per engine
0.69	Engine 3 switching
1.08	Engine 3 idling

LOCOMOTIVE EMISSIONS Mitigated
Phillips 66 Santa Maria Rail Project

LOCOMOTIVE/TRIP INFORMATION			
Units/week	5	Total time onsite, hrs	11.5
Weeks per year	50	Switching time per engine unloading (hr)	2.58
Line Haul # engines/unit	3	Idling time per engine unloading (hr)	3.08
Line Haul Engine power (HP)	4300	Switching number of engines	2
Roundtrip Distance to SLOC Line (mi)	134	Switching power (hp)	4300
RT Distance SLOC Line to CA Border (mi)	1193	Switching load Factor	0.206
Average Line haul Speed, mph	40	Fraction Tier 0 Engines	0
Roundtrip Duration to SLOC Line (hr)	3.35	Fraction Tier 1 Engines	0
Roundtrip SLOC Line to CA Border (hr)	29.8225	Idling number of engines, non-switching	1
Line Haul Load Factor	0.28	Idling time per engine, non-switching	1.08
SM to SLO Extra Engines Number	2	Switching time per engine, non-switching	0.69
SM to SLO Distance, RT miles	30	Idling fuel use, gal/hr	3.3
SM to SLO Time (20 mph), hrs	1.5	Fraction of switching emissions onsite	0.85
SM to SLO Load	0.18		

	Emission Factor (g/bhp-hr/engine)								
Source	ROG	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O
Line Haul, Tier 4, max	0.14	1.50	1.30	0.060	0.030	0.029	490.7	0.0385	0.0125
Line Haul, Tier 4, avg	0.04	1.28	1.00	0.060	0.015	0.015	490.7	0.0385	0.0125
Switching, Tier 4, max	0.14	1.83	1.30	0.060	0.030	0.029	671.5	0.0526	0.0171
Switching, Tier 4, avg	0.08	1.83	1.00	0.060	0.015	0.015	671.5	0.0526	0.0171
	Emission Factor (g/hr/engine)								
	ROG	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	CO_2	CH_4	N_2O
Idling	63	80	1064	56	27	26	33866	2.6544	0.8627

		Peak Day Emissions, lbs/day						Annual Emissions, tons/year or MT/yr for GHG									
Source		ROG	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$	ROG	CO	NOx	SO2	PM10	PM25	CO_2	CH_4	N_2O	$MTCO_2E$
Within SLOC																	
Line Haul		3.73	40.01	34.67	1.60	0.80	0.78	0.13	4.27	3.33	0.20	0.05	0.05	1,472.40	0.12	0.04	1,486.45
Line Haul SM/SLO		0.71	7.63	6.61	0.31	0.15	0.15	0.03	0.81	0.64	0.04	0.01	0.01	439.20	0.03	0.01	443.39
Switching		1.60	20.89	14.84	0.69	0.34	0.33	0.11	2.61	1.43	0.09	0.02	0.02	761.30	0.06	0.02	768.56
Idling		1.01	1.28	16.99	0.89	0.43	0.42	0.13	0.16	2.12	0.11	0.05	0.05	51.76	0.00	0.00	52.26
Total		7.05	69.81	73.12	3.48	1.73	1.67	0.40	7.85	7.52	0.44	0.13	0.13	2,724.66	0.21	0.07	2,750.66
Onsite Rail		2.37	19.13	29.67	1.48	0.72	0.70	0.22	2.39	3.34	0.18	0.07	0.07	702.18	0.06	0.02	708.88
By District Outside of SLOC to Switch Yards																	
Northern Route - via Oakland	***Miles RT***																
Placer	1.8	0.05	0.54	0.47	0.02	0.01	0.01	0.00	0.06	0.04	0.00	0.00	0.00	19.76	0.00	0.00	19.95
Sacramento Metro	30.8	0.86	9.20	7.97	0.37	0.18	0.18	0.03	0.98	0.77	0.05	0.01	0.01	338.40	0.03	0.01	341.63
Yolo Solano	64.2	1.79	19.16	16.61	0.77	0.38	0.37	0.06	2.04	1.60	0.10	0.02	0.02	705.13	0.06	0.02	711.86
Bay Area	276.9	7.71	82.60	71.59	3.30	1.65	1.60	0.28	8.81	6.88	0.41	0.10	0.10	3,039.89	0.24	0.08	3,068.90
Monterrey Bay	226.8	6.32	67.67	58.64	2.71	1.35	1.31	0.23	7.22	5.64	0.34	0.08	0.08	2,490.24	0.20	0.06	2,514.00
San Luis Obispo	134.1	3.73	40.00	34.66	1.60	0.80	0.78	0.13	4.27	3.33	0.20	0.05	0.05	1,471.96	0.12	0.04	1,486.01
Total		20.45	219.15	189.93	8.77	4.38	4.25	0.73	23.38	18.26	1.10	0.27	0.27	8,065.39	0.63	0.21	8,142.35
Northern Route - via Altamont	***Miles RT***																
Placer	1.8	0.05	0.54	0.47	0.02	0.01	0.01	0.00	0.06	0.04	0.00	0.00	0.00	19.76	0.00	0.00	19.95
Sacramento Metro	75.8	2.11	22.61	19.59	0.90	0.45	0.44	0.08	2.41	1.88	0.11	0.03	0.03	832.06	0.07	0.02	840.00
San Joaquin Valley	100.3	2.79	29.92	25.93	1.20	0.60	0.58	0.10	3.19	2.49	0.15	0.04	0.04	1,101.28	0.09	0.03	1,111.79
Bay Area	179.6	5.00	53.58	46.43	2.14	1.07	1.04	0.18	5.71	4.46	0.27	0.07	0.06	1,971.77	0.15	0.05	1,990.58
Monterrey Bay	226.8	6.32	67.67	58.64	2.71	1.35	1.31	0.23	7.22	5.64	0.34	0.08	0.08	2,490.24	0.20	0.06	2,514.00
San Luis Obispo	134.1	3.73	40.00	34.66	1.60	0.80	0.78	0.13	4.27	3.33	0.20	0.05	0.05	1,471.96	0.12	0.04	1,486.01
Total		20.00	214.31	185.73	8.57	4.29	4.16	0.71	22.86	17.86	1.07	0.27	0.26	7,887.07	0.62	0.20	7,962.34
Southern Route	***Miles RT***																
San Luis Obispo	9.5	0.27	2.85	2.47	0.11	0.06	0.06	0.01	0.30	0.24	0.01	0.00	0.00	104.75	0.01	0.00	105.75
Santa Barbara	216.4	6.03	64.56	55.95	2.58	1.29	1.25	0.22	6.89	5.38	0.32	0.08	0.08	2,376.05	0.19	0.06	2,398.72
Ventura	115.6	3.22	34.48	29.88	1.38	0.69	0.67	0.11	3.68	2.87	0.17	0.04	0.04	1,268.84	0.10	0.03	1,280.94
South Coast	176.2	4.91	52.56	45.55	2.10	1.05	1.02	0.18	5.61	4.38	0.26	0.07	0.06	1,934.44	0.15	0.05	1,952.90
Total		14.42	154.45	133.86	6.18	3.09	3.00	0.51	16.47	12.87	0.77	0.19	0.19	5,684.07	0.45	0.14	5,738.31
Within California																	
Mainline Rail		37.66	403.54	349.73	16.14	8.07	7.83	1.35	43.04	33.63	2.02	0.50	0.49	15,009.51	1.18	0.38	15,152.74
Project Total		40.27	425.71	381.56	17.72	8.84	8.58	1.59	45.82	37.18	2.22	0.58	0.56	15,822.57	1.24	0.40	15,973.56
Mainline Rail Outside SLO County		33.22	355.90	308.45	14.24	7.12	6.90	1.19	37.96	29.66	1.78	0.44	0.43	13,097.91	1.03	0.33	13,222.90

Locomotive Emissions Notes

Notes:

Mitigated peak day assumes use of Tier 2+ engines.
Duration used in the evaluation is the total time of train travel from the project site to the SLO boundary at the given speed.
Locomotives assumed to use the higher sulfur diesel as they come from out of state.
Mitigated peak day is assumed to be all 3 locomotive are Tier 2+.
Mitigated annual emissions assume Tier 2+ engines and EPA 2009 factors.
Emission factors for peak day are EPA Tier 2+ engines (EPA 2009)(adjusted to higher sulfur diesel).
Idling emission factors and fuel use based on CARB Preliminary Draft Locomotive Inventory Memo and the BAH 1992 report for a 16-710G3 engine.
PM2.5/PM10 ratio based on 0.97 from EPA study, 2009.
SO2 factor based on combined ULSD and out-of-state diesel (350ppm) as per Port of LA Calculations, 2011.
Emission factors for GHG based on kg/gallon. Conversion based on EPA 2009 (20.8 for line haul, 15.2 switching - bhp-hr/gal and 10.2065 CO2 kg/gallon).
The 10.2065 CO2 kg/gallon conversion is derived from the CARB mandatory reporting rule for diesel #2.
GHG Emissions tabulated in metric tonnes.
Locomotive load factor based on POLA 2011, and POS 2011.
Locomotive speed based on POLB 2008 of 40 mph.
Estimated switching locomotive fuel use of --> 1585 gallons per week, using EPA 2009 factor of 15.2 bhp-hr/gallon.
Rail distance based on UP rail line maps and data provided by UPRR.
Total round trip distance within CA for the UP northern route (through Reno) is longer than the Southern Route (through Yuma) by about only 2 miles.
Switching time based on information provided in Project Description.
Line Haul SM/SLO are the additional engines required between Santa Margarita and SLO for the Cuesta Grade.
SM to SLO Grade would add 2 engines, operating under dynamic braking (2.1% load) coming downhill (11.7miles), standard 28% load uphill (3.3 miles) and a standard 28% load returning (15 miles) for an average of 18% load.
Switching load factor based on EPA 1998 for switching, with idling portion removed.
Some switching emissions occur offsite along the mainline track siding.

Sources:

Booz-Allen Hamilton, 1992 Report on Locomotive Emission Inventory: Locomotive Emissions by County. August 1992.
EPA 2009, United States Environmental Protection Agency. Emission Factors for Locomotives. Office of Transportation and Air Quality. EPA-420-F-09-025.April 2009.
EPA 1998, Locomotive Emission Standards-Regulatory Support Doucment, EPA, April 1998 (EPA-420-R-98-101)
CARB, Carl Moyer Program Guidelines 2011 for Locomotives
POS 20011, Carbon Footprint Study for the Asia to North America Intermodal Trade, Port of Seattle (POS), June, 2011
POLA 2011, Port of Los Angeles Inventory of Air Emissions 2010, Port of Los Angeles, July 2011
POLB 2008, Port of Long Beach
CARB Preliminary Draft, Locomotive Emission Inventory, http://www.arb.ca.gov/msei/offroad/techmemo/locomotive_memo_2.pdf

Air Quality Miscelaneous Calculations

Crude Movements

5	Units/week average
80	Cars/Unit
714	BBLs/Car
57,143	Crude per unit, bbls
50	weeks/year
14,285,714	Crude throughput, bbls/year
39,139	Avg bbls/day

Crude Throughput

Year	Throughput	Average (bpd)
2003	13,813,748	37,851
2004	14,352,098	39,326
2005	15,489,149	42,442
2006	14,290,448	39,157
2007	15,810,183	43,321
2008	15,249,521	41,665
2009	13,080,967	35,838
2010	13,724,829	37,785
2011	14,126,030	38,701
2012	13,724,829	37,602
3 yr avg		38,029
Permit limit		48,950
Excess		10,921
Trains per year		69.8

Cancer Risk Calculation

	Res	Worker
Breathing rate	393	149
Inhale absorb rate	1	1
Exposure frequency	350	245
Exposure duration	70	30
AT	25550	25550
SF	1.1	1.1
cancer risk x ug/m3	414.5	47.1

per million
BR: 393 for the 95th percentile for residential
BR: 302 for the 80th percentile

Santa Margarita to SLO Load Calculation

2.1	Dynamic braking load
11.7	Dynamic braking distance
28.0	Uphill load
3.3	Uphill distance
7.8	Average load with full load
28	Average load returning (empty)
18	Average load both ways

Diesel CO2 Density CARB MMR Table 1

0.138	kg/mmbtu
73.96	mmbtu/gal
10.20648	kg CO2/gallon

CARB Fleet Mix Emission Factors for UP

from CARB website: http://www.arb.ca.gov/msprog/offroad/loco/loco.htm

Year 2009 data			Line Haul, g/bhp-hr				Switching, g/bhp-hr			
Engine Type	Number	Fraction	PM	NOx	HC	CO	PM	Nox	HC	CO
pre-Tier 0	1,986	0.24	0.32	13	0.48	1.28	0.44	17.4	1.01	1.83
Tier 0 and 0+	3,787	0.46	0.26	7.9	0.39	1.28	0.335	11.6	0.79	1.83
Tier 1 and 1+	1,184	0.14	0.26	6.7	0.38	1.28	0.335	9.9	0.79	1.83
Tier 2	1,319	0.16	0.18	4.95	0.26	1.28	0.19	7.3	0.51	1.83
Total/Weighted Avg	8,276		0.26	8.48	0.39	1.28	0.34	12.06	0.80	1.83

Notes
UP data only provided for Tier and Tier+ combined. Assumed equally split between the two emission factors

Odor Analysis

SCREEN3 Results: Fugitive emissions, area source

2810	source area, m2, 550 feet by 55 feet
3.96	emission rate, lbs/day, ROC
9600	H2S, ppmw
0.00001	ROC, emission rate, g/s-m2
7.1E-08	H2S, emission rate, g/s-m2
1420	H2S, ug/ppm
1.65	3 min/60min avg time ratio, as per
1.52	H2S, Result, ug/m3, 1 hr avg time
0.00107	H2S, ppm result
1.07	H2S, ppb result
2.50965	H2S, Result, ug/m3, 3min avg time
0.00177	H2S, ppm result
1.77	H2S, ppb result

SCREEN3 Results: Canister emissions, pt source

2.24	emission rate, lbs/day, ROC
4.8	H2S, ppmv
29	H2S MW
50	Gas approx MW
1.2E-02	ROC, emission rate, g/s
3.3E-08	H2S, emission rate, g/s
1420	H2S, ug/ppm
1.65	3 min/60min avg time ratio, as per
2.60E-04	H2S, Result, ug/m3, 1 hr avg time
0.00000	H2S, ppm result
0.0002	H2S, ppb result
0.000429	H2S, Result, ug/m3, 3min avg time
0.00000	H2S, ppm result
0.0003	H2S, ppb result

Phillips 66 Rail Spur Project
Construction Truck Traffic

Stage	Activity	Units	Total Trips	Number of Days	Average Trips per Day	Peak Day Trips, RT	Peak Day Trips, OW
Demolition	Debris Removal	1000 yds3	100	11	9.1	10	20
	Construction Equipment Delivery	6 equipment pieces	12	4	3.0	6	12
	Misc		50	88	0.6	2	4
	Total		***162***		***12.7***	***18***	***36***
Turnout Track	Construction Equipment Delivery	7 equipment pieces	14	4	3.5	7	14
	Misc		50	88	0.6	2	4
	Total		***64***		***4.1***	***9***	***18***
Grading	Access Rd granite	Length 3,000 feet at 3" deep, 12' wide	33	44	0.8	5	10
	Construction Equipment Delivery	16 equipment pieces	32	4	8.0	16	32
	Utility/Foremans trucks		240	44	5.5	10	20
	Misc	misc	27	88	0.3	2	4
	Total		***332***		***14.5***	***33***	***66***
Unloading Facility and Pipeline Construction	Asphalt	1.7 acres at 3"	93	44	2.1	4	8
	CMB	4.6 acres at 3"	186	44	4.2	5	10
	Insulation		14	44	0.3	2	4
	Paint/Steel/Concrete		345	44	7.8	16	32
	Process equipment		64	44	1.5	3	6
	Restroom and septic system	estimated	10	44	0.2	2	4
	Electrical Equipment		21	44	0.5	2	4
	Fence		7	44	0.2	2	4
	Pipeline pipe		16	44	0.4	2	4
	Construction Equipment Delivery	17 equipment pieces	34	4	8.5	10	20
	Misc	Misc	66	88	0.8	2	4
	Total		***855***		***26.4***	***50***	***100***
Rail Construction	Tracks	assume 139 pound rail, total rail length of 31,260x2	72	88	0.8	2	4
	RR Ties		60	11	5.5	10	20
	Ballast and sub-ballast		1400	22	63.6	75	150
	Turnouts		7	11	0.6	2	4
	Construction Equipment Delivery	10 equipment pieces	20	4	5.0	10	20
	Misc	Misc	147	22	6.7	10	20
	Total		***1706***		***82.2***	***109***	***218***
Commissioning	Misc	Misc	88	44	2.0	4	8

Source: Adapted by MRS from Phillips 66 Application to County and Comments by Phillips 66 on Project Description.

CalEEMod Summary: Construction Emissions
Taken from CalEEMod version 2013.2.2

PEAK DAY SUMMARY

	Emissions, Peak Day, Lbs/Day									
Year	**ROG**	**NOX**	**CO**	**Sox**	**PM10 Dust**	**PM10 Exh**	**PM All**	**PM25 Dust**	**PM25 Exh**	**PM25 All**
2014	19.0	221.7	136.2	0.2	18.8	8.5	27.3	9.2	7.8	17.0
2015	39.0	155.0	98.7	0.2	6.4	6.5	12.9	2.5	6.0	8.6
Mitigated										
2014	12.4	140.9	106.0	0.2	9.3	4.6	13.8	4.1	4.2	8.3
2015	39.0	127.3	93.0	0.2	4.5	4.9	9.4	1.5	4.5	6.1

Note: CalEEMod2013 calculates peak day mitigated Pmdust incorrectly . Corrected manually herein
Peak period based on 2014. 2015 Peak day includes commissioning, which would not occur at the same time as other activities

Peak Day Mitigated	ROC+Nox	153.3	
Peak Day Mitigated	DPM	4.9	
Peak Day Mitigated	ROC+Nox	77.01	with staggered construction

Peak Day Detailed Breakdown

Unmitigated	Emissions, Peak Day, Lbs/Day									
Activity	**ROG**	**NOX**	**CO**	**Sox**	**PM10 Dust**	**PM10 Exh**	**PM All**	**PM25 Dust**	**PM25 Exh**	**PM25 All**
Demolition										
onsite	9.04	101.47	70.87	0.07	1.00	4.97	5.98	0.15	4.58	4.73
offsite	0.53	4.70	5.96	0.01	0.48	0.08	0.56	0.13	0.07	0.20
Soil Transport										
onsite	4.80	56.25	31.47	0.05	6.02	2.32	8.35	3.31	2.14	5.45
offsite	0.13	0.19	1.77	0.00	0.20	0.00	0.20	0.05	0.00	0.05
Grading										
onsite	6.94	81.69	46.85	0.07	6.59	3.55	10.13	3.37	3.26	6.63
offsite	0.32	1.91	3.87	0.01	0.36	0.03	0.39	0.10	0.03	0.13
Site Prep - Rail 2014										
onsite	4.11	48.14	25.17	0.05	3.01	2.00	5.01	1.66	1.84	3.49
offsite	2.65	33.52	27.05	0.06	2.60	0.59	3.19	0.68	0.55	1.23
Site Prep - Rail 2015										
onsite	4.04	46.79	24.80	0.05	3.01	1.94	4.95	1.66	1.78	3.44
offsite	2.44	29.05	25.52	0.06	2.60	0.44	3.04	0.68	0.40	1.08
Site Prep-pipeline 2015										
onsite	2.28	26.54	12.10	0.03	0.00	1.08	1.08	0.00	1.00	1.00
offsite	0.32	2.59	3.72	0.01	0.34	0.04	0.38	0.09	0.04	0.13
Constr-Unloading Area										
onsite	4.10	38.12	22.56	0.03		2.29	2.29		2.13	2.13
offsite	0.37	2.66	4.32	0.01	0.42	0.04	0.46	0.11	0.04	0.15
Constr-paving										
onsite	1.42	9.26	5.67	0.01		0.71	0.71		0.65	0.65
offsite	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Commissioning										
onsite	39.00									
offsite										

CalEEMod Summary: Construction Emissions Mitigated

Mitigated	**Emissions, Peak Day, Lbs/Day**									
Activity	**ROG**	**NOX**	**CO**	**Sox**	**PM10 Dust**	**PM10 Exh**	**PM All**	**PM25 Dust**	**PM25 Exh**	**PM25 All**
Demolition										
onsite	2.17	20.82	35.54	0.07	0.39	0.70	1.09	0.06	0.65	0.71
offsite	0.53	4.70	5.96	0.01	0.48	0.08	0.56	0.13	0.07	0.20
Soil Transport										
onsite	3.17	36.55	21.45	0.05	2.35	1.38	3.73	1.29	1.27	2.56
offsite	0.13	0.19	1.77	0.00	0.20	0.00	0.20	0.05	0.00	0.05
Grading										
onsite	2.95	31.79	31.72	0.07	2.57	1.15	3.72	1.31	1.06	2.38
offsite	0.32	1.91	3.87	0.01	0.36	0.03	0.39	0.10	0.03	0.13
Site Prep - Rail 2014										
onsite	3.16	36.99	20.14	0.05	1.17	1.42	2.59	0.65	1.30	1.95
offsite	2.65	33.52	27.05	0.06	2.60	0.59	3.19	0.68	0.55	1.23
Site Prep - Rail 2015										
onsite	3.09	35.75	19.84	0.05	1.17	1.37	2.54	0.65	1.26	1.90
offsite	2.44	29.05	25.52	0.06	2.60	0.44	3.04	0.68	0.40	1.08
Site Prep-pipeline 2015										
onsite	2.00	23.32	11.94	0.03	0.00	0.89	0.89	0.00	0.82	0.82
offsite	0.32	2.59	3.72	0.01	0.34	0.04	0.38	0.09	0.04	0.13
Constr-Unloading Area										
onsite	2.91	24.63	21.97	0.03		1.42	1.42		1.34	1.34
offsite	0.37	2.66	4.32	0.01	0.42	0.04	0.46	0.11	0.04	0.15
Constr-paving										
onsite	1.42	9.26	5.67	0.01		0.71	0.71		0.65	0.65
offsite	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Commissioning										
onsite	39.00									
offsite										

CalEEMod Construction Emissions: ANNUAL TOTAL SUMMARY

	Emissions, Total, tons													
Year	ROG	NOX	CO	Sox	PM10 Dust	PM10 Exh	PM All	PM25 Dust	PM25 Exh	PM25 All	CO2	CH4	N2O	MTCO2e
2014	0.68	7.78	4.80	0.01	0.64	0.33	0.97	0.33	0.30	0.63	671	0.18	0.00	675
2015	1.13	2.78	1.69	0.01	0.07	0.13	0.20	0.03	0.12	0.15	289	0.06	0.00	291
Mitigated														
2014	0.35	3.77	3.28	0.01	0.28	0.13	0.41	0.13	0.12	0.26	671	0.18	0.00	675
2015	1.08	2.17	1.64	0.003	0.05	0.09	0.14	0.02	0.09	0.10	289	0.06	0.00	291

TOTAL DETAILS

unmitigated	Emissions, Total, tons									
Activity	**ROG**	**NOX**	**CO**	**Sox**	**PM10 Dust**	**PM10 Exh**	**PM All**	**PM25 Dust**	**PM25 Exh**	**PM25 All**
Demolition										
Offroad	0.0995	1.1162	0.7796	0.01	0.01	0.0547	0.0547	0.01	0.0503	0.0503
Offsite	0.0055	0.052	0.0615	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Fugitive Dust Mit										
Soil Transport										
Fugitive Dust					0.265			0.1457		
Offroad	0.2112	2.4749	1.3845	0.01		0.1023	0.1023		0.0941	0.0941
Offsite	0.0055	0.01	0.0759	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Fugitive Dust Mit					0.1			0.06		
Grading										
Fugitive Dust					0.29			0.15		
Offroad	0.3053	3.5945	2.0616	0.01		0.156	0.156		0.1435	0.1435
Offsite	0.0134	0.0843	0.1624	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Fugitive Dust Mit					0.11			0.06		
Rail Construction-2014										
Fugitive Dust					0.033			0.018		
Offroad	0.0226	0.2647	0.1385	0.01		0.01	0.01		0.01	0.01
Offsite	0.0138	0.1859	0.1355	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Fugitive Dust Mit					0.0129			0.01		
Rail Construction-2015										
Fugitive Dust					0.033			0.018		
Offroad	0.0222	0.2573	0.1364	0.01		0.01	0.01		0.01	0.01
Offsite	0.0138	0.1611	0.1273	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Fugitive Dust Mit					0.01			0.01		
Pipeline Construction										
Fugitive Dust										
Offroad	0.0754	0.8758	0.3992	0.01		0.0357	0.0357		0.0329	0.0329
Offsite	0.01	0.0861	0.115	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Fugitive Dust Mit										
Unloading Construction										
Fugitive Dust										
Offroad	0.1354	1.2579	0.7446	0.01		0.0755	0.0755		0.0704	0.0704
Offsite	0.0114	0.0883	0.1346	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Fugitive Dust Mit										
Paving Construction										
Asphalt	0.01									
Offroad	0.01	0.05	0.03	0.01		0.01	0.01		0.01	0.01
Offsite										
Fugitive Dust Mit										
Commissioning										
Painting	0.8581									
Offroad										
Offsite	0.01	0.018	0.0252	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Fugitive Dust Mit										

CalEEMod Construction Emissions
MITIGATED Worst Case Scenario

	Emissions, Total, tons									
Activity	**ROG**	**NOX**	**CO**	**Sox**	**PM10 Dust**	**PM10 Exh**	**PM All**	**PM25 Dust**	**PM25 Exh**	**PM25 All**
Soil Transport										
Fugitive Dust					0.1033		0.1033	0.0568		0.0568
Offroad	0.1393	1.6083	0.9439	0.002		0.061	0.061		0.056	0.056
Offsite	0.0055	0.01	0.0759	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Fugitive Dust Mit					0.1033			0.0568		
Grading										
Fugitive Dust					0.1131		0.1131	0.0579		0.0579
Offroad	0.1296	1.3989	1.3955	0.01		0.0508	0.0508		0.0468	0.0468
Offsite	0.0134	0.0843	0.1624	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Fugitive Dust Mit					0.1131			0.0579		
Rail Construction-2014										
Fugitive Dust					0.0129		0.0129	0.0071		0.0071
Offroad	0.0174	0.2034	0.1108	0.01		0.0078	0.0078		0.0072	0.0072
Offsite	0.0138	0.1859	0.1355	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Fugitive Dust Mit					0.0129			0.01		

Quarter Scenarios

	Peak Quarter Emissions, Total, tons									
Scenario	**ROG**	**NOX**	**CO**	**Sox**	**PM10 Dust**	**PM10 Exh**	**PM All**	**PM25 Dust**	**PM25 Exh**	**PM25 All**
Grading, Soil Transportation and Rail	0.44	5.07	3.04	0.05	0.47	0.23		0.26	0.21	
Rail, Pipeline, Unloading and paving	0.23	2.20	1.34	0.06	0.07	0.13		0.05	0.12	

Grading, Soil Transportation and Rail										
Onsite: Fugitive Dust					0.45			0.24		
Onsite: Vehicles	0.41	4.82	2.72	0.03		0.20			0.19	
Offsite: Fugitive Dust					0.03			0.03		
Offsite: Vehicles	0.03	0.26	0.31	0.03		0.03			0.03	
Total	0.44	5.07	3.04	0.05	0.47	0.23		0.26	0.21	

Grading, Soil Transportation and Rail: MITIGATED										
Onsite: Fugitive Dust					0.17			0.10		
Onsite: Vehicles	0.22	2.46	1.87	0.02		0.09			0.08	
Offsite: Fugitive Dust					0.03			0.03		
Offsite: Vehicles	0.03	0.26	0.31	0.03		0.03			0.03	
Total	0.25	2.72	2.18	0.04	0.20	0.12		0.13	0.11	
Percent Reduction	44%	46%	28%	12%	59%	49%		53%	49%	

Note: Quarterly emissions based on total emissions for grading/soil transportation multiplied by 0.75 plus 2014 rail total emissions

Peak Qrtr Activity	Months	Notes
Soil Transport	3	soil transport phase durations of 4 months
Grading	3	grading phase durations of 4 months
Rail Construction	1	rail construction duration of 1 month

Peak Qrtr Mitigated	ROC+Nox	2.96	
Peak Qrtr Mitigated	ROC+Nox	2.03	with schedule staggering, grading and soil transport only over 5 months
Peak Qrtr Mitigated	DPM	0.12	
Peak Qrtr Mitigated	Fug Dust	0.20	

Phillips 66 Santa Maria

San Luis Obispo County, Winter

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
User Defined Industrial	1.00	User Defined Unit	47.00	0.00	0
Other Asphalt Surfaces	1.70	Acre	1.70	74,052.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	3.2	**Precipitation Freq (Days)**	44
Climate Zone	4			**Operational Year**	2016
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use - edit

Construction Phase - assumptions

Off-road Equipment -

Off-road Equipment - Applicant data and data pn paving requirements

Off-road Equipment - applicant data

Off-road Equipment - Applicant info

Off-road Equipment - site assumptions

Off-road Equipment - assumptions

Off-road Equipment - assumption

Off-road Equipment - site assumptions

Off-road Equipment - assumption

Trips and VMT - demolition material to be sent offsite
Soil transport onsite handled by on-site equipment levels and use

Demolition -

Grading - total site disturbance

Road Dust - test

Water And Wastewater - onsite septic only

Construction Off-road Equipment Mitigation - Standard and BACT

Operational Off-Road Equipment - truck use along rail spur dirt road

Table Name	Column Name	Default Value	New Value
tblAreaCoating	Area_Nonresidential_Interior	111078	0
tblConstEquipMitigation	DPF	No Change	Level 3
tblConstEquipMitigation	DPF	No Change	Level 3
tblConstEquipMitigation	DPF	No Change	Level 3
tblConstEquipMitigation	DPF	No Change	Level 3
tblConstEquipMitigation	DPF	No Change	Level 3
tblConstEquipMitigation	DPF	No Change	Level 3

tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	9.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	10.00
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstructionPhase	NumDays	55.00	44.00
tblConstructionPhase	NumDays	740.00	66.00
tblConstructionPhase	NumDays	50.00	22.00
tblConstructionPhase	NumDays	75.00	88.00
tblConstructionPhase	NumDays	55.00	11.00
tblConstructionPhase	NumDays	30.00	88.00
tblConstructionPhase	NumDays	30.00	22.00
tblConstructionPhase	NumDays	30.00	66.00
tblConstructionPhase	PhaseEndDate	3/18/2015	7/1/2015
tblConstructionPhase	PhaseEndDate	7/3/2015	4/2/2015
tblConstructionPhase	PhaseEndDate	8/29/2014	8/30/2014
tblConstructionPhase	PhaseEndDate	5/4/2015	12/31/2014
tblConstructionPhase	PhaseEndDate	4/17/2015	1/15/2015
tblConstructionPhase	PhaseEndDate	1/30/2015	1/15/2015
tblConstructionPhase	PhaseEndDate	4/17/2015	4/2/2015
tblConstructionPhase	PhaseStartDate	1/16/2015	5/1/2015

tblConstructionPhase	PhaseStartDate	4/3/2015	1/1/2015
tblConstructionPhase	PhaseStartDate	1/1/2015	9/1/2014
tblConstructionPhase	PhaseStartDate	4/3/2015	1/1/2015
tblConstructionPhase	PhaseStartDate	8/31/2014	9/1/2014
tblConstructionPhase	PhaseStartDate	1/1/2015	12/17/2014
tblConstructionPhase	PhaseStartDate	1/16/2015	1/1/2015
tblGrading	AcresOfGrading	132.00	47.00
tblLandUse	LotAcreage	0.00	47.00
tblOffRoadEquipment	HorsePower	226.00	208.00
tblOffRoadEquipment	HorsePower	162.00	157.00
tblOffRoadEquipment	HorsePower	89.00	149.00
tblOffRoadEquipment	HorsePower	174.00	162.00
tblOffRoadEquipment	HorsePower	125.00	89.00
tblOffRoadEquipment	HorsePower	255.00	358.00
tblOffRoadEquipment	HorsePower	255.00	358.00
tblOffRoadEquipment	HorsePower	255.00	358.00
tblOffRoadEquipment	HorsePower	255.00	358.00
tblOffRoadEquipment	HorsePower	255.00	358.00
tblOffRoadEquipment	HorsePower	361.00	356.00
tblOffRoadEquipment	HorsePower	97.00	75.00
tblOffRoadEquipment	HorsePower	97.00	75.00
tblOffRoadEquipment	HorsePower	97.00	75.00
tblOffRoadEquipment	HorsePower	205.00	82.00
tblOffRoadEquipment	HorsePower	226.00	208.00
tblOffRoadEquipment	HorsePower	400.00	381.00
tblOffRoadEquipment	HorsePower	400.00	381.00
tblOffRoadEquipment	HorsePower	400.00	381.00
tblOffRoadEquipment	HorsePower	400.00	381.00

tblOffRoadEquipment	HorsePower	400.00	381.00
tblOffRoadEquipment	HorsePower	97.00	75.00
tblOffRoadEquipment	HorsePower	97.00	75.00
tblOffRoadEquipment	LoadFactor	0.20	0.40
tblOffRoadEquipment	LoadFactor	0.74	0.42
tblOffRoadEquipment	LoadFactor	0.45	0.42
tblOffRoadEquipment	LoadFactor	0.48	0.42
tblOffRoadEquipment	LoadFactor	0.50	0.42
tblOffRoadEquipment	LoadFactor	0.43	0.42
tblOffRoadEquipment	LoadFactor	0.43	0.42
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	3.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	4.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	4.00	1.00
tblOffRoadEquipment	UsageHours	8.00	4.00
tblOffRoadEquipment	UsageHours	8.00	4.00
tblOffRoadEquipment	UsageHours	8.00	5.00
tblOffRoadEquipment	UsageHours	8.00	5.00
tblOffRoadEquipment	UsageHours	8.00	4.00
tblOffRoadEquipment	UsageHours	8.00	4.00
tblOffRoadEquipment	UsageHours	8.00	4.00
tblOffRoadEquipment	UsageHours	8.00	4.00
tblOffRoadEquipment	UsageHours	8.00	4.00

tblOffRoadEquipment	UsageHours	8.00	4.00
tblOffRoadEquipment	UsageHours	8.00	4.00
tblOperationalOffRoadEquipment	OperDaysPerYear	260.00	0.00
tblOperationalOffRoadEquipment	OperHorsePower	400.00	381.00
tblOperationalOffRoadEquipment	OperHoursPerDay	8.00	0.00
tblProjectCharacteristics	OperationalYear	2014	2016
tblTripsAndVMT	HaulingTripNumber	99.00	226.00
tblTripsAndVMT	HaulingTripNumber	0.00	332.00
tblTripsAndVMT	HaulingTripNumber	0.00	1,706.00
tblTripsAndVMT	HaulingTripNumber	0.00	426.00
tblTripsAndVMT	HaulingTripNumber	0.00	426.00
tblTripsAndVMT	VendorTripNumber	12.00	0.00
tblTripsAndVMT	WorkerTripNumber	25.00	23.00
tblTripsAndVMT	WorkerTripNumber	18.00	23.00
tblTripsAndVMT	WorkerTripNumber	10.00	0.00
tblVehicleEF	HHD	0.02	0.07
tblVehicleEF	HHD	0.01	0.03
tblVehicleEF	HHD	0.00	0.13
tblVehicleEF	HHD	2.71	8.13
tblVehicleEF	HHD	1.34	3.98
tblVehicleEF	HHD	89.49	34.56
tblVehicleEF	HHD	565.98	575.19
tblVehicleEF	HHD	1,681.93	1,721.44
tblVehicleEF	HHD	65.88	68.22
tblVehicleEF	HHD	0.02	0.02
tblVehicleEF	HHD	5.29	18.73
tblVehicleEF	HHD	6.79	8.39
tblVehicleEF	HHD	5.80	3.93

tblVehicleEF	HHD	0.02	0.18
tblVehicleEF	HHD	0.06	0.02
tblVehicleEF	HHD	0.03	0.03
tblVehicleEF	HHD	0.09	0.29
tblVehicleEF	HHD	6.6660e-003	2.5000e-003
tblVehicleEF	HHD	0.02	0.18
tblVehicleEF	HHD	0.03	0.02
tblVehicleEF	HHD	8.6600e-003	0.03
tblVehicleEF	HHD	0.08	0.29
tblVehicleEF	HHD	5.4820e-003	2.5000e-003
tblVehicleEF	HHD	3.7330e-003	1.2000e-003
tblVehicleEF	HHD	0.28	0.03
tblVehicleEF	HHD	0.50	1.68
tblVehicleEF	HHD	2.2720e-003	6.0000e-004
tblVehicleEF	HHD	0.25	0.70
tblVehicleEF	HHD	1.33	0.03
tblVehicleEF	HHD	4.59	2.29
tblVehicleEF	HHD	5.5960e-003	0.01
tblVehicleEF	HHD	0.02	0.01
tblVehicleEF	HHD	2.2310e-003	8.0000e-004
tblVehicleEF	HHD	3.7330e-003	1.2000e-003
tblVehicleEF	HHD	0.28	0.03
tblVehicleEF	HHD	0.57	1.92
tblVehicleEF	HHD	2.2720e-003	6.0000e-004
tblVehicleEF	HHD	0.28	0.79
tblVehicleEF	HHD	1.33	0.03
tblVehicleEF	HHD	4.91	2.45
tblVehicleEF	HHD	0.02	0.07

tblVehicleEF	HHD	0.01	0.03
tblVehicleEF	HHD	0.00	0.10
tblVehicleEF	HHD	1.97	5.33
tblVehicleEF	HHD	1.34	4.01
tblVehicleEF	HHD	68.01	25.49
tblVehicleEF	HHD	599.61	609.36
tblVehicleEF	HHD	1,681.93	1,721.44
tblVehicleEF	HHD	65.88	68.22
tblVehicleEF	HHD	0.02	0.02
tblVehicleEF	HHD	5.46	19.67
tblVehicleEF	HHD	6.57	8.51
tblVehicleEF	HHD	5.47	3.70
tblVehicleEF	HHD	0.02	0.14
tblVehicleEF	HHD	0.06	0.02
tblVehicleEF	HHD	0.03	0.03
tblVehicleEF	HHD	0.09	0.29
tblVehicleEF	HHD	6.6660e-003	2.5000e-003
tblVehicleEF	HHD	0.01	0.14
tblVehicleEF	HHD	0.03	0.02
tblVehicleEF	HHD	8.6600e-003	0.03
tblVehicleEF	HHD	0.08	0.29
tblVehicleEF	HHD	5.4820e-003	2.5000e-003
tblVehicleEF	HHD	7.1400e-003	2.5000e-003
tblVehicleEF	HHD	0.28	0.03
tblVehicleEF	HHD	0.47	1.54
tblVehicleEF	HHD	4.2630e-003	1.3000e-003
tblVehicleEF	HHD	0.25	0.70
tblVehicleEF	HHD	1.28	0.03

tblVehicleEF	HHD	3.63	1.86
tblVehicleEF	HHD	5.9280e-003	0.01
tblVehicleEF	HHD	0.02	0.01
tblVehicleEF	HHD	1.8640e-003	6.0000e-004
tblVehicleEF	HHD	7.1400e-003	2.5000e-003
tblVehicleEF	HHD	0.28	0.03
tblVehicleEF	HHD	0.53	1.76
tblVehicleEF	HHD	4.2630e-003	1.3000e-003
tblVehicleEF	HHD	0.28	0.79
tblVehicleEF	HHD	1.28	0.03
tblVehicleEF	HHD	3.88	1.99
tblVehicleEF	HHD	0.02	0.08
tblVehicleEF	HHD	0.01	0.03
tblVehicleEF	HHD	0.00	0.13
tblVehicleEF	HHD	3.74	10.13
tblVehicleEF	HHD	1.33	3.97
tblVehicleEF	HHD	102.00	35.05
tblVehicleEF	HHD	519.55	528.00
tblVehicleEF	HHD	1,681.93	1,721.44
tblVehicleEF	HHD	65.88	68.22
tblVehicleEF	HHD	0.02	0.02
tblVehicleEF	HHD	5.05	18.06
tblVehicleEF	HHD	6.73	8.71
tblVehicleEF	HHD	5.98	3.95
tblVehicleEF	HHD	0.02	0.21
tblVehicleEF	HHD	0.06	0.02
tblVehicleEF	HHD	0.03	0.03
tblVehicleEF	HHD	0.09	0.29

tblVehicleEF	HHD	6.6660e-003	2.5000e-003
tblVehicleEF	HHD	0.02	0.21
tblVehicleEF	HHD	0.03	0.02
tblVehicleEF	HHD	8.6600e-003	0.03
tblVehicleEF	HHD	0.08	0.29
tblVehicleEF	HHD	5.4820e-003	2.5000e-003
tblVehicleEF	HHD	2.6080e-003	1.3000e-003
tblVehicleEF	HHD	0.35	0.04
tblVehicleEF	HHD	0.54	1.78
tblVehicleEF	HHD	1.7350e-003	8.0000e-004
tblVehicleEF	HHD	0.25	0.70
tblVehicleEF	HHD	1.44	0.03
tblVehicleEF	HHD	5.14	2.32
tblVehicleEF	HHD	5.1360e-003	9.5000e-003
tblVehicleEF	HHD	0.02	0.01
tblVehicleEF	HHD	2.4450e-003	8.0000e-004
tblVehicleEF	HHD	2.6080e-003	1.3000e-003
tblVehicleEF	HHD	0.35	0.04
tblVehicleEF	HHD	0.61	2.03
tblVehicleEF	HHD	1.7350e-003	8.0000e-004
tblVehicleEF	HHD	0.28	0.79
tblVehicleEF	HHD	1.44	0.03
tblVehicleEF	HHD	5.51	2.48
tblVehicleEF	LDA	0.01	0.01
tblVehicleEF	LDA	0.01	0.02
tblVehicleEF	LDA	1.26	1.83
tblVehicleEF	LDA	2.84	4.79
tblVehicleEF	LDA	264.46	286.67

tblVehicleEF	LDA	61.62	66.44
tblVehicleEF	LDA	0.46	0.44
tblVehicleEF	LDA	0.14	0.19
tblVehicleEF	LDA	0.19	0.31
tblVehicleEF	LDA	0.04	0.01
tblVehicleEF	LDA	1.9850e-003	9.4000e-003
tblVehicleEF	LDA	3.2170e-003	6.4000e-003
tblVehicleEF	LDA	0.02	0.01
tblVehicleEF	LDA	2.0000e-003	8.0000e-003
tblVehicleEF	LDA	1.8090e-003	9.4000e-003
tblVehicleEF	LDA	2.9410e-003	6.4000e-003
tblVehicleEF	LDA	0.05	0.07
tblVehicleEF	LDA	0.14	0.17
tblVehicleEF	LDA	0.04	0.05
tblVehicleEF	LDA	0.04	0.06
tblVehicleEF	LDA	0.34	0.08
tblVehicleEF	LDA	0.23	0.40
tblVehicleEF	LDA	3.2540e-003	3.3000e-003
tblVehicleEF	LDA	7.8400e-004	8.0000e-004
tblVehicleEF	LDA	0.05	0.07
tblVehicleEF	LDA	0.14	0.17
tblVehicleEF	LDA	0.04	0.05
tblVehicleEF	LDA	0.06	0.08
tblVehicleEF	LDA	0.34	0.08
tblVehicleEF	LDA	0.24	0.42
tblVehicleEF	LDA	0.01	0.01
tblVehicleEF	LDA	0.01	0.01
tblVehicleEF	LDA	1.33	2.00

tblVehicleEF	LDA	2.17	3.48
tblVehicleEF	LDA	275.59	298.70
tblVehicleEF	LDA	61.62	66.44
tblVehicleEF	LDA	0.46	0.44
tblVehicleEF	LDA	0.12	0.18
tblVehicleEF	LDA	0.18	0.28
tblVehicleEF	LDA	0.04	0.01
tblVehicleEF	LDA	1.9850e-003	9.4000e-003
tblVehicleEF	LDA	3.2170e-003	6.4000e-003
tblVehicleEF	LDA	0.02	0.01
tblVehicleEF	LDA	2.0000e-003	8.0000e-003
tblVehicleEF	LDA	1.8090e-003	9.4000e-003
tblVehicleEF	LDA	2.9410e-003	6.4000e-003
tblVehicleEF	LDA	0.08	0.15
tblVehicleEF	LDA	0.15	0.19
tblVehicleEF	LDA	0.06	0.11
tblVehicleEF	LDA	0.04	0.06
tblVehicleEF	LDA	0.32	0.08
tblVehicleEF	LDA	0.18	0.31
tblVehicleEF	LDA	3.3930e-003	3.5000e-003
tblVehicleEF	LDA	7.7200e-004	8.0000e-004
tblVehicleEF	LDA	0.08	0.15
tblVehicleEF	LDA	0.15	0.19
tblVehicleEF	LDA	0.06	0.11
tblVehicleEF	LDA	0.06	0.08
tblVehicleEF	LDA	0.32	0.08
tblVehicleEF	LDA	0.20	0.33
tblVehicleEF	LDA	0.01	0.01

tblVehicleEF	LDA	0.01	0.02
tblVehicleEF	LDA	1.26	1.79
tblVehicleEF	LDA	3.17	4.91
tblVehicleEF	LDA	262.24	284.27
tblVehicleEF	LDA	61.62	66.44
tblVehicleEF	LDA	0.46	0.44
tblVehicleEF	LDA	0.14	0.20
tblVehicleEF	LDA	0.20	0.32
tblVehicleEF	LDA	0.04	0.01
tblVehicleEF	LDA	1.9850e-003	9.4000e-003
tblVehicleEF	LDA	3.2170e-003	6.4000e-003
tblVehicleEF	LDA	0.02	0.01
tblVehicleEF	LDA	2.0000e-003	8.0000e-003
tblVehicleEF	LDA	1.8090e-003	9.4000e-003
tblVehicleEF	LDA	2.9410e-003	6.4000e-003
tblVehicleEF	LDA	0.04	0.07
tblVehicleEF	LDA	0.16	0.21
tblVehicleEF	LDA	0.03	0.05
tblVehicleEF	LDA	0.04	0.06
tblVehicleEF	LDA	0.39	0.09
tblVehicleEF	LDA	0.25	0.40
tblVehicleEF	LDA	3.2270e-003	3.2000e-003
tblVehicleEF	LDA	7.8900e-004	8.0000e-004
tblVehicleEF	LDA	0.04	0.07
tblVehicleEF	LDA	0.16	0.21
tblVehicleEF	LDA	0.03	0.05
tblVehicleEF	LDA	0.06	0.07
tblVehicleEF	LDA	0.39	0.09

tblVehicleEF	LDA	0.26	0.43
tblVehicleEF	LDT1	0.02	0.03
tblVehicleEF	LDT1	0.03	0.03
tblVehicleEF	LDT1	3.16	4.12
tblVehicleEF	LDT1	5.43	8.27
tblVehicleEF	LDT1	320.87	343.62
tblVehicleEF	LDT1	74.98	80.88
tblVehicleEF	LDT1	0.04	0.19
tblVehicleEF	LDT1	0.33	0.50
tblVehicleEF	LDT1	0.31	0.45
tblVehicleEF	LDT1	0.04	0.01
tblVehicleEF	LDT1	3.4520e-003	0.01
tblVehicleEF	LDT1	4.6840e-003	8.3000e-003
tblVehicleEF	LDT1	0.02	0.01
tblVehicleEF	LDT1	2.0000e-003	8.0000e-003
tblVehicleEF	LDT1	3.0790e-003	0.01
tblVehicleEF	LDT1	4.2060e-003	8.3000e-003
tblVehicleEF	LDT1	0.10	0.12
tblVehicleEF	LDT1	0.26	0.26
tblVehicleEF	LDT1	0.07	0.08
tblVehicleEF	LDT1	0.13	0.14
tblVehicleEF	LDT1	0.88	0.22
tblVehicleEF	LDT1	0.43	0.63
tblVehicleEF	LDT1	3.8050e-003	4.1000e-003
tblVehicleEF	LDT1	9.5700e-004	1.0000e-003
tblVehicleEF	LDT1	0.10	0.12
tblVehicleEF	LDT1	0.26	0.26
tblVehicleEF	LDT1	0.07	0.08

tblVehicleEF	LDT1	0.16	0.18
tblVehicleEF	LDT1	0.88	0.22
tblVehicleEF	LDT1	0.46	0.67
tblVehicleEF	LDT1	0.02	0.03
tblVehicleEF	LDT1	0.03	0.02
tblVehicleEF	LDT1	3.23	4.37
tblVehicleEF	LDT1	4.18	6.01
tblVehicleEF	LDT1	333.47	356.91
tblVehicleEF	LDT1	74.98	80.88
tblVehicleEF	LDT1	0.04	0.19
tblVehicleEF	LDT1	0.30	0.49
tblVehicleEF	LDT1	0.28	0.41
tblVehicleEF	LDT1	0.04	0.01
tblVehicleEF	LDT1	3.4520e-003	0.01
tblVehicleEF	LDT1	4.6840e-003	8.3000e-003
tblVehicleEF	LDT1	0.02	0.01
tblVehicleEF	LDT1	2.0000e-003	8.0000e-003
tblVehicleEF	LDT1	3.0790e-003	0.01
tblVehicleEF	LDT1	4.2060e-003	8.3000e-003
tblVehicleEF	LDT1	0.18	0.25
tblVehicleEF	LDT1	0.26	0.29
tblVehicleEF	LDT1	0.12	0.19
tblVehicleEF	LDT1	0.13	0.15
tblVehicleEF	LDT1	0.79	0.20
tblVehicleEF	LDT1	0.35	0.50
tblVehicleEF	LDT1	3.9550e-003	4.3000e-003
tblVehicleEF	LDT1	9.3500e-004	9.0000e-004
tblVehicleEF	LDT1	0.18	0.25

tblVehicleEF	LDT1	0.26	0.29
tblVehicleEF	LDT1	0.12	0.19
tblVehicleEF	LDT1	0.16	0.18
tblVehicleEF	LDT1	0.79	0.20
tblVehicleEF	LDT1	0.38	0.53
tblVehicleEF	LDT1	0.02	0.03
tblVehicleEF	LDT1	0.03	0.03
tblVehicleEF	LDT1	3.20	4.05
tblVehicleEF	LDT1	6.04	8.46
tblVehicleEF	LDT1	318.36	340.97
tblVehicleEF	LDT1	74.98	80.88
tblVehicleEF	LDT1	0.04	0.19
tblVehicleEF	LDT1	0.34	0.54
tblVehicleEF	LDT1	0.32	0.46
tblVehicleEF	LDT1	0.04	0.01
tblVehicleEF	LDT1	3.4520e-003	0.01
tblVehicleEF	LDT1	4.6840e-003	8.3000e-003
tblVehicleEF	LDT1	0.02	0.01
tblVehicleEF	LDT1	2.0000e-003	8.0000e-003
tblVehicleEF	LDT1	3.0790e-003	0.01
tblVehicleEF	LDT1	4.2060e-003	8.3000e-003
tblVehicleEF	LDT1	0.07	0.13
tblVehicleEF	LDT1	0.30	0.33
tblVehicleEF	LDT1	0.05	0.09
tblVehicleEF	LDT1	0.14	0.14
tblVehicleEF	LDT1	1.05	0.27
tblVehicleEF	LDT1	0.47	0.64
tblVehicleEF	LDT1	3.7760e-003	4.0000e-003

tblVehicleEF	LDT1	9.6800e-004	1.0000e-003
tblVehicleEF	LDT1	0.07	0.13
tblVehicleEF	LDT1	0.30	0.33
tblVehicleEF	LDT1	0.05	0.09
tblVehicleEF	LDT1	0.16	0.18
tblVehicleEF	LDT1	1.05	0.27
tblVehicleEF	LDT1	0.51	0.68
tblVehicleEF	LDT2	0.02	0.02
tblVehicleEF	LDT2	0.02	0.02
tblVehicleEF	LDT2	1.92	2.69
tblVehicleEF	LDT2	4.63	6.55
tblVehicleEF	LDT2	381.86	405.99
tblVehicleEF	LDT2	88.00	93.08
tblVehicleEF	LDT2	0.21	0.20
tblVehicleEF	LDT2	0.29	0.40
tblVehicleEF	LDT2	0.42	0.63
tblVehicleEF	LDT2	0.04	0.01
tblVehicleEF	LDT2	2.2050e-003	0.02
tblVehicleEF	LDT2	3.5240e-003	0.01
tblVehicleEF	LDT2	0.02	0.01
tblVehicleEF	LDT2	2.0000e-003	8.0000e-003
tblVehicleEF	LDT2	2.0260e-003	0.02
tblVehicleEF	LDT2	3.2470e-003	0.01
tblVehicleEF	LDT2	0.07	0.08
tblVehicleEF	LDT2	0.19	0.18
tblVehicleEF	LDT2	0.05	0.05
tblVehicleEF	LDT2	0.06	0.08
tblVehicleEF	LDT2	0.66	0.15

tblVehicleEF	LDT2	0.36	0.51
tblVehicleEF	LDT2	4.4480e-003	4.1000e-003
tblVehicleEF	LDT2	1.0860e-003	1.0000e-003
tblVehicleEF	LDT2	0.07	0.08
tblVehicleEF	LDT2	0.19	0.18
tblVehicleEF	LDT2	0.05	0.05
tblVehicleEF	LDT2	0.08	0.11
tblVehicleEF	LDT2	0.66	0.15
tblVehicleEF	LDT2	0.39	0.55
tblVehicleEF	LDT2	0.02	0.02
tblVehicleEF	LDT2	0.02	0.02
tblVehicleEF	LDT2	2.04	2.91
tblVehicleEF	LDT2	3.51	4.74
tblVehicleEF	LDT2	397.40	422.39
tblVehicleEF	LDT2	88.00	93.08
tblVehicleEF	LDT2	0.21	0.20
tblVehicleEF	LDT2	0.26	0.39
tblVehicleEF	LDT2	0.39	0.57
tblVehicleEF	LDT2	0.04	0.01
tblVehicleEF	LDT2	2.2050e-003	0.02
tblVehicleEF	LDT2	3.5240e-003	0.01
tblVehicleEF	LDT2	0.02	0.01
tblVehicleEF	LDT2	2.0000e-003	8.0000e-003
tblVehicleEF	LDT2	2.0260e-003	0.02
tblVehicleEF	LDT2	3.2470e-003	0.01
tblVehicleEF	LDT2	0.12	0.16
tblVehicleEF	LDT2	0.20	0.20
tblVehicleEF	LDT2	0.09	0.12

tblVehicleEF	LDT2	0.06	0.08
tblVehicleEF	LDT2	0.59	0.13
tblVehicleEF	LDT2	0.30	0.40
tblVehicleEF	LDT2	4.6300e-003	4.4000e-003
tblVehicleEF	LDT2	1.0660e-003	9.0000e-004
tblVehicleEF	LDT2	0.12	0.16
tblVehicleEF	LDT2	0.20	0.20
tblVehicleEF	LDT2	0.09	0.12
tblVehicleEF	LDT2	0.08	0.11
tblVehicleEF	LDT2	0.59	0.13
tblVehicleEF	LDT2	0.32	0.43
tblVehicleEF	LDT2	0.02	0.02
tblVehicleEF	LDT2	0.02	0.02
tblVehicleEF	LDT2	1.91	2.63
tblVehicleEF	LDT2	5.18	6.71
tblVehicleEF	LDT2	378.77	402.73
tblVehicleEF	LDT2	88.00	93.08
tblVehicleEF	LDT2	0.21	0.20
tblVehicleEF	LDT2	0.30	0.43
tblVehicleEF	LDT2	0.44	0.63
tblVehicleEF	LDT2	0.04	0.01
tblVehicleEF	LDT2	2.2050e-003	0.02
tblVehicleEF	LDT2	3.5240e-003	0.01
tblVehicleEF	LDT2	0.02	0.01
tblVehicleEF	LDT2	2.0000e-003	8.0000e-003
tblVehicleEF	LDT2	2.0260e-003	0.02
tblVehicleEF	LDT2	3.2470e-003	0.01
tblVehicleEF	LDT2	0.05	0.08

tblVehicleEF	LDT2	0.21	0.22
tblVehicleEF	LDT2	0.04	0.06
tblVehicleEF	LDT2	0.06	0.08
tblVehicleEF	LDT2	0.80	0.18
tblVehicleEF	LDT2	0.40	0.52
tblVehicleEF	LDT2	4.4110e-003	4.0000e-003
tblVehicleEF	LDT2	1.0950e-003	1.0000e-003
tblVehicleEF	LDT2	0.05	0.08
tblVehicleEF	LDT2	0.21	0.22
tblVehicleEF	LDT2	0.04	0.06
tblVehicleEF	LDT2	0.08	0.10
tblVehicleEF	LDT2	0.80	0.18
tblVehicleEF	LDT2	0.42	0.56
tblVehicleEF	LHD1	1.0610e-003	1.4000e-003
tblVehicleEF	LHD1	0.02	0.01
tblVehicleEF	LHD1	0.02	0.01
tblVehicleEF	LHD1	0.16	0.20
tblVehicleEF	LHD1	2.12	1.29
tblVehicleEF	LHD1	4.53	3.46
tblVehicleEF	LHD1	8.95	9.14
tblVehicleEF	LHD1	734.28	749.43
tblVehicleEF	LHD1	32.09	32.49
tblVehicleEF	LHD1	0.07	0.02
tblVehicleEF	LHD1	0.09	0.02
tblVehicleEF	LHD1	2.10	1.13
tblVehicleEF	LHD1	1.02	1.27
tblVehicleEF	LHD1	9.7000e-004	3.0000e-004
tblVehicleEF	LHD1	0.06	0.01

tblVehicleEF	LHD1	9.8670e-003	0.01
tblVehicleEF	LHD1	0.02	0.02
tblVehicleEF	LHD1	1.1260e-003	1.3000e-003
tblVehicleEF	LHD1	8.9300e-004	3.0000e-004
tblVehicleEF	LHD1	0.02	0.01
tblVehicleEF	LHD1	2.4670e-003	0.01
tblVehicleEF	LHD1	0.02	0.02
tblVehicleEF	LHD1	1.0360e-003	1.3000e-003
tblVehicleEF	LHD1	1.9670e-003	8.0000e-004
tblVehicleEF	LHD1	0.07	0.02
tblVehicleEF	LHD1	0.02	0.03
tblVehicleEF	LHD1	1.0220e-003	3.0000e-004
tblVehicleEF	LHD1	0.21	0.13
tblVehicleEF	LHD1	0.55	0.19
tblVehicleEF	LHD1	0.37	0.26
tblVehicleEF	LHD1	9.3000e-005	1.0000e-004
tblVehicleEF	LHD1	7.5180e-003	8.1000e-003
tblVehicleEF	LHD1	4.1500e-004	4.0000e-004
tblVehicleEF	LHD1	1.9670e-003	8.0000e-004
tblVehicleEF	LHD1	0.07	0.02
tblVehicleEF	LHD1	0.03	0.03
tblVehicleEF	LHD1	1.0220e-003	3.0000e-004
tblVehicleEF	LHD1	0.25	0.15
tblVehicleEF	LHD1	0.55	0.19
tblVehicleEF	LHD1	0.39	0.28
tblVehicleEF	LHD1	1.0610e-003	1.4000e-003
tblVehicleEF	LHD1	0.02	0.01
tblVehicleEF	LHD1	0.02	0.01

tblVehicleEF	LHD1	0.16	0.20
tblVehicleEF	LHD1	2.16	1.31
tblVehicleEF	LHD1	3.38	2.49
tblVehicleEF	LHD1	8.95	9.14
tblVehicleEF	LHD1	734.28	749.43
tblVehicleEF	LHD1	32.09	32.49
tblVehicleEF	LHD1	0.07	0.02
tblVehicleEF	LHD1	0.09	0.02
tblVehicleEF	LHD1	2.02	1.14
tblVehicleEF	LHD1	0.96	1.20
tblVehicleEF	LHD1	9.7000e-004	3.0000e-004
tblVehicleEF	LHD1	0.06	0.01
tblVehicleEF	LHD1	9.8670e-003	0.01
tblVehicleEF	LHD1	0.02	0.02
tblVehicleEF	LHD1	1.1260e-003	1.3000e-003
tblVehicleEF	LHD1	8.9300e-004	3.0000e-004
tblVehicleEF	LHD1	0.02	0.01
tblVehicleEF	LHD1	2.4670e-003	0.01
tblVehicleEF	LHD1	0.02	0.02
tblVehicleEF	LHD1	1.0360e-003	1.3000e-003
tblVehicleEF	LHD1	3.5500e-003	1.5000e-003
tblVehicleEF	LHD1	0.08	0.02
tblVehicleEF	LHD1	0.02	0.03
tblVehicleEF	LHD1	1.7730e-003	7.0000e-004
tblVehicleEF	LHD1	0.22	0.13
tblVehicleEF	LHD1	0.52	0.18
tblVehicleEF	LHD1	0.31	0.21
tblVehicleEF	LHD1	9.3000e-005	1.0000e-004

tblVehicleEF	LHD1	7.5190e-003	8.1000e-003
tblVehicleEF	LHD1	3.9500e-004	4.0000e-004
tblVehicleEF	LHD1	3.5500e-003	1.5000e-003
tblVehicleEF	LHD1	0.08	0.02
tblVehicleEF	LHD1	0.03	0.03
tblVehicleEF	LHD1	1.7730e-003	7.0000e-004
tblVehicleEF	LHD1	0.25	0.15
tblVehicleEF	LHD1	0.52	0.18
tblVehicleEF	LHD1	0.33	0.23
tblVehicleEF	LHD1	1.0610e-003	1.4000e-003
tblVehicleEF	LHD1	0.02	0.01
tblVehicleEF	LHD1	0.02	0.01
tblVehicleEF	LHD1	0.16	0.20
tblVehicleEF	LHD1	2.10	1.29
tblVehicleEF	LHD1	5.19	3.55
tblVehicleEF	LHD1	8.95	9.14
tblVehicleEF	LHD1	734.28	749.43
tblVehicleEF	LHD1	32.09	32.49
tblVehicleEF	LHD1	0.07	0.02
tblVehicleEF	LHD1	0.09	0.02
tblVehicleEF	LHD1	2.08	1.18
tblVehicleEF	LHD1	1.05	1.28
tblVehicleEF	LHD1	9.7000e-004	3.0000e-004
tblVehicleEF	LHD1	0.06	0.01
tblVehicleEF	LHD1	9.8670e-003	0.01
tblVehicleEF	LHD1	0.02	0.02
tblVehicleEF	LHD1	1.1260e-003	1.3000e-003
tblVehicleEF	LHD1	8.9300e-004	3.0000e-004

tblVehicleEF	LHD1	0.02	0.01
tblVehicleEF	LHD1	2.4670e-003	0.01
tblVehicleEF	LHD1	0.02	0.02
tblVehicleEF	LHD1	1.0360e-003	1.3000e-003
tblVehicleEF	LHD1	1.4260e-003	9.0000e-004
tblVehicleEF	LHD1	0.09	0.03
tblVehicleEF	LHD1	0.02	0.03
tblVehicleEF	LHD1	8.0000e-004	4.0000e-004
tblVehicleEF	LHD1	0.21	0.13
tblVehicleEF	LHD1	0.60	0.21
tblVehicleEF	LHD1	0.40	0.26
tblVehicleEF	LHD1	9.3000e-005	1.0000e-004
tblVehicleEF	LHD1	7.5180e-003	8.1000e-003
tblVehicleEF	LHD1	4.2600e-004	4.0000e-004
tblVehicleEF	LHD1	1.4260e-003	9.0000e-004
tblVehicleEF	LHD1	0.09	0.03
tblVehicleEF	LHD1	0.03	0.03
tblVehicleEF	LHD1	8.0000e-004	4.0000e-004
tblVehicleEF	LHD1	0.24	0.15
tblVehicleEF	LHD1	0.60	0.21
tblVehicleEF	LHD1	0.43	0.28
tblVehicleEF	LHD2	7.1200e-004	1.3000e-003
tblVehicleEF	LHD2	0.01	0.02
tblVehicleEF	LHD2	8.7140e-003	0.02
tblVehicleEF	LHD2	0.11	0.18
tblVehicleEF	LHD2	1.27	2.13
tblVehicleEF	LHD2	1.59	4.73
tblVehicleEF	LHD2	9.98	10.19

tblVehicleEF	LHD2	606.16	618.24
tblVehicleEF	LHD2	15.38	15.97
tblVehicleEF	LHD2	9.9440e-003	0.01
tblVehicleEF	LHD2	0.15	0.05
tblVehicleEF	LHD2	2.89	2.08
tblVehicleEF	LHD2	0.44	1.17
tblVehicleEF	LHD2	1.6310e-003	7.0000e-004
tblVehicleEF	LHD2	0.08	0.01
tblVehicleEF	LHD2	0.01	0.01
tblVehicleEF	LHD2	0.03	0.03
tblVehicleEF	LHD2	4.8300e-004	1.6000e-003
tblVehicleEF	LHD2	1.5000e-003	7.0000e-004
tblVehicleEF	LHD2	0.03	0.01
tblVehicleEF	LHD2	2.7620e-003	0.01
tblVehicleEF	LHD2	0.03	0.03
tblVehicleEF	LHD2	4.2600e-004	1.6000e-003
tblVehicleEF	LHD2	6.7300e-004	1.5000e-003
tblVehicleEF	LHD2	0.03	0.04
tblVehicleEF	LHD2	0.02	0.02
tblVehicleEF	LHD2	3.7200e-004	5.0000e-004
tblVehicleEF	LHD2	0.18	0.22
tblVehicleEF	LHD2	0.18	0.43
tblVehicleEF	LHD2	0.15	0.35
tblVehicleEF	LHD2	1.0100e-004	1.0000e-004
tblVehicleEF	LHD2	6.1050e-003	7.2000e-003
tblVehicleEF	LHD2	1.8900e-004	4.0000e-004
tblVehicleEF	LHD2	6.7300e-004	1.5000e-003
tblVehicleEF	LHD2	0.03	0.04

tblVehicleEF	LHD2	0.02	0.03
tblVehicleEF	LHD2	3.7200e-004	5.0000e-004
tblVehicleEF	LHD2	0.20	0.26
tblVehicleEF	LHD2	0.18	0.43
tblVehicleEF	LHD2	0.16	0.38
tblVehicleEF	LHD2	7.1200e-004	1.3000e-003
tblVehicleEF	LHD2	0.01	0.02
tblVehicleEF	LHD2	8.7140e-003	0.01
tblVehicleEF	LHD2	0.11	0.18
tblVehicleEF	LHD2	1.26	2.16
tblVehicleEF	LHD2	1.23	3.42
tblVehicleEF	LHD2	9.98	10.19
tblVehicleEF	LHD2	606.16	618.24
tblVehicleEF	LHD2	15.38	15.97
tblVehicleEF	LHD2	9.9440e-003	0.01
tblVehicleEF	LHD2	0.15	0.05
tblVehicleEF	LHD2	2.79	2.11
tblVehicleEF	LHD2	0.42	1.11
tblVehicleEF	LHD2	1.6310e-003	7.0000e-004
tblVehicleEF	LHD2	0.08	0.01
tblVehicleEF	LHD2	0.01	0.01
tblVehicleEF	LHD2	0.03	0.03
tblVehicleEF	LHD2	4.8300e-004	1.6000e-003
tblVehicleEF	LHD2	1.5000e-003	7.0000e-004
tblVehicleEF	LHD2	0.03	0.01
tblVehicleEF	LHD2	2.7620e-003	0.01
tblVehicleEF	LHD2	0.03	0.03
tblVehicleEF	LHD2	4.2600e-004	1.6000e-003

tblVehicleEF	LHD2	1.2110e-003	3.0000e-003
tblVehicleEF	LHD2	0.03	0.04
tblVehicleEF	LHD2	0.02	0.02
tblVehicleEF	LHD2	6.4800e-004	1.1000e-003
tblVehicleEF	LHD2	0.18	0.23
tblVehicleEF	LHD2	0.18	0.41
tblVehicleEF	LHD2	0.13	0.29
tblVehicleEF	LHD2	1.0100e-004	1.0000e-004
tblVehicleEF	LHD2	6.1050e-003	7.2000e-003
tblVehicleEF	LHD2	1.8200e-004	4.0000e-004
tblVehicleEF	LHD2	1.2110e-003	3.0000e-003
tblVehicleEF	LHD2	0.03	0.04
tblVehicleEF	LHD2	0.02	0.03
tblVehicleEF	LHD2	6.4800e-004	1.1000e-003
tblVehicleEF	LHD2	0.20	0.26
tblVehicleEF	LHD2	0.18	0.41
tblVehicleEF	LHD2	0.14	0.31
tblVehicleEF	LHD2	7.1200e-004	1.3000e-003
tblVehicleEF	LHD2	0.01	0.02
tblVehicleEF	LHD2	8.7140e-003	0.02
tblVehicleEF	LHD2	0.11	0.18
tblVehicleEF	LHD2	1.28	2.12
tblVehicleEF	LHD2	1.81	4.84
tblVehicleEF	LHD2	9.98	10.19
tblVehicleEF	LHD2	606.16	618.24
tblVehicleEF	LHD2	15.38	15.97
tblVehicleEF	LHD2	9.9440e-003	0.01
tblVehicleEF	LHD2	0.15	0.05

tblVehicleEF	LHD2	2.86	2.16
tblVehicleEF	LHD2	0.46	1.18
tblVehicleEF	LHD2	1.6310e-003	7.0000e-004
tblVehicleEF	LHD2	0.08	0.01
tblVehicleEF	LHD2	0.01	0.01
tblVehicleEF	LHD2	0.03	0.03
tblVehicleEF	LHD2	4.8300e-004	1.6000e-003
tblVehicleEF	LHD2	1.5000e-003	7.0000e-004
tblVehicleEF	LHD2	0.03	0.01
tblVehicleEF	LHD2	2.7620e-003	0.01
tblVehicleEF	LHD2	0.03	0.03
tblVehicleEF	LHD2	4.2600e-004	1.6000e-003
tblVehicleEF	LHD2	4.9000e-004	1.8000e-003
tblVehicleEF	LHD2	0.04	0.06
tblVehicleEF	LHD2	0.02	0.02
tblVehicleEF	LHD2	2.9000e-004	6.0000e-004
tblVehicleEF	LHD2	0.18	0.22
tblVehicleEF	LHD2	0.20	0.47
tblVehicleEF	LHD2	0.16	0.36
tblVehicleEF	LHD2	1.0100e-004	1.0000e-004
tblVehicleEF	LHD2	6.1050e-003	7.2000e-003
tblVehicleEF	LHD2	1.9300e-004	4.0000e-004
tblVehicleEF	LHD2	4.9000e-004	1.8000e-003
tblVehicleEF	LHD2	0.04	0.06
tblVehicleEF	LHD2	0.02	0.03
tblVehicleEF	LHD2	2.9000e-004	6.0000e-004
tblVehicleEF	LHD2	0.20	0.26
tblVehicleEF	LHD2	0.20	0.47

tblVehicleEF	LHD2	0.18	0.38
tblVehicleEF	MCY	0.00	0.21
tblVehicleEF	MCY	0.00	0.14
tblVehicleEF	MCY	27.88	29.50
tblVehicleEF	MCY	10.71	10.65
tblVehicleEF	MCY	148.32	145.57
tblVehicleEF	MCY	43.66	46.37
tblVehicleEF	MCY	8.7430e-003	0.01
tblVehicleEF	MCY	1.29	1.22
tblVehicleEF	MCY	0.32	0.31
tblVehicleEF	MCY	0.04	6.3000e-003
tblVehicleEF	MCY	8.0000e-003	4.0000e-003
tblVehicleEF	MCY	6.1000e-004	0.02
tblVehicleEF	MCY	1.9710e-003	0.01
tblVehicleEF	MCY	0.02	6.3000e-003
tblVehicleEF	MCY	2.0000e-003	4.0000e-003
tblVehicleEF	MCY	4.9300e-004	0.02
tblVehicleEF	MCY	1.5590e-003	0.01
tblVehicleEF	MCY	0.64	0.63
tblVehicleEF	MCY	0.44	0.32
tblVehicleEF	MCY	0.31	0.30
tblVehicleEF	MCY	2.74	2.80
tblVehicleEF	MCY	1.74	0.39
tblVehicleEF	MCY	2.32	2.33
tblVehicleEF	MCY	2.0610e-003	2.0000e-003
tblVehicleEF	MCY	6.9400e-004	7.0000e-004
tblVehicleEF	MCY	0.64	0.63
tblVehicleEF	MCY	0.44	0.32

tblVehicleEF	MCY	0.31	0.30
tblVehicleEF	MCY	2.99	3.05
tblVehicleEF	MCY	1.74	0.39
tblVehicleEF	MCY	2.50	2.50
tblVehicleEF	MCY	0.00	0.21
tblVehicleEF	MCY	0.00	0.12
tblVehicleEF	MCY	25.97	27.70
tblVehicleEF	MCY	9.10	8.95
tblVehicleEF	MCY	148.32	145.57
tblVehicleEF	MCY	43.66	46.37
tblVehicleEF	MCY	8.7430e-003	0.01
tblVehicleEF	MCY	1.16	1.19
tblVehicleEF	MCY	0.30	0.29
tblVehicleEF	MCY	0.04	6.3000e-003
tblVehicleEF	MCY	8.0000e-003	4.0000e-003
tblVehicleEF	MCY	6.1000e-004	0.02
tblVehicleEF	MCY	1.9710e-003	0.01
tblVehicleEF	MCY	0.02	6.3000e-003
tblVehicleEF	MCY	2.0000e-003	4.0000e-003
tblVehicleEF	MCY	4.9300e-004	0.02
tblVehicleEF	MCY	1.5590e-003	0.01
tblVehicleEF	MCY	1.26	1.34
tblVehicleEF	MCY	0.49	0.40
tblVehicleEF	MCY	0.67	0.86
tblVehicleEF	MCY	2.62	2.67
tblVehicleEF	MCY	1.57	0.36
tblVehicleEF	MCY	1.95	1.91
tblVehicleEF	MCY	2.0270e-003	1.9000e-003

tblVehicleEF	MCY	6.5700e-004	6.0000e-004
tblVehicleEF	MCY	1.26	1.34
tblVehicleEF	MCY	0.49	0.40
tblVehicleEF	MCY	0.67	0.86
tblVehicleEF	MCY	2.87	2.92
tblVehicleEF	MCY	1.57	0.36
tblVehicleEF	MCY	2.09	2.06
tblVehicleEF	MCY	0.00	0.21
tblVehicleEF	MCY	0.00	0.15
tblVehicleEF	MCY	29.20	29.74
tblVehicleEF	MCY	11.60	10.76
tblVehicleEF	MCY	148.32	145.57
tblVehicleEF	MCY	43.66	46.37
tblVehicleEF	MCY	8.7430e-003	0.01
tblVehicleEF	MCY	1.30	1.31
tblVehicleEF	MCY	0.33	0.31
tblVehicleEF	MCY	0.04	6.3000e-003
tblVehicleEF	MCY	8.0000e-003	4.0000e-003
tblVehicleEF	MCY	6.1000e-004	0.02
tblVehicleEF	MCY	1.9710e-003	0.01
tblVehicleEF	MCY	0.02	6.3000e-003
tblVehicleEF	MCY	2.0000e-003	4.0000e-003
tblVehicleEF	MCY	4.9300e-004	0.02
tblVehicleEF	MCY	1.5590e-003	0.01
tblVehicleEF	MCY	0.47	0.74
tblVehicleEF	MCY	0.57	0.49
tblVehicleEF	MCY	0.21	0.36
tblVehicleEF	MCY	2.81	2.81

tblVehicleEF	MCY	2.07	0.47
tblVehicleEF	MCY	2.53	2.36
tblVehicleEF	MCY	2.0830e-003	2.0000e-003
tblVehicleEF	MCY	7.1400e-004	7.0000e-004
tblVehicleEF	MCY	0.47	0.74
tblVehicleEF	MCY	0.57	0.49
tblVehicleEF	MCY	0.21	0.36
tblVehicleEF	MCY	3.07	3.07
tblVehicleEF	MCY	2.07	0.47
tblVehicleEF	MCY	2.72	2.53
tblVehicleEF	MDV	0.03	0.03
tblVehicleEF	MDV	0.03	0.03
tblVehicleEF	MDV	2.64	2.80
tblVehicleEF	MDV	7.05	7.31
tblVehicleEF	MDV	500.81	526.05
tblVehicleEF	MDV	114.79	119.65
tblVehicleEF	MDV	0.15	0.08
tblVehicleEF	MDV	0.44	0.44
tblVehicleEF	MDV	0.71	0.76
tblVehicleEF	MDV	0.04	0.01
tblVehicleEF	MDV	2.2910e-003	0.02
tblVehicleEF	MDV	3.9310e-003	0.01
tblVehicleEF	MDV	0.02	0.01
tblVehicleEF	MDV	2.0000e-003	8.0000e-003
tblVehicleEF	MDV	2.1040e-003	0.02
tblVehicleEF	MDV	3.6200e-003	0.01
tblVehicleEF	MDV	0.07	0.06
tblVehicleEF	MDV	0.22	0.15

tblVehicleEF	MDV	0.06	0.05
tblVehicleEF	MDV	0.08	0.08
tblVehicleEF	MDV	0.75	0.12
tblVehicleEF	MDV	0.61	0.63
tblVehicleEF	MDV	5.6360e-003	5.6000e-003
tblVehicleEF	MDV	1.3890e-003	1.3000e-003
tblVehicleEF	MDV	0.07	0.06
tblVehicleEF	MDV	0.22	0.15
tblVehicleEF	MDV	0.06	0.05
tblVehicleEF	MDV	0.11	0.12
tblVehicleEF	MDV	0.75	0.12
tblVehicleEF	MDV	0.66	0.68
tblVehicleEF	MDV	0.03	0.03
tblVehicleEF	MDV	0.03	0.02
tblVehicleEF	MDV	2.78	3.02
tblVehicleEF	MDV	5.36	5.31
tblVehicleEF	MDV	521.03	547.18
tblVehicleEF	MDV	114.79	119.65
tblVehicleEF	MDV	0.15	0.08
tblVehicleEF	MDV	0.40	0.43
tblVehicleEF	MDV	0.65	0.69
tblVehicleEF	MDV	0.04	0.01
tblVehicleEF	MDV	2.2910e-003	0.02
tblVehicleEF	MDV	3.9310e-003	0.01
tblVehicleEF	MDV	0.02	0.01
tblVehicleEF	MDV	2.0000e-003	8.0000e-003
tblVehicleEF	MDV	2.1040e-003	0.02
tblVehicleEF	MDV	3.6200e-003	0.01

tblVehicleEF	MDV	0.13	0.13
tblVehicleEF	MDV	0.23	0.17
tblVehicleEF	MDV	0.11	0.11
tblVehicleEF	MDV	0.09	0.09
tblVehicleEF	MDV	0.68	0.11
tblVehicleEF	MDV	0.50	0.50
tblVehicleEF	MDV	5.8660e-003	5.9000e-003
tblVehicleEF	MDV	1.3590e-003	1.3000e-003
tblVehicleEF	MDV	0.13	0.13
tblVehicleEF	MDV	0.23	0.17
tblVehicleEF	MDV	0.11	0.11
tblVehicleEF	MDV	0.12	0.12
tblVehicleEF	MDV	0.68	0.11
tblVehicleEF	MDV	0.54	0.53
tblVehicleEF	MDV	0.03	0.03
tblVehicleEF	MDV	0.03	0.03
tblVehicleEF	MDV	2.63	2.73
tblVehicleEF	MDV	7.87	7.49
tblVehicleEF	MDV	496.78	521.84
tblVehicleEF	MDV	114.79	119.65
tblVehicleEF	MDV	0.15	0.08
tblVehicleEF	MDV	0.45	0.47
tblVehicleEF	MDV	0.74	0.77
tblVehicleEF	MDV	0.04	0.01
tblVehicleEF	MDV	2.2910e-003	0.02
tblVehicleEF	MDV	3.9310e-003	0.01
tblVehicleEF	MDV	0.02	0.01
tblVehicleEF	MDV	2.0000e-003	8.0000e-003

tblVehicleEF	MDV	2.1040e-003	0.02
tblVehicleEF	MDV	3.6200e-003	0.01
tblVehicleEF	MDV	0.06	0.06
tblVehicleEF	MDV	0.24	0.19
tblVehicleEF	MDV	0.05	0.05
tblVehicleEF	MDV	0.08	0.08
tblVehicleEF	MDV	0.90	0.14
tblVehicleEF	MDV	0.67	0.64
tblVehicleEF	MDV	5.5910e-003	5.4000e-003
tblVehicleEF	MDV	1.4040e-003	1.3000e-003
tblVehicleEF	MDV	0.06	0.06
tblVehicleEF	MDV	0.24	0.19
tblVehicleEF	MDV	0.05	0.05
tblVehicleEF	MDV	0.11	0.12
tblVehicleEF	MDV	0.90	0.14
tblVehicleEF	MDV	0.72	0.69
tblVehicleEF	MH	0.00	0.04
tblVehicleEF	MH	0.00	0.04
tblVehicleEF	MH	4.83	7.96
tblVehicleEF	MH	10.13	14.05
tblVehicleEF	MH	749.06	765.34
tblVehicleEF	MH	30.29	32.30
tblVehicleEF	MH	4.6800e-003	5.7690e-003
tblVehicleEF	MH	2.05	1.78
tblVehicleEF	MH	0.89	1.14
tblVehicleEF	MH	0.05	0.01
tblVehicleEF	MH	8.6990e-003	0.01
tblVehicleEF	MH	0.04	0.01

tblVehicleEF	MH	1.5180e-003	8.0000e-004
tblVehicleEF	MH	0.02	0.01
tblVehicleEF	MH	2.1750e-003	0.01
tblVehicleEF	MH	0.03	0.01
tblVehicleEF	MH	1.3330e-003	8.0000e-004
tblVehicleEF	MH	0.98	1.25
tblVehicleEF	MH	0.08	0.09
tblVehicleEF	MH	0.38	0.47
tblVehicleEF	MH	0.19	0.29
tblVehicleEF	MH	2.20	0.02
tblVehicleEF	MH	0.58	0.80
tblVehicleEF	MH	7.7360e-003	7.6000e-003
tblVehicleEF	MH	4.9100e-004	6.0000e-004
tblVehicleEF	MH	0.98	1.25
tblVehicleEF	MH	0.08	0.09
tblVehicleEF	MH	0.38	0.47
tblVehicleEF	MH	0.23	0.33
tblVehicleEF	MH	2.20	0.02
tblVehicleEF	MH	0.62	0.86
tblVehicleEF	MH	0.00	0.04
tblVehicleEF	MH	0.00	0.03
tblVehicleEF	MH	4.88	8.11
tblVehicleEF	MH	7.34	9.74
tblVehicleEF	MH	749.05	765.34
tblVehicleEF	MH	30.29	32.30
tblVehicleEF	MH	4.6800e-003	5.7690e-003
tblVehicleEF	MH	1.93	1.78
tblVehicleEF	MH	0.84	1.07

tblVehicleEF	MH	0.05	0.01
tblVehicleEF	MH	8.6990e-003	0.01
tblVehicleEF	MH	0.04	0.01
tblVehicleEF	MH	1.5180e-003	8.0000e-004
tblVehicleEF	MH	0.02	0.01
tblVehicleEF	MH	2.1750e-003	0.01
tblVehicleEF	MH	0.03	0.01
tblVehicleEF	MH	1.3330e-003	8.0000e-004
tblVehicleEF	MH	1.74	2.35
tblVehicleEF	MH	0.08	0.09
tblVehicleEF	MH	0.62	0.93
tblVehicleEF	MH	0.19	0.30
tblVehicleEF	MH	2.12	0.02
tblVehicleEF	MH	0.46	0.61
tblVehicleEF	MH	7.7360e-003	7.6000e-003
tblVehicleEF	MH	4.4300e-004	5.0000e-004
tblVehicleEF	MH	1.74	2.35
tblVehicleEF	MH	0.08	0.09
tblVehicleEF	MH	0.62	0.93
tblVehicleEF	MH	0.23	0.34
tblVehicleEF	MH	2.12	0.02
tblVehicleEF	MH	0.49	0.65
tblVehicleEF	MH	0.00	0.04
tblVehicleEF	MH	0.00	0.04
tblVehicleEF	MH	4.83	7.94
tblVehicleEF	MH	11.74	14.25
tblVehicleEF	MH	749.05	765.34
tblVehicleEF	MH	30.29	32.30

tblVehicleEF	MH	4.6800e-003	5.7690e-003
tblVehicleEF	MH	2.04	1.89
tblVehicleEF	MH	0.92	1.14
tblVehicleEF	MH	0.05	0.01
tblVehicleEF	MH	8.6990e-003	0.01
tblVehicleEF	MH	0.04	0.01
tblVehicleEF	MH	1.5180e-003	8.0000e-004
tblVehicleEF	MH	0.02	0.01
tblVehicleEF	MH	2.1750e-003	0.01
tblVehicleEF	MH	0.03	0.01
tblVehicleEF	MH	1.3330e-003	8.0000e-004
tblVehicleEF	MH	0.74	1.42
tblVehicleEF	MH	0.11	0.13
tblVehicleEF	MH	0.31	0.62
tblVehicleEF	MH	0.19	0.29
tblVehicleEF	MH	2.34	0.02
tblVehicleEF	MH	0.65	0.81
tblVehicleEF	MH	7.7360e-003	7.6000e-003
tblVehicleEF	MH	5.1800e-004	6.0000e-004
tblVehicleEF	MH	0.74	1.42
tblVehicleEF	MH	0.11	0.13
tblVehicleEF	MH	0.31	0.62
tblVehicleEF	MH	0.23	0.33
tblVehicleEF	MH	2.34	0.02
tblVehicleEF	MH	0.70	0.87
tblVehicleEF	MHD	8.1280e-003	9.0000e-004
tblVehicleEF	MHD	8.6090e-003	0.01
tblVehicleEF	MHD	0.00	0.03

tblVehicleEF	MHD	1.88	0.14
tblVehicleEF	MHD	1.33	2.83
tblVehicleEF	MHD	25.00	8.38
tblVehicleEF	MHD	603.24	599.64
tblVehicleEF	MHD	1,078.06	1,105.07
tblVehicleEF	MHD	60.03	66.47
tblVehicleEF	MHD	0.02	0.01
tblVehicleEF	MHD	6.58	0.17
tblVehicleEF	MHD	3.99	4.92
tblVehicleEF	MHD	2.04	0.70
tblVehicleEF	MHD	0.03	2.3000e-003
tblVehicleEF	MHD	0.12	0.01
tblVehicleEF	MHD	0.01	0.01
tblVehicleEF	MHD	0.10	0.16
tblVehicleEF	MHD	4.5390e-003	1.3000e-003
tblVehicleEF	MHD	0.03	2.3000e-003
tblVehicleEF	MHD	0.05	0.01
tblVehicleEF	MHD	2.8530e-003	0.01
tblVehicleEF	MHD	0.09	0.16
tblVehicleEF	MHD	3.8250e-003	1.3000e-003
tblVehicleEF	MHD	3.3460e-003	1.0000e-003
tblVehicleEF	MHD	0.17	0.02
tblVehicleEF	MHD	0.17	0.02
tblVehicleEF	MHD	1.7640e-003	4.0000e-004
tblVehicleEF	MHD	0.22	0.21
tblVehicleEF	MHD	0.72	0.19
tblVehicleEF	MHD	1.65	0.63
tblVehicleEF	MHD	5.9640e-003	1.0000e-004

tblVehicleEF	MHD	0.01	0.01
tblVehicleEF	MHD	1.0660e-003	3.0000e-004
tblVehicleEF	MHD	3.3460e-003	1.0000e-003
tblVehicleEF	MHD	0.17	0.02
tblVehicleEF	MHD	0.20	0.02
tblVehicleEF	MHD	1.7640e-003	4.0000e-004
tblVehicleEF	MHD	0.25	0.24
tblVehicleEF	MHD	0.72	0.19
tblVehicleEF	MHD	1.77	0.68
tblVehicleEF	MHD	7.6600e-003	9.0000e-004
tblVehicleEF	MHD	8.6090e-003	0.01
tblVehicleEF	MHD	0.00	0.03
tblVehicleEF	MHD	1.36	0.14
tblVehicleEF	MHD	1.33	2.83
tblVehicleEF	MHD	18.92	6.33
tblVehicleEF	MHD	639.07	635.27
tblVehicleEF	MHD	1,078.06	1,105.07
tblVehicleEF	MHD	60.03	66.47
tblVehicleEF	MHD	0.02	0.01
tblVehicleEF	MHD	6.79	0.17
tblVehicleEF	MHD	3.84	5.00
tblVehicleEF	MHD	1.93	0.66
tblVehicleEF	MHD	0.03	2.3000e-003
tblVehicleEF	MHD	0.12	0.01
tblVehicleEF	MHD	0.01	0.01
tblVehicleEF	MHD	0.10	0.16
tblVehicleEF	MHD	4.5390e-003	1.3000e-003
tblVehicleEF	MHD	0.02	2.3000e-003

tblVehicleEF	MHD	0.05	0.01
tblVehicleEF	MHD	2.8530e-003	0.01
tblVehicleEF	MHD	0.09	0.16
tblVehicleEF	MHD	3.8250e-003	1.3000e-003
tblVehicleEF	MHD	6.2420e-003	1.9000e-003
tblVehicleEF	MHD	0.18	0.02
tblVehicleEF	MHD	0.16	0.02
tblVehicleEF	MHD	3.2020e-003	8.0000e-004
tblVehicleEF	MHD	0.22	0.21
tblVehicleEF	MHD	0.69	0.19
tblVehicleEF	MHD	1.33	0.49
tblVehicleEF	MHD	6.3180e-003	1.0000e-004
tblVehicleEF	MHD	0.01	0.01
tblVehicleEF	MHD	9.6000e-004	3.0000e-004
tblVehicleEF	MHD	6.2420e-003	1.9000e-003
tblVehicleEF	MHD	0.18	0.02
tblVehicleEF	MHD	0.19	0.02
tblVehicleEF	MHD	3.2020e-003	8.0000e-004
tblVehicleEF	MHD	0.25	0.24
tblVehicleEF	MHD	0.69	0.19
tblVehicleEF	MHD	1.43	0.53
tblVehicleEF	MHD	8.7750e-003	9.0000e-004
tblVehicleEF	MHD	8.6090e-003	0.01
tblVehicleEF	MHD	0.00	0.04
tblVehicleEF	MHD	2.58	0.14
tblVehicleEF	MHD	1.33	2.83
tblVehicleEF	MHD	28.52	8.49
tblVehicleEF	MHD	553.74	550.44

tblVehicleEF	MHD	1,078.06	1,105.07
tblVehicleEF	MHD	60.03	66.47
tblVehicleEF	MHD	0.02	0.01
tblVehicleEF	MHD	6.28	0.17
tblVehicleEF	MHD	3.95	5.13
tblVehicleEF	MHD	2.11	0.70
tblVehicleEF	MHD	0.04	2.3000e-003
tblVehicleEF	MHD	0.12	0.01
tblVehicleEF	MHD	0.01	0.01
tblVehicleEF	MHD	0.10	0.16
tblVehicleEF	MHD	4.5390e-003	1.3000e-003
tblVehicleEF	MHD	0.03	2.3000e-003
tblVehicleEF	MHD	0.05	0.01
tblVehicleEF	MHD	2.8530e-003	0.01
tblVehicleEF	MHD	0.09	0.16
tblVehicleEF	MHD	3.8250e-003	1.3000e-003
tblVehicleEF	MHD	2.3550e-003	1.1000e-003
tblVehicleEF	MHD	0.21	0.03
tblVehicleEF	MHD	0.19	0.02
tblVehicleEF	MHD	1.3640e-003	5.0000e-004
tblVehicleEF	MHD	0.22	0.21
tblVehicleEF	MHD	0.79	0.20
tblVehicleEF	MHD	1.84	0.64
tblVehicleEF	MHD	5.4750e-003	1.0000e-004
tblVehicleEF	MHD	0.01	0.01
tblVehicleEF	MHD	1.1270e-003	3.0000e-004
tblVehicleEF	MHD	2.3550e-003	1.1000e-003
tblVehicleEF	MHD	0.21	0.03

tblVehicleEF	MHD	0.22	0.02
tblVehicleEF	MHD	1.3640e-003	5.0000e-004
tblVehicleEF	MHD	0.25	0.24
tblVehicleEF	MHD	0.79	0.20
tblVehicleEF	MHD	1.97	0.69
tblVehicleEF	OBUS	0.02	1.2000e-003
tblVehicleEF	OBUS	2.9060e-003	0.03
tblVehicleEF	OBUS	0.00	0.05
tblVehicleEF	OBUS	2.36	0.18
tblVehicleEF	OBUS	2.00	4.39
tblVehicleEF	OBUS	13.66	14.42
tblVehicleEF	OBUS	571.35	573.90
tblVehicleEF	OBUS	1,072.43	1,087.06
tblVehicleEF	OBUS	35.51	37.41
tblVehicleEF	OBUS	2.3300e-003	1.2000e-003
tblVehicleEF	OBUS	5.94	0.11
tblVehicleEF	OBUS	4.02	4.02
tblVehicleEF	OBUS	1.74	1.73
tblVehicleEF	OBUS	0.02	1.4000e-003
tblVehicleEF	OBUS	0.09	0.01
tblVehicleEF	OBUS	0.01	0.01
tblVehicleEF	OBUS	0.05	0.11
tblVehicleEF	OBUS	9.3700e-004	2.5000e-003
tblVehicleEF	OBUS	0.02	1.4000e-003
tblVehicleEF	OBUS	0.04	0.01
tblVehicleEF	OBUS	2.5410e-003	0.01
tblVehicleEF	OBUS	0.04	0.11
tblVehicleEF	OBUS	8.4800e-004	2.5000e-003

tblVehicleEF	OBUS	7.2000e-004	8.0000e-004
tblVehicleEF	OBUS	0.03	0.02
tblVehicleEF	OBUS	0.41	0.02
tblVehicleEF	OBUS	3.5900e-004	4.0000e-004
tblVehicleEF	OBUS	0.20	0.27
tblVehicleEF	OBUS	0.27	0.25
tblVehicleEF	OBUS	0.79	0.86
tblVehicleEF	OBUS	5.6490e-003	1.0000e-004
tblVehicleEF	OBUS	0.01	0.01
tblVehicleEF	OBUS	6.0700e-004	5.0000e-004
tblVehicleEF	OBUS	7.2000e-004	8.0000e-004
tblVehicleEF	OBUS	0.03	0.02
tblVehicleEF	OBUS	0.47	0.03
tblVehicleEF	OBUS	3.5900e-004	4.0000e-004
tblVehicleEF	OBUS	0.23	0.32
tblVehicleEF	OBUS	0.27	0.25
tblVehicleEF	OBUS	0.84	0.92
tblVehicleEF	OBUS	0.02	1.2000e-003
tblVehicleEF	OBUS	2.9060e-003	0.03
tblVehicleEF	OBUS	0.00	0.04
tblVehicleEF	OBUS	1.72	0.18
tblVehicleEF	OBUS	2.04	4.47
tblVehicleEF	OBUS	10.18	10.64
tblVehicleEF	OBUS	605.30	607.99
tblVehicleEF	OBUS	1,072.43	1,087.06
tblVehicleEF	OBUS	35.51	37.41
tblVehicleEF	OBUS	2.3300e-003	1.2000e-003
tblVehicleEF	OBUS	6.13	0.11

tblVehicleEF	OBUS	3.86	4.07
tblVehicleEF	OBUS	1.64	1.63
tblVehicleEF	OBUS	0.02	1.4000e-003
tblVehicleEF	OBUS	0.09	0.01
tblVehicleEF	OBUS	0.01	0.01
tblVehicleEF	OBUS	0.05	0.11
tblVehicleEF	OBUS	9.3700e-004	2.5000e-003
tblVehicleEF	OBUS	0.01	1.4000e-003
tblVehicleEF	OBUS	0.04	0.01
tblVehicleEF	OBUS	2.5410e-003	0.01
tblVehicleEF	OBUS	0.04	0.11
tblVehicleEF	OBUS	8.4800e-004	2.5000e-003
tblVehicleEF	OBUS	1.2640e-003	1.6000e-003
tblVehicleEF	OBUS	0.03	0.02
tblVehicleEF	OBUS	0.39	0.02
tblVehicleEF	OBUS	6.0400e-004	8.0000e-004
tblVehicleEF	OBUS	0.20	0.28
tblVehicleEF	OBUS	0.26	0.25
tblVehicleEF	OBUS	0.66	0.70
tblVehicleEF	OBUS	5.9840e-003	1.0000e-004
tblVehicleEF	OBUS	0.01	0.01
tblVehicleEF	OBUS	5.4800e-004	4.0000e-004
tblVehicleEF	OBUS	1.2640e-003	1.6000e-003
tblVehicleEF	OBUS	0.03	0.02
tblVehicleEF	OBUS	0.44	0.03
tblVehicleEF	OBUS	6.0400e-004	8.0000e-004
tblVehicleEF	OBUS	0.23	0.33
tblVehicleEF	OBUS	0.26	0.25

tblVehicleEF	OBUS	0.71	0.75
tblVehicleEF	OBUS	0.02	1.2000e-003
tblVehicleEF	OBUS	2.9060e-003	0.03
tblVehicleEF	OBUS	0.00	0.05
tblVehicleEF	OBUS	3.26	0.18
tblVehicleEF	OBUS	1.98	4.38
tblVehicleEF	OBUS	15.66	14.64
tblVehicleEF	OBUS	524.48	526.81
tblVehicleEF	OBUS	1,072.43	1,087.06
tblVehicleEF	OBUS	35.51	37.41
tblVehicleEF	OBUS	2.3300e-003	1.2000e-003
tblVehicleEF	OBUS	5.67	0.11
tblVehicleEF	OBUS	3.99	4.23
tblVehicleEF	OBUS	1.79	1.74
tblVehicleEF	OBUS	0.02	1.4000e-003
tblVehicleEF	OBUS	0.09	0.01
tblVehicleEF	OBUS	0.01	0.01
tblVehicleEF	OBUS	0.05	0.11
tblVehicleEF	OBUS	9.3700e-004	2.5000e-003
tblVehicleEF	OBUS	0.02	1.4000e-003
tblVehicleEF	OBUS	0.04	0.01
tblVehicleEF	OBUS	2.5410e-003	0.01
tblVehicleEF	OBUS	0.04	0.11
tblVehicleEF	OBUS	8.4800e-004	2.5000e-003
tblVehicleEF	OBUS	5.4700e-004	9.0000e-004
tblVehicleEF	OBUS	0.03	0.03
tblVehicleEF	OBUS	0.45	0.02
tblVehicleEF	OBUS	2.8700e-004	5.0000e-004

tblVehicleEF	OBUS	0.20	0.27
tblVehicleEF	OBUS	0.30	0.27
tblVehicleEF	OBUS	0.86	0.87
tblVehicleEF	OBUS	5.1850e-003	1.0000e-004
tblVehicleEF	OBUS	0.01	0.01
tblVehicleEF	OBUS	6.4000e-004	5.0000e-004
tblVehicleEF	OBUS	5.4700e-004	9.0000e-004
tblVehicleEF	OBUS	0.03	0.03
tblVehicleEF	OBUS	0.51	0.03
tblVehicleEF	OBUS	2.8700e-004	5.0000e-004
tblVehicleEF	OBUS	0.23	0.32
tblVehicleEF	OBUS	0.30	0.27
tblVehicleEF	OBUS	0.92	0.93
tblVehicleEF	SBUS	5.4360e-003	0.03
tblVehicleEF	SBUS	6.8750e-003	0.03
tblVehicleEF	SBUS	0.00	0.03
tblVehicleEF	SBUS	1.06	6.26
tblVehicleEF	SBUS	5.99	6.52
tblVehicleEF	SBUS	45.40	10.00
tblVehicleEF	SBUS	570.82	581.72
tblVehicleEF	SBUS	1,072.05	1,095.57
tblVehicleEF	SBUS	127.47	132.36
tblVehicleEF	SBUS	8.5500e-004	1.1560e-003
tblVehicleEF	SBUS	8.09	8.05
tblVehicleEF	SBUS	7.99	8.56
tblVehicleEF	SBUS	3.73	0.78
tblVehicleEF	SBUS	0.03	0.11
tblVehicleEF	SBUS	0.51	0.01

tblVehicleEF	SBUS	0.01	0.01
tblVehicleEF	SBUS	0.08	0.34
tblVehicleEF	SBUS	6.7140e-003	1.6000e-003
tblVehicleEF	SBUS	0.02	0.11
tblVehicleEF	SBUS	0.22	0.01
tblVehicleEF	SBUS	2.6630e-003	0.01
tblVehicleEF	SBUS	0.07	0.34
tblVehicleEF	SBUS	5.8740e-003	1.6000e-003
tblVehicleEF	SBUS	0.03	6.5000e-003
tblVehicleEF	SBUS	0.31	0.05
tblVehicleEF	SBUS	0.12	0.90
tblVehicleEF	SBUS	0.01	2.4000e-003
tblVehicleEF	SBUS	0.47	0.49
tblVehicleEF	SBUS	2.73	0.06
tblVehicleEF	SBUS	2.87	0.66
tblVehicleEF	SBUS	5.6430e-003	5.4000e-003
tblVehicleEF	SBUS	0.01	0.01
tblVehicleEF	SBUS	2.1220e-003	4.0000e-004
tblVehicleEF	SBUS	0.03	6.5000e-003
tblVehicleEF	SBUS	0.31	0.05
tblVehicleEF	SBUS	0.13	0.98
tblVehicleEF	SBUS	0.01	2.4000e-003
tblVehicleEF	SBUS	0.53	0.56
tblVehicleEF	SBUS	2.73	0.06
tblVehicleEF	SBUS	3.07	0.71
tblVehicleEF	SBUS	5.1230e-003	0.03
tblVehicleEF	SBUS	6.8750e-003	0.03
tblVehicleEF	SBUS	0.00	0.03

tblVehicleEF	SBUS	0.77	6.26
tblVehicleEF	SBUS	5.90	6.44
tblVehicleEF	SBUS	37.84	8.17
tblVehicleEF	SBUS	604.73	616.28
tblVehicleEF	SBUS	1,072.05	1,095.57
tblVehicleEF	SBUS	127.47	132.36
tblVehicleEF	SBUS	8.5500e-004	1.1560e-003
tblVehicleEF	SBUS	8.35	8.05
tblVehicleEF	SBUS	7.67	8.70
tblVehicleEF	SBUS	3.51	0.73
tblVehicleEF	SBUS	0.02	0.11
tblVehicleEF	SBUS	0.51	0.01
tblVehicleEF	SBUS	0.01	0.01
tblVehicleEF	SBUS	0.08	0.34
tblVehicleEF	SBUS	6.7140e-003	1.6000e-003
tblVehicleEF	SBUS	0.02	0.11
tblVehicleEF	SBUS	0.22	0.01
tblVehicleEF	SBUS	2.6630e-003	0.01
tblVehicleEF	SBUS	0.07	0.34
tblVehicleEF	SBUS	5.8740e-003	1.6000e-003
tblVehicleEF	SBUS	0.05	0.01
tblVehicleEF	SBUS	0.31	0.06
tblVehicleEF	SBUS	0.11	0.90
tblVehicleEF	SBUS	0.02	5.0000e-003
tblVehicleEF	SBUS	0.47	0.49
tblVehicleEF	SBUS	2.35	0.05
tblVehicleEF	SBUS	2.53	0.57
tblVehicleEF	SBUS	5.9790e-003	5.4000e-003

tblVehicleEF	SBUS	0.01	0.01
tblVehicleEF	SBUS	1.9930e-003	4.0000e-004
tblVehicleEF	SBUS	0.05	0.01
tblVehicleEF	SBUS	0.31	0.06
tblVehicleEF	SBUS	0.13	0.98
tblVehicleEF	SBUS	0.02	5.0000e-003
tblVehicleEF	SBUS	0.53	0.56
tblVehicleEF	SBUS	2.35	0.05
tblVehicleEF	SBUS	2.70	0.61
tblVehicleEF	SBUS	5.8680e-003	0.03
tblVehicleEF	SBUS	6.8750e-003	0.03
tblVehicleEF	SBUS	0.00	0.04
tblVehicleEF	SBUS	1.46	6.26
tblVehicleEF	SBUS	6.06	6.54
tblVehicleEF	SBUS	49.32	10.37
tblVehicleEF	SBUS	523.99	533.99
tblVehicleEF	SBUS	1,072.05	1,095.57
tblVehicleEF	SBUS	127.47	132.36
tblVehicleEF	SBUS	8.5500e-004	1.1560e-003
tblVehicleEF	SBUS	7.73	8.05
tblVehicleEF	SBUS	7.94	8.90
tblVehicleEF	SBUS	3.83	0.80
tblVehicleEF	SBUS	0.03	0.11
tblVehicleEF	SBUS	0.51	0.01
tblVehicleEF	SBUS	0.01	0.01
tblVehicleEF	SBUS	0.08	0.34
tblVehicleEF	SBUS	6.7140e-003	1.6000e-003
tblVehicleEF	SBUS	0.03	0.11

tblVehicleEF	SBUS	0.22	0.01
tblVehicleEF	SBUS	2.6630e-003	0.01
tblVehicleEF	SBUS	0.07	0.34
tblVehicleEF	SBUS	5.8740e-003	1.6000e-003
tblVehicleEF	SBUS	0.02	7.5000e-003
tblVehicleEF	SBUS	0.38	0.07
tblVehicleEF	SBUS	0.13	0.90
tblVehicleEF	SBUS	8.6780e-003	3.1000e-003
tblVehicleEF	SBUS	0.47	0.49
tblVehicleEF	SBUS	3.41	0.08
tblVehicleEF	SBUS	3.04	0.68
tblVehicleEF	SBUS	5.1800e-003	5.4000e-003
tblVehicleEF	SBUS	0.01	0.01
tblVehicleEF	SBUS	2.1890e-003	4.0000e-004
tblVehicleEF	SBUS	0.02	7.5000e-003
tblVehicleEF	SBUS	0.38	0.07
tblVehicleEF	SBUS	0.14	0.98
tblVehicleEF	SBUS	8.6780e-003	3.1000e-003
tblVehicleEF	SBUS	0.53	0.56
tblVehicleEF	SBUS	3.41	0.08
tblVehicleEF	SBUS	3.25	0.72
tblVehicleEF	UBUS	0.00	0.04
tblVehicleEF	UBUS	0.00	0.06
tblVehicleEF	UBUS	3.37	4.00
tblVehicleEF	UBUS	7.19	14.10
tblVehicleEF	UBUS	2,084.88	2,140.27
tblVehicleEF	UBUS	31.79	32.45
tblVehicleEF	UBUS	1.4010e-003	1.1900e-003

tblVehicleEF	UBUS	11.28	9.20
tblVehicleEF	UBUS	0.92	1.87
tblVehicleEF	UBUS	0.66	0.01
tblVehicleEF	UBUS	8.0000e-003	9.6000e-003
tblVehicleEF	UBUS	0.21	0.15
tblVehicleEF	UBUS	3.8100e-004	4.8000e-003
tblVehicleEF	UBUS	0.28	0.01
tblVehicleEF	UBUS	2.0000e-003	9.6000e-003
tblVehicleEF	UBUS	0.19	0.15
tblVehicleEF	UBUS	3.5400e-004	4.8000e-003
tblVehicleEF	UBUS	2.6130e-003	4.3000e-003
tblVehicleEF	UBUS	0.06	0.10
tblVehicleEF	UBUS	1.6530e-003	2.6000e-003
tblVehicleEF	UBUS	0.65	0.75
tblVehicleEF	UBUS	0.47	0.02
tblVehicleEF	UBUS	0.61	1.17
tblVehicleEF	UBUS	0.02	0.01
tblVehicleEF	UBUS	4.6100e-004	8.0000e-004
tblVehicleEF	UBUS	2.6130e-003	4.3000e-003
tblVehicleEF	UBUS	0.06	0.10
tblVehicleEF	UBUS	1.6530e-003	2.6000e-003
tblVehicleEF	UBUS	0.72	0.83
tblVehicleEF	UBUS	0.47	0.02
tblVehicleEF	UBUS	0.66	1.25
tblVehicleEF	UBUS	0.00	0.04
tblVehicleEF	UBUS	0.00	0.05
tblVehicleEF	UBUS	3.41	4.09
tblVehicleEF	UBUS	5.65	10.91

tblVehicleEF	UBUS	2,084.88	2,140.27
tblVehicleEF	UBUS	31.79	32.45
tblVehicleEF	UBUS	1.4010e-003	1.1900e-003
tblVehicleEF	UBUS	10.90	9.37
tblVehicleEF	UBUS	0.87	1.76
tblVehicleEF	UBUS	0.66	0.01
tblVehicleEF	UBUS	8.0000e-003	9.6000e-003
tblVehicleEF	UBUS	0.21	0.15
tblVehicleEF	UBUS	3.8100e-004	4.8000e-003
tblVehicleEF	UBUS	0.28	0.01
tblVehicleEF	UBUS	2.0000e-003	9.6000e-003
tblVehicleEF	UBUS	0.19	0.15
tblVehicleEF	UBUS	3.5400e-004	4.8000e-003
tblVehicleEF	UBUS	4.5220e-003	7.8000e-003
tblVehicleEF	UBUS	0.06	0.10
tblVehicleEF	UBUS	2.6270e-003	5.0000e-003
tblVehicleEF	UBUS	0.66	0.77
tblVehicleEF	UBUS	0.42	0.02
tblVehicleEF	UBUS	0.53	1.01
tblVehicleEF	UBUS	0.02	0.01
tblVehicleEF	UBUS	4.3400e-004	8.0000e-004
tblVehicleEF	UBUS	4.5220e-003	7.8000e-003
tblVehicleEF	UBUS	0.06	0.10
tblVehicleEF	UBUS	2.6270e-003	5.0000e-003
tblVehicleEF	UBUS	0.73	0.86
tblVehicleEF	UBUS	0.42	0.02
tblVehicleEF	UBUS	0.57	1.08
tblVehicleEF	UBUS	0.00	0.04

tblVehicleEF	UBUS	0.00	0.06
tblVehicleEF	UBUS	3.34	3.99
tblVehicleEF	UBUS	8.01	14.28
tblVehicleEF	UBUS	2,084.88	2,140.27
tblVehicleEF	UBUS	31.79	32.45
tblVehicleEF	UBUS	1.4010e-003	1.1900e-003
tblVehicleEF	UBUS	11.18	9.60
tblVehicleEF	UBUS	0.95	1.88
tblVehicleEF	UBUS	0.66	0.01
tblVehicleEF	UBUS	8.0000e-003	9.6000e-003
tblVehicleEF	UBUS	0.21	0.15
tblVehicleEF	UBUS	3.8100e-004	4.8000e-003
tblVehicleEF	UBUS	0.28	0.01
tblVehicleEF	UBUS	2.0000e-003	9.6000e-003
tblVehicleEF	UBUS	0.19	0.15
tblVehicleEF	UBUS	3.5400e-004	4.8000e-003
tblVehicleEF	UBUS	2.1300e-003	4.9000e-003
tblVehicleEF	UBUS	0.07	0.13
tblVehicleEF	UBUS	1.3100e-003	3.2000e-003
tblVehicleEF	UBUS	0.64	0.75
tblVehicleEF	UBUS	0.56	0.03
tblVehicleEF	UBUS	0.66	1.18
tblVehicleEF	UBUS	0.02	0.01
tblVehicleEF	UBUS	4.7500e-004	8.0000e-004
tblVehicleEF	UBUS	2.1300e-003	4.9000e-003
tblVehicleEF	UBUS	0.07	0.13
tblVehicleEF	UBUS	1.3100e-003	3.2000e-003
tblVehicleEF	UBUS	0.72	0.83

tblVehicleEF	UBUS	0.56	0.03
tblVehicleEF	UBUS	0.70	1.26
tblWater	AerobicPercent	87.46	0.00
tblWater	AnaDigestCombDigestGasPercent	100.00	0.00
tblWater	AnaerobicandFacultativeLagoonsPercent	2.21	0.00
tblWater	ElectricityIntensityFactorForWastewaterTreatment	1,911.00	0.00
tblWater	SepticTankPercent	10.33	100.00

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2014	18.9528	221.6903	136.1751	0.2324	18.7826	8.4940	27.2766	9.1667	7.8144	16.9811			24,298.2124	5.2170	0.0000	24,407.7695
2015	39.0035	155.0034	98.7004	0.1898	6.3707	6.5310	12.9017	2.5391	6.0376	8.5767			19,438.8752	3.5467	0.0000	19,513.3567
Total	**57.9563**	**376.6937**	**234.8755**	**0.4221**	**25.1533**	**15.0250**	**40.1783**	**11.7058**	**13.8520**	**25.5578**			**43,737.0877**	**8.7637**	**0.0000**	**43,921.1261**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2014	12.3808	140.9460	105.9857	0.2324	9.2534	4.5777	13.8311	4.0813	4.2125	8.2938			24,298.2124	5.2170	0.0000	24,407.7695
2015	39.0035	127.2635	92.9968	0.1898	4.5340	4.8955	9.4295	1.5295	4.5334	6.0629			19,438.8752	3.5467	0.0000	19,513.3566
Total	**51.3844**	**268.2095**	**198.9825**	**0.4221**	**13.7874**	**9.4732**	**23.2606**	**5.6108**	**8.7458**	**14.3567**			**43,737.0876**	**8.7637**	**0.0000**	**43,921.1261**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**11.34**	**28.80**	**15.28**	**0.00**	**45.19**	**36.95**	**42.11**	**52.07**	**36.86**	**43.83**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	1.7023	0.0000	2.8000e-004	0.0000		0.0000	0.0000		0.0000	0.0000			5.9000e-004	0.0000		6.3000e-004
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000		0.0000
Offroad	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000			0.0000	0.0000		0.0000
Total	**1.7023**	**0.0000**	**2.8000e-004**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**			**5.9000e-004**	**0.0000**	**0.0000**	**6.3000e-004**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	1.7023	0.0000	2.8000e-004	0.0000		0.0000	0.0000		0.0000	0.0000			5.9000e-004	0.0000		6.3000e-004
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000		0.0000
Offroad	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000			0.0000	0.0000		0.0000
Total	**1.7023**	**0.0000**	**2.8000e-004**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**			**5.9000e-004**	**0.0000**	**0.0000**	**6.3000e-004**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Demolition	Demolition	7/31/2014	8/30/2014	5	22	Removal of existing rail track, equipment, piping and buldings, if applicable
2	Soil Transport	Site Preparation	9/1/2014	12/31/2014	5	88	Movement of soils onsite
3	Grading	Grading	9/1/2014	12/31/2014	5	88	Grading of spur area
4	Site Preparation - Rail line	Site Preparation	12/17/2014	1/15/2015	5	22	Preparation of the spur area for equipment construction
5	Site Preparation - Pipe line	Site Preparation	1/1/2015	4/2/2015	5	66	Preparation of the pipeline route area for equipment construction
6	Construction - Unloading area	Building Construction	1/1/2015	4/2/2015	5	66	Construction of the unloading equipment and buildings
7	Construction - Paving	Paving	1/1/2015	1/15/2015	5	11	Paving of the roadways and unloading area
8	Commissioning	Architectural Coating	5/1/2015	7/1/2015	5	44	Startup of facilities

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 47

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 111,078; Non-Residential Outdoor: 37,026 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Demolition	Off-Highway Trucks	3	4.00	381	0.38
Demolition	Rubber Tired Dozers	1	4.00	358	0.40
Demolition	Rubber Tired Dozers	3	8.00	358	0.40
Demolition	Tractors/Loaders/Backhoes	1	4.00	75	0.37
Demolition	Tractors/Loaders/Backhoes	4	8.00	75	0.37
Soil Transport	Off-Highway Trucks	6	4.00	381	0.38
Soil Transport	Rubber Tired Dozers	2	4.00	358	0.40
Grading	Excavators	1	4.00	157	0.38

Grading	Graders	2	4.00	162	0.41
Grading	Off-Highway Trucks	5	4.00	381	0.38
Grading	Rubber Tired Dozers	2	4.00	358	0.40
Grading	Scrapers	2	4.00	356	0.48
Site Preparation - Rail line	Bore/Drill Rigs	1	2.00	82	0.42
Site Preparation - Rail line	Off-Highway Trucks	6	4.00	381	0.38
Site Preparation - Rail line	Plate Compactors	1	2.00	8	0.42
Site Preparation - Rail line	Rubber Tired Dozers	1	4.00	358	0.40
Site Preparation - Rail line	Tractors/Loaders/Backhoes	1	4.00	75	0.37
Site Preparation - Pipe line	Air Compressors	0	6.00	78	0.42
Site Preparation - Pipe line	Cranes	1	2.00	208	0.29
Site Preparation - Pipe line	Off-Highway Trucks	4	4.00	381	0.38
Site Preparation - Pipe line	Plate Compactors	1	2.00	8	0.42
Site Preparation - Pipe line	Tractors/Loaders/Backhoes	1	4.00	75	0.37
Construction - Unloading area	Cranes	1	7.00	208	0.29
Construction - Unloading area	Forklifts	3	8.00	149	0.40
Construction - Unloading area	Generator Sets	1	8.00	84	0.42
Construction - Unloading area	Tractors/Loaders/Backhoes	3	7.00	75	0.37
Construction - Unloading area	Welders	1	8.00	46	0.42
Construction - Paving	Pavers	2	5.00	89	0.42
Construction - Paving	Rollers	2	5.00	80	0.38

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Demolition	12	30.00	0.00	226.00	13.00	5.00	20.00	LD_Mix	HDT_Mix	HHDT
Soil Transport	8	20.00	0.00	0.00	13.00	5.00	20.00	LD_Mix	HDT_Mix	HHDT
Grading	12	30.00	0.00	332.00	13.00	5.00	20.00	LD_Mix	HDT_Mix	HHDT
Site Preparation - Rail line	10	23.00	0.00	1,706.00	13.00	5.00	20.00	LD_Mix	HDT_Mix	HHDT
Site Preparation - Pipe line	7	23.00	0.00	426.00	13.00	5.00	20.00	LD_Mix	HDT_Mix	HHDT
Construction - Unloading area	9	31.00	0.00	426.00	13.00	5.00	20.00	LD_Mix	HDT_Mix	HHDT
Construction - Paving	4	0.00	0.00	0.00	13.00	5.00	20.00	LD_Mix	HDT_Mix	HHDT
Commissioning				0.00	13.00	5.00				

3.1 Mitigation Measures Construction

Use Cleaner Engines for Construction Equipment

Use DPF for Construction Equipment

Water Exposed Area

Reduce Vehicle Speed on Unpaved Roads

Clean Paved Roads

3.2 Demolition - 2014

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					1.0041	0.0000	1.0041	0.1521	0.0000	0.1521			0.0000			0.0000
Off-Road	9.0409	101.4704	70.8715	0.0733		4.9744	4.9744		4.5765	4.5765			7,785.6201	2.3007		7,833.9356
Total	**9.0409**	**101.4704**	**70.8715**	**0.0733**	**1.0041**	**4.9744**	**5.9785**	**0.1521**	**4.5765**	**4.7285**			**7,785.6201**	**2.3007**		**7,833.9356**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.3306	4.4110	3.3144	7.7700e-003	0.1786	0.0784	0.2570	0.0489	0.0721	0.1210			797.1278	7.6300e-003		797.2881
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000		0.0000
Worker	0.2015	0.2869	2.6480	3.2500e-003	0.2966	2.8200e-003	0.2994	0.0787	2.5200e-003	0.0812			289.3125	0.0208		289.7485
Total	**0.5321**	**4.6979**	**5.9625**	**0.0110**	**0.4752**	**0.0812**	**0.5564**	**0.1275**	**0.0746**	**0.2021**			**1,086.4403**	**0.0284**		**1,087.0366**

3.2 Demolition - 2014

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.3916	0.0000	0.3916	0.0593	0.0000	0.0593			0.0000			0.0000
Off-Road	2.1695	20.8184	35.5446	0.0733		0.7009	0.7009		0.6459	0.6459			7,785.6201	2.3007		7,833.9355
Total	**2.1695**	**20.8184**	**35.5446**	**0.0733**	**0.3916**	**0.7009**	**1.0925**	**0.0593**	**0.6459**	**0.7052**			**7,785.6201**	**2.3007**		**7,833.9355**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.3306	4.4110	3.3144	7.7700e-003	0.1786	0.0784	0.2570	0.0489	0.0721	0.1210			797.1278	7.6300e-003		797.2881
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000		0.0000
Worker	0.2015	0.2869	2.6480	3.2500e-003	0.2966	2.8200e-003	0.2994	0.0787	2.5200e-003	0.0812			289.3125	0.0208		289.7485
Total	**0.5321**	**4.6979**	**5.9625**	**0.0110**	**0.4752**	**0.0812**	**0.5564**	**0.1275**	**0.0746**	**0.2021**			**1,086.4403**	**0.0284**		**1,087.0366**

3.3 Soil Transport - 2014

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					6.0221	0.0000	6.0221	3.3102	0.0000	3.3102			0.0000			0.0000
Off-Road	4.8001	56.2469	31.4665	0.0501		2.3242	2.3242		2.1383	2.1383			5,316.6609	1.5711		5,349.6546
Total	**4.8001**	**56.2469**	**31.4665**	**0.0501**	**6.0221**	**2.3242**	**8.3463**	**3.3102**	**2.1383**	**5.4485**			**5,316.6609**	**1.5711**		**5,349.6546**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000		0.0000
Worker	0.1343	0.1913	1.7653	2.1600e-003	0.1977	1.8800e-003	0.1996	0.0524	1.6800e-003	0.0541			192.8750	0.0138		193.1657
Total	**0.1343**	**0.1913**	**1.7653**	**2.1600e-003**	**0.1977**	**1.8800e-003**	**0.1996**	**0.0524**	**1.6800e-003**	**0.0541**			**192.8750**	**0.0138**		**193.1657**

3.3 Soil Transport - 2014

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					2.3486	0.0000	2.3486	1.2910	0.0000	1.2910			0.0000			0.0000
Off-Road	3.1654	36.5516	21.4532	0.0501		1.3784	1.3784		1.2683	1.2683			5,316.6609	1.5711		5,349.6546
Total	**3.1654**	**36.5516**	**21.4532**	**0.0501**	**2.3486**	**1.3784**	**3.7270**	**1.2910**	**1.2683**	**2.5593**			**5,316.6609**	**1.5711**		**5,349.6546**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000		0.0000
Worker	0.1343	0.1913	1.7653	2.1600e-003	0.1977	1.8800e-003	0.1996	0.0524	1.6800e-003	0.0541			192.8750	0.0138		193.1657
Total	**0.1343**	**0.1913**	**1.7653**	**2.1600e-003**	**0.1977**	**1.8800e-003**	**0.1996**	**0.0524**	**1.6800e-003**	**0.0541**			**192.8750**	**0.0138**		**193.1657**

3.4 Grading - 2014

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					6.5885	0.0000	6.5885	3.3714	0.0000	3.3714			0.0000			0.0000
Off-Road	6.9379	81.6935	46.8533	0.0669		3.5453	3.5453		3.2617	3.2617			7,100.9114	2.0984		7,144.9778
Total	**6.9379**	**81.6935**	**46.8533**	**0.0669**	**6.5885**	**3.5453**	**10.1338**	**3.3714**	**3.2617**	**6.6331**			**7,100.9114**	**2.0984**		**7,144.9778**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.1214	1.6200	1.2173	2.8500e-003	0.0656	0.0288	0.0944	0.0180	0.0265	0.0444			292.7505	2.8000e-003		292.8094
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000		0.0000
Worker	0.2015	0.2869	2.6480	3.2500e-003	0.2966	2.8200e-003	0.2994	0.0787	2.5200e-003	0.0812			289.3125	0.0208		289.7485
Total	**0.3229**	**1.9069**	**3.8653**	**6.1000e-003**	**0.3622**	**0.0316**	**0.3938**	**0.0966**	**0.0290**	**0.1256**			**582.0629**	**0.0236**		**582.5578**

3.4 Grading - 2014

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					2.5695	0.0000	2.5695	1.3148	0.0000	1.3148			0.0000			0.0000
Off-Road	2.9458	31.7941	31.7151	0.0669		1.1548	1.1548		1.0631	1.0631			7,100.9114	2.0984		7,144.9778
Total	**2.9458**	**31.7941**	**31.7151**	**0.0669**	**2.5695**	**1.1548**	**3.7243**	**1.3148**	**1.0631**	**2.3780**			**7,100.9114**	**2.0984**		**7,144.9778**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.1214	1.6200	1.2173	2.8500e-003	0.0656	0.0288	0.0944	0.0180	0.0265	0.0444			292.7505	2.8000e-003		292.8094
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000		0.0000
Worker	0.2015	0.2869	2.6480	3.2500e-003	0.2966	2.8200e-003	0.2994	0.0787	2.5200e-003	0.0812			289.3125	0.0208		289.7485
Total	**0.3229**	**1.9069**	**3.8653**	**6.1000e-003**	**0.3622**	**0.0316**	**0.3938**	**0.0966**	**0.0290**	**0.1256**			**582.0629**	**0.0236**		**582.5578**

3.5 Site Preparation - Rail line - 2014

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					3.0110	0.0000	3.0110	1.6551	0.0000	1.6551			0.0000			0.0000
Off-Road	4.1076	48.1350	25.1749	0.0459		1.9973	1.9973		1.8377	1.8377			4,866.6391	1.4365		4,896.8063
Total	**4.1076**	**48.1350**	**25.1749**	**0.0459**	**3.0110**	**1.9973**	**5.0083**	**1.6551**	**1.8377**	**3.4928**			**4,866.6391**	**1.4365**		**4,896.8063**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	2.4955	33.2968	25.0197	0.0586	2.3737	0.5916	2.9652	0.6206	0.5441	1.1647			6,017.2569	0.0576		6,018.4668
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000		0.0000
Worker	0.1545	0.2200	2.0301	2.4900e-003	0.2274	2.1600e-003	0.2295	0.0603	1.9300e-003	0.0622			221.8062	0.0159		222.1405
Total	**2.6500**	**33.5168**	**27.0498**	**0.0611**	**2.6011**	**0.5937**	**3.1948**	**0.6809**	**0.5461**	**1.2270**			**6,239.0631**	**0.0735**		**6,240.6073**

3.5 Site Preparation - Rail line - 2014

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					1.1743	0.0000	1.1743	0.6455	0.0000	0.6455			0.0000			0.0000
Off-Road	3.1625	36.9853	20.1370	0.0459		1.4174	1.4174		1.3043	1.3043			4,866.6391	1.4365		4,896.8063
Total	**3.1625**	**36.9853**	**20.1370**	**0.0459**	**1.1743**	**1.4174**	**2.5917**	**0.6455**	**1.3043**	**1.9498**			**4,866.6391**	**1.4365**		**4,896.8063**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	2.4955	33.2968	25.0197	0.0586	2.3737	0.5916	2.9652	0.6206	0.5441	1.1647			6,017.2569	0.0576		6,018.4668
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000		0.0000
Worker	0.1545	0.2200	2.0301	2.4900e-003	0.2274	2.1600e-003	0.2295	0.0603	1.9300e-003	0.0622			221.8062	0.0159		222.1405
Total	**2.6500**	**33.5168**	**27.0498**	**0.0611**	**2.6011**	**0.5937**	**3.1948**	**0.6809**	**0.5461**	**1.2270**			**6,239.0631**	**0.0735**		**6,240.6073**

3.5 Site Preparation - Rail line - 2015

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					3.0110	0.0000	3.0110	1.6551	0.0000	1.6551			0.0000			0.0000
Off-Road	4.0364	46.7851	24.8026	0.0459		1.9387	1.9387		1.7838	1.7838			4,817.6519	1.4366		4,847.8212
Total	**4.0364**	**46.7851**	**24.8026**	**0.0459**	**3.0110**	**1.9387**	**4.9497**	**1.6551**	**1.7838**	**3.4389**			**4,817.6519**	**1.4366**		**4,847.8212**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	2.3049	28.8546	23.7879	0.0585	2.3739	0.4356	2.8095	0.6207	0.4006	1.0213			5,943.4186	0.0499		5,944.4668
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000		0.0000
Worker	0.1312	0.1913	1.7367	2.4800e-003	0.2274	1.9500e-003	0.2293	0.0603	1.7500e-003	0.0621			214.1530	0.0141		214.4482
Total	**2.4362**	**29.0459**	**25.5246**	**0.0610**	**2.6013**	**0.4376**	**3.0389**	**0.6810**	**0.4024**	**1.0834**			**6,157.5716**	**0.0640**		**6,158.9151**

3.5 Site Preparation - Rail line - 2015

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					1.1743	0.0000	1.1743	0.6455	0.0000	0.6455			0.0000			0.0000
Off-Road	3.0938	35.7510	19.8435	0.0459		1.3654	1.3654		1.2565	1.2565			4,817.6519	1.4366		4,847.8212
Total	**3.0938**	**35.7510**	**19.8435**	**0.0459**	**1.1743**	**1.3654**	**2.5397**	**0.6455**	**1.2565**	**1.9020**			**4,817.6519**	**1.4366**		**4,847.8212**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	2.3049	28.8546	23.7879	0.0585	2.3739	0.4356	2.8095	0.6207	0.4006	1.0213			5,943.4186	0.0499		5,944.4668
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000		0.0000
Worker	0.1312	0.1913	1.7367	2.4800e-003	0.2274	1.9500e-003	0.2293	0.0603	1.7500e-003	0.0621			214.1530	0.0141		214.4482
Total	**2.4362**	**29.0459**	**25.5246**	**0.0610**	**2.6013**	**0.4376**	**3.0389**	**0.6810**	**0.4024**	**1.0834**			**6,157.5716**	**0.0640**		**6,158.9151**

3.6 Site Preparation - Pipe line - 2015

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Off-Road	2.2834	26.5393	12.0962	0.0277		1.0820	1.0820		0.9957	0.9957			2,905.7054	0.8658		2,923.8879
Total	**2.2834**	**26.5393**	**12.0962**	**0.0277**	**0.0000**	**1.0820**	**1.0820**	**0.0000**	**0.9957**	**0.9957**			**2,905.7054**	**0.8658**		**2,923.8879**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.1919	2.4017	1.9800	4.8700e-003	0.1123	0.0363	0.1485	0.0307	0.0334	0.0641			494.7042	4.1500e-003		494.7915
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000		0.0000
Worker	0.1312	0.1913	1.7367	2.4800e-003	0.2274	1.9500e-003	0.2293	0.0603	1.7500e-003	0.0621			214.1530	0.0141		214.4482
Total	**0.3231**	**2.5930**	**3.7167**	**7.3500e-003**	**0.3396**	**0.0382**	**0.3779**	**0.0910**	**0.0351**	**0.1261**			**708.8573**	**0.0182**		**709.2397**

3.6 Site Preparation - Pipe line - 2015

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Off-Road	2.0039	23.3182	11.9433	0.0277		0.8863	0.8863		0.8156	0.8156			2,905.7054	0.8658		2,923.8879
Total	**2.0039**	**23.3182**	**11.9433**	**0.0277**	**0.0000**	**0.8863**	**0.8863**	**0.0000**	**0.8156**	**0.8156**			**2,905.7054**	**0.8658**		**2,923.8879**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.1919	2.4017	1.9800	4.8700e-003	0.1123	0.0363	0.1485	0.0307	0.0334	0.0641			494.7042	4.1500e-003		494.7915
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000		0.0000
Worker	0.1312	0.1913	1.7367	2.4800e-003	0.2274	1.9500e-003	0.2293	0.0603	1.7500e-003	0.0621			214.1530	0.0141		214.4482
Total	**0.3231**	**2.5930**	**3.7167**	**7.3500e-003**	**0.3396**	**0.0382**	**0.3779**	**0.0910**	**0.0351**	**0.1261**			**708.8573**	**0.0182**		**709.2397**

3.7 Construction - Unloading area - 2015

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	4.1024	38.1165	22.5648	0.0323		2.2874	2.2874		2.1334	2.1334			3,301.8187	0.9109		3,320.9479
Total	**4.1024**	**38.1165**	**22.5648**	**0.0323**		**2.2874**	**2.2874**		**2.1334**	**2.1334**			**3,301.8187**	**0.9109**		**3,320.9479**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.1919	2.4017	1.9800	4.8700e-003	0.1123	0.0363	0.1485	0.0307	0.0334	0.0641			494.7042	4.1500e-003		494.7915
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000		0.0000
Worker	0.1769	0.2579	2.3408	3.3500e-003	0.3065	2.6200e-003	0.3091	0.0813	2.3600e-003	0.0836			288.6410	0.0190		289.0389
Total	**0.3687**	**2.6596**	**4.3208**	**8.2200e-003**	**0.4187**	**0.0389**	**0.4576**	**0.1120**	**0.0357**	**0.1477**			**783.3453**	**0.0231**		**783.8304**

3.7 Construction - Unloading area - 2015

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	2.9062	24.6318	21.9732	0.0323		1.4209	1.4209		1.3364	1.3364			3,301.8187	0.9109		3,320.9479
Total	**2.9062**	**24.6318**	**21.9732**	**0.0323**		**1.4209**	**1.4209**		**1.3364**	**1.3364**			**3,301.8187**	**0.9109**		**3,320.9479**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.1919	2.4017	1.9800	4.8700e-003	0.1123	0.0363	0.1485	0.0307	0.0334	0.0641			494.7042	4.1500e-003		494.7915
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000		0.0000
Worker	0.1769	0.2579	2.3408	3.3500e-003	0.3065	2.6200e-003	0.3091	0.0813	2.3600e-003	0.0836			288.6410	0.0190		289.0389
Total	**0.3687**	**2.6596**	**4.3208**	**8.2200e-003**	**0.4187**	**0.0389**	**0.4576**	**0.1120**	**0.0357**	**0.1477**			**783.3453**	**0.0231**		**783.8304**

3.8 Construction - Paving - 2015

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.0183	9.2639	5.6747	7.2700e-003		0.7083	0.7083		0.6516	0.6516			763.9250	0.2281		768.7144
Paving	0.4049					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**1.4232**	**9.2639**	**5.6747**	**7.2700e-003**		**0.7083**	**0.7083**		**0.6516**	**0.6516**			**763.9250**	**0.2281**		**768.7144**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000		0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**			**0.0000**	**0.0000**		**0.0000**

3.8 Construction - Paving - 2015

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.0183	9.2639	5.6747	7.2700e-003		0.7083	0.7083		0.6516	0.6516			763.9250	0.2281		768.7144
Paving	0.4049					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**1.4232**	**9.2639**	**5.6747**	**7.2700e-003**		**0.7083**	**0.7083**		**0.6516**	**0.6516**			**763.9250**	**0.2281**		**768.7144**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000		0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**			**0.0000**	**0.0000**		**0.0000**

3.9 Commissioning - 2015

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating	39.0035					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**39.0035**					**0.0000**	**0.0000**		**0.0000**	**0.0000**			**0.0000**			**0.0000**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Vendor					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Worker					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Total					**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**			**0.0000**			**0.0000**

3.9 Commissioning - 2015

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating	39.0035					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**39.0035**					**0.0000**	**0.0000**		**0.0000**	**0.0000**			**0.0000**			**0.0000**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Vendor					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Worker					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000			0.0000
Total					**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**			**0.0000**			**0.0000**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000		0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000		0.0000

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Other Asphalt Surfaces	0.00	0.00	0.00		
User Defined Industrial	0.00	0.00	0.00		
Total	0.00	0.00	0.00		

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Other Asphalt Surfaces	13.00	5.00	5.00	0.00	0.00	0.00	0	0	0
User Defined Industrial	13.00	5.00	5.00	0.00	0.00	0.00	0	0	0

LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
0.440203	0.187725	0.202335	0.081928	0.024463	0.012999	0.013453	0.015831	0.001200	0.001190	0.011748	0.001156	0.005769

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
User Defined Industrial	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**			**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
User Defined Industrial	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**			**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	1.7023	0.0000	2.8000e-004	0.0000		0.0000	0.0000		0.0000	0.0000			5.9000e-004	0.0000		6.3000e-004
Unmitigated	1.7023	0.0000	2.8000e-004	0.0000		0.0000	0.0000		0.0000	0.0000			5.9000e-004	0.0000		6.3000e-004

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.1175					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	1.5847					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	3.0000e-005	0.0000	2.8000e-004	0.0000		0.0000	0.0000		0.0000	0.0000			5.9000e-004	0.0000		6.3000e-004
Total	**1.7023**	**0.0000**	**2.8000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**			**5.9000e-004**	**0.0000**		**6.3000e-004**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.1175					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	1.5847					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	3.0000e-005	0.0000	2.8000e-004	0.0000		0.0000	0.0000		0.0000	0.0000			5.9000e-004	0.0000		6.3000e-004
Total	**1.7023**	**0.0000**	**2.8000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**			**5.9000e-004**	**0.0000**		**6.3000e-004**

7.0 Water Detail

7.1 Mitigation Measures Water

8.0 Waste Detail

8.1 Mitigation Measures Waste

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type
Off-Highway Trucks	0	0.00	0	381	0.38	Diesel

UnMitigated/Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Equipment Type	lb/day										lb/day					
Off-Highway Trucks	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000			0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**			**0.0000**	**0.0000**		**0.0000**

10.0 Vegetation

Phillips 66 Santa Maria

San Luis Obispo County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
User Defined Industrial	1.00	User Defined Unit	47.00	0.00	0
Other Asphalt Surfaces	1.70	Acre	1.70	74,052.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	3.2	**Precipitation Freq (Days)**	44
Climate Zone	4			**Operational Year**	2016
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use - edit

Construction Phase - assumptions

Off-road Equipment -

Off-road Equipment - Applicant data and data pn paving requirements

Off-road Equipment - applicant data

Off-road Equipment - Applicant info

Off-road Equipment - site assumptions

Off-road Equipment - assumptions

Off-road Equipment - assumption

Off-road Equipment - site assumptions

Off-road Equipment - assumption

Trips and VMT - demolition material to be sent offsite
Soil transport onsite handled by on-site equipment levels and use

Demolition -

Grading - total site disturbance

Road Dust - test

Water And Wastewater - onsite septic only

Construction Off-road Equipment Mitigation - Standard and BACT

Operational Off-Road Equipment - truck use along rail spur dirt road

Table Name	Column Name	Default Value	New Value
tblAreaCoating	Area_Nonresidential_Interior	111078	0
tblConstEquipMitigation	DPF	No Change	Level 3
tblConstEquipMitigation	DPF	No Change	Level 3
tblConstEquipMitigation	DPF	No Change	Level 3
tblConstEquipMitigation	DPF	No Change	Level 3
tblConstEquipMitigation	DPF	No Change	Level 3
tblConstEquipMitigation	DPF	No Change	Level 3

tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	9.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	10.00
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstructionPhase	NumDays	55.00	44.00
tblConstructionPhase	NumDays	740.00	66.00
tblConstructionPhase	NumDays	50.00	22.00
tblConstructionPhase	NumDays	75.00	88.00
tblConstructionPhase	NumDays	55.00	11.00
tblConstructionPhase	NumDays	30.00	88.00
tblConstructionPhase	NumDays	30.00	22.00
tblConstructionPhase	NumDays	30.00	66.00
tblConstructionPhase	PhaseEndDate	3/18/2015	7/1/2015
tblConstructionPhase	PhaseEndDate	7/3/2015	4/2/2015
tblConstructionPhase	PhaseEndDate	8/29/2014	8/30/2014
tblConstructionPhase	PhaseEndDate	5/4/2015	12/31/2014
tblConstructionPhase	PhaseEndDate	4/17/2015	1/15/2015
tblConstructionPhase	PhaseEndDate	1/30/2015	1/15/2015
tblConstructionPhase	PhaseEndDate	4/17/2015	4/2/2015
tblConstructionPhase	PhaseStartDate	1/16/2015	5/1/2015

tblConstructionPhase	PhaseStartDate	4/3/2015	1/1/2015
tblConstructionPhase	PhaseStartDate	1/1/2015	9/1/2014
tblConstructionPhase	PhaseStartDate	4/3/2015	1/1/2015
tblConstructionPhase	PhaseStartDate	8/31/2014	9/1/2014
tblConstructionPhase	PhaseStartDate	1/1/2015	12/17/2014
tblConstructionPhase	PhaseStartDate	1/16/2015	1/1/2015
tblGrading	AcresOfGrading	132.00	47.00
tblLandUse	LotAcreage	0.00	47.00
tblOffRoadEquipment	HorsePower	226.00	208.00
tblOffRoadEquipment	HorsePower	162.00	157.00
tblOffRoadEquipment	HorsePower	89.00	149.00
tblOffRoadEquipment	HorsePower	174.00	162.00
tblOffRoadEquipment	HorsePower	125.00	89.00
tblOffRoadEquipment	HorsePower	255.00	358.00
tblOffRoadEquipment	HorsePower	255.00	358.00
tblOffRoadEquipment	HorsePower	255.00	358.00
tblOffRoadEquipment	HorsePower	255.00	358.00
tblOffRoadEquipment	HorsePower	255.00	358.00
tblOffRoadEquipment	HorsePower	361.00	356.00
tblOffRoadEquipment	HorsePower	97.00	75.00
tblOffRoadEquipment	HorsePower	97.00	75.00
tblOffRoadEquipment	HorsePower	97.00	75.00
tblOffRoadEquipment	HorsePower	205.00	82.00
tblOffRoadEquipment	HorsePower	226.00	208.00
tblOffRoadEquipment	HorsePower	400.00	381.00
tblOffRoadEquipment	HorsePower	400.00	381.00
tblOffRoadEquipment	HorsePower	400.00	381.00
tblOffRoadEquipment	HorsePower	400.00	381.00

tblOffRoadEquipment	HorsePower	400.00	381.00
tblOffRoadEquipment	HorsePower	97.00	75.00
tblOffRoadEquipment	HorsePower	97.00	75.00
tblOffRoadEquipment	LoadFactor	0.20	0.40
tblOffRoadEquipment	LoadFactor	0.74	0.42
tblOffRoadEquipment	LoadFactor	0.45	0.42
tblOffRoadEquipment	LoadFactor	0.48	0.42
tblOffRoadEquipment	LoadFactor	0.50	0.42
tblOffRoadEquipment	LoadFactor	0.43	0.42
tblOffRoadEquipment	LoadFactor	0.43	0.42
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	3.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	4.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	4.00	1.00
tblOffRoadEquipment	UsageHours	8.00	4.00
tblOffRoadEquipment	UsageHours	8.00	4.00
tblOffRoadEquipment	UsageHours	8.00	5.00
tblOffRoadEquipment	UsageHours	8.00	5.00
tblOffRoadEquipment	UsageHours	8.00	4.00
tblOffRoadEquipment	UsageHours	8.00	4.00
tblOffRoadEquipment	UsageHours	8.00	4.00
tblOffRoadEquipment	UsageHours	8.00	4.00
tblOffRoadEquipment	UsageHours	8.00	4.00

tblOffRoadEquipment	UsageHours	8.00	4.00
tblOffRoadEquipment	UsageHours	8.00	4.00
tblOperationalOffRoadEquipment	OperDaysPerYear	260.00	0.00
tblOperationalOffRoadEquipment	OperHorsePower	400.00	381.00
tblOperationalOffRoadEquipment	OperHoursPerDay	8.00	0.00
tblProjectCharacteristics	OperationalYear	2014	2016
tblTripsAndVMT	HaulingTripNumber	99.00	226.00
tblTripsAndVMT	HaulingTripNumber	0.00	332.00
tblTripsAndVMT	HaulingTripNumber	0.00	1,706.00
tblTripsAndVMT	HaulingTripNumber	0.00	426.00
tblTripsAndVMT	HaulingTripNumber	0.00	426.00
tblTripsAndVMT	VendorTripNumber	12.00	0.00
tblTripsAndVMT	WorkerTripNumber	25.00	23.00
tblTripsAndVMT	WorkerTripNumber	18.00	23.00
tblTripsAndVMT	WorkerTripNumber	10.00	0.00
tblVehicleEF	HHD	0.02	0.07
tblVehicleEF	HHD	0.01	0.03
tblVehicleEF	HHD	0.00	0.13
tblVehicleEF	HHD	2.71	8.13
tblVehicleEF	HHD	1.34	3.98
tblVehicleEF	HHD	89.49	34.56
tblVehicleEF	HHD	565.98	575.19
tblVehicleEF	HHD	1,681.93	1,721.44
tblVehicleEF	HHD	65.88	68.22
tblVehicleEF	HHD	0.02	0.02
tblVehicleEF	HHD	5.29	18.73
tblVehicleEF	HHD	6.79	8.39
tblVehicleEF	HHD	5.80	3.93

tblVehicleEF	HHD	0.02	0.18
tblVehicleEF	HHD	0.06	0.02
tblVehicleEF	HHD	0.03	0.03
tblVehicleEF	HHD	0.09	0.29
tblVehicleEF	HHD	6.6660e-003	2.5000e-003
tblVehicleEF	HHD	0.02	0.18
tblVehicleEF	HHD	0.03	0.02
tblVehicleEF	HHD	8.6600e-003	0.03
tblVehicleEF	HHD	0.08	0.29
tblVehicleEF	HHD	5.4820e-003	2.5000e-003
tblVehicleEF	HHD	3.7330e-003	1.2000e-003
tblVehicleEF	HHD	0.28	0.03
tblVehicleEF	HHD	0.50	1.68
tblVehicleEF	HHD	2.2720e-003	6.0000e-004
tblVehicleEF	HHD	0.25	0.70
tblVehicleEF	HHD	1.33	0.03
tblVehicleEF	HHD	4.59	2.29
tblVehicleEF	HHD	5.5960e-003	0.01
tblVehicleEF	HHD	0.02	0.01
tblVehicleEF	HHD	2.2310e-003	8.0000e-004
tblVehicleEF	HHD	3.7330e-003	1.2000e-003
tblVehicleEF	HHD	0.28	0.03
tblVehicleEF	HHD	0.57	1.92
tblVehicleEF	HHD	2.2720e-003	6.0000e-004
tblVehicleEF	HHD	0.28	0.79
tblVehicleEF	HHD	1.33	0.03
tblVehicleEF	HHD	4.91	2.45
tblVehicleEF	HHD	0.02	0.07

tblVehicleEF	HHD	0.01	0.03
tblVehicleEF	HHD	0.00	0.10
tblVehicleEF	HHD	1.97	5.33
tblVehicleEF	HHD	1.34	4.01
tblVehicleEF	HHD	68.01	25.49
tblVehicleEF	HHD	599.61	609.36
tblVehicleEF	HHD	1,681.93	1,721.44
tblVehicleEF	HHD	65.88	68.22
tblVehicleEF	HHD	0.02	0.02
tblVehicleEF	HHD	5.46	19.67
tblVehicleEF	HHD	6.57	8.51
tblVehicleEF	HHD	5.47	3.70
tblVehicleEF	HHD	0.02	0.14
tblVehicleEF	HHD	0.06	0.02
tblVehicleEF	HHD	0.03	0.03
tblVehicleEF	HHD	0.09	0.29
tblVehicleEF	HHD	6.6660e-003	2.5000e-003
tblVehicleEF	HHD	0.01	0.14
tblVehicleEF	HHD	0.03	0.02
tblVehicleEF	HHD	8.6600e-003	0.03
tblVehicleEF	HHD	0.08	0.29
tblVehicleEF	HHD	5.4820e-003	2.5000e-003
tblVehicleEF	HHD	7.1400e-003	2.5000e-003
tblVehicleEF	HHD	0.28	0.03
tblVehicleEF	HHD	0.47	1.54
tblVehicleEF	HHD	4.2630e-003	1.3000e-003
tblVehicleEF	HHD	0.25	0.70
tblVehicleEF	HHD	1.28	0.03

tblVehicleEF	HHD	3.63	1.86
tblVehicleEF	HHD	5.9280e-003	0.01
tblVehicleEF	HHD	0.02	0.01
tblVehicleEF	HHD	1.8640e-003	6.0000e-004
tblVehicleEF	HHD	7.1400e-003	2.5000e-003
tblVehicleEF	HHD	0.28	0.03
tblVehicleEF	HHD	0.53	1.76
tblVehicleEF	HHD	4.2630e-003	1.3000e-003
tblVehicleEF	HHD	0.28	0.79
tblVehicleEF	HHD	1.28	0.03
tblVehicleEF	HHD	3.88	1.99
tblVehicleEF	HHD	0.02	0.08
tblVehicleEF	HHD	0.01	0.03
tblVehicleEF	HHD	0.00	0.13
tblVehicleEF	HHD	3.74	10.13
tblVehicleEF	HHD	1.33	3.97
tblVehicleEF	HHD	102.00	35.05
tblVehicleEF	HHD	519.55	528.00
tblVehicleEF	HHD	1,681.93	1,721.44
tblVehicleEF	HHD	65.88	68.22
tblVehicleEF	HHD	0.02	0.02
tblVehicleEF	HHD	5.05	18.06
tblVehicleEF	HHD	6.73	8.71
tblVehicleEF	HHD	5.98	3.95
tblVehicleEF	HHD	0.02	0.21
tblVehicleEF	HHD	0.06	0.02
tblVehicleEF	HHD	0.03	0.03
tblVehicleEF	HHD	0.09	0.29

tblVehicleEF	HHD	6.6660e-003	2.5000e-003
tblVehicleEF	HHD	0.02	0.21
tblVehicleEF	HHD	0.03	0.02
tblVehicleEF	HHD	8.6600e-003	0.03
tblVehicleEF	HHD	0.08	0.29
tblVehicleEF	HHD	5.4820e-003	2.5000e-003
tblVehicleEF	HHD	2.6080e-003	1.3000e-003
tblVehicleEF	HHD	0.35	0.04
tblVehicleEF	HHD	0.54	1.78
tblVehicleEF	HHD	1.7350e-003	8.0000e-004
tblVehicleEF	HHD	0.25	0.70
tblVehicleEF	HHD	1.44	0.03
tblVehicleEF	HHD	5.14	2.32
tblVehicleEF	HHD	5.1360e-003	9.5000e-003
tblVehicleEF	HHD	0.02	0.01
tblVehicleEF	HHD	2.4450e-003	8.0000e-004
tblVehicleEF	HHD	2.6080e-003	1.3000e-003
tblVehicleEF	HHD	0.35	0.04
tblVehicleEF	HHD	0.61	2.03
tblVehicleEF	HHD	1.7350e-003	8.0000e-004
tblVehicleEF	HHD	0.28	0.79
tblVehicleEF	HHD	1.44	0.03
tblVehicleEF	HHD	5.51	2.48
tblVehicleEF	LDA	0.01	0.01
tblVehicleEF	LDA	0.01	0.02
tblVehicleEF	LDA	1.26	1.83
tblVehicleEF	LDA	2.84	4.79
tblVehicleEF	LDA	264.46	286.67

tblVehicleEF	LDA	61.62	66.44
tblVehicleEF	LDA	0.46	0.44
tblVehicleEF	LDA	0.14	0.19
tblVehicleEF	LDA	0.19	0.31
tblVehicleEF	LDA	0.04	0.01
tblVehicleEF	LDA	1.9850e-003	9.4000e-003
tblVehicleEF	LDA	3.2170e-003	6.4000e-003
tblVehicleEF	LDA	0.02	0.01
tblVehicleEF	LDA	2.0000e-003	8.0000e-003
tblVehicleEF	LDA	1.8090e-003	9.4000e-003
tblVehicleEF	LDA	2.9410e-003	6.4000e-003
tblVehicleEF	LDA	0.05	0.07
tblVehicleEF	LDA	0.14	0.17
tblVehicleEF	LDA	0.04	0.05
tblVehicleEF	LDA	0.04	0.06
tblVehicleEF	LDA	0.34	0.08
tblVehicleEF	LDA	0.23	0.40
tblVehicleEF	LDA	3.2540e-003	3.3000e-003
tblVehicleEF	LDA	7.8400e-004	8.0000e-004
tblVehicleEF	LDA	0.05	0.07
tblVehicleEF	LDA	0.14	0.17
tblVehicleEF	LDA	0.04	0.05
tblVehicleEF	LDA	0.06	0.08
tblVehicleEF	LDA	0.34	0.08
tblVehicleEF	LDA	0.24	0.42
tblVehicleEF	LDA	0.01	0.01
tblVehicleEF	LDA	0.01	0.01
tblVehicleEF	LDA	1.33	2.00

tblVehicleEF	LDA	2.17	3.48
tblVehicleEF	LDA	275.59	298.70
tblVehicleEF	LDA	61.62	66.44
tblVehicleEF	LDA	0.46	0.44
tblVehicleEF	LDA	0.12	0.18
tblVehicleEF	LDA	0.18	0.28
tblVehicleEF	LDA	0.04	0.01
tblVehicleEF	LDA	1.9850e-003	9.4000e-003
tblVehicleEF	LDA	3.2170e-003	6.4000e-003
tblVehicleEF	LDA	0.02	0.01
tblVehicleEF	LDA	2.0000e-003	8.0000e-003
tblVehicleEF	LDA	1.8090e-003	9.4000e-003
tblVehicleEF	LDA	2.9410e-003	6.4000e-003
tblVehicleEF	LDA	0.08	0.15
tblVehicleEF	LDA	0.15	0.19
tblVehicleEF	LDA	0.06	0.11
tblVehicleEF	LDA	0.04	0.06
tblVehicleEF	LDA	0.32	0.08
tblVehicleEF	LDA	0.18	0.31
tblVehicleEF	LDA	3.3930e-003	3.5000e-003
tblVehicleEF	LDA	7.7200e-004	8.0000e-004
tblVehicleEF	LDA	0.08	0.15
tblVehicleEF	LDA	0.15	0.19
tblVehicleEF	LDA	0.06	0.11
tblVehicleEF	LDA	0.06	0.08
tblVehicleEF	LDA	0.32	0.08
tblVehicleEF	LDA	0.20	0.33
tblVehicleEF	LDA	0.01	0.01

tblVehicleEF	LDA	0.01	0.02
tblVehicleEF	LDA	1.26	1.79
tblVehicleEF	LDA	3.17	4.91
tblVehicleEF	LDA	262.24	284.27
tblVehicleEF	LDA	61.62	66.44
tblVehicleEF	LDA	0.46	0.44
tblVehicleEF	LDA	0.14	0.20
tblVehicleEF	LDA	0.20	0.32
tblVehicleEF	LDA	0.04	0.01
tblVehicleEF	LDA	1.9850e-003	9.4000e-003
tblVehicleEF	LDA	3.2170e-003	6.4000e-003
tblVehicleEF	LDA	0.02	0.01
tblVehicleEF	LDA	2.0000e-003	8.0000e-003
tblVehicleEF	LDA	1.8090e-003	9.4000e-003
tblVehicleEF	LDA	2.9410e-003	6.4000e-003
tblVehicleEF	LDA	0.04	0.07
tblVehicleEF	LDA	0.16	0.21
tblVehicleEF	LDA	0.03	0.05
tblVehicleEF	LDA	0.04	0.06
tblVehicleEF	LDA	0.39	0.09
tblVehicleEF	LDA	0.25	0.40
tblVehicleEF	LDA	3.2270e-003	3.2000e-003
tblVehicleEF	LDA	7.8900e-004	8.0000e-004
tblVehicleEF	LDA	0.04	0.07
tblVehicleEF	LDA	0.16	0.21
tblVehicleEF	LDA	0.03	0.05
tblVehicleEF	LDA	0.06	0.07
tblVehicleEF	LDA	0.39	0.09

tblVehicleEF	LDA	0.26	0.43
tblVehicleEF	LDT1	0.02	0.03
tblVehicleEF	LDT1	0.03	0.03
tblVehicleEF	LDT1	3.16	4.12
tblVehicleEF	LDT1	5.43	8.27
tblVehicleEF	LDT1	320.87	343.62
tblVehicleEF	LDT1	74.98	80.88
tblVehicleEF	LDT1	0.04	0.19
tblVehicleEF	LDT1	0.33	0.50
tblVehicleEF	LDT1	0.31	0.45
tblVehicleEF	LDT1	0.04	0.01
tblVehicleEF	LDT1	3.4520e-003	0.01
tblVehicleEF	LDT1	4.6840e-003	8.3000e-003
tblVehicleEF	LDT1	0.02	0.01
tblVehicleEF	LDT1	2.0000e-003	8.0000e-003
tblVehicleEF	LDT1	3.0790e-003	0.01
tblVehicleEF	LDT1	4.2060e-003	8.3000e-003
tblVehicleEF	LDT1	0.10	0.12
tblVehicleEF	LDT1	0.26	0.26
tblVehicleEF	LDT1	0.07	0.08
tblVehicleEF	LDT1	0.13	0.14
tblVehicleEF	LDT1	0.88	0.22
tblVehicleEF	LDT1	0.43	0.63
tblVehicleEF	LDT1	3.8050e-003	4.1000e-003
tblVehicleEF	LDT1	9.5700e-004	1.0000e-003
tblVehicleEF	LDT1	0.10	0.12
tblVehicleEF	LDT1	0.26	0.26
tblVehicleEF	LDT1	0.07	0.08

tblVehicleEF	LDT1	0.16	0.18
tblVehicleEF	LDT1	0.88	0.22
tblVehicleEF	LDT1	0.46	0.67
tblVehicleEF	LDT1	0.02	0.03
tblVehicleEF	LDT1	0.03	0.02
tblVehicleEF	LDT1	3.23	4.37
tblVehicleEF	LDT1	4.18	6.01
tblVehicleEF	LDT1	333.47	356.91
tblVehicleEF	LDT1	74.98	80.88
tblVehicleEF	LDT1	0.04	0.19
tblVehicleEF	LDT1	0.30	0.49
tblVehicleEF	LDT1	0.28	0.41
tblVehicleEF	LDT1	0.04	0.01
tblVehicleEF	LDT1	3.4520e-003	0.01
tblVehicleEF	LDT1	4.6840e-003	8.3000e-003
tblVehicleEF	LDT1	0.02	0.01
tblVehicleEF	LDT1	2.0000e-003	8.0000e-003
tblVehicleEF	LDT1	3.0790e-003	0.01
tblVehicleEF	LDT1	4.2060e-003	8.3000e-003
tblVehicleEF	LDT1	0.18	0.25
tblVehicleEF	LDT1	0.26	0.29
tblVehicleEF	LDT1	0.12	0.19
tblVehicleEF	LDT1	0.13	0.15
tblVehicleEF	LDT1	0.79	0.20
tblVehicleEF	LDT1	0.35	0.50
tblVehicleEF	LDT1	3.9550e-003	4.3000e-003
tblVehicleEF	LDT1	9.3500e-004	9.0000e-004
tblVehicleEF	LDT1	0.18	0.25

tblVehicleEF	LDT1	0.26	0.29
tblVehicleEF	LDT1	0.12	0.19
tblVehicleEF	LDT1	0.16	0.18
tblVehicleEF	LDT1	0.79	0.20
tblVehicleEF	LDT1	0.38	0.53
tblVehicleEF	LDT1	0.02	0.03
tblVehicleEF	LDT1	0.03	0.03
tblVehicleEF	LDT1	3.20	4.05
tblVehicleEF	LDT1	6.04	8.46
tblVehicleEF	LDT1	318.36	340.97
tblVehicleEF	LDT1	74.98	80.88
tblVehicleEF	LDT1	0.04	0.19
tblVehicleEF	LDT1	0.34	0.54
tblVehicleEF	LDT1	0.32	0.46
tblVehicleEF	LDT1	0.04	0.01
tblVehicleEF	LDT1	3.4520e-003	0.01
tblVehicleEF	LDT1	4.6840e-003	8.3000e-003
tblVehicleEF	LDT1	0.02	0.01
tblVehicleEF	LDT1	2.0000e-003	8.0000e-003
tblVehicleEF	LDT1	3.0790e-003	0.01
tblVehicleEF	LDT1	4.2060e-003	8.3000e-003
tblVehicleEF	LDT1	0.07	0.13
tblVehicleEF	LDT1	0.30	0.33
tblVehicleEF	LDT1	0.05	0.09
tblVehicleEF	LDT1	0.14	0.14
tblVehicleEF	LDT1	1.05	0.27
tblVehicleEF	LDT1	0.47	0.64
tblVehicleEF	LDT1	3.7760e-003	4.0000e-003

tblVehicleEF	LDT1	9.6800e-004	1.0000e-003
tblVehicleEF	LDT1	0.07	0.13
tblVehicleEF	LDT1	0.30	0.33
tblVehicleEF	LDT1	0.05	0.09
tblVehicleEF	LDT1	0.16	0.18
tblVehicleEF	LDT1	1.05	0.27
tblVehicleEF	LDT1	0.51	0.68
tblVehicleEF	LDT2	0.02	0.02
tblVehicleEF	LDT2	0.02	0.02
tblVehicleEF	LDT2	1.92	2.69
tblVehicleEF	LDT2	4.63	6.55
tblVehicleEF	LDT2	381.86	405.99
tblVehicleEF	LDT2	88.00	93.08
tblVehicleEF	LDT2	0.21	0.20
tblVehicleEF	LDT2	0.29	0.40
tblVehicleEF	LDT2	0.42	0.63
tblVehicleEF	LDT2	0.04	0.01
tblVehicleEF	LDT2	2.2050e-003	0.02
tblVehicleEF	LDT2	3.5240e-003	0.01
tblVehicleEF	LDT2	0.02	0.01
tblVehicleEF	LDT2	2.0000e-003	8.0000e-003
tblVehicleEF	LDT2	2.0260e-003	0.02
tblVehicleEF	LDT2	3.2470e-003	0.01
tblVehicleEF	LDT2	0.07	0.08
tblVehicleEF	LDT2	0.19	0.18
tblVehicleEF	LDT2	0.05	0.05
tblVehicleEF	LDT2	0.06	0.08
tblVehicleEF	LDT2	0.66	0.15

tblVehicleEF	LDT2	0.36	0.51
tblVehicleEF	LDT2	4.4480e-003	4.1000e-003
tblVehicleEF	LDT2	1.0860e-003	1.0000e-003
tblVehicleEF	LDT2	0.07	0.08
tblVehicleEF	LDT2	0.19	0.18
tblVehicleEF	LDT2	0.05	0.05
tblVehicleEF	LDT2	0.08	0.11
tblVehicleEF	LDT2	0.66	0.15
tblVehicleEF	LDT2	0.39	0.55
tblVehicleEF	LDT2	0.02	0.02
tblVehicleEF	LDT2	0.02	0.02
tblVehicleEF	LDT2	2.04	2.91
tblVehicleEF	LDT2	3.51	4.74
tblVehicleEF	LDT2	397.40	422.39
tblVehicleEF	LDT2	88.00	93.08
tblVehicleEF	LDT2	0.21	0.20
tblVehicleEF	LDT2	0.26	0.39
tblVehicleEF	LDT2	0.39	0.57
tblVehicleEF	LDT2	0.04	0.01
tblVehicleEF	LDT2	2.2050e-003	0.02
tblVehicleEF	LDT2	3.5240e-003	0.01
tblVehicleEF	LDT2	0.02	0.01
tblVehicleEF	LDT2	2.0000e-003	8.0000e-003
tblVehicleEF	LDT2	2.0260e-003	0.02
tblVehicleEF	LDT2	3.2470e-003	0.01
tblVehicleEF	LDT2	0.12	0.16
tblVehicleEF	LDT2	0.20	0.20
tblVehicleEF	LDT2	0.09	0.12

tblVehicleEF	LDT2	0.06	0.08
tblVehicleEF	LDT2	0.59	0.13
tblVehicleEF	LDT2	0.30	0.40
tblVehicleEF	LDT2	4.6300e-003	4.4000e-003
tblVehicleEF	LDT2	1.0660e-003	9.0000e-004
tblVehicleEF	LDT2	0.12	0.16
tblVehicleEF	LDT2	0.20	0.20
tblVehicleEF	LDT2	0.09	0.12
tblVehicleEF	LDT2	0.08	0.11
tblVehicleEF	LDT2	0.59	0.13
tblVehicleEF	LDT2	0.32	0.43
tblVehicleEF	LDT2	0.02	0.02
tblVehicleEF	LDT2	0.02	0.02
tblVehicleEF	LDT2	1.91	2.63
tblVehicleEF	LDT2	5.18	6.71
tblVehicleEF	LDT2	378.77	402.73
tblVehicleEF	LDT2	88.00	93.08
tblVehicleEF	LDT2	0.21	0.20
tblVehicleEF	LDT2	0.30	0.43
tblVehicleEF	LDT2	0.44	0.63
tblVehicleEF	LDT2	0.04	0.01
tblVehicleEF	LDT2	2.2050e-003	0.02
tblVehicleEF	LDT2	3.5240e-003	0.01
tblVehicleEF	LDT2	0.02	0.01
tblVehicleEF	LDT2	2.0000e-003	8.0000e-003
tblVehicleEF	LDT2	2.0260e-003	0.02
tblVehicleEF	LDT2	3.2470e-003	0.01
tblVehicleEF	LDT2	0.05	0.08

tblVehicleEF	LDT2	0.21	0.22
tblVehicleEF	LDT2	0.04	0.06
tblVehicleEF	LDT2	0.06	0.08
tblVehicleEF	LDT2	0.80	0.18
tblVehicleEF	LDT2	0.40	0.52
tblVehicleEF	LDT2	4.4110e-003	4.0000e-003
tblVehicleEF	LDT2	1.0950e-003	1.0000e-003
tblVehicleEF	LDT2	0.05	0.08
tblVehicleEF	LDT2	0.21	0.22
tblVehicleEF	LDT2	0.04	0.06
tblVehicleEF	LDT2	0.08	0.10
tblVehicleEF	LDT2	0.80	0.18
tblVehicleEF	LDT2	0.42	0.56
tblVehicleEF	LHD1	1.0610e-003	1.4000e-003
tblVehicleEF	LHD1	0.02	0.01
tblVehicleEF	LHD1	0.02	0.01
tblVehicleEF	LHD1	0.16	0.20
tblVehicleEF	LHD1	2.12	1.29
tblVehicleEF	LHD1	4.53	3.46
tblVehicleEF	LHD1	8.95	9.14
tblVehicleEF	LHD1	734.28	749.43
tblVehicleEF	LHD1	32.09	32.49
tblVehicleEF	LHD1	0.07	0.02
tblVehicleEF	LHD1	0.09	0.02
tblVehicleEF	LHD1	2.10	1.13
tblVehicleEF	LHD1	1.02	1.27
tblVehicleEF	LHD1	9.7000e-004	3.0000e-004
tblVehicleEF	LHD1	0.06	0.01

tblVehicleEF	LHD1	9.8670e-003	0.01
tblVehicleEF	LHD1	0.02	0.02
tblVehicleEF	LHD1	1.1260e-003	1.3000e-003
tblVehicleEF	LHD1	8.9300e-004	3.0000e-004
tblVehicleEF	LHD1	0.02	0.01
tblVehicleEF	LHD1	2.4670e-003	0.01
tblVehicleEF	LHD1	0.02	0.02
tblVehicleEF	LHD1	1.0360e-003	1.3000e-003
tblVehicleEF	LHD1	1.9670e-003	8.0000e-004
tblVehicleEF	LHD1	0.07	0.02
tblVehicleEF	LHD1	0.02	0.03
tblVehicleEF	LHD1	1.0220e-003	3.0000e-004
tblVehicleEF	LHD1	0.21	0.13
tblVehicleEF	LHD1	0.55	0.19
tblVehicleEF	LHD1	0.37	0.26
tblVehicleEF	LHD1	9.3000e-005	1.0000e-004
tblVehicleEF	LHD1	7.5180e-003	8.1000e-003
tblVehicleEF	LHD1	4.1500e-004	4.0000e-004
tblVehicleEF	LHD1	1.9670e-003	8.0000e-004
tblVehicleEF	LHD1	0.07	0.02
tblVehicleEF	LHD1	0.03	0.03
tblVehicleEF	LHD1	1.0220e-003	3.0000e-004
tblVehicleEF	LHD1	0.25	0.15
tblVehicleEF	LHD1	0.55	0.19
tblVehicleEF	LHD1	0.39	0.28
tblVehicleEF	LHD1	1.0610e-003	1.4000e-003
tblVehicleEF	LHD1	0.02	0.01
tblVehicleEF	LHD1	0.02	0.01

tblVehicleEF	LHD1	0.16	0.20
tblVehicleEF	LHD1	2.16	1.31
tblVehicleEF	LHD1	3.38	2.49
tblVehicleEF	LHD1	8.95	9.14
tblVehicleEF	LHD1	734.28	749.43
tblVehicleEF	LHD1	32.09	32.49
tblVehicleEF	LHD1	0.07	0.02
tblVehicleEF	LHD1	0.09	0.02
tblVehicleEF	LHD1	2.02	1.14
tblVehicleEF	LHD1	0.96	1.20
tblVehicleEF	LHD1	9.7000e-004	3.0000e-004
tblVehicleEF	LHD1	0.06	0.01
tblVehicleEF	LHD1	9.8670e-003	0.01
tblVehicleEF	LHD1	0.02	0.02
tblVehicleEF	LHD1	1.1260e-003	1.3000e-003
tblVehicleEF	LHD1	8.9300e-004	3.0000e-004
tblVehicleEF	LHD1	0.02	0.01
tblVehicleEF	LHD1	2.4670e-003	0.01
tblVehicleEF	LHD1	0.02	0.02
tblVehicleEF	LHD1	1.0360e-003	1.3000e-003
tblVehicleEF	LHD1	3.5500e-003	1.5000e-003
tblVehicleEF	LHD1	0.08	0.02
tblVehicleEF	LHD1	0.02	0.03
tblVehicleEF	LHD1	1.7730e-003	7.0000e-004
tblVehicleEF	LHD1	0.22	0.13
tblVehicleEF	LHD1	0.52	0.18
tblVehicleEF	LHD1	0.31	0.21
tblVehicleEF	LHD1	9.3000e-005	1.0000e-004

tblVehicleEF	LHD1	7.5190e-003	8.1000e-003
tblVehicleEF	LHD1	3.9500e-004	4.0000e-004
tblVehicleEF	LHD1	3.5500e-003	1.5000e-003
tblVehicleEF	LHD1	0.08	0.02
tblVehicleEF	LHD1	0.03	0.03
tblVehicleEF	LHD1	1.7730e-003	7.0000e-004
tblVehicleEF	LHD1	0.25	0.15
tblVehicleEF	LHD1	0.52	0.18
tblVehicleEF	LHD1	0.33	0.23
tblVehicleEF	LHD1	1.0610e-003	1.4000e-003
tblVehicleEF	LHD1	0.02	0.01
tblVehicleEF	LHD1	0.02	0.01
tblVehicleEF	LHD1	0.16	0.20
tblVehicleEF	LHD1	2.10	1.29
tblVehicleEF	LHD1	5.19	3.55
tblVehicleEF	LHD1	8.95	9.14
tblVehicleEF	LHD1	734.28	749.43
tblVehicleEF	LHD1	32.09	32.49
tblVehicleEF	LHD1	0.07	0.02
tblVehicleEF	LHD1	0.09	0.02
tblVehicleEF	LHD1	2.08	1.18
tblVehicleEF	LHD1	1.05	1.28
tblVehicleEF	LHD1	9.7000e-004	3.0000e-004
tblVehicleEF	LHD1	0.06	0.01
tblVehicleEF	LHD1	9.8670e-003	0.01
tblVehicleEF	LHD1	0.02	0.02
tblVehicleEF	LHD1	1.1260e-003	1.3000e-003
tblVehicleEF	LHD1	8.9300e-004	3.0000e-004

tblVehicleEF	LHD1	0.02	0.01
tblVehicleEF	LHD1	2.4670e-003	0.01
tblVehicleEF	LHD1	0.02	0.02
tblVehicleEF	LHD1	1.0360e-003	1.3000e-003
tblVehicleEF	LHD1	1.4260e-003	9.0000e-004
tblVehicleEF	LHD1	0.09	0.03
tblVehicleEF	LHD1	0.02	0.03
tblVehicleEF	LHD1	8.0000e-004	4.0000e-004
tblVehicleEF	LHD1	0.21	0.13
tblVehicleEF	LHD1	0.60	0.21
tblVehicleEF	LHD1	0.40	0.26
tblVehicleEF	LHD1	9.3000e-005	1.0000e-004
tblVehicleEF	LHD1	7.5180e-003	8.1000e-003
tblVehicleEF	LHD1	4.2600e-004	4.0000e-004
tblVehicleEF	LHD1	1.4260e-003	9.0000e-004
tblVehicleEF	LHD1	0.09	0.03
tblVehicleEF	LHD1	0.03	0.03
tblVehicleEF	LHD1	8.0000e-004	4.0000e-004
tblVehicleEF	LHD1	0.24	0.15
tblVehicleEF	LHD1	0.60	0.21
tblVehicleEF	LHD1	0.43	0.28
tblVehicleEF	LHD2	7.1200e-004	1.3000e-003
tblVehicleEF	LHD2	0.01	0.02
tblVehicleEF	LHD2	8.7140e-003	0.02
tblVehicleEF	LHD2	0.11	0.18
tblVehicleEF	LHD2	1.27	2.13
tblVehicleEF	LHD2	1.59	4.73
tblVehicleEF	LHD2	9.98	10.19

tblVehicleEF	LHD2	606.16	618.24
tblVehicleEF	LHD2	15.38	15.97
tblVehicleEF	LHD2	9.9440e-003	0.01
tblVehicleEF	LHD2	0.15	0.05
tblVehicleEF	LHD2	2.89	2.08
tblVehicleEF	LHD2	0.44	1.17
tblVehicleEF	LHD2	1.6310e-003	7.0000e-004
tblVehicleEF	LHD2	0.08	0.01
tblVehicleEF	LHD2	0.01	0.01
tblVehicleEF	LHD2	0.03	0.03
tblVehicleEF	LHD2	4.8300e-004	1.6000e-003
tblVehicleEF	LHD2	1.5000e-003	7.0000e-004
tblVehicleEF	LHD2	0.03	0.01
tblVehicleEF	LHD2	2.7620e-003	0.01
tblVehicleEF	LHD2	0.03	0.03
tblVehicleEF	LHD2	4.2600e-004	1.6000e-003
tblVehicleEF	LHD2	6.7300e-004	1.5000e-003
tblVehicleEF	LHD2	0.03	0.04
tblVehicleEF	LHD2	0.02	0.02
tblVehicleEF	LHD2	3.7200e-004	5.0000e-004
tblVehicleEF	LHD2	0.18	0.22
tblVehicleEF	LHD2	0.18	0.43
tblVehicleEF	LHD2	0.15	0.35
tblVehicleEF	LHD2	1.0100e-004	1.0000e-004
tblVehicleEF	LHD2	6.1050e-003	7.2000e-003
tblVehicleEF	LHD2	1.8900e-004	4.0000e-004
tblVehicleEF	LHD2	6.7300e-004	1.5000e-003
tblVehicleEF	LHD2	0.03	0.04

tblVehicleEF	LHD2	0.02	0.03
tblVehicleEF	LHD2	3.7200e-004	5.0000e-004
tblVehicleEF	LHD2	0.20	0.26
tblVehicleEF	LHD2	0.18	0.43
tblVehicleEF	LHD2	0.16	0.38
tblVehicleEF	LHD2	7.1200e-004	1.3000e-003
tblVehicleEF	LHD2	0.01	0.02
tblVehicleEF	LHD2	8.7140e-003	0.01
tblVehicleEF	LHD2	0.11	0.18
tblVehicleEF	LHD2	1.26	2.16
tblVehicleEF	LHD2	1.23	3.42
tblVehicleEF	LHD2	9.98	10.19
tblVehicleEF	LHD2	606.16	618.24
tblVehicleEF	LHD2	15.38	15.97
tblVehicleEF	LHD2	9.9440e-003	0.01
tblVehicleEF	LHD2	0.15	0.05
tblVehicleEF	LHD2	2.79	2.11
tblVehicleEF	LHD2	0.42	1.11
tblVehicleEF	LHD2	1.6310e-003	7.0000e-004
tblVehicleEF	LHD2	0.08	0.01
tblVehicleEF	LHD2	0.01	0.01
tblVehicleEF	LHD2	0.03	0.03
tblVehicleEF	LHD2	4.8300e-004	1.6000e-003
tblVehicleEF	LHD2	1.5000e-003	7.0000e-004
tblVehicleEF	LHD2	0.03	0.01
tblVehicleEF	LHD2	2.7620e-003	0.01
tblVehicleEF	LHD2	0.03	0.03
tblVehicleEF	LHD2	4.2600e-004	1.6000e-003

tblVehicleEF	LHD2	1.2110e-003	3.0000e-003
tblVehicleEF	LHD2	0.03	0.04
tblVehicleEF	LHD2	0.02	0.02
tblVehicleEF	LHD2	6.4800e-004	1.1000e-003
tblVehicleEF	LHD2	0.18	0.23
tblVehicleEF	LHD2	0.18	0.41
tblVehicleEF	LHD2	0.13	0.29
tblVehicleEF	LHD2	1.0100e-004	1.0000e-004
tblVehicleEF	LHD2	6.1050e-003	7.2000e-003
tblVehicleEF	LHD2	1.8200e-004	4.0000e-004
tblVehicleEF	LHD2	1.2110e-003	3.0000e-003
tblVehicleEF	LHD2	0.03	0.04
tblVehicleEF	LHD2	0.02	0.03
tblVehicleEF	LHD2	6.4800e-004	1.1000e-003
tblVehicleEF	LHD2	0.20	0.26
tblVehicleEF	LHD2	0.18	0.41
tblVehicleEF	LHD2	0.14	0.31
tblVehicleEF	LHD2	7.1200e-004	1.3000e-003
tblVehicleEF	LHD2	0.01	0.02
tblVehicleEF	LHD2	8.7140e-003	0.02
tblVehicleEF	LHD2	0.11	0.18
tblVehicleEF	LHD2	1.28	2.12
tblVehicleEF	LHD2	1.81	4.84
tblVehicleEF	LHD2	9.98	10.19
tblVehicleEF	LHD2	606.16	618.24
tblVehicleEF	LHD2	15.38	15.97
tblVehicleEF	LHD2	9.9440e-003	0.01
tblVehicleEF	LHD2	0.15	0.05

tblVehicleEF	LHD2	2.86	2.16
tblVehicleEF	LHD2	0.46	1.18
tblVehicleEF	LHD2	1.6310e-003	7.0000e-004
tblVehicleEF	LHD2	0.08	0.01
tblVehicleEF	LHD2	0.01	0.01
tblVehicleEF	LHD2	0.03	0.03
tblVehicleEF	LHD2	4.8300e-004	1.6000e-003
tblVehicleEF	LHD2	1.5000e-003	7.0000e-004
tblVehicleEF	LHD2	0.03	0.01
tblVehicleEF	LHD2	2.7620e-003	0.01
tblVehicleEF	LHD2	0.03	0.03
tblVehicleEF	LHD2	4.2600e-004	1.6000e-003
tblVehicleEF	LHD2	4.9000e-004	1.8000e-003
tblVehicleEF	LHD2	0.04	0.06
tblVehicleEF	LHD2	0.02	0.02
tblVehicleEF	LHD2	2.9000e-004	6.0000e-004
tblVehicleEF	LHD2	0.18	0.22
tblVehicleEF	LHD2	0.20	0.47
tblVehicleEF	LHD2	0.16	0.36
tblVehicleEF	LHD2	1.0100e-004	1.0000e-004
tblVehicleEF	LHD2	6.1050e-003	7.2000e-003
tblVehicleEF	LHD2	1.9300e-004	4.0000e-004
tblVehicleEF	LHD2	4.9000e-004	1.8000e-003
tblVehicleEF	LHD2	0.04	0.06
tblVehicleEF	LHD2	0.02	0.03
tblVehicleEF	LHD2	2.9000e-004	6.0000e-004
tblVehicleEF	LHD2	0.20	0.26
tblVehicleEF	LHD2	0.20	0.47

tblVehicleEF	LHD2	0.18	0.38
tblVehicleEF	MCY	0.00	0.21
tblVehicleEF	MCY	0.00	0.14
tblVehicleEF	MCY	27.88	29.50
tblVehicleEF	MCY	10.71	10.65
tblVehicleEF	MCY	148.32	145.57
tblVehicleEF	MCY	43.66	46.37
tblVehicleEF	MCY	8.7430e-003	0.01
tblVehicleEF	MCY	1.29	1.22
tblVehicleEF	MCY	0.32	0.31
tblVehicleEF	MCY	0.04	6.3000e-003
tblVehicleEF	MCY	8.0000e-003	4.0000e-003
tblVehicleEF	MCY	6.1000e-004	0.02
tblVehicleEF	MCY	1.9710e-003	0.01
tblVehicleEF	MCY	0.02	6.3000e-003
tblVehicleEF	MCY	2.0000e-003	4.0000e-003
tblVehicleEF	MCY	4.9300e-004	0.02
tblVehicleEF	MCY	1.5590e-003	0.01
tblVehicleEF	MCY	0.64	0.63
tblVehicleEF	MCY	0.44	0.32
tblVehicleEF	MCY	0.31	0.30
tblVehicleEF	MCY	2.74	2.80
tblVehicleEF	MCY	1.74	0.39
tblVehicleEF	MCY	2.32	2.33
tblVehicleEF	MCY	2.0610e-003	2.0000e-003
tblVehicleEF	MCY	6.9400e-004	7.0000e-004
tblVehicleEF	MCY	0.64	0.63
tblVehicleEF	MCY	0.44	0.32

tblVehicleEF	MCY	0.31	0.30
tblVehicleEF	MCY	2.99	3.05
tblVehicleEF	MCY	1.74	0.39
tblVehicleEF	MCY	2.50	2.50
tblVehicleEF	MCY	0.00	0.21
tblVehicleEF	MCY	0.00	0.12
tblVehicleEF	MCY	25.97	27.70
tblVehicleEF	MCY	9.10	8.95
tblVehicleEF	MCY	148.32	145.57
tblVehicleEF	MCY	43.66	46.37
tblVehicleEF	MCY	8.7430e-003	0.01
tblVehicleEF	MCY	1.16	1.19
tblVehicleEF	MCY	0.30	0.29
tblVehicleEF	MCY	0.04	6.3000e-003
tblVehicleEF	MCY	8.0000e-003	4.0000e-003
tblVehicleEF	MCY	6.1000e-004	0.02
tblVehicleEF	MCY	1.9710e-003	0.01
tblVehicleEF	MCY	0.02	6.3000e-003
tblVehicleEF	MCY	2.0000e-003	4.0000e-003
tblVehicleEF	MCY	4.9300e-004	0.02
tblVehicleEF	MCY	1.5590e-003	0.01
tblVehicleEF	MCY	1.26	1.34
tblVehicleEF	MCY	0.49	0.40
tblVehicleEF	MCY	0.67	0.86
tblVehicleEF	MCY	2.62	2.67
tblVehicleEF	MCY	1.57	0.36
tblVehicleEF	MCY	1.95	1.91
tblVehicleEF	MCY	2.0270e-003	1.9000e-003

tblVehicleEF	MCY	6.5700e-004	6.0000e-004
tblVehicleEF	MCY	1.26	1.34
tblVehicleEF	MCY	0.49	0.40
tblVehicleEF	MCY	0.67	0.86
tblVehicleEF	MCY	2.87	2.92
tblVehicleEF	MCY	1.57	0.36
tblVehicleEF	MCY	2.09	2.06
tblVehicleEF	MCY	0.00	0.21
tblVehicleEF	MCY	0.00	0.15
tblVehicleEF	MCY	29.20	29.74
tblVehicleEF	MCY	11.60	10.76
tblVehicleEF	MCY	148.32	145.57
tblVehicleEF	MCY	43.66	46.37
tblVehicleEF	MCY	8.7430e-003	0.01
tblVehicleEF	MCY	1.30	1.31
tblVehicleEF	MCY	0.33	0.31
tblVehicleEF	MCY	0.04	6.3000e-003
tblVehicleEF	MCY	8.0000e-003	4.0000e-003
tblVehicleEF	MCY	6.1000e-004	0.02
tblVehicleEF	MCY	1.9710e-003	0.01
tblVehicleEF	MCY	0.02	6.3000e-003
tblVehicleEF	MCY	2.0000e-003	4.0000e-003
tblVehicleEF	MCY	4.9300e-004	0.02
tblVehicleEF	MCY	1.5590e-003	0.01
tblVehicleEF	MCY	0.47	0.74
tblVehicleEF	MCY	0.57	0.49
tblVehicleEF	MCY	0.21	0.36
tblVehicleEF	MCY	2.81	2.81

tblVehicleEF	MCY	2.07	0.47
tblVehicleEF	MCY	2.53	2.36
tblVehicleEF	MCY	2.0830e-003	2.0000e-003
tblVehicleEF	MCY	7.1400e-004	7.0000e-004
tblVehicleEF	MCY	0.47	0.74
tblVehicleEF	MCY	0.57	0.49
tblVehicleEF	MCY	0.21	0.36
tblVehicleEF	MCY	3.07	3.07
tblVehicleEF	MCY	2.07	0.47
tblVehicleEF	MCY	2.72	2.53
tblVehicleEF	MDV	0.03	0.03
tblVehicleEF	MDV	0.03	0.03
tblVehicleEF	MDV	2.64	2.80
tblVehicleEF	MDV	7.05	7.31
tblVehicleEF	MDV	500.81	526.05
tblVehicleEF	MDV	114.79	119.65
tblVehicleEF	MDV	0.15	0.08
tblVehicleEF	MDV	0.44	0.44
tblVehicleEF	MDV	0.71	0.76
tblVehicleEF	MDV	0.04	0.01
tblVehicleEF	MDV	2.2910e-003	0.02
tblVehicleEF	MDV	3.9310e-003	0.01
tblVehicleEF	MDV	0.02	0.01
tblVehicleEF	MDV	2.0000e-003	8.0000e-003
tblVehicleEF	MDV	2.1040e-003	0.02
tblVehicleEF	MDV	3.6200e-003	0.01
tblVehicleEF	MDV	0.07	0.06
tblVehicleEF	MDV	0.22	0.15

tblVehicleEF	MDV	0.06	0.05
tblVehicleEF	MDV	0.08	0.08
tblVehicleEF	MDV	0.75	0.12
tblVehicleEF	MDV	0.61	0.63
tblVehicleEF	MDV	5.6360e-003	5.6000e-003
tblVehicleEF	MDV	1.3890e-003	1.3000e-003
tblVehicleEF	MDV	0.07	0.06
tblVehicleEF	MDV	0.22	0.15
tblVehicleEF	MDV	0.06	0.05
tblVehicleEF	MDV	0.11	0.12
tblVehicleEF	MDV	0.75	0.12
tblVehicleEF	MDV	0.66	0.68
tblVehicleEF	MDV	0.03	0.03
tblVehicleEF	MDV	0.03	0.02
tblVehicleEF	MDV	2.78	3.02
tblVehicleEF	MDV	5.36	5.31
tblVehicleEF	MDV	521.03	547.18
tblVehicleEF	MDV	114.79	119.65
tblVehicleEF	MDV	0.15	0.08
tblVehicleEF	MDV	0.40	0.43
tblVehicleEF	MDV	0.65	0.69
tblVehicleEF	MDV	0.04	0.01
tblVehicleEF	MDV	2.2910e-003	0.02
tblVehicleEF	MDV	3.9310e-003	0.01
tblVehicleEF	MDV	0.02	0.01
tblVehicleEF	MDV	2.0000e-003	8.0000e-003
tblVehicleEF	MDV	2.1040e-003	0.02
tblVehicleEF	MDV	3.6200e-003	0.01

tblVehicleEF	MDV	0.13	0.13
tblVehicleEF	MDV	0.23	0.17
tblVehicleEF	MDV	0.11	0.11
tblVehicleEF	MDV	0.09	0.09
tblVehicleEF	MDV	0.68	0.11
tblVehicleEF	MDV	0.50	0.50
tblVehicleEF	MDV	5.8660e-003	5.9000e-003
tblVehicleEF	MDV	1.3590e-003	1.3000e-003
tblVehicleEF	MDV	0.13	0.13
tblVehicleEF	MDV	0.23	0.17
tblVehicleEF	MDV	0.11	0.11
tblVehicleEF	MDV	0.12	0.12
tblVehicleEF	MDV	0.68	0.11
tblVehicleEF	MDV	0.54	0.53
tblVehicleEF	MDV	0.03	0.03
tblVehicleEF	MDV	0.03	0.03
tblVehicleEF	MDV	2.63	2.73
tblVehicleEF	MDV	7.87	7.49
tblVehicleEF	MDV	496.78	521.84
tblVehicleEF	MDV	114.79	119.65
tblVehicleEF	MDV	0.15	0.08
tblVehicleEF	MDV	0.45	0.47
tblVehicleEF	MDV	0.74	0.77
tblVehicleEF	MDV	0.04	0.01
tblVehicleEF	MDV	2.2910e-003	0.02
tblVehicleEF	MDV	3.9310e-003	0.01
tblVehicleEF	MDV	0.02	0.01
tblVehicleEF	MDV	2.0000e-003	8.0000e-003

tblVehicleEF	MDV	2.1040e-003	0.02
tblVehicleEF	MDV	3.6200e-003	0.01
tblVehicleEF	MDV	0.06	0.06
tblVehicleEF	MDV	0.24	0.19
tblVehicleEF	MDV	0.05	0.05
tblVehicleEF	MDV	0.08	0.08
tblVehicleEF	MDV	0.90	0.14
tblVehicleEF	MDV	0.67	0.64
tblVehicleEF	MDV	5.5910e-003	5.4000e-003
tblVehicleEF	MDV	1.4040e-003	1.3000e-003
tblVehicleEF	MDV	0.06	0.06
tblVehicleEF	MDV	0.24	0.19
tblVehicleEF	MDV	0.05	0.05
tblVehicleEF	MDV	0.11	0.12
tblVehicleEF	MDV	0.90	0.14
tblVehicleEF	MDV	0.72	0.69
tblVehicleEF	MH	0.00	0.04
tblVehicleEF	MH	0.00	0.04
tblVehicleEF	MH	4.83	7.96
tblVehicleEF	MH	10.13	14.05
tblVehicleEF	MH	749.06	765.34
tblVehicleEF	MH	30.29	32.30
tblVehicleEF	MH	4.6800e-003	5.7690e-003
tblVehicleEF	MH	2.05	1.78
tblVehicleEF	MH	0.89	1.14
tblVehicleEF	MH	0.05	0.01
tblVehicleEF	MH	8.6990e-003	0.01
tblVehicleEF	MH	0.04	0.01

tblVehicleEF	MH	1.5180e-003	8.0000e-004
tblVehicleEF	MH	0.02	0.01
tblVehicleEF	MH	2.1750e-003	0.01
tblVehicleEF	MH	0.03	0.01
tblVehicleEF	MH	1.3330e-003	8.0000e-004
tblVehicleEF	MH	0.98	1.25
tblVehicleEF	MH	0.08	0.09
tblVehicleEF	MH	0.38	0.47
tblVehicleEF	MH	0.19	0.29
tblVehicleEF	MH	2.20	0.02
tblVehicleEF	MH	0.58	0.80
tblVehicleEF	MH	7.7360e-003	7.6000e-003
tblVehicleEF	MH	4.9100e-004	6.0000e-004
tblVehicleEF	MH	0.98	1.25
tblVehicleEF	MH	0.08	0.09
tblVehicleEF	MH	0.38	0.47
tblVehicleEF	MH	0.23	0.33
tblVehicleEF	MH	2.20	0.02
tblVehicleEF	MH	0.62	0.86
tblVehicleEF	MH	0.00	0.04
tblVehicleEF	MH	0.00	0.03
tblVehicleEF	MH	4.88	8.11
tblVehicleEF	MH	7.34	9.74
tblVehicleEF	MH	749.05	765.34
tblVehicleEF	MH	30.29	32.30
tblVehicleEF	MH	4.6800e-003	5.7690e-003
tblVehicleEF	MH	1.93	1.78
tblVehicleEF	MH	0.84	1.07

tblVehicleEF	MH	0.05	0.01
tblVehicleEF	MH	8.6990e-003	0.01
tblVehicleEF	MH	0.04	0.01
tblVehicleEF	MH	1.5180e-003	8.0000e-004
tblVehicleEF	MH	0.02	0.01
tblVehicleEF	MH	2.1750e-003	0.01
tblVehicleEF	MH	0.03	0.01
tblVehicleEF	MH	1.3330e-003	8.0000e-004
tblVehicleEF	MH	1.74	2.35
tblVehicleEF	MH	0.08	0.09
tblVehicleEF	MH	0.62	0.93
tblVehicleEF	MH	0.19	0.30
tblVehicleEF	MH	2.12	0.02
tblVehicleEF	MH	0.46	0.61
tblVehicleEF	MH	7.7360e-003	7.6000e-003
tblVehicleEF	MH	4.4300e-004	5.0000e-004
tblVehicleEF	MH	1.74	2.35
tblVehicleEF	MH	0.08	0.09
tblVehicleEF	MH	0.62	0.93
tblVehicleEF	MH	0.23	0.34
tblVehicleEF	MH	2.12	0.02
tblVehicleEF	MH	0.49	0.65
tblVehicleEF	MH	0.00	0.04
tblVehicleEF	MH	0.00	0.04
tblVehicleEF	MH	4.83	7.94
tblVehicleEF	MH	11.74	14.25
tblVehicleEF	MH	749.05	765.34
tblVehicleEF	MH	30.29	32.30

tblVehicleEF	MH	4.6800e-003	5.7690e-003
tblVehicleEF	MH	2.04	1.89
tblVehicleEF	MH	0.92	1.14
tblVehicleEF	MH	0.05	0.01
tblVehicleEF	MH	8.6990e-003	0.01
tblVehicleEF	MH	0.04	0.01
tblVehicleEF	MH	1.5180e-003	8.0000e-004
tblVehicleEF	MH	0.02	0.01
tblVehicleEF	MH	2.1750e-003	0.01
tblVehicleEF	MH	0.03	0.01
tblVehicleEF	MH	1.3330e-003	8.0000e-004
tblVehicleEF	MH	0.74	1.42
tblVehicleEF	MH	0.11	0.13
tblVehicleEF	MH	0.31	0.62
tblVehicleEF	MH	0.19	0.29
tblVehicleEF	MH	2.34	0.02
tblVehicleEF	MH	0.65	0.81
tblVehicleEF	MH	7.7360e-003	7.6000e-003
tblVehicleEF	MH	5.1800e-004	6.0000e-004
tblVehicleEF	MH	0.74	1.42
tblVehicleEF	MH	0.11	0.13
tblVehicleEF	MH	0.31	0.62
tblVehicleEF	MH	0.23	0.33
tblVehicleEF	MH	2.34	0.02
tblVehicleEF	MH	0.70	0.87
tblVehicleEF	MHD	8.1280e-003	9.0000e-004
tblVehicleEF	MHD	8.6090e-003	0.01
tblVehicleEF	MHD	0.00	0.03

tblVehicleEF	MHD	1.88	0.14
tblVehicleEF	MHD	1.33	2.83
tblVehicleEF	MHD	25.00	8.38
tblVehicleEF	MHD	603.24	599.64
tblVehicleEF	MHD	1,078.06	1,105.07
tblVehicleEF	MHD	60.03	66.47
tblVehicleEF	MHD	0.02	0.01
tblVehicleEF	MHD	6.58	0.17
tblVehicleEF	MHD	3.99	4.92
tblVehicleEF	MHD	2.04	0.70
tblVehicleEF	MHD	0.03	2.3000e-003
tblVehicleEF	MHD	0.12	0.01
tblVehicleEF	MHD	0.01	0.01
tblVehicleEF	MHD	0.10	0.16
tblVehicleEF	MHD	4.5390e-003	1.3000e-003
tblVehicleEF	MHD	0.03	2.3000e-003
tblVehicleEF	MHD	0.05	0.01
tblVehicleEF	MHD	2.8530e-003	0.01
tblVehicleEF	MHD	0.09	0.16
tblVehicleEF	MHD	3.8250e-003	1.3000e-003
tblVehicleEF	MHD	3.3460e-003	1.0000e-003
tblVehicleEF	MHD	0.17	0.02
tblVehicleEF	MHD	0.17	0.02
tblVehicleEF	MHD	1.7640e-003	4.0000e-004
tblVehicleEF	MHD	0.22	0.21
tblVehicleEF	MHD	0.72	0.19
tblVehicleEF	MHD	1.65	0.63
tblVehicleEF	MHD	5.9640e-003	1.0000e-004

tblVehicleEF	MHD	0.01	0.01
tblVehicleEF	MHD	1.0660e-003	3.0000e-004
tblVehicleEF	MHD	3.3460e-003	1.0000e-003
tblVehicleEF	MHD	0.17	0.02
tblVehicleEF	MHD	0.20	0.02
tblVehicleEF	MHD	1.7640e-003	4.0000e-004
tblVehicleEF	MHD	0.25	0.24
tblVehicleEF	MHD	0.72	0.19
tblVehicleEF	MHD	1.77	0.68
tblVehicleEF	MHD	7.6600e-003	9.0000e-004
tblVehicleEF	MHD	8.6090e-003	0.01
tblVehicleEF	MHD	0.00	0.03
tblVehicleEF	MHD	1.36	0.14
tblVehicleEF	MHD	1.33	2.83
tblVehicleEF	MHD	18.92	6.33
tblVehicleEF	MHD	639.07	635.27
tblVehicleEF	MHD	1,078.06	1,105.07
tblVehicleEF	MHD	60.03	66.47
tblVehicleEF	MHD	0.02	0.01
tblVehicleEF	MHD	6.79	0.17
tblVehicleEF	MHD	3.84	5.00
tblVehicleEF	MHD	1.93	0.66
tblVehicleEF	MHD	0.03	2.3000e-003
tblVehicleEF	MHD	0.12	0.01
tblVehicleEF	MHD	0.01	0.01
tblVehicleEF	MHD	0.10	0.16
tblVehicleEF	MHD	4.5390e-003	1.3000e-003
tblVehicleEF	MHD	0.02	2.3000e-003

tblVehicleEF	MHD	0.05	0.01
tblVehicleEF	MHD	2.8530e-003	0.01
tblVehicleEF	MHD	0.09	0.16
tblVehicleEF	MHD	3.8250e-003	1.3000e-003
tblVehicleEF	MHD	6.2420e-003	1.9000e-003
tblVehicleEF	MHD	0.18	0.02
tblVehicleEF	MHD	0.16	0.02
tblVehicleEF	MHD	3.2020e-003	8.0000e-004
tblVehicleEF	MHD	0.22	0.21
tblVehicleEF	MHD	0.69	0.19
tblVehicleEF	MHD	1.33	0.49
tblVehicleEF	MHD	6.3180e-003	1.0000e-004
tblVehicleEF	MHD	0.01	0.01
tblVehicleEF	MHD	9.6000e-004	3.0000e-004
tblVehicleEF	MHD	6.2420e-003	1.9000e-003
tblVehicleEF	MHD	0.18	0.02
tblVehicleEF	MHD	0.19	0.02
tblVehicleEF	MHD	3.2020e-003	8.0000e-004
tblVehicleEF	MHD	0.25	0.24
tblVehicleEF	MHD	0.69	0.19
tblVehicleEF	MHD	1.43	0.53
tblVehicleEF	MHD	8.7750e-003	9.0000e-004
tblVehicleEF	MHD	8.6090e-003	0.01
tblVehicleEF	MHD	0.00	0.04
tblVehicleEF	MHD	2.58	0.14
tblVehicleEF	MHD	1.33	2.83
tblVehicleEF	MHD	28.52	8.49
tblVehicleEF	MHD	553.74	550.44

tblVehicleEF	MHD	1,078.06	1,105.07
tblVehicleEF	MHD	60.03	66.47
tblVehicleEF	MHD	0.02	0.01
tblVehicleEF	MHD	6.28	0.17
tblVehicleEF	MHD	3.95	5.13
tblVehicleEF	MHD	2.11	0.70
tblVehicleEF	MHD	0.04	2.3000e-003
tblVehicleEF	MHD	0.12	0.01
tblVehicleEF	MHD	0.01	0.01
tblVehicleEF	MHD	0.10	0.16
tblVehicleEF	MHD	4.5390e-003	1.3000e-003
tblVehicleEF	MHD	0.03	2.3000e-003
tblVehicleEF	MHD	0.05	0.01
tblVehicleEF	MHD	2.8530e-003	0.01
tblVehicleEF	MHD	0.09	0.16
tblVehicleEF	MHD	3.8250e-003	1.3000e-003
tblVehicleEF	MHD	2.3550e-003	1.1000e-003
tblVehicleEF	MHD	0.21	0.03
tblVehicleEF	MHD	0.19	0.02
tblVehicleEF	MHD	1.3640e-003	5.0000e-004
tblVehicleEF	MHD	0.22	0.21
tblVehicleEF	MHD	0.79	0.20
tblVehicleEF	MHD	1.84	0.64
tblVehicleEF	MHD	5.4750e-003	1.0000e-004
tblVehicleEF	MHD	0.01	0.01
tblVehicleEF	MHD	1.1270e-003	3.0000e-004
tblVehicleEF	MHD	2.3550e-003	1.1000e-003
tblVehicleEF	MHD	0.21	0.03

tblVehicleEF	MHD	0.22	0.02
tblVehicleEF	MHD	1.3640e-003	5.0000e-004
tblVehicleEF	MHD	0.25	0.24
tblVehicleEF	MHD	0.79	0.20
tblVehicleEF	MHD	1.97	0.69
tblVehicleEF	OBUS	0.02	1.2000e-003
tblVehicleEF	OBUS	2.9060e-003	0.03
tblVehicleEF	OBUS	0.00	0.05
tblVehicleEF	OBUS	2.36	0.18
tblVehicleEF	OBUS	2.00	4.39
tblVehicleEF	OBUS	13.66	14.42
tblVehicleEF	OBUS	571.35	573.90
tblVehicleEF	OBUS	1,072.43	1,087.06
tblVehicleEF	OBUS	35.51	37.41
tblVehicleEF	OBUS	2.3300e-003	1.2000e-003
tblVehicleEF	OBUS	5.94	0.11
tblVehicleEF	OBUS	4.02	4.02
tblVehicleEF	OBUS	1.74	1.73
tblVehicleEF	OBUS	0.02	1.4000e-003
tblVehicleEF	OBUS	0.09	0.01
tblVehicleEF	OBUS	0.01	0.01
tblVehicleEF	OBUS	0.05	0.11
tblVehicleEF	OBUS	9.3700e-004	2.5000e-003
tblVehicleEF	OBUS	0.02	1.4000e-003
tblVehicleEF	OBUS	0.04	0.01
tblVehicleEF	OBUS	2.5410e-003	0.01
tblVehicleEF	OBUS	0.04	0.11
tblVehicleEF	OBUS	8.4800e-004	2.5000e-003

tblVehicleEF	OBUS	7.2000e-004	8.0000e-004
tblVehicleEF	OBUS	0.03	0.02
tblVehicleEF	OBUS	0.41	0.02
tblVehicleEF	OBUS	3.5900e-004	4.0000e-004
tblVehicleEF	OBUS	0.20	0.27
tblVehicleEF	OBUS	0.27	0.25
tblVehicleEF	OBUS	0.79	0.86
tblVehicleEF	OBUS	5.6490e-003	1.0000e-004
tblVehicleEF	OBUS	0.01	0.01
tblVehicleEF	OBUS	6.0700e-004	5.0000e-004
tblVehicleEF	OBUS	7.2000e-004	8.0000e-004
tblVehicleEF	OBUS	0.03	0.02
tblVehicleEF	OBUS	0.47	0.03
tblVehicleEF	OBUS	3.5900e-004	4.0000e-004
tblVehicleEF	OBUS	0.23	0.32
tblVehicleEF	OBUS	0.27	0.25
tblVehicleEF	OBUS	0.84	0.92
tblVehicleEF	OBUS	0.02	1.2000e-003
tblVehicleEF	OBUS	2.9060e-003	0.03
tblVehicleEF	OBUS	0.00	0.04
tblVehicleEF	OBUS	1.72	0.18
tblVehicleEF	OBUS	2.04	4.47
tblVehicleEF	OBUS	10.18	10.64
tblVehicleEF	OBUS	605.30	607.99
tblVehicleEF	OBUS	1,072.43	1,087.06
tblVehicleEF	OBUS	35.51	37.41
tblVehicleEF	OBUS	2.3300e-003	1.2000e-003
tblVehicleEF	OBUS	6.13	0.11

tblVehicleEF	OBUS	3.86	4.07
tblVehicleEF	OBUS	1.64	1.63
tblVehicleEF	OBUS	0.02	1.4000e-003
tblVehicleEF	OBUS	0.09	0.01
tblVehicleEF	OBUS	0.01	0.01
tblVehicleEF	OBUS	0.05	0.11
tblVehicleEF	OBUS	9.3700e-004	2.5000e-003
tblVehicleEF	OBUS	0.01	1.4000e-003
tblVehicleEF	OBUS	0.04	0.01
tblVehicleEF	OBUS	2.5410e-003	0.01
tblVehicleEF	OBUS	0.04	0.11
tblVehicleEF	OBUS	8.4800e-004	2.5000e-003
tblVehicleEF	OBUS	1.2640e-003	1.6000e-003
tblVehicleEF	OBUS	0.03	0.02
tblVehicleEF	OBUS	0.39	0.02
tblVehicleEF	OBUS	6.0400e-004	8.0000e-004
tblVehicleEF	OBUS	0.20	0.28
tblVehicleEF	OBUS	0.26	0.25
tblVehicleEF	OBUS	0.66	0.70
tblVehicleEF	OBUS	5.9840e-003	1.0000e-004
tblVehicleEF	OBUS	0.01	0.01
tblVehicleEF	OBUS	5.4800e-004	4.0000e-004
tblVehicleEF	OBUS	1.2640e-003	1.6000e-003
tblVehicleEF	OBUS	0.03	0.02
tblVehicleEF	OBUS	0.44	0.03
tblVehicleEF	OBUS	6.0400e-004	8.0000e-004
tblVehicleEF	OBUS	0.23	0.33
tblVehicleEF	OBUS	0.26	0.25

tblVehicleEF	OBUS	0.71	0.75
tblVehicleEF	OBUS	0.02	1.2000e-003
tblVehicleEF	OBUS	2.9060e-003	0.03
tblVehicleEF	OBUS	0.00	0.05
tblVehicleEF	OBUS	3.26	0.18
tblVehicleEF	OBUS	1.98	4.38
tblVehicleEF	OBUS	15.66	14.64
tblVehicleEF	OBUS	524.48	526.81
tblVehicleEF	OBUS	1,072.43	1,087.06
tblVehicleEF	OBUS	35.51	37.41
tblVehicleEF	OBUS	2.3300e-003	1.2000e-003
tblVehicleEF	OBUS	5.67	0.11
tblVehicleEF	OBUS	3.99	4.23
tblVehicleEF	OBUS	1.79	1.74
tblVehicleEF	OBUS	0.02	1.4000e-003
tblVehicleEF	OBUS	0.09	0.01
tblVehicleEF	OBUS	0.01	0.01
tblVehicleEF	OBUS	0.05	0.11
tblVehicleEF	OBUS	9.3700e-004	2.5000e-003
tblVehicleEF	OBUS	0.02	1.4000e-003
tblVehicleEF	OBUS	0.04	0.01
tblVehicleEF	OBUS	2.5410e-003	0.01
tblVehicleEF	OBUS	0.04	0.11
tblVehicleEF	OBUS	8.4800e-004	2.5000e-003
tblVehicleEF	OBUS	5.4700e-004	9.0000e-004
tblVehicleEF	OBUS	0.03	0.03
tblVehicleEF	OBUS	0.45	0.02
tblVehicleEF	OBUS	2.8700e-004	5.0000e-004

tblVehicleEF	OBUS	0.20	0.27
tblVehicleEF	OBUS	0.30	0.27
tblVehicleEF	OBUS	0.86	0.87
tblVehicleEF	OBUS	5.1850e-003	1.0000e-004
tblVehicleEF	OBUS	0.01	0.01
tblVehicleEF	OBUS	6.4000e-004	5.0000e-004
tblVehicleEF	OBUS	5.4700e-004	9.0000e-004
tblVehicleEF	OBUS	0.03	0.03
tblVehicleEF	OBUS	0.51	0.03
tblVehicleEF	OBUS	2.8700e-004	5.0000e-004
tblVehicleEF	OBUS	0.23	0.32
tblVehicleEF	OBUS	0.30	0.27
tblVehicleEF	OBUS	0.92	0.93
tblVehicleEF	SBUS	5.4360e-003	0.03
tblVehicleEF	SBUS	6.8750e-003	0.03
tblVehicleEF	SBUS	0.00	0.03
tblVehicleEF	SBUS	1.06	6.26
tblVehicleEF	SBUS	5.99	6.52
tblVehicleEF	SBUS	45.40	10.00
tblVehicleEF	SBUS	570.82	581.72
tblVehicleEF	SBUS	1,072.05	1,095.57
tblVehicleEF	SBUS	127.47	132.36
tblVehicleEF	SBUS	8.5500e-004	1.1560e-003
tblVehicleEF	SBUS	8.09	8.05
tblVehicleEF	SBUS	7.99	8.56
tblVehicleEF	SBUS	3.73	0.78
tblVehicleEF	SBUS	0.03	0.11
tblVehicleEF	SBUS	0.51	0.01

tblVehicleEF	SBUS	0.01	0.01
tblVehicleEF	SBUS	0.08	0.34
tblVehicleEF	SBUS	6.7140e-003	1.6000e-003
tblVehicleEF	SBUS	0.02	0.11
tblVehicleEF	SBUS	0.22	0.01
tblVehicleEF	SBUS	2.6630e-003	0.01
tblVehicleEF	SBUS	0.07	0.34
tblVehicleEF	SBUS	5.8740e-003	1.6000e-003
tblVehicleEF	SBUS	0.03	6.5000e-003
tblVehicleEF	SBUS	0.31	0.05
tblVehicleEF	SBUS	0.12	0.90
tblVehicleEF	SBUS	0.01	2.4000e-003
tblVehicleEF	SBUS	0.47	0.49
tblVehicleEF	SBUS	2.73	0.06
tblVehicleEF	SBUS	2.87	0.66
tblVehicleEF	SBUS	5.6430e-003	5.4000e-003
tblVehicleEF	SBUS	0.01	0.01
tblVehicleEF	SBUS	2.1220e-003	4.0000e-004
tblVehicleEF	SBUS	0.03	6.5000e-003
tblVehicleEF	SBUS	0.31	0.05
tblVehicleEF	SBUS	0.13	0.98
tblVehicleEF	SBUS	0.01	2.4000e-003
tblVehicleEF	SBUS	0.53	0.56
tblVehicleEF	SBUS	2.73	0.06
tblVehicleEF	SBUS	3.07	0.71
tblVehicleEF	SBUS	5.1230e-003	0.03
tblVehicleEF	SBUS	6.8750e-003	0.03
tblVehicleEF	SBUS	0.00	0.03

tblVehicleEF	SBUS	0.77	6.26
tblVehicleEF	SBUS	5.90	6.44
tblVehicleEF	SBUS	37.84	8.17
tblVehicleEF	SBUS	604.73	616.28
tblVehicleEF	SBUS	1,072.05	1,095.57
tblVehicleEF	SBUS	127.47	132.36
tblVehicleEF	SBUS	8.5500e-004	1.1560e-003
tblVehicleEF	SBUS	8.35	8.05
tblVehicleEF	SBUS	7.67	8.70
tblVehicleEF	SBUS	3.51	0.73
tblVehicleEF	SBUS	0.02	0.11
tblVehicleEF	SBUS	0.51	0.01
tblVehicleEF	SBUS	0.01	0.01
tblVehicleEF	SBUS	0.08	0.34
tblVehicleEF	SBUS	6.7140e-003	1.6000e-003
tblVehicleEF	SBUS	0.02	0.11
tblVehicleEF	SBUS	0.22	0.01
tblVehicleEF	SBUS	2.6630e-003	0.01
tblVehicleEF	SBUS	0.07	0.34
tblVehicleEF	SBUS	5.8740e-003	1.6000e-003
tblVehicleEF	SBUS	0.05	0.01
tblVehicleEF	SBUS	0.31	0.06
tblVehicleEF	SBUS	0.11	0.90
tblVehicleEF	SBUS	0.02	5.0000e-003
tblVehicleEF	SBUS	0.47	0.49
tblVehicleEF	SBUS	2.35	0.05
tblVehicleEF	SBUS	2.53	0.57
tblVehicleEF	SBUS	5.9790e-003	5.4000e-003

tblVehicleEF	SBUS	0.01	0.01
tblVehicleEF	SBUS	1.9930e-003	4.0000e-004
tblVehicleEF	SBUS	0.05	0.01
tblVehicleEF	SBUS	0.31	0.06
tblVehicleEF	SBUS	0.13	0.98
tblVehicleEF	SBUS	0.02	5.0000e-003
tblVehicleEF	SBUS	0.53	0.56
tblVehicleEF	SBUS	2.35	0.05
tblVehicleEF	SBUS	2.70	0.61
tblVehicleEF	SBUS	5.8680e-003	0.03
tblVehicleEF	SBUS	6.8750e-003	0.03
tblVehicleEF	SBUS	0.00	0.04
tblVehicleEF	SBUS	1.46	6.26
tblVehicleEF	SBUS	6.06	6.54
tblVehicleEF	SBUS	49.32	10.37
tblVehicleEF	SBUS	523.99	533.99
tblVehicleEF	SBUS	1,072.05	1,095.57
tblVehicleEF	SBUS	127.47	132.36
tblVehicleEF	SBUS	8.5500e-004	1.1560e-003
tblVehicleEF	SBUS	7.73	8.05
tblVehicleEF	SBUS	7.94	8.90
tblVehicleEF	SBUS	3.83	0.80
tblVehicleEF	SBUS	0.03	0.11
tblVehicleEF	SBUS	0.51	0.01
tblVehicleEF	SBUS	0.01	0.01
tblVehicleEF	SBUS	0.08	0.34
tblVehicleEF	SBUS	6.7140e-003	1.6000e-003
tblVehicleEF	SBUS	0.03	0.11

tblVehicleEF	SBUS	0.22	0.01
tblVehicleEF	SBUS	2.6630e-003	0.01
tblVehicleEF	SBUS	0.07	0.34
tblVehicleEF	SBUS	5.8740e-003	1.6000e-003
tblVehicleEF	SBUS	0.02	7.5000e-003
tblVehicleEF	SBUS	0.38	0.07
tblVehicleEF	SBUS	0.13	0.90
tblVehicleEF	SBUS	8.6780e-003	3.1000e-003
tblVehicleEF	SBUS	0.47	0.49
tblVehicleEF	SBUS	3.41	0.08
tblVehicleEF	SBUS	3.04	0.68
tblVehicleEF	SBUS	5.1800e-003	5.4000e-003
tblVehicleEF	SBUS	0.01	0.01
tblVehicleEF	SBUS	2.1890e-003	4.0000e-004
tblVehicleEF	SBUS	0.02	7.5000e-003
tblVehicleEF	SBUS	0.38	0.07
tblVehicleEF	SBUS	0.14	0.98
tblVehicleEF	SBUS	8.6780e-003	3.1000e-003
tblVehicleEF	SBUS	0.53	0.56
tblVehicleEF	SBUS	3.41	0.08
tblVehicleEF	SBUS	3.25	0.72
tblVehicleEF	UBUS	0.00	0.04
tblVehicleEF	UBUS	0.00	0.06
tblVehicleEF	UBUS	3.37	4.00
tblVehicleEF	UBUS	7.19	14.10
tblVehicleEF	UBUS	2,084.88	2,140.27
tblVehicleEF	UBUS	31.79	32.45
tblVehicleEF	UBUS	1.4010e-003	1.1900e-003

tblVehicleEF	UBUS	11.28	9.20
tblVehicleEF	UBUS	0.92	1.87
tblVehicleEF	UBUS	0.66	0.01
tblVehicleEF	UBUS	8.0000e-003	9.6000e-003
tblVehicleEF	UBUS	0.21	0.15
tblVehicleEF	UBUS	3.8100e-004	4.8000e-003
tblVehicleEF	UBUS	0.28	0.01
tblVehicleEF	UBUS	2.0000e-003	9.6000e-003
tblVehicleEF	UBUS	0.19	0.15
tblVehicleEF	UBUS	3.5400e-004	4.8000e-003
tblVehicleEF	UBUS	2.6130e-003	4.3000e-003
tblVehicleEF	UBUS	0.06	0.10
tblVehicleEF	UBUS	1.6530e-003	2.6000e-003
tblVehicleEF	UBUS	0.65	0.75
tblVehicleEF	UBUS	0.47	0.02
tblVehicleEF	UBUS	0.61	1.17
tblVehicleEF	UBUS	0.02	0.01
tblVehicleEF	UBUS	4.6100e-004	8.0000e-004
tblVehicleEF	UBUS	2.6130e-003	4.3000e-003
tblVehicleEF	UBUS	0.06	0.10
tblVehicleEF	UBUS	1.6530e-003	2.6000e-003
tblVehicleEF	UBUS	0.72	0.83
tblVehicleEF	UBUS	0.47	0.02
tblVehicleEF	UBUS	0.66	1.25
tblVehicleEF	UBUS	0.00	0.04
tblVehicleEF	UBUS	0.00	0.05
tblVehicleEF	UBUS	3.41	4.09
tblVehicleEF	UBUS	5.65	10.91

tblVehicleEF	UBUS	2,084.88	2,140.27
tblVehicleEF	UBUS	31.79	32.45
tblVehicleEF	UBUS	1.4010e-003	1.1900e-003
tblVehicleEF	UBUS	10.90	9.37
tblVehicleEF	UBUS	0.87	1.76
tblVehicleEF	UBUS	0.66	0.01
tblVehicleEF	UBUS	8.0000e-003	9.6000e-003
tblVehicleEF	UBUS	0.21	0.15
tblVehicleEF	UBUS	3.8100e-004	4.8000e-003
tblVehicleEF	UBUS	0.28	0.01
tblVehicleEF	UBUS	2.0000e-003	9.6000e-003
tblVehicleEF	UBUS	0.19	0.15
tblVehicleEF	UBUS	3.5400e-004	4.8000e-003
tblVehicleEF	UBUS	4.5220e-003	7.8000e-003
tblVehicleEF	UBUS	0.06	0.10
tblVehicleEF	UBUS	2.6270e-003	5.0000e-003
tblVehicleEF	UBUS	0.66	0.77
tblVehicleEF	UBUS	0.42	0.02
tblVehicleEF	UBUS	0.53	1.01
tblVehicleEF	UBUS	0.02	0.01
tblVehicleEF	UBUS	4.3400e-004	8.0000e-004
tblVehicleEF	UBUS	4.5220e-003	7.8000e-003
tblVehicleEF	UBUS	0.06	0.10
tblVehicleEF	UBUS	2.6270e-003	5.0000e-003
tblVehicleEF	UBUS	0.73	0.86
tblVehicleEF	UBUS	0.42	0.02
tblVehicleEF	UBUS	0.57	1.08
tblVehicleEF	UBUS	0.00	0.04

tblVehicleEF	UBUS	0.00	0.06
tblVehicleEF	UBUS	3.34	3.99
tblVehicleEF	UBUS	8.01	14.28
tblVehicleEF	UBUS	2,084.88	2,140.27
tblVehicleEF	UBUS	31.79	32.45
tblVehicleEF	UBUS	1.4010e-003	1.1900e-003
tblVehicleEF	UBUS	11.18	9.60
tblVehicleEF	UBUS	0.95	1.88
tblVehicleEF	UBUS	0.66	0.01
tblVehicleEF	UBUS	8.0000e-003	9.6000e-003
tblVehicleEF	UBUS	0.21	0.15
tblVehicleEF	UBUS	3.8100e-004	4.8000e-003
tblVehicleEF	UBUS	0.28	0.01
tblVehicleEF	UBUS	2.0000e-003	9.6000e-003
tblVehicleEF	UBUS	0.19	0.15
tblVehicleEF	UBUS	3.5400e-004	4.8000e-003
tblVehicleEF	UBUS	2.1300e-003	4.9000e-003
tblVehicleEF	UBUS	0.07	0.13
tblVehicleEF	UBUS	1.3100e-003	3.2000e-003
tblVehicleEF	UBUS	0.64	0.75
tblVehicleEF	UBUS	0.56	0.03
tblVehicleEF	UBUS	0.66	1.18
tblVehicleEF	UBUS	0.02	0.01
tblVehicleEF	UBUS	4.7500e-004	8.0000e-004
tblVehicleEF	UBUS	2.1300e-003	4.9000e-003
tblVehicleEF	UBUS	0.07	0.13
tblVehicleEF	UBUS	1.3100e-003	3.2000e-003
tblVehicleEF	UBUS	0.72	0.83

tblVehicleEF	UBUS	0.56	0.03
tblVehicleEF	UBUS	0.70	1.26
tblWater	AerobicPercent	87.46	0.00
tblWater	AnaDigestCombDigestGasPercent	100.00	0.00
tblWater	AnaerobicandFacultativeLagoonsPercent	2.21	0.00
tblWater	ElectricityIntensityFactorForWastewaterTreatment	1,911.00	0.00
tblWater	SepticTankPercent	10.33	100.00

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2014	0.6767	7.7808	4.7994	7.0300e-003	0.6421	0.3296	0.9716	0.3253	0.3032	0.6285			670.7934	0.1787	0.0000	674.5470
2015	1.1329	2.7774	1.6884	3.1300e-003	0.0715	0.1307	0.2021	0.0284	0.1212	0.1496			289.2896	0.0631	0.0000	290.6136
Total	**1.8096**	**10.5582**	**6.4878**	**0.0102**	**0.7135**	**0.4603**	**1.1738**	**0.3537**	**0.4244**	**0.7781**			**960.0830**	**0.2418**	**0.0000**	**965.1606**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2014	0.3483	3.7701	3.2765	7.0300e-003	0.2767	0.1326	0.4092	0.1338	0.1220	0.2559			670.7927	0.1787	0.0000	674.5463
2015	1.0790	2.1654	1.6365	3.1300e-003	0.0513	0.0925	0.1437	0.0173	0.0861	0.1034			289.2893	0.0631	0.0000	290.6134
Total	**1.4273**	**5.9356**	**4.9130**	**0.0102**	**0.3279**	**0.2251**	**0.5530**	**0.1511**	**0.2081**	**0.3592**			**960.0820**	**0.2418**	**0.0000**	**965.1596**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**21.12**	**43.78**	**24.27**	**0.00**	**54.04**	**51.10**	**52.89**	**57.27**	**50.97**	**53.84**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.3107	0.0000	5.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000			9.0000e-005	0.0000	0.0000	9.0000e-005
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Offroad	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Waste						0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Water						0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Total	**0.3107**	**0.0000**	**5.0000e-005**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**			**9.0000e-005**	**0.0000**	**0.0000**	**9.0000e-005**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.3107	0.0000	5.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000			9.0000e-005	0.0000	0.0000	9.0000e-005
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Offroad	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Waste						0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Water						0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Total	**0.3107**	**0.0000**	**5.0000e-005**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**			**9.0000e-005**	**0.0000**	**0.0000**	**9.0000e-005**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Demolition	Demolition	7/31/2014	8/30/2014	5	22	Removal of existing rail track, equipment, piping and buldings, if applicable
2	Soil Transport	Site Preparation	9/1/2014	12/31/2014	5	88	Movement of soils onsite
3	Grading	Grading	9/1/2014	12/31/2014	5	88	Grading of spur area
4	Site Preparation - Rail line	Site Preparation	12/17/2014	1/15/2015	5	22	Preparation of the spur area for equipment construction
5	Site Preparation - Pipe line	Site Preparation	1/1/2015	4/2/2015	5	66	Preparation of the pipeline route area for equipment construction
6	Construction - Unloading area	Building Construction	1/1/2015	4/2/2015	5	66	Construction of the unloading equipment and buildings
7	Construction - Paving	Paving	1/1/2015	1/15/2015	5	11	Paving of the roadways and unloading area
8	Commissioning	Architectural Coating	5/1/2015	7/1/2015	5	44	Startup of facilities

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 47

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 111,078; Non-Residential Outdoor: 37,026 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Demolition	Off-Highway Trucks	3	4.00	381	0.38
Demolition	Rubber Tired Dozers	1	4.00	358	0.40
Demolition	Rubber Tired Dozers	3	8.00	358	0.40
Demolition	Tractors/Loaders/Backhoes	1	4.00	75	0.37
Demolition	Tractors/Loaders/Backhoes	4	8.00	75	0.37
Soil Transport	Off-Highway Trucks	6	4.00	381	0.38
Soil Transport	Rubber Tired Dozers	2	4.00	358	0.40
Grading	Excavators	1	4.00	157	0.38

Grading	Graders	2	4.00	162	0.41
Grading	Off-Highway Trucks	5	4.00	381	0.38
Grading	Rubber Tired Dozers	2	4.00	358	0.40
Grading	Scrapers	2	4.00	356	0.48
Site Preparation - Rail line	Bore/Drill Rigs	1	2.00	82	0.42
Site Preparation - Rail line	Off-Highway Trucks	6	4.00	381	0.38
Site Preparation - Rail line	Plate Compactors	1	2.00	8	0.42
Site Preparation - Rail line	Rubber Tired Dozers	1	4.00	358	0.40
Site Preparation - Rail line	Tractors/Loaders/Backhoes	1	4.00	75	0.37
Site Preparation - Pipe line	Air Compressors	0	6.00	78	0.42
Site Preparation - Pipe line	Cranes	1	2.00	208	0.29
Site Preparation - Pipe line	Off-Highway Trucks	4	4.00	381	0.38
Site Preparation - Pipe line	Plate Compactors	1	2.00	8	0.42
Site Preparation - Pipe line	Tractors/Loaders/Backhoes	1	4.00	75	0.37
Construction - Unloading area	Cranes	1	7.00	208	0.29
Construction - Unloading area	Forklifts	3	8.00	149	0.40
Construction - Unloading area	Generator Sets	1	8.00	84	0.42
Construction - Unloading area	Tractors/Loaders/Backhoes	3	7.00	75	0.37
Construction - Unloading area	Welders	1	8.00	46	0.42
Construction - Paving	Pavers	2	5.00	89	0.42
Construction - Paving	Rollers	2	5.00	80	0.38

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Demolition	12	30.00	0.00	226.00	13.00	5.00	20.00	LD_Mix	HDT_Mix	HHDT
Soil Transport	8	20.00	0.00	0.00	13.00	5.00	20.00	LD_Mix	HDT_Mix	HHDT
Grading	12	30.00	0.00	332.00	13.00	5.00	20.00	LD_Mix	HDT_Mix	HHDT
Site Preparation - Rail line	10	23.00	0.00	1,706.00	13.00	5.00	20.00	LD_Mix	HDT_Mix	HHDT
Site Preparation - Pipe line	7	23.00	0.00	426.00	13.00	5.00	20.00	LD_Mix	HDT_Mix	HHDT
Construction - Unloading area	9	31.00	0.00	426.00	13.00	5.00	20.00	LD_Mix	HDT_Mix	HHDT
Construction - Paving	4	0.00	0.00	0.00	13.00	5.00	20.00	LD_Mix	HDT_Mix	HHDT
Commissioning				0.00	13.00	5.00				

3.1 Mitigation Measures Construction

Use Cleaner Engines for Construction Equipment

Use DPF for Construction Equipment

Water Exposed Area

Reduce Vehicle Speed on Unpaved Roads

Clean Paved Roads

3.2 Demolition - 2014

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0110	0.0000	0.0110	1.6700e-003	0.0000	1.6700e-003			0.0000	0.0000	0.0000	0.0000
Off-Road	0.0995	1.1162	0.7796	8.1000e-004		0.0547	0.0547		0.0503	0.0503			77.6930	0.0230	0.0000	78.1751
Total	**0.0995**	**1.1162**	**0.7796**	**8.1000e-004**	**0.0110**	**0.0547**	**0.0658**	**1.6700e-003**	**0.0503**	**0.0520**			**77.6930**	**0.0230**	**0.0000**	**78.1751**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	3.4400e-003	0.0489	0.0330	9.0000e-005	1.9200e-003	8.6000e-004	2.7800e-003	5.3000e-004	7.9000e-004	1.3200e-003			7.9652	8.0000e-005	0.0000	7.9668
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Worker	2.0800e-003	3.1100e-003	0.0285	4.0000e-005	3.1800e-003	3.0000e-005	3.2100e-003	8.4000e-004	3.0000e-005	8.7000e-004			2.9102	2.1000e-004	0.0000	2.9145
Total	**5.5200e-003**	**0.0520**	**0.0615**	**1.3000e-004**	**5.1000e-003**	**8.9000e-004**	**5.9900e-003**	**1.3700e-003**	**8.2000e-004**	**2.1900e-003**			**10.8754**	**2.9000e-004**	**0.0000**	**10.8814**

3.2 Demolition - 2014

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					4.3100e-003	0.0000	4.3100e-003	6.5000e-004	0.0000	6.5000e-004			0.0000	0.0000	0.0000	0.0000
Off-Road	0.0239	0.2290	0.3910	8.1000e-004		7.7100e-003	7.7100e-003		7.1000e-003	7.1000e-003			77.6929	0.0230	0.0000	78.1750
Total	**0.0239**	**0.2290**	**0.3910**	**8.1000e-004**	**4.3100e-003**	**7.7100e-003**	**0.0120**	**6.5000e-004**	**7.1000e-003**	**7.7500e-003**			**77.6929**	**0.0230**	**0.0000**	**78.1750**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	3.4400e-003	0.0489	0.0330	9.0000e-005	1.9200e-003	8.6000e-004	2.7800e-003	5.3000e-004	7.9000e-004	1.3200e-003			7.9652	8.0000e-005	0.0000	7.9668
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Worker	2.0800e-003	3.1100e-003	0.0285	4.0000e-005	3.1800e-003	3.0000e-005	3.2100e-003	8.4000e-004	3.0000e-005	8.7000e-004			2.9102	2.1000e-004	0.0000	2.9145
Total	**5.5200e-003**	**0.0520**	**0.0615**	**1.3000e-004**	**5.1000e-003**	**8.9000e-004**	**5.9900e-003**	**1.3700e-003**	**8.2000e-004**	**2.1900e-003**			**10.8754**	**2.9000e-004**	**0.0000**	**10.8814**

3.3 Soil Transport - 2014

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.2650	0.0000	0.2650	0.1457	0.0000	0.1457			0.0000	0.0000	0.0000	0.0000
Off-Road	0.2112	2.4749	1.3845	2.2100e-003		0.1023	0.1023		0.0941	0.0941			212.2205	0.0627	0.0000	213.5375
Total	**0.2112**	**2.4749**	**1.3845**	**2.2100e-003**	**0.2650**	**0.1023**	**0.3672**	**0.1457**	**0.0941**	**0.2397**			**212.2205**	**0.0627**	**0.0000**	**213.5375**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Worker	5.5300e-003	8.2800e-003	0.0759	1.0000e-004	8.4700e-003	8.0000e-005	8.5500e-003	2.2500e-003	7.0000e-005	2.3300e-003			7.7605	5.5000e-004	0.0000	7.7721
Total	**5.5300e-003**	**8.2800e-003**	**0.0759**	**1.0000e-004**	**8.4700e-003**	**8.0000e-005**	**8.5500e-003**	**2.2500e-003**	**7.0000e-005**	**2.3300e-003**			**7.7605**	**5.5000e-004**	**0.0000**	**7.7721**

3.3 Soil Transport - 2014

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.1033	0.0000	0.1033	0.0568	0.0000	0.0568			0.0000	0.0000	0.0000	0.0000
Off-Road	0.1393	1.6083	0.9439	2.2100e-003		0.0607	0.0607		0.0558	0.0558			212.2203	0.0627	0.0000	213.5373
Total	**0.1393**	**1.6083**	**0.9439**	**2.2100e-003**	**0.1033**	**0.0607**	**0.1640**	**0.0568**	**0.0558**	**0.1126**			**212.2203**	**0.0627**	**0.0000**	**213.5373**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Worker	5.5300e-003	8.2800e-003	0.0759	1.0000e-004	8.4700e-003	8.0000e-005	8.5500e-003	2.2500e-003	7.0000e-005	2.3300e-003			7.7605	5.5000e-004	0.0000	7.7721
Total	**5.5300e-003**	**8.2800e-003**	**0.0759**	**1.0000e-004**	**8.4700e-003**	**8.0000e-005**	**8.5500e-003**	**2.2500e-003**	**7.0000e-005**	**2.3300e-003**			**7.7605**	**5.5000e-004**	**0.0000**	**7.7721**

3.4 Grading - 2014

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.2899	0.0000	0.2899	0.1483	0.0000	0.1483			0.0000	0.0000	0.0000	0.0000
Off-Road	0.3053	3.5945	2.0616	2.9400e-003		0.1560	0.1560		0.1435	0.1435			283.4409	0.0838	0.0000	285.1999
Total	**0.3053**	**3.5945**	**2.0616**	**2.9400e-003**	**0.2899**	**0.1560**	**0.4459**	**0.1483**	**0.1435**	**0.2919**			**283.4409**	**0.0838**	**0.0000**	**285.1999**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	5.0500e-003	0.0719	0.0485	1.3000e-004	2.8200e-003	1.2600e-003	4.0800e-003	7.7000e-004	1.1600e-003	1.9400e-003			11.7011	1.1000e-004	0.0000	11.7035
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Worker	8.3000e-003	0.0124	0.1139	1.4000e-004	0.0127	1.2000e-004	0.0128	3.3800e-003	1.1000e-004	3.4900e-003			11.6408	8.3000e-004	0.0000	11.6582
Total	**0.0134**	**0.0843**	**0.1624**	**2.7000e-004**	**0.0155**	**1.3800e-003**	**0.0169**	**4.1500e-003**	**1.2700e-003**	**5.4300e-003**			**23.3419**	**9.4000e-004**	**0.0000**	**23.3617**

3.4 Grading - 2014

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.1131	0.0000	0.1131	0.0579	0.0000	0.0579			0.0000	0.0000	0.0000	0.0000
Off-Road	0.1296	1.3989	1.3955	2.9400e-003		0.0508	0.0508		0.0468	0.0468			283.4406	0.0838	0.0000	285.1995
Total	**0.1296**	**1.3989**	**1.3955**	**2.9400e-003**	**0.1131**	**0.0508**	**0.1639**	**0.0579**	**0.0468**	**0.1046**			**283.4406**	**0.0838**	**0.0000**	**285.1995**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	5.0500e-003	0.0719	0.0485	1.3000e-004	2.8200e-003	1.2600e-003	4.0800e-003	7.7000e-004	1.1600e-003	1.9400e-003			11.7011	1.1000e-004	0.0000	11.7035
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Worker	8.3000e-003	0.0124	0.1139	1.4000e-004	0.0127	1.2000e-004	0.0128	3.3800e-003	1.1000e-004	3.4900e-003			11.6408	8.3000e-004	0.0000	11.6582
Total	**0.0134**	**0.0843**	**0.1624**	**2.7000e-004**	**0.0155**	**1.3800e-003**	**0.0169**	**4.1500e-003**	**1.2700e-003**	**5.4300e-003**			**23.3419**	**9.4000e-004**	**0.0000**	**23.3617**

3.5 Site Preparation - Rail line - 2014

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0331	0.0000	0.0331	0.0182	0.0000	0.0182			0.0000	0.0000	0.0000	0.0000
Off-Road	0.0226	0.2647	0.1385	2.5000e-004		0.0110	0.0110		0.0101	0.0101			24.2822	7.1700e-003	0.0000	24.4327
Total	**0.0226**	**0.2647**	**0.1385**	**2.5000e-004**	**0.0331**	**0.0110**	**0.0441**	**0.0182**	**0.0101**	**0.0283**			**24.2822**	**7.1700e-003**	**0.0000**	**24.4327**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0130	0.1847	0.1246	3.2000e-004	0.0127	3.2500e-003	0.0160	3.3300e-003	2.9900e-003	6.3200e-003			30.0635	2.9000e-004	0.0000	30.0695
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Worker	8.0000e-004	1.1900e-003	0.0109	1.0000e-005	1.2200e-003	1.0000e-005	1.2300e-003	3.2000e-004	1.0000e-005	3.3000e-004			1.1156	8.0000e-005	0.0000	1.1172
Total	**0.0138**	**0.1859**	**0.1355**	**3.3000e-004**	**0.0139**	**3.2600e-003**	**0.0172**	**3.6500e-003**	**3.0000e-003**	**6.6500e-003**			**31.1790**	**3.7000e-004**	**0.0000**	**31.1867**

3.5 Site Preparation - Rail line - 2014

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0129	0.0000	0.0129	7.1000e-003	0.0000	7.1000e-003			0.0000	0.0000	0.0000	0.0000
Off-Road	0.0174	0.2034	0.1108	2.5000e-004		7.8000e-003	7.8000e-003		7.1700e-003	7.1700e-003			24.2822	7.1700e-003	0.0000	24.4327
Total	**0.0174**	**0.2034**	**0.1108**	**2.5000e-004**	**0.0129**	**7.8000e-003**	**0.0207**	**7.1000e-003**	**7.1700e-003**	**0.0143**			**24.2822**	**7.1700e-003**	**0.0000**	**24.4327**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0130	0.1847	0.1246	3.2000e-004	0.0127	3.2500e-003	0.0160	3.3300e-003	2.9900e-003	6.3200e-003			30.0635	2.9000e-004	0.0000	30.0695
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Worker	8.0000e-004	1.1900e-003	0.0109	1.0000e-005	1.2200e-003	1.0000e-005	1.2300e-003	3.2000e-004	1.0000e-005	3.3000e-004			1.1156	8.0000e-005	0.0000	1.1172
Total	**0.0138**	**0.1859**	**0.1355**	**3.3000e-004**	**0.0139**	**3.2600e-003**	**0.0172**	**3.6500e-003**	**3.0000e-003**	**6.6500e-003**			**31.1790**	**3.7000e-004**	**0.0000**	**31.1867**

3.5 Site Preparation - Rail line - 2015

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0331	0.0000	0.0331	0.0182	0.0000	0.0182			0.0000	0.0000	0.0000	0.0000
Off-Road	0.0222	0.2573	0.1364	2.5000e-004		0.0107	0.0107		9.8100e-003	9.8100e-003			24.0378	7.1700e-003	0.0000	24.1883
Total	**0.0222**	**0.2573**	**0.1364**	**2.5000e-004**	**0.0331**	**0.0107**	**0.0438**	**0.0182**	**9.8100e-003**	**0.0280**			**24.0378**	**7.1700e-003**	**0.0000**	**24.1883**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0119	0.1600	0.1180	3.2000e-004	0.0127	2.3900e-003	0.0151	3.3300e-003	2.2000e-003	5.5300e-003			29.6947	2.5000e-004	0.0000	29.6999
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Worker	6.8000e-004	1.0400e-003	9.3600e-003	1.0000e-005	1.2200e-003	1.0000e-005	1.2300e-003	3.2000e-004	1.0000e-005	3.3000e-004			1.0771	7.0000e-005	0.0000	1.0786
Total	**0.0126**	**0.1611**	**0.1273**	**3.3000e-004**	**0.0139**	**2.4000e-003**	**0.0163**	**3.6500e-003**	**2.2100e-003**	**5.8600e-003**			**30.7718**	**3.2000e-004**	**0.0000**	**30.7785**

3.5 Site Preparation - Rail line - 2015

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0129	0.0000	0.0129	7.1000e-003	0.0000	7.1000e-003			0.0000	0.0000	0.0000	0.0000
Off-Road	0.0170	0.1966	0.1091	2.5000e-004		7.5100e-003	7.5100e-003		6.9100e-003	6.9100e-003			24.0377	7.1700e-003	0.0000	24.1883
Total	**0.0170**	**0.1966**	**0.1091**	**2.5000e-004**	**0.0129**	**7.5100e-003**	**0.0204**	**7.1000e-003**	**6.9100e-003**	**0.0140**			**24.0377**	**7.1700e-003**	**0.0000**	**24.1883**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0119	0.1600	0.1180	3.2000e-004	0.0127	2.3900e-003	0.0151	3.3300e-003	2.2000e-003	5.5300e-003			29.6947	2.5000e-004	0.0000	29.6999
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Worker	6.8000e-004	1.0400e-003	9.3600e-003	1.0000e-005	1.2200e-003	1.0000e-005	1.2300e-003	3.2000e-004	1.0000e-005	3.3000e-004			1.0771	7.0000e-005	0.0000	1.0786
Total	**0.0126**	**0.1611**	**0.1273**	**3.3000e-004**	**0.0139**	**2.4000e-003**	**0.0163**	**3.6500e-003**	**2.2100e-003**	**5.8600e-003**			**30.7718**	**3.2000e-004**	**0.0000**	**30.7785**

3.6 Site Preparation - Pipe line - 2015

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Off-Road	0.0754	0.8758	0.3992	9.1000e-004		0.0357	0.0357		0.0329	0.0329			86.9884	0.0259	0.0000	87.5327
Total	**0.0754**	**0.8758**	**0.3992**	**9.1000e-004**	**0.0000**	**0.0357**	**0.0357**	**0.0000**	**0.0329**	**0.0329**			**86.9884**	**0.0259**	**0.0000**	**87.5327**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	5.9600e-003	0.0799	0.0589	1.6000e-004	3.6200e-003	1.1900e-003	4.8100e-003	9.9000e-004	1.1000e-003	2.0900e-003			14.8299	1.2000e-004	0.0000	14.8325
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Worker	4.0600e-003	6.2100e-003	0.0561	8.0000e-005	7.3100e-003	6.0000e-005	7.3700e-003	1.9400e-003	6.0000e-005	2.0000e-003			6.4627	4.2000e-004	0.0000	6.4715
Total	**0.0100**	**0.0861**	**0.1150**	**2.4000e-004**	**0.0109**	**1.2500e-003**	**0.0122**	**2.9300e-003**	**1.1600e-003**	**4.0900e-003**			**21.2926**	**5.4000e-004**	**0.0000**	**21.3041**

3.6 Site Preparation - Pipe line - 2015

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Off-Road	0.0661	0.7695	0.3941	9.1000e-004		0.0293	0.0293		0.0269	0.0269			86.9883	0.0259	0.0000	87.5326
Total	**0.0661**	**0.7695**	**0.3941**	**9.1000e-004**	**0.0000**	**0.0293**	**0.0293**	**0.0000**	**0.0269**	**0.0269**			**86.9883**	**0.0259**	**0.0000**	**87.5326**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	5.9600e-003	0.0799	0.0589	1.6000e-004	3.6200e-003	1.1900e-003	4.8100e-003	9.9000e-004	1.1000e-003	2.0900e-003			14.8299	1.2000e-004	0.0000	14.8325
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Worker	4.0600e-003	6.2100e-003	0.0561	8.0000e-005	7.3100e-003	6.0000e-005	7.3700e-003	1.9400e-003	6.0000e-005	2.0000e-003			6.4627	4.2000e-004	0.0000	6.4715
Total	**0.0100**	**0.0861**	**0.1150**	**2.4000e-004**	**0.0109**	**1.2500e-003**	**0.0122**	**2.9300e-003**	**1.1600e-003**	**4.0900e-003**			**21.2926**	**5.4000e-004**	**0.0000**	**21.3041**

3.7 Construction - Unloading area - 2015

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.1354	1.2579	0.7446	1.0700e-003		0.0755	0.0755		0.0704	0.0704			98.8469	0.0273	0.0000	99.4195
Total	**0.1354**	**1.2579**	**0.7446**	**1.0700e-003**		**0.0755**	**0.0755**		**0.0704**	**0.0704**			**98.8469**	**0.0273**	**0.0000**	**99.4195**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	5.9600e-003	0.0799	0.0589	1.6000e-004	3.6200e-003	1.1900e-003	4.8100e-003	9.9000e-004	1.1000e-003	2.0900e-003			14.8299	1.2000e-004	0.0000	14.8325
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Worker	5.4700e-003	8.3700e-003	0.0757	1.1000e-004	9.8500e-003	9.0000e-005	9.9400e-003	2.6200e-003	8.0000e-005	2.7000e-003			8.7106	5.7000e-004	0.0000	8.7225
Total	**0.0114**	**0.0883**	**0.1346**	**2.7000e-004**	**0.0135**	**1.2800e-003**	**0.0148**	**3.6100e-003**	**1.1800e-003**	**4.7900e-003**			**23.5405**	**6.9000e-004**	**0.0000**	**23.5550**

3.7 Construction - Unloading area - 2015

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0959	0.8129	0.7251	1.0700e-003		0.0469	0.0469		0.0441	0.0441			98.8468	0.0273	0.0000	99.4194
Total	**0.0959**	**0.8129**	**0.7251**	**1.0700e-003**		**0.0469**	**0.0469**		**0.0441**	**0.0441**			**98.8468**	**0.0273**	**0.0000**	**99.4194**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	5.9600e-003	0.0799	0.0589	1.6000e-004	3.6200e-003	1.1900e-003	4.8100e-003	9.9000e-004	1.1000e-003	2.0900e-003			14.8299	1.2000e-004	0.0000	14.8325
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Worker	5.4700e-003	8.3700e-003	0.0757	1.1000e-004	9.8500e-003	9.0000e-005	9.9400e-003	2.6200e-003	8.0000e-005	2.7000e-003			8.7106	5.7000e-004	0.0000	8.7225
Total	**0.0114**	**0.0883**	**0.1346**	**2.7000e-004**	**0.0135**	**1.2800e-003**	**0.0148**	**3.6100e-003**	**1.1800e-003**	**4.7900e-003**			**23.5405**	**6.9000e-004**	**0.0000**	**23.5550**

3.8 Construction - Paving - 2015

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	5.6000e-003	0.0510	0.0312	4.0000e-005		3.9000e-003	3.9000e-003		3.5800e-003	3.5800e-003			3.8116	1.1400e-003	0.0000	3.8355
Paving	2.2300e-003					0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Total	**7.8300e-003**	**0.0510**	**0.0312**	**4.0000e-005**		**3.9000e-003**	**3.9000e-003**		**3.5800e-003**	**3.5800e-003**			**3.8116**	**1.1400e-003**	**0.0000**	**3.8355**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**			**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.8 Construction - Paving - 2015

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	5.6000e-003	0.0510	0.0312	4.0000e-005		3.9000e-003	3.9000e-003		3.5800e-003	3.5800e-003			3.8116	1.1400e-003	0.0000	3.8355
Paving	2.2300e-003					0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Total	**7.8300e-003**	**0.0510**	**0.0312**	**4.0000e-005**		**3.9000e-003**	**3.9000e-003**		**3.5800e-003**	**3.5800e-003**			**3.8116**	**1.1400e-003**	**0.0000**	**3.8355**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**			**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.9 Commissioning - 2015

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.8581					0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Total	**0.8581**					**0.0000**	**0.0000**		**0.0000**	**0.0000**			**0.0000**	**0.0000**	**0.0000**	**0.0000**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Vendor					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Worker					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Total					**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**			**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.9 Commissioning - 2015

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.8581					0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Total	**0.8581**					**0.0000**	**0.0000**		**0.0000**	**0.0000**			**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Vendor					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Worker					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Total					**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**			**0.0000**	**0.0000**	**0.0000**	**0.0000**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000	0.0000	0.0000

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Other Asphalt Surfaces	0.00	0.00	0.00		
User Defined Industrial	0.00	0.00	0.00		
Total	0.00	0.00	0.00		

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Other Asphalt Surfaces	13.00	5.00	5.00	0.00	0.00	0.00	0	0	0
User Defined Industrial	13.00	5.00	5.00	0.00	0.00	0.00	0	0	0

LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
0.440203	0.187725	0.202335	0.081928	0.024463	0.012999	0.013453	0.015831	0.001200	0.001190	0.011748	0.001156	0.005769

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
User Defined Industrial	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**			**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
User Defined Industrial	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**			**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
User Defined Industrial	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
User Defined Industrial	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.3107	0.0000	5.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000			9.0000e-005	0.0000	0.0000	9.0000e-005
Unmitigated	0.3107	0.0000	5.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000			9.0000e-005	0.0000	0.0000	9.0000e-005

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.0215					0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Consumer Products	0.2892					0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Landscaping	0.0000	0.0000	5.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000			9.0000e-005	0.0000	0.0000	9.0000e-005
Total	**0.3107**	**0.0000**	**5.0000e-005**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**			**9.0000e-005**	**0.0000**	**0.0000**	**9.0000e-005**

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.0215					0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Consumer Products	0.2892					0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Landscaping	0.0000	0.0000	5.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000			9.0000e-005	0.0000	0.0000	9.0000e-005
Total	**0.3107**	**0.0000**	**5.0000e-005**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**			**9.0000e-005**	**0.0000**	**0.0000**	**9.0000e-005**

7.0 Water Detail

7.1 Mitigation Measures Water

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Other Asphalt Surfaces	0 / 0	0.0000	0.0000	0.0000	0.0000
User Defined Industrial	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Other Asphalt Surfaces	0 / 0	0.0000	0.0000	0.0000	0.0000
User Defined Industrial	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
User Defined Industrial	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

8.2 Waste by Land Use

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
User Defined Industrial	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type
Off-Highway Trucks	0	0.00	0	381	0.38	Diesel

UnMitigated/Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Equipment Type	tons/yr										MT/yr					
Off-Highway Trucks	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**			**0.0000**	**0.0000**	**0.0000**	**0.0000**

10.0 Vegetation

Coastal Access

San Luis Obispo County, Winter

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Other Asphalt Surfaces	7.80	Acre	7.80	339,768.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	3.2	**Precipitation Freq (Days)**	44
Climate Zone	4			**Operational Year**	2014
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics - Phillips66 Coastal Access Construction Emissions

Land Use -

Construction Phase - Building construction would be installation of the bridge. Paving would be for the roadway, 2 miles long by 30 feet wide, and parking area

Off-road Equipment - Construction equipment estimated

Off-road Equipment - equipment estimated

Off-road Equipment - equipment estimated

Off-road Equipment -

Grading - Area based on 2 miles by 35 feet plus about 0.5 acres for bridge construction plus 1.0 ares for parking area. Silt content based on AP-42 for sand, 2.6, table 13.2.4-1

Trips and VMT - Worker trips estimated. Haul trips based on asphalt (2" deep) and sub-base volume (6" deep), and on an estimated 20 trips to haul bridge components

Energy Use -

Construction Off-road Equipment Mitigation -

Architectural Coating - Assumed that bridge would come mostly painted, with only touchup and misc painting for an estaimted total of 5,000 ft2

Table Name	Column Name	Default Value	New Value
tblArchitecturalCoating	ConstArea_Nonresidential_Exterior	169,884.00	5,000.00
tblArchitecturalCoating	ConstArea_Nonresidential_Interior	509,652.00	0.00
tblConstructionPhase	NumDays	20.00	10.00
tblConstructionPhase	NumDays	230.00	20.00
tblConstructionPhase	NumDays	20.00	10.00
tblConstructionPhase	PhaseEndDate	3/25/2014	2/25/2014
tblConstructionPhase	PhaseStartDate	2/26/2014	1/29/2014
tblGrading	AcresOfGrading	5.00	10.00
tblGrading	MaterialSiltContent	6.90	2.60
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblTripsAndVMT	HaulingTripNumber	0.00	627.00
tblTripsAndVMT	HaulingTripNumber	0.00	161.00
tblTripsAndVMT	HaulingTripNumber	0.00	209.00
tblTripsAndVMT	VendorTripNumber	56.00	2.00
tblTripsAndVMT	WorkerTripNumber	8.00	5.00
tblTripsAndVMT	WorkerTripNumber	143.00	10.00
tblTripsAndVMT	WorkerTripNumber	8.00	5.00
tblTripsAndVMT	WorkerTripNumber	29.00	2.00

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2014	6.2534	55.9484	39.1550	0.0662	3.5932	2.2549	5.6399	1.4521	2.1220	3.3349			6,852.5943	0.7957	0.0000	6,869.3030
Total	**6.2534**	**55.9484**	**39.1550**	**0.0662**	**3.5932**	**2.2549**	**5.6399**	**1.4521**	**2.1220**	**3.3349**			**6,852.5943**	**0.7957**	**0.0000**	**6,869.3030**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2014	6.2534	55.9484	39.1550	0.0662	2.2438	2.2549	4.2905	0.8247	2.1220	2.7076			6,852.5943	0.7957	0.0000	6,869.3030
Total	**6.2534**	**55.9484**	**39.1550**	**0.0662**	**2.2438**	**2.2549**	**4.2905**	**0.8247**	**2.1220**	**2.7076**			**6,852.5943**	**0.7957**	**0.0000**	**6,869.3030**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**37.55**	**0.00**	**23.93**	**43.20**	**0.00**	**18.81**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	9.4284	1.0000e-005	8.3000e-004	0.0000		0.0000	0.0000		0.0000	0.0000			1.7100e-003	1.0000e-005		1.8100e-003
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000		0.0000
Total	**9.4284**	**1.0000e-005**	**8.3000e-004**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**			**1.7100e-003**	**1.0000e-005**	**0.0000**	**1.8100e-003**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	9.4284	1.0000e-005	8.3000e-004	0.0000		0.0000	0.0000		0.0000	0.0000			1.7100e-003	1.0000e-005		1.8100e-003
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000		0.0000
Total	**9.4284**	**1.0000e-005**	**8.3000e-004**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**			**1.7100e-003**	**1.0000e-005**	**0.0000**	**1.8100e-003**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Grading	Grading	1/15/2014	1/28/2014	5	10	
2	Building Construction	Building Construction	1/29/2014	2/25/2014	5	20	
3	Paving	Paving	1/29/2014	2/25/2014	5	20	
4	Architectural Coating	Architectural Coating	2/26/2014	3/11/2014	5	10	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 10

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 5,000 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Architectural Coating	Air Compressors	1	6.00	78	0.48
Building Construction	Cranes	1	7.00	226	0.29
Building Construction	Forklifts	1	8.00	89	0.20
Building Construction	Generator Sets	1	8.00	84	0.74
Paving	Pavers	1	8.00	125	0.42
Paving	Rollers	1	8.00	80	0.38
Grading	Rubber Tired Dozers	1	8.00	255	0.40
Building Construction	Tractors/Loaders/Backhoes	1	7.00	97	0.37
Grading	Graders	1	8.00	174	0.41
Grading	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Paving	Paving Equipment	1	8.00	130	0.36
Building Construction	Welders	1	8.00	46	0.45

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Grading	3	5.00	0.00	627.00	13.00	5.00	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	5	10.00	2.00	161.00	13.00	5.00	20.00	LD_Mix	HDT_Mix	HHDT
Paving	3	5.00	0.00	209.00	13.00	5.00	20.00	LD_Mix	HDT_Mix	HHDT
Architectural Coating	1	2.00	0.00	0.00	13.00	5.00	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Water Exposed Area

Reduce Vehicle Speed on Unpaved Roads

Clean Paved Roads

3.2 Grading - 2014

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					2.4534	0.0000	2.4534	1.1407	0.0000	1.1407			0.0000			0.0000
Off-Road	2.7064	28.9782	18.4838	0.0183		1.5679	1.5679		1.4425	1.4425			1,939.0742	0.5730		1,951.1075
Total	**2.7064**	**28.9782**	**18.4838**	**0.0183**	**2.4534**	**1.5679**	**4.0213**	**1.1407**	**1.4425**	**2.5831**			**1,939.0742**	**0.5730**		**1,951.1075**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	2.0178	26.9224	20.2298	0.0474	1.0903	0.4783	1.5686	0.2983	0.4400	0.7383			4,865.3014	0.0466		4,866.2797
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000		0.0000
Worker	0.0336	0.0478	0.4413	5.4000e-004	0.0494	4.7000e-004	0.0499	0.0131	4.2000e-004	0.0135			48.2187	3.4600e-003		48.2914
Total	**2.0513**	**26.9702**	**20.6712**	**0.0479**	**1.1397**	**0.4788**	**1.6185**	**0.3114**	**0.4404**	**0.7518**			**4,913.5201**	**0.0500**		**4,914.5711**

3.2 Grading - 2014

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					1.1041	0.0000	1.1041	0.5133	0.0000	0.5133			0.0000			0.0000
Off-Road	2.7064	28.9782	18.4838	0.0183		1.5679	1.5679		1.4425	1.4425			1,939.0742	0.5730		1,951.1075
Total	**2.7064**	**28.9782**	**18.4838**	**0.0183**	**1.1041**	**1.5679**	**2.6720**	**0.5133**	**1.4425**	**1.9558**			**1,939.0742**	**0.5730**		**1,951.1075**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	2.0178	26.9224	20.2298	0.0474	1.0903	0.4783	1.5686	0.2983	0.4400	0.7383			4,865.3014	0.0466		4,866.2797
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000		0.0000
Worker	0.0336	0.0478	0.4413	5.4000e-004	0.0494	4.7000e-004	0.0499	0.0131	4.2000e-004	0.0135			48.2187	3.4600e-003		48.2914
Total	**2.0513**	**26.9702**	**20.6712**	**0.0479**	**1.1397**	**0.4788**	**1.6185**	**0.3114**	**0.4404**	**0.7518**			**4,913.5201**	**0.0500**		**4,914.5711**

3.3 Building Construction - 2014

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	2.7242	20.7718	12.1289	0.0183		1.3821	1.3821		1.3191	1.3191			1,805.8100	0.4219		1,814.6700
Total	**2.7242**	**20.7718**	**12.1289**	**0.0183**		**1.3821**	**1.3821**		**1.3191**	**1.3191**			**1,805.8100**	**0.4219**		**1,814.6700**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.2591	3.4566	2.5973	6.0900e-003	0.1400	0.0614	0.2014	0.0383	0.0565	0.0948			624.6519	5.9800e-003		624.7775
Vendor	0.0332	0.2131	0.3636	3.4000e-004	9.1100e-003	4.0800e-003	0.0132	2.6000e-003	3.7500e-003	6.3500e-003			34.4546	4.1000e-004		34.4632
Worker	0.0672	0.0956	0.8827	1.0800e-003	0.0989	9.4000e-004	0.0998	0.0262	8.4000e-004	0.0271			96.4375	6.9200e-003		96.5828
Total	**0.3594**	**3.7653**	**3.8436**	**7.5100e-003**	**0.2480**	**0.0664**	**0.3144**	**0.0671**	**0.0611**	**0.1282**			**755.5440**	**0.0133**		**755.8235**

3.3 Building Construction - 2014

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	2.7242	20.7718	12.1289	0.0183		1.3821	1.3821		1.3191	1.3191			1,805.8100	0.4219		1,814.6700
Total	**2.7242**	**20.7718**	**12.1289**	**0.0183**		**1.3821**	**1.3821**		**1.3191**	**1.3191**			**1,805.8100**	**0.4219**		**1,814.6700**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.2591	3.4566	2.5973	6.0900e-003	0.1400	0.0614	0.2014	0.0383	0.0565	0.0948			624.6519	5.9800e-003		624.7775
Vendor	0.0332	0.2131	0.3636	3.4000e-004	9.1100e-003	4.0800e-003	0.0132	2.6000e-003	3.7500e-003	6.3500e-003			34.4546	4.1000e-004		34.4632
Worker	0.0672	0.0956	0.8827	1.0800e-003	0.0989	9.4000e-004	0.0998	0.0262	8.4000e-004	0.0271			96.4375	6.9200e-003		96.5828
Total	**0.3594**	**3.7653**	**3.8436**	**7.5100e-003**	**0.2480**	**0.0664**	**0.3144**	**0.0671**	**0.0611**	**0.1282**			**755.5440**	**0.0133**		**755.8235**

3.4 Paving - 2014

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.1805	13.0428	7.4825	0.0111		0.7261	0.7261		0.6681	0.6681			1,181.7453	0.3492		1,189.0789
Paving	1.0218					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**2.2023**	**13.0428**	**7.4825**	**0.0111**		**0.7261**	**0.7261**		**0.6681**	**0.6681**			**1,181.7453**	**0.3492**		**1,189.0789**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.3363	4.4871	3.3716	7.9000e-003	0.1817	0.0797	0.2614	0.0497	0.0733	0.1231			810.8836	7.7600e-003		811.0466
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000		0.0000
Worker	0.0336	0.0478	0.4413	5.4000e-004	0.0494	4.7000e-004	0.0499	0.0131	4.2000e-004	0.0135			48.2187	3.4600e-003		48.2914
Total	**0.3699**	**4.5349**	**3.8130**	**8.4400e-003**	**0.2312**	**0.0802**	**0.3113**	**0.0628**	**0.0738**	**0.1366**			**859.1023**	**0.0112**		**859.3380**

3.4 Paving - 2014

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.1805	13.0428	7.4825	0.0111		0.7261	0.7261		0.6681	0.6681			1,181.7453	0.3492		1,189.0789
Paving	1.0218					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**2.2023**	**13.0428**	**7.4825**	**0.0111**		**0.7261**	**0.7261**		**0.6681**	**0.6681**			**1,181.7453**	**0.3492**		**1,189.0789**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.3363	4.4871	3.3716	7.9000e-003	0.1817	0.0797	0.2614	0.0497	0.0733	0.1231			810.8836	7.7600e-003		811.0466
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000		0.0000
Worker	0.0336	0.0478	0.4413	5.4000e-004	0.0494	4.7000e-004	0.0499	0.0131	4.2000e-004	0.0135			48.2187	3.4600e-003		48.2914
Total	**0.3699**	**4.5349**	**3.8130**	**8.4400e-003**	**0.2312**	**0.0802**	**0.3113**	**0.0628**	**0.0738**	**0.1366**			**859.1023**	**0.0112**		**859.3380**

3.5 Architectural Coating - 2014

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating	5.7938					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.4462	2.7773	1.9216	2.9700e-003		0.2452	0.2452		0.2452	0.2452			281.4481	0.0401		282.2905
Total	**6.2400**	**2.7773**	**1.9216**	**2.9700e-003**		**0.2452**	**0.2452**		**0.2452**	**0.2452**			**281.4481**	**0.0401**		**282.2905**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000		0.0000
Worker	0.0134	0.0191	0.1765	2.2000e-004	0.0198	1.9000e-004	0.0200	5.2400e-003	1.7000e-004	5.4100e-003			19.2875	1.3800e-003		19.3166
Total	**0.0134**	**0.0191**	**0.1765**	**2.2000e-004**	**0.0198**	**1.9000e-004**	**0.0200**	**5.2400e-003**	**1.7000e-004**	**5.4100e-003**			**19.2875**	**1.3800e-003**		**19.3166**

3.5 Architectural Coating - 2014

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating	5.7938					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.4462	2.7773	1.9216	2.9700e-003		0.2452	0.2452		0.2452	0.2452			281.4481	0.0401		282.2905
Total	**6.2400**	**2.7773**	**1.9216**	**2.9700e-003**		**0.2452**	**0.2452**		**0.2452**	**0.2452**			**281.4481**	**0.0401**		**282.2905**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000		0.0000
Worker	0.0134	0.0191	0.1765	2.2000e-004	0.0198	1.9000e-004	0.0200	5.2400e-003	1.7000e-004	5.4100e-003			19.2875	1.3800e-003		19.3166
Total	**0.0134**	**0.0191**	**0.1765**	**2.2000e-004**	**0.0198**	**1.9000e-004**	**0.0200**	**5.2400e-003**	**1.7000e-004**	**5.4100e-003**			**19.2875**	**1.3800e-003**		**19.3166**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000		0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000		0.0000

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Other Asphalt Surfaces	0.00	0.00	0.00		
Total	0.00	0.00	0.00		

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Other Asphalt Surfaces	13.00	5.00	5.00	0.00	0.00	0.00	0	0	0

LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
0.455690	0.042546	0.214770	0.152257	0.068772	0.010100	0.016640	0.021228	0.002325	0.001418	0.008694	0.000867	0.004695

4.4 Fleet Mix

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**			**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**			**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	9.4284	1.0000e-005	8.3000e-004	0.0000		0.0000	0.0000		0.0000	0.0000			1.7100e-003	1.0000e-005		1.8100e-003
Unmitigated	9.4284	1.0000e-005	8.3000e-004	0.0000		0.0000	0.0000		0.0000	0.0000			1.7100e-003	1.0000e-005		1.8100e-003

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	2.1573					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	7.2710					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	8.0000e-005	1.0000e-005	8.3000e-004	0.0000		0.0000	0.0000		0.0000	0.0000			1.7100e-003	1.0000e-005		1.8100e-003
Total	**9.4284**	**1.0000e-005**	**8.3000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**			**1.7100e-003**	**1.0000e-005**		**1.8100e-003**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	2.1573					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	7.2710					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	8.0000e-005	1.0000e-005	8.3000e-004	0.0000		0.0000	0.0000		0.0000	0.0000			1.7100e-003	1.0000e-005		1.8100e-003
Total	**9.4284**	**1.0000e-005**	**8.3000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**			**1.7100e-003**	**1.0000e-005**		**1.8100e-003**

7.0 Water Detail

7.1 Mitigation Measures Water

8.0 Waste Detail

8.1 Mitigation Measures Waste

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Vegetation

Coastal Access

San Luis Obispo County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Other Asphalt Surfaces	7.80	Acre	7.80	339,768.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	3.2	**Precipitation Freq (Days)**	44
Climate Zone	4			**Operational Year**	2014
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics - Phillips66 Coastal Access Construction Emissions

Land Use -

Construction Phase - Building construction would be installation of the bridge. Paving would be for the roadway, 2 miles long by 30 feet wide, and parking area

Off-road Equipment - Construction equipment estimated

Off-road Equipment - equipment estimated

Off-road Equipment - equipment estimated

Off-road Equipment -

Grading - Area based on 2 miles by 35 feet plus about 0.5 acres for bridge construction plus 1.0 ares for parking area. Silt content based on AP-42 for sand, 2.6, table 13.2.4-1

Trips and VMT - Worker trips estimated. Haul trips based on asphalt (2" deep) and sub-base volume (6" deep), and on an estimated 20 trips to haul bridge components

Energy Use -

Construction Off-road Equipment Mitigation -

Architectural Coating - Assumed that bridge would come mostly painted, with only touchup and misc painting for an estaimted total of 5,000 ft2

Table Name	Column Name	Default Value	New Value
tblArchitecturalCoating	ConstArea_Nonresidential_Exterior	169,884.00	5,000.00
tblArchitecturalCoating	ConstArea_Nonresidential_Interior	509,652.00	0.00
tblConstructionPhase	NumDays	20.00	10.00
tblConstructionPhase	NumDays	230.00	20.00
tblConstructionPhase	NumDays	20.00	10.00
tblConstructionPhase	PhaseEndDate	3/25/2014	2/25/2014
tblConstructionPhase	PhaseStartDate	2/26/2014	1/29/2014
tblGrading	AcresOfGrading	5.00	10.00
tblGrading	MaterialSiltContent	6.90	2.60
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblTripsAndVMT	HaulingTripNumber	0.00	627.00
tblTripsAndVMT	HaulingTripNumber	0.00	161.00
tblTripsAndVMT	HaulingTripNumber	0.00	209.00
tblTripsAndVMT	VendorTripNumber	56.00	2.00
tblTripsAndVMT	WorkerTripNumber	8.00	5.00
tblTripsAndVMT	WorkerTripNumber	143.00	10.00
tblTripsAndVMT	WorkerTripNumber	8.00	5.00
tblTripsAndVMT	WorkerTripNumber	29.00	2.00

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2014	0.1106	0.7167	0.4630	8.0000e-004	0.0226	0.0340	0.0566	8.5300e-003	0.0319	0.0404			74.2594	0.0102	0.0000	74.4742
Total	**0.1106**	**0.7167**	**0.4630**	**8.0000e-004**	**0.0226**	**0.0340**	**0.0566**	**8.5300e-003**	**0.0319**	**0.0404**			**74.2594**	**0.0102**	**0.0000**	**74.4742**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2014	0.1106	0.7167	0.4630	8.0000e-004	0.0159	0.0340	0.0499	5.3900e-003	0.0319	0.0372			74.2593	0.0102	0.0000	74.4742
Total	**0.1106**	**0.7167**	**0.4630**	**8.0000e-004**	**0.0159**	**0.0340**	**0.0499**	**5.3900e-003**	**0.0319**	**0.0372**			**74.2593**	**0.0102**	**0.0000**	**74.4742**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**29.85**	**0.00**	**11.92**	**36.81**	**0.00**	**7.78**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	1.7207	0.0000	1.4000e-004	0.0000		0.0000	0.0000		0.0000	0.0000			2.6000e-004	0.0000	0.0000	2.7000e-004
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Waste						0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Water						0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Total	**1.7207**	**0.0000**	**1.4000e-004**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**			**2.6000e-004**	**0.0000**	**0.0000**	**2.7000e-004**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	1.7207	0.0000	1.4000e-004	0.0000		0.0000	0.0000		0.0000	0.0000			2.6000e-004	0.0000	0.0000	2.7000e-004
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Waste						0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Water						0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Total	**1.7207**	**0.0000**	**1.4000e-004**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**			**2.6000e-004**	**0.0000**	**0.0000**	**2.7000e-004**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Grading	Grading	1/15/2014	1/28/2014	5	10	
2	Building Construction	Building Construction	1/29/2014	2/25/2014	5	20	
3	Paving	Paving	1/29/2014	2/25/2014	5	20	
4	Architectural Coating	Architectural Coating	2/26/2014	3/11/2014	5	10	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 10

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 5,000 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Architectural Coating	Air Compressors	1	6.00	78	0.48
Building Construction	Cranes	1	7.00	226	0.29
Building Construction	Forklifts	1	8.00	89	0.20
Building Construction	Generator Sets	1	8.00	84	0.74
Paving	Pavers	1	8.00	125	0.42
Paving	Rollers	1	8.00	80	0.38
Grading	Rubber Tired Dozers	1	8.00	255	0.40
Building Construction	Tractors/Loaders/Backhoes	1	7.00	97	0.37
Grading	Graders	1	8.00	174	0.41
Grading	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Paving	Paving Equipment	1	8.00	130	0.36
Building Construction	Welders	1	8.00	46	0.45

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Grading	3	5.00	0.00	627.00	13.00	5.00	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	5	10.00	2.00	161.00	13.00	5.00	20.00	LD_Mix	HDT_Mix	HHDT
Paving	3	5.00	0.00	209.00	13.00	5.00	20.00	LD_Mix	HDT_Mix	HHDT
Architectural Coating	1	2.00	0.00	0.00	13.00	5.00	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Water Exposed Area

Reduce Vehicle Speed on Unpaved Roads

Clean Paved Roads

3.2 Grading - 2014

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0123	0.0000	0.0123	5.7000e-003	0.0000	5.7000e-003			0.0000	0.0000	0.0000	0.0000
Off-Road	0.0135	0.1449	0.0924	9.0000e-005		7.8400e-003	7.8400e-003		7.2100e-003	7.2100e-003			8.7955	2.6000e-003	0.0000	8.8501
Total	**0.0135**	**0.1449**	**0.0924**	**9.0000e-005**	**0.0123**	**7.8400e-003**	**0.0201**	**5.7000e-003**	**7.2100e-003**	**0.0129**			**8.7955**	**2.6000e-003**	**0.0000**	**8.8501**

3.2 Grading - 2014

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	9.5400e-003	0.1358	0.0916	2.4000e-004	5.3300e-003	2.3900e-003	7.7100e-003	1.4600e-003	2.1900e-003	3.6600e-003			22.0982	2.1000e-004	0.0000	22.1026
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Worker	1.6000e-004	2.4000e-004	2.1600e-003	0.0000	2.4000e-004	0.0000	2.4000e-004	6.0000e-005	0.0000	7.0000e-005			0.2205	2.0000e-005	0.0000	0.2208
Total	**9.7000e-003**	**0.1360**	**0.0938**	**2.4000e-004**	**5.5700e-003**	**2.3900e-003**	**7.9500e-003**	**1.5200e-003**	**2.1900e-003**	**3.7300e-003**			**22.3187**	**2.3000e-004**	**0.0000**	**22.3234**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					5.5200e-003	0.0000	5.5200e-003	2.5700e-003	0.0000	2.5700e-003			0.0000	0.0000	0.0000	0.0000
Off-Road	0.0135	0.1449	0.0924	9.0000e-005		7.8400e-003	7.8400e-003		7.2100e-003	7.2100e-003			8.7955	2.6000e-003	0.0000	8.8501
Total	**0.0135**	**0.1449**	**0.0924**	**9.0000e-005**	**5.5200e-003**	**7.8400e-003**	**0.0134**	**2.5700e-003**	**7.2100e-003**	**9.7800e-003**			**8.7955**	**2.6000e-003**	**0.0000**	**8.8501**

3.2 Grading - 2014

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	9.5400e-003	0.1358	0.0916	2.4000e-004	5.3300e-003	2.3900e-003	7.7100e-003	1.4600e-003	2.1900e-003	3.6600e-003			22.0982	2.1000e-004	0.0000	22.1026
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Worker	1.6000e-004	2.4000e-004	2.1600e-003	0.0000	2.4000e-004	0.0000	2.4000e-004	6.0000e-005	0.0000	7.0000e-005			0.2205	2.0000e-005	0.0000	0.2208
Total	**9.7000e-003**	**0.1360**	**0.0938**	**2.4000e-004**	**5.5700e-003**	**2.3900e-003**	**7.9500e-003**	**1.5200e-003**	**2.1900e-003**	**3.7300e-003**			**22.3187**	**2.3000e-004**	**0.0000**	**22.3234**

3.3 Building Construction - 2014

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0272	0.2077	0.1213	1.8000e-004		0.0138	0.0138		0.0132	0.0132			16.3820	3.8300e-003	0.0000	16.4624
Total	**0.0272**	**0.2077**	**0.1213**	**1.8000e-004**		**0.0138**	**0.0138**		**0.0132**	**0.0132**			**16.3820**	**3.8300e-003**	**0.0000**	**16.4624**

3.3 Building Construction - 2014

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	2.4500e-003	0.0349	0.0235	6.0000e-005	1.3700e-003	6.1000e-004	1.9800e-003	3.8000e-004	5.6000e-004	9.4000e-004			5.6743	5.0000e-005	0.0000	5.6755
Vendor	3.1000e-004	2.1500e-003	3.2200e-003	0.0000	9.0000e-005	4.0000e-005	1.3000e-004	3.0000e-005	4.0000e-005	6.0000e-005			0.3145	0.0000	0.0000	0.3146
Worker	6.3000e-004	9.4000e-004	8.6300e-003	1.0000e-005	9.6000e-004	1.0000e-005	9.7000e-004	2.6000e-004	1.0000e-005	2.6000e-004			0.8819	6.0000e-005	0.0000	0.8832
Total	**3.3900e-003**	**0.0380**	**0.0354**	**7.0000e-005**	**2.4200e-003**	**6.6000e-004**	**3.0800e-003**	**6.7000e-004**	**6.1000e-004**	**1.2600e-003**			**6.8707**	**1.1000e-004**	**0.0000**	**6.8733**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0272	0.2077	0.1213	1.8000e-004		0.0138	0.0138		0.0132	0.0132			16.3820	3.8300e-003	0.0000	16.4624
Total	**0.0272**	**0.2077**	**0.1213**	**1.8000e-004**		**0.0138**	**0.0138**		**0.0132**	**0.0132**			**16.3820**	**3.8300e-003**	**0.0000**	**16.4624**

3.3 Building Construction - 2014

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	2.4500e-003	0.0349	0.0235	6.0000e-005	1.3700e-003	6.1000e-004	1.9800e-003	3.8000e-004	5.6000e-004	9.4000e-004			5.6743	5.0000e-005	0.0000	5.6755
Vendor	3.1000e-004	2.1500e-003	3.2200e-003	0.0000	9.0000e-005	4.0000e-005	1.3000e-004	3.0000e-005	4.0000e-005	6.0000e-005			0.3145	0.0000	0.0000	0.3146
Worker	6.3000e-004	9.4000e-004	8.6300e-003	1.0000e-005	9.6000e-004	1.0000e-005	9.7000e-004	2.6000e-004	1.0000e-005	2.6000e-004			0.8819	6.0000e-005	0.0000	0.8832
Total	**3.3900e-003**	**0.0380**	**0.0354**	**7.0000e-005**	**2.4200e-003**	**6.6000e-004**	**3.0800e-003**	**6.7000e-004**	**6.1000e-004**	**1.2600e-003**			**6.8707**	**1.1000e-004**	**0.0000**	**6.8733**

3.4 Paving - 2014

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0118	0.1304	0.0748	1.1000e-004		7.2600e-003	7.2600e-003		6.6800e-003	6.6800e-003			10.7206	3.1700e-003	0.0000	10.7871
Paving	0.0102					0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Total	**0.0220**	**0.1304**	**0.0748**	**1.1000e-004**		**7.2600e-003**	**7.2600e-003**		**6.6800e-003**	**6.6800e-003**			**10.7206**	**3.1700e-003**	**0.0000**	**10.7871**

3.4 Paving - 2014

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	3.1800e-003	0.0453	0.0305	8.0000e-005	1.7800e-003	8.0000e-004	2.5700e-003	4.9000e-004	7.3000e-004	1.2200e-003			7.3661	7.0000e-005	0.0000	7.3676
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Worker	3.1000e-004	4.7000e-004	4.3100e-003	1.0000e-005	4.8000e-004	0.0000	4.9000e-004	1.3000e-004	0.0000	1.3000e-004			0.4409	3.0000e-005	0.0000	0.4416
Total	**3.4900e-003**	**0.0457**	**0.0349**	**9.0000e-005**	**2.2600e-003**	**8.0000e-004**	**3.0600e-003**	**6.2000e-004**	**7.3000e-004**	**1.3500e-003**			**7.8070**	**1.0000e-004**	**0.0000**	**7.8092**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0118	0.1304	0.0748	1.1000e-004		7.2600e-003	7.2600e-003		6.6800e-003	6.6800e-003			10.7206	3.1700e-003	0.0000	10.7871
Paving	0.0102					0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Total	**0.0220**	**0.1304**	**0.0748**	**1.1000e-004**		**7.2600e-003**	**7.2600e-003**		**6.6800e-003**	**6.6800e-003**			**10.7206**	**3.1700e-003**	**0.0000**	**10.7871**

3.4 Paving - 2014

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	3.1800e-003	0.0453	0.0305	8.0000e-005	1.7800e-003	8.0000e-004	2.5700e-003	4.9000e-004	7.3000e-004	1.2200e-003			7.3661	7.0000e-005	0.0000	7.3676
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Worker	3.1000e-004	4.7000e-004	4.3100e-003	1.0000e-005	4.8000e-004	0.0000	4.9000e-004	1.3000e-004	0.0000	1.3000e-004			0.4409	3.0000e-005	0.0000	0.4416
Total	**3.4900e-003**	**0.0457**	**0.0349**	**9.0000e-005**	**2.2600e-003**	**8.0000e-004**	**3.0600e-003**	**6.2000e-004**	**7.3000e-004**	**1.3500e-003**			**7.8070**	**1.0000e-004**	**0.0000**	**7.8092**

3.5 Architectural Coating - 2014

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.0290					0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Off-Road	2.2300e-003	0.0139	9.6100e-003	1.0000e-005		1.2300e-003	1.2300e-003		1.2300e-003	1.2300e-003			1.2766	1.8000e-004	0.0000	1.2805
Total	**0.0312**	**0.0139**	**9.6100e-003**	**1.0000e-005**		**1.2300e-003**	**1.2300e-003**		**1.2300e-003**	**1.2300e-003**			**1.2766**	**1.8000e-004**	**0.0000**	**1.2805**

3.5 Architectural Coating - 2014

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Worker	6.0000e-005	9.0000e-005	8.6000e-004	0.0000	1.0000e-004	0.0000	1.0000e-004	3.0000e-005	0.0000	3.0000e-005			0.0882	1.0000e-005	0.0000	0.0883
Total	**6.0000e-005**	**9.0000e-005**	**8.6000e-004**	**0.0000**	**1.0000e-004**	**0.0000**	**1.0000e-004**	**3.0000e-005**	**0.0000**	**3.0000e-005**			**0.0882**	**1.0000e-005**	**0.0000**	**0.0883**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.0290					0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Off-Road	2.2300e-003	0.0139	9.6100e-003	1.0000e-005		1.2300e-003	1.2300e-003		1.2300e-003	1.2300e-003			1.2766	1.8000e-004	0.0000	1.2805
Total	**0.0312**	**0.0139**	**9.6100e-003**	**1.0000e-005**		**1.2300e-003**	**1.2300e-003**		**1.2300e-003**	**1.2300e-003**			**1.2766**	**1.8000e-004**	**0.0000**	**1.2805**

3.5 Architectural Coating - 2014

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Worker	6.0000e-005	9.0000e-005	8.6000e-004	0.0000	1.0000e-004	0.0000	1.0000e-004	3.0000e-005	0.0000	3.0000e-005			0.0882	1.0000e-005	0.0000	0.0883
Total	**6.0000e-005**	**9.0000e-005**	**8.6000e-004**	**0.0000**	**1.0000e-004**	**0.0000**	**1.0000e-004**	**3.0000e-005**	**0.0000**	**3.0000e-005**			**0.0882**	**1.0000e-005**	**0.0000**	**0.0883**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			0.0000	0.0000	0.0000	0.0000

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Other Asphalt Surfaces	0.00	0.00	0.00		
Total	0.00	0.00	0.00		

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Other Asphalt Surfaces	13.00	5.00	5.00	0.00	0.00	0.00	0	0	0

LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
0.455690	0.042546	0.214770	0.152257	0.068772	0.010100	0.016640	0.021228	0.002325	0.001418	0.008694	0.000867	0.004695

5.0 Energy Detail

4.4 Fleet Mix

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**			**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**			**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.3 Energy by Land Use - Electricity

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	1.7207	0.0000	1.4000e-004	0.0000		0.0000	0.0000		0.0000	0.0000			2.6000e-004	0.0000	0.0000	2.7000e-004
Unmitigated	1.7207	0.0000	1.4000e-004	0.0000		0.0000	0.0000		0.0000	0.0000			2.6000e-004	0.0000	0.0000	2.7000e-004

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.3937					0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Consumer Products	1.3270					0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Landscaping	1.0000e-005	0.0000	1.4000e-004	0.0000		0.0000	0.0000		0.0000	0.0000			2.6000e-004	0.0000	0.0000	2.7000e-004
Total	**1.7207**	**0.0000**	**1.4000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**			**2.6000e-004**	**0.0000**	**0.0000**	**2.7000e-004**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.3937					0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Consumer Products	1.3270					0.0000	0.0000		0.0000	0.0000			0.0000	0.0000	0.0000	0.0000
Landscaping	1.0000e-005	0.0000	1.4000e-004	0.0000		0.0000	0.0000		0.0000	0.0000			2.6000e-004	0.0000	0.0000	2.7000e-004
Total	**1.7207**	**0.0000**	**1.4000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**			**2.6000e-004**	**0.0000**	**0.0000**	**2.7000e-004**

7.0 Water Detail

7.1 Mitigation Measures Water

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Other Asphalt Surfaces	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Other Asphalt Surfaces	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Vegetation

OZONE Impact Analysis: Mortality/Morbidity

Air District/Basin	Ozone Standards (ppm)				Current Attainment Status[1]				2014 Maximum Ozone Concentration (ppm)[2]		Ozone Precursor NO_X + VOC/ROG Inventory[4]		Project Impacts		
	State		Federal		State		Federal								
	1 hour	8 hour	1 hour	8 hour	1 hour	8 hour	1 hour	8 hour	1 hour	8 hour	Tons/Day	Year	Incremental Increase in Ozone, ppb	Mortality	Mobidity
SCAQMD					N	N	--	N	0.13	0.106	1351	2012	0.002	0.01	0.01
VCAPCD					N	N	--	N	0.092	0.085	121.5	2002	0.012	0.03	0.05
SBCAPCD					N	N	--	U/A	0.102	0.089	69.8	2007	0.040	0.13	0.15
SLOAPCD					A	N	--	N	0.081	0.076	96.9	2009	0.015	0.06	0.06
MBUAPCD					N	N	--	U/A	0.083	0.075	120	2010	0.020	0.06	0.08
SMAQMD					N	N	--	N	0.102	0.083	133	2010	0.007	0.02	0.03
SJVAPCD					N	N	--	N	0.113	0.111	1035	2012	0.002	0.01	0.01
Yolo/Solano AQMD[3]					N	N	--	N	0.113	0.111	17.3	2008	0.059	0.18	0.23
BAAQMD	0.09	0.07	--	0.075	N	N	--	N	0.079	0.096	622	2012	0.006	0.02	0.02
PCAPCD					N	N	--	N	0.124	0.105	54	2010	0.050	0.17	0.19
Nevada/Northern Sierra					N	N	--	N	0.128	0.12	50	est.	0.020	0.08	0.08
Feather River					N	N	--	A	0.091	0.086	181	2012	0.004	0.01	0.01
Butte					N	N	--	N	0.088	0.081	31	2012	0.034	0.17	0.13
Tehama					N	N	--	A	0.101	0.085	18	2012	0.055	0.26	0.21
Shasta					N	N	--	A	0.094	0.081	39	2012	0.043	0.20	0.17
Siskiyou					A	A	--	A	0.076	0.072	20	2012	0.092	0.46	0.36
Mojave					N	N	--	N	0.119	0.108	144	2012	0.043	0.13	0.17

[1] Attainment status = Attainment (A), Non-Attainment (N), or Unclassifiable Attainment (U/A).

[2] Source – CA Air Resources Board Air Quality and Meteorological Information System (AQMIS) through 6/10/14.

[3] Combined air quality management district for Yolo and Solano Counties, separate air basin ozone precursor data available.

[4] Source – Air quality management or control district Clean Air Plan for year annotated except SJVAPCD.

[5] Source – Air Resources Board Almanac 2012 data.

Mainline Rail Routes: District Thresholds

Mitigated

Thresholds of Significance							Project Emissions, lbs/day		Project Emissions, tpy			
Air District	NO_X		VOC/ROG		Diesel Particulate		NOx	VOC	NOx	VOC	Sig NOx?	Sign VOC?
	Daily	Annual	Daily	Annual	Daily	Annual						
SCAQMD	55 lbs.		55 lbs.				56.55	6.11			N	N
VCAPCD[1]	25 lbs.		25 lbs.				29.88	3.22			Y	N
SBCAPCD[2]	55 lbs.	10 tons	55 lbs.	10 tons			55.95	6.03	5.38	0.22	Y	N
SLOAPCD[3]	25 lbs.	25 tons	25 lbs.	25 tons	1.25 lbs.		34.66	3.73	3.33	0.13	Y	N
MBUAPCD[4]	137 lbs.		137 lbs.				58.64	6.32			N	N
SMAQMD	65 lbs.		65 lbs.				19.59	2.11			N	N
SJVAPCD[5]		10 tons		10 tons			25.93	2.79	2.49	0.10	N	N
Yolo/Solano AQMD		10 tons		10 tons			16.61	1.79	1.60	0.06	N	N
BAAQMD	80 lbs	15 tons	80 lbs	15 tons			71.59	7.71	6.88	0.28	N	N
PCAPCD	82 lbs		82 lbs				46.17	4.95	4.44	0.20	N	N
Nevada/Northern Sierra	25 lbs.		25 lbs.				15.30	1.60	1.50	0.10	N	N
Feather River	25 lbs.		25 lbs.				13.60	1.50	1.30	0.00	N	N
Butte	25 lbs.		25 lbs.				23.62	2.54	2.27	0.09	N	N
Tehama	25 lbs.		25 lbs.				20.98	2.26	2.02	0.08	N	N
Shasta	25 lbs.		25 lbs.				37.19	4.01	3.58	0.14	Y	N
Siskiyou	25 lbs.		25 lbs.				46.21	4.98	4.44	0.18	Y	N
Mojave	137 lbs.	25 tons	137 lbs.	25 tons			103.80	11.20	10.00	0.40	N	N

1 Outside the Ojai Planning Area.

2 Based on SBCAPCD New Source Review Rule.

3 Threshold value is for NO_X and ROG combined.

4 Threshold value for direct plus indirect sources.

5 Values provided are recommended thresholds of significance.

Calculation for Ozone Excess Mortality and Morbidity

BAAQMD

	Construction	Operations	Traffic	
Increased ozone (ppb)	0	0	0.01	Input
Increased Mortality Rate	0.00000%	0.00000%	0.00046%	Output
Increased Mortality (per thousand exposed)	**0.00**	**0.00**	**0.02**	Output
Increased ozone (ppb)	0	0	0.006119352	Input
Increased Morbidity Rate	0.00000%	0.00000%	0.00125%	Output
Increased Morbidity (per thousand exposed)	**0.00**	**0.00**	**0.02**	Output

Compare Results to:

Baseline Mortality (CARB, 2005)	**6.78**	per 1000 persons/year
Baseline Morbidity (CARB, 2005)	**10.13**	per 1000 persons/year
	(see Table B-17 from CARB 2005 (volume 4)	

Calculation of Mortality and Morbidity Rates

Mortality	**Construction**	**Operations**	**Traffic**
β	0.489	0.489	0.489
RR	1.000	1.000	1.003
PAR	0.000	0.000	0.003
Δy	0.000	0.000	0.020
Morbidity	**Construction**	**Operations**	**Traffic**
β	0.389	0.389	0.389
RR	1.000	1.000	1.002
PAR	0.000	0.000	0.002
Δy	0.000	0.000	0.024

Slope of

Increase in Mortality (CARB, 2005)	**0.75%**	**per 10 ppb increase**
Increase in Morbidity (CARB, 2005)	**2.05%**	**per 10 ppb increase**

Most of the epidemiologic studies used in our estimates have used a log-linear model to represent the relationship between ozone exposure and the health endpoint. In this case, the relationship between ozone levels and the natural logarithm of the health effect is estimated by a linear regression. This regression model generates a beta coefficient that relates the percent change in the health outcome to a unit increase in ozone. Existing studies have reported either a beta coefficient for a unit change in exposure or a relative risk (RR) for a specified change in ozone concentrations, such as 10 ppb 1-hour maximum. The RR is defined as the ratio of the health effect predicted from the higher exposure relative to some baseline exposure. Health effect estimates presented in a given study as RR for a specified change in ozone, Δ O3, were converted into an estimated beta using the equation:

$\beta = \ln(RR) / \Delta O3$

The daily change in ozone at each monitoring site i.e., the difference between current ozone and the standard (= ΔO3) was used to calculate RR:

$RR = \exp(\beta \Delta O3)$

Then, the RR estimates were used to determine the population attributable risk (PAR), which represents the proportion of the health effects in the whole population that may be prevented if the cause (ozone pollution in our case) is reduced by a given amount. Specifically,

$PAR = (RR - 1) / RR$

Ultimately, the estimated impact on the health outcome is calculated as follows:

$\Delta y = PAR \times y0 \times pop$

where:

Δy = changes in the incidence of a health endpoint corresponding to a particular change in ozone,
y0 = baseline incidence rate/person within a defined at-risk subgroup, and
pop = population size of the group exposed.

Calculation for Ozone Excess Mortality and Morbidity

Yolo/Solano AQMD3

	Construction	Operations	Traffic	
Increased ozone (ppb)	0	0	0.06	Input
Increased Mortality Rate	0.00000%	0.00000%	0.00443%	Output
Increased Mortality (per thousand exposed)	**0.00**	**0.00**	**0.18**	Output
Increased ozone (ppb)	0	0	0.059008092	Input
Increased Morbidity Rate	0.00000%	0.00000%	0.01210%	Output
Increased Morbidity (per thousand exposed)	**0.00**	**0.00**	**0.23**	Output

Compare Results to:

Baseline Mortality (CARB, 2005)	**6.37**	per 1000 persons/year
Baseline Morbidity (CARB, 2005)	**10.13**	per 1000 persons/year
	(see Table B-17 from CARB 2005 (volume 4)	

Calculation of Mortality and Morbidity Rates

Mortality	**Construction**	**Operations**	**Traffic**
β	0.489	0.489	0.489
RR	1.000	1.000	1.029
PAR	0.000	0.000	0.028
Δy	0.000	0.000	0.181
Morbidity	**Construction**	**Operations**	**Traffic**
β	0.389	0.389	0.389
RR	1.000	1.000	1.023
PAR	0.000	0.000	0.023
Δy	0.000	0.000	0.230

Slope of

Increase in Mortality (CARB, 2005)	**0.75%**	**per 10 ppb increase**
Increase in Morbidity (CARB, 2005)	**2.05%**	**per 10 ppb increase**

Most of the epidemiologic studies used in our estimates have used a log-linear model to represent the relationship between ozone exposure and the health endpoint. In this case, the relationship between ozone levels and the natural logarithm of the health effect is estimated by a linear regression. This regression model generates a beta coefficient that relates the percent change in the health outcome to a unit increase in ozone. Existing studies have reported either a beta coefficient for a unit change in exposure or a relative risk (RR) for a specified change in ozone concentrations, such as 10 ppb 1-hour maximum. The RR is defined as the ratio of the health effect predicted from the higher exposure relative to some baseline exposure. Health effect estimates presented in a given study as RR for a specified change in ozone, Δ O3, were converted into an estimated beta using the equation:

$\beta = \ln(RR) / \Delta O3$

The daily change in ozone at each monitoring site i.e., the difference between current ozone and the standard (= ΔO3) was used to calculate RR:

$RR = \exp(\beta \Delta O3)$

Then, the RR estimates were used to determine the population attributable risk (PAR), which represents the proportion of the health effects in the whole population that may be prevented if the cause (ozone pollution in our case) is reduced by a given amount. Specifically,

$PAR = (RR - 1) / RR$

Ultimately, the estimated impact on the health outcome is calculated as follows:

$\Delta y = PAR \times y0 \times pop$

where:

Δy = changes in the incidence of a health endpoint corresponding to a particular change in ozone,
y0 = baseline incidence rate/person within a defined at-risk subgroup, and
pop = population size of the group exposed.

Calculation for Ozone Excess Mortality and Morbidity

SJVAPCD

	Construction	Operations	Traffic	
Increased ozone (ppb)	0	0	0.00	Input
Increased Mortality Rate	0.00000%	0.00000%	0.00012%	Output
Increased Mortality (per thousand exposed)	**0.00**	**0.00**	**0.01**	Output
Increased ozone (ppb)	0	0	0.001540451	Input
Increased Morbidity Rate	0.00000%	0.00000%	0.00032%	Output
Increased Morbidity (per thousand exposed)	**0.00**	**0.00**	**0.01**	Output

Compare Results to:

Baseline Mortality (CARB, 2005)	**6.98**	per 1000 persons/year
Baseline Morbidity (CARB, 2005)	**10.13**	per 1000 persons/year
	(see Table B-17 from CARB 2005 (volume 4)	

Calculation of Mortality and Morbidity Rates

Mortality	**Construction**	**Operations**	**Traffic**
β	0.489	0.489	0.489
RR	1.000	1.000	1.001
PAR	0.000	0.000	0.001
Δy	0.000	0.000	0.005
Morbidity	**Construction**	**Operations**	**Traffic**
β	0.389	0.389	0.389
RR	1.000	1.000	1.001
PAR	0.000	0.000	0.001
Δy	0.000	0.000	0.006

Slope of

Increase in Mortality (CARB, 2005)	**0.75%**	**per 10 ppb increase**
Increase in Morbidity (CARB, 2005)	**2.05%**	**per 10 ppb increase**

Most of the epidemiologic studies used in our estimates have used a log-linear model to represent the relationship between ozone exposure and the health endpoint. In this case, the relationship between ozone levels and the natural logarithm of the health effect is estimated by a linear regression. This regression model generates a beta coefficient that relates the percent change in the health outcome to a unit increase in ozone. Existing studies have reported either a beta coefficient for a unit change in exposure or a relative risk (RR) for a specified change in ozone concentrations, such as 10 ppb 1-hour maximum. The RR is defined as the ratio of the health effect predicted from the higher exposure relative to some baseline exposure. Health effect estimates presented in a given study as RR for a specified change in ozone, Δ O3, were converted into an estimated beta using the equation:

$\beta = \ln(RR) / \Delta O3$

The daily change in ozone at each monitoring site i.e., the difference between current ozone and the standard (= ΔO3) was used to calculate RR:

$RR = \exp(\beta \Delta O3)$

Then, the RR estimates were used to determine the population attributable risk (PAR), which represents the proportion of the health effects in the whole population that may be prevented if the cause (ozone pollution in our case) is reduced by a given amount. Specifically,

$PAR = (RR - 1) / RR$

Ultimately, the estimated impact on the health outcome is calculated as follows:

$\Delta y = PAR \times y0 \times pop$

where:

Δy = changes in the incidence of a health endpoint corresponding to a particular change in ozone,
y0 = baseline incidence rate/person within a defined at-risk subgroup, and
pop = population size of the group exposed.

Calculation for Ozone Excess Mortality and Morbidity

SMAQMD

	Construction	Operations	Traffic	
Increased ozone (ppb)	0	0	0.01	Input
Increased Mortality Rate	0.00000%	0.00000%	0.00051%	Output
Increased Mortality (per thousand exposed)	**0.00**	**0.00**	**0.02**	Output
Increased ozone (ppb)	0	0	0.006772444	Input
Increased Morbidity Rate	0.00000%	0.00000%	0.00139%	Output
Increased Morbidity (per thousand exposed)	**0.00**	**0.00**	**0.03**	Output

Compare Results to:

Baseline Mortality (CARB, 2005)	**7.14**	per 1000 persons/year
Baseline Morbidity (CARB, 2005)	**10.13**	per 1000 persons/year
	(see Table B-17 from CARB 2005 (volume 4)	

Calculation of Mortality and Morbidity Rates

Mortality	**Construction**	**Operations**	**Traffic**
β	0.489	0.489	0.489
RR	1.000	1.000	1.003
PAR	0.000	0.000	0.003
Δy	0.000	0.000	0.024
Morbidity	**Construction**	**Operations**	**Traffic**
β	0.389	0.389	0.389
RR	1.000	1.000	1.003
PAR	0.000	0.000	0.003
Δy	0.000	0.000	0.027

Slope of

Increase in Mortality (CARB, 2005)	**0.75%**	**per 10 ppb increase**
Increase in Morbidity (CARB, 2005)	**2.05%**	**per 10 ppb increase**

Most of the epidemiologic studies used in our estimates have used a log-linear model to represent the relationship between ozone exposure and the health endpoint. In this case, the relationship between ozone levels and the natural logarithm of the health effect is estimated by a linear regression. This regression model generates a beta coefficient that relates the percent change in the health outcome to a unit increase in ozone. Existing studies have reported either a beta coefficient for a unit change in exposure or a relative risk (RR) for a specified change in ozone concentrations, such as 10 ppb 1-hour maximum. The RR is defined as the ratio of the health effect predicted from the higher exposure relative to some baseline exposure. Health effect estimates presented in a given study as RR for a specified change in ozone, Δ O3, were converted into an estimated beta using the equation:

$\beta = \ln(RR) / \Delta O3$

The daily change in ozone at each monitoring site i.e., the difference between current ozone and the standard (= ΔO3) was used to calculate RR:

$RR = \exp(\beta \Delta O3)$

Then, the RR estimates were used to determine the population attributable risk (PAR), which represents the proportion of the health effects in the whole population that may be prevented if the cause (ozone pollution in our case) is reduced by a given amount. Specifically,

$PAR = (RR - 1) / RR$

Ultimately, the estimated impact on the health outcome is calculated as follows:

$\Delta y = PAR \times y0 \times pop$

where:

Δy = changes in the incidence of a health endpoint corresponding to a particular change in ozone,
y0 = baseline incidence rate/person within a defined at-risk subgroup, and
pop = population size of the group exposed.

Calculation for Ozone Excess Mortality and Morbidity

MBUAPCD

	Construction	Operations	Traffic	
Increased ozone (ppb)	0	0	0.02	Input
Increased Mortality Rate	0.00000%	0.00000%	0.00152%	Output
Increased Mortality (per thousand exposed)	**0.00**	**0.00**	**0.06**	Output
Increased ozone (ppb)	0	0	0.020299599	Input
Increased Morbidity Rate	0.00000%	0.00000%	0.00416%	Output
Increased Morbidity (per thousand exposed)	**0.00**	**0.00**	**0.08**	Output

Compare Results to:

Baseline Mortality (CARB, 2005)	**5.88**	per 1000 persons/year
Baseline Morbidity (CARB, 2005)	**10.13**	per 1000 persons/year
	(see Table B-17 from CARB 2005 (volume 4)	

Calculation of Mortality and Morbidity Rates

Mortality	**Construction**	**Operations**	**Traffic**
β	0.489	0.489	0.489
RR	1.000	1.000	1.010
PAR	0.000	0.000	0.010
Δy	0.000	0.000	0.058
Morbidity	**Construction**	**Operations**	**Traffic**
β	0.389	0.389	0.389
RR	1.000	1.000	1.008
PAR	0.000	0.000	0.008
Δy	0.000	0.000	0.080

Slope of

Increase in Mortality (CARB, 2005)	**0.75%**	**per 10 ppb increase**
Increase in Morbidity (CARB, 2005)	**2.05%**	**per 10 ppb increase**

Most of the epidemiologic studies used in our estimates have used a log-linear model to represent the relationship between ozone exposure and the health endpoint. In this case, the relationship between ozone levels and the natural logarithm of the health effect is estimated by a linear regression. This regression model generates a beta coefficient that relates the percent change in the health outcome to a unit increase in ozone. Existing studies have reported either a beta coefficient for a unit change in exposure or a relative risk (RR) for a specified change in ozone concentrations, such as 10 ppb 1-hour maximum. The RR is defined as the ratio of the health effect predicted from the higher exposure relative to some baseline exposure. Health effect estimates presented in a given study as RR for a specified change in ozone, Δ O3, were converted into an estimated beta using the equation:

$\beta = \ln(RR) / \Delta O3$

The daily change in ozone at each monitoring site i.e., the difference between current ozone and the standard (= ΔO3) was used to calculate RR:

$RR = \exp(\beta \Delta O3)$

Then, the RR estimates were used to determine the population attributable risk (PAR), which represents the proportion of the health effects in the whole population that may be prevented if the cause (ozone pollution in our case) is reduced by a given amount. Specifically,

$PAR = (RR - 1) / RR$

Ultimately, the estimated impact on the health outcome is calculated as follows:

$\Delta y = PAR \times y0 \times pop$

where:

Δy = changes in the incidence of a health endpoint corresponding to a particular change in ozone,
y0 = baseline incidence rate/person within a defined at-risk subgroup, and
pop = population size of the group exposed.

Calculation for Ozone Excess Mortality and Morbidity

SLOAPCD

	Construction	Operations	Traffic	
Increased ozone (ppb)	0	0	0.02	Input
Increased Mortality Rate	0.00000%	0.00000%	0.00113%	Output
Increased Mortality (per thousand exposed)	**0.00**	**0.00**	**0.06**	Output
Increased ozone (ppb)	0	0	0.015057519	Input
Increased Morbidity Rate	0.00000%	0.00000%	0.00309%	Output
Increased Morbidity (per thousand exposed)	**0.00**	**0.00**	**0.06**	Output

Compare Results to:

Baseline Mortality (CARB, 2005)	**7.87**	per 1000 persons/year
Baseline Morbidity (CARB, 2005)	**10.13**	per 1000 persons/year
	(see Table B-17 from CARB 2005 (volume 4)	

Calculation of Mortality and Morbidity Rates

Mortality	**Construction**	**Operations**	**Traffic**
β	0.489	0.489	0.489
RR	1.000	1.000	1.007
PAR	0.000	0.000	0.007
Δy	0.000	0.000	0.058
Morbidity	**Construction**	**Operations**	**Traffic**
β	0.389	0.389	0.389
RR	1.000	1.000	1.006
PAR	0.000	0.000	0.006
Δy	0.000	0.000	0.059

Slope of

Increase in Mortality (CARB, 2005)	**0.75%**	**per 10 ppb increase**
Increase in Morbidity (CARB, 2005)	**2.05%**	**per 10 ppb increase**

Most of the epidemiologic studies used in our estimates have used a log-linear model to represent the relationship between ozone exposure and the health endpoint. In this case, the relationship between ozone levels and the natural logarithm of the health effect is estimated by a linear regression. This regression model generates a beta coefficient that relates the percent change in the health outcome to a unit increase in ozone. Existing studies have reported either a beta coefficient for a unit change in exposure or a relative risk (RR) for a specified change in ozone concentrations, such as 10 ppb 1-hour maximum. The RR is defined as the ratio of the health effect predicted from the higher exposure relative to some baseline exposure. Health effect estimates presented in a given study as RR for a specified change in ozone, Δ O3, were converted into an estimated beta using the equation:

$\beta = \ln(RR) / \Delta O3$

The daily change in ozone at each monitoring site i.e., the difference between current ozone and the standard (= ΔO3) was used to calculate RR:

$RR = \exp(\beta \Delta O3)$

Then, the RR estimates were used to determine the population attributable risk (PAR), which represents the proportion of the health effects in the whole population that may be prevented if the cause (ozone pollution in our case) is reduced by a given amount. Specifically,

$PAR = (RR - 1) / RR$

Ultimately, the estimated impact on the health outcome is calculated as follows:

$\Delta y = PAR \times y0 \times pop$

where:

Δy = changes in the incidence of a health endpoint corresponding to a particular change in ozone,
y0 = baseline incidence rate/person within a defined at-risk subgroup, and
pop = population size of the group exposed.

Calculation for Ozone Excess Mortality and Morbidity

SBCAPCD

	Construction	Operations	Traffic	
Increased ozone (ppb)	0	0	0.04	Input
Increased Mortality Rate	0.00000%	0.00000%	0.00296%	Output
Increased Mortality (per thousand exposed)	**0.00**	**0.00**	**0.13**	Output
Increased ozone (ppb)	0	0	0.039514477	Input
Increased Morbidity Rate	0.00000%	0.00000%	0.00810%	Output
Increased Morbidity (per thousand exposed)	**0.00**	**0.00**	**0.15**	Output

Compare Results to:

Baseline Mortality (CARB, 2005)	**6.8**	per 1000 persons/year
Baseline Morbidity (CARB, 2005)	**10.13**	per 1000 persons/year
	(see Table B-17 from CARB 2005 (volume 4)	

Calculation of Mortality and Morbidity Rates

Mortality	**Construction**	**Operations**	**Traffic**
β	0.489	0.489	0.489
RR	1.000	1.000	1.020
PAR	0.000	0.000	0.019
Δy	0.000	0.000	0.130
Morbidity	**Construction**	**Operations**	**Traffic**
β	0.389	0.389	0.389
RR	1.000	1.000	1.015
PAR	0.000	0.000	0.015
Δy	0.000	0.000	0.154

Slope of

Increase in Mortality (CARB, 2005)	**0.75%**	**per 10 ppb increase**
Increase in Morbidity (CARB, 2005)	**2.05%**	**per 10 ppb increase**

Most of the epidemiologic studies used in our estimates have used a log-linear model to represent the relationship between ozone exposure and the health endpoint. In this case, the relationship between ozone levels and the natural logarithm of the health effect is estimated by a linear regression. This regression model generates a beta coefficient that relates the percent change in the health outcome to a unit increase in ozone. Existing studies have reported either a beta coefficient for a unit change in exposure or a relative risk (RR) for a specified change in ozone concentrations, such as 10 ppb 1-hour maximum. The RR is defined as the ratio of the health effect predicted from the higher exposure relative to some baseline exposure. Health effect estimates presented in a given study as RR for a specified change in ozone, Δ O3, were converted into an estimated beta using the equation:

$\beta = \ln(RR) / \Delta O3$

The daily change in ozone at each monitoring site i.e., the difference between current ozone and the standard (= ΔO3) was used to calculate RR:

$RR = \exp(\beta \Delta O3)$

Then, the RR estimates were used to determine the population attributable risk (PAR), which represents the proportion of the health effects in the whole population that may be prevented if the cause (ozone pollution in our case) is reduced by a given amount. Specifically,

$PAR = (RR - 1) / RR$

Ultimately, the estimated impact on the health outcome is calculated as follows:

$\Delta y = PAR \times y0 \times pop$

where:

Δy = changes in the incidence of a health endpoint corresponding to a particular change in ozone,
y0 = baseline incidence rate/person within a defined at-risk subgroup, and
pop = population size of the group exposed.

Calculation for Ozone Excess Mortality and Morbidity

VCAPCD

	Construction	Operations	Traffic	
Increased ozone (ppb)	0	0	0.01	Input
Increased Mortality Rate	0.00000%	0.00000%	0.00087%	Output
Increased Mortality (per thousand exposed)	**0.00**	**0.00**	**0.03**	Output
Increased ozone (ppb)	0	0	0.011577494	Input
Increased Morbidity Rate	0.00000%	0.00000%	0.00237%	Output
Increased Morbidity (per thousand exposed)	**0.00**	**0.00**	**0.05**	Output

Compare Results to:

Baseline Mortality (CARB, 2005)	**5.76**	per 1000 persons/year
Baseline Morbidity (CARB, 2005)	**10.13**	per 1000 persons/year

(see Table B-17 from CARB 2005 (volume 4)

Calculation of Mortality and Morbidity Rates

Mortality	**Construction**	**Operations**	**Traffic**
β	0.489	0.489	0.489
RR	1.000	1.000	1.006
PAR	0.000	0.000	0.006
Δy	0.000	0.000	0.033
Morbidity	**Construction**	**Operations**	**Traffic**
β	0.389	0.389	0.389
RR	1.000	1.000	1.005
PAR	0.000	0.000	0.004
Δy	0.000	0.000	0.045

Slope of

Increase in Mortality (CARB, 2005)	**0.75%**	**per 10 ppb increase**
Increase in Morbidity (CARB, 2005)	**2.05%**	**per 10 ppb increase**

Most of the epidemiologic studies used in our estimates have used a log-linear model to represent the relationship between ozone exposure and the health endpoint. In this case, the relationship between ozone levels and the natural logarithm of the health effect is estimated by a linear regression. This regression model generates a beta coefficient that relates the percent change in the health outcome to a unit increase in ozone. Existing studies have reported either a beta coefficient for a unit change in exposure or a relative risk (RR) for a specified change in ozone concentrations, such as 10 ppb 1-hour maximum. The RR is defined as the ratio of the health effect predicted from the higher exposure relative to some baseline exposure. Health effect estimates presented in a given study as RR for a specified change in ozone, Δ O3, were converted into an estimated beta using the equation:

$\beta = \ln(RR) / \Delta O3$

The daily change in ozone at each monitoring site i.e., the difference between current ozone and the standard (= ΔO3) was used to calculate RR:

$RR = \exp(\beta \Delta O3)$

Then, the RR estimates were used to determine the population attributable risk (PAR), which represents the proportion of the health effects in the whole population that may be prevented if the cause (ozone pollution in our case) is reduced by a given amount. Specifically,

$PAR = (RR - 1) / RR$

Ultimately, the estimated impact on the health outcome is calculated as follows:

$\Delta y = PAR \times y0 \times pop$

where:

Δy = changes in the incidence of a health endpoint corresponding to a particular change in ozone,
y0 = baseline incidence rate/person within a defined at-risk subgroup, and
pop = population size of the group exposed.

Calculation for Ozone Excess Mortality and Morbidity

SCAQMD

	Construction	Operations	Traffic	
Increased ozone (ppb)	0	0	0.00	Input
Increased Mortality Rate	0.00000%	0.00000%	0.00015%	Output
Increased Mortality (per thousand exposed)	**0.00**	**0.00**	**0.01**	Output
Increased ozone (ppb)	0	0	0.001979573	Input
Increased Morbidity Rate	0.00000%	0.00000%	0.00041%	Output
Increased Morbidity (per thousand exposed)	**0.00**	**0.00**	**0.01**	Output

Compare Results to:

Baseline Mortality (CARB, 2005)	**6.08**	per 1000 persons/year
Baseline Morbidity (CARB, 2005)	**10.13**	per 1000 persons/year
	(see Table B-17 from CARB 2005 (volume 4)	

Calculation of Mortality and Morbidity Rates

Mortality	**Construction**	**Operations**	**Traffic**
β	0.489	0.489	0.489
RR	1.000	1.000	1.001
PAR	0.000	0.000	0.001
Δy	0.000	0.000	0.006
Morbidity	**Construction**	**Operations**	**Traffic**
β	0.389	0.389	0.389
RR	1.000	1.000	1.001
PAR	0.000	0.000	0.001
Δy	0.000	0.000	0.008

Slope of

Increase in Mortality (CARB, 2005)	**0.75%**	**per 10 ppb increase**
Increase in Morbidity (CARB, 2005)	**2.05%**	**per 10 ppb increase**

Most of the epidemiologic studies used in our estimates have used a log-linear model to represent the relationship between ozone exposure and the health endpoint. In this case, the relationship between ozone levels and the natural logarithm of the health effect is estimated by a linear regression. This regression model generates a beta coefficient that relates the percent change in the health outcome to a unit increase in ozone. Existing studies have reported either a beta coefficient for a unit change in exposure or a relative risk (RR) for a specified change in ozone concentrations, such as 10 ppb 1-hour maximum. The RR is defined as the ratio of the health effect predicted from the higher exposure relative to some baseline exposure. Health effect estimates presented in a given study as RR for a specified change in ozone, Δ O3, were converted into an estimated beta using the equation:

$\beta = \ln(RR) / \Delta O3$

The daily change in ozone at each monitoring site i.e., the difference between current ozone and the standard (= ΔO3) was used to calculate RR:

$RR = \exp(\beta \Delta O3)$

Then, the RR estimates were used to determine the population attributable risk (PAR), which represents the proportion of the health effects in the whole population that may be prevented if the cause (ozone pollution in our case) is reduced by a given amount. Specifically,

$PAR = (RR - 1) / RR$

Ultimately, the estimated impact on the health outcome is calculated as follows:

$\Delta y = PAR \times y0 \times pop$

where:

Δy = changes in the incidence of a health endpoint corresponding to a particular change in ozone,
y0 = baseline incidence rate/person within a defined at-risk subgroup, and
pop = population size of the group exposed.

Calculation for Ozone Excess Mortality and Morbidity

PCAPCD

	Construction	Operations	Traffic	
Increased ozone (ppb)	0	0	0.04970	Input
Increased Mortality Rate	0.00000%	0.00000%	0.00373%	Output
Increased Mortality (per thousand exposed)	**0.00**	**0.00**	**0.17**	Output
Increased ozone (ppb)	0	0	0.04970	Input
Increased Morbidity Rate	0.00000%	0.00000%	0.01019%	Output
Increased Morbidity (per thousand exposed)	**0.00**	**0.00**	**0.19**	Output

Compare Results to:

Baseline Mortality (CARB, 2005)	**7.00**	per 1000 persons/year for	Placer County
Baseline Morbidity (CARB, 2005)	**10.13**	per 1000 persons/year for	Placer County
	(see Table B-17 from CARB 2005 (volume 4)		

Calculation of Mortality and Morbidity Rates

Mortality	**Construction**	**Operations**	**Traffic**
β	0.489	0.489	0.489
RR	1.000	1.000	1.025
PAR	0.000	0.000	0.024
Δy	0.000	0.000	0.168
Morbidity	**Construction**	**Operations**	**Traffic**
β	0.389	0.389	0.389
RR	1.000	1.000	1.020
PAR	0.000	0.000	0.019
Δy	0.000	0.000	0.194

Slope of

Increase in Mortality (CARB, 2005)	**0.75%**	**per 10 ppb increase**
Increase in Morbidity (CARB, 2005)	**2.05%**	**per 10 ppb increase**

Most of the epidemiologic studies used in our estimates have used a log-linear model to represent the relationship between ozone exposure and the health endpoint. In this case, the relationship between ozone levels and the natural logarithm of the health effect is estimated by a linear regression. This regression model generates a beta coefficient that relates the percent change in the health outcome to a unit increase in ozone. Existing studies have reported either a beta coefficient for a unit change in exposure or a relative risk (RR) for a specified change in ozone concentrations, such as 10 ppb 1-hour maximum. The RR is defined as the ratio of the health effect predicted from the higher exposure relative to some baseline exposure. Health effect estimates presented in a given study as RR for a specified change in ozone, Δ O3, were converted into an estimated beta using the equation:

$\beta = \ln(RR) / \Delta O3$

The daily change in ozone at each monitoring site i.e., the difference between current ozone and the standard (= ΔO3) was used to calculate RR:

$RR = \exp(\beta \Delta O3)$

Then, the RR estimates were used to determine the population attributable risk (PAR), which represents the proportion of the health effects in the whole population that may be prevented if the cause (ozone pollution in our case) is reduced by a given amount. Specifically,

$PAR = (RR - 1) / RR$

Ultimately, the estimated impact on the health outcome is calculated as follows:

$\Delta y = PAR \times y0 \times pop$

where:

Δy = changes in the incidence of a health endpoint corresponding to a particular change in ozone,
y0 = baseline incidence rate/person within a defined at-risk subgroup, and
pop = population size of the group exposed.

Calculation for Ozone Excess Mortality and Morbidity

Nevada/Northern Sierra

	Construction	Operations	Traffic	
Increased ozone (ppb)	0	0	0.02028	Input
Increased Mortality Rate	0.00000%	0.00000%	0.00152%	Output
Increased Mortality (per thousand exposed)	**0.00**	**0.00**	**0.08**	Output
Increased ozone (ppb)	0	0	0.02028	Input
Increased Morbidity Rate	0.00000%	0.00000%	0.00416%	Output
Increased Morbidity (per thousand exposed)	**0.00**	**0.00**	**0.08**	Output

Compare Results to:

Baseline Mortality (CARB, 2005)	**8.56**	per 1000 persons/year for	Nevada/Northern Sierra
Baseline Morbidity (CARB, 2005)	**10.13**	per 1000 persons/year for	Nevada/Northern Sierra

(see Table B-17 from CARB 2005 (volume 4)

Calculation of Mortality and Morbidity Rates

Mortality	**Construction**	**Operations**	**Traffic**
β	0.489	0.489	0.489
RR	1.000	1.000	1.010
PAR	0.000	0.000	0.010
Δy	0.000	0.000	0.085
Morbidity	**Construction**	**Operations**	**Traffic**
β	0.389	0.389	0.389
RR	1.000	1.000	1.008
PAR	0.000	0.000	0.008
Δy	0.000	0.000	0.080

Slope of

Increase in Mortality (CARB, 2005)	**0.75%**	**per 10 ppb increase**
Increase in Morbidity (CARB, 2005)	**2.05%**	**per 10 ppb increase**

Most of the epidemiologic studies used in our estimates have used a log-linear model to represent the relationship between ozone exposure and the health endpoint. In this case, the relationship between ozone levels and the natural logarithm of the health effect is estimated by a linear regression. This regression model generates a beta coefficient that relates the percent change in the health outcome to a unit increase in ozone. Existing studies have reported either a beta coefficient for a unit change in exposure or a relative risk (RR) for a specified change in ozone concentrations, such as 10 ppb 1-hour maximum. The RR is defined as the ratio of the health effect predicted from the higher exposure relative to some baseline exposure. Health effect estimates presented in a given study as RR for a specified change in ozone, Δ O3, were converted into an estimated beta using the equation:

$\beta = \ln(RR) / \Delta O3$

The daily change in ozone at each monitoring site i.e., the difference between current ozone and the standard (= ΔO3) was used to calculate RR:

$RR = \exp(\beta \Delta O3)$

Then, the RR estimates were used to determine the population attributable risk (PAR), which represents the proportion of the health effects in the whole population that may be prevented if the cause (ozone pollution in our case) is reduced by a given amount. Specifically,

$PAR = (RR - 1) / RR$

Ultimately, the estimated impact on the health outcome is calculated as follows:

$\Delta y = PAR \times y0 \times pop$

where:

Δy = changes in the incidence of a health endpoint corresponding to a particular change in ozone,
y0 = baseline incidence rate/person within a defined at-risk subgroup, and
pop = population size of the group exposed.

Calculation for Ozone Excess Mortality and Morbidity

Feather River

	Construction	Operations	Traffic	
Increased ozone (ppb)	0	0	0.00359	Input
Increased Mortality Rate	0.00000%	0.00000%	0.00027%	Output
Increased Mortality (per thousand exposed)	**0.00**	**0.00**	**0.01**	Output
Increased ozone (ppb)	0	0	0.00359	Input
Increased Morbidity Rate	0.00000%	0.00000%	0.00074%	Output
Increased Morbidity (per thousand exposed)	**0.00**	**0.00**	**0.01**	Output

Compare Results to:

Baseline Mortality (CARB, 2005)	**7.43**	per 1000 persons/year for	Feather River
Baseline Morbidity (CARB, 2005)	**10.13**	per 1000 persons/year for	Feather River
	(see Table B-17 from CARB 2005 (volume 4)		

Calculation of Mortality and Morbidity Rates

Mortality	**Construction**	**Operations**	**Traffic**
β	0.489	0.489	0.489
RR	1.000	1.000	1.002
PAR	0.000	0.000	0.002
Δy	0.000	0.000	0.013
Morbidity	**Construction**	**Operations**	**Traffic**
β	0.389	0.389	0.389
RR	1.000	1.000	1.001
PAR	0.000	0.000	0.001
Δy	0.000	0.000	0.014

Slope of

Increase in Mortality (CARB, 2005)	**0.75%**	**per 10 ppb increase**
Increase in Morbidity (CARB, 2005)	**2.05%**	**per 10 ppb increase**

Most of the epidemiologic studies used in our estimates have used a log-linear model to represent the relationship between ozone exposure and the health endpoint. In this case, the relationship between ozone levels and the natural logarithm of the health effect is estimated by a linear regression. This regression model generates a beta coefficient that relates the percent change in the health outcome to a unit increase in ozone. Existing studies have reported either a beta coefficient for a unit change in exposure or a relative risk (RR) for a specified change in ozone concentrations, such as 10 ppb 1-hour maximum. The RR is defined as the ratio of the health effect predicted from the higher exposure relative to some baseline exposure. Health effect estimates presented in a given study as RR for a specified change in ozone, Δ O3, were converted into an estimated beta using the equation:

$\beta = \ln(RR) / \Delta O3$

The daily change in ozone at each monitoring site i.e., the difference between current ozone and the standard (= ΔO3) was used to calculate RR:

$RR = \exp(\beta \Delta O3)$

Then, the RR estimates were used to determine the population attributable risk (PAR), which represents the proportion of the health effects in the whole population that may be prevented if the cause (ozone pollution in our case) is reduced by a given amount. Specifically,

$PAR = (RR - 1) / RR$

Ultimately, the estimated impact on the health outcome is calculated as follows:

$\Delta y = PAR \times y0 \times pop$

where:

Δy = changes in the incidence of a health endpoint corresponding to a particular change in ozone,
y0 = baseline incidence rate/person within a defined at-risk subgroup, and
pop = population size of the group exposed.

Calculation for Ozone Excess Mortality and Morbidity

Butte

	Construction	Operations	Traffic	
Increased ozone (ppb)	0	0	0.03418	Input
Increased Mortality Rate	0.00000%	0.00000%	0.00256%	Output
Increased Mortality (per thousand exposed)	**0.00**	**0.00**	**0.17**	Output
Increased ozone (ppb)	0	0	0.03418	Input
Increased Morbidity Rate	0.00000%	0.00000%	0.00701%	Output
Increased Morbidity (per thousand exposed)	**0.00**	**0.00**	**0.13**	Output

Compare Results to:

Baseline Mortality (CARB, 2005)	**10.40**	per 1000 persons/year for	Butte
Baseline Morbidity (CARB, 2005)	**10.13**	per 1000 persons/year for	Butte
	(see Table B-17 from CARB 2005 (volume 4)		

Calculation of Mortality and Morbidity Rates

Mortality	**Construction**	**Operations**	**Traffic**
β	0.489	0.489	0.489
RR	1.000	1.000	1.017
PAR	0.000	0.000	0.017
Δy	0.000	0.000	0.172
Morbidity	**Construction**	**Operations**	**Traffic**
β	0.389	0.389	0.389
RR	1.000	1.000	1.013
PAR	0.000	0.000	0.013
Δy	0.000	0.000	0.134

Slope of

Increase in Mortality (CARB, 2005)	**0.75%**	**per 10 ppb increase**
Increase in Morbidity (CARB, 2005)	**2.05%**	**per 10 ppb increase**

Most of the epidemiologic studies used in our estimates have used a log-linear model to represent the relationship between ozone exposure and the health endpoint. In this case, the relationship between ozone levels and the natural logarithm of the health effect is estimated by a linear regression. This regression model generates a beta coefficient that relates the percent change in the health outcome to a unit increase in ozone. Existing studies have reported either a beta coefficient for a unit change in exposure or a relative risk (RR) for a specified change in ozone concentrations, such as 10 ppb 1-hour maximum. The RR is defined as the ratio of the health effect predicted from the higher exposure relative to some baseline exposure. Health effect estimates presented in a given study as RR for a specified change in ozone, Δ O3, were converted into an estimated beta using the equation:

$\beta = \ln(RR) / \Delta O3$

The daily change in ozone at each monitoring site i.e., the difference between current ozone and the standard (= ΔO3) was used to calculate RR:

$RR = \exp(\beta \Delta O3)$

Then, the RR estimates were used to determine the population attributable risk (PAR), which represents the proportion of the health effects in the whole population that may be prevented if the cause (ozone pollution in our case) is reduced by a given amount. Specifically,

$PAR = (RR - 1) / RR$

Ultimately, the estimated impact on the health outcome is calculated as follows:

$\Delta y = PAR \times y0 \times pop$

where:

Δy = changes in the incidence of a health endpoint corresponding to a particular change in ozone,
y0 = baseline incidence rate/person within a defined at-risk subgroup, and
pop = population size of the group exposed.

Calculation for Ozone Excess Mortality and Morbidity

Tehama

	Construction	Operations	Traffic	
Increased ozone (ppb)	0	0	0.05487	Input
Increased Mortality Rate	0.00000%	0.00000%	0.00412%	Output
Increased Mortality (per thousand exposed)	**0.00**	**0.00**	**0.26**	Output
Increased ozone (ppb)	0	0	0.05487	Input
Increased Morbidity Rate	0.00000%	0.00000%	0.01125%	Output
Increased Morbidity (per thousand exposed)	**0.00**	**0.00**	**0.21**	Output

Compare Results to:

Baseline Mortality (CARB, 2005)	**9.90**	per 1000 persons/year for	Tehama
Baseline Morbidity (CARB, 2005)	**10.13**	per 1000 persons/year for	Tehama
	(see Table B-17 from CARB 2005 (volume 4)		

Calculation of Mortality and Morbidity Rates

Mortality	**Construction**	**Operations**	**Traffic**
β	0.489	0.489	0.489
RR	1.000	1.000	1.027
PAR	0.000	0.000	0.026
Δy	0.000	0.000	0.262
Morbidity	**Construction**	**Operations**	**Traffic**
β	0.389	0.389	0.389
RR	1.000	1.000	1.022
PAR	0.000	0.000	0.021
Δy	0.000	0.000	0.214

Slope of

Increase in Mortality (CARB, 2005)	**0.75%**	**per 10 ppb increase**
Increase in Morbidity (CARB, 2005)	**2.05%**	**per 10 ppb increase**

Most of the epidemiologic studies used in our estimates have used a log-linear model to represent the relationship between ozone exposure and the health endpoint. In this case, the relationship between ozone levels and the natural logarithm of the health effect is estimated by a linear regression. This regression model generates a beta coefficient that relates the percent change in the health outcome to a unit increase in ozone. Existing studies have reported either a beta coefficient for a unit change in exposure or a relative risk (RR) for a specified change in ozone concentrations, such as 10 ppb 1-hour maximum. The RR is defined as the ratio of the health effect predicted from the higher exposure relative to some baseline exposure. Health effect estimates presented in a given study as RR for a specified change in ozone, Δ O3, were converted into an estimated beta using the equation:

$\beta = \ln(RR) / \Delta O3$

The daily change in ozone at each monitoring site i.e., the difference between current ozone and the standard (= ΔO3) was used to calculate RR:

$RR = \exp(\beta \Delta O3)$

Then, the RR estimates were used to determine the population attributable risk (PAR), which represents the proportion of the health effects in the whole population that may be prevented if the cause (ozone pollution in our case) is reduced by a given amount. Specifically,

$PAR = (RR - 1) / RR$

Ultimately, the estimated impact on the health outcome is calculated as follows:

$\Delta y = PAR \times y0 \times pop$

where:

Δy = changes in the incidence of a health endpoint corresponding to a particular change in ozone,
y0 = baseline incidence rate/person within a defined at-risk subgroup, and
pop = population size of the group exposed.

Calculation for Ozone Excess Mortality and Morbidity

Shasta

	Construction	Operations	Traffic	
Increased ozone (ppb)	0	0	0.04278	Input
Increased Mortality Rate	0.00000%	0.00000%	0.00321%	Output
Increased Mortality (per thousand exposed)	**0.00**	**0.00**	**0.20**	Output
Increased ozone (ppb)	0	0	0.04278	Input
Increased Morbidity Rate	0.00000%	0.00000%	0.00877%	Output
Increased Morbidity (per thousand exposed)	**0.00**	**0.00**	**0.17**	Output

Compare Results to:

Baseline Mortality (CARB, 2005)	**9.50**	per 1000 persons/year for	Shasta
Baseline Morbidity (CARB, 2005)	**10.13**	per 1000 persons/year for	Shasta
	(see Table B-17 from CARB 2005 (volume 4)		

Calculation of Mortality and Morbidity Rates

Mortality	**Construction**	**Operations**	**Traffic**
β	0.489	0.489	0.489
RR	1.000	1.000	1.021
PAR	0.000	0.000	0.021
Δy	0.000	0.000	0.197
Morbidity	**Construction**	**Operations**	**Traffic**
β	0.389	0.389	0.389
RR	1.000	1.000	1.017
PAR	0.000	0.000	0.016
Δy	0.000	0.000	0.167

Slope of

Increase in Mortality (CARB, 2005)	**0.75%**	**per 10 ppb increase**
Increase in Morbidity (CARB, 2005)	**2.05%**	**per 10 ppb increase**

Most of the epidemiologic studies used in our estimates have used a log-linear model to represent the relationship between ozone exposure and the health endpoint. In this case, the relationship between ozone levels and the natural logarithm of the health effect is estimated by a linear regression. This regression model generates a beta coefficient that relates the percent change in the health outcome to a unit increase in ozone. Existing studies have reported either a beta coefficient for a unit change in exposure or a relative risk (RR) for a specified change in ozone concentrations, such as 10 ppb 1-hour maximum. The RR is defined as the ratio of the health effect predicted from the higher exposure relative to some baseline exposure. Health effect estimates presented in a given study as RR for a specified change in ozone, Δ O3, were converted into an estimated beta using the equation:

$\beta = \ln(RR) / \Delta O3$

The daily change in ozone at each monitoring site i.e., the difference between current ozone and the standard (= ΔO3) was used to calculate RR:

$RR = \exp(\beta \Delta O3)$

Then, the RR estimates were used to determine the population attributable risk (PAR), which represents the proportion of the health effects in the whole population that may be prevented if the cause (ozone pollution in our case) is reduced by a given amount. Specifically,

$PAR = (RR - 1) / RR$

Ultimately, the estimated impact on the health outcome is calculated as follows:

$\Delta y = PAR \times y0 \times pop$

where:

Δy = changes in the incidence of a health endpoint corresponding to a particular change in ozone,
y0 = baseline incidence rate/person within a defined at-risk subgroup, and
pop = population size of the group exposed.

Calculation for Ozone Excess Mortality and Morbidity

Siskiyou

	Construction	Operations	Traffic	
Increased ozone (ppb)	0	0	0.09214	Input
Increased Mortality Rate	0.00000%	0.00000%	0.00691%	Output
Increased Mortality (per thousand exposed)	**0.00**	**0.00**	**0.46**	Output
Increased ozone (ppb)	0	0	0.09214	Input
Increased Morbidity Rate	0.00000%	0.00000%	0.01889%	Output
Increased Morbidity (per thousand exposed)	**0.00**	**0.00**	**0.36**	Output

Compare Results to:

Baseline Mortality (CARB, 2005)	**10.42**	per 1000 persons/year for	Siskiyou
Baseline Morbidity (CARB, 2005)	**10.13**	per 1000 persons/year for	Siskiyou
	(see Table B-17 from CARB 2005 (volume 4)		

Calculation of Mortality and Morbidity Rates

Mortality	**Construction**	**Operations**	**Traffic**
β	0.489	0.489	0.489
RR	1.000	1.000	1.046
PAR	0.000	0.000	0.044
Δy	0.000	0.000	0.459
Morbidity	**Construction**	**Operations**	**Traffic**
β	0.389	0.389	0.389
RR	1.000	1.000	1.036
PAR	0.000	0.000	0.035
Δy	0.000	0.000	0.356

Slope of

Increase in Mortality (CARB, 2005)	**0.75%**	**per 10 ppb increase**
Increase in Morbidity (CARB, 2005)	**2.05%**	**per 10 ppb increase**

Most of the epidemiologic studies used in our estimates have used a log-linear model to represent the relationship between ozone exposure and the health endpoint. In this case, the relationship between ozone levels and the natural logarithm of the health effect is estimated by a linear regression. This regression model generates a beta coefficient that relates the percent change in the health outcome to a unit increase in ozone. Existing studies have reported either a beta coefficient for a unit change in exposure or a relative risk (RR) for a specified change in ozone concentrations, such as 10 ppb 1-hour maximum. The RR is defined as the ratio of the health effect predicted from the higher exposure relative to some baseline exposure. Health effect estimates presented in a given study as RR for a specified change in ozone, Δ O3, were converted into an estimated beta using the equation:

$\beta = \ln(RR) / \Delta O3$

The daily change in ozone at each monitoring site i.e., the difference between current ozone and the standard (= ΔO3) was used to calculate RR:

$RR = \exp(\beta \Delta O3)$

Then, the RR estimates were used to determine the population attributable risk (PAR), which represents the proportion of the health effects in the whole population that may be prevented if the cause (ozone pollution in our case) is reduced by a given amount. Specifically,

$PAR = (RR - 1) / RR$

Ultimately, the estimated impact on the health outcome is calculated as follows:

$\Delta y = PAR \times y0 \times pop$

where:

Δy = changes in the incidence of a health endpoint corresponding to a particular change in ozone,
y0 = baseline incidence rate/person within a defined at-risk subgroup, and
pop = population size of the group exposed.

Calculation for Ozone Excess Mortality and Morbidity

Mojave

	Construction	Operations	Traffic	
Increased ozone (ppb)	0	0	0.04313	Input
Increased Mortality Rate	0.00000%	0.00000%	0.00323%	Output
Increased Mortality (per thousand exposed)	**0.00**	**0.00**	**0.13**	Output
Increased ozone (ppb)	0	0	0.04313	Input
Increased Morbidity Rate	0.00000%	0.00000%	0.00884%	Output
Increased Morbidity (per thousand exposed)	**0.00**	**0.00**	**0.17**	Output

Compare Results to:

Baseline Mortality (CARB, 2005)	**6.10**	per 1000 persons/year for	Mojave
Baseline Morbidity (CARB, 2005)	**10.13**	per 1000 persons/year for	Mojave
	(see Table B-17 from CARB 2005 (volume 4)		

Calculation of Mortality and Morbidity Rates

Mortality	**Construction**	**Operations**	**Traffic**
β	0.489	0.489	0.489
RR	1.000	1.000	1.021
PAR	0.000	0.000	0.021
Δy	0.000	0.000	0.127
Morbidity	**Construction**	**Operations**	**Traffic**
β	0.389	0.389	0.389
RR	1.000	1.000	1.017
PAR	0.000	0.000	0.017
Δy	0.000	0.000	0.168

Slope of

Increase in Mortality (CARB, 2005)	**0.75%**	**per 10 ppb increase**
Increase in Morbidity (CARB, 2005)	**2.05%**	**per 10 ppb increase**

Most of the epidemiologic studies used in our estimates have used a log-linear model to represent the relationship between ozone exposure and the health endpoint. In this case, the relationship between ozone levels and the natural logarithm of the health effect is estimated by a linear regression. This regression model generates a beta coefficient that relates the percent change in the health outcome to a unit increase in ozone. Existing studies have reported either a beta coefficient for a unit change in exposure or a relative risk (RR) for a specified change in ozone concentrations, such as 10 ppb 1-hour maximum. The RR is defined as the ratio of the health effect predicted from the higher exposure relative to some baseline exposure. Health effect estimates presented in a given study as RR for a specified change in ozone, Δ O3, were converted into an estimated beta using the equation:

$\beta = \ln(RR) / \Delta O3$

The daily change in ozone at each monitoring site i.e., the difference between current ozone and the standard (= ΔO3) was used to calculate RR:

$RR = \exp(\beta \Delta O3)$

Then, the RR estimates were used to determine the population attributable risk (PAR), which represents the proportion of the health effects in the whole population that may be prevented if the cause (ozone pollution in our case) is reduced by a given amount. Specifically,

$PAR = (RR - 1) / RR$

Ultimately, the estimated impact on the health outcome is calculated as follows:

$\Delta y = PAR \times y0 \times pop$

where:

Δy = changes in the incidence of a health endpoint corresponding to a particular change in ozone,
y0 = baseline incidence rate/person within a defined at-risk subgroup, and
pop = population size of the group exposed.

Existing Baseline Mortaility and Morbidity by County

County Name	Mortality (Short-Term Exposures) Non-Accidental, All Ages	Morbidity, Hospital Admissions, All Respiratory, All Ages	ER Visits for Asthma, Age Under 18	School Loss Days, All Illness, Age 5-17	MRAD Age>18
Alameda County	6.60	10.13	3.81	5990.10	7805.39
Alpine County	7.40	10.13	3.81	5990.10	7805.39
Amador County	9.99	10.13	3.81	5990.10	7805.39
Butte County	10.40	10.13	3.81	5990.10	7805.39
Calaveras County	8.90	10.13	3.81	5990.10	7805.39
Colusa County	7.10	10.13	3.81	5990.10	7805.39
Contra Costa County	6.78	10.13	3.81	5990.10	7805.39
Del Norte County	8.41	10.13	3.81	5990.10	7805.39
El Dorado County	6.29	10.13	3.81	5990.10	7805.39
Fresno County	6.41	10.13	3.81	5990.10	7805.39
Glenn County	7.71	10.13	3.81	5990.10	7805.39
Humboldt County	8.51	10.13	3.81	5990.10	7805.39
Imperial County	5.44	10.13	3.81	5990.10	7805.39
Inyo County	11.81	10.13	3.81	5990.10	7805.39
Kern County	6.60	10.13	3.81	5990.10	7805.39
Kings County	5.66	10.13	3.81	5990.10	7805.39
Lake County	13.13	10.13	3.81	5990.10	7805.39
Lassen County	5.75	10.13	3.81	5990.10	7805.39
Los Angeles County	6.08	10.13	3.81	5990.10	7805.39
Madera County	6.35	10.13	3.81	5990.10	7805.39
Marin County	7.47	10.13	3.81	5990.10	7805.39
Mariposa County	9.48	10.13	3.81	5990.10	7805.39
Mendocino County	8.89	10.13	3.81	5990.10	7805.39
Merced County	6.29	10.13	3.81	5990.10	7805.39
Modoc County	11.62	10.13	3.81	5990.10	7805.39
Mono County	3.87	10.13	3.81	5990.10	7805.39
Monterey County	5.88	10.13	3.81	5990.10	7805.39
Napa County	10.45	10.13	3.81	5990.10	7805.39
Nevada County	8.56	10.13	3.81	5990.10	7805.39
Orange County	5.68	10.13	3.81	5990.10	7805.39
Placer County	7.00	10.13	3.81	5990.10	7805.39
Plumas County	10.08	10.13	3.81	5990.10	7805.39
Riverside County	7.37	10.13	3.81	5990.10	7805.39
Sacramento County	7.14	10.13	3.81	5990.10	7805.39
San Benito County	5.06	10.13	3.81	5990.10	7805.39
San Bernardino County	6.10	10.13	3.81	5990.10	7805.39
San Diego County	6.41	10.13	3.81	5990.10	7805.39
San Francisco County	8.78	10.13	3.81	5990.10	7805.39
San Joaquin County	6.98	10.13	3.81	5990.10	7805.39
San Luis Obispo County	7.87	10.13	3.81	5990.10	7805.39
San Mateo County	6.77	10.13	3.81	5990.10	7805.39
Santa Barbara County	6.80	10.13	3.81	5990.10	7805.39
Santa Clara County	5.19	10.13	3.81	5990.10	7805.39
Santa Cruz County	6.56	10.13	3.81	5990.10	7805.39
Shasta County	9.50	10.13	3.81	5990.10	7805.39
Sierra County	9.26	10.13	3.81	5990.10	7805.39
Siskiyou County	10.42	10.13	3.81	5990.10	7805.39
Solano County	5.90	10.13	3.81	5990.10	7805.39
Sonoma County	8.17	10.13	3.81	5990.10	7805.39
Stanislaus County	7.22	10.13	3.81	5990.10	7805.39
Sutter County	7.43	10.13	3.81	5990.10	7805.39
Tehama County	9.90	10.13	3.81	5990.10	7805.39
Trinity County	10.73	10.13	3.81	5990.10	7805.39
Tulare County	6.71	10.13	3.81	5990.10	7805.39
Tuolumne County	9.50	10.13	3.81	5990.10	7805.39
Ventura County	5.76	10.13	3.81	5990.10	7805.39
Yolo County	6.37	10.13	3.81	5990.10	7805.39
Yuba County	7.26	10.13	3.81	5990.10	7805.39

BAY AREA
AIR QUALITY
MANAGEMENT
DISTRICT

ALAMEDA COUNTY
Tom Bates
Margaret Fujioka
Scott Haggerty
Nate Miley

CONTRA COSTA COUNTY
John Gioia
David Hudson
Karen Mitchoff
Mark Ross

MARIN COUNTY
Katie Rice

NAPA COUNTY
Brad Wagenknecht

SAN FRANCISCO COUNTY
John Avalos
Edwin M. Lee
Eric Mar
(Vice-Chair)

SAN MATEO COUNTY
David J. Canepa
Carole Groom
(Chair)

SANTA CLARA COUNTY
Cindy Chavez
Liz Kniss
(Secretary)
Jan Pepper
Rod G. Sinks

SOLANO COUNTY
James Spering

SONOMA COUNTY
Teresa Barrett
Shirlee Zane

Jean Roggenkamp
EXECUTIVE OFFICER/APCO

February 1, 2016

Ryan Hostetter, Project Manager
SLO County Department of Planning and Building
976 Osos St., Room 300
San Luis Obispo, CA 93408

Subject: FEIR for Phillips 66 Company Rail Spur Extension and Crude Unloading Project

Dear Ms. Hostetter,

Bay Area Air Quality Management District (Air District) staff reviewed the Final Environmental Impact Report (FEIR) prepared by San Luis Obispo County (County) on the Phillips 66 Company (Applicant) Rail Spur Extension and Crude Unloading Project (Project).

The FEIR concludes that the Project will result in significant air quality and greenhouse gas (GHG) emission impacts in numerous air basins throughout the State including the Bay Area. Air District staff understands that the County Department of Planning and Building has made a recommendation to deny the approval of the Project, in part due to these significant impacts.

Air District staff is concerned about the significant air quality and GHG impacts of the Project, due to ongoing air quality concerns in many California air basins and the State's challenge in achieving long-term GHG emission reductions. Air District staff believes it is critical to reduce air pollutant and GHG emissions from the Project as aggressively as possible.

The County has identified Mitigation Measure AQ.3 (MM AQ.3) to lessen air quality impacts identified in each air basin. MM AQ.3 was amended in the FEIR and currently states:

Prior to issuance of the Notice to Proceed, the Applicant shall provide a mitigation, monitoring and reporting plan. The plan shall investigate methods for reducing the locomotive emissions through contracting arrangements that require the use of Tier 4 locomotives or equivalent emission levels. The plan shall indicate that, on an annual basis, if the mainline rail emissions of ROG+NOx with the above mitigations still exceed the applicable Air District thresholds, the Applicant shall secure emission reductions in ROG + NOx emissions or contribute to new or existing programs within each applicable Air District, similar to the emission reduction program utilized by the SLOCAPCD, to ensure that the main line rail ROG + NOx emissions do not exceed the Air District thresholds for the life of the project. The Applicant shall provide documentation from each Air District to the San Luis Obispo County Planning and Building Department that emissions

reductions have been secured for the life of the project prior to issuance of the Notice to Proceed.

Air District staff supports the revised MM AQ.3, and is prepared to assist the County, Applicant, San Luis Obispo County Air Pollution Control District and any other affected air districts with the implementation of MM AQ.3 by:

- Assisting in the tracking and documenting of locomotive emissions in all air basins.
- Identifying potential offsite mitigation projects that can be funded by the Applicant.
- Accepting funding from the Applicant and assisting with the administration of an off-site mitigation program to achieve emission reductions in the Bay Area.
- Providing documentation to the County and the Applicant that emission reductions have been secured for the Project per MM AQ.3 requirements.
- Assisting in the development of the mitigation, monitoring and reporting plan.

In addition, operational activities associated with the Project would generate GHG emissions that exceed SLOCAPCD thresholds. Air District staff strongly supports the County's implementation of MM AQ.6 which requires the Applicant to provide a GHG mitigation, monitoring and reporting plan and provide GHG emission reduction credits for all of the project GHG emissions that exceed the thresholds.

Air District staff is available to assist the County in addressing these comments and implementing MM AQ.3. If you have any questions, please contact Jennifer Langfield, Senior Planner, at (415) 749-8619 or jlangfield@baaqmd.gov.

Sincerely,

Jean Roggenkamp
Deputy Executive Officer

cc: BAAQMD Board Members
Don Campbell, SLO County Planning Commission Chair
Air Pollution Control Officers in all affected Air Districts

OFFICE OF ENVIRONMENTAL HEALTH HAZARD ASSESSMENT

Air Toxics Hot Spots Program

Risk Assessment Guidelines

Guidance Manual for Preparation of Health Risk Assessments

February 2015

Air, Community, and Environmental Research Branch
Office of Environmental Health Hazard Assessment
California Environmental Protection Agency

Note that some situations may also require that on-site receptor (worker or residential) locations be evaluated. The risk assessor can contact the District or reviewing authority for guidance if on-site exposure situations are present at the emitting facility. However, these on-site locations should be included in the HRA. Some examples where the health impacts of on-site receptors may be appropriate could be military base housing, prisons, universities, day care facilities, or locations where the public may have regular access for the appropriate exposure period (e.g., a lunch time café or museum for acute exposures). When a receptor lives and works on the facility, site, or property, then these receptors should be evaluated and reported under both residential and worker scenarios and the one that is most health protective should be used for risk management decisions. The cancer risk estimates for the onsite residents may use a 30-year exposure duration while the 25-year exposure duration is used for a worker. Under a Tier 2 analysis, alternate exposure durations may be evaluated and presented with all assumptions supported.

All of these locations (i.e., PMI, MEIR, and MEIW) must be identified for potential multipathway carcinogenic and noncarcinogenic effects. It is possible that the estimated PMI, MEIR, and MEIW risk for cancer, chronic noncancer, 8-hour, and acute noncarcinogenic risks occur at different locations or that some of these evaluations may not be necessary (e.g., the receptor does not exist). For example, some facilities will not have off-site workers in the vicinity of the facility and will not need to evaluate worker exposure, or the exposure situation may only require the evaluation of short-term carcinogenic or acute noncancer impacts (see Section 8.2.10 for a discussion of short-term projects). The approval to revise the exposure assessment for a receptor, or to omit the MEIW receptor, should be verified in writing with the District or reviewing authority and included in the HRA.

Other sensitive receptor locations may also be of interest and required to be included in the HRA. The District or reviewing authority should be consulted to determine which sensitive receptor locations must be included.

The results from a screening model (if available) can be used to identify the area(s) where the maximum concentrations are likely to occur. Receptor points should also be located at the population centroids (see Section 4.7.2) and sensitive receptor locations (see Section 4.6.4). The exact configuration of the receptor array used in an analysis will depend on the topography, population distribution patterns, and other site-specific factors. All receptor locations should be identified in the HRA using UTM (Universal Transverse Mercator) coordinates and receptor number. The receptor numbers in the summary tables should match receptor numbers in the computer output (e.g., HARP output files). In addition to actual UTM coordinates, the block/street locations (i.e., north side of 3,000 block of Smith Street) should be provided in the HRA for the PMI, MEIR, and MEIW for carcinogenic and noncarcinogenic health effects. Chapter 9 provides an outline that specifies the content and recommended format of HRA results.

4.7.1.1 Receptor Height

To evaluate localized impacts, receptor height should be taken into account at the point of maximum impact on a case-by-case basis. For example, receptor heights may have to be included to account for receptors significantly above ground level. Flagpole receptors at the height of the breathing zone of a person may need to be considered when the source receptor distance is less than a few hundred meters. Consideration must also be given to the noninhalation pathway analysis which requires modeling of chemical deposition onto soil or water at ground level. For the inhalation pathway, a health protective approach is to select a receptor height from 0 meters to 1.8 meters that will result in the highest predicted downwind concentration. Final approval of this part of the modeling protocol should be with the District or reviewing authority.

4.7.2 *Centroid Locations*

For each subarea analyzed, a centroid location (the location at which a calculated ambient concentration is assumed to represent the entire subarea) should be determined. When population is uniformly distributed within a population unit, a geographic centroid based on the shape of the population unit can be used. If only a portion of the census tract lies within the isopleth or area of interest, then only the population that falls within the isopleth should be used in the calculation for population exposure. To determine this level of detail, local planning and zoning information may need to be collected. Where populations are not uniformly distributed, a population-weighted centroid may be used. Another alternative uses the concentration at the point of maximum impact within that census tract as the concentration to which the entire population of that census tract is exposed. While this less refined approach is commonly accepted, Districts should be contacted to approve this method prior to its use in a risk assessment.

The centroids represent locations that should be included as receptor points in the dispersion modeling analysis. Annual average concentrations should be calculated at each centroid using the modeling procedures presented in this chapter.

For census tracts and BG/EDs, judgments can be made using census tracts maps and street maps to determine the centroid location. At the block level, a geographic centroid is sufficient.

4.7.3 *Spatial Averaging*

Since the inception of the “Hot Spots” and California’s Air Toxics Programs, HRA results for an individual receptor have typically been based on air dispersion modeling results at a single point or location. With a few exceptions, this method has been traditionally used for all types of receptors (e.g., PMI, MEIR, MEIW, pathway receptors, etc.). The assumptions used in risk assessment are designed to prevent underestimation of health impacts to the public resulting in a health protective approach. However, basing risk estimates on a single highest point (PMI, MEIR, or MEIW) does not take into account that a person does not remain at one location on their property, or in one location at the

workplace over an extended period of time. Therefore, the average air concentration over a small area is likely to be more representative than using the air concentration at a single point, particularly in those situations where concentrations fall off rapidly around that single point. The concept of averaging air concentrations over a small area is known as spatial averaging.

In order to understand how spatial averaging can impact air dispersion modeling results with various types of facilities, the ARB, in conjunction with the OEHHA, performed sensitivity analyses to evaluate the impacts of spatially averaging air dispersion modeling results (see Appendix C of the Air Toxics Hot Spots Program Risk Assessment Guidelines: Technical Support Document for Exposure Assessment and Stochastic Analysis (EASA)). Based on these sensitivity analyses, it is reasonable and appropriate to include spatial averaging techniques in air toxic risk assessments as supplemental information to Tier 1 information (i.e., modeling results that are based on the air concentration from a single point or location). While all risk assessments must include results based on Tier 1 methodology, the spatially averaged concentrations around the point of interest (e.g., PMI, MEIR, MEIW, multipathway exposure evaluations, etc.) could also be included as an option in risk assessments and acceptable for risk management decisions subject to approval by the District or reviewing agency. Spatial averaging is an option for the purpose of additional refinement to the risk assessment.

A few reasons that support the inclusion of spatially averaged modeled concentrations in risk assessment include the following:

- Averaging results over a small domain will give a more representative picture of individual exposure and risk than an estimate based on one single location within their property.
- Spatial averaging will allow air dispersion modeling and risk assessment results to be characterized as the estimated concentration and risk in a discrete area of interest, rather than an exact value for a single location.
- From a risk communication standpoint, the ARB and OEHHA feel it is more appropriate to present the modeling output and the calculated health impacts as the potential impacts within a small or discrete area, rather than an exact value at a specific point on a grid or map.
- Spatial averaging is the recommended procedure in ARB's Lead Risk Management Guidelines (2001) and has been used in several complex source HRAs [e.g., Roseville Railyard (2004), Ports of LA/LB (2006), Port of Oakland (2008)].
- Spatially averaging the deposition concentrations over pasture land, a garden, or a water body for multipathway exposure scenarios is a planned upgrade for the HARP Software. This will provide an option that will refine multipathway exposure assessments. Average deposition on these types of areas (e.g., a water body) is not necessarily well represented by the single highest point of deposition, or deposition at the geographic center of the water body. Likewise, since produce is grown over the entire surface of the garden and cows graze the

5 - Exposure Assessment
Estimation of Concentration and Dose

5.1 Introduction

This chapter provides a summary of how toxicant ground level air concentrations estimated from air dispersion modeling or monitoring results are used to determine dose at receptors of interest. This chapter includes all the algorithms and data (e.g., point estimates, distributions, and transfer factors) that are needed to determine the substance-specific concentration in exposure media and the dose at a receptor of interest. The determination of exposure concentration and dose precedes the calculations of potential health impacts. See Chapter 8 and Appendix I for information on calculating potential health impacts.

At a minimum, three receptors are evaluated in Hot Spots health risk assessments (HRA) (see Section 4.7); these are:

- the Point of Maximum Impact (PMI),
- the Maximally Exposed Individual Resident (MEIR), and
- the Maximally Exposed Individual Worker (MEIW).

The PMI is defined as the receptor point(s) with the highest acute, 8-hour, chronic, or cancer health impact outside the facility boundary. The facility boundary is defined as the property line. Often the fence is on the property line. The MEIR is typically defined as the existing off-site residence(s) (i.e., house, apartment or other dwelling) with the highest acute, chronic, or cancer health impact. Calculating an 8-hour hazard index is not required for the MEIR, but can be performed at the discretion of the District. The MEIW is typically defined as the existing offsite workplace with the highest acute, 8-hour, chronic, or cancer health impact.

In addition, it may be necessary to determine risks at sensitive receptors (e.g., schools, day care centers, elder care centers, and hospitals). The District or reviewing authority should be consulted in order to determine the appropriate sensitive receptors for evaluation. Some situations may require that on-site receptor (worker or residential) locations be evaluated. Some examples where the health impacts of on-site receptors may be appropriate could be military base housing, prisons, universities, or locations where the public may have regular access for the appropriate exposure period (e.g., a lunch time café or museum for acute exposures). The risk assessor should contact the Air Pollution Control or Air Quality Management District (the District) for guidance about any on-site exposure situations at the emitting facility. These on-site locations should be included in the health risk assessment (HRA). If the facility emits multiple substances from two or more stacks, the acute, 8-hour, chronic, and cancer health impacts at the PMI may be located at different physical locations. The MEIR or MEIW cancer, acute, 8-hour, and chronic receptors may also be at different locations.

g. *List of Substances*

Include tables listing all "Hot Spots" Program substances which are emitted, plus any other substances required by the District. Indicate substances to be evaluated for cancer risks and noncancer effects.

h. *Exposed Population and Receptor Location*

Report the following information regarding exposed population and receptor locations:

- Description of zone of impact including map showing the location of the facility, boundaries of zone of impact, census tracts, emission sources, sites of maximum exposure, and the location of all appropriate receptors. This should be a true map (one that shows roads, structures, etc.), drawn to scale, and not just a schematic drawing. USGS 7.5 minute maps or GIS based maps are usually the most appropriate choices. (If significant development has occurred since the user's survey, this should be indicated.)

- Separate maps for the cancer risk zone of impact and the hazard index (noncancer) zone of impact(s). The cancer zone of impact should include isopleths down to at least the 1/1,000,000 risk level. Because some districts use a level below 1/1,000,000 to define the zone of impact, the District should be consulted. For the noncancer zone of impact, three separate isopleths (to represent chronic, 8-hour, and acute HI) should be created to define the zone of impact for the hazard index from both inhalation and noninhalation pathways greater than or equal to 0.5. The point of maximum impact (PMI), maximum exposed individual at a residential receptor (MEIR), and maximum exposed individual worker (MEIW) for both cancer and noncancer risks should be located on the maps.

- Tables identifying population units and sensitive receptors (UTM coordinates, receptor IDs or index from the modeling, and street addresses of specified receptors)

- Heights or elevations of the receptor points.

- **Spatial averaging**: For each receptor type (e.g., PMI, MEIR, and MEIW, or other location of interest) that will utilize spatial averaging, the domain size and grid resolution must be clearly identified. If another domain or grid resolution other than 20 meters by 20 meters with 5-meter grid spacing will be used for a receptor, then care should be taken to determine the proper domain size and grid resolution that should be used. For a worker, the HRA shall support all assumptions used, including, but not limited to, documentation for all workers

Tesoro Savage Vancouver Energy Distribution Terminal Facility

Draft Environmental Impact Statement

November 2015

Washington State Environmental Policy Act Lead Agency:

State of Washington, Energy Facility Site Evaluation Council
P.O. Box 43172, 1300 S Evergreen Park Dr. SW
Olympia, WA 98504-3172

Appendix F

Vancouver Energy - Air Quality Technical Report

emissions from a locomotive stack. ENVIRON therefore employed an additional adjustment to compensate for this limitation in the AERMOD model.

In 2004, as part of the Roseville Rail Yard Study, the California Air Resources Board (CARB) developed a method to estimate initial locomotive plume rise adjustments from buoyancy and downwash effects using the EPA SCREEN3 model. [9] Consistent with the ARB's adjustment calculations, ENVIRON estimated initial plume height using SCREEN3 based on typical in-stack temperature and flow rates based on average notch settings and approximate speed of the trains during transit. [10] Thus, the release height and vertical dimension of emissions from transiting trains take into account not only the height of the locomotive emission sources, but the buoyancy of the emission gasses and downwash effects generated by the train's movement. ENVIRON used the resulting estimated stack and release heights (**Table 5**) in the AERMOD assessment.

Idling locomotives were considered in the dispersion modeling as point sources with stack exhaust temperature, flow rate, and diameter based on stack testing for an idling GE ES44DC model locomotive engine. The ES44DC is a reasonable representation of the C44 locomotives expected to service the proposed Facility. Stack testing data provided by the Southwest Research Institute's Locomotive Technology Center did not include typical stack heights for locomotives with an ES44DC engine. Therefore, stack heights used for idling locomotives were estimated using the Roseville Rail Yard Study.

Table 5. Combustion Source Modeling Parameters

POINT Sources	Stack Height (m)	Stack Temp. (K)	Exit Velocity (m/s)	Exit Diam. (m)
Vessels	30	673.15	20	0.5
Idling Locomotives	4.52	374.15	1.85	0.6
VOLUME Sources				
VOLUME Sources	**Release Height (m)**	**Initial Lateral Dimension (m)**	**Initial Vertical Dimension (m)**	
Transiting Trains	5.5	7.1	2.1	

3.2.3 Permitted Emissions Sources

All on-site project-related stationary emission sources subject to air quality permitting under EFSEC rules were considered in a separate air quality modeling assessment conducted during preparation of the permit application. The emissions and dispersion modeling parameters

(9) State of California Air Resources Board, 2004, *Roseville Rail Yard Study*; this method does not consider variability in ambient meteorological conditions and wind speeds because as a screening-level model, SCREEN3 assumes fairly basic, static conditions in estimating dispersion. This technique represents a reasonable and previously applied method for representing plume rise associated with locomotive emissions.

(10) ENVIRON received notch-specific temperature and flow rates from Steve Fritz of the Southwest Research Institute's Locomotive Technology Center.