MITIGATED NEGATIVE DECLARATION (MND) ADDENDUM

This Addendum is prepared as a supplemental environmental document to the following adopted environmental document:

- *November 30, 1993 Mitigated Negative Declaration adopted for the oil and gas facility authorized by CUP No. 2491-1.* (Attachment 1)

In addition, the following documents are referenced for information and analysis on well stimulation techniques:

- *July 1, 2015 Environmental Impact Report: Analysis of Oil and Gas Well Stimulation Treatments in California*; SCH No. 2013112046; Certified by the California Department of Conservation. (Attachment 2)

- August 28, 2014 report titled: *Advanced Well Stimulation Technologies in California, An Independent Review of Scientific and Technical Information.* This report was prepared by the California Council on Science and Technology and commissioned by the U.S. Bureau of Land Management. (Attachment 3)

A. BACKGROUND INFORMATION AND PROJECT DESCRIPTION:

1. **Entitlement:** Modification of Conditional Use Permit (CUP) No. 2491-1 to authorize the continued operation and maintenance of 3 existing oil and gas wells and related production equipment within an existing oil and gas production facility, and to utilize a former storage tank site for road and facility maintenance. (Case No. PL18-0058).

2. **Applicant:** Carbon California Operating Company, LLC, and Carbon California Company, LLC, (Carbon), (Representative: Jane Farkas)

3. **Property Owner:** Carbon California Operating Company, LLC, and Carbon California Company, LLC, (Carbon), 270 Quail Court, Suite B, Santa Paula, CA 93060

4. **Location:** The project site is located near the northern terminus of Goodenough Road on the Basenberg "A" and "B" leases about 4 miles north of the City of Fillmore. (Attachment 4)

5. **APNs:** The Assessor's Parcel Numbers (APN) of the parcels that encompass the oil and gas operations included in the proposed project are 041-0-070-080, 041-0-040-365, 041-0-040-415, 041-0-040-375.

6. **Lot Size:** 120-acre Lease "A" area (1.11-acre production pad); 15-acre Lease "B" area (1-acre graded pad).

County of Ventura
Plannng Director Hearing
Case No. PL18-0058
Exhibit 4 - Environmental Document
(MND Addendum)

7. **General Plan Land Use Designation:** Open Space

8. **Zoning Designation:** OS-160 ac (Open Space, 160-acre minimum lot size)

9. **Background:** Oil exploration and production activities began in the Sespe Oil Field in the vicinity of the project site in 1887. The four existing wells on the Basenberg “A” Lease were drilled in 1968 and 1969. One of these has been abandoned. The other three are active or idle and are included in the proposed project.

10. **Project Description:**

The applicant requests that a modified conditional use permit be granted to authorize the continued operation and maintenance of an existing oil and gas facility for an additional 20-year period ending in 2038.

Oil production operations are proposed to continue on the existing 1.11-acre unvegetated graded pad located on the 120-acre Basenberg “A” Lease. There are four existing oil and gas wells located on this pad as follows:

Well Name	API Number	Use	Status
Basenberg #1	11120076	O&G Production	Active
Basenberg #2	11120120	O&G Prod./W.D.	Abandoned
Basenberg #3	11120176	Water Disposal	Idle
Basenberg #4	11120187	O&G Production	Idle

Standard well repair and maintenance activities (such as pump changes) would continue in accordance with California Geologic Energy Management Division (CalGEM) guidelines. Ancillary production equipment, such as pumping units, valves, electrical connections and pipelines, will continue to be used as part of facility operations. No flaring of gas is proposed to occur on the 1.11-acre production site or elsewhere on the subject lease. Produced fluids and gas will continue to be transported from the production facilities by existing pipelines. Oil will continue to be separated from produced wastewater at existing facilities within the Sespe Oil Field. The oil will continue to be shipped to market by pipeline. Wastewater will continue to be conveyed by pipeline from the separation facilities to existing permitted wastewater disposal wells for injection.

The three existing wells may be re-completed (i.e. perforating the existing well casing to produce fluid from a new geologic zone) or re-drilled to penetrate and produce fluid from new zones in the subsurface. Any re-drilled well would include the subsurface installation of new well casing. The existing surface casing would continue to be used.

An existing 0.5-acre graded pad on the Basenberg “A” Lease located south of the oil production pad will be revegetated and restored as it is no longer used at part of the oil and gas operation.

The 15-acre Basenberg “B” Lease will continue to be included in the permit area. A former tank battery site that encompasses approximately 1-acre on this lease will continue to be used as a road maintenance and oil field equipment staging area. It will also be used for pipeline inspection and maintenance.

Hydraulic fracturing, acid well stimulation and other “well stimulation treatments” as defined in Public Resources Code Section 3157 are not proposed and would not be authorized by the requested permit. Additional environmental review pursuant to CEQA, a modified CUP and an additional public hearing is required for these stimulation techniques to be utilized.

Re-activation of the abandoned well (Basenberg #2) is not proposed and would not be authorized by the requested permit.

B. <u>CEQA BASELINE</u>:

<u>Existing Setting:</u>

The existing permitted facility is comprised of two sites on the Basenberg “A” and “B” leases in the Sespe Oil Field. Three existing oil and gas wells, and associated ancillary equipment such as pipelines, pumping units, valves, and electrical controls are currently operated on an existing 1.11-acre unvegetated graded pad on the Basenberg “A” Lease. A 1-acre unvegetated graded pad currently exists on the Basenberg “B” Lease that is the former site of a permitted produced fluid storage facility (i.e. a tank battery).

The proposed project primarily consists of the continued operation, maintenance, and reworking of the three existing wells and the associated production facilities located on the Basenberg “A” Lease. The reworking of the three existing wells includes the potential re-completion and re-drilling of the wells. As with two of the three existing wells on the Basenberg “A” Lease, and most of the wells in the Sespe Oil Field, the re-completed or re-drilled well bores will be subject to “well stimulation techniques” such as hydraulic fracturing and acid well stimulation as defined in PRC 3157.

The continued operation, maintenance and reworking of the three existing oil and gas wells and associated facilities constitutes a continuation of the existing environmental setting. No new impacts would result from these components of the proposed project. Note that well stimulation by hydraulic fracturing has been a common practice in the Sespe Oil Field for more than 50 years. However, substantial public concern has been expressed regarding the potential for this technique to result in adverse environmental effects. The potential for such effects due to the re-completion or re-drilling of the three existing wells is addressed in this document.

<u>Project changes:</u>

Changes in the existing project include the use of the 1-acre disturbed pad on the Basenberg “B” Lease as a staging area for road and facility maintenance and as a site for the placement of portable produced fluid tanks and temporary trucking operations. The potential environmental effects of these proposed project changes are evaluated herein.

In addition to the changes in the use of the Basenberg “B” site, the environmental effects of anticipated future well re-completion and well re-drilling activities at the Basenberg “A” Lease are also evaluated in this document. Although these activities are considered part of the ongoing operation of the Sespe Oil Field, they are analyzed for environmental effect for informational purposes.

Finally, the effects of the existing facility and proposed project changes on the generation of greenhouse gases (GHG) are evaluated in this document.

C. STATEMENT OF ENVIRONMENTAL FINDINGS:

Previous Environmental Review:

On November 30, 1993, the Ventura County Planning Director granted CUP No. 2941-1 and adopted a Mitigated Negative Declaration (MND; Attachment 1) that evaluated the environmental impacts of the drilling, operation and maintenance of six new oil and gas wells in addition to the four existing oil wells (including the now-abandoned Basenberg #2 well) on the subject Basenberg Lease. The approved project also included storage of produced fluid in an onsite tank battery and truck transport of the oil to market. A maximum of 36 one-way truck trips per day (18 truckloads per day) are authorized under CUP 2941-1.

Mitigation measures identified in the MND were required to be implemented by the operator of the oil and gas facility authorized by CUP No. 2941-1. These mitigation measures addressed impacts on biological resources and visual resources. These measures involved actions to reduce the potential effects on the environment of the oil storage facility located on the Basenberg "B" Lease. One measure required that a berm be constructed around the storage tanks to prevent spillage of fluids in the event of a tank leak. The other measure required the development and implementation of a lighting plan for this site to minimize the spillover of light onto adjacent properties.

The storage tank facility on the Basenberg "B" Lease was taken out of service and abandoned in the mid-1990s. Since that time, produced fluid has been conveyed from the Basenberg "A" Lease by pipeline rather than by tanker trucks.

The current proposal involves the use of the former tank site as a staging area for the ongoing maintenance of the US Forest Service road that provides access to the Sespe Oil Field and adjacent federal public lands. The site would also be used for the placement of portable storage tanks for up to 120 days in any one year to temporarily hold produced fluid in the event of an interruption of pipeline service. During this interim operation, oil would be shipped to market by tanker truck. A maximum of 8 one-way truck trips (4 truckloads per day) is proposed. A berm consistent with the former tank facility would be constructed to protect against fluid spillage during any occasional temporary use of portable storage tanks. No permanent lighting would be installed on the Basenberg "B" Lease. Only temporary lighting required by applicable safety regulations would be utilized. Thus, the mitigation measures identified in the MND will, in effect, continue to be implemented. No potentially significant impacts were identified in the adopted MND for the oil well operations on the Basenberg "A" lease.

On July 1, 2015, the State Oil and Gas Supervisor (Dr. Steve Bohlen) certified the environmental impact report (EIR) titled "Analysis of Oil and Gas Well Stimulation Treatments in California" (Attachment 2). This EIR was commissioned by the California Legislature through the passage of Senate Bill 4 (SB4) in 2013. This document was prepared to *"provide* *the public with detailed information regarding any potential environmental impacts of well stimulation in the State."*

The certified EIR (Attachment 2) prepared by the State is a programmatic document that identified various significant impacts on the environment due to the cumulative effect of all well stimulation activity, and oil and gas development facilitated by such activity, in the State of California. Notably, an impact on groundwater quality was not identified in the EIR to result from hydraulic fracturing or acid well stimulation. This is consistent with the public statements of the now-former State Oil and Gas Supervisor Tim Kustic (i.e. the administrator of the California Geologic Energy Management Division or CalGEM). Mr. Kustic is quoted in the December 18, 2012 edition of the San Jose Mercury News as follows:

> *"There is no evidence of harm from fracking in groundwater in California at this point in time. And it has been going on for many years."*

Mr. Kustic made a similar statement to the Ventura County Board of Supervisors in a 2013 noticed public hearing.

Note that the July 1, 2015 certification of the State EIR has been challenged and is currently under consideration by the California appellate court. No injunction against its use has been issued and no decision on its adequacy to meet the requirements of CEQA has been rendered by the appellate court.

The California Council on Science and Technology (CCST) reached a conclusion similar to the findings of the State EIR regarding potential effects on groundwater in an extensive August 28, 2014 report (Attachment 3) commissioned by the U.S. Bureau of Land Management (BLM) titled: *Advanced Well Stimulation Technologies in California, An Independent Review of Scientific and Technical Information.* This report reached the following conclusion regarding the potential effects of hydraulic fracturing:

> *"There are no publicly recorded instances of subsurface release of contaminated fluids into potable groundwater in California."*

Thus, no substantial evidence that well stimulation techniques have had a significant effect on groundwater quality has been identified anywhere in the State of California. The identified effects of the well stimulation treatments are limited to changes in the ground surface and degradation of air quality.

The impacts identified in the certified EIR are largely due to the cumulative effect of oil and gas development in the State that may be facilitated or made economic by the availability and use of well stimulation techniques. Increases in air pollutant and greenhouse gas emissions, effects on biological or cultural resources due to land clearing for well pads, and risk of upset due to hazardous fluid trucking or accidents occurring at the wellsite during well stimulation events are potentially significant when considered on a Statewide basis. However, these impacts do not reflect the far lower likelihood of potential impacts due to the application of hydraulic fracturing to a single well or a few wells in an existing oil field such as is proposed in the current project. In the current project, no new well pad is proposed and the potential future use of the subject well stimulation techniques would be limited to the existing three oil wells. Thus, there would be no new wells to contribute to air pollution and GHG generation, and no new effects on biological or cultural resources. The potential for an accident to occur during a well stimulation event at this specific facility is very low and speculative given the general rarity of such events and the decades of such activities at the Sespe Oil Field without reported incident.

The current operations and anticipated future changes in the Sespe Oil Field are described on pages 11.0-7 to 11.0-11 of the certified State EIR. Thus, in each issue area the potential contribution of this field to the identified Statewide impacts are considered. As indicated in the EIR (Page 11.0-11), it is anticipated that only 2 to 4 wells per year will be drilled in the Sespe Oil Field in the next 25 years with hydraulic fracturing treatments expected to be limited to new wells. This is in contrast to the 983 wells in the State that were subject to hydraulic fracturing treatments in a one-year period from 2012 to 2013. Thus, the activities at the Sespe Oil Field do not make a substantial contribution to the Statewide impacts identified in the EIR.

Environmental Review of the proposed project:

The potential impacts of the proposed project, and the environmental effects of future well re-completion and well re-drilling activities are evaluated by issue area below.

Air Quality:

Thresholds of Significance:

Criteria Pollutants:

25 pounds per day of Reactive Organic Compounds (ROC)
25 pounds per day of Nitrogen Oxides (NOx)

Greenhouse gas (GHG):

10,000 $MTCO_2e$ per year

Analysis of impacts (long-term):

The proposed project primarily involves the continued operation of three existing oil wells located on the Basenberg "A" Lease. No new oil wells are proposed. Thus, no new emissions due to oil well installation would result from project implementation. Each oil well would continue to contribute approximately 2 pounds/day of ROC emissions. The total of 6 pounds per day of ROC emissions is part of the existing CEQA baseline condition and does not constitute an impact of the proposed project. In any case, these emissions are less than the 25 pound/day Threshold of Significance.

Gas produced from the Basenberg Lease will continue to be conveyed from the project site by pipeline to field compression facilities and then conveyed by pipeline to the Torrey Gas Plant located south of the Santa Clara Valley. From that plant, gas is sold to the Southern California Gas Company (SoCalGas) for distribution to residential and other customers of that public utility. There are no permanent or continuously-operated flares in the Sespe Oil Field. Only emergency flares are utilized under permit from the Ventura County Air Pollution Control District (VCAPCD).

Because the gas produced from the project wells would continue to serve existing urban demand and not be flared, no new NOx emissions would result from project implementation. This would be the case even if gas production increased due to anticipated future well re-completion or well re-redrilling activities. The level of NOx emissions due to the burning of natural gas by the customers of a public utility is based on demand, not the source of the natural gas. More gas production in the local oil and gas fields would only result in less gas being imported from outside the area by SoCalGas.

Since the project was originally reviewed and the MND adopted, the role of greenhouse gas (GHG) emissions and their potential contribution to global climate change has become an important and widely debated scientific, economic and political issue. The GHG emissions associated with oil field operations results from oil well operation, flaring of gas, and emissions of trucks that transport produced fluids. In the case of the proposed project, there is no long-term flaring of gas or fluid trucking. Thus, the ROC emissions of the three existing oil wells would be the source of GHG emissions. These emissions are estimated below based on the following factors provided by the VCAPCD.

VCAPCD ROC emission factor: 2 lb/day ROC per well
ROC emissions per year: 0.365 short tons ROC/year per well
Conversion to metric tonnes: 0.9072 MT/short ton
ROC emissions per well: 0.3311 MT ROC/year per well
Ratio of Methane emissions to ROC: 3.04
Methane emissions per year per well: 1.01 MT
Ratio of CO2 emissions per unit of methane: 25

Project GHG emissions: 3 wells x 1.01 MT methane/well/year x 25 = **75.7 $MTCO_2e$/year**

The estimated 75.7 $MTCO_2e$/year of GHG emissions due to the three existing oil wells is part of the existing environmental setting and not an impact of the proposed project. In any case, the GHG emissions are far less than the 10,000 $MTCO_2e$/year Threshold of Significance recommended by the VCAPCD (Attachment 5). Impacts on climate change would be less than significant.

Note that the gas produced in the Sespe Oil Field is sold to the SoCalGas public utility for distribution to and use by urban customers. The gas burned by urban consumers does produce NOx and GHG emissions. These emissions are a function of urban demand, however, and do not increase or decrease with the fluctuations in supply obtained from oil and gas fields.

Each of the facility components on the Basenberg Lease operate in accordance with a Permit to Operate issued by the VCAPCD. The VCAPCD permit program involves periodic inspections of the oil wells and other facilities by District personnel to detect and require correction of any leaks of oil and gas. This Countywide program minimizes the emissions from the existing oil fields.

In summary, air quality impacts due to ongoing operations of the three Basenberg wells on the Basenberg “A” Lease would be less than significant.

<u>Analysis of impacts (short-term):</u>

It is anticipated that the three wells will be subject to future re-completion or re-drilling activities during the requested permit term. These activities would be a continuation of standard oil field practice and not constitute a change from the existing setting. In any case, the short-term effects of these activities are evaluated below:

Re-completion of an existing well:

The re-completion of an existing wellbore would be a standard oil field practice involving the temporary use of a workover rig to potentially plug existing casing perforations or install new perforations in the well casing in order to produce fluids from a different subsurface geologic zone. Unless the newly tapped geologic zone is subject to hydraulic fracturing, re-completion activities would not be substantially different with other ongoing well maintenance (such as pump changes) and would not result in any discernible new impact on air quality.

If a new zone is subject to well stimulation by hydraulic fracturing, a series of truck mounted pumps and fluid tanks would be brought to the wellsite to pump fluid under high pressure into the wellbore. Additional short-term emissions due to truck travel to the well site and the operation of diesel engines to pump fluids into the wellbore. A hydraulic fracturing treatment is anticipated to be completed in one day. According to a September 6, 2017 memorandum prepared by the VCAPCD (Attachment 6), a drilling rig using a Tier 3 diesel engine and consuming 1,000 gallons per day of diesel fuel, will generate 90 pounds of criteria pollutants (NOx + ROC) per day of operation. With the assumption that three such engines would be operated simultaneously during a hydraulic fracturing treatment and that all three existing wells would receive such treatment, it is estimated that 810 pounds of NOx/ROC would be generated by hydraulic fracturing of the project wells. Averaged over the 20-year life of the project, the average daily increase in emissions due to hydraulic fracturing would be 0.11 pounds per day. This would be far less than the 25 pound per day Threshold of Significance.

Re-drilling of an existing well:

The re-drilling of an existing well would involve the temporary operation of a drilling rig over an estimated three-week period. It would also involve temporary vehicle traffic to and from the well site by rig personnel. According to a September 6, 2017 memorandum prepared by the VCAPCD (Attachment 6), a drilling rig using a Tier 3 diesel engine and consuming 1,000 gallons per day of diesel fuel, will generate 90 pounds of criteria pollutants (NOx + ROC) per day of operation. In addition, the daily travel of 15 employees to and from the rig site from a 10-mile distance would generate an additional 0.06 pounds per day of NOx and 0.06 pounds per day of ROC. Thus, over a 21-day period, total emissions (NOx + ROC) is estimated to be 1,893 pounds [(90 x 21) + (0.06 x 21) + (0.06 x 21) = 1,893]

As described above for well re-completion, an estimated 810 pounds of NOx/ROC would be generated by hydraulic fracturing of the three wells. Thus, a total of 2,703 pounds (810 + 1893 = 2,703) of criteria pollutants would be generated by the re-drilling and subsequent hydraulic fracturing of the three existing wells. Averaged over the 20-year life of the project, the average daily increase in emissions due to re-drilling and hydraulic fracturing of the three wells would be 0.37 pounds per day. This would be far less than the 25 pound per day Threshold of Significance.

The proposed changes in the use of the existing 1-acre pad on the Basenberg "B" Lease involve equipment staging for ongoing road maintenance and temporary placement of portable tanks and trucking of produced fluid from the site in the event of an interruption of pipeline service.

The use of the existing pad on the Basenberg “B” Lease for road maintenance would not involve any substantial new impact on air quality. This is because the road maintenance activities by the operator of the Sespe Oil Field have been ongoing for several decades. These activities extend from the Basenberg “B” Lease on the south to sections of the roadway affected by landslides located about 1 mile to the north. The incorporation of this feature into the project description serves to formalize the historic use of the former tank site for equipment staging.

The occasional use of the Basenberg “B” Lease pad for the placement of portable tanks and the associated trucking of oil would involve a short-term increase in emissions. It is proposed that trucking be limited to a maximum of 120 days in any one year and 8 one-way truck trips (4 truckloads) in any one day.

With the assumption that produced oil will be trucked from the project site to the Crimson pipeline terminal in Santa Paula, a distance of about 12 miles, the truck traffic would involve a maximum of approximately 11,500 vehicle miles travelled in any one year. In a February 6, 2017 analysis (Attachment 7) prepared by the VCAPCD, tanker trucks generate emissions at a rate of 0.0017 pounds of NOx and 0.00025 pounds of ROC per vehicle mile travelled. Thus, the maximum emissions in a single year due to temporary trucking operations would be 19.55 pounds of NOx and 2.88 pounds of ROC. Averaged over a one-year time period, these emissions average 0.054 pounds per day of NOx and 0.008 pounds per day of ROC. Thus, even if temporary trucking occurred every year during the 20-year life of the project, emissions due to trucking would be less than significant.

Analysis of impacts (Cumulative):

If it is assumed that temporary trucking of produced oil will occur each year for 120 days, the combined emissions (NOx + ROC) of trucking and hydraulic fracturing averaged over the 20-year permit term is estimated to be 0.30 pounds per day (0.37 + 0.054 + 0.008 = 0.432). This level of emissions is far below the applicable 25 pounds per day Threshold of Significance.

Water Resources:

Threshold of Significance:

Water quality:

A project that is designed to meet all of the applicable requirements set forth in the following authorities shall not be considered to have a significant impact in this environmental area:

- California Health and Safety Code, Division 104, Part 13, Chapter 4
- California Code of Regulations, Title 22, Division 4.
- Ventura County Building Code, Article 1, Article 6
- Ventura County Ordinance Code, Division 4, Chapter 8

Note: Domestic water quality regulations for water systems with 15 or more service connections are enforced by the California Department of Public Health.

Water quantity:

A project has the potential to have a significant impact on water supply - quantity, if it either individually or cumulatively when combined with recently approved, current, and reasonably foreseeable probable future projects would introduce physical development that would adversely affect the water supply - quantity of the hydrologic unit in which the project site is located.

Analysis of Impacts (Water quality):

There are no proposed changes in oil field equipment or surface facilities that would affect surface water quality. No new pads or roadways are proposed to be developed and no new wells would be drilled.

Future oil field activities are anticipated to involve re-completion or re-drilling of the existing three oil wells on the Basenberg "A" Lease and the hydraulic fracture stimulation of those wells. While a valve or conduit failure of the surface equipment could conceivably occur and result in a spill of fluids on the surface, such an event is very unlikely and speculative. In the six-year period from 2009 to 2014, a total of 949 fluid spills were reported to the State Office of Emergency Services. None were reported to be associated with hydraulic fracturing or acid well stimulation treatments. Furthermore, of the 7,833 spills in oil fields reported to OES from 1993-2014, none involved a confirmed spill of well stimulation flowback or wastewater. This information is published on pages 10.15-36 and 10.15-37 of the State EIR (Attachment 2). Thus, there is no substantial evidence of even an occasional failure of hydraulic fracturing equipment, and the resulting leakage of fluids, at a well site.

As indicated in the discussion on Page 6 above, no substantial evidence has been identified that well stimulation techniques have had a significant effect on groundwater quality anywhere in the State of California. The effects of the well stimulation treatments identified in the State EIR are limited to changes in the ground surface and degradation of air quality.

A permit from CalGEM is required to conduct a hydraulic fracturing well treatment. CalGEM may approve the treatment only if the geologic conditions and the engineering of the subject well is demonstrated by the operator to be adequate to prevent the leakage of injected fluids into protected groundwater resources.

The use of the existing pad on the Basenberg "B" Lease for the temporary placement of portable storage tanks would not pose a substantial risk to water quality. The site will be required to be bermed such that any leakage from the tanks will be contained and prevented from reaching surface water bodies or drainage courses.

In summary, no significant effects on water quality have been identified that would result from project implementation.

Analysis of Impacts (Water quantity):

Hydraulic fracturing treatments and the re-drilling of the three existing wells will involve the consumption of fresh water. An average of 130,000 gallons of water are required for a hydraulic fracturing well treatment according to the 2014 report by the California Council of Science and Technology (Attachment 3). Thus, if the three existing wells are subject to such a treatment, approximately 390,000 gallons of water will be consumed.

If each of the three wells are re-drilled, water will be consumed as part of the drilling process. It is estimated that 3500 barrels (147,000 gallons) of water will be consumed in the re-drilling of each well. In addition, about 20,000 gallons of water will be stored on the site for fire suppression purposes. Thus, an estimated 14,000 barrels (588,000 gallons) will be consumed for well re-drilling. The source of the water to be used for oil field activities is an existing water well in the Sespe Oil Field owned by the applicant. This well produces fresh water from an aquifer that is not used for any domestic potable water supply.

In summary, re-drilling of the wells and hydraulic fracturing will result in the consumption of an estimated 978,000 gallons (3.0 acre-feet) of water. Averaged over the 20-year life of the project, the annual water demand will be 0.15 acre-feet per year. This negligible level of water demand does not have the potential to result in a significant effect on groundwater resources. Impacts on water quantity will be less than significant regardless of whether future well re-completion and re-drilling activities are considered part of the existing baseline setting or an impact of the proposed project.

Traffic:

Threshold of Significance

Project-Specific Impacts:

A potentially significant adverse project-specific traffic impact is assumed to occur at any intersection on the Regional Road Network if the project will exceed the thresholds established in Table 2. (For this analysis scenario, projects funded in the County's Capital Improvement Program may be used as mitigation measures. The improvements identified in these projects may be incorporated into the capacity analysis to mitigate project specific impacts.)

Table 2: Thresholds of Significance for Changes in LOS at Intersections

Intersection LOS (Existing)	**Increase in V/C or Trips greater than:**
A	0.20
B	0.15
C	0.10
D	10 PHTs*
E	5 PHTs*
F	1 PHT*
*To critical movements. These are the highest combination of left and opposing through/right-turn PHTM.	

Vehicle Miles Traveled (VMT)

As determined by the Governor's Office of Planning and Research under State Bill743, the Regional Transportation Plan/Sustainable Communities Strategy and Ventura County Public Works Roads and Transportation Division, projects that generate or attract fewer than 110 trips per day are presumed to have a less than significant impact on VMT. The project is authorized to have a maximum of 36 one-way truck trips per day (18 truckloads per day). Therefore, the project generated VMT is below the significant threshold of 110 trips per day and has no significant CEQA impact.

Cumulative Impacts:

A potentially significant adverse cumulative traffic impact is assumed to occur at any intersection if any one of the following results from the project:

a. If the project will add one or more PHT to the critical movements at an intersection that is part of the regional road network and which is currently operating at an unacceptable LOS as defined in Table 1 by the year 2020.

b. If the project will add 10 or more PHT to an intersection that is part of the regional road network, which is projected to operate at an unacceptable LOS defined in Table 1 by the year 2020.

<u>Analysis of Impacts:</u>

There will be no new long-term traffic associated with the proposed project. Produced fluids will continue to be conveyed from the project site by pipeline. Except in emergency situations, traffic will be comprised of ongoing field maintenance by existing field personnel.

In the event of an interruption of pipeline service, it is proposed that produced oil be transported from the site by tanker truck for up to 120 days in any one year. A maximum of 8 one-way truck trips (4 truckloads) per day would be authorized by the requested permit.

Averaged over a year, the requested level of tanker truck traffic would be 2.6 one-way trips per day. This low level of traffic, even in the unlikely event that it occurred every year, would not have the potential to cause a significant effect on traffic safety or circulation. Note that transport of oil by tanker trucks (even on an emergency basis) has not occurred from the Basenberg leases for more than 20 years.

Biological Resources:

<u>Thresholds of Significance:</u>

Species Project Impact Thresholds:

A project will have a direct or indirect physical impact to a plant or animal species if a project, directly or indirectly:

(a) reduces a species' population,
(b) reduces a species' habitat,
(c) increases habitat fragmentation, or
(d) restricts reproductive capacity.

The determination of whether a project's impact is significant or not shall be based on both the current conservation status of the species affected and the severity or intensity of impact caused by the project. Endangered, rare and threatened species, as well as special status species, are more susceptible to project impacts than a more common species. If a project's impact is severe or intense, it may cause a population of a more common species to decline substantially or drop below self-sustaining levels, which would be considered a significant impact.

Sensitive Plant Communities Project Impact Thresholds:

The following types of impacts to sensitive plant communities are considered potentially significant:

- Construction, grading, clearing, or other activities that would temporarily or permanently remove sensitive plant communities. Temporary impacts to sensitive plant communities would be considered significant unless the sensitive plant community is restored once the temporary impact is complete.

- Indirect impacts resulting from project operation at levels that would degrade the health of a sensitive plant community. Cumulative

Waters and Wetlands Thresholds:

An analysis of potential project impacts to waters and wetlands must examine the direct and indirect impacts to the entire aquatic or wetland ecosystem potentially impacted by the project, including impacts within the watershed that would adversely affect the aquatic or wetland ecosystem. Waters and wetlands depend on a source of water, and therefore impacts to the quality, quantity, flow rate, or timing of that water source can adversely impact a water or wetland just as much as direct development impacts to aquatic or wetland habitat. Wetlands perform numerous beneficial functions, including groundwater recharge, stream recharge, pollution filtration, flood control, and wildlife habitat. Impacts that reduce or eliminate the functions provided by a wetland would be considered significant.

<u>Analysis of Impacts:</u>

The proposed project does not involve any new disturbance of native habitat. The currently disturbed areas on the Basenberg "A" and "B" leases will not be expanded. There is no change in the long-term operation or configuration of the equipment and facilities on the ground surface. The use of the Basenberg "B" Lease for temporary trucking operations will not have a discernible effect on wildlife as this site is located adjacent to the main oil field and forest access road. Thus, no substantial impacts related to the ongoing operations of the three Basenberg wells or the proposed uses of the 1-acre unvegetated pad on the Basenberg "B" Lease are anticipated.

A potentially significant impact on biological resources was identified in the adopted MND due to the potential for fluid spills at the authorized tank battery at the Basenberg "B" Lease pad. As a mitigation measure, a berm was required to be constructed to prevent the flow of any spilled liquids off of the pad. A similar berm will be required by the terms of the requested permit to be installed if any temporary tanks are placed on the “B” Lease. Thus, the required mitigation measure will continue to be implanted and impacts will be less that significant.

Since the CUP 2941-1 was granted to authorize the Basenberg Lease oil and gas operations, public concern has been expressed regarding the potential impacts of such operations on the endangered California Condor. This issue is addressed in detail in Section D.3 below. In summary, no potentially significant impacts on the Condor have been identified.

Noise:

Thresholds of Significance:

> If the noise from the proposed project is estimated to exceed any of the following standards at the nearest noise sensitive use, the noise impact is deemed to have a potentially significant noise impact and a consultant prepared acoustical analysis must be completed:
>
> - 55 dB(A) between 6:00 a.m. and 7:00 p.m.,
> - 50 dB(A) between 7:00 p.m. and 10:00 p.m., or
> - 45 dB(A) between 10:00 p.m. and 6:00 a.m.

Analysis of Impacts:

The well pad on the Basenberg “A” Lease is located in a remote mountainous area that is more than 2,000 feet from any residential use or other sensitive receptor. The noise associated with the ongoing operation, maintenance and reworking of the existing three wells and associated equipment cannot be heard from any offsite location. Thus, no significant noise impact has been identified for future activities on the well pad.

Well re-drilling activities would involve the transport of a truck-mounted drilling rig to and from the well pad. It is anticipated that this would occur three times during the 20-year term of the requested permit. The noise generated on City streets (Goodenough Road and “A” Street) between the well site and State Highway 126 by two truck trips (one in and one out) occurring three times over a 20-year period does not have the potential to exceed the established Thresholds. At a speed of 25 miles per hour, a truck would be closer than 500 feet to any specific sensitive receptor for approximately 30 seconds. This brief time could not increase the one-hour average noise level (Leq-1 hour) above any applicable Threshold. Note that the noise of any project-related trucking would have no discernible effect on the ambient vehicle noise on State Highway 126. Many thousands of heavy truck trips occur each day on this highway.

It is also anticipated that each of the existing wells will be subject to hydraulic fracturing well stimulation treatments after being re-completed or re-drilled. Assuming that three heavy pump trucks will travel to the site, there could be six truck trips (3 in and 3 out) in a 2 or 3-day period. The 90 seconds (3 trucks x 30 seconds per truck) of noise experienced at a sensitive receptor on any one day due to the travel of hydraulic fracturing trucks does not have the potential to increase the one-hour average noise level (Leq-1 hour) above any applicable Threshold. Although numerous truck trips will be required to deliver fresh water to the well site for use in the hydraulic fracturing process, they would not travel outside of the Sespe Oil Field. This is because the water will be obtained from an onsite well. Note that the drilling rig and any trucks associated with a hydraulic fracturing treatment would not travel to or from the well site on the same day.

The potential temporary truck transport of produced oil from portable tanks on the Basenberg "A" Lease could generate new noise experienced by sensitive receptors along City of Fillmore streets. The requested permit would limit tanker truck traffic to 8 one-way trips (4 truckloads) per day. Given the time required to load a tanker truck, the 12-mile distance to the receiver site in Santa Paula, and the time to offload the oil, it would require at least one hour to complete the round trip from the site of the portable tanks on the Basenberg "A" Lease. Thus, two truck trips per hour could occur due to temporary oil transport activities. At a speed of 25 miles per hour, a truck would be closer than 500 feet to any specific sensitive receptor for approximately 30 seconds. Thus, additional truck noise could be experienced for about 60 seconds per hour. This brief time could not increase the one-hour average noise level (Leq-1 hour) above any applicable Threshold. In any case, such tanker trucking events would rarely occur in the unlikely event of a disruption of pipeline service.

In summary, no aspect of the proposed project has been identified that would result in a significant noise impact.

Visual Impacts:

Threshold of Significance:

1. A project has the potential to create a significant impact to scenic resources if it:

    a. Is located within an area that has a scenic resource that is visible from a public viewing location; and,

    b. Would physically alter the scenic resource either individually or cumulatively when combined with recently approved, current, and reasonably foreseeable future projects; or

    c. Would substantially obstruct, degrade, or obscure the scenic vista, either individually or cumulatively when combined with recently approved, current, and reasonably foreseeable future projects.

Analysis of Impacts:

A potentially significant impact was identified in the adopted MND regarding the spillage of light from the tank battery on the Basenberg "B" Lease. The Permittee was required to prepare and implement a lighting plan for this site to minimize the spillover of light onto adjacent properties. The current proposal does not include any permanent lighting fixtures. The only lighting that would be installed on this site would be limited to that necessary to satisfy applicable safety regulations for the temporary use of portable fluid storage tanks and associated trucking operations. Given the limited nature of the lighting and the anticipated infrequency of temporary trucking operations, impacts related to lighting will be less than significant.

The well pad on the Basenberg “A” Lease is not visible from any offsite location. Thus, no impacts on visual resources are anticipated for the continued oil field operations on this remote site.

D. CEQA GUIDELINES REQUIREMENTS

CEQA Guidelines section 15164(a) states that the lead agency shall prepare an addendum to an adopted negative declaration (ND or MND) if only minor technical changes or additions are necessary or none of the conditions described in the CEQA Guidelines section 15162 calling for the preparation of a subsequent EIR or subsequent ND have occurred. This Addendum includes a description of the changes or additions that are necessary to the adopted MND and certified EIR and, a discussion of why none of the conditions described in CEQA Guidelines section 15162 exist which require the preparation of a subsequent EIR or ND.

In summary, the proposed project is primarily comprised of the continued operation of an existing oil and gas facility. As indicated in the discussion in Section C above, the County has not identified any significant impacts that would result from the continued operation, maintenance and reworking of the three existing oil and gas wells and associated equipment on the Basenberg “A” Lease. Similarly, no significant impacts have been identified for the use of the existing graded pad on the Basenberg “B” Lease as a road maintenance and facility staging area or as a site for the temporary use of portable fluid storage tanks.

The conditions described in Section 15162 of the CEQA Guidelines which require the preparation of an EIR or subsequent negative declaration, are provided below, along with a discussion as to why a subsequent EIR or subsequent ND is not required for the proposed project:

1. **Substantial changes are proposed in the project which will require major revisions of the previous EIR or negative declaration due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified significant effects [§ 15162(a)(1)].**

   The requested permit modification would extend the effective period of CUP No. 2941-1 to authorize continued operation of the existing oil and gas production facility for an additional 20-year period ending in 2038. The proposed continued operation of the three existing wells does not include a physical change in the environment on the ground surface of the Basenberg “A” Lease. The three existing wells and associated equipment would continue to be utilized to produce oil and gas. The ongoing well operations would continue to include routine maintenance activities such as periodic use of a workover drill rig to change or reposition downhole pumping equipment, reconfigure wellbore perforations, perform chemical treatments to clean away precipitates that obstruct fluid flow, and other similar procedures.

   Also included in the proposed project is the subsurface directional re-drilling of the three existing wells while utilizing the existing surface casing. The re-drilling of a well would involve the installation and temporary use of a drilling rig for several weeks but no permanent change in the surface facilities on the Basenberg “A” Lease. Consistent with most wells drilled in the Sespe Oil Field, any re-drilled well would likely be subject to stimulation techniques such as hydraulic fracturing and acid well stimulation as defined in Public Resources Code (PRC) Section 3157. Two of the existing wells (Basenberg #1 and #4) were subject to hydraulic fracturing when they were initially drilled in 1968 and 1969.

The existing graded pad on the Basenberg "B" Lease would be used as a staging area for road maintenance and for the placement of portable fluid storage tanks. These tanks would be used to temporarily to hold produced fluid for up to 120 days until pipeline operations resume. Trucking of produced fluid would be limited to 8 one-way trips (4 truckloads) per day under the requested permit. The "B" Lease was the site of fluid storage tanks that were removed in the 1990s. The "B" Lease pad would not be expanded and would be bermed to ensure containment of any temporarily stored produced fluid.

As indicated in Section C above, no potentially significant impacts have been identified that would result from the proposed project.

Based on the above discussion, major revisions of the previous MND due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified significant effects are not required as a result of substantial changes in the project.

2. **Substantial changes occur with respect to the circumstances under which the project is undertaken which will require major revisions of the previous EIR or negative declaration due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified significant effects [§ 15162(a)(2)].**

As explained below, the circumstances under which the potential impacts to the environment were evaluated have not substantially changed since the MND was adopted in 1993.

The subject oil and gas facility is located on an existing 1.11-acre graded pad in a remote area of the extensive Sespe Oil Field. This site (Basenberg Lease "A") has not substantially changed since the facility was last permitted in 1993. Except for other oil field facilities, the several square miles of mountainous open space lands that surround the site remain undeveloped.

The project site is located about 4 miles north of the City of Fillmore and cannot be seen from offsite locations.

There have been no substantial changes in the operation of other oil and gas facilities in operation in the Sespe Oil Field since 1993.

Based on the foregoing, substantial changes have not occurred with respect to the circumstances under which the project is undertaken which will require major revisions of the previous MND due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified significant effects.

3. **New information of substantial importance, which was not known and could not have been known with the exercise of reasonable diligence at the time the previous negative declaration was adopted, shows any of the following:**

   a. **The project will have one or more significant effects not discussed in the previous EIR [§ 15162(a)(3)(A)].**

      The impact of Greenhouse Gas (GHG) emissions on climate change were not evaluated or disclosed in the 1993 MND. GHG emissions will continue to be generated by the ongoing operation of the subject oil and gas facility. These emissions will not increase from the existing baseline conditions as no new wells or other facilities are proposed. Thus, no new impact on climate change would result from project implementation.

      Since the project was originally reviewed and the MND adopted, the role of greenhouse gas (GHG) emissions and their potential contribution to global climate change has become an important and widely debated scientific, economic and political issue. The GHG emissions associated with oil field operations results from oil well operation, flaring of gas, and emissions of trucks that transport produced fluids. In the case of the proposed project, there is no long-term flaring of gas or fluid trucking. Thus, the ROC emissions of the three existing oil wells would be the source of GHG emissions. These emissions are estimated below based on the following factors provided by the VCAPCD.

      VCAPCD ROC emission factor: 2 lb/day ROC per well
      ROC emissions per year: 0.365 short tons ROC/year per well
      Conversion to metric tonnes: 0.9072 MT/short ton
      ROC emissions per well: 0.3311 MT ROC/year per well
      Ratio of Methane emissions to ROC: 3.04
      Methane emissions per year per well: 1.01 MT
      Ratio of CO2 emissions per unit of methane: 25

      Project GHG emissions: 3 wells x 1.01 MT methane/well/year x 25 = **75.7 $MTCO_2e$/year**

      The estimated 75.7 $MTCO_2e$/year of GHG emissions due to the three existing oil wells is part of the existing environmental setting and not an impact of the proposed project. In any case, the GHG emissions are far less than the 10,000 $MTCO_2e$/year Threshold of Significance recommended by the VCAPCD (Attachment 5). Impacts on climate change would be less than significant.

      Impacts involving greenhouse gas emissions pertain to changes in global climate. This is a cumulative effect that would not involve project-specific or local impacts. As indicated above, the estimated GHG emissions would be less than the applicable threshold. Thus, the contribution of the project to the impact of global climate change is not cumulatively considerable.

   b. **Significant effects previously examined will be substantially more severe than shown in the previous EIR [§ 15162(a)(3)(B)].**

The environmental conditions that currently exist on site are substantially the same as those that existed at the time the MND was adopted. The continued operation of the three oil and gas wells and related production facilities that existed at the time the previous MND was adopted will not result in any new significant effects not discussed in the previous MND.

c. **Mitigation measures or alternatives previously found not to be feasible would in fact be feasible and would substantially reduce one or more significant effects of the project, but the project proponents decline to adopt the mitigation measure or alternative [§ 15162(a)(3)(C)].**

The potentially significant effects identified in the previous MND were related to the storage facilities that were located in the past on the Basenberg Lease "B" site. These facilities were largely removed more than 20 years ago with the installation of a pipeline system to convey produced oil, water and gas. The remaining 1-acre unvegetated pad is proposed to be used as a staging area for road and facility maintenance, and as a site for the temporary placement of portable storage tanks in the event of an interruption of pipeline service. No significant impacts have been identified for the proposed uses on and associated with the Basenberg "B" Lease site.

The environmental conditions that currently exist on Basenberg Lease "A" site are substantially the same as those that existed at the time the MND was adopted. The continued operation of the three oil and gas wells and related production facilities that existed at the time the previous MND was adopted will not result in any new significant effects not discussed in the previous MND. The proposed project primarily involves a continuation of the existing environmental setting.

d. **Mitigation measures or alternatives which are considerably different from those analyzed in the previous EIR would substantially reduce one or more significant effects on the environment, but the project proponents decline to adopt the mitigation measure or alternative [§15162(a)(3)(D).**

Since the County adopted the MND in 1993, concerns about possible effects of oil and gas operations on the California condor have been raised in public testimony on other proposed oil and gas projects. To date, no substantial evidence has been presented or identified that a condor has ever been injured or killed as a result of oil and gas operations. Measures have nonetheless been developed in consultation with the U.S. Fish and Wildlife Service to minimize any potential adverse effect on the California condor and other nesting birds resulting from oil and gas operations. The California Department of Fish and Wildlife concurs with these measures. Although not required to address an identified potentially significant impact, these measures (reproduced below) will be incorporated into the recommended conditions of approval of the requested permit modification as best management practices to protect this important species.

Note that these measures were largely developed based on the experience gained in the Condor re-introduction efforts that have taken place in the vicinity of the Sespe Oil Field. The applicant, Carbon California Operating Company, LLC, and Carbon California Company, LLC, (Carbon), has implemented these measures in all of its operations in the Sespe Oil Field in consultation with the U.S. Fish and Wildlife Service

(USFWS). By letter dated November 17, 2014 (Attachment 8), the USFWS states that *"this is to confirm that to our knowledge, no California Condors have been injured or killed as a result of Seneca's operations."*

California Condor Protection Best Management Practices (BMPs)

Purpose: To avoid significant impacts during construction and operation and ensure compatibility with conservation efforts outlined in the *Recovery Plan for California Condor* (April 19, 1996) and direction provided by United States Fish and Wildlife Service (USFWS) for oil and gas facilities within the range of the California Condor in Ventura County (USFWS, 2013).

Requirement: During construction and operation, the Permittee shall adhere to the following USFWS recommended California condor Best Management Practices (BMPs):

Landing Deterrents

a. All power lines, poles, and guy wires shall be retrofitted with raptor guards, flight diverters, and other anti-perching or anti-collision devices to minimize the potential for collision or electrocution of condors. Landing deterrents (e.g. Daddi Long Legs or porcupine wire) shall be attached to the walking beams on pumping units.

b. All surface structures which are identified by the USFWS or County-approved qualified biologists as a risk to California condors, shall be modified (e.g. to include installation of raptor guards, anti-perching devices, landing deterrents) or relocated to reduce or eliminate the risk.

Microtrash

c. All construction debris, food items, and other trash including micro-trash e.g. small items as screws, nuts, washers, nails, coins, rags, small electrical components, small pieces of plastic, glass, or wire, and anything that is colorful or shiny) will be covered or otherwise removed from a project site at the end of each day or prior to periods when workers are not present at the site.

d. All hoses or cords that must be placed on the ground due to drilling operations that are outside of the primary work area (immediate vicinity of the drilling rig) will be covered to prevent California condor access. Covering will take the form of burying or covering with heavy mats, planks, or grating that will preclude access by California condors.

e. All equipment and work-related materials (including, but not limited to, loose wires, open containers, rags, hoses, or other supplies or materials) shall be contained in closed containers either in the work area or placed inside vehicles.

f. Poly chemical lines shall be replaced with stainless steel lines to preclude condors from obtaining and ingesting pieces of poly line.

g. Prior to issuance of a Zoning Clearance for land clearing activities or construction, informational signs describing the threat that micro-trash poses to condors, and the cleanup or avoidance measures being implemented, shall be posted at the site.

h. Prior to conducting work on-site, employees and contractors shall be made aware of the California condor, and how to avoid impacts on them. Special emphasis shall be placed on keeping the well pad site free of micro-trash and other hazards.

i. Wells pads shall be inspected closely for micro-trash on a daily basis.

Chemicals

j. Ethylene glycol based anti-freeze or other ethylene glycol based liquid substances shall be avoided, and propylene glycol based antifreeze will be encouraged. Equipment or vehicles that use ethylene glycol based anti-freeze or other ethylene glycol based liquid substances shall be inspected daily for leaks, including (but not limited to) areas below vehicles for leaks and puddles. Standing fluid (e.g. a puddle of anti-freeze) will be remediated (e.g. cleaned up, absorbed, or covered) immediately upon discovery. Leaks shall be repaired immediately. The changing of antifreeze of any type shall be prohibited onsite.

k. Open drilling mud, water, oil, or other liquid storage or retention structures shall be prohibited. All such structures must have netting or other covering that precludes entry or other use by condors or other listed avian species.

l. The design and location of any flaring equipment shall be subject to review and approval by the Planning Director in consultation with the USFWS.

Miscellaneous

m. All food items and associated refuse shall be placed in covered containers that preclude access or use by California condors.

n. All equipment and work-related materials (including loose wires, open containers, rags, hoses, or other supplies) will be placed in closed containers or inside vehicles.

o. No dogs or other potentially predatory domesticated animals shall be allowed on the drill site unless on a leash or otherwise contained at all times.

p. All construction equipment, staging areas, materials, and personnel shall remain within the perimeter of the disturbed area authorized under the applicable permit.

q. The discharge of firearms at the project site or vicinity by any employee or contractor of the Permittee shall be prohibited.

r. Feeding of wildlife by any employee or contractor of the Permittee shall be prohibited.

s. Access to the project site shall be made available to the representatives of the State and Federal wildlife agencies (California Department of Fish and Wildlife (CDFW) U.S. Fish and Wildlife Service) upon reasonable notice to the Permittee and compliance with all required drill site safety measures. Access to the site shall be provided within 24 hours of the receipt of the notice.

t. The Permittee shall place signage on the project site to inform personnel and visitors of the above requirements.

The Permittee shall implement the BMPs listed above throughout the entire life of the project, unless modified by the County Planning Director in consultation with USFWS and CDFW. A County-approved qualified biologist shall confirm and photo-document the installation of the BMPs.

Documentation: The Permittee shall prepare photo documentation of the complete installation of the signage and above BMPs.

Timing: Prior to the issuance of the Zoning Clearance for Use Inauguration, the Permittee shall take the following actions:

- Install signage.

- Submit photo-documentation of the installation of the signage to the Planning Division.

- Arrange for a site inspection by County staff to confirm that the measures included in this condition have been implemented.

Monitoring and Reporting: Planning Division staff will review the submitted reports. The Planning Division has the authority to conduct site inspections to ensure ongoing compliance with this condition consistent with the requirements of § 8114-3 of the *Ventura County Non-Coastal Zoning Ordinance*.

<u>Additional California Condor Protection Best Management Practices</u>

Purpose: To avoid significant impacts during construction and operation and ensure compatibility with conservation efforts outlined in the *Recovery Plan for California Condor* (April 19, 1996) and direction provided by United States Fish and Wildlife Service (USFWS) for oil and gas facilities within the range of the California Condor in Ventura County (USFWS, 2013).

Requirement: During construction and operation, the Permittee shall adhere to the following additional USFWS recommended California condor Best Management Practices (BMPs):

a. All food items and associated refuse shall be placed in covered containers that preclude access or use by California condors.

b. All equipment and work-related materials (including loose wires, open containers, rags, hoses, or other supplies) will be placed in closed containers or inside vehicles.

c. No dogs or other potentially predatory domesticated animals shall be allowed on the drill site unless on a leash or otherwise contained at all times.

d. All construction equipment, staging areas, materials, and personnel shall remain within the perimeter of the disturbed area authorized under the applicable permit.

e. The discharge of firearms at the project site or vicinity by any employee or contractor of the Permittee shall be prohibited.

f. Feeding of wildlife by any employee or contractor of the Permittee shall be prohibited.

g. Access to the project site shall be made available to the representatives of the State and Federal wildlife agencies (California Department of Fish and Wildlife, U.S. Fish and Wildlife Service) upon reasonable notice to the Permittee and compliance with all required drill site safety measures. Access to the site shall be provided within 24 hours of the receipt of the notice.

The Permittee shall implement the BMPs listed above throughout the entire life of the project, unless waived by USFWS or a County-approved qualified biologist in consultation with USFWS, California Department of Fish and Wildlife (CDFW), and the Planning Division. A County-approved qualified biologist shall confirm and photo-document the installation of the BMPs. The Permittee shall place signage on the project site to inform personnel and visitors of the above requirements.

Documentation: The application shall prepare photo documentation of the complete installation of the signage and implementation of the above BMPs.

Timing: Prior to the issuance of a Zoning Clearance for use inauguration, the Permittee must take the following actions:

- Install signage.
- Submit photo-documentation of the installation of the signage to the Planning Division.
- Arrange for a site inspection by County staff to confirm that the measures included in this condition have been implemented.

Prior issuance of a Zoning Clearance for Use Inauguration, the Permittee must provide the Planning Division with photo documentation of the implementation of the above requirements and obtain written concurrence by the Planning Division that the required BMPs are in place.

Monitoring and Reporting: Planning Division staff will review the submitted reports. The Planning Division has the authority to conduct site inspections to ensure ongoing compliance with this condition consistent with the requirements of *§ 8114-3 of the Ventura County Non-Coastal Zoning Ordinance.*

Based on the information provided above, and the whole of the record, none of the conditions have occurred set forth in CEQA Guidelines section 15162 to require the preparation of a subsequent EIR or subsequent MND. The decision-making body shall consider this Addendum to the adopted MND prior to making a decision on the project.

D. PUBLIC REVIEW:

Pursuant to the State CEQA Guidelines section 15164(c), this addendum to the MND does not need to be circulated for public review, and shall be included in, or attached to, the adopted MND.

Prepared by:

Justin Bertoline

Justin Bertoline, Senior Planner
Commercial & Industrial Permits Section

Attachments to the MND Addendum

Attachment 1: November 30, 1993 adopted MND

Attachment 2: July 1, 2015 Environmental Impact Report: Analysis of Oil and Gas Well Stimulation Treatments in California; SCH No. 2013112046; Certified by the California Department of Conservation. (Certification statement by State Oil and Gas Supervisor only)

Attachment 3: August 28, 2014 report titled: Advanced Well Stimulation Technologies in California, An Independent Review of Scientific and Technical Information. This report was prepared by the California Council on Science and Technology and commissioned by the U.S. Bureau of Land Management.

Attachment 4: Site plans

Attachment 5: January 30, 2018 VCAPCD Memorandum Regarding GHG Threshold of Significance

Attachment 6: September 6, 2017 VCAPCD memorandum on drilling operation emissions

Attachment 7: February 6, 2017 VCAPCD calculation of tanker truck emissions

Attachment 8: November 17, 2014 USFWS letter to Seneca Resources

MITIGATED NEGATIVE DECLARATION

A. PROJECT DESCRIPTION:

1. Entitlement: CUP-2941, Modification No. 1

2. Applicant: Seneca Resources Corporation

3. Location: (see Exhibit "1"): Near terminus Goodenough Road, Fillmore, CA

4. Assessor Parcel No(s). 41-0-070-08; 41-0-040-33, -07, -09

5. Parcel Size: ± 134.70 acres (Sites "A" and "B")

6. General Plan Designation: Open Space

7. Existing Zoning: "O-S-160" (Open Space, 160 acre minimum)

8. Project Description: Modify CUP-2941 to add to the existing 120-acre permit area (Site "A") a 14-acre area (Site "B") which includes an existing but unpermitted oil storage and shipping facility. This Modification would authorize an existing unpermitted well (No. 4) on the existing drilling pad on Site "A", and approve the drilling of an additional five (5) exploration/production wells on the same drilling pad. The Modification would approve the transport by existing pipeline from Site "A" to Site "B" and then, as necessary, south on Goodenough Road to an existing facility located at the western terminus of Fourth Street in the City of Fillmore. The Modification would approve the use of Site "B" as a 24-hour shipping facility. (See Exhibits "2" and "3")

9. Responsible Agencies: Department of Conservation, Division of Oil and Gas

B. STATEMENT OF ENVIRONMENTAL FINDINGS

State law requires that an Initial Study (environmental evaluation) be conducted to determine if this project could significantly affect the environment. Based on the findings contained in the attached Initial Study, it has been determined that this project could have a significant effect on the environment; therefore, a Mitigated Negative Declaration (MND) has been prepared. The potentially significant effects identified can be reduced to less than significant levels if the proposed Mitigation Measures are adopted as Conditions of Approval.

C. LISTING OF POTENTIALLY SIGNIFICANT ENVIRONMENTAL IMPACTS IDENTIFIED (See Initial Study Section Note for Mitigation Measures)

Biological Resources, Visual Resources, Noise and Vibration

D. PUBLIC REVIEW:

1. Legal Notice Method: Direct mailing to property owners within 300 feet of proposed project boundary, and a legal notice in a newspaper of general circulation.

2. Document Posting Period: January 25 - February 24, 1993

3. Comments: The public is encouraged to submit written comments regarding the adequacy of this MND no later than 5:00 p.m. on the last day of the above posting period to the Case Planner, RMA/Planning, 800 S. Victoria Avenue, Ventura, CA 93009. The FAX number is (805) 654-2509.

E. CONSIDERATION AND APPROVAL:

Prior to approving the project, the decision-making body of the Lead Agency must consider this MND and all comments received during public review. That body shall approve the MND if it finds that all the significant effects have been identified and that the proposed mitigation measures will reduce those effects to less than significant levels.

1. Prepared by: Kelly Scoles, Case Planner, Phone No. (805) 654-5042.

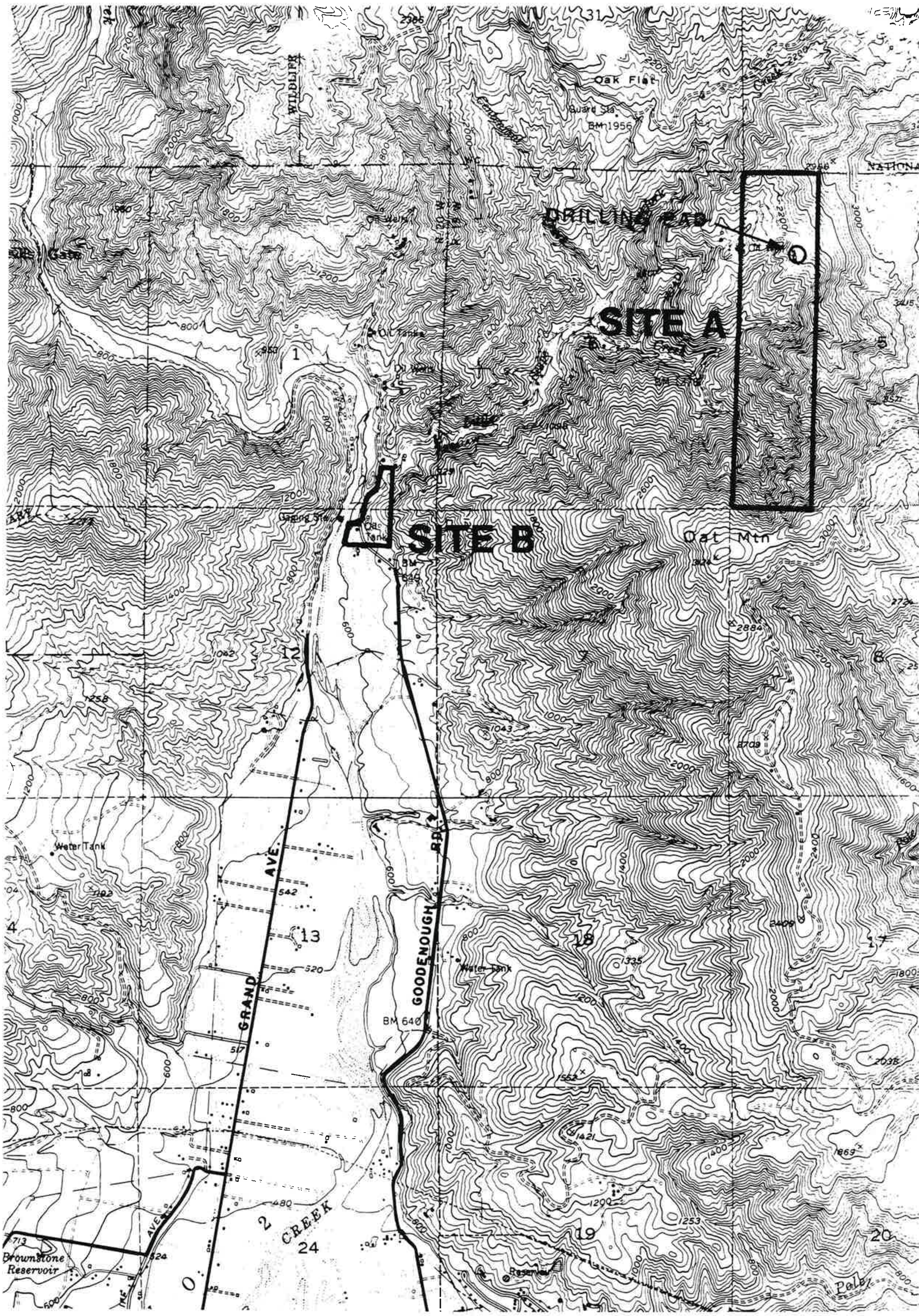
2. Reviewed for Release to the Public by: Robert K. Laughlin, Manager, Commercial/Industrial Land Use Section. RKL 1-19-93

3. Recommended for Approval by Lead Agency by: Keith Turner, Director, Planning Division.

KS:ka/1A146-7.93

Exhibit "1" - Location Map
Exhibit "2" - Site "A" Uses
Exhibit "3" - Site "B" Uses

Attachment 1 - November 30, 1993 adopted MND

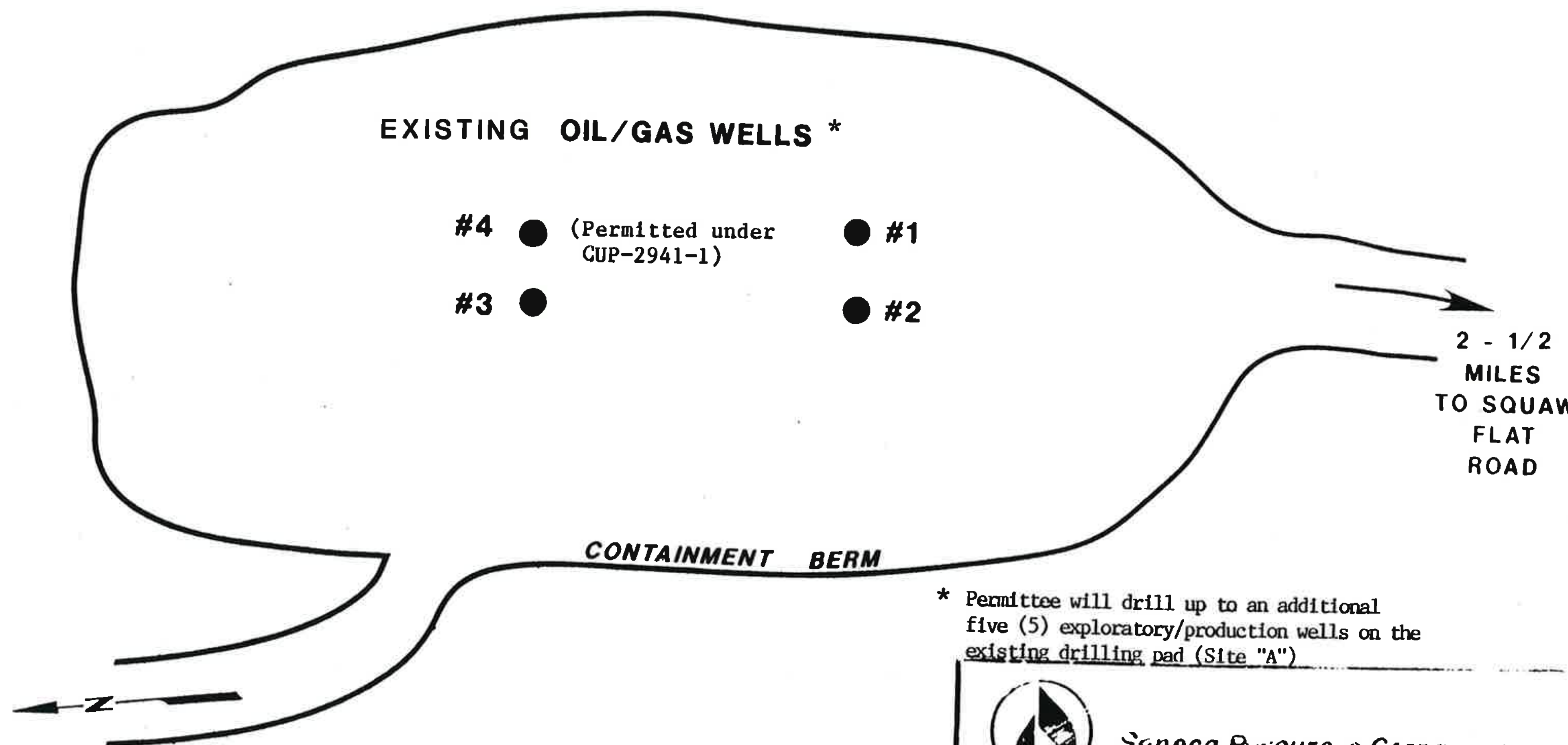


Ventura County
Resource
Management
Agency

CUP-2941-1

1"=2000'

EXHIBIT "1"



* Permittee will drill up to an additional five (5) exploratory/production wells on the existing drilling pad (Site "A")

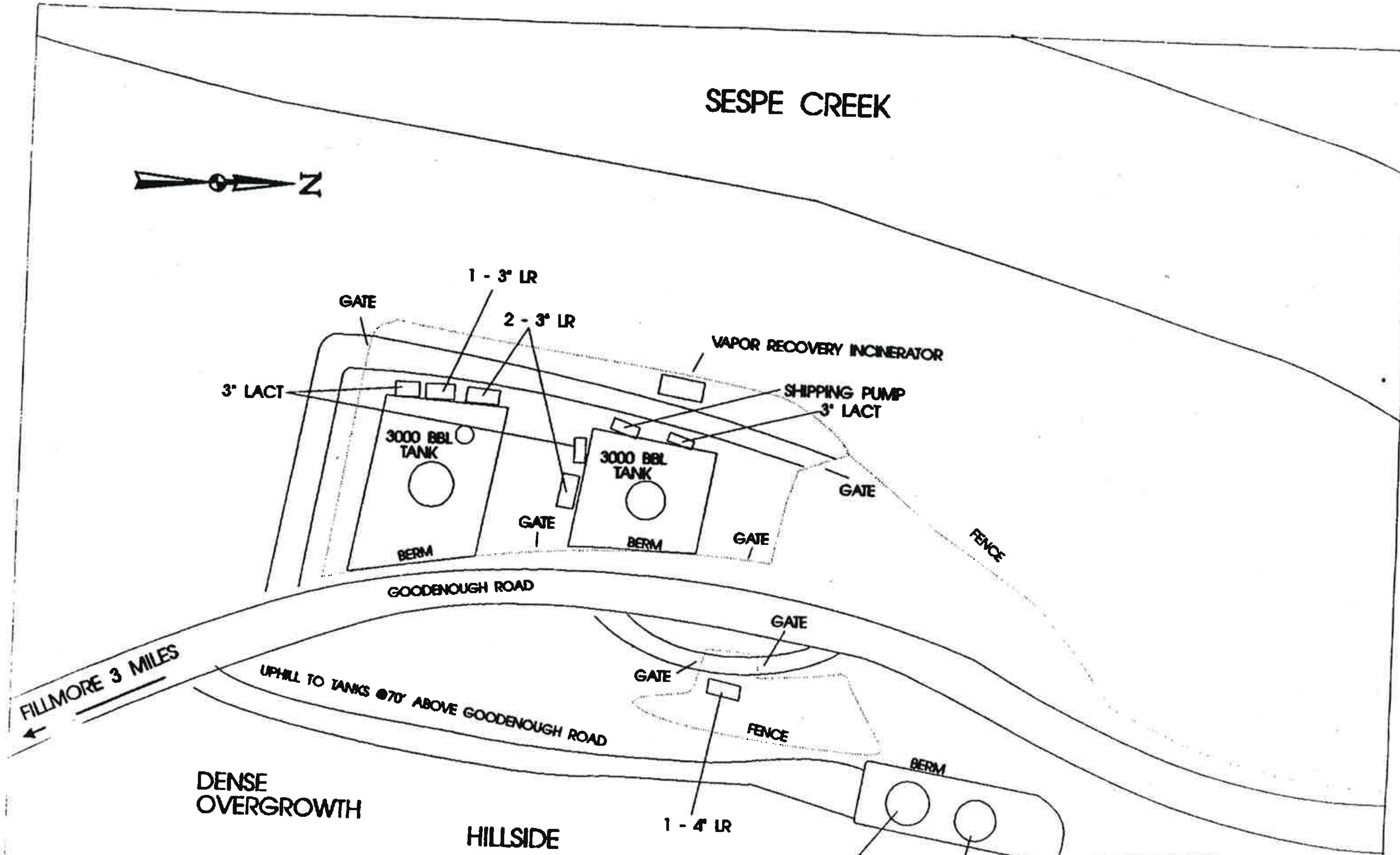
Seneca Resources Corporation

BASENBERG LEASE
EXISTING DRILLSITE

SITE PLAN - CUP 2941 Site "A"

Scale: NONE | Date: 3-19-92 | Geol. | Drafted by: L.G.T.

Exhibit "2"



"LACT" - Lease Automated Custody Transfer

"LR" - Loading Rack

Seneca Resources Corporation
a National Fuel Gas System company

CUP-2941 Mod. 1

CRUDE OIL SHIPPING FACILITY SITE PLAN Site "B"

NO SCALE

Exhibit "3"

Final Environmental Impact Report Executive Summary

This Final Environmental Impact Report (Final EIR) has been prepared to address the environmental effects of oil and gas well stimulation treatments in California, as mandated by Public Resources Code (PRC) Section 3161 (b)(3)(A) and (B) of Chapter 1, Division 3 (the State's laws for the conservation of petroleum and gas). These provisions are part of Senate Bill 4 (SB 4) (Chapter 313), which was authored by State Senator Fran Pavley et al., and signed into law by Governor Edmund G. Brown Jr. on September 20, 2013. SB 4 established a comprehensive regulatory program for oil and gas well stimulation treatments. SB 4 amended PRC Sections 3213, 3215, 3236.5 and 3401, added a new Article 3 (Sections 3150 through 3161) to Chapter 1, Division 3, of the PRC, and added a new Section 10783 to Part 2.76 (Groundwater Quality Monitoring) of the State's Water Code.[1]

PRC Section 3157 (a) and (b) define oil and gas well stimulation treatments as follows:

> *(a) For purposes of this article, "well stimulation treatment" means any treatment of a well designed to enhance oil and gas production or recovery by increasing the permeability of the formation. Well stimulation treatments include, but are not limited to, hydraulic fracturing treatments and acid well stimulation treatments.*
>
> *(b) Well stimulation treatments do not include steam flooding, water flooding, or cyclic steaming and do not include routine well cleanout work, routine well maintenance, routine removal of formation damage due to drilling, bottom hole pressure surveys, or routine activities that do not affect the integrity of the well or the formation.*[2]

As presented in Final EIR Executive Summary Section ES.2 (Summary of the Project), the "project" involves either hydraulic fracturing, acid fracturing, or acid matrix stimulation of an oil and gas well within the State, where the well either (1) existed prior to January 1, 2014, or (2) could be drilled after January 1, 2014, specifically for the purpose of a well stimulation treatment (PRC Section 3161(b)(3)(B)(ii)).

This Final EIR Executive Summary contains the following Sections:

- ES.1 Environmental Review Process and Use of the Final Environmental Impact Report
- ES.2 Summary of the Project
- ES.3 Summary of Project Alternatives
- ES.4 Summary of Content and Conclusions of the Final Environmental Impact Report
- ES.5 Environmentally Superior Alternative
- ES.6 Use and Application of the Final Environmental Impact Report Mitigation Measures
- ES.7 Areas of Known Controversy
- ES.8 Issues to be Resolved

---

[1] PRC Section 3161 was subsequently amended in 2014 by Senate Bill 861 (Statutes 2014, Chapter 35).

[2] Please refer to Draft EIR Section 7.3.5 (Description of the Project, Testing and Production) (Final EIR Volume II) for additional information on routine well cleanout work, routine well maintenance, routine removal of formation damage due to drilling, bottom hole pressure surveys, and routine activities that do not affect the integrity of a well or formation and are not considered to be well stimulation treatments.

Attachment 2 - July 1, 2015 EIR

ES.1 Environmental Review Process and Use of the Final Environmental Impact Report

Consistent with Section 15082 of the State California Environmental Quality Act (CEQA) Guidelines, a Notice of Preparation (NOP) for the project was issued on November 15, 2013; the NOP requested comments on the Draft EIR's scope and content from interested parties within a 60-day timeframe (November 15, 2013 through January 16, 2014). During this period, five public meetings on the scope and content of the Draft EIR were held in Oakland (December 10, 2013), Sacramento (December 11, 2013), Bakersfield (December 12, 2013), Ventura (January 8, 2014) and Long Beach (January 9, 2014), where comments by interested parties were also received.

The Draft EIR, a Notice of Completion, and a Notice of Availability for the project were released on January 14, 2015. The Draft EIR was made available for review and comment for a 62-day period (January 14, 2015, through March 16, 2015), during which time six public meetings on the Draft EIR were held in Ventura (February 10, 2015), Los Angeles (February 1, 2015), Oakland (February 18, 2015), Sacramento (February 19, 2015), Bakersfield (February 23, 2015) and Salinas (February 25, 2015). An estimated 2,100 written and verbal comments on the Draft EIR were received. In this Final EIR the Department of Conservation (DOC), acting on behalf of its Division of Oil, Gas and Geothermal Resources (DOGGR), has prepared written responses to all significant environmental points contained in those comments, consistent with State CEQA Guidelines Section 15088.

This Final EIR represents the documentation necessary for the project's full environmental review under CEQA. Section ES.4 of this Executive Summary provides a summation of the Final EIR's content and conclusions. Consistent with PRC Section 3161 (b)(3)(B)(i), this Final EIR will be considered for certification by the decision maker for the project on or before July 1, 2015. For the purposes of this Final EIR, the "decision maker" is the State Oil and Gas Supervisor.

ES.2 Summary of the Project

Description of the Project

For the purposes of this Final EIR, well stimulation treatments include hydraulic fracturing, acid fracturing and acid matrix stimulation. Well stimulation treatments do not include steam flooding, water flooding, or cyclic steaming. Additionally, such treatments do not include routine well cleanout work, routine well maintenance, routine removal of formation damage due to drilling, bottom hole pressure surveys, or routine activities that do not affect the integrity of a well or formation. Further, high rate gravel packing is not considered a well stimulation treatment when it is used to control sand within a well;[3] however, gravel (i.e., sand) packing treatments that are performed for well stimulation with the intent of fracturing a geologic formation are considered.

As directed by PRC Section 3161(b)(3)(A), this document focuses on the physical acts associated with hydraulic fracturing, acid fracturing, and acid matrix stimulation as they apply to both existing and future oil and gas wells in the State. This Final EIR analyzes the impacts of these well stimulation treatments with implementation of DOGGR's permanent regulations for well stimulation treatments, which were

[3] High rate gravel packing is a technique where the annulus (the space between the casing and the drilled hole or wellbore) of a well is packed, at a high pumping rate, with gravel, water, and additives to limit the entry of fines and sand from a geologic formation into the wellbore. The size of the gravel is similar to the size of the proppant (sand) used for hydraulic fracturing.

adopted on December 30, 2014, and have amended California Code of Regulations Title 14, Division 2, Chapter 4, Subchapter 2. These regulations will go into effect on July 1, 2015, as required by PRC Section 3161(a). This Final EIR's analysis assumes that well stimulation treatments, with application of DOGGR's permanent regulations, could occur either within or outside of existing oil and gas field boundaries. For the purposes of this Final EIR the "project" is defined as all activities associated with a stimulation treatment that could occur either at an existing oil and gas well, or at an oil and gas well that is drilled in the future expressly for the purposes of stimulation treatment.

The project also assumes implementation of the mitigation measures recommended in this Final EIR, as applicable at a site-specific level of analysis, to avoid or minimize potential impacts to certain categories of environmental resources. Please refer to Final EIR Executive Summary Section ES.6 (Use and Application of the Final Environmental Impact Report Mitigation Measures) for a discussion of the project's mitigation measures. Draft EIR Chapter 7 (Description of the Project), as revised for this Final EIR and contained in Volume II details the activities associated with the well stimulation treatments analyzed.

Objectives of the Project

Section 15124(b) of the State CEQA Guidelines requires that an EIR's "Project Description" include a clearly written statement of a proposed project's objectives to help a Lead Agency develop a reasonable range of alternatives, and aid its decision making body when preparing Findings of Fact and a Statement of Overriding Considerations, if necessary. Unlike most EIRs, which are typically prepared in response to a specific project proposal such as a permit application or proposed legislative action, this EIR has been prepared in response to the mandate set forth in PRC Section 3161(b)(3). Accordingly, this EIR has not been prepared in response to a specific project proposal, but rather is an informational document regarding the potential impacts of well stimulation which may serve to inform other CEQA documents. The statute adds that the mandate to prepare a statewide EIR does not prohibit a local lead agency from conducting its own EIR.

SB 4 also directs other State, regional and local agencies, in collaboration with DOGGR, to establish their respective authority, responsibility, notification and reporting requirements as related to various aspects of well stimulation treatments. Although the execution of some of the requirements of SB 4 are independent and exclusive of each other, they are all inter-related in the sense that they all serve the overall objective of SB 4 to rigorously evaluate well stimulation treatments and determine whether they can be conducted safely and with minimal impacts to the environment. To this end, the over-arching objectives of this EIR are not limited to oil and gas well stimulation treatments alone, but also include the objectives of the regulatory processes prescribed by SB 4, as follows:

1. Objectives of Oil and Gas Well Stimulation Treatments
    a. To increase the recovery of oil and gas resources by increasing the reservoir permeability to create an economically feasible production rate from presently unusable formations.
    b. To minimize the number of new wells required for the recovery of hydrocarbon resources.
    c. To maximize the efficiency and production capacity of existing and planned oil and gas wells.
    d. To allow continued development of the State's hydrocarbon resources.
    e. To conduct well stimulation treatments safely to minimize impacts to the environment and natural resources.
    f. To reduce the State's and nation's reliance on foreign oil and gas resources.

2. Objectives of the Environmental Impact Report

    a. To comply with PRC Section 3161, Subdivisions (b)(3)(A) and (B) by providing the public with detailed information regarding the practice of well stimulation.

    b. To provide DOGGR and other applicable regulatory agencies with information which may be necessary to efficiently and effectively evaluate future permit applications for proposed oil and gas well stimulation practices, during or following well completion, in order to ensure a consistent approach to CEQA compliance.

    c. To identify and develop impact avoidance and mitigation strategies to address any significant environmental effects directly, indirectly or cumulatively resulting from well stimulation practices that are not already sufficiently addressed by the permanent regulations addressing well stimulation treatments adopted by DOGGR on December 30, 2014, pursuant to PRC Section 3160, Subdivision (b)(1).

    d. To facilitate on-going coordination between DOGGR and other federal, State, regional and local agencies having regulatory authority over well stimulation practices.

3. Objectives of the Regulatory Process Mandated by SB 4

    a. To ensure cooperation and communication among regulatory agencies to expressly regulate the practice of well stimulation through the imposition of certain standards, to require the collection of data regarding well stimulation in California, and to require notification to those potentially affected by well stimulation practices.

    b. To prevent, as far as possible, damage to life, health, property, and natural resources resulting directly or indirectly from well stimulation, consistent with State statutes authorizing the efficient recovery of hydrocarbon resources, and consistent with impact avoidance and mitigation concepts of CEQA.

    c. To prevent damage to underground and surface waters suitable for irrigation or domestic purposes by the infiltration of, or the addition of, detrimental substances resulting directly or indirectly from well stimulation, consistent with State statutes authorizing the efficient recovery of hydrocarbon resources, and consistent with impact avoidance and mitigation concepts of CEQA.

ES.3 Summary of Project Alternatives

The statutory requirements for an EIR's evaluation of alternatives are detailed in Draft EIR Chapter 8 (Description of the Alternatives) and Chapter 14 (Comparison of the Alternatives), as revised for this Final EIR (Volumes II and III). Draft EIR Chapter 12 Environmental Analysis of the Alternatives), as also revised for this Final EIR (Volume III), provides the subject-specific assessment of the project's alternatives. Alternatives to the project include the:

- No Future Well Simulation Treatments Alternative (Alternative 1);
- No Future Well Stimulation Treatments Outside of Existing Oil and Gas Field Boundaries (Alternative 2);
- Well Pad Consolidation Alternative (Alternative 3);
- Urbanized Area Protection Alternative (Alternative 4);
- Active Fault Zone Restrictions Alternative (Alternative 5); and
- No Project Alternative (Alternative 6).

Additional detail regarding the alternatives can also be found in Draft EIR Section 1.2 (Summary of Project Alternatives), as revised for this Final EIR and contained in Volume II.

ES.4 Summary of Content and Conclusions of the Final Environmental Impact Report

Final Environmental Impact Report Content

Consistent with State CEQA Guidelines Sections 15088 and 15132, this Final EIR provides all comments received on, and written responses to, all significant environmental issues raised on the Draft EIR, as well as all revisions to the text of the Draft EIR. All changes to the text of the Draft EIR are contained in Volumes II and III of this Final EIR, and are indicated in strikethrough (~~strikethrough~~) text for deletions and underline (<u>underline</u>) text for additions.

Volume I of this Final EIR contains this Executive Summary, four chapters and one technical appendix, as follows:

- Executive Summary — Summary of the Final EIR's content and conclusions, including narratives of how its mitigation measures will be applied in the future, and new "areas of known controversy" and "issues to be resolved" that have been identified since publication of the Draft EIR
- Chapter A — Introduction
- Chapter B — Draft Environmental Impact Report Review Comments
- Chapter C — Responses to Review Comments on the Draft Environmental Impact Report
- Chapter D — Revisions to the Draft Environmental Impact Report Map Book
- Appendix 1 — Draft Environmental Impact Report Comment Correspondence and Public Meeting Transcripts

The Draft EIR, as revised and contained in Volumes II and III of this Final EIR addresses the project and its six alternatives at a programmatic level of analysis per the assumptions detailed in revised Draft EIR Chapter 9 (Overall Approach to the Environmental Analysis) (Final EIR Volume II). The Final EIR analyzes 23 subjects including:

- Aesthetics
- Agriculture and Forestry Resources
- Air Quality
- Biological Resources (Terrestrial Environment)
- Biological Resources (Coastal and Marine Environment)
- Coastal Processes and Marine Water Quality
- Commercial and Recreational Fishing
- Cultural Resources
- Paleontological Resources
- Environmental Justice
- Geology, Soils and Mineral Resources
- Greenhouse Gas Emissions
- Hazards and Hazardous Materials
- Groundwater Resources
- Surface Water Resources
- Land Use and Planning
- Noise and Vibration
- Population and Housing
- Public Services
- Recreation
- Risk of Upset/Public and Worker Safety
- Transportation and Traffic
- Utilities and Service Systems

For the purposes of these evaluations, the State was divided into six study regions, which follow the boundaries of DOGGR's six administrative Districts. Further refinement of these study regions was applied to reflect where oil and gas development can either be reasonably predicted to occur in the future, or has occurred. The study regions are described in revised Draft EIR Chapter 5 (Location and Regional Setting for the Project and Alternatives), and revised Draft EIR Section 5.8 details those areas of the State that the analysis concentrates on (Study Region Areas of Focus) (Final EIR Volume II).

For each subject programmatically evaluated, the Draft EIR, as revised for this Final EIR, assesses direct and reasonably foreseeable indirect impacts of the project, as well as three specific oil and gas fields, including the: Wilmington Oil and Gas Field (Study Region 1); Inglewood Oil and Gas Field (Study Region 1); and Sespe Oil and Gas Field (Study Region 2). The Draft EIR, as revised for this Final EIR, additionally analyzes the project's incremental contribution to cumulative impacts (revised Draft EIR Chapter 13), as well as its effects related to "other CEQA considerations" (revised Draft EIR Chapter 15).

In total, the Draft EIR, as revised for this Final EIR and contained in Volumes II and III, is made up of an Executive Summary, 19 chapters and 11 technical appendices, as follows:

- Executive Summary — Summary of the Draft EIR, including a narrative of areas of known controversy and issues to be resolved
- Chapter 1 — Introduction
- Chapter 2 — Regulatory Framework for the Division of Oil, Gas and Geothermal Resources
- Chapter 3 — Other Relevant Regulatory Schemes
- Chapter 4 — Scope and Intent of the Environmental Impact Report
- Chapter 5 — Location and Regional Setting for the Project and Alternatives
- Chapter 6 — Overview of California's Oil and Gas Resources
- Chapter 7 — Description of the Project
- Chapter 8 — Description of the Alternatives
- Chapter 9 — Overall Approach to the Environmental Analysis
- Chapter 10 — Programmatic Level Analysis of the Project
- Chapter 11 — Programmatic Level Analysis of Specific Oil and Gas Fields
- Chapter 12 — Environmental Analysis of the Alternatives
- Chapter 13 — Cumulative Impact Analysis
- Chapter 14 — Comparison of Alternatives
- Chapter 15 — Other CEQA Considerations
- Chapter 16 — Public Participation and Noticing
- Chapter 17 — References and Organizations/Persons Consulted
- Chapter 18 — List of Acronyms
- Chapter 19 — List of Preparers and Reviewers
- Appendix A — Oil and Gas Glossary of Terms
- Appendix B — Text of Senate Bill No. 4 (as modified in 2014)
- Appendix C — Well Stimulation Treatment Neighborhood Notification Form
- Appendix D — Guidelines and Environmental Checklist for Future Environmental Reviews and Clearances
- Appendix E — Emission Calculation Examples – Well Stimulation Treatments
- Appendix F — California History, Prehistory, and Cultural Resources Types
- Appendix G — Descriptions of Native American Tribes and Reservations

- Appendix H Paleontological Resources Assessments for the Wilmington and Sespe Oil and Gas Fields
- Appendix I Chemicals Used in Hydraulic Fracturing
- Appendix J Groundwater Basin Data for Study Regions 1 through 6
- Appendix K Summary of National Train Accident Data for Class I Railroads (excluding Amtrak)

In addition, the Draft EIR includes a companion Map Book, which contains the maps associated with the Draft EIR's content and subject-specific analyses, as revised for this Final EIR. For the purposes of this Final EIR, the Draft EIR Map Book has not been re-published. Revisions to its content can be found in Final EIR Volume I, Chapter D (Revisions to the Draft Environmental Impact Report Map Book). The entire Draft EIR and its Map Book can be accessed at:

http://www.conservation.ca.gov/dog/SB 4DEIR/Pages/SB 4_DEIR_TOC.aspx

The Draft EIR and Map Book can also be viewed in published form at all six DOGGR District offices, as follows:

DOC Headquarters/DOGGR District 6
801 K Street, MS 24-01
Sacramento, CA 95814

DOGGR District 1
5816 Corporate Avenue, Suite 200
Cypress, CA 90630-4731

DOGGR District 2
1000 South Hill Road, Suite 116
Ventura, CA 93003-4458

DOGGR District 3
195 South Broadway, Suite 101
Orcutt, CA 93455-4655

DOGGR District 4
4800 Stockdale Highway, Suite 417
Bakersfield, CA 93309-0279

DOGGR District 5
466 North Fifth Street
Coalinga, CA 93210-1793

Conclusions of the Final Environmental Impact Report

For the purposes of calibrating potential impacts and their significance, for each subject-specific impact evaluated in this Final EIR, the following impact classification system is applied:

- **Class I:** Significant and Unavoidable Impact. Class I impacts are significant adverse environmental effects that cannot be mitigated to a level of less than significant through the application of feasible mitigation measures.
- **Class II:** Less Than Significant Impact With Mitigation Incorporated. Class II Impacts are significant adverse environmental effects that can be reduced to a level of less than significant with the application of feasible mitigation measures.
- **Class III:** Less Than Significant Impact. Class III impacts are adverse environmental effects that have been determined to be comparatively minor in the sense that they do not meet or exceed the subject-specific criteria established to gauge significance.
- **Class IV:** No Impact. Class IV impacts do not have any adverse or beneficial environmental effects.

At a programmatic level of analysis, the Final EIR concludes that the project has the potential to cause significant and unavoidable (Class I) impacts to aesthetics, air quality, biological resources (terrestrial environment), cultural resources, geology, soils and mineral resources, greenhouse gas emissions, land use and planning, risk of upset/public and worker safety, and transportation and traffic, as summarized in Table ES-1 (Summary of Significant and Unavoidable (Class I) Impacts of the Project). As the table notes, the occurrence of Class I impacts is dependent on the site-specific conditions in particular areas in which well stimulation treatments may occur. In some instances, less than significant impacts with mitigation incorporated (Class II), less than significant impacts (Class III), or no impact (Class IV) could occur.

At a programmatic level of analysis, the Final EIR concludes that the project has the potential to cause Class II through Class IV impacts, as summarized in Table ES-2 (Summary of Impacts and Mitigation Measures for the Project), starting on page ES-30.

At a programmatic level of analysis for specific oil and gas fields, the Final EIR concludes that significant and unavoidable impacts (Class I) for air quality, biological resources (terrestrial environment), cultural resources, greenhouse gas emissions, land use and planning, risk of upset/public and worker safety, and transportation and traffic could occur. These impacts, as well as the less than significant impacts with mitigation incorporated (Class II), less than significant impacts (Class III), and no impact (Class IV) that could occur at a field-specific level, are summarized in Table ES-3 (Summary of Impacts and Mitigation Measures for the Project: Analysis of Specific Oil and Gas Fields), starting on page ES-46.

Table ES-1. Summary of Significant and Unavoidable (Class I) Impacts of the Project*

Subject / Impact Criteria	Mitigation Measures	Significance after Mitigation
Aesthetics		
Impact AES-1: Substantially adversely affect scenic vistas	**AES-1a:** Prepare and Implement a Site Plan to Reduce Visual Impacts to Sensitive Receptors **AES-1b:** Minimize Lighting Visibility Offsite	Class I or II in new areas depending on site-specific conditions
Impact AES-2: Substantially alter or damage scenic resources	**AES-1a:** Prepare and Implement a Site Plan to Reduce Visual Impacts to Sensitive Receptors **AES-1b:** Minimize Lighting Visibility Offsite	Class I or II in new areas depending on site-specific conditions
Impact AES-3: Substantially degrade the existing visual character or quality of a site and its surroundings	**AES-1a:** Prepare and Implement a Site Plan to Reduce Visual Impacts to Sensitive Receptors **AES-1b:** Minimize Lighting Visibility Offsite	Class I or II in new areas depending on site-specific conditions
Impact AES-4: Create new sources of substantial light and glare	**AES-1a:** Prepare and Implement a Site Plan to Reduce Visual Impacts to Sensitive Receptors **AES-1b:** Minimize Lighting Visibility Offsite	Class I or II in new areas depending on site-specific conditions
Air Quality		
Impact AQ-1: Conflict with or obstruct implementation of an applicable air quality plan	**AQ-1a:** Improve Air Quality Planning Inventories and Local Control Measures **AQ-1b:** Improve Methodologies and Emission Factors Used in Inventory Development	Class I (Statewide) Class III (in SCAQMD)
Impact AQ-2: Increase criteria pollutants or precursor pollutants to levels that violate an air quality standard or contribute substantially to an existing or projected air quality violation	**AQ-2a:** Reduce Hydrocarbon Emissions from Well Stimulation Treatments **AQ-2b:** Reduce Emissions from Portable Equipment and Mobile Sources **AQ-2c:** Reduce Emissions from Dust-Causing Activities	Class I
Impact AQ-3: Expose sensitive receptors to substantial pollutant concentrations	**AQ-3a:** Comply with Local Air District Protocols Relating to the Preparation of a Health Risk Assessment and Implement Emission Controls **AQ-3b:** Avoid Unnecessary Exposure to Air Pollutants by Improving Local Land Use Compatibility	Class I

Table ES-1. Summary of Significant and Unavoidable (Class I) Impacts of the Project*

Subject / Impact Criteria	Mitigation Measures	Significance after Mitigation
Impact AQ-4: Create objectionable odors affecting a substantial number of people	**AQ-4a:** Prepare and Implement an Odor Minimization Plan **AQ-4b:** Avoid Unnecessary Exposure to Odors by Improving Local Land Use Compatibility	Class I
Biological Resources: Terrestrial Environment		
Impact BIOT-1: Substantially reduce the habitat of a fish or wildlife species	**BIOT-1a:** Evaluate Impacts to Native Vegetation and Fish and Wildlife Habitat **BIOT-1b:** Minimize Impacts to Native Vegetation and Habitat **BIOT-1c:** Replace or Offset Loss of Sensitive Habitat **AQ-2c:** Reduce Emissions from Dust-Causing Activities **GW-1a:** Use Alternative Water Sources to the Extent Feasible **GW-1b:** Minimize Groundwater Impacts **HAZ-1a:** Ensure that Spill Contingency Plan Provides Adequate Protection Against Leaks or Discharges of Dangerous Fluids and Other Potentially Dangerous Materials **SWR-1a:** Require Stormwater Pollution Prevention Plan **SWR-2a:** Implement Erosion Control Plan **SWR-3a:** Ensure Adequate Water Availability	Class I through III depending on site-specific conditions
Impact BIOT-2: Cause a fish or wildlife population to drop below self-sustaining levels	**BIOT-1b:** Minimize Impacts to Native Vegetation and Habitat **BIOT-1c:** Replace or Offset Loss of Sensitive Habitat **BIOT-2a:** Prevent Hazards to Fish and Wildlife **BIOT-2b:** California Condor Protection Measures **BIOT-2c:** Nelson's Bighorn Sheep Protection Measures **BIOT-3a:** Minimize and Mitigate Impacts to Special-status Fish and Wildlife **BIOT-4b:** Minimize Impacts to Protected Birds **BIOT-7a:** Prevent or Mitigate Habitat Fragmentation and Impacts to Fish and Wildlife Movement **GW-4a:** Demonstrate that Wells within the ADSA Have Effective Cement Well Seals and Monitor Wells during Well Stimulation **GW-4b:** Install a Well Seal Across Protected Groundwater for New Wells Subject to Well Stimulation Treatments **HAZ-1a:** Ensure that Spill Contingency Plan Provides Adequate Protection Against Leaks or Discharges of Dangerous Fluids and Other Potentially Dangerous Materials **SWR-1a:** Require Stormwater Pollution Prevention Plan **SWR-2a:** Implement Erosion Control Plan	Class I through III depending on site-specific conditions

Table ES-1. Summary of Significant and Unavoidable (Class I) Impacts of the Project*

Subject / Impact Criteria	Mitigation Measures	Significance after Mitigation
Impact BIOT-3: Substantially reduce the number or restrict the range of an endangered, rare, or threatened species	**BIOT-1b:** Minimize Impacts to Native Vegetation and Habitat **BIOT-1c:** Replace or Offset Loss of Sensitive Habitat **BIOT-2a:** Prevent Hazards to Fish and Wildlife **BIOT-3a:** Minimize and Mitigate Impacts to Special-status Fish and Wildlife **BIOT-3b:** Minimize and Mitigate Impacts to Special-status Plants **BIOT-4b:** Minimize Impacts to Protected Birds **BIOT-7a:** Prevent or Mitigate Habitat Fragmentation and Impacts to Fish and Wildlife Movement **AQ-2c:** Reduce Emissions from Dust-Causing Activities **SWR-1a:** Require Stormwater Pollution Prevention Plan	Class I through III depending on site-specific conditions
Impact BIOT-4: Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by CDFW or USFWS	**BIOT-1b:** Minimize Impacts to Native Vegetation and Habitat **BIOT-1c:** Replace or Offset Loss of Sensitive Habitat **BIOT-2a:** Prevent Hazards to Fish and Wildlife **BIOT-3a:** Minimize and Mitigate Impacts to Special-status Fish and Wildlife **BIOT-3b:** Minimize and Mitigate Impacts to Special-status Plants **BIOT-4a** Minimize and Mitigate Impacts to All Species Identified as a Candidate, Sensitive, or Special-status Species in Local or Regional Plans, Policies, or Regulations, or by CDFW or USFWS **BIOT-4b:** Minimize Impacts to Protected Birds **BIOT-7a:** Prevent or Mitigate Habitat Fragmentation and Impacts to Fish and Wildlife Movement	Class I through III depending on site-specific conditions
Impact BIOT-5: Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by CDFW or USFWS	**BIOT-1a:** Evaluate Impacts to Native Vegetation and Fish and Wildlife Habitat **BIOT-1b:** Minimize Impacts to Native Vegetation and Habitat **BIOT-1c:** Replace or Offset Loss of Sensitive Habitat **AQ-2c:** Reduce Emissions from Dust-Causing Activities **GW-4a:** Demonstrate that Wells within the ADSA Have Effective Cement Well Seals and Monitor Wells during Well Stimulation **GW-4b:** Install a Well Seal Across Protected Groundwater for New Wells Subject to Well Stimulation Treatments **SWR-1a:** Require Stormwater Pollution Prevention Plan **SWR-1b:** Surface Water Protection **SWR-2a:** Implement Erosion Control Plan **SWR-3a:** Ensure Adequate Water Availability	Class I through III depending on site-specific conditions

Table ES-1. Summary of Significant and Unavoidable (Class I) Impacts of the Project*

Subject / Impact Criteria	Mitigation Measures	Significance after Mitigation
Impact BIOT-6: Have a substantial adverse effect on federally protected wetlands as defined by Section 404, of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means	**BIOT-1a:** Evaluate Impacts to Native Vegetation and Fish and Wildlife Habitat **BIOT-1b:** Minimize Impacts to Native Vegetation and Habitat **BIOT-1c:** Replace or Offset Loss of Sensitive Habitat **BIOT-2a:** Prevent Hazards to Fish and Wildlife **BIOT-3a:** Minimize and Mitigate Impacts to Special-status Fish and Wildlife **BIOT-6a:** Protect Jurisdictional Waters **GW-1a:** Use Alternative Water Sources to the Extent Feasible **GW-1b:** Minimize Groundwater Impacts **GW-4a:** Demonstrate that Wells within the ADSA Have Effective Cement Well Seals and Monitor Wells during Well Stimulation **GW-4b:** Install a Well Seal Across Protected Groundwater for New Wells Subject to Well Stimulation Treatments **SWR-1a:** Require Stormwater Pollution Prevention Plan **SWR-1b:** Surface Water Protection **SWR-2a:** Implement Erosion Control Plan **SWR-3a:** Ensure Adequate Water Availability	Class I through III depending on site-specific conditions
Impact BIOT-7: Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites	**BIOT-7a:** Prevent Habitat Fragmentation and Impacts to Fish and Wildlife Movement	Class I through III depending on site-specific conditions
Impact BIOT-8: Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance	**BIOT-8a:** Coordinate with Local Agencies and Jurisdictions Regarding Local Policies and Conservation Plans	Class I through III depending on site-specific conditions
Impact BIOT-9: Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan	**BIOT-9a:** Coordinate with CDFW, USFWS, and Permittees Regarding NCCPs, HCPs, and Other Conservation Plans	Class I through III depending on site-specific conditions
Impact BIOT-10: Contribute to global climate change and consequent impacts to biodiversity	**AQ-2a:** Reduce Hydrocarbon Emissions from Well Stimulation Treatments **AQ-2b:** Reduce Emissions from Portable Equipment and Mobile Sources **GHG-1a:** Prevent Methane Emissions from Associated Gas and Casinghead gas **GHG-1b:** Reduce Emissions by Implementing Clean Development Mechanism (CDM) Strategies **GHG-2a:** Require Applicant to Enter into Mitigation Programs or Agreements for GHG Emissions not Covered by or Exempt from ARB's Cap and Trade Program	Class I

Table ES-1. Summary of Significant and Unavoidable (Class I) Impacts of the Project*

Subject / Impact Criteria	Mitigation Measures	Significance after Mitigation
Cultural Resources		
Impact CUL-1: Affect historic-era archaeological and built-environment resources	**CUL-1a:** Require Information and Evaluate Cultural Resources **CUL-1b:** Complete Native American Coordination **CUL-1c:** Prepare and Implement Cultural Resources Management and Treatment Plan **CUL-1d:** Prepare Plan for the Inadvertent Discovery of Human Remains **CUL-1e:** Provide Cultural Resources Specialist with the Authority to Halt Earth Disturbing Activities **CUL-1f:** Conduct a Cultural Resources Worker Environmental Awareness Program **CUL-1g:** Monitor Earth Disturbing Activities for Cultural Resources **CUL-1h:** Provide Native American Monitors during Earth Disturbing Activities **CUL-1i:** Prepare Cultural Resources Documents for the Monitoring of Earth Disturbing Activities **CUL-1j:** Curate all Discovered Cultural Resources Associated with Earth Disturbing Activities	Class I through IV depending on site-specific conditions
Impact CUL-2: Affect prehistoric resources	**CUL-1a:** Require Information and Evaluate Cultural Resources **CUL-1b:** Complete Native American Coordination **CUL-1c:** Prepare and Implement Cultural Resources Management and Treatment Plan **CUL-1d:** Prepare Plan for the Inadvertent Discovery of Human Remains **CUL-1e:** Provide Cultural Resources Specialist with the Authority to Halt Earth Disturbing Activities **CUL-1f:** Conduct a Cultural Resources Worker Environmental Awareness Program **CUL-1g:** Monitor Earth Disturbing Activities for Cultural Resources **CUL-1h:** Provide Native American Monitors during Earth Disturbing Activities **CUL-1i:** Prepare Cultural Resources Documents for the Monitoring of Earth Disturbing Activities **CUL-1j:** Curate all Discovered Cultural Resources Associated with Earth Disturbing Activities	Class I through IV depending on site-specific conditions

Table ES-1. Summary of Significant and Unavoidable (Class I) Impacts of the Project*

Subject / Impact Criteria	Mitigation Measures	Significance after Mitigation
Impact CUL-3: Disturb human remains or cultural items, including funerary objects, sacred objects, and objects of cultural patrimony	**CUL-1a:** Require Information and Evaluate Cultural Resources **CUL-1b:** Complete Native American Coordination **CUL-1c:** Prepare and Implement Cultural Resources Management and Treatment Plan **CUL-1d:** Prepare Plan for the Inadvertent Discovery of Human Remains **CUL-1e:** Provide Cultural Resources Specialist with the Authority to Halt Earth Disturbing Activities **CUL-1f:** Conduct a Cultural Resources Worker Environmental Awareness Program **CUL-1g:** Monitor Earth Disturbing Activities for Cultural Resources **CUL-1h:** Provide Native American Monitors during Earth Disturbing Activities **CUL-1i:** Prepare Cultural Resources Documents for the Monitoring of Earth Disturbing Activities **CUL-1j:** Curate all Discovered Cultural Resources Associated with Earth Disturbing Activities	Class I through IV depending on site-specific conditions
Impact CUL-4: Affect cultural landscapes	**CUL-1a:** Require Information and Evaluate Cultural Resources **CUL-1b:** Complete Native American Coordination **CUL-1c:** Prepare and Implement Cultural Resources Management and Treatment Plan **CUL-1d:** Prepare Plan for the Inadvertent Discovery of Human Remains **CUL-1e:** Provide Cultural Resources Specialist with the Authority to Halt Earth Disturbing Activities **CUL-1f:** Conduct a Cultural Resources Worker Environmental Awareness Program **CUL-1g:** Monitor Earth Disturbing Activities for Cultural Resources **CUL-1h:** Provide Native American Monitors during Earth Disturbing Activities **CUL-1i:** Prepare Cultural Resources Documents for the Monitoring of Earth Disturbing Activities **CUL-1j:** Curate all Discovered Cultural Resources Associated with Earth Disturbing Activities	Class I through IV depending on site-specific conditions
Geology, Soils and Mineral Resources		
Impact GEO-6: Result in the loss of availability of known mineral resource, or loss of a locally important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan	No mitigation proposed	Class III in most instances; Class I in some cases when local governments, with proper findings, approve land uses that preclude further access to important mineral resources

Table ES-1. Summary of Significant and Unavoidable (Class I) Impacts of the Project*

Subject / Impact Criteria	Mitigation Measures	Significance after Mitigation
Greenhouse Gas Emissions		
Impact GHG-1: Generate greenhouse gas emissions that may have a significant impact on the environment	**AQ-2a:** Reduce Emissions from Well Stimulation Treatments **AQ-2b:** Reduce Emissions from Portable Equipment and Mobile Sources **GHG-1a:** Prevent Methane Emissions from Associated Gas and Casinghead Gas **GHG-1b:** Reduce Emissions by Implementing Clean Development Mechanism (CDM) Strategies **GHG-1c:** Detect and Quantify Fugitive and Vented Methane and Carbon Dioxide	Class I
Impact GHG-2: Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases	**AQ-2a:** Reduce Emissions from Well Stimulation Treatments **AQ-2b:** Reduce Emissions from Portable Equipment and Mobile Sources **GHG-1c:** Detect and Quantify Fugitive and Vented Methane and Carbon Dioxide **GHG-2a:** Require Applicant Enter into Mitigation Programs or Agreements for GHG Emissions not Covered by or Exempt from ARB's Cap and Trade Program	Class I
Land Use and Planning		
Impact LU-1: Preclude existing or permitted land uses, or create a disturbance that would diminish the function of land uses	(None available for significant and unavoidable impacts associated with Risk of Upset/Public and Worker Safety)	Class I
Risk of Upset/Public and Worker Safety		
Impact RSK-1: Create a hazard to the public or environment through crude oil transport and reasonably foreseeable accidents and releases	**RSK-1a:** Increase the Number of CPUC Rail Inspectors **RSK-1b:** Expedite the Phase-out of Older Tank Cars **RSK-1c:** Implement New Accident Prevention Technology **RSK-1d:** Monitor and Enforce New Speed Limits **RSK-1e:** Monitor the Implementation of Trackside Safety Technology **RSK-1f:** Improve Emergency Preparedness and Response Programs **RSK-1g:** Provide Real-Time Shipment Information to Emergency Responders **RSK-1h:** Provide Additional Accident and Injury Data to the State	Class I
Impact RSK-6: Increase risks to public safety by exposing the public to accidental hazardous materials releases from pipelines	**RSK-6a:** Increase Inspection of Mechanical Integrity **RSK-6b:** Improve Leak Detection Capability **RSK-6c:** Reduce Mainline Valve Spacing	Class I
Transportation and Traffic		
Impact TR-4: Transport hazardous materials	**TR-4a:** Know Spill Prevention Measures	Class I

*Note: The occurrence of Class I Impacts is contingent on site-specific conditions of where a well stimulation treatment may occur. In some instances less than significant impacts with mitigation incorporated (Class II), less than significant impacts (Class III), or no impacts (Class IV) could occur.

In addition to the project's direct and indirect effects, the Final EIR concludes that the project would have the potential to incrementally contribute to significant and unavoidable impacts related to aesthetics, air quality, agricultural and forestry resources, biological resources (terrestrial environment), cultural resources, environmental justice, greenhouse gas emissions, geology, soils and mineral resources, groundwater resources, land use and planning, risk of upset/public and worker safety, surface water resources, and transportation and traffic. These impacts are summarized in Table ES-4 (Summary of the Project's Incremental Contribution to Cumulative Impacts).

Table ES-4. Summary of the Project's Incremental Contribution to Cumulative Impacts

Subject / Impact Criteria[1]	Impact Significance and Mitigation Measures[2,3]
Aesthetics	
Impact AES-1. Substantially adversely affect scenic vistas	Class III in existing fields; Class I or II in new areas; for Class I and II impacts the mitigation measures as identified in Table ES-2 apply
Impact AES-2: Substantially alter or damage scenic resources	Class III in existing fields; Class I or II in new areas for Class I and II impacts the mitigation measures as identified in Table ES-2 apply
Impact AES-3: Substantially degrade the existing visual character or quality of a site and its surroundings	Class III in existing fields; Class I or II in new areas; for Class I and II impacts the mitigation measures as identified in Table ES-2 apply
Impact AES-4: Create new sources of substantial light and glare	Class III in existing fields; Class I or II in new areas for Class I and II impacts the mitigation measures as identified in Table ES-2 apply
Agricultural and Forestry Resources	
Impact AGF-1: Convert Prime Farmland, Unique Farmland, or Farmland of statewide Importance (Important Farmland), as designated by the Farmland Mapping and Monitoring Program, to non-agricultural use	Class I on or adjacent to Important Farmland; for Class I impacts the same mitigation measures as identified in Table ES-2 apply
Impact AGF-2: Conflict with existing zoning for agricultural use or with Williamson Act contracts	Class II on land zoned for agricultural use or enrolled in Williamson Act contracts; for Class II impacts the same mitigation measures as identified in Table ES-2 apply
Impact AGF-3: Conflict with existing zoning for, or cause rezoning of, forest land, timberland, or timberland zoned Timberland Production	Class II on land zoned as forestland, timberland, or Timberland Production; for Class II impacts the same mitigation measures as identified in Table ES-2 apply
Impact AGF-4: Result in the loss of forest land or conversion of forest land to non-forest use	Class I on forest land; for Class I impacts the same mitigation measures as identified in Table ES-2 apply
Impact AGF-5: Directly or indirectly impair the use of agricultural land or forest land	Class II for well stimulation activities on or within 1,500 feet of agricultural or forest land; for Class II impacts the same mitigation measures as identified in Table ES-2 apply
Air Quality	
Impact AQ-1: Conflict with or obstruct implementation of an applicable air quality plan	Class I (Statewide); Class III (in SCAQMD). For Class I impacts the same mitigation measures as identified in Table ES-2 apply
Impact AQ-2: Increase criteria pollutants or precursor pollutants to levels that violate an air quality standard or contribute substantially to an existing or projected air quality violation	Class I; the same mitigation measures as identified in Table ES-2 apply

Table ES-4. Summary of the Project's Incremental Contribution to Cumulative Impacts

Subject / Impact Criteria[1]	Impact Significance and Mitigation Measures[2,3]
Impact AQ-3: Expose sensitive receptors to substantial pollutant concentrations	Class I; the same mitigation measures as identified in Table ES-2 apply
Impact AQ-4: Create objectionable odors affecting a substantial number of people	Class I; the same mitigation measures as identified in Table ES-2 apply
Biological Resources: Terrestrial Environment	
Impact BIOT-1: Substantially reduce the habitat of a fish or wildlife species	Class I; the same mitigation measures as identified in Table ES-2 apply
Impact BIOT-2: Cause a fish or wildlife population to drop below self-sustaining levels	Class I; the same mitigation measures as identified in Table ES-2 apply
Impact BIOT-3: Substantially reduce the number or restrict the range of an endangered, rare, or threatened species	Class I; the same mitigation measures as identified in Table ES-2 apply
Impact BIOT-4: Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by CDFW or USFWS	Class I; the same mitigation measures as identified in Table ES-2 apply
Impact BIOT-5: Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by CDFW or USFWS	Class I; the same mitigation measures as identified in Table ES-2 apply
Impact BIOT-6: Have a substantial adverse effect on federally protected wetlands as defined by Section 404, of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means	Class I; the same mitigation measures as identified in Table ES-2 apply
Impact BIOT-7: Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites	Class I; the same mitigation measures as identified in Table ES-2 apply
Impact BIOT-8: Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance	Class II; the same mitigation measures as identified in Table ES-2 apply
Impact BIOT-9: Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan	Class II; the same mitigation measures as identified in Table ES-2 apply
Impact BIOT-10: Contribute to global climate change and consequent impacts to biodiversity	Class I; the same mitigation measures as identified in Table ES-2 apply
Biological Resources: Coastal and Marine Environment	
Impact BIOCM-1: Substantially affect any species identified as a candidate, sensitive, or special status species or their habitat	Class III; no mitigation required
Impact BIOCM-2: Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites	Class III; no mitigation required

Table ES-4. Summary of the Project's Incremental Contribution to Cumulative Impacts

Subject / Impact Criteria[1]	Impact Significance and Mitigation Measures[2,3]
Impact BIOCM-3: Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means	Class III; no mitigation required
Coastal Processes and Marine Water Quality	
Impact CPMWQ-1: Change marine water chemical composition with respect to known hazardous substances; or the measured water temperature, salinity, conductivity, or turbidity	Class II; the same mitigation measures as identified in Table ES-2 apply
Impact CPMWQ-2: Change the velocity or direction of ocean currents	Class IV; no mitigation required
Impact CPMWQ-3: Change the velocity or direction of coastal and ocean winds	Class IV; no mitigation required
Impact CPMWQ-4: Change the direction, size, or period of ocean waves	Class IV; no mitigation required
Impact CPMWQ-5: Increase the risk of a tsunami	Class III; no mitigation required
Commercial and Recreational Fishing	
Impact CRF-1: Cause long-term exclusion of important commercial and recreational fishing areas	Class III; no mitigation required
Impact CRF-2: Result in substantial loss of total catch to commercial and recreational fishing industries	Class III; no mitigation required
Cultural Resources	
Impact CUL-1: Affect historic-era archaeological and built-environment resources	Class I or Class II if historic or built-environment resources are present (mitigation measures identified in Table ES-2 apply); Class III or Class IV if historic or built-environment resources are not considered significant or are not present (no mitigation required)
Impact CUL-2: Affect prehistoric resources	Class I or Class II if historic or built-environment resources are present (mitigation measures identified in Table ES-2 apply); Class III or Class IV if historic or built-environment resources are not considered significant or are not present (no mitigation required)
Impact CUL-3: Disturb human remains or cultural items, including funerary objects, sacred objects, and objects of cultural patrimony	Class I or Class II if historic or built-environment resources are present (mitigation measures identified in Table ES-2 apply); Class III or Class IV if historic or built-environment resources are not considered significant or are not present (no mitigation required)
Impact CUL-4: Affect cultural landscapes	Class I or Class II if historic or built-environment resources are present (mitigation measures identified in Table ES-2 apply); Class III or Class IV if historic or built-environment resources are not considered significant or are not present (no mitigation required)

Table ES-4. Summary of the Project's Incremental Contribution to Cumulative Impacts

Subject / Impact Criteria[1]	Impact Significance and Mitigation Measures[2,3]
Environmental Justice	
Impact EJ-1: Disproportionately affect minority or low-income populations	Class I through Class IV depending on site-specific demographics; the same mitigation measure as identified in Table ES-2 applies to Class I and II impacts
Geology, Soils and Mineral Resources	
Impact GEO-1: Expose people or structures to potential substantial adverse effects as a result of rupture of a known fault, seismically induced groundshaking, and/or ground failure	Class III; no mitigation required
Impact GEO-2: Result in substantial soil erosion or the loss of topsoil	Class III; no mitigation required
Impact GEO-3: Be located on a geologic unit or soil that is unstable and result in on- or off-site landslide, lateral spreading, subsidence or collapse	Class II; the same mitigation measure as identified in Table ES-2 applies
Impact GEO-4: Be located on expansive soil creating substantial risks to life or property	Class III; no mitigation required
Impact GEO-5: Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems	Class III; no mitigation required
Impact GEO-6: Result in the loss of availability of known mineral resource loss of a locally important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan	Class III in most instances; Class I in some cases when local governments, with proper findings, approve land uses that preclude further access to important mineral resources; no mitigation measures proposed
Impact GEO-7: Cause an induced seismic event including ground shaking and ground failure	Class III; no mitigation required
Greenhouse Gas Emissions	
Impact GHG-1: Generate greenhouse gas emissions that may have a significant impact on the environment	Class I; the same mitigation measures as identified in Table ES-2 apply
Impact GHG-2: Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases	Class I; the same mitigation measures as identified in Table ES-2 apply
Hazards and Hazardous Materials	
Impact HAZ-1: Release hazardous materials into the environment from a spill or leak	Class II; the same mitigation measures as identified in Table ES-2 apply
Groundwater Resources	
Impact GW-1: Cause or contribute to overdraft conditions	Class I; the same mitigation measures as identified in Table ES-2 apply
Impact GW-2: Lower groundwater levels through pumping, resulting in inelastic land subsidence or interconnected surface water	Class II; the same mitigation measures as identified in Table ES-2 apply
Impact GW-3: Adversely impact groundwater quality through surface spills or leaks during well stimulation	Class II; the same mitigation measures as identified in Table ES-2 apply

Table ES-4. Summary of the Project's Incremental Contribution to Cumulative Impacts

Subject / Impact Criteria[1]	Impact Significance and Mitigation Measures[2,3]
Impact GW-4: Migration of well stimulation fluids or formation fluids including gas to protected groundwater through non-existent or ineffective annular well seals	Class II; the same mitigation measures as identified in Table ES-2 apply
Impact GW-5: Migration of well stimulation fluids or formation fluids including gas into protected groundwater through damaged or improperly abandoned wells	Class II; the same mitigation measures as identified in Table ES-2 apply
Impact GW-6: Improper disposal of flowback in injection wells could potentially impact groundwater quality	Class II; the same mitigation measures as identified in Table ES-2 apply
Impact GW-7: Inability to identify specific impacts to groundwater quality from well stimulation activities	Class II; the same mitigation measures as identified in Table ES-2 apply
Land Use and Planning	
Impact LU-1: Preclude existing or permitted land uses, or create a disturbance that would diminish the function of land uses	Class I; the same mitigation measures as identified in Table ES-2 apply
Impact LU-2: Physically divide an established community	Class IV; no mitigation required
Impact LU-3: Conflict with applicable land use plans, policies, programs, ordinances or other land use regulations of agencies with jurisdiction over a project adopted for the purpose of avoiding or mitigating an environmental effect	Class IV; no mitigation required
Noise and Vibration	
Impact NOI-1: Cause exposure of persons to or generation of excessive noise levels or a substantial increase in ambient noise levels	Class II; the same mitigation measures as identified in Table ES-2 apply
Impact NOI-2: Cause exposure of persons to or generation of excessive groundborne vibration	Class III; no mitigation required
Paleontological Resources	
Impact PALEO-1: Destroy or disturb surface or near-surface significant paleontological resources	Class II if fossil bearing geologic units are present (the same mitigation measures as identified in Table ES-2 apply); Class IV if no fossil bearing units are present (no mitigation required)
Population and Housing	
Impact POP-1: Induce substantial population growth	Class III; no mitigation required
Impact POP-2: Displace substantial numbers of people or existing housing, necessitating the construction of replacement housing elsewhere	Class III; no mitigation required
Public Services	
Impact PUB-1: Require new or physically altered governmental facilities in order to maintain acceptable service ratios, response times, or to other performance objectives for fire, police, or schools	Class II; the same mitigation measures as identified in Table ES-2 apply
Recreation	
Impact REC-1: Result in the physical deterioration of recreational resources	Class III; not mitigation required

Table ES-4. Summary of the Project's Incremental Contribution to Cumulative Impacts

Subject / Impact Criteria[1]	Impact Significance and Mitigation Measures[2,3]
Impact REC-2: Cause disruptions in designated recreation areas	Class II; the same mitigation measures as identified in Table ES-2 apply
Risk of Upset/Public and Worker Safety	
Impact RSK-1: Create a hazard to the public or environment through crude oil transport and reasonably foreseeable accidents and releases	Class I; the same mitigation measures as identified in Table ES-2 apply
Impact RSK-2: Create a hazard to the public, workers, or environment through a reasonably foreseeable accidental release of hazardous materials due to a hose leak or connection leak while pumping well stimulation treatment fluids	Class II; the same mitigation measures as identified in Table ES-2 apply
Impact RSK-3: Substantially increase the potential for major oil spills due to ship groundings and collisions	Class III; no mitigation required
Impact RSK-4: Create a hazard to the public, workers, or environment through a reasonably foreseeable accidental pressure changes during flowback activity caused by blocked pump discharge, sudden change in downhole condition, or human error	Class II; the same mitigation measures as identified in Table ES-2 apply
Impact RSK-5: Generate risks to public safety by causing a flammable atmosphere in the flowback tank	Class II; the same mitigation measures as identified in Table ES-2 apply
Impact RSK-6: Increase risks to public safety by exposing the public to accidental hazardous materials releases from pipelines	Class I; the same mitigation measures as identified in Table ES-2 apply
Impact RSK-7: Expose workers and public to hazardous levels of airborne silica during the use of proppant	Class II; the same mitigation measures as identified in Table ES-2 apply
Surface Water Resources	
Impact SWR-1: Violate water quality standards or waste discharge requirements, provide substantial additional sources of polluted runoff, or otherwise substantially degrade or diminish surface water quality	Class I; the same mitigation measures as identified in Table ES-2 apply
Impact SWR-2: Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site	Class I in Study Regions 2,4 and 5 (the same mitigation measure as identified in Table ES-2 applies); Class III in Study Region 1 and Class IV in Study Regions 3 and 6 (no mitigation required)
Impact SWR-3: Substantially diminish surface water quantity	Class I; the same mitigation measures as identified in Table ES-2 apply
Impact SWR-4: Create flood hazard by substantially altering existing drainage patterns, substantially increasing the rate or amount of surface runoff, impeding or redirecting flood flows, or exposing people or structures to flooding	Class II; the same mitigation measures as identified in Table ES-2 apply
Transportation and Traffic	
Impact TR-1: Generate additional truck traffic and disrupt traffic operations	Class III for project activities in Study Region 6 and for existing fields (no mitigation required); Class II outside of existing oil and gas fields in Study Regions 1 through 5 where 10 or more wells are drilled by a single applicant within one square mile (the same mitigation measures as identified in Table ES-2 apply)

Table ES-4. Summary of the Project's Incremental Contribution to Cumulative Impacts

Subject / Impact Criteria[1]	Impact Significance and Mitigation Measures[2,3]
Impact TR-2: Inadvertently damage road rights-of-way	Class III for project activities in Study Region 6 and for existing fields (no mitigation required); Class II outside of existing oil and gas fields in Study Regions 1 through 5 where 10 or more wells are drilled by a single applicant within one square mile (the same mitigation measures as identified in Table ES-2 apply)
Impact TR-3: Cause traffic safety hazards for vehicles, bicyclists, and pedestrians	Class III for project activities in Study Region 6 and for existing fields (no mitigation required); Class II outside of existing oil and gas fields in Study Regions 1 through 5 where 10 or more wells are drilled by a single applicant within one square mile (the same mitigation measures as identified in Table ES-2 apply)
Impact TR-4: Transport hazardous materials	Class I; the same mitigation measures as identified in Table ES-2 apply
Impact TR-5: Change air traffic patterns	Class IV if no airports are nearby (no mitigation required); Class III if FAA notification under 14 CFR 77 is required (no mitigation required)
Impact TR-6: Temporarily interfere with emergency response	Class III for project activities in Study Region 6 and for existing fields (no mitigation required); Class II outside of existing oil and gas fields in Study Regions 1 through 5 where 10 or more wells are drilled by a single applicant within one square mile (the same mitigation measures as identified in Table ES-2 apply)
Utilities and Service Systems	
Impact UTL-1: Adversely affect utilities and service systems due to population growth from Project-related development	Class III; no mitigation required
Impact UTL-2: Require new or expanded electrical or natural gas infrastructure	Class III; no mitigation required
Impact UTL-3: Exceed existing municipal wastewater treatment provider capacities	Class II; the same mitigation measures as identified in Table ES-2 apply
Impact UTL-4: Exceed permitted solid waste capacity of landfills	Class II; the same mitigation measures as identified in Table ES-2 apply
Energy Conservation (Other CEQA Considerations)	
Impact EN-1: Result in substantial new energy requirements or energy use inefficiencies	Class III; no mitigation required
Impact EN-2: Cause an adverse effect on local and regional energy supplies and requirements for additional capacity because of inefficient, wasteful, or unnecessary energy use	Class III; no mitigation required
Impact EN-3: Cause an adverse effect on peak and base period demands for electricity and other forms of energy because of inefficient, wasteful, or unnecessary energy use	Class III; no mitigation required
Impact EN-4: Disrupt compliance with existing energy standards	Class III; no mitigation required
Impact EN-5: Cause an adverse effect on energy resources because of inefficient, wasteful, or unnecessary energy use	Class III; no mitigation required
Impact EN-6: Result in inefficient, wasteful, or unnecessary transportation energy use	Class III; no mitigation required

1 - The occurrence of significant and unavoidable impacts (Class I) for some subject areas is contingent on site-specific conditions of where a proposed well stimulation treatment may occur. As example, if a proposed well stimulation site's future environmental review demonstrates that no cultural resources are present, no impacts would occur and no mitigation would be required. However, if the site does contain such resources, potential impacts could be either significant and unavoidable (Class I), less than significant with mitigation incorporated (Class II), less than significant (Class III) or no impact (Class IV).
2 - Class I = Significant and Unavoidable Impact; Class II = Less Than Significant Impact With Mitigation Incorporated; Class III = Less Than Significant Impact; Class IV = No Impact.
3 - For the purposes of the EIR's cumulative analysis, the Wilmington and Inglewood Oil and Gas Fields are considered to be part of Study Region 1 as a whole and thus are not addressed individually. Similarly, the Sespe Oil and Gas Field is considered to be part of Study Region 2 as a whole and thus is not addressed individually.

The Final EIR concludes that the direct and indirect impacts associated with the project's six alternatives could also range from significant and unavoidable (Class I) to no impact (Class IV). Collectively, significant and unavoidable impacts (Class I) were identified for aesthetics, agriculture and forestry resources, air quality, biological resources (terrestrial environment), cultural resources, coastal processes and marine water quality, geology, soils and mineral resources, greenhouse gas emissions, hazards and hazardous materials, groundwater resources, land use and planning, noise and vibration, paleontological resources, public services, recreation, risk of upset/public and worker safety, surface water resources, and transportation and traffic. Many of the significant and unavoidable impacts identified are related to Alternative 6 (No Project Alternative) because its implementation would not include application of the mitigation measures applied to the project and its alternatives (e.g., only implementation of DOGGR's permanent regulations for well stimulation treatments would occur). All impacts associated with each project alternative are identified in Table ES-5 (Summary of Impacts for the Alternatives), starting on page ES-64.

ES.5 Environmentally Superior Alternative

As noted in the Draft EIR, the determination of an "environmentally superior alternative," as required by State CEQA Guidelines Section 15126.6, is often somewhat subjective, as it requires a balancing of different kinds of impacts against one another. Thus, it is possible that an alternative can be superior to others in certain impact categories and yet not be considered the overall environmentally superior alternative. As such, in addition to identifying an overall environmentally superior alternative, this Final EIR also identifies the preferred alternative(s) for each resource area evaluated. An alternative identified as "preferred" for one resource topic may still have significant environmental effects, but when compared with the other alternatives, its environmental effects would be less than, or the same as, those of the other alternatives. Significant and unavoidable (Class I) impacts of the project are noted in Final EIR Executive Summary Table ES-1. Highlighting these impacts identifies whether any alternative would be capable of eliminating one or more significant and adverse environmental effects of the project, as well as which alternatives would create significant and adverse impacts.

Draft EIR Chapter 14 (Comparison of Alternatives), as revised for this Final EIR (Volume III) presents a preference ranking by alternative for each resource/issue-area analyzed, which allows consideration of all subjects equally. However, in the overall comparison of the project and its alternatives, the choice of the environmentally superior alternative during the decision making process may place more weight on certain issue areas than on others. For example, it is common for lead agencies to give greater weight to alternatives that reduce impacts to human health and biological resources than to alternatives that reduce impacts that are primarily sources of irritation to humans (such as noise impacts or impacts on aesthetics or transportation facilities). Here, reflecting what DOGGR considers to be among California's current top regulatory concerns, DOGGR is particularly concerned with greenhouse gas emissions and water consumption, and has given greater weight to those categories of impact than to others. As such, although this Final EIR identifies an environmentally superior alternative, it is possible that the decision maker may balance the importance of each impact area differently and reach different conclusions.

The Draft EIR identified the project as the environmentally superior alternative. The basis for this conclusion was that with implementation of the project standards for resource protection as related to water recycling, habitat, surface water and groundwater, and all recommended mitigation measures contained in that document, the project would have the fewest direct and indirect impacts. Numerous parties commented the Draft EIR's alternatives analysis and the selection of the project as the environmentally superior alternative; these comments ranged from agreement with DOGGR's determination to strong condemnation of the selection of any alternative other than the No Future Well Stimulation Treatments Alternative (Alternative 1) as the environmentally superior alternative. As a consequence of these comments, and similar comments on the project's standards, great care was placed on consideration of the alternatives, as demonstrated in Final EIR Chapter C (Responses to Review Comments on the Draft Environmental Impact Report), and most notably Global Responses GR-15 and GR-16.

With implementation of all of the mitigation measures contained in this Final EIR, the project is still considered to be the environmentally superior alternative. Alternatives 3 through 5 were designed to consolidate impacts and reduce overall ground disturbance, reduce impacts to urbanized areas, and reduce seismic impacts. Based upon the revised analysis contained in this Final EIR, the project would be largely similar to Alternatives 3 through 5, although somewhat less area might be affected under these alternatives. These alternatives, however, have been developed primarily for consideration by local agencies and would not be implemented by DOGGR by itself; thus they are largely outside of DOGGR's control. It is also possible that these alternatives would not be implemented, as the local agencies at issue may choose not to take the actions recommended by these alternatives. Therefore, their implementation is uncertain. Given that the impacts of the project and these three alternatives would be largely similar, DOGGR gave preference to the project because it could be solely implemented by DOGGR, and its implementation was not uncertain. Therefore, in contrast to Alternatives 3 through 5, the actions necessary to mitigate or avoid the environmental effects of the project would be under the control of DOGGR and reasonably expected to occur as described in this Final EIR.

Under Alternative 6 (the No Project Alternative), the project's mitigation measures as identified in this EIR would not be implemented. Therefore, due to much greater environmental impacts associated with all issue areas except population and housing, where impacts would remain less than significant (Class III), Alternative 6 was not found to be environmentally preferable to the project.

Because Alternative 1 (the No Future Well Stimulation Alternative) would prohibit all well stimulation treatments within and outside of existing oil and gas fields, Alternative 1 would be environmentally superior for the programmatic level analysis at the Wilmington, Inglewood, and Sespe Oil and Gas Fields, because it would eliminate all direct environmental impacts, including all surface and subsurface disturbances, associated with well stimulation activities. Although additional conventional wells would likely be drilled to make up for lost production, some wells may also be abandoned within the fields, which would partially offset this indirect impact. However, viewed on a larger programmatic level, the indirect impacts outside of those fields would create much greater impacts to greenhouse gas emissions from the importation of oil and gas from out of the State that would result if Alternative 1 were implemented. Given the importance in California law of efforts to address climate change (e.g., Assembly Bill 32, the California Global Warming Solutions Act), DOGGR has given considerable weight to this negative attribute of Alternative 1, and finds that, for this reason, Alternative 1 cannot be the environmentally superior alternative.

Similarly, Alternative 2 (the Not Future Well Stimulation Treatments Outside of Existing Oil and Gas Field Boundaries Alternative) is better than the project in some ways, because it would eliminate all direct impacts related to well stimulation outside of existing oil and gas fields. Additional wells may still be developed and stimulated within existing fields, which would reduce the need to drill new conventional wells or import oil and gas from out of State compared to Alternative 1. Therefore, indirect environmental impacts would be reduced compared to those described under Alternative 1. However, because many of the mature oil and gas fields in California are in decline and Alternative 2 would prohibit developing new fields that require well stimulation, there would be some loss of oil and gas reserves and production due to implementation of this alternative, which would result in similar indirect impacts as associated with Alternative 1. Among these indirect effects would be those associated with increased oil imports, most notably, an increase in greenhouse gas emissions. As with Alternative 1, DOGGR has concluded that, in light of the centrality of climate change policy under California law, Alternative 2 cannot be the environmentally superior alternative.

ES.6 Use and Application of the Final Environmental Impact Report Mitigation Measures

As addressed in Final EIR Volume I, Section A.8.2 (Revised Treatment of Project Standards for Resources Protection), DOGGR no longer proposes to implement any of the Project Standards for Resources Protection ("standards") as part of the project, as presented in Draft EIR Section 7.5 (Project Standards for Resource Protection), starting on Draft EIR page 7-48. Two of the Draft EIR standards, the Water Recycling Standard and the Surface Water Protection Standard, have been converted into mitigation measure (MM) GW-1a (Use Alternative Water Sources to the Extent Feasible) and MM SWR-1b (Surface Water Protection), respectively.

DOGGR has also determined that the intent of the Groundwater Protection Standard will be adequately addressed by a combination of existing laws and regulations and other mitigation measures, as revised and presented in Final EIR Volume II, Sections 10.4 (Biological Resources–Terrestrial Environment) and 10.14 (Groundwater Resources) (e.g., MMs GW-1a, GW-1b, GW-4a, GW-5a, GW-6a, and GW-7a and MMs BIOT-1a through BIOT-9a).

The Habitat Protection Standard has been eliminated, and has not been replaced. DOGGR has determined that, taken together, the package of mitigation measures addressing impacts to terrestrial biological resources (MMs BIOT-1a through BIOT-9a) will be sufficient to protect the specific habitat types mentioned in the former proposed standard. The requirements in the Habitat Protection Standard as related to coastal and marine biological resources were always considered redundant because of existing State and federal regulations that protect sensitive habitat. As a consequence, removal of this standard did not require the creation of a new mitigation measure.

In addition to the above, DOGGR has comprehensively reviewed all of the Draft EIR mitigation measures in light of concerns expressed by various commenters (see Final EIR Chapter C (Responses to Review Comments on the Draft Environmental Impact Report)), and has revised a number of the mitigation measures that were presented in the Draft EIR. DOGGR has also eliminated some previously proposed mitigation measures entirely, added others, and, in some instances, has combined mitigation measures to avoid redundancy. Throughout this process, DOGGR's primary objective was to stringently protect public health and the environment while avoiding the prospect of imposing generally applicable permit conditions on particular permit applicants whose well stimulation projects simply do not require such generally applicable conditions. For example, many well stimulation treatment projects, particularly those in highly developed existing oil and gas fields, will likely cause very minimal, if any, effects on aesthetics, agricultural and forestry resources, cultural resources, paleontological resources, or habitat for special-status species. DOGGR has modified the original mitigation measures for these categories of impacts to ensure that conditions of approval will be imposed only where the resources at issue are likely actually present and in danger of being impacted. DOGGR's expert engineers and other knowledgeable professionals also participated in this process with respect to certain mitigation measures presented in the Draft EIR that, after much deliberation, were determined to be either unworkable or counterproductive from a practical standpoint.

The above-referenced revisions to the Draft EIR's mitigation measures are detailed in Final EIR Volume I, Section A.8.3 (Revisions to Mitigation Measures in Response to Comments on the Draft EIR and Further Consideration of Their Applicability and Feasibility). These mitigation measures, as well as those that have not been modified since publication of the Draft EIR, are all listed in Final EIR Executive Summary Table ES-2.

Seven of the project's final mitigation measures will be converted into proposed regulations and subjected to a formal rulemaking process under the Administrative Procedure Act. When the final regulations are in place, they will appear in DOGGR's regulations in Title 14 of the California Code of Regulations. These mitigation measures include:

- New Mitigation Measure GW-1a, which is based on the former proposed Resource Protection Standard for Water Recycling;
- Mitigation Measure GW-4b, as modified in this Final EIR, which requires, for a new well drilled for a stimulation treatment, that the well contain an annular 500-foot cement seal extending across the base of protected water and that the integrity of the seal will prevent unintended migration of fluids;
- New Mitigation Measure SWR-1b, which is based on the former proposed Resource Protection Standard for Surface Water as found in Draft EIR Section 7.5.3;
- Mitigation Measures GEO-1a and GEO-1b, which require that the Spill Contingency Plan already required for each oil and gas well by Section 1722.9 of Title 14 of the California Code of Regulations include as additional contents well control and well shut-in procedures that adequately address the consequences of the rupture of a known fault, seismically induced ground shaking, and/or ground failure that could occur during the well stimulation process;
- Mitigation Measure GEO-1e, which requires that the Spill Contingency Plan also include elements of an earthquake response plan; and
- Mitigation Measure HAZ-1a, which requires that the Spill Contingency Plan be sufficient to prevent any leaks, spills, or other discharges of well stimulation fluids, flowback fluids, produced water, hazardous chemicals, contaminated surface water runoff, oil, or other potentially dangerous materials that might occur before, during, and after the well stimulation process from reaching the soil at all site pads.

The remaining mitigation measures contained in this EIR will be included in a Mitigation Policy Manual that DOGGR will use for determining the exact mitigation measures that might be necessary for a particular proposed well stimulation treatment permit or groups of permits, depending on circumstances and the potential severity of impacts that might occur. The measures in the Mitigation Policy Manual will represent DOGGR's starting point for determining what level of site-specific mitigation will be required for individual well stimulation treatment permits or groups of permits. Particular mitigation measures will not be required absent the kinds of significant impacts to which they are addressed. Further, even where there are significant impacts of the kind at which DOGGR's mitigation measures are aimed, DOGGR may not impose the measures exactly as they are written. Before imposing any measures without change, however, DOGGR will first ascertain whether site-specific revisions might be appropriate, and whether there might already be similar alternative mitigation strategies in place based on past local government regulatory actions governing the oil and/or gas field in question. In determining whether any revisions are required, DOGGR will also consult, through environmental review, with permit applicants, affected or interested State and local agencies, and/or interested members of the public regarding how, if at all, the Final EIR mitigation measures may be modified to address the specific conditions applicable to individual permits.

The mitigation measures in the Mitigation Policy Manual, as used in support of site-specific Mitigated Negative Declarations and EIRs, will "set a floor," albeit a somewhat flexible one, for future mitigation that DOGGR will impose as permit conditions. In their final form after input from various stakeholders, the mitigation measures for individual permits or groups of permits will have to be substantially consistent with the measures found in the Mitigation Policy Manual. In determining whether a particular measure is substantially consistent with DOGGR's own recommended mitigation, DOGGR will take full account of the following: (1) any local lead agency's analysis as to whether a particular impact is significant and thus requires feasible mitigation, if any is available; and (2) the extent to which the level of any impact reduction that would be achieved by the locally imposed measure would be reasonably comparable to the level of mitigation that would have been achieved by the DOGGR-recommended measures.

The above-referenced seven mitigation measures (MMs GW-1a, GW-4b, SWR-1b, GEO-1a, GEO-1b, GEO-1e and HAZ-1a) will be temporarily included within the Mitigation Policy Manual with the understanding that they will simultaneously be converted into proposed regulations and subjected to a formal rulemaking process. When the final regulations are in place, they will be deleted from the Mitigation Policy Manual. Similarly, other mitigation measures in the Mitigation Policy Manual might also be included only temporarily. Using its authority under PRC Section 3106(a), DOGGR has developed mitigation measures that it hopes, and in some cases anticipates, will be superseded by new regulation or other enforceable requirements imposed in the future by sister agencies, such as the Air Resources Board and the State Water Resources Control Board. DOGGR's measures will function as placeholders, ensuring stringent mitigation, until such time as the sister agencies' requirements are in place. Examples of this kind include MM AQ-2a (Reduce Hydrocarbon Emissions from Well Stimulation Treatments), MM GHG-1a (Prevent Methane Emissions from Associated Gas and Casinghead Gas), MM GHG-1b (Reduce Emissions by Implementing Clean Development Mechanism (CDM) Strategies), MM GHG-1c (Detect and Quantify Fugitive and Vented Methane and Carbon Dioxide), and MM GW-7a (Add a Tracer to Well Stimulation Fluids or Develop a Reasonable Method to Distinguish Well Stimulation Fluids in the Environment).

ES.7 Areas of Known Controversy

Draft EIR Executive Summary Section ES.8 (Areas of Known Controversy) (Final EIR Volume II) outlines the national and State areas of known controversy related to well stimulation treatments; no substantive changes to, or resolution of, these issues has occurred since the Draft EIR's publication, and they are incorporated herein by reference.

As demonstrated in Final EIR Chapter B (Draft Environmental Impact Report Review Comments) and its corresponding Appendix 1 (Draft Environmental Impact Report Comment Correspondence and Public Meeting Transcripts), public opinion regarding well stimulation treatments is highly varied, including full support, neutrality and acute opposition. Numerous parties that have participated in the EIR's environmental review process assert that the analyses and mitigation measures contained in the document are not rigorous enough to avoid or minimize the potential impacts of well stimulation treatments, while others contend that the document's analysis and recommended mitigation measures exceed what is proportionate to identified impacts and thus should not be required. It is noted that the EIR's analysis is programmatic in nature and that it expressly states, and frequently reiterates, that the potential for impacts, their significance, and required mitigation measures at a project level of analysis in the future will be contingent on site-specific conditions. It is also noted that the EIR, without bias, considers the potential impacts of well stimulation treatments and the potentially feasible mitigation measures that can be applied to minimize them, and that, to date, impartial technical and scientific assessment of well stimulation treatments both in California and nationally remains a relatively new field of study, and that a large percentage of the materials on well stimulation treatments that are publicly available have a predisposition either in favor of, or against, these practices. To this end, it is concluded that the public remains severely divided on the subject of whether well stimulation treatments should be entirely prohibited at a statewide level, or if they should remain legal practices, with or without implementation of DOGGR's permanent regulations and the mitigation measures recommended in this EIR.

ES.8 Issues to be Resolved

The issues to be resolved regarding well stimulation treatments remain the same as those that were provided in Draft EIR Executive Summary Section ES.9 (Final EIR Volume II), and they are incorporated herein by reference.

As noted in Final EIR Executive Summary Section ES.7 (Areas of Known Controversy), the controversy regarding well stimulation treatments is not expected to be resolved as a consequence of this EIR; the effectiveness of DOGGR's permanent regulations and the mitigation measures recommended herein remains to be realized in the future. Once their effectiveness is established, decision makers will then need to make a determination as to whether further regulation and/or study is warranted.

Current Review and Future Regulatory Amendment to DOGGR's Underground Injection Control Program: Background and Discussion. As related to oil and gas exploration and development as a whole, within which well stimulation treatments are included, Class II injection wells are defined by the U.S. Environmental Protection Agency (EPA) as wells "that inject brines and other fluids associated with oil and gas production, or storage of hydrocarbons. Class II well types include salt water disposal wells, enhanced recovery wells, and hydrocarbon storage wells." There are three types of Class II injection wells: (1) Enhanced Recovery Wells (or Enhanced Oil Recovery [EOR] Wells), which inject brine, water, steam, polymers, or carbon dioxide into oil-bearing formations to recover residual oil and, in some limited applications, natural gas; (2) Disposal Wells, which inject brines and other fluids associated with the production of oil and natural gas or natural gas storage operations; and (3) Hydrocarbon Storage Wells, which inject liquid hydrocarbons in underground formations where they are stored, generally, as part of the U.S. Strategic Petroleum Reserve.

States may request that the EPA provide them with direct "primacy," or regulatory authority, to implement and enforce the requirements of the federal Safe Drinking Water Act (SDWA) for Class II injection wells if it can be demonstrated to the EPA's satisfaction that that state's Underground Injection Control (UIC) program is fully compliant with either SDWA Section 1422 or Section 1425, as follows:

- Section 1422 requires states to meet the EPA's minimum requirements for UIC programs. Programs authorized under section 1422 must include the construction, operation, monitoring and testing, reporting, and closure requirements for well owners or operators. EOR wells may either be issued permits or be authorized by rule (e.g., regulation). Disposal wells are issued permits. The owners or operators of the wells must meet all applicable requirements, including strict construction and conversion standards and regular testing and inspection.

- Section 1425 allows states to demonstrate that their existing standards and regulations are effective in preventing endangerment of Underground Source[s] of Drinking Water (USDWs). These programs must include permitting, inspection, monitoring, and record-keeping and reporting that demonstrates the effectiveness of their requirements.

In regard to SDWA Section 1425, an USDW is defined as an "aquifer or portion of an aquifer that supplies any public water system or that contains a sufficient quantity of ground water to supply a public water system, and currently supplies drinking water for human consumption, or that contains fewer than 10,000 milligrams per liter (mg/l) of total dissolved solids (TDS) and is not an exempted aquifer [40 Code of Federal Regulations Section 144.3]." An exempted aquifer is defined as an "aquifer, or a portion of an aquifer, that meets the criteria for a USDW, for which protection under the SDWA has been waived by the UIC Program. [A]n aquifer may be exempted if it is either not currently being used, and will not be used in the future, as a drinking water source, or it is not reasonably expected to supply a public water system due to a high total dissolved solids content. Without an aquifer exemption, certain types of energy production, mining, or waste disposal into USDWs would be prohibited." The EPA makes the final determination on granting or denying all aquifer exemptions.

In 1983, DOGGR obtained primacy from the EPA to implement and enforce the requirements of the SDWA for the protection of USDWs pursuant to the State's Class II UIC program. In 2011, an audit was completed, on behalf of the EPA, to review DOGGR's practices and regulations to ensure compliance with its obligations to properly administer its Class II UIC program pursuant to the federal SDWA and applicable California law. The audit identified several areas of concern for which the EPA requested that DOGGR and the State Water Resources Control Board (State Water Board), which assists DOGGR with the UIC Program's implementation, prepare a corrective plan.

In addition, DOGGR and the EPA have established that some existing Class II wells were injecting into 11 aquifers that had been treated historically as exempted may not actually qualify for exemption. These wells are associated with one oil and gas field located in EIR Study Region 2, six oil and gas fields located in EIR Study Region 4, and two gas fields located in EIR Study Region 6.

In a letter to the EPA dated February 6, 2015, DOGGR and the State Water Board outlined a corrective plan to bring DOGGR into compliance with all aspects regarding the SDWA, noting that several items in need of correction could be implemented either through existing regulations or with further amendment to existing regulations, but that the development and adoption of these new or amended regulations would be require time. The letter also outlined a schedule for addressing injection into USDWs, either by obtaining EPA aquifer exemptions or by prohibiting injection into these aquifers. The Class II injection compliance schedule currently includes the following:

- October 15, 2015: Well shut-in completion date for injection into non-hydrocarbon-bearing aquifers with less than 3,000 mg/L TDS that do not have an aquifer exemption.
- December 31, 2016: Well shut-in completion date for the 11 specific aquifers historically treated as exempted by the EPA unless the EPA takes further action to affirm exemption of the pertinent aquifer(s) before that date.
- February 15, 2017: Well shut-in completion date for injection into aquifers with less than 10,000 mg/L TDS that do not have an aquifer exemption.

On April 20, 2015, emergency regulations for DOGGR's UIC program were put into effect for the above-referenced compliance schedule, as approved by the Office of Administrative Law (OAL), adopting Sections 1760.1 and 1779.1 into Title 14 of the California Code of Regulations. While these regulations are in effect, DOGGR will continue its development, finalization, and adoption of both amended and new regulations for compliance with the SWDA. DOGGR anticipates consideration of new or amended regulations for the following:

- Well construction and cementing requirements
- Plugging and abandoning requirements
- Evaluation of the zone of endangering influence (ZEI)
- Requirements for fluid disposal
- Requirements for monitoring of zone pressure
- Annual project reviews
- Well monitoring requirements
- Inspections and compliance/enforcement practices and tools
- Idle-well planning and testing program
- Cyclic steam injection wells
- Production from diatomite

These regulations are anticipated to be extensive and will require a considerable amount of time to develop. They will also require extensive coordination and input from the EPA, State Water Board, Regional Water Quality Control Boards, other State agencies, oil and gas operators, local agencies, non-government organizations and the public.

As of the time of this Final EIR's publication, a schedule for completion and adoption of the above-referenced new and amended regulations had not been established. While it is important to recognize that SB 4, through its amendment to the State's Water Code, specifically Sections 10783(g)(2) and (k)(2), requires consideration of the EPA's definition of USDWs and exempted aquifers as related to well stimulation treatments, it must also be understood that DOGGR's forthcoming new and amended regulations may further govern such practices in the future.

Table ES-2. Summary of Impacts and Mitigation Measures for the Project

Subject / Impact Criteria[1]	Impact Significance with Mitigation Incoporated[2]	Mitigation Measures
Aesthetics		
Impact AES-1: Substantially adversely affect scenic vistas	Class III in existing fields; Class I or II in new areas	**AES-1a:** Prepare and Implement a Site Plan to Reduce Visual Impacts to Sensitive Receptors **AES-1b:** Minimize Lighting Visibility Offsite
Impact AES-2: Substantially alter or damage scenic resources	Class III in existing fields; Class I or II in new areas	**AES-1a:** Prepare and Implement a Site Plan to Reduce Visual Impacts to Sensitive Receptors **AES-1b:** Minimize Lighting Visibility Offsite
Impact AES-3: Substantially degrade the existing visual character or quality of a site and its surroundings	Class III in existing fields; Class I or II in new areas	**AES-1a:** Prepare and Implement a Site Plan to Reduce Visual Impacts to Sensitive Receptors **AES-1b:** Minimize Lighting Visibility Offsite
Impact AES-4: Create new sources of substantial light and glare	Class III in existing fields; Class I or II in new areas	**AES-1a:** Prepare and Implement a Site Plan to Reduce Visual Impacts to Sensitive Receptors **AES-1b:** Minimize Lighting Visibility Offsite
Agricultural and Forestry Resources		
Impact AGF-1: Convert Prime Farmland, Unique Farmland, or Farmland of statewide Importance (Important Farmland), as designated by the Farmland Mapping and Monitoring Program, to non-agricultural use	Class II on or adjacent to Important Farmland	**AGF-1a:** Minimize Impacts to Important Farmland **AGF-1b:** Develop an Agricultural Resources Protection Plan **AGF-1c:** Compensate for Loss of Important Farmland
Impact AGF-2: Conflict with existing zoning for agricultural use or with Williamson Act contracts	Class II on land zoned for agricultural use or enrolled in Williamson Act contracts	**AGF-2a:** Ensure Compatibility with Agricultural Zoning **AGF-2b:** Ensure Compatibility with Williamson Act Contracts or Terminate Williamson Act Contracts
Impact AGF-3: Conflict with existing zoning for, or cause rezoning of, forest land, timberland, or timberland zoned Timberland Production	Class II on land zoned as forestland, timberland, or Timberland Production	**AGF-3a:** Ensure Compatibility with Forest and Timberland Zoning
Impact AGF-4: Result in the loss of forest land or conversion of forest land to non-forest use	Class II on forest land	**AGF-4a:** Minimize Impacts to Forest Land **AGF-4b:** Develop a Forest Land Protection Plan **AGF-4c:** Compensate for Loss of Forest Land

Table ES-2. Summary of Impacts and Mitigation Measures for the Project

Subject / Impact Criteria[1]	Impact Significance with Mitigation Incoporated[2]	Mitigation Measures
Impact AGF-5: Directly or indirectly impair the use of agricultural land or forest land	Class II for well stimulation activities on or within 1,500 feet of agricultural or forest land	**AGF-1a:** Minimize Impacts to Important Farmland **AGF-1b:** Develop an Agricultural Resources Protection Plan MM **AGF-4a:** Minimize Impacts to Forest Land **AGF-4b:** Develop a Forest Land Protection Plan **AQ-2c:** Reduce Emissions from Dust-Causing Activities **BIOT-2a:** Prevent Hazards to Fish and Wildlife **HAZ-1a:** Ensure that Spill Contingency Plan Provides Adequate Protection Against Leaks or Discharges of Dangerous Fluids and Other Potentially Dangerous Materials **GW-4b:** Install a Well Seal Across Protected Groundwater for New Wells Subject to Well Stimulation Treatments **SWR-1a:** Require Stormwater Pollution Prevention Plan **SWR-2a:** Implement Erosion Control Plan **SWR-3a:** Ensure Adequate Water Availability **TR-1a:** Prepare Traffic Plan
Air Quality		
Impact AQ-1: Conflict with or obstruct implementation of an applicable air quality plan	Class I (Statewide) Class III (in SCAQMD)	**AQ-1a:** Improve Air Quality Planning Inventories and Local Control Measures **AQ-1b:** Improve the Methodologies and Emission Factors Used in Inventory Development
Impact AQ-2: Increase criteria pollutants or precursor pollutants to levels that violate an air quality standard or contribute substantially to an existing or projected air quality violation	Class I	**AQ-2a:** Reduce Hydrocarbon Emissions from Well Stimulation Treatments **AQ-2b:** Reduce Emissions from Portable Equipment and Mobile Sources **AQ-2c:** Reduce Emissions from Dust-Causing Activities
Impact AQ-3: Expose sensitive receptors to substantial pollutant concentrations	Class I	**AQ-3a:** Comply with Local Air District Protocols Relating to the Preparation of a Health Risk Assessment and Implement Emission Controls **AQ-3b:** Avoid Unnecessary Exposure to Air Pollutants by Improving Local Land Use Compatibility
Impact AQ-4: Create objectionable odors affecting a substantial number of people	Class I	**AQ-4a:** Prepare and Implement an Odor Minimization Plan **AQ-4b:** Avoid Unnecessary Exposure to Odors by Improving Local Land Use Compatibility

Table ES-2. Summary of Impacts and Mitigation Measures for the Project

Subject / Impact Criteria[1]	Impact Significance with Mitigation Incoporated[2]	Mitigation Measures
Biological Resources: Terrestrial Environment		
Impact BIOT-1: Substantially reduce the habitat of a fish or wildlife species	Class I, II, or III	**BIOT-1a:** Evaluate Impacts to Native Vegetation and Fish and Wildlife Habitat **BIOT-1b:** Minimize Impacts to Native Vegetation and Habitat **BIOT-1c:** Replace or Offset Loss of Sensitive Habitat **GW-1a:** Use Alternative Water Sources to the Extent Feasible **GW-1b:** Minimize Groundwater Impacts **HAZ-1a:** Ensure that Spill Contingency Plan Provides Adequate Protection Against Leaks or Discharges of Dangerous Fluids and Other Potentially Dangerous Materials **AQ-2c:** Reduce Emissions from Dust-Causing Activities **SWR-1a:** Require Stormwater Pollution Prevention Plan **SWR-2a:** Implement Erosion Control Plan **SWR-3a:** Ensure Adequate Water Availability
Impact BIOT-2: Cause a fish or wildlife population to drop below self-sustaining levels	Class I, II, or III	**BIOT-1b:** Minimize Impacts to Native Vegetation and Habitat **BIOT-1c:** Replace or Offset Loss of Sensitive Habitat **BIOT-2a:** Prevent Hazards to Fish and Wildlife **BIOT-2b:** California Condor Protection Measures **BIOT-2c:** Nelson's Bighorn Sheep Protection Measures **BIOT-3a:** Minimize and Mitigate Impacts to Special-status Fish and Wildlife **BIOT-4b:** Minimize Impacts to Protected Birds **BIOT-7a:** Prevent or Mitigate Habitat Fragmentation and Impacts to Fish and Wildlife Movement **GW-4a:** Demonstrate that Wells within the ADSA Have Effective Cement Well Seals and Monitor Wells during Well Stimulation **GW-4b:** Install a Well Seal Across Protected Groundwater for New Wells Subject to Well Stimulation Treatments **HAZ-1a:** Ensure that Spill Contingency Plan Provides Adequate Protection Against Leaks or Discharges of Dangerous Fluids and Other Potentially Dangerous Materials **SWR-1a:** Require Stormwater Pollution Prevention Plan **SWR-2a:** Implement Erosion Control Plan

Table ES-2. Summary of Impacts and Mitigation Measures for the Project

Subject / Impact Criteria[1]	Impact Significance with Mitigation Incoporated[2]	Mitigation Measures
Impact BIOT-3: Substantially reduce the number or restrict the range of an endangered, rare, or threatened species	Class I, II, or III	**BIOT-1b:** Minimize Impacts to Native Vegetation and Habitat **BIOT-1c:** Replace or Offset Loss of Sensitive Habitat **BIOT-2a:** Prevent Hazards to Fish and Wildlife **BIOT-3a:** Minimize and Mitigate Impacts to Special-status Fish and Wildlife **BIOT-3b:** Minimize and Mitigate Impacts to Special-status Plants **BIOT-4b:** Minimize Impacts to Protected Birds **BIOT-7a:** Prevent or Mitigate Habitat Fragmentation and Impacts to Fish and Wildlife Movement **AQ-2c:** Reduce Emissions from Dust-Causing Activities **SWR-1a:** Require Stormwater Pollution Prevention Plan
Impact BIOT-4: Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by CDFW or USFWS	Class I, II, or III	**BIOT-1b:** Minimize Impacts to Native Vegetation and Habitat **BIOT-1c:** Replace or Offset Loss of Sensitive Habitat **BIOT-2a:** Prevent Hazards to Fish and Wildlife **BIOT-3a:** Minimize and Mitigate Impacts to Special-status Fish and Wildlife **BIOT-3b:** Minimize and Mitigate Impacts to Special-status Plants **BIOT-4a** Minimize and Mitigate Impacts to all species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by CDFW or USFWS **BIOT-4b:** Minimize Impacts to Protected Birds **BIOT-7a:** Prevent or Mitigate Habitat Fragmentation and Impacts to Fish and Wildlife Movement
Impact BIOT-5: Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by CDFW or USFWS	Class I, II, or III	**BIOT-1a:** Evaluate Impacts to Native Vegetation and Fish and Wildlife Habitat **BIOT-1b:** Minimize Impacts to Native Vegetation and Habitat **BIOT-1c:** Replace or Offset Loss of Sensitive Habitat **AQ-2c:** Reduce Emissions from Dust-Causing Activities **GW-4a:** Demonstrate that Wells within the ADSA Have Effective Cement Well Seals and Monitor Wells during Well Stimulation **GW-4b:** Install a Well Seal Across Protected Groundwater for New Wells Subject to Well Stimulation Treatments **SWR-1a:** Require Stormwater Pollution Prevention Plan **SWR-1b:** Surface Water Protection **SWR-2a:** Implement Erosion Control Plan **SWR-3a:** Ensure Adequate Water Availability

Table ES-2. Summary of Impacts and Mitigation Measures for the Project

Subject / Impact Criteria[1]	Impact Significance with Mitigation Incoporated[2]	Mitigation Measures
Impact BIOT-6: Have a substantial adverse effect on federally protected wetlands as defined by Section 404, of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means	Class I, II, or III	**BIOT-1a:** Evaluate Impacts to Native Vegetation and Fish and Wildlife Habitat **BIOT-1b:** Minimize Impacts to Native Vegetation and Habitat **BIOT-1c:** Replace or Offset Loss of Sensitive Habitat **BIOT-2a:** Prevent Hazards to Fish and Wildlife **BIOT-3a:** Minimize and Mitigate Impacts to Special-status Fish and Wildlife **BIOT-6a:** Protect Jurisdictional Waters **GW-1a:** Use Alternative Water Sources to the Extent Feasible **GW-1b:** Minimize Groundwater Impacts **GW-4a:** Demonstrate that Wells within the ADSA Have Effective Cement Well Seals and Monitor Wells during Well Stimulation **GW-4b:** Install a Well Seal Across Protected Groundwater for New Wells Subject to Well Stimulation Treatments **SWR-1a:** Require Stormwater Pollution Prevention Plan **SWR-1b:** Surface Water Protection **SWR-2a:** Implement Erosion Control Plan **SWR-3a:** Ensure Adequate Water Availability
Impact BIOT-7: Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites	Class I, II, or III	**BIOT-7a:** Prevent Habitat Fragmentation and Impacts to Fish and Wildlife Movement
Impact BIOT-8: Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance	Class I, II, or III	**BIOT-8a:** Coordinate with Local Agencies and Jurisdictions Regarding Local Policies and Conservation Plans
Impact BIOT-9: Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan	Class I, II, or III	**BIOT-9a:** Coordinate with CDFW, USFWS, and Permittees Regarding NCCPs, HCPs, and Other Conservation Plans

Table ES-2. Summary of Impacts and Mitigation Measures for the Project

Subject / Impact Criteria[1]	Impact Significance with Mitigation Incoporated[2]	Mitigation Measures
Impact BIOT-10: Contribute to global climate change and consequent impacts to biodiversity	Class I	**AQ-2a:** Reduce Hydrocarbon Emissions from Well Stimulation Treatments **AQ-2b:** Reduce Emissions from Portable Equipment and Mobile Sources **GHG-1a:** Prevent Methane Emissions from Associated Gas and Casinghead Gas **GHG-1b:** Reduce Emissions by Implementing Clean Development Mechanism (CDM) Strategies **GHG-2a:** Require Applicant to Enter into Mitigation Programs or Agreements for GHG Emissions not Covered by or Exempt from ARB's Cap and Trade Program
Biological Resources: Coastal and Marine Environment		
Impact BIOCM-1: Substantially affect any species identified as a candidate, sensitive, or special status species or their habitat	Class III	No mitigation required
Impact BIOCM-2: Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites	Class III	No mitigation required
Impact BIOCM-3: Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means	Class III	No mitigation required
Coastal Processes and Marine Water Quality		
Impact CPMWQ-1: Change marine water chemical composition with respect to known hazardous substances; or the measured water temperature, salinity, conductivity, or turbidity	Class II	**CPMWQ-1a:** Protect Marine Water Quality
Impact CPMWQ-2: Change the velocity or direction of ocean currents	Class II	**CPMWQ-2a:** Prepare and Implement Marine Current Plan
Impact CPMWQ-3: Change the velocity or direction of coastal and ocean winds	Class III	No mitigation required

Table ES-2. Summary of Impacts and Mitigation Measures for the Project

Subject / Impact Criteria[1]	Impact Significance with Mitigation Incoporated[2]	Mitigation Measures
Impact CPMWQ-4: Change the direction, size, or period of ocean waves	Class IV	No mitigation required
Impact CPMWQ-5: Increase the risk of a tsunami	Class III	No mitigation required
Commercial and Recreational Fishing		
Impact CRF-1: Cause long-term exclusion of important commercial and recreational fishing areas	Class III	No mitigation required
Impact CRF-2: Result in substantial loss of total catch to commercial and recreational fishing industries	Class III	No mitigation required
Cultural Resources		
Impact CUL-1: Affect historic-era archaeological and built-environment resources	Class I or Class II if historic or built-environment resources are present Class III or Class IV if historic or built-environment resources are not considered significant or are not present	**CUL-1a:** Require Information and Evaluate Cultural Resources **CUL-1b:** Complete Native American Coordination **CUL-1c:** Prepare and Implement Cultural Resources Management and Treatment Plan **CUL-1d:** Prepare Plan for the Inadvertent Discovery of Human Remains **CUL-1e:** Provide Cultural Resources Specialist with the Authority to Halt Earth Disturbing Activities **CUL-1f:** Conduct a Cultural Resources Worker Environmental Awareness Program **CUL-1g:** Monitor Earth Disturbing Activities for Cultural Resources **CUL-1h:** Provide Native American Monitors during Earth Disturbing Activities **CUL-1i:** Prepare Cultural Resources Documents for the Monitoring of Earth Disturbing Activities **CUL-1j:** Curate all Discovered Cultural Resources Associated with Earth Disturbing Activities

Table ES-2. Summary of Impacts and Mitigation Measures for the Project

Subject / Impact Criteria[1]	Impact Significance with Mitigation Incoporated[2]	Mitigation Measures
Impact CUL-2: Affect prehistoric resources	Class I or II if prehistoric resources are present Class III or Class IV if prehistoric resources are not considered significant or are not present	**CUL-1a:** Require Information and Evaluate Cultural Resources **CUL-1b:** Complete Native American Coordination **CUL-1c:** Prepare and Implement Cultural Resources Management and Treatment Plan **CUL-1d:** Prepare Plan for the Inadvertent Discovery of Human Remains **CUL-1e:** Provide Cultural Resources Specialist with the Authority to Halt Earth Disturbing Activities **CUL-1f:** Conduct a Cultural Resources Worker Environmental Awareness Program **CUL-1g:** Monitor Earth Disturbing Activities for Cultural Resources **CUL-1h:** Provide Native American Monitors during Earth Disturbing Activities **CUL-1i:** Prepare Cultural Resources Documents for the Monitoring of Earth Disturbing Activities **CUL-1j:** Curate all Discovered Cultural Resources Associated with Earth Disturbing Activities
Impact CUL-3: Disturb human remains or cultural items, including funerary objects, sacred objects, and objects of cultural patrimony	Class I or II if human remains or cultural items are present Class III or Class IV if cultural items are not considered significant or are not present Class IV if human remains are not present	**CUL-1a:** Require Information and Evaluate Cultural Resources **CUL-1b:** Complete Native American Coordination **CUL-1c:** Prepare and Implement Cultural Resources Management and Treatment Plan **CUL-1d:** Prepare Plan for the Inadvertent Discovery of Human Remains **CUL-1e:** Provide Cultural Resources Specialist with the Authority to Halt Earth Disturbing Activities **CUL-1f:** Conduct a Cultural Resources Worker Environmental Awareness Program **CUL-1g:** Monitor Earth Disturbing Activities for Cultural Resources **CUL-1h:** Provide Native American Monitors during Earth Disturbing Activities **CUL-1i:** Prepare Cultural Resources Documents for the Monitoring of Earth Disturbing Activities **CUL-1j:** Curate all Discovered Cultural Resources Associated with Earth Disturbing Activities

Table ES-2. Summary of Impacts and Mitigation Measures for the Project

Subject / Impact Criteria[1]	Impact Significance with Mitigation Incoporated[2]	Mitigation Measures
Impact CUL-4: Affect cultural landscapes	Class I or II if cultural landscapes are present Class III or Class IV if cultural landscapes are not considered significant or are not present	**CUL-1a:** Require Information and Evaluate Cultural Resources **CUL-1b:** Complete Native American Coordination **CUL-1c:** Prepare and Implement Cultural Resources Management and Treatment Plan **CUL-1d:** Prepare Plan for the Inadvertent Discovery of Human Remains **CUL-1e:** Provide Cultural Resources Specialist with the Authority to Halt Earth Disturbing Activities **CUL-1f:** Conduct a Cultural Resources Worker Environmental Awareness Program **CUL-1g:** Monitor Earth Disturbing Activities for Cultural Resources **CUL-1h:** Provide Native American Monitors during Earth Disturbing Activities **CUL-1i:** Prepare Cultural Resources Documents for the Monitoring of Earth Disturbing Activities **CUL-1j:** Curate all Discovered Cultural Resources Associated with Earth Disturbing Activities
Environmental Justice		
Impact EJ-1: Disproportionately affect minority or low-income populations	Unknown	**EJ-1a:** Track Characteristics of Affected Populations in the Vicinity of Well Stimulation Treatments
Geology, Soils, and Mineral Resources		
Impact GEO-1: Expose people or structures to potential substantial adverse effects as a result of rupture of a known fault, seismically induced groundshaking, and/or ground failure	Class II	**GEO-1a:** Avoid Active Faults if Necessary **GEO-1b:** Implement an Appropriate Setback if Necessary **GEO-1c:** Implement Industry Accepted Practices **GEO-1d:** Conduct Ground Monitoring **GEO-1e:** Include an Earthquake Response Plan within the Spill Response Plan
Impact GEO-2: Result in substantial soil erosion or the loss of topsoil	Class II	**SWR-1a:** Require Stormwater Pollution Prevention Plan **SWR-2a:** Implement Erosion Control Plan
Impact GEO-3: Be located on a geologic unit or soil that is unstable and result in on- or off-site landslide, lateral spreading, subsidence or collapse	Class II	**GEO-3a:** Prepare Geotechnical Report if Necessary
Impact GEO-4: Be located on expansive soil creating substantial risks to life or property	Class III	No mitigation required

Table ES-2. Summary of Impacts and Mitigation Measures for the Project

Subject / Impact Criteria[1]	Impact Significance with Mitigation Incoporated[2]	Mitigation Measures
Impact GEO-5: Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems	Class IV	No mitigation required
Impact GEO-6: Result in the loss of availability of known mineral resource loss of a locally important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan	Class III in most instances; Class I in some instances	No mitigation proposed
Impact GEO-7: Cause an induced seismic event including ground shaking and ground failure	Class III	No mitigation required
Greenhouse Gas Emissions		
Impact GHG-1: Generate greenhouse gas emissions that may have a significant impact on the environment	Class I	**AQ-2a:** Reduce Emissions from Well Stimulation Treatments **AQ-2b:** Reduce Emissions from Portable Equipment and Mobile Sources **GHG-1a:** Prevent Methane Emissions from Associated Gas and Casinghead Gas **GHG-1b:** Reduce Emissions by Implementing Clean Development Mechanism (CDM) Strategies **GHG-1c:** Detect and Quantify Fugitive and Vented Methane and Carbon Dioxide
Impact GHG-2: Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases	Class I	**AQ-2a:** Reduce Emissions from Well stimulation Treatments **AQ-2b:** Reduce Emissions from Portable Equipment and Mobile Sources **GHG-1c:** Detect and Quantify Fugitive and Vented Methane and Carbon Dioxide **GHG-2a:** Require Applicant Enter into Mitigation Programs or Agreements for GHG Emissions not Covered by or Exempt from ARB's Cap and Trade Program
Hazards and Hazardous Materials		
Impact HAZ-1: Release hazardous materials into the environment from a spill or leak	Class II	**HAZ-1a:** Ensure that Spill Contingency Plan Provides Adequate Protection Against Leaks or Discharges of Dangerous Fluids and Other Potentially Dangerous Materials
Groundwater Resources		
Impact GW-1: Cause or contribute to overdraft conditions	Class II	**GW-1a:** Use Alternative Water Sources to the Extent Feasible **GW-1b:** Minimize Groundwater Impacts

Table ES-2. Summary of Impacts and Mitigation Measures for the Project

Subject / Impact Criteria[1]	Impact Significance with Mitigation Incoporated[2]	Mitigation Measures
Impact GW-2: Lower groundwater levels through pumping, resulting in inelastic land subsidence or interconnected surface water	Class II	**GW-1a:** Use Alternative Water Sources to the Extent Feasible **GW-1b:** Minimize Groundwater Impacts
Impact GW-3: Adversely impact groundwater quality through surface spills or leaks during well stimulation	Class II	**HAZ-1a:** Ensure that Spill Contingency Plan Provides Adequate Protection Against Leaks or Discharges of Dangerous Fluids and Other Potentially Dangerous Materials
Impact GW-4: Migration of well stimulation fluids or formation fluids including gas to protected groundwater through non-existent or ineffective annular well seals	Class II	**GW-4a:** Demonstrate that Wells within the ADSA Have Effective Cement Well Seals and Monitor Wells during Well Stimulation Treatment **GW-4b:** Install a Well Seal across Protected Groundwater for New Wells Subject to Well Stimulation Treatments **GW-4c:** Install Methane Sensors on Wells Subject to Well Stimulation Treatments
Impact GW-5: Migration of well stimulation fluids or formation fluids including gas into protected groundwater through damaged or improperly abandoned wells	Class II	**GW-5a:** Conduct Surface Geophysical Surveys or Apply Other Field Methods to Locate Improperly Abandoned Wells and Mitigate
Impact GW-6: Improper disposal of flowback in injection wells could potentially impact groundwater quality	Class II	**GW-6a:** Require Wastewater Disposal Wells to Inject Only into Exempted Aquifers to Protect Groundwater
Impact GW-7: Inability to identify specific impacts to groundwater quality from well stimulation activities	Class II	**GW-7a:** Add a Tracer to Well Stimulation Fluids or Develop a Reasonable Method to Distinguish Well Stimulation Fluids in the Environment
Land Use and Planning		
Impact LU-1: Preclude existing or permitted land uses, or create a disturbance that would diminish the function of land uses	Class I	None available for unavoidable and significant impacts associated with Risk of Upset/Public and Worker Safety
Impact LU-2: Physically divide an established community	Class III	No mitigation required
Impact LU-3: Conflict with applicable land use plans, policies, programs, ordinances or other land use regulations of agencies with jurisdiction over a project adopted for the purpose of avoiding or mitigating an environmental effect	Class II	PRC Section 1783.2 requiring "Neighbor Notification" All mitigation measures prescribed in this EIR

Table ES-2. Summary of Impacts and Mitigation Measures for the Project

Subject / Impact Criteria[1]	Impact Significance with Mitigation Incoporated[2]	Mitigation Measures
Noise and Vibration		
Impact NOI-1: Cause exposure of persons to or generation of excessive noise levels or a substantial increase in ambient noise levels	Class II	**NOI-1a:** Control Noise Levels near Sensitive Land Uses
Impact NOI-2: Cause exposure of persons to or generation of excessive groundborne vibration	Class III	No mitigation required
Paleontological Resources		
Impact PALEO-1: Destroy or disturb surface or near-surface significant paleontological resources	Class II if fossil bearing geologic units are present Class IV if no fossil bearing units are present	**PALEO-1a:** Require Information and Evaluate Paleontological Resources **PALEO-1b:** Develop Paleontological Resource Mitigation Plan **PALEO-1c:** Retain Qualified Paleontological Resources Staff **PALEO-1d:** Conduct a Paleontological Resources Worker Environmental Awareness Program **PALEO-1e:** Monitor Earth Disturbing Activities for Paleontological Resources **PALEO-1f:** Provide Qualified Paleontological Resources Monitor with Authority to Halt Earth Disturbing Activities **PALEO-1g:** Prepare Paleontological Resources Report for the Monitoring of Earth Disturbing Activities **PALEO-1h:** Curate all Discovered Paleontological Resources Associated with Earth Disturbing Activities
Population and Housing		
Impact POP-1: Induce substantial population growth	Class III	No mitigation required
Impact POP-2: Displace substantial numbers of people or existing housing, necessitating the construction of replacement housing elsewhere	Class III	No mitigation required

Table ES-2. Summary of Impacts and Mitigation Measures for the Project

Subject / Impact Criteria[1]	Impact Significance with Mitigation Incoporated[2]	Mitigation Measures
Public Services		
Impact PUB-1: Require new or physically altered governmental facilities in order to maintain acceptable service ratios, response times, or to other performance objectives for fire, police, or schools	Class II (Fire or Police Services); Class III (Population Growth)	**PUB-1a:** Assess Public Service Ratios and Ensure Adequate Compensation **HAZ-1:** Ensure that Spill Contingency Plan Provides Adequate Protection Against Leaks or Discharges of Dangerous Fluids and Other Potentially Dangerous Materials **TR-1a:** Prepare Traffic Plan
Recreation		
Impact REC-1: Result in the physical deterioration of recreational resources	Class III	No mitigation required
Impact REC-2: Cause disruptions in designated recreation areas	Class II	**REC-2a:** Coordinate Well Stimulation Treatment Schedule with Managing Officer(s) for Affected Recreation Areas **REC-2b:** Provide Noticing of Closures and Identify Alternative Recreation Areas
Risk of Upset / Public and Worker Safety		
Impact RSK-1: Create a hazard to the public or environment through crude oil transport and reasonably foreseeable accidents and releases	Class I	**RSK-1a:** Increase the Number of CPUC Rail Inspectors **RSK-1b:** Expedite the Phase-out of Older Tank Cars **RSK-1c:** Implement New Accident Prevention Technology **RSK-1d:** Monitor and Enforce New Speed Limits **RSK-1e:** Monitor the Implementation of Trackside Safety Technology **RSK-1f:** Improve Emergency Preparedness and Response Programs **RSK-1g:** Provide Real-Time Shipment Information to Emergency Responders **RSK-1h:** Provide Additional Accident and Injury Data to the State
Impact RSK-2: Create a hazard to the public, workers, or environment through a reasonably foreseeable accidental release of hazardous materials due to a hose leak or connection leak while pumping well stimulation treatment fluids	Class II	**RSK-2a:** Reduce the Inventory/Volumes Handled with the Hazardous Chemicals **RSK-2b:** Conduct a Facility Siting Study or a Quantitative Risk Assessment **RSK-2c:** Ensure Mechanical Integrity Program Through Compliance with Permanent Regulation
Impact RSK-3: Increase the potential for major oil spills due to ship groundings and collisions	Class III	No mitigation required

Table ES-2. Summary of Impacts and Mitigation Measures for the Project

Subject / Impact Criteria[1]	Impact Significance with Mitigation Incoporated[2]	Mitigation Measures
Impact RSK-4: Create a hazard to the public, workers, or environment through a reasonably foreseeable accidental pressure changes during flowback activity caused by blocked pump discharge, sudden change in downhole condition, or human error	Class II	**RSK-4a:** Conduct a Process Hazard Analysis (PHA) followed by a Layer of Protection Analysis (LOPA) to Ensure Installation of Proper Safety Interlocks
Impact RSK-5: Generate risks to public safety by causing a flammable atmosphere in the flowback tank	Class II	**RSK-5a:** Prepare and Implement the Procedures to Avoid Pump Cavitation during all Well Stimulation Activities **RSK-5b:** Verify the Need of Installation of Flame Arresters on the Tank Vents **RSK-5c:** Prepare and Implement a Control of Ignition Sources Plan
Impact RSK-6: Increase risks to public safety by exposing the public to accidental hazardous materials releases from pipelines	Class I	**RSK-6a:** Increase Inspection of Mechanical Integrity **RSK-6b:** Improve Leak Detection Capability **RSK-6c:** Reduce Mainline Valve Spacing
Impact RSK-7: Expose workers and public to hazardous levels of airborne silica during the use of proppant	Class II	**RSK-7a:** Use Alternative Proppant (e.g., Sintered Bauxite, Ceramics, Resins) or Use Alternative Proppant Delivery System **RSK-7b:** Reduce Emissions from Dust-Causing Activities
Surface Water Resources		
Impact SWR-1: Violate water quality standards or waste discharge requirements, provide substantial additional sources of polluted runoff, or otherwise substantially degrade or diminish surface water quality	Class II	**SWR-1a:** Require Stormwater Pollution Prevention Plan **SWR-1b:** Surface Water Protection **SWR-1c:** Provide Adequate Flood Protection **SWR-1d:** Protect Surface Water Reservoirs **BIOT-2a:** Prevent Hazards to Fish and Wildlife
Impact SWR-2: Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site	Class II	**SWR-2a:** Implement Erosion Control Plan
Impact SWR-3: Substantially diminish surface water quantity	Class II	**SWR-3a:** Ensure Adequate Water Availability

Table ES-2. Summary of Impacts and Mitigation Measures for the Project

Subject / Impact Criteria[1]	Impact Significance with Mitigation Incoporated[2]	Mitigation Measures
Impact SWR-4: Create flood hazard by substantially altering existing drainage patterns, substantially increasing the rate or amount of surface runoff, impeding or redirecting flood flows, or exposing people or structures to flooding	Class II	**SWR-1c:** Provide Adequate Flood Protection
Transportation and Traffic		
Impact TR-1: Generate additional truck traffic and disrupt traffic operations	Class III for project activities in Study Region 6 and for existing fields Class II outside of existing oil and gas fields in Study Regions 1-5 where 10 or more wells are drilled by a single applicant within one square mile	**TR-1a:** Prepare Traffic Plan
Impact TR-2: Inadvertently damage road rights-of-way	Class III for project activities in Study Region 6 and in existing oil and gas fields Class II outside of existing oil and gas fields in Study Regions 1-5 where 10 or more wells are drilled by a single applicant within one square mile	**TR-2a:** Repair Roadway Damage
Impact TR-3: Cause traffic safety hazards for vehicles, bicyclists, and pedestrians	Class III for project activities in Study Region 6 and for existing fields Class II outside of existing oil and gas fields in Study Regions 1-5 where 10 or more wells are drilled by a single applicant within one square mile	**TR-1a:** Prepare Traffic Plan
Impact TR-4: Transport hazardous materials	Class I	**TR-4a:** Know Spill Prevention Measures
Impact TR-5: Change air traffic patterns	Class IV if no airports are nearby Class III if FAA notification under 14 CFR 77 is required	No mitigation required
Impact TR-6: Temporarily interfere with emergency response	Class III for project activities in Study Region 6 and for existing fields Class II in Study Regions 1-5 outside of existing oil and gas fields	**TR-1a:** Prepare Traffic Plan

Table ES-2. Summary of Impacts and Mitigation Measures for the Project

Subject / Impact Criteria[1]	Impact Significance with Mitigation Incoporated[2]	Mitigation Measures
Utilities and Service Systems		
Impact UTL-1: Adversely affect utilities and service systems due to population growth from Project-related development	Class III	No mitigation required
Impact UTL-2: Require new or expanded electrical or natural gas infrastructure	Class III	No mitigation required
Impact UTL-3: Exceed existing municipal wastewater treatment provider capacities	Class II	**UTL-3a:** Assess Wastewater Quality and Ensure Adequate Capacity to Process Wastewater at Municipal and Private Wastewater Treatment Plants
Impact UTL-4: Exceed permitted solid waste capacity of landfills	Class II	**UTL-4a:** Assess Non-Hazardous Solid Waste Generation and Ensure Adequate Capacity to Accept Solid Waste at Municipal and Private Solid Waste Facilities
Energy Conservation (Other CEQA Considerations)		
Impact EN-1: Result in substantial new energy requirements or energy use inefficiencies	Class III	No mitigation required
Impact EN-2: Cause an adverse effect on local and regional energy supplies and requirements for additional capacity because of inefficient, wasteful, or unnecessary energy use	Class III	No mitigation required
Impact EN-3: Cause an adverse effect on peak and base period demands for electricity and other forms of energy because of ineffi-cient, wasteful, or unnecessary energy use	Class III	No mitigation required
Impact EN-4: Disrupt compliance with existing energy standards	Class III	No mitigation required
Impact EN-5: Cause an adverse effect on energy resources because of inefficient, wasteful, or unnecessary energy use	Class III	No mitigation required
Impact EN-6: Result in inefficient, wasteful, or unnecessary transportation energy use	Class III	No mitigation required

1 - The occurrence of significant and unavoidable impacts (Class I) for some subject areas is contingent on site-specific conditions of where a proposed well stimulation treatment may occur. As example, if a proposed well stimulation site's future environmental review demonstrates that no cultural resources are present, no impacts would occur and no mitigation would be required. However, if the site does contain such resources, potential impacts could be either significant and unavoidable (Class I), less than significant with mitigation incorporated (Class II), less than significant (Class III) or no impact (Class IV).

2 - Class I = Significant and Unavoidable Impact; Class II = Less Than Significant Impact With Mitigation Incorporated; Class III = Less Than Significant Impact; Class IV = No Impact.

Table ES-3. Summary of Impacts and Mitigation Measures for the Project: Analysis of Specific Oil and Gas Fields

	Impact Significance with Mitigation Incorporated, by Oil & Gas Field[2]			
Subject / Impact Criteria[1]	**Wilmington**	**Inglewood**	**Sespe**	**Mitigation Measures**
Aesthetics				
Impact AES-1: Substantially adversely affect scenic vistas	Class III	Class III	Class III	No mitigation required
Impact AES-2: Substantially alter or damage scenic resources	Class III	Class III	Class III	No mitigation required
Impact AES-3: Substantially degrade the existing visual character or quality of a site and its surroundings	Class III	Class III	Class III	No mitigation required
Impact AES-4: Create new sources of substantial light and glare	Class III	Class III	Class III	No mitigation required
Agricultural and Forestry Resources				
Impact AGF-1: Convert Prime Farmland, Unique Farmland, or Farmland of statewide Importance (Important Farmland), as designated by the Farmland Mapping and Monitoring Program, to non-agricultural use	Class IV	Class IV	Class II	Wilmington and Inglewood: No mitigation required Sespe: **AGF-2b:** Ensure Compatibility with Williamson Act Contracts or Terminate Williamson Act Contracts
Impact AGF-2: Conflict with existing zoning for agricultural use or with Williamson Act contracts	Class IV	Class IV	Class II	Wilmington and Inglewood: No mitigation required Sespe: Same as for the project (see Table ES-2)
Impact AGF-3: Conflict with existing zoning for, or cause rezoning of, forest land, timberland, or timberland zoned Timberland Production	Class IV	Class IV	Class IV	No mitigation required
Impact AGF-4: Result in the loss of forest land or conversion of forest land to non-forest use	Class IV	Class IV	Class II	Wilmington and Inglewood: No mitigation required Sespe: Same as for the project (see Table ES-2)

Table ES-3. Summary of Impacts and Mitigation Measures for the Project: Analysis of Specific Oil and Gas Fields

	Impact Significance with Mitigation Incorporated, by Oil & Gas Field[2]			
Subject / Impact Criteria[1]	**Wilmington**	**Inglewood**	**Sespe**	**Mitigation Measures**
Impact AGF-5: Directly or indirectly impair the use of agricultural land or forest land	Class IV	Class II	Class II	Wilmington: No mitigation required Inglewood and Sespe: Same as for the project (see Table ES-2)
Air Quality				
Impact AQ-1: Conflict with or obstruct implementation of an applicable air quality plan	Class III	Class III	Class I~~II~~	Wilmington and Inglewood: No mitigation required Sespe: **AQ-1a:** Improve Air Quality Planning Inventories and Local Control Measures **AQ-1b:** Improve the Methodologies and Emission Factors Used in Inventory Development
Impact AQ-2: Increase criteria pollutants or precursor pollutants to levels that violate an air quality standard or contribute substantially to an existing or projected air quality violation	Class I	Class I	Class I	Same as for the project (see Table ES-2)
Impact AQ-3: Expose sensitive receptors to substantial pollutant concentrations	Class I	Class I	Class I	Same as for the project (see Table ES-2)
Impact AQ-4: Create objectionable odors affecting a substantial number of people	Class I	Class I	Class I	Same as for the project (see Table ES-2)
Biological Resources: Terrestrial Environment				
Impact BIOT-1: Substantially reduce the habitat of a fish or wildlife species	Class I, II, or III	Class I, II, or III	Class I, II, or III	Class III Impacts: No mitigation required Class I and II Impacts: Same as for the project (see Table ES-2)

Table ES-3. Summary of Impacts and Mitigation Measures for the Project: Analysis of Specific Oil and Gas Fields

	Impact Significance with Mitigation Incorporated, by Oil & Gas Field[2]			
Subject / Impact Criteria[1]	**Wilmington**	**Inglewood**	**Sespe**	**Mitigation Measures**
Impact BIOT-2: Cause a fish or wildlife population to drop below self-sustaining levels	Class I, II, or III	Class I, II, or III	Class I, II, or III	Class III Impacts: No mitigation required Class I and II Impacts: Wilmington and Inglewood: **BIOT-1b:** Minimize Impacts to Native Vegetation and Habitat **BIOT-1c:** Replace or Offset Loss of Sensitive Habitat **BIOT-2a:** Prevent Hazards to Fish and Wildlife **BIOT-3a:** Minimize and Mitigate Impacts to Special-status Fish and Wildlife **BIOT-4b:** Minimize Impacts to Protected Birds **BIOT-7a:** Prevent or Mitigate Habitat Fragmentation and Impacts to Fish and Wildlife Movement **GW-4a:** Demonstrate that Wells within the ADSA Have Effective Cement Well Seals and Monitor Wells during Well Stimulation **GW-4b:** Install a Well Seal Across Protected Groundwater for New Wells Subject to Well Stimulation Treatments **HAZ-1a:** Ensure that Spill Contingency Plan Provides Adequate Protection Against Leaks or Discharges of Dangerous Fluids and Other Potentially Dangerous Materials **SWR-1a:** Require Stormwater Pollution Prevention Plan **SWR-2a:** Implement Erosion Control Plan Sespe: Same as above and **BIOT-2b:** California Condor Protection Measures **BIOT-2c:** Nelson's Bighorn Sheep Protection Measures
Impact BIOT-3: Substantially reduce the number or restrict the range of an endangered, rare, or threatened species	Class I, II, or III	Class I, II, or III	Class I, II, or III	Class III Impacts: No mitigation required Class I and II Impacts: Wilmington and Inglewood: Same as for the project (see Table ES-2) Sespe: Same as for the project (see Table ES-2) and **BIOT-2b:** California Condor Protection Measures **BIOT-2c:** Nelson's Bighorn Sheep Protection Measures

Table ES-3. Summary of Impacts and Mitigation Measures for the Project: Analysis of Specific Oil and Gas Fields

	Impact Significance with Mitigation Incorporated, by Oil & Gas Field[2]			
Subject / Impact Criteria[1]	**Wilmington**	**Inglewood**	**Sespe**	**Mitigation Measures**
Impact BIOT-4: Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by CDFW or USFWS	Class I, II, or III	Class I, II, or III	Class I, II, or III	Class III Impacts: No mitigation required Class I and II Impacts: Wilmington and Inglewood: Same as for the project (see Table ES-2) Sespe: Same as for the project (see Table ES-2) and **BIOT-2b:** California Condor Protection Measures **BIOT-2c:** Nelson's Bighorn Sheep Protection Measures
Impact BIOT-5: Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by CDFW or USFWS	Class I, II, or III	Class I, II, or III	Class I, II, or III	Class III Impacts: No mitigation required Class I and II Impacts: Same as for the project (see Table ES-2)
Impact BIOT-6: Have a substantial adverse effect on federally protected wetlands as defined by Section 404, of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means	Class I, II, or III	Class I, II, or III	Class I, II, or III	Class III Impacts: No mitigation required Class I and II Impacts: Same as for the project (see Table ES-2)
Impact BIOT-7: Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites	Class III	Class III	Class I, II, or III	Class III Impacts: No mitigation required Class I and II Impacts: Same as for the project (see Table ES-2)

Table ES-3. Summary of Impacts and Mitigation Measures for the Project: Analysis of Specific Oil and Gas Fields

	Impact Significance with Mitigation Incorporated, by Oil & Gas Field[2]			
Subject / Impact Criteria[1]	**Wilmington**	**Inglewood**	**Sespe**	**Mitigation Measures**
Impact BIOT-8: Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance	Class II or III	Class III	Class II or III	Class III Impacts: No mitigation required Class II Impacts: Same as for the project (see Table ES-2)
Impact BIOT-9: Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan	Class II or III	Class II or III	Class II or III	Class III Impacts: No mitigation required Class II Impacts: Same as for the project (see Table ES-2)
Impact BIOT-10: Contribute to global climate change and consequent impacts to biodiversity	Class I, II, or III	Class I, II, or III	Class I, II, or III	Class III Impacts: No mitigation required Class I and II Impacts: Same as for the project (see Table ES-2)
Biological Resources: Coastal and Marine Environment				
Impact BIOCM-1: Substantially affect any species identified as a candidate, sensitive, or special status species or their habitat	Class III	N/A	N/A	No mitigation required
Impact BIOCM-2: Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites	Class III	N/A	N/A	No mitigation required

Table ES-3. Summary of Impacts and Mitigation Measures for the Project: Analysis of Specific Oil and Gas Fields

	Impact Significance with Mitigation Incorporated, by Oil & Gas Field[2]			
Subject / Impact Criteria[1]	**Wilmington**	**Inglewood**	**Sespe**	**Mitigation Measures**
Impact BIOCM-3: Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means	Class III	N/A	N/A	No mitigation required
Coastal Processes and Marine Water Quality				
Impact CPMWQ-1: Change marine water chemical composition with respect to known hazardous substances; or the measured water temperature, salinity, conductivity, or turbidity	Class II	N/A	N/A	Wilmington: Same as for the project (see Table ES-2) Inglewood and Sespe: No mitigation required
Impact CPMWQ-2: Change the velocity or direction of ocean currents	Class II	N/A	N/A	Wilmington: Same as for the project (see Table ES-2) Inglewood and Sespe: No mitigation required
Impact CPMWQ-3: Change the velocity or direction of coastal and ocean winds	Class III	N/A	N/A	No mitigation required
Impact CPMWQ-4: Change the direction, size, or period of ocean waves	Class IV	N/A	N/A	No mitigation required
Impact CPMWQ-5: Increase the risk of a tsunami	Class III	N/A	N/A	No mitigation required

Table ES-3. Summary of Impacts and Mitigation Measures for the Project: Analysis of Specific Oil and Gas Fields

	Impact Significance with Mitigation Incorporated, by Oil & Gas Field[2]			
Subject / Impact Criteria[1]	**Wilmington**	**Inglewood**	**Sespe**	**Mitigation Measures**
Commercial and Recreational Fishing				
Impact CRF-1: Cause long-term exclusion of important commercial and recreational fishing areas	Class III	N/A	N/A	No mitigation required
Impact CRF-2: Result in substantial loss of total catch to commercial and recreational fishing industries	Class III	N/A	N/A	No mitigation required
Cultural Resources				
Impact CUL-1: Affect historic-era archaeological and built-environment resources	Class I or Class II if historic or built-environment resources are present; Class III or Class IV if historic or built-environment resources are not considered significant or are not present	Class I or Class II if historic or built-environment resources are present; Class III or Class IV if historic or built-environment resources are not considered significant or are not present	Class I or Class II if historic or built-environment resources are present; Class III or Class IV if historic or built-environment resources are not considered significant or are not present	Class I and II Impacts: Same as for the project (see Table ES-2) Class III and IV Impacts: No mitigation required
Impact CUL-2: Affect prehistoric resources	Class I or II if pre-historic resources are present; Class III or Class IV if prehistoric resources are not considered significant or are not present	Class I or II if pre-historic resources are present; Class III or Class IV if prehistoric resources are not considered significant or are not present	Class I or II if pre-historic resources are present; Class III or Class IV if prehistoric resources are not considered significant or are not present	Class I and II Impacts: Same as for the project (see Table ES-2) Class III and IV Impacts: No mitigation required

Table ES-3. Summary of Impacts and Mitigation Measures for the Project: Analysis of Specific Oil and Gas Fields

	Impact Significance with Mitigation Incorporated, by Oil & Gas Field[2]			
Subject / Impact Criteria[1]	Wilmington	Inglewood	Sespe	Mitigation Measures
Impact CUL-3: Disturb human remains or cultural items, including funerary objects, sacred objects, and objects of cultural patrimony	Class I or II if human remains or cultural items are present; Class III or Class IV if cultural items are not considered significant or are not present Class IV if human remains are not present	Class I or II if human remains or cultural items are present; Class III or Class IV if cultural items are not considered significant or are not present Class IV if human remains are not present	Class I or II if human remains or cultural items are present; Class III or Class IV if cultural items are not considered significant or are not present Class IV if human remains are not present	Class I and II Impacts: Same as for the project (see Table ES-2) Class III and IV Impacts: No mitigation required
Impact CUL-4: Affect cultural landscapes	Class I or II if cultural landscapes are present; Class III or Class IV if cultural landscapes are not considered significant or are not present	Class I or II if cultural landscapes are present; Class III or Class IV if cultural landscapes are not considered significant or are not present	Class I or II if cultural landscapes are present; Class III or Class IV if cultural landscapes are not considered significant or are not present	Class I and II Impacts: Same as for the project (see Table ES-2) Class III and IV Impacts: No mitigation required
Environmental Justice				
Impact EJ-1: Disproportionately affect minority or low-income populations	Unknown	Unknown	Unknown	Wilmington: Same as for the project (see Table ES-2), except **GEO-1a** would not be required (see Table ES-2) Inglewood and Sespe: Same as for the project (see Table ES-2)

Table ES-3. Summary of Impacts and Mitigation Measures for the Project: Analysis of Specific Oil and Gas Fields

	Impact Significance with Mitigation Incorporated, by Oil & Gas Field[2]			
Subject / Impact Criteria[1]	**Wilmington**	**Inglewood**	**Sespe**	**Mitigation Measures**
Geology, Soils and Mineral Resources				
Impact GEO-1: Expose people or structures to potential substantial adverse effects as a result of rupture of a known fault, seismically induced groundshaking, and/or ground failure	Class II	Class II	Class II	Same as for the project (see Table ES-2)
Impact GEO-2: Result in substantial soil erosion or the loss of topsoil	Class II	Class II	Class II	Same as for the project (see Table ES-2)
Impact GEO-3: Be located on a geologic unit or soil that is unstable and result in on- or off-site landslide, lateral spreading, subsidence or collapse	Class II	Class II	Class II	Same as for the project (see Table ES-2)
Impact GEO-4: Be located on expansive soil creating substantial risks to life or property	Class III	Class III	Class III	No mitigation required
Impact GEO-5: Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems	Class IV	Class IV	Class IV	No mitigation required
Impact GEO-6: Result in the loss of availability of known mineral resource or loss of a locally important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan	Class III	Class III	Class III	No mitigation required
Impact GEO-7: Cause an induced seismic event including ground shaking and ground failure	Class III	Class III	Class III	No mitigation required

Table ES-3. Summary of Impacts and Mitigation Measures for the Project: Analysis of Specific Oil and Gas Fields

	Impact Significance with Mitigation Incorporated, by Oil & Gas Field[2]			
Subject / Impact Criteria[1]	**Wilmington**	**Inglewood**	**Sespe**	**Mitigation Measures**
Greenhouse Gas Emissions				
Impact GHG-1: Generate greenhouse gas emissions that may have a significant impact on the environment	Class I to Class III	Class I	Class I to Class III	Class I and II Impacts: Same as for the project (see Table ES-2) Class III Impacts: No mitigation required
Impact GHG-2: Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases	Class III	Class I	Class III	Inglewood: Same as for the project (see Table ES-2) Wilmington and Sespe: No mitigation required
Hazards and Hazardous Materials				
Impact HAZ-1: Release hazardous materials into the environment from a spill or leak	Class II	Class II	Class II	Same as for the project (see Table ES-2) and **HAZ-1b:** Require the Operator to Conduct an Annual Inventory of Its Well Stimulation Equipment and Report of the Aged Infrastructure and Its Likelihood of Failure Leading to Spills or Leaks to DOGGR
Groundwater Resources				
Impact GW-1: Cause or contribute to overdraft conditions	Class II	Class II	Class III	Wilmington and Inglewood: Same as for the project (see Table ES-2) Sespe: No mitigation required
Impact GW-2: Lower groundwater levels through pumping, resulting in inelastic land subsidence or interconnected surface water	Class II	Class II	Class III	Wilmington and Inglewood: **GW-1b:** Minimize Groundwater Impacts Sespe: No mitigation required
Impact GW-3: Adversely impact groundwater quality through surface spills or leaks during well stimulation	Class II	Class II	Class II	Same as for the project (see Table ES-2)
Impact GW-4: Migration of well stimulation fluids or formation fluids including gas to protected groundwater through non-existent or ineffective annular well seals	Class II	Class II	Class II	Same as for the project (see Table ES-2)

Table ES-3. Summary of Impacts and Mitigation Measures for the Project: Analysis of Specific Oil and Gas Fields

Subject / Impact Criteria[1]	Impact Significance with Mitigation Incorporated, by Oil & Gas Field[2]			Mitigation Measures
	Wilmington	Inglewood	Sespe	
Impact GW-5: Migration of well stimulation fluids or formation fluids including gas into protected groundwater through damaged or improperly abandoned wells	Class II	Class II	Class II	Same as for the project (see Table ES-2)
Impact GW-6: Improper disposal of flowback in injection wells could potentially impact groundwater quality	Class II	Class II	Class II	Same as for the project (see Table ES-2)
Impact GW-7: Inability to identify specific impacts to groundwater quality from well stimulation activities	Class II	Class II	Class II	Same as for the project (see Table ES-2)
Land Use and Planning				
Impact LU-1: Preclude existing or permitted land uses, or create a disturbance that would diminish the function of land uses	Class II	Class I	Class III	Wilmington: **HAZ-1a:** Provide a Physical Barrier on the Ground Surface at the Site Pad for All Production Facilities, Regardless of the Amount of Time They Are in Place, Prior to Moving in Hazardous Materials and Manage Surface Water Runoff and Drainage on the Barrier Using Best Management Practices **HAZ-1b:** Require the Operator to Conduct an Annual Inventory of its Well Stimulation Equipment and Report of the Aged Infrastructure and its Likelihood of Failure Leading to Spills or Leaks to DOGGR **RSK-2a:** Conduct a Reactive Hazard Assessment (RHA) **RSK-2b:** Reduce the Inventory/Volumes Handled with the Hazardous Chemicals **RSK-2c:** Install an Upgraded SCADA System **RSK-2d:** Conduct a Facility Siting Study or a Quantitative Risk Assessment **RSK-2e:** Use Totes or Hazardous Materials Storage Containers Provided with a Protective Outer Shell or a Double Containment Storage System **RSK-2f:** Ensure Mechanical Integrity Program Complies with Regulation

Table ES-3. Summary of Impacts and Mitigation Measures for the Project: Analysis of Specific Oil and Gas Fields

	Impact Significance with Mitigation Incorporated, by Oil & Gas Field[2]			
Subject / Impact Criteria[1]	**Wilmington**	**Inglewood**	**Sespe**	**Mitigation Measures**
Impact LU-1, *continued*				**RSK-4a:** Conduct a Process Hazard Analysis (PHA) Followed by a Layer of Protection Analysis (LOPA) to Ensure Installation of Proper Safety Interlocks **RSK-5a:** Prepare and Implement the Procedures to Avoid Pump Cavitation during all Well Stimulation Activities **RSK-5b:** Verify the Need of Installation of Flame Arresters on the Tank Vents **RSK-5c:** Prepare and Implement a Control of Ignition Sources Plan **RSK-7a:** Use Alternative Proppant (e.g., Sintered Bauxite, Ceramics, Resins) **RSK-7b:** Reduce Emissions from Dust-Causing Activities **REC-2a:** Coordinate Well Stimulation Treatment Schedule with Managing Officer(s) for Affected Recreation Areas **REC-2b:** Provide Noticing of Closures and Identify Alternative Recreation Areas Inglewood: Same as for the project (see Table ES-2) Sespe: No mitigation required
Impact LU-2: Physically divide an established community	Class IV	Class IV	Class IV	No mitigation required
Impact LU-3: Conflict with applicable land use plans, policies, programs, ordinances or other land use regulations of agencies with jurisdiction over a project adopted for the purpose of avoiding or mitigating an environmental effect	Class II	Class II	Class II	Wilmington and Sespe: **HAZ-1a:** Provide a Physical Barrier on the Ground Surface at the Site Pad for All Production Facilities, Regardless of the Amount of Time They Are in Place, Prior to Moving in Hazardous Materials and Manage Surface Water Runoff and Drainage on the Barrier Using Best Management Practices **HAZ-1b:** Require the Operator to Conduct an Annual Inventory of its Well Stimulation Equipment and Report of the Aged Infrastructure and its Likelihood of Failure Leading to Spills or Leaks to DOGGR **RSK-2a:** Reduce the Inventory/Volumes Handled with the Hazardous Chemicals **RSK-2b:** Conduct a Facility Siting Study or Quantitative Risk Assessment **RSK-2c:** Ensure Mechanical Integrity Through Compliance with Permanent Regulation

Table ES-3. Summary of Impacts and Mitigation Measures for the Project: Analysis of Specific Oil and Gas Fields

	Impact Significance with Mitigation Incorporated, by Oil & Gas Field[2]			
Subject / Impact Criteria[1]	**Wilmington**	**Inglewood**	**Sespe**	**Mitigation Measures**
Impact LU-3. *continued*				**RSK-4a:** Conduct a Process Hazard Analysis (PHA) Followed by a Layer of Protection Analysis (LOPA) to Ensure Installation of Proper Safety Interlocks **RSK-5a:** Prepare and Implement the Procedures to Avoid Pump Cavitation during all Well Stimulation Activities **RSK-5b:** Verify the Need of Installation of Flame Arresters on the Tank Vents **RSK-5c:** Prepare and Implement a Control of Ignition Sources Plan **RSK-7a:** Use Alternative Proppant (e.g., Sintered Bauxite, Ceramics, Resins) **RSK-7b:** Reduce Emissions from Dust-Causing Activities **REC-2a:** Coordinate Well Stimulation Treatment Schedule with Managing Officer(s) for Affected Recreation Areas **REC-2b:** Provide Noticing of Closures and Identify Alternative Recreation Areas Inglewood: Same as for the project (see Table ES-2)
Noise and Vibration				
Impact NOI-1: Cause exposure of persons to or generation of excessive noise levels or a substantial increase in ambient noise levels	Class II	Class II	Class II	Same as for the project (see Table ES-2)
Impact NOI-2: Cause exposure of persons to or generation of excessive groundborne vibration	Class III	Class III	Class III	No mitigation required
Paleontological Resources				
Impact PALEO-1: Destroy or disturb surface or near-surface significant paleontological resources	Class II if fossil bearing geologic units are present; Class IV if no fossil bearing units are present	Class II if fossil bearing geologic units are present; Class IV if no fossil bearing units are present	Class II if fossil bearing geologic units are present; Class IV if no fossil bearing units are present	Class II Impacts: Same as for the project (see Table ES-2) Class IV Impacts: No mitigation required

Table ES-3. Summary of Impacts and Mitigation Measures for the Project: Analysis of Specific Oil and Gas Fields

	Impact Significance with Mitigation Incorporated, by Oil & Gas Field[2]			
Subject / Impact Criteria[1]	**Wilmington**	**Inglewood**	**Sespe**	**Mitigation Measures**
Population and Housing				
Impact POP-1: Induce substantial population growth	Class III	Class III	Class III	No mitigation required
Impact POP-2: Displace substantial numbers of people or existing housing, necessitating the construction of replacement housing elsewhere	Class IV	Class III	Class III	No mitigation required
Public Services				
Impact PUB-1: Require new or physically altered governmental facilities in order to maintain acceptable service ratios, response times, or to other performance objectives for fire, police, or schools	Class II	Class II	Class II	Same as for the project (see Table ES-2) and **HAZ-1b:** Require the Operator to Conduct an Annual Inventory of Its Well Stimulation Equipment and Report of the Aged Infrastructure and Its Likelihood of Failure Leading to Spills or Leaks to DOGGR
Recreation				
Impact REC-1: Result in the physical deterioration of recreational resources	Class III	Class III	Class III	No mitigation required
Impact REC-2: Cause disruptions in designated recreation areas	Class II	Class II	Class II	Sespe: No mitigation required Wilmington an Inglewood: Same as for the project (see Table ES-2)
Risk of Upset/Public and Worker Safety				
Impact RSK-1: Create a hazard to the public or environment through crude oil transport and reasonably foreseeable accidents and releases	Class I	Class IV	Class I	Class I Impacts: Same as for the project (see Table ES-2) Class IV Impacts: No mitigation required

Table ES-3. Summary of Impacts and Mitigation Measures for the Project: Analysis of Specific Oil and Gas Fields

	Impact Significance with Mitigation Incorporated, by Oil & Gas Field[2]			
Subject / Impact Criteria[1]	**Wilmington**	**Inglewood**	**Sespe**	**Mitigation Measures**
Impact RSK-2: Create a hazard to the public, workers, or environment through a reasonably foreseeable accidental release of hazardous materials due to a hose leak or connection leak while pumping well stimulation treatment fluids	Class II	Class II	Class II	Same as for the project (see Table ES-2)
Impact RSK-3: Increase the potential for major oil spills due to ship groundings and collisions	Class III	Class IV	Class IV	No mitigation required
Impact RSK-4: Create a hazard to the public, workers, or environment through a reasonably foreseeable accidental pressure changes during flowback activity caused by blocked pump discharge, sudden change in downhole condition, or human error	Class II	Class II	Class II	Same as for the project (see Table ES-2)
Impact RSK-5: Generate risks to public safety by causing a flammable atmosphere in the flowback tank	Class II	Class II	Class II	Same as for the project (see Table ES-2)
Impact RSK-6: Increase risks to public safety by exposing the public to accidental hazardous materials releases from pipelines	Class I	Class I	Class I	Same as for the project (see Table ES-2)
RSK-7: Expose workers and public to hazardous levels of airborne silica during the use of proppant	Class II	Class II	Class II	Same as for the project (see Table ES-2)

Table ES-3. Summary of Impacts and Mitigation Measures for the Project: Analysis of Specific Oil and Gas Fields

	Impact Significance with Mitigation Incorporated, by Oil & Gas Field[2]			
Subject / Impact Criteria[1]	**Wilmington**	**Inglewood**	**Sespe**	**Mitigation Measures**
Surface Water Resources				
Impact SWR-1: Violate water quality standards or waste discharge requirements, provide substantial additional sources of polluted runoff, or otherwise substantially degrade or diminish surface water quality	Class II	Class II	Class II	Wilmington, Inglewood, and Sespe: **SWR-1a:** Require Stormwater Pollution Prevention Plan **SWR-1b:** Surface Water Protection **SWR-1c:** Provide Adequate Flood Protection
Impact SWR-2: Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site	Class II	Class II	Class II	Wilmington: Same as for the project (see Table ES-2) Inglewood: Same as for the project (see Table ES-2) and mitigation measures in the Baldwin Hills CSD Final EIR (LA County, 2008) Sespe: Same as for the project (see Table ES-2) and **SWR-1d:** Protect Surface Water
Impact SWR-3: Substantially diminish surface water quantity	Class II	Class II	Class II	Wilmington and Sespe: Same as for the project (see Table ES-2) Inglewood: Same as for the project (see Table ES-2) and mitigation measures in the Baldwin Hills CSD Final EIR (LA County, 2008)
Impact SWR-4: Create flood hazard by substantially altering existing drainage patterns, substantially increasing the rate or amount of surface runoff, impeding or redirecting flood flows, or exposing people or structures to flooding	Class II	Class II	Class II	Wilmington and Sespe: Same as for the project (see Table ES-2) Inglewood: Same as for the project (see Table ES-2) and mitigation measures in the Baldwin Hills CSD Final EIR (LA County, 2008)
Transportation and Traffic				
Impact TR-1: Generate additional truck traffic and disrupt traffic operations	Class III	Class III	Class III	No mitigation required
Impact TR-2: Inadvertently damage road rights-of-way	Class III	Class III	Class II	Wilmington and Inglewood: No mitigation required Sespe: Same as for the project in the City of Fillmore (see Table ES-2)

Table ES-3. Summary of Impacts and Mitigation Measures for the Project: Analysis of Specific Oil and Gas Fields

	Impact Significance with Mitigation Incorporated, by Oil & Gas Field[2]			
Subject / Impact Criteria[1]	**Wilmington**	**Inglewood**	**Sespe**	**Mitigation Measures**
Impact TR-3: Cause traffic safety hazards for vehicles, bicyclists, and pedestrians	Class III	Class III	Class III	No mitigation required
Impact TR-4: Transport hazardous materials	Class I	Class I	Class I	Same as for the project (see Table ES-2)
Impact TR-5: Change air traffic patterns	Class III	Class III	Class IV	No mitigation required
Impact TR-6: Temporarily interfere with emergency response	Class III	Class III	Class III	No mitigation required
Utilities and Service Systems				
Impact UTL-1: Adversely affect utilities and service systems due to population growth from Project-related development	Class III	Class III	Class III	No mitigation required
Impact UTL-2: Require new or expanded electrical or natural gas infrastructure	Class III	Class III	Class III	No mitigation required
Impact UTL-3: Exceed existing municipal wastewater treatment provider capacities	Class II	Class II	Class II	Same as for the project (see Table ES-2)
Impact UTL-4: Exceed permitted solid waste capacity of landfills	Class II	Class II	Class II	Same as for the project (see Table ES-2)
Energy Conservation (Other CEQA Considerations)				
Impact EN-1: Result in substantial new energy requirements or energy use inefficiencies	Class III	Class III	Class III	No mitigation required

Table ES-3. Summary of Impacts and Mitigation Measures for the Project: Analysis of Specific Oil and Gas Fields

	Impact Significance with Mitigation Incorporated, by Oil & Gas Field[2]			
Subject / Impact Criteria[1]	**Wilmington**	**Inglewood**	**Sespe**	**Mitigation Measures**
Impact EN-2: Cause an adverse effect on local and regional energy supplies and requirements for additional capacity because of inefficient, wasteful, or unnecessary energy use	Class III	Class III	Class III	No mitigation required
Impact EN-3: Cause an adverse effect on peak and base period demands for electricity and other forms of energy because of inefficient, wasteful, or unnecessary energy use	Class III	Class III	Class III	No mitigation required
Impact EN-4: Disrupt compliance with existing energy standards	Class III	Class III	Class III	No mitigation required
Impact EN-5: Cause an adverse effect on energy resources because of inefficient, wasteful, or unnecessary energy use	Class III	Class III	Class III	No mitigation required
Impact EN-6: Result in inefficient, wasteful, or unnecessary transportation energy use	Class III	Class III	Class III	No mitigation required

1 - The occurrence of significant and unavoidable impacts (Class I) for some subject areas is contingent on site-specific conditions of where a proposed well stimulation treatment may occur. As example, if a proposed well stimulation site's future environmental review demonstrates that no cultural resources are present, no impacts would occur and no mitigation would be required. However, if the site does contain such resources, potential impacts could be either significant and unavoidable (Class I), less than significant with mitigation incorporated (Class II), less than significant (Class III) or no impact (Class IV).

2 - Class I = Significant and Unavoidable Impact; Class II = Less Than Significant Impact With Mitigation Incorporated; Class III = Less Than Significant Impact; Class IV = No Impact.

N/A - Not applicable to the resource because the Inglewood and Sespe Oil and Gas Fields are located inland.

Table ES-5. Summary of Impacts for the Alternatives

Subject / Impact Criteria[1]	Alternative[2]	Impact Significance with Mitigation Incorporated[3]	Mitigation Measures
Aesthetics			
Impact AES-1: Substantially adversely affect scenic vistas	1	Class IV and V (Direct) Class I, II, III and IV (Indirect) Class I, II, III for new or expanded terminals	None available for new or expanded areas
	2	Class III or IV (Direct) Class IIII (Indirect)	None available for new or expanded areas
	3	New well pad: Class I or Class II; Existing well pad: Class III	**AES-1a:** Prepare and Implement a Site Plan to Reduce Visual Impacts to Sensitive Receptors **AES-1b:** Minimize Lighting Visibility Offsite
	4	Class III in existing fields Class I or II in new areas	Existing Fields: No mitigation required New Areas: Same mitigations as applied to Alternative 3 (**AES-1a** and **AES-1b** for new areas)
	5	Class III in existing fields Class I or II in new areas	Same mitigations as applied to Alternative 3 (**AES-1a** and **AES-1b** for new areas)
	6	Class III in existing fields Class I in new areas	No mitigation applied
Impact AES-2: Substantially alter or damage scenic resources	1	Class IV and V (Direct) Class I, II, III, and IV (Indirect)	No mitigation available for new or expanded areas
	2	Class I, II, III, or IV (Direct) Class III (Indirect) Class I or II for new or expanded terminals	No mitigation available for new or expanded areas
	3	New well pad: Class I or Class II; Existing well pad: Class III	**AES-1a:** Prepare and Implement a Site Plan to Reduce Visual Impacts to Sensitive Receptors

Table ES-5. Summary of Impacts for the Alternatives

Subject / Impact Criteria[1]	Alternative[2]	Impact Significance with Mitigation Incorporated[3]	Mitigation Measures
Impact AES-2, *continued*	4	Class III in existing fields Class I or II in new areas	Existing Fields: No mitigation required New Areas: **AES-1a:** Prepare and Implement a Site Plan to Reduce Visual Impacts to Sensitive Receptors **AES-1b:** Minimize Offsite Lighting Visibility.
	5	Class III in existing fields Class I or II in new areas	Same mitigations as applied to Alternative 3 (**AES-1a** and **AES-1b** for new areas)
	6	Class III in existing fields Class I in new areas	No mitigation applied
Impact AES-3: Substantially degrade the existing visual character or quality of a site and its surroundings	1	Class IV and V (Direct) Class I, II, III, and IV (Indirect)	No mitigation available for new or expanded areas
	2	Class III or IV (Direct) Class III (Indirect) Class I, II, III for new or expanded terminals	No mitigation available for new or expanded areas
	3	New well pad: Class I or Class II; Existing well pad: Class III	New areas: **AES-1a:** Prepare and Implement a Site Plan to Reduce Visual Impacts to Sensitive Receptors **AES-1b:** Minimize Lighting Visibility Offsite
	4	Class III in existing fields Class I or II in new areas	Existing Fields: No mitigation required New Areas: Same mitigations as applied to Alternative 3 (**AES-1a** and **AES-1b** for new areas)
	5	New well pad: Class I or Class II; Existing well pad: Class III	Same mitigations as applied to Alternative 3 (**AES-1a** and **AES-1b** for new areas)
	6	Class III in existing fields Class I in new areas	No mitigation applied

Table ES-5. Summary of Impacts for the Alternatives

Subject / Impact Criteria[1]	Alternative[2]	Impact Significance with Mitigation Incorporated[3]	Mitigation Measures
Impact AES-4: Create new sources of substantial light and glare	1	Class IV and V (Direct) Class I, II, III, and IV (Indirect)	No mitigation available for new or expanded areas
	2	Class III or IV (Direct) Class III (Indirect) Class II for new or expanded terminals	No mitigation available for new or expanded areas
	3	New well pad: Class I or Class II; Existing well pad: Class III	**AES-1a:** Prepare and Implement a Site Plan to Reduce Visual Impacts to Sensitive Receptors **AES-1b:** Minimize Lighting Visibility Offsite
	4	Class III in existing fields Class I or II in new areas	Existing Fields: No mitigation required New Areas: Same mitigations as applied to Alternative 3 (**AES-1a** and **AES-1b** for new areas)
	5	Class III in existing fields Class I or II in new areas	Existing Fields: No mitigation required Same mitigations as applied to Alternative 3 (**AES-1a** and **AES-1b** for new areas)
	6	Class III in existing fields Class I in new areas	No mitigation applied
Agricultural and Forestry Resources			
Impact AGF-1: Convert Prime Farmland, Unique Farmland, or Farmland of statewide Importance (Important Farmland), as designated by the Farmland Mapping and Monitoring Program, to non-agricultural use	1	Class IV (Direct) Class V and II (Indirect)	**AGF-1a:** Minimize Impacts to Important Farmland **AGF-1b:** Develop an Agricultural Resources Protection Plan **AGF-1c:** Compensate for Loss of Important Farmland
	2	Class IV (Direct) Class II or V (Indirect)	Same mitigations as applied to Alternative 1 (**AGF-1a** through **AGF-1c**)
	3	Class II	Same mitigations as applied to Alternative 1 (**AGF-1a** through **AGF-1c**)
	4	Class II on or adjacent to Important Farmland	Same mitigations as applied to Alternative 1 (**AGF-1a** through **AGF-1c**)
	5	Class II on or adjacent to Important Farmland	Same mitigations as applied to Alternative 1 (**AGF-1a** through **AGF-1c**)
	6	Class I on or adjacent to Important Farmland	No mitigation applied

Table ES-5. Summary of Impacts for the Alternatives

Subject / Impact Criteria[1]	Alternative[2]	Impact Significance with Mitigation Incorporated[3]	Mitigation Measures
Impact AGF-2: Conflict with existing zoning for agricultural use or with Williamson Act contracts	1	Class IV (Direct) Class V and II (Indirect)	**AGF-2a:** Ensure Compatibility with Agricultural Zoning **AGF-2b:** Ensure Compatibility with Williamson Act Contracts or Terminate Williamson Act Contracts
	2	Class IV (Direct) Class II or V (Indirect)	Same mitigations as applied to Alternative 1 (**AGF-2a** and **AGF-2b**)
	3	Class II	Same mitigations as applied to Alternative 1 (**AGF-2a** and **AGF-2b**)
	4	Class II on land zoned for agricultural use or enrolled in Williamson Act contracts	Same mitigations as applied to Alternative 1 (**AGF-2a** and **AGF-2b**)
	5	Class II on land zoned for agricultural use or enrolled in Williamson Act contracts	Same mitigations as applied to Alternative 1 (**AGF-2a** and **AGF-2b**)
	6	Class I on land zoned for agricultural use or enrolled in Williamson Act contracts	No mitigation applied
Impact AGF-3: Conflict with existing zoning for, or cause rezoning of, forest land, timberland, or timberland zoned Timberland Production	1	Class IV (Direct) Class V and II (Indirect)	**AGF-3a:** Ensure Compatibility with Forest and Timberland Zoning
	2	Class IV (Direct) Class II or V (Indirect)	Same mitigation as applied to Alternative 1 **(AGF-3a)**
	3	Class II	Same mitigation as applied to Alternative 1 **(AGF-3a)**
	4	Class II on land zoned as forestland, timberland, or Timberland Production	Same mitigation as applied to Alternative 1 **(AGF-3a)**
	5	Class II on land zoned as forestland, timberland, or Timberland Production	Same mitigation as applied to Alternative 1 **(AGF-3a)**
	6	Class I on land zoned as forestland, timberland, or Timberland Production	No mitigation applied
Impact AGF-4: Result in the loss of forest land or conversion of forest land to non-forest use	1	Class IV (Direct) Class V and II (Indirect)	**AGF-4a:** Minimize Impacts to Forest Land **AGF-4b:** Develop a Forest Land Protection Plan **AGF-4c:** Compensate for Loss of Forest Land
	2	Class IV (Direct) Class II or V (Indirect)	Same mitigations as applied to Alternative 1 (**AGF-4a** through **AGF-4c**)

Table ES-5. Summary of Impacts for the Alternatives

Subject / Impact Criteria[1]	Alternative[2]	Impact Significance with Mitigation Incorporated[3]	Mitigation Measures
Impact AGF-4, *continued*	3	Class II on forest land	Same mitigations as applied to Alternative 1 (**AGF-4a** through **AGF-4c**)
	4	Class II on forest land	Same mitigations as applied to Alternative 1 (**AGF-4a** through **AGF-4c**)
	5	Class II on forest land	Same mitigations as applied to Alternative 1 (**AGF-4a** through **AGF-4c**)
	6	Class I on forest land	No mitigation applied
Impact AGF-5: Directly or indirectly impair the use of agricultural land or forest land	1	Class IV (Direct) Class V and II (Indirect)	**AGF-1a:** Minimize Impacts to Important Farmland **AGF-1b:** Develop an Agricultural Resources Protection Plan **AGF-4a:** Minimize Impacts to Forest Land **AGF-4b:** Develop a Forest Land Protection Plan **AQ-2c:** Reduce Emissions from Dust-Causing Activities **BIOT-2a:** Prevent Hazards to Fish and Wildlife **HAZ-1a:** Ensure that Spill Contingency Plan Provides Adequate Protection Against Leaks or Discharges of Dangerous Fluids and Other Potentially Dangerous Materials **GW-4b:** Install a Well Seal Across Protected Groundwater for New Wells Subject to Well Stimulation Treatments **SWR-1a:** Require Stormwater Pollution Prevention Plan **SWR-2a:** Implement Erosion Control Plan **SWR-3a:** Ensure Adequate Water Availability **TR-1a:** Prepare Traffic Plan
	2	Class IV (Direct) Class II or V (Indirect)	Same mitigations as applied to Alternative 1 (**AGF-1a, AGF-1b, AGF-4a, AGF-4b, AQ-2c, BIOT-2a, HAZ-1a, GW-4b, SWR-1a, SWR-2a, SWR-3a, TR-1a**)
	3	Class II for well stimulation activities on or within 1,500 feet of agricultural or forest land	Same mitigations as applied to Alternative 1 (**AGF-1a, AGF-1b, AGF-4a, AGF-4b, AQ-2c, BIOT-2a, HAZ-1a, GW-4b, SWR-1a, SWR-2a, SWR-3a, TR-1a**)
	4	Class II for well stimulation activities on or within 1,500 feet of agricultural or forest land	Same mitigations as applied to Alternative 1 (**AGF-1a, AGF-1b, AGF-4a, AGF-4b, AQ-2c, BIOT-2a, HAZ-1a, GW-4b, SWR-1a, SWR-2a, SWR-3a, TR-1a**)

Table ES-5. Summary of Impacts for the Alternatives

Subject / Impact Criteria[1]	Alternative[2]	Impact Significance with Mitigation Incorporated[3]	Mitigation Measures
Impact AGF-5, *continued*	5	Class **II** for well stimulation activities on or within 1,500 feet of agricultural or forest land	Same mitigations as applied to Alternative 1 (**AGF-1a, AGF-1b, AGF-4a, AGF-4b, AQ-2c, BIOT-2a, HAZ-1a, GW-4b, SWR-1a, SWR-2a, SWR-3a, TR-1a**)
	6	Class **I** for well stimulation activities on or within 1,500 feet of agricultural or forest land	No mitigation applied
Air Quality			
Impact AQ-1: Conflict with or obstruct implementation of an applicable air quality plan	1	Class **I** (Indirect)	**AQ-1a:** Improve Air Quality Planning Inventories and Local Control Measures
	2	Class **I** (Indirect)	**AQ-1a:** Improve Air Quality Planning Inventories and Local Control Measures **AQ-1b:** Improve the Methodologies and Emission Factors Used in Inventory Development
	3	Class **I** (Statewide) Class **III** (in SCAQMD)	Same mitigation as applied to Alternative 2 (**AQ-1a and AQ-1b**)
	4	Class **I** (Statewide) Class **III** (in SCAQMD)	Same mitigations as applied to Alternative 2 (**AQ-1a** and **AQ-1b**)
	5	Class **I** (Statewide) Class **III** (in SCAQMD)	Same mitigations as applied to Alternative 2 (**AQ-1a** and **AQ-1b**)
	6	Class **I** (Statewide) Class **III** (in SCAQMD)	No mitigation applied
Impact AQ-2: Increase criteria pollutants or precursor pollutants to levels that violate an air quality standard or contribute substantially to an existing or projected air quality violation	1	Class **I** (Indirect)	**AQ-2b:** Reduce Emissions from Portable Equipment and Mobile Sources **AQ-2c:** Reduce Emissions from Dust-Causing Activities
	2	Class **I** (Indirect)	**AQ-2a:** Reduce Hydrocarbon Emissions from Well Stimulation Treatments **AQ-2b:** Reduce Emissions from Portable Equipment and Mobile Sources **AQ-2c:** Reduce Emissions from Dust-Causing Activities
	3	Class **I**	Same mitigations as applied to Alternative 2 (**AQ-2a** through **AQ-2c**)

Table ES-5. Summary of Impacts for the Alternatives

Subject / Impact Criteria[1]	Alternative[2]	Impact Significance with Mitigation Incorporated[3]	Mitigation Measures
Impact AQ-2, *continued*	4	Class I (Indirect)	Same mitigations as applied to Alternative 2 (**AQ-2a** through **AQ-2c**)
	5	Class I (Indirect)	Same mitigations as applied to Alternative 1 (**AQ-2a** through **AQ-2c**)
	6	Class I	No mitigation applied
Impact AQ-3: Expose sensitive receptors to substantial pollutant concentrations	1	Class I (Indirect)	**AQ-3a:** Comply with Local Air District Protocols Relating to the Preparation of a Health Risk Assessment and Implement Emission Controls **AQ-3b:** Avoid Unnecessary Exposure to Air Pollutants by Improving Local Land Use Compatibility.
	2	Class I (Indirect)	Same mitigation as applied to Alternative 1 (**AQ-3a and AQ-3b**)
	3	Class I	Same mitigation as applied to Alternative 1 (**AQ-3a and AQ-3b**)
	4	Class I	Same mitigation as applied to Alternative 1 (**AQ-3a and AQ-3b**)
	5	Class II (Indirect)	Same mitigation as applied to Alternative 1 (**AQ-3a and AQ-3b**)
	6	Class I	No mitigation applied
Impact AQ-4: Create objectionable odors affecting a substantial number of people	1	Class I (Indirect)	**AQ-4a:** Prepare and Implement an Odor Minimization Plan **AQ-4b:** Avoid Unnecessary Exposure to Odors by Improving Local Land Use Compatibility.
	2	Class I	Same mitigations as applied to Alternative 1 (**AQ-4a and AQ-4b**)
	3	Class I (Indirect)	Same mitigation as applied to Alternative 1 (**AQ-4a**)
	4	Class I	Same mitigations as applied to Alternative 1 (**AQ-4a and AQ-4b**)
	5	Class I (Indirect)	Same mitigation as applied to Alternative 1 (**AQ-4a and AQ-4b**)
	6	Class I	No mitigation applied

Table ES-5. Summary of Impacts for the Alternatives

Subject / Impact Criteria[1]	Alternative[2]	Impact Significance with Mitigation Incorporated[3]	Mitigation Measures
Biological Resources: Terrestrial Environment			
Impact BIOT-1: Substantially reduce the habitat of a fish or wildlife species	1	Class IV (Direct) Class I (Indirect)	**BIOT-1a:** Evaluate Impacts to Native Vegetation and Fish and Wildlife Habitat **BIOT-1b:** Minimize Impacts to Native Vegetation and Habitat **BIOT-1c:** Replace of Offset Loss of Sensitive Habitat **AQ-2c:** Reduce Emissions from Dust-Causing Activities **SWR-1a:** Require Stormwater Pollution Prevention Plan **SWR-2a:** Implement Erosion Control **SWR-3a:** Ensure Adequate Water Availability
	2	Class I	Same mitigations as applied to Alternative 1 (**BIOT-1a, BIOT-1b, BIOT-1c, AQ-2c, SWR-1a, SWR-2a, SWR-3a**)
	3	Class I, II or III	Same mitigations as applied to Alternative 1 (**BIOT-1a, BIOT-1b, BIOT-1c, AQ-2c, SWR-1a, SWR-2a, SWR-3a**)
	4	Class I	Same mitigations as applied to Alternative 1 (**BIOT-1a, BIOT-1b, BIOT-1c, AQ-2c, SWR-1a, SWR-2a, SWR-3a**)
	5	Class I, II or III	Same mitigations as applied to Alternative 1 (**BIOT-1a, BIOT-1b, BIOT-1c, AQ-2c, SWR-1a, SWR-2a, SWR-3a**)
	6	Class I	No mitigation applied

Table ES-5. Summary of Impacts for the Alternatives

Subject / Impact Criteria[1]	Alternative[2]	Impact Significance with Mitigation Incorporated[3]	Mitigation Measures
Impact BIOT-2: Cause a fish or wildlife population to drop below self-sustaining levels	1	Class IV (Direct) Class I (Indirect)	**BIOT-1b:** Minimize Impacts to Native Vegetation and Habitat **BIOT-1c:** Replace or Offset Loss of Sensitive Habitat **BIOT-2a:** Prevent Hazards to Fish and Wildlife **BIOT-3a:** Minimize and Mitigate Impacts to Special-status Fish and Wildlife **BIOT-4b:** Minimize Impacts to Protected Birds **BIOT-7a:** Prevent or Mitigate Habitat Fragmentation and Impacts to Fish and Wildlife Movement **GW-4a:** Demonstrate that Wells within the ADSA Have Effective Cement Well Seals and Monitor Wells during Well Stimulation **GW-4b:** Install a Well Seal Across Protected Groundwater for New Wells Subject to Well Stimulation Treatments **HAZ-1a:** Ensure that Spill Contingency Plan Provides Adequate Protection Against Leaks or Discharges of Dangerous Fluids and Other Potentially Dangerous Materials **SWR-1a:** Require Stormwater Pollution Prevention Plan **SWR-2a:** Implement Erosion Control Plan
	2	Class I	Same mitigations as applied to Alternative 1 (**BIOT-1b, BIOT-1c, BIOT-2a, BIOT-3a, BIOT-4b, BIOT-7a, GW-4a, GW-4b, HAZ-1a, SWR-1a, SWR-2a**)
	3	Class I, II or III	Same mitigations as applied to Alternative 1 (**BIOT-1b, BIOT-1c, BIOT-2a, BIOT-3a, BIOT-4b, BIOT-7a, GW-4a, GW-4b, HAZ-1a, SWR-1a, SWR-2a**)
	4	Class I	Same mitigations as applied to Alternative 1 (**BIOT-1b, BIOT-1c, BIOT-2a, BIOT-3a, BIOT-4b, BIOT-7a, GW-4a, GW-4b, HAZ-1a, SWR-1a, SWR-2a**)
	5	Class I, II or III	Same mitigations as applied to Alternative 1 (**BIOT-1b, BIOT-1c, BIOT-2a, BIOT-3a, BIOT-4b, BIOT-7a, GW-4a, GW-4b, HAZ-1a, SWR-1a, SWR-2a**)
	6	Class I or III	No mitigation applied

Table ES-5. Summary of Impacts for the Alternatives

Subject / Impact Criteria[1]	Alternative[2]	Impact Significance with Mitigation Incorporated[3]	Mitigation Measures
Impact BIOT-3: Substantially reduce the number or restrict the range of an endangered, rare, or threatened species	1	Class IV (Direct) Class I (Indirect)	**BIOT-1b:** Minimize Impacts to Native Vegetation and Habitat **BIOT-1c:** Replace or Offset Loss of Sensitive Habitat **BIOT-2a:** Prevent Hazards to Fish and Wildlife **BIOT-3a:** Minimize and Mitigate Impacts to Special-status Fish and Wildlife **BIOT-3b:** Minimize and Mitigate Impacts to Special-status Plants **BIOT-4b:** Minimize Impacts to Protected Birds **BIOT-7a:** Prevent or Mitigate Habitat Fragmentation and Impacts to Fish and Wildlife Movement **AQ-2c:** Reduce Emissions from Dust-Causing Activities **SWR-1a:** Require Stormwater Pollution Prevention Plan
	2	Class I	Same mitigations as applied to Alternative 1 (**BIOT-1b, BIOT-1c, BIOT-2a, BIOT-3a, BIOT-4b, BIOT-7a, AQ-2c, SWR-1a**)
	3	Class I, II or III	Same mitigations as applied to Alternative 1 (**BIOT-1b, BIOT-1c, BIOT-2a, BIOT-3a, BIOT-4b, BIOT-7a, AQ-2c, SWR-1a**)
	4	Class I	Same mitigations as applied to Alternative 1 (**BIOT-1b, BIOT-1c, BIOT-2a, BIOT-3a, BIOT-3b, BIOT-4b, BIOT-7a, AQ-2c, SWR-1a**)
	5	Class I, II or III	Same mitigations as applied to Alternative 1 (**BIOT-1b, BIOT-1c, BIOT-2a, BIOT-3a, BIOT-4b, BIOT-7a, AQ-2c, SWR-1a**)
	6	Class I or III	No mitigation applied
Impact BIOT-4: Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by CDFW or USFWS	1	Class IV (Direct) Class I (Indirect)	**BIOT-1b:** Minimize Impacts to Native Vegetation and Habitat **BIOT-1c:** Replace or Offset Loss of Sensitive Habitat **BIOT-2a:** Prevent Hazards to Fish and Wildlife **BIOT-3a:** Minimize and Mitigate Impacts to Special-status Fish and Wildlife **BIOT-3b:** Minimize and Mitigate Impacts to Special-status Plants **BIOT-4a** Minimize and Mitigate Impacts to all Species Identified as a Candidate, Sensitive, or Special-Status Species in Local or Regional Plans, Policies, or Regulations, or by CDFW or USFWS **BIOT-4b:** Minimize Impacts to Protected Birds **BIOT-7a:** Prevent or Mitigate Habitat Fragmentation and Impacts to Fish and Wildlife Movement

Table ES-5. Summary of Impacts for the Alternatives

Subject / Impact Criteria[1]	Alternative[2]	Impact Significance with Mitigation Incorporated[3]	Mitigation Measures
Impact BIOT-4, *continued*	2	Class I	Same mitigations as applied to Alternative 1 (**BIOT-1b, BIOT-1c, BIOT-2a, BIOT-3a, BIO-3b, BIOT-4a, BIOT-4b, BIOT-7a**)
	3	Class I, II or III	Same mitigations as applied to Alternative 1 (**BIOT-1b, BIOT-1c, BIOT-2a, BIOT-3a, BIO-3b, BIOT-4a, BIOT-4b, BIOT-7a**)
	4	Class I	Same mitigations as applied to Alternative 1(**BIOT-1b, BIOT-1c, BIOT-2a, BIOT-3a, BIO-3b, BIOT-4a, BIOT-4b, BIOT-7a**)
	5	Class I	Same mitigations as applied to Alternative 1 (**BIOT-1b, BIOT-1c, BIOT-2a, BIOT-3a, BIO-3b, BIOT-4a, BIOT-4b, BIOT-7a**)
	6	Class I	No mitigation applied
Impact BIOT-5: Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by CDFW or USFWS	1	Class IV (Direct) Class I (Indirect)	**BIOT-1a:** Evaluate Impacts to Native Vegetation and Fish and Wildlife Habitat **BIOT-1b:** Minimize Impacts to Native Vegetation and Habitat **BIOT-1c:** Replace or Offset Loss of Sensitive Habitat **AQ-2c:** Reduce Emissions from Dust-Causing Activities **GW-4a:** Demonstrate that Wells within the ADSA Have Effective Cement Well Seals and Monitor Wells during Well Stimulation **GW-4b:** Install a Well Seal Across Protected Groundwater for New Wells Subject to Well Stimulation Treatments **SWR-1a:** Require Stormwater Pollution Prevention Plan **SWR-1b:** Surface Water Protection **SWR-2a:** Implement Erosion Control Plan **SWR-3a:** Ensure Adequate Water Availability
	2	Class I	Same mitigations as applied to Alternative 1 (**BIOT-1a, BIOT-1b, BIOT-1c, AQ-2c, GW-4a, GW-4b, SWR-1a, SWR-1b, SWR-2a, SWR-3a**)
	3	Class I, II or III	Same mitigations as applied to Alternative 1 (**BIOT-1a, BIOT-1b, BIOT-1c, AQ-2c, GW-4a, GW-4b, SWR-1a, SWR-1b, SWR-2a, SWR-3a**)
	4	Class I	Same mitigations as applied to Alternative 1 (**BIOT-1a, BIOT-1b, BIOT-1c, AQ-2c, GW-4a, GW-4b, SWR-1a, SWR-1b, SWR-2a, SWR-3a**)

Table ES-5. Summary of Impacts for the Alternatives

Subject / Impact Criteria[1]	Alternative[2]	Impact Significance with Mitigation Incorporated[3]	Mitigation Measures
Impact BIOT-5, *continued*	5	Class I	Same mitigations as applied to Alternative 1 (**BIOT-1a, BIOT-1b, BIOT-1c, AQ-2c, GW-4a, GW-4b, SWR-1a, SWR-1b. SWR-2a, SWR-3a**)
	6	Class I or III	No mitigation applied
Impact BIOT-6: Have a substantial adverse effect on federally protected wetlands as defined by Section 404, of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means	1	Class IV (Direct) Class I (Indirect)	**BIOT-1a:** Evaluate Impacts to Native Vegetation and Fish and Wildlife Habitat **BIOT-1b:** Minimize Impacts to Native Vegetation and Habitat **BIOT-1c:** Replace or Offset Loss of Sensitive Habitat **BIOT-2a:** Prevent Hazards to Fish and Wildlife **BIOT-3a:** Minimize and Mitigate Impacts to Special-status Fish and Wildlife **BIOT-6a:** Protect Jurisdictional Waters **GW-1a:** Use Alternative Water Sources to the Extent Feasible **GW-1b:** Minimize Groundwater Impacts **GW-4a:** Demonstrate that Wells within the ADSA Have Effective Cement Well Seals and Monitor Wells during Well Stimulation **GW-4b:** Install a Well Seal Across Protected Groundwater for New Wells Subject to Well Stimulation Treatments **SWR-1a:** Require Stormwater Pollution Prevention Plan **SWR-1b:** Surface Water Protection **SWR-2a:** Implement Erosion Control Plan **SWR-3a:** Ensure Adequate Water Availability
	2	Class I	Same mitigations as applied to Alternative 1 (**BIOT-1a, BIOT-1b, BIOT-1c, BIOT-2a, BIO-3a, BIOT-6a, GW-1a, GW-1b, GW-4a, GW-4b, SWR-1a, SWR-1b, SWR-2a, SWR-3a**)
	3	Class I, II or III	Same mitigations as applied to Alternative 1 (**BIOT-1a, BIOT-1b, BIOT-1c, BIOT-2a, BIO-3a, BIOT-6a, GW-1a, GW-1b, GW-4a, GW-4b, SWR-1a, SWR-1b, SWR-2a, SWR-3a**)
	4	Class I	Same mitigations as applied to Alternative 1 (**BIOT-1a, BIOT-1b, BIOT-1c, BIOT-2a, BIO-3a, BIOT-6a, GW-1a, GW-1b, GW-4a, GW-4b, SWR-1a, SWR-1b, SWR-2a, SWR-3a**)

Table ES-5. Summary of Impacts for the Alternatives

Subject / Impact Criteria[1]	Alternative[2]	Impact Significance with Mitigation Incorporated[3]	Mitigation Measures
Impact BIOT-6, *continued*	5	Class I	Same mitigations as applied to Alternative 1 (**BIOT-1a, BIOT-1b, BIOT-1c, BIOT-2a, BIO-3a, BIOT-6a, GW-1a, GW-1b, GW-4a, GW-4b, SWR-1a, SWR-1b, SWR-2a, SWR-3a**)
	6	Class I	No mitigation applied
Impact BIOT-7: Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites	1	Class IV (Direct) Class I (Indirect)	**BIOT-7a:** Prevent or Mitigate Habitat Fragmentation and Impacts to Fish and Wildlife Movement
	2	Class I	Same mitigation as applied to Alternative 1 (**BIOT-7a**)
	3	Class II or III	Same mitigation as applied to Alternative 1 (**BIOT-7a**)
	4	Class I	Same mitigation as applied to Alternative 1 (**BIOT-7a**)
	5	Class I	Same mitigation as applied to Alternative 1 (**BIOT-7a**)
	6	Class I or III	No mitigation applied
Impact BIOT-8: Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance	1	Class IV (Direct) Class I (Indirect)	**BIOT-8a:** Coordinate with Local Agencies and Jurisdictions Regarding Local Policies and Conservation Plans
	2	Class II	Same mitigation as applied to Alternative 1 (**BIOT-8a**)
	3	Class II or III	Same mitigation as applied to Alternative 1 (**BIOT-8a**)
	4	Class II	Same mitigation as applied to Alternative 1 (**BIOT-8a**)
	5	Class II	Same mitigation as applied to Alternative 1 (**BIOT-8a**)
	6	Class I or III	No mitigation applied
Impact BIOT-9: Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan	1	Class IV (Direct) Class I (Indirect)	**BIOT-9a:** Coordinate with CDFW, USFWS, and Permittees Regarding NCCPs, HCPs, and Other Conservation Plans
	2	Class II	Same mitigation as applied to Alternative 1 (**BIOT-9a**)
	3	Class II or III	Same mitigation as applied to Alternative 1 (**BIOT-9a**)
	4	Class II	Same mitigation as applied to Alternative 1 (**BIOT-9a**)
	5	Class I	Same mitigation as applied to Alternative 1 (**BIOT-9a**)
	6	Class I or III	No mitigation applied

Table ES-5. Summary of Impacts for the Alternatives

Subject / Impact Criteria[1]	Alternative[2]	Impact Significance with Mitigation Incorporated[3]	Mitigation Measures
Impact BIOT-10: Contribute to global climate change and consequent impacts to biodiversity	1	Class IV (Direct) Class I (Indirect)	**AQ-2a:** Reduce Emissions from Well Stimulation Treatments **AQ-2b:** Reduce Emissions from Portable Equipment and Mobile Sources **GHG-1a:** Prevent Methane Emissions from Associated Gas and Casinghead Gas **GHG-1b:** Reduce Emissions by Implementing Clean Development Mechanism (CDM) Strategies **GHG-2a:** Require Applicant to Enter into Mitigation Programs or Agreements for GHG Emissions not Covered by or Exempt from ARB's Cap and Trade Program
	2	Class I	Same mitigations as applied to Alternative 1 (**AQ-2a, AQ-2b, GHG-1a, GHG-1b, GHG-2a**)
	3	Class I	Same mitigations as applied to Alternative 1 (**AQ-2a, AQ-2b, GHG-1a, GHG-1b, GHG-2a**)
	4	Class I	Same mitigations as applied to Alternative 1 (**AQ-2a, AQ-2b, GHG-1a, GHG-1b, GHG-2a**)
	5	Class I	Same mitigations as applied to Alternative 1 (**AQ-2a, AQ-2b, GHG-1a, GHG-1b, GHG-2a**)
	6	Class I	No mitigation applied
Biological Resources: Coastal and Marine Environment			
Impact BIOCM-1: Substantially affect rare, threatened, or endangered coastal/marine species or their habitat	1	Class IV (Direct) Class III (Indirect)	No mitigation required
	2	Class III	No mitigation required
	5	Class III	No mitigation required
	6	Class III	No mitigation required
Impact BIOCM-2: Interfere with migration or movement of coastal/marine fish or wildlife	1	Class IV (Direct) Class III (Indirect)	No mitigation required
	2	Class III	No mitigation required
	5	Class III	No mitigation required
	6	Class III	No mitigation required

Table ES-5. Summary of Impacts for the Alternatives

Subject / Impact Criteria[1]	Alternative[2]	Impact Significance with Mitigation Incorporated[3]	Mitigation Measures
Impact BIOCM-3: Result in substantial loss or alteration of coastal/marine habitat	1	Class IV (Direct) Class III (Indirect)	No mitigation required
	2	Class III	No mitigation required
	5	Class III	No mitigation required
	6	Class III	No mitigation required
Impact BIOCM-4: Substantially disrupt or affect local coastal/marine biological communities or habitats	1	Class IV (Direct) Class III (Indirect)	No mitigation required
	2	Class III	No mitigation required
	5	Class III	No mitigation required
	6	Class III	No mitigation required
Coastal Processes and Marine Water Quality			
Impact CPMWQ-1: Change marine water chemical composition with respect to known hazardous substances; or the measured water temperature, salinity, conductivity, or turbidity	1	Class II	**CPMWQ-1a:** Protect Marine Water Quality
	2	Class II	Same mitigation as applied to Alternative 1 (**CPMWQ-1a**)
	5	Class II	Same mitigation as applied to Alternative 1 (**CPMWQ-1a**)
	6	Class I	No mitigation applied
Impact CPMWQ-2: Change the velocity or direction of ocean currents	1	Class II	**CPMWQ-2a:** Prepare and Implement Marine Current Plan
	2	Class II	Same mitigation as applied to Alternative 1 (**CPMWQ-2a**)
	5	Class II	Same mitigation as applied to Alternative 1 (**CPMWQ-2a**)
	6	Class I	No mitigation applied
Impact CPMWQ-3: Change the velocity or direction of coastal and ocean winds	1	Class III	No mitigation required
	2	Class III	No mitigation required
	5	Class III	No mitigation required
	6	Class III	No mitigation applied

Table ES-5. Summary of Impacts for the Alternatives

Subject / Impact Criteria[1]	Alternative[2]	Impact Significance with Mitigation Incorporated[3]	Mitigation Measures
Impact CPMWQ-4: Change the direction, size, or period of ocean waves	1	Class IV	No mitigation required
	2	Class IV	No mitigation required
	5	Class IV	No mitigation required
	6	Class IV	No mitigation required
Impact CPMWQ-5: Increase the risk of a tsunami	1	Class IV (Direct) Class III (Indirect)	No mitigation required
	2	Class III	No mitigation required
	5	Class III	No mitigation required
	6	Class III	No mitigation required
Commercial and Recreational Fishing			
Impact CRF-1: Cause long-term exclusion of important commercial and recreational fishing areas	1	Class IV (Direct) Class III (Indirect)	No mitigation required
	2	Class III	No mitigation required
	5	Class III	No mitigation required
	6	Class III	No mitigation applied
Impact CRF-2: Result in substantial economic losses to local commercial and recreational fishing industries	1	Class IV (Direct) Class III (Indirect)	No mitigation required
	2	Class III	No mitigation required
	5	Class III	No mitigation required
	6	Class III	No mitigation applied

Table ES-5. Summary of Impacts for the Alternatives

Subject / Impact Criteria[1]	Alternative[2]	Impact Significance with Mitigation Incorporated[3]	Mitigation Measures
Cultural Resources			
Impact CUL-1: Affect historic-era archaeological and built-environment resources	1	Class IV (Direct) Class I (Indirect)	**CUL-1a:** Require Information and Evaluate Cultural Resources. **CUL-1b:** Complete Native American Coordination. **CUL-1c:** Prepare and Implement Cultural Resources Management and Treatment Plan. **CUL-1d:** Prepare Plan for the Inadvertent Discovery of Human Remains. **CUL-1e:** Provide Cultural Resources Specialist with the Authority to Halt Earth Disturbing Activities. **CUL-1f:** Conduct a Cultural Resources Worker Environmental Awareness Program. **CUL-1g:** Monitor Earth Disturbing Activities for Cultural Resources. **CUL-1h:** Provide Native American Monitors during Earth Disturbing Activities. **CUL-1i:** Prepare Cultural Resources Documents for the Monitoring of Earth Disturbing Activities. **CUL-1j:** Curate all Discovered Cultural Resources Associated with Earth Disturbing Activities
	2	Class I	Same mitigations as applied to Alternative 1 (**CUL-1a** through **CUL-1j**)
	3	Class I or II if cultural landscapes are present; Class III or Class IV if cultural landscapes are not considered significant or are not present	Same mitigations as applied to Alternative 1 (**CUL-1a** through **CUL-1j**)
	4	Class I or Class II if historic or built-environment resources are present; Class III or Class IV if historic or built-environment resources are not considered significant or are not present	Same mitigations as applied to Alternative 1 (**CUL-1a** through **CUL-1j**)
	5	Class I or Class II if historic or built-environment resources are present; Class III or Class IV if historic or built-environment resources are not considered significant or are not present	Same mitigations as applied to Alternative 1 (**CUL-1a** through **CUL-1j**)

Table ES-5. Summary of Impacts for the Alternatives

Subject / Impact Criteria[1]	Alternative[2]	Impact Significance with Mitigation Incorporated[3]	Mitigation Measures
Impact CUL-1, *continued*	6	Class I if historic or built-environment resources are present Class III or Class IV if historic or built-environment resources are not considered significant or are not present	No mitigation applied
Impact CUL-2: Affect prehistoric resources	1	Class IV (Direct) Class I (Indirect)	Same mitigations as applied to **Impact CUL-1** (**CUL-1a** through **CUL-1j**)
	2	Class I	Same mitigations as applied to Alternative 1 (**CUL-1a** through **CUL-1j**)
	3	Class I or II if cultural landscapes are present; Class III or Class IV if cultural landscapes are not considered significant or are not present	Same mitigations as applied to Alternative 1 (**CUL-1** (**CUL-1a** through **CUL-1j**)
	4	Class I or Class II if historic or built-environment resources are present; Class III or Class IV if historic or built-environment resources are not considered significant or are not present	Same mitigations as applied to Alternative 1 (**CUL-1a** through **CUL-1j**)
	5	Class I or Class II if historic or built-environment resources are present; Class III or Class IV if historic or built-environment resources are not considered significant or are not present	Same mitigations as applied to Alternative 1 (**CUL-1a** through **CUL-1j**)
	6	Class I if prehistoric resources are present Class III or Class IV if prehistoric resources are not considered significant or are not present	No mitigation applied
Impact CUL-3: Disturb human remains or cultural items, including funerary objects, sacred objects, and objects of cultural patrimony	1	Class IV (Direct) Class I (Indirect)	Same mitigations as applied to **Impact CUL-1** (**CUL-1a** through **CUL-1j**)
	2	Class I	Same mitigations as applied to Alternative 1 (**CUL-1a** through **CUL-1j**)

Table ES-5. Summary of Impacts for the Alternatives

Subject / Impact Criteria[1]	Alternative[2]	Impact Significance with Mitigation Incorporated[3]	Mitigation Measures
Impact CUL-3, *continued*	3	Class I or II if human remains or cultural items are present Class III or Class IV if cultural items are not considered significant or are not present Class IV if human remains are not present	Same mitigations as applied to Alternative 1 (**CUL-1a** through **CUL-1j**)
	4	Class I or II if human remains or cultural items are present Class III or Class IV if cultural items are not considered significant or are not present Class IV if human remains are not present	Same mitigations as applied to Alternative 1(**CUL-1a** through **CUL-1j**)
	5	Class I or Class II if historic or built-environment resources are present; Class III or Class IV if historic or built-environment resources are not considered significant or are not present	Same mitigations as applied to Alternative 1 (**CUL-1a** through **CUL-1j**)
	6	Class I if human remains or cultural items are present Class III or Class IV if cultural items are not considered significant or are not present Class IV if human remains are not present	No mitigation applied
Impact CUL-4: Affect cultural landscapes	1	Class IV (Direct) Class I (Indirect)	Same mitigations as applied to **Impact CUL-1** (**CUL-1a** through **CUL-1j**)
	2	Class I	Same mitigations as applied to Alternative 1 (**CUL-1a** through **CUL-1j**)
	3	Class I or II if cultural landscapes are present; Class III or Class IV if cultural landscapes are not considered significant or are not present	Same mitigations as applied to Alternative 1 (**CUL-1a** through **CUL-1j**)
	4	Class I if cultural landscapes are present Class III or Class IV if cultural landscapes are not considered significant or are not present	Same mitigations as applied to Alternative 1 (**CUL-1a** through **CUL-1j**)

Table ES-5. Summary of Impacts for the Alternatives

Subject / Impact Criteria[1]	Alternative[2]	Impact Significance with Mitigation Incorporated[3]	Mitigation Measures
Impact CUL-4, *continued*	5	Class I if cultural landscapes are present Class III or Class IV if cultural landscapes are not considered significant or are not present	Same mitigations as applied to Alternative 1 (**CUL-1a** through **CUL-1j**)
	6	Class I if cultural landscapes are present Class III or Class IV if cultural landscapes are not considered significant or are not present	No mitigation applied
Environmental Justice			
Impact EJ-1: Significant impacts would disproportionately affect minority or low-income populations	1	Unknown, possibly Class I (Indirect)	**EJ-1a:** Track Characteristics of Affected Populations in the Vicinity of Well Stimulation Treatments
	2	Unknown, possibly Class I (Indirect)	Same mitigation as applied to Alternative 1 (**EJ-1a**)
	3	Unknown, possibly Class I (Indirect)	Same mitigation as applied to Alternative 1 (**EJ-1a**)
	4	Unknown, possibly Class I	Same mitigation as applied to Alternative 1 (**EJ-1a**)
	5	Unknown, possibly Class I	Same mitigation as applied to Alternative 1 (**EJ-1a**)
	6	Class I	No mitigation applied
Geology, Soils and Mineral Resources			
Impact GEO-1: Expose people or structures to potential substantial adverse effects as a result of rupture of a known fault, seismically induced groundshaking, and/or ground failure	1	Class IV (Direct) Class II (Indirect)	**GEO-1a:** Avoid Active Faults if Necessary **GEO-1b:** Implement an Appropriate Setback if Necessary **GEO-1e:** Include an Earthquake Response Plan within the Spill Contingency Plan
	2	Class IV (Direct) Class II	Same mitigations as applied to Alternative 1 (**GEO-1a, GEO-1b, GEO-1e**)
	3	Class II	**GEO-1a:** Avoid Active Faults if Necessary **GEO-1b:** Implement an Appropriate Setback if Necessary **GEO-1d:** Conduct Ground Monitoring **GEO-1e:** Include an Earthquake Response Plan with the Spill Contingency Plan

Table ES-5. Summary of Impacts for the Alternatives

Subject / Impact Criteria[1]	Alternative[2]	Impact Significance with Mitigation Incorporated[3]	Mitigation Measures
Impact GEO-1, *continued*	4	Class II	**GEO-1a:** Avoid Active Faults if Necessary **GEO-1b:** Implement an Appropriate Setback if Necessary **GEO-1c:** Implement Industry Accepted Practices **GEO-1d:** Conduct Ground Monitoring **GEO-1e:** Include an Earthquake Response Plan within the Spill Contingency Plan
	5	Class II	**GEO-1b:** Implement Appropriate Setback **GEO-1c:** Implement Industry Accepted Practices **GEO-1d:** Conduct Ground Monitoring **GEO-1e:** Include an Earthquake Response Plan with the Spill Contingency Plan
	6	Class I	No mitigation applied
Impact GEO-2: Result in substantial soil erosion or the loss of topsoil	1	Class IV (Direct) Class II (Indirect)	**SWR-1a:** Require Stormwater Pollution Prevention Plan
	2	Class IV outside of existing fields (Direct) Class II within existing fields (Indirect) Class III (Indirect)	Same mitigation as applied to Alternative 1 (**SWR-1a**)
	3	Class II	No mitigation required
	4	Class III	**SWR 1a:** Require Stormwater Pollution Prevention Plan **SWR 2a:** Implement Erosion Control Plan
	5	Class III	Same mitigation as applied to Alternative 4 (**SWR-1a and SWR-2a**)
	6	Class I	No mitigation applied
Impact GEO-3: Be located on a geologic unit or soil that is unstable and result in on- or off-site landslide, lateral spreading, subsidence or collapse	1	Class IV (Direct) Class II (Indirect)	**GEO-3a:** Prepare Geotechnical Report if Necessary
	2	Class IV outside of existing fields (Direct) Class II within existing fields (Direct) Class III (Indirect)	Same mitigation as applied to Alternative 1 (**GEO-3a**)
	3	Class II	Same mitigation as applied to Alternative 1 (**GEO-3a**)

Table ES-5. Summary of Impacts for the Alternatives

Subject / Impact Criteria[1]	Alternative[2]	Impact Significance with Mitigation Incorporated[3]	Mitigation Measures
Impact GEO-3, *continued*	4	Class II	Same mitigation as applied to Alternative 1 (**GEO-3a**)
	5	Class II	Same mitigation as applied to Alternative 1 (**GEO-3a**)
	6	Class I	No mitigation applied
Impact GEO-4: Be located on expansive soil creating substantial risks to life or property	1	Class IV (Direct) Class III (Indirect)	No mitigation required
	2	Class IV outside of existing fields (Direct) Class III within existing fields (Indirect) Class III (Indirect)	No mitigation required
	3	Class III	No mitigation required
	4	Class III	No mitigation required
	5	Class III	No mitigation required
	6	Class III	No mitigation required
Impact GEO-5: Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems	1	Class IV	No mitigation required
	2	Class IV	No mitigation required
	3	Class IV	No mitigation required
	4	Class IV	No mitigation required
	5	Class IV	No mitigation required
	6	Class IV	No mitigation required
Impact GEO-6: Result in the loss of availability of known mineral resource, loss of a locally important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan	1	Class IV (Direct) Class I (loss of fossil fuels) Indirect) Class III (loss of non-fuel resources) (Indirect)	No mitigation proposed
	2	Class IV (loss of non-fuel resources) (Direct) Class I (loss of fossil fuels) (Direct) Class III (Indirect)	No mitigation proposed
	3	Class III in most instances; Class I in some instances	No mitigation proposed

Table ES-5. Summary of Impacts for the Alternatives

Subject / Impact Criteria[1]	Alternative[2]	Impact Significance with Mitigation Incorporated[3]	Mitigation Measures
Impact GEO-6, *continued*	4	Class III in most instances; Class I in some instances	No mitigation proposed
	5	Class III in most instances; Class I in some instances	No mitigation proposed
	6	Class I or III	No mitigation proposed
Impact GEO-7: Cause an induced seismic event including ground shaking and ground failure	1	Class IV (Direct) Class III (Indirect)	No mitigation required
	2	Class IV (Direct) Class III (Indirect)	No mitigation required
	3	Class III	No mitigation required
	4	Class III	No mitigation required
	5	Class III	No mitigation required
	6	Class III	No mitigation required
Greenhouse Gas Emissions			
Impact GHG-1: Generate greenhouse gas emissions that may have a significant impact on the environment	1	Class IV (Direct) Class I (Indirect)	**AQ-2b:** Reduce Emissions from Portable Equipment and Mobile Sources **GHG-1a:** Prevent Methane Emissions from Associated Gas and Casinghead Gas
	2	Class I	**GHG-1a:** Prevent Methane Emissions from Associated Gas and Casinghead Gas **GHG-1b:** Reduce Emissions by Implementing Clean Development Mechanism (CDM) Strategies **GHG-1c:** Detect and Quantify Fugitive and Vented Methane and Carbon Dioxide

Table ES-5. Summary of Impacts for the Alternatives

Subject / Impact Criteria[1]	Alternative[2]	Impact Significance with Mitigation Incorporated[3]	Mitigation Measures
Impact GHG-1, *continued*	3	Class I	**AQ-2a:** Reduce Hydrocarbon Emissions from Well Stimulation Treatments **AQ-2b:** Reduce Emissions from Portable Equipment and Mobile Sources **GHG-1a:** Prevent Methane Emissions from Associated Gas and Casinghead Gas **GHG-1b:** Reduce Emissions by Implementing Clean Development Mechanism (CDM) Strategies GHG 1c: Detect and Quantify Fugitive and Vented Methane and Carbon Dioxide
	4	Class I	Same mitigations as applied to Alternative 3 (**AQ-2a, AQ-2b, GHG-1a, GHG-1b, GHG-1c**)
	5	Class I	**AQ-2a:** Reduce Hydrocarbon Emissions from Well Stimulation Treatments **AQ-2b:** Reduce Emissions from Portable Equipment and Mobile Sources **GHG-1a:** Prevent Methane Emissions from Associated Gas and Casinghead Gas **GHG-1b:** Reduce Emissions by Implementing Clean Development Mechanism (CDM) Strategies. **GHG-1c:** Detect and Quantify Fugitive and Vented Methane and Carbon Dioxide
	6	Class I	No mitigation applied
Impact GHG-2: Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases	1	Class I	**AQ-2b:** Reduce Emissions from Portable Equipment and Mobile Sources **GHG-1a:** Prevent Methane Emissions from Associated Gas and Casinghead Gas

Table ES-5. Summary of Impacts for the Alternatives

Subject / Impact Criteria[1]	Alternative[2]	Impact Significance with Mitigation Incorporated[3]	Mitigation Measures
Impact GHG-2, *continued*	2	Class I	**AQ-2a:** Reduce Hydrocarbon Emissions from Well Stimulation Treatments **AQ-2b:** Reduce Emissions from Portable Equipment and Mobile Sources **GHG-1a:** Prevent Methane Emissions from Associated Gas and Casinghead Gas **GHG-2a:** Require Applicant to Enter into Mitigation Programs or Agreements for GHG Emissions not Covered by or Exempt from ARB's Cap and Trade Program
	3	Class I	**AQ-2a:** Reduce Hydrocarbon Emissions from Well Stimulation Treatments **AQ-2b:** Reduce Emissions from Portable Equipment and Mobile Sources **GHG-2a:** Require Applicant to Enter into Mitigation Programs or Agreements for GHG Emissions not Covered by or Exempt from ARB's Cap and Trade Program **GHG-1c:** Detect and Quantify Fugitive and Vented Methane and Carbon Dioxide
	4	Class I	**AQ-2a:** Reduce Hydrocarbon Emissions from Well Stimulation Treatments **AQ-2b:** Reduce Emissions from Portable Equipment and Mobile Sources **GHG-1c:** Detect and Quantify Fugitive and Vented Methane and Carbon Dioxide **GHG-2a:** Require Applicant Enter into Mitigation Programs or Agreements for GHG Emissions not Covered by or Exempt from ARB's Cap and Trade Program

Table ES-5. Summary of Impacts for the Alternatives

Subject / Impact Criteria[1]	Alternative[2]	Impact Significance with Mitigation Incorporated[3]	Mitigation Measures
Impact GHG-2, *continued*	5	Class I	**AQ-2a:** Reduce Hydrocarbon Emissions from Well Stimulation Treatments. **AQ-2b:** Reduce Emissions from Portable Equipment and Mobile Sources. **GHG-1c:** Detect and Quantify Fugitive and Vented Methane and Carbon Dioxide **GHG 2a:** Require Applicant Enter into Mitigation Programs or Agreements for GHG Emissions not Covered by or Exempt from ARB's Cap and Trade Program
	6	Class I	No mitigation applied
Hazards and Hazardous Materials			
Impact HAZ-1: Hazardous materials associated with well stimulation fluids could be released to the environment from a spill or leak	1	Class IV and V (Direct) Class I and III (Indirect)	No mitigation available
	2	Class II	**HAZ-1a:** Ensure that Spill Contingency Plan Provides Adequate Protection Against Leaks or Discharges of Dangerous Fluids and Other Potentially Dangerous Materials
	3	Class II	Same mitigation as applied to Alternative 2 (**HAZ-1a**)
	4	Class II	Same mitigation as applied to Alternative 2 (**HAZ-1a**)
	5	Class II	Same mitigation as applied to Alternative 2 (**HAZ-1a**)
	6	Class I	No mitigation applied
Groundwater Resources			
Impact GW-1: Cause or contribute to overdraft conditions in critically impacted groundwater basins	1	Class II (federal lands), III, and IV	**GW-1a:** Use Alternative Water Sources to the Extent Feasible
	2	Class II (Direct) Class IV (Indirect)	**GW-1a:** Use Alternative Water Sources to the Extent Feasible **GW-1b:** Minimize Groundwater Impacts
	3	Class II	Same mitigations as applied to Alternative 2 (**GW-1a, GW-1b**)
	4	Class II	Same mitigations as applied to Alternative 2 (**GW-1a, GW-1b**)
	5	Class II	Same mitigations as applied to Alternative 2 (**GW-1a, GW-1b**)
	6	Class I	No mitigation applied

Table ES-5. Summary of Impacts for the Alternatives

Subject / Impact Criteria[1]	Alternative[2]	Impact Significance with Mitigation Incorporated[3]	Mitigation Measures
Impact GW-2: Lower groundwater levels through pumping, resulting in subsidence or impacts to nearby water wells	1	Class II (federal lands), III, and IV	**GW-1b:** Minimize Groundwater Impacts
	2	Class II (Direct) Class IV (Indirect)	Same mitigation as applied to Alternative 1 (**GW-1b**)
	3	Class II	Same mitigation as applied to Alternative 1 (**GW-1b**)
	4	Class II	Same mitigation as applied to Alternative 1 (**GW-2a**)
	5	Class II	Same mitigation as applied to Alternative 1 (**GW-2a**)
	6	Class I	No mitigation applied
Impact GW-3: Water quality in the Protected Water zone is adversely affected through surface spill or leak during well stimulation treatment	1	Class II (federal lands)	**HAZ-1a:** Ensure that Spill Contingency Plan Provides Adequate Protection Against Leaks or Discharges of Dangerous Fluids and Other Potentially Dangerous Materials
	2	Class II (Direct) Class IV (Indirect)	Same mitigation as applied to Alternative 1 (**HAZ-1a**)
	3	Class II	Same mitigation as applied to Alternative 1 (**HAZ-1a**)
	4	Class II	Same mitigation as applied to Alternative 1 (**HAZ-1a**)
	5	Class II	Same mitigation as applied to Alternative 1 (**HAZ-1a**)
	6	Class I	No mitigation applied
Impact GW-4: Non-existent or ineffective well seals in annular space resulting in migration of fluids	1	Class II (federal lands) and IV	**GW-4a:** Demonstrate that Wells within the ADSA Have Effective Cement Well Seals and Monitor Wells during Well Stimulation Treatment **GW-4b:** Install a Well Seal Across Protected Groundwater for New Wells Subject to Well Stimulation Treatments **GW-4c:** Install Methane Sensors on Wells Subject to Well Stimulation Treatments.
	2	Class II (Direct) Class IV (Indirect)	Same mitigations as applied to Alternative 1 (**GW-4a** through **GW-4c**)
	3	Class II	Same mitigations as applied to Alternative 1 (**GW-4a** through **GW-4c**)

Table ES-5. Summary of Impacts for the Alternatives

Subject / Impact Criteria[1]	Alternative[2]	Impact Significance with Mitigation Incorporated[3]	Mitigation Measures
Impact GW-4, *continued*	4	Class II	Same mitigations as applied to Alternative 1 (**GW-4a** through **GW-4c**)
	5	Class II	Same mitigations as applied to Alternative 1 (**GW-4a** through **GW-4c**)
	6	Class I	No mitigation applied
Impact GW-5: Fluids introduced to Protected Water through damaged or improperly abandoned wells within area of influence of new well.	1	Class II (federal lands) and IV	**GW-5a:** Conduct Surface Geophysical Surveys or Apply Other Field Methods to Locate Improperly Abandoned Wells and Mitigate
	2	Class II (Direct) Class IV (Indirect)	Same mitigation as applied to Alternative 1 (**GW-5a**)
	3	Class II	Same mitigation as applied to Alternative 1 (**GW-5a**)
	4	Class II	Same mitigation as applied to Alternative 1 (**GW-5a**)
	5	Class II	Same mitigation as applied to Alternative 1 (**GW-5a**)
	6	Class I	No mitigation applied
Impact GW-6: Improper disposal of flowback in injection wells could potentially impact groundwater quality	1	Class II (federal lands) and IV	**GW-6a:** Require Wastewater Disposal Wells to Inject Only into Exempted Aquifers to Protect Groundwater
	2	Class II (Direct) Class IV (Indirect)	Same mitigation as applied to Alternative 1 (**GW-6a**)
	3	Class II	Same mitigation as applied to Alternative 1 (**GW-6a**)
	4	Class II	Same mitigation as applied to Alternative 1 (**GW-6a**)
	5	Class II	Same mitigation as applied to Alternative 1 (**GW-6a**)
	6	Class I	No mitigation applied
Impact GW-7: Inability to identify specific impacts to groundwater quality from well stimulation activities	1	Class II (federal lands) and IV	**GW-7a:** Add a Tracer to Well Stimulation Fluids or Develop a Reasonable Method to Distinguish These Fluids in the Environment
	2	Class II (Direct) Class IV (Indirect)	Same mitigation as applied to Alternative 1 (**GW-7a**)
	3	Class II	Same mitigation as applied to Alternative 1 (**GW-7a**)
	4	Class II	Same mitigation as applied to Alternative 1 (**GW-7a**)

Table ES-5. Summary of Impacts for the Alternatives

Subject / Impact Criteria[1]	Alternative[2]	Impact Significance with Mitigation Incorporated[3]	Mitigation Measures
Impact GW-7, *continued*	5	Class II	Same mitigation as applied to Alternative 1 (**GW-7a**)
	6	Class I	No mitigation applied
Land Use and Planning			
LU-1: Preclude existing or permitted land uses, or create a disturbance that would diminish the function of land uses	1	Class IV (Direct) Class I or III(Indirect)	(No mitigation available for impacts associated with Risk of Upset/Public and Worker Safety)
	2	Class I	(No mitigation for impacts associated with Risk of Upset/Public and Worker Safety)
	3	Class I	(No mitigation available for impacts associated with Risk of Upset/Public and Worker Safety)
	4	Class I	(No mitigation available for impacts associated with Risk of Upset/Public and Worker Safety)
	5	Class I	(No mitigation available for impacts associated with Risk of Upset/Public and Worker Safety)
	6	Class I	No mitigation applied
Impact LU-2: Physically divide an established community	1	Class IV	No mitigation required
	2	Class III	No mitigation required
	3	Class III	No mitigation required
	4	Class III	No mitigation required
	5	Class III	No mitigation required
	6	Class III	No mitigation required
Impact LU-3: Conflict with applicable land use plans, policies, programs, ordinances or other land use regulations of agencies with jurisdiction over a project adopted for the purpose of avoiding or mitigating an environmental effect	1	Class IV	No mitigation required
	2	Class II	(PRC Section 1783.2 requiring "Neighbor Notification") (All mitigation measures prescribed in this EIR)
	3	Class II	(PRC Section 1783.2 requiring "Neighbor Notification") (All mitigation measures prescribed in this EIR)
	4	Class II	(PRC Section 1783.2 requiring "Neighbor Notification") (All mitigation measures prescribed in this EIR)

Table ES-5. Summary of Impacts for the Alternatives

Subject / Impact Criteria[1]	Alternative[2]	Impact Significance with Mitigation Incorporated[3]	Mitigation Measures
Impact LU-3, *continued*	5	Class II	(PRC Section 1783.2 requiring "Neighbor Notification") (All mitigation measures prescribed in this EIR)
	6	Class I	No mitigation applied
Noise and Vibration			
Impact NOI-1: Cause exposure of persons to or generation of excessive noise levels or a substantial increase in ambient noise levels	1	Class IV and V (Direct) Class II (federal lands) and V (Indirect)	**NOI-1a:** Control Noise Levels near Sensitive Land Uses **NOI-1b:** Control Noise Levels from Well Drilling Near Noise Sensitive Land Uses
	2	Class II (Direct) Class II to Class IV (Indirect)	Same mitigation as applied to Alternative 1 (**NOI-1a**)
	3	Class II	Same mitigation as applied to Alternative 1 (**NOI-1a**)
	4	Class II	Same mitigation as applied to Alternative 1 (**NOI-1a**)
	5	Class II	Same mitigation as applied to Alternative 1 (**NOI-1a**)
	6	Class I	No mitigation applied
Impact NOI-2: Cause exposure of persons to or generation of excessive groundborne vibration	1	Class IV and V (Direct) Class II and V (Indirect)	Mitigation may be required if new infrastructure is closer to noise sensitive receivers
	2	Class IV (Direct) Class I to IV (Indirect)	Mitigation may be required if new infrastructure is closer to noise sensitive receivers
	3	Class III	No mitigation required
	4	Class III	No mitigation required
	5	Class III	No mitigation required
	6	Class III	No mitigation applied

Table ES-5. Summary of Impacts for the Alternatives

Subject / Impact Criteria[1]	Alternative[2]	Impact Significance with Mitigation Incorporated[3]	Mitigation Measures
Paleontological Resources			
Impact PALEO-1: Well stimulation treatments would destroy or disturb surface or near-surface significant paleontological resources	1	Class IV (Direct) Class II (Indirect)	**PALEO-1a:** Require Information and Evaluate Paleontological Resources **PALEO-1b:** Develop Paleontological Resource Mitigation Plan **PALEO-1c:** Retain Qualified Paleontological Resources Staff **PALEO-1d:** Conduct a Paleontological Resources Worker Environmental Awareness Program **PALEO-1e:** Monitor Earth Disturbing Activities for Paleontological Resources **PALEO-1f:** Provide Qualified Paleontological Resources Monitor with Authority to Halt Earth Disturbing Activities **PALEO-1g:** Prepare Paleontological Resources Report for the Monitoring of Earth Disturbing Activities **PALEO-1h:** Curate all Discovered Paleontological Resources Associated with Earth Disturbing Activities
	2	Class II	Same mitigations as applied to Alternative 1 (**PALEO-1a** through **PALEO-1h**)
	3	Class II if fossil bearing geologic units are present Class IV if no fossil bearing units are present	Same mitigations as applied to Alternative 1 (**PALEO-1a** through **PALEO-1h**)
	4	Class II if fossil bearing geologic units are present Class IV if no fossil bearing units are present	Same mitigation as applied to Alternative 1 (**PALEO-1a** through **PALEO-1h**)
	5	Class II if fossil bearing geologic units are present Class IV if no fossil bearing units are present	Same mitigations as applied to Alternative 1 (**PALEO-1a** through **PALEO-1h**)
	6	Class I if fossil bearing geologic units are present	No mitigation applied
Population and Housing			
Impact POP-1: Induce substantial population growth	1	Class III	No mitigation required
	2	Class III	No mitigation required
	3	Class III	No mitigation required

Table ES-5. Summary of Impacts for the Alternatives

Subject / Impact Criteria[1]	Alternative[2]	Impact Significance with Mitigation Incorporated[3]	Mitigation Measures
Impact POP-1, *continued*	4	Class III	No mitigation required
	5	Class III	No mitigation required
	6	Class III	No mitigation applied
Impact POP-2: Displace substantial numbers of people or existing housing, necessitating the construction of replacement housing elsewhere	1	Class III	No mitigation required
	2	Class III	No mitigation required
	3	Class III	No mitigation required
	4	Class III	No mitigation required
	5	Class III	No mitigation required
	6	Class III	No mitigation required
Public Services			
Impact PUB-1: Require new or physically altered governmental facilities in order to maintain acceptable service ratios, response times, or to other performance objectives for fire, police, or schools	1	Class IV (Direct) Class II (Indirect)	**PUB-1a:** Assess Public Service Ratios and Ensure Adequate Compensation
	2	Class II	Same mitigation as applied to Alternative 1 (**PUB-1a**)
	3	Class II outside of existing oil and gas fields where 10 or more wells are drilled by a single applicant within 1 square mile; Otherwise, Class III	Same mitigation as applied to Alternative 1 (**PUB-1a**) **TR-1a:** Prepare Traffic Plan
	4	Class II	Same mitigation as applied to Alternative 1 (**PUB-1a)**
	5	Class II	Same mitigation as applied to Alternative 1 (**PUB-1a)**
	6	Class I for Increased Need for Fire or Police Services Due to Project Activities Class III for Increased Need for Public Services Due to Population Growth	No mitigation applied

Table ES-5. Summary of Impacts for the Alternatives

Subject / Impact Criteria[1]	Alternative[2]	Impact Significance with Mitigation Incorporated[3]	Mitigation Measures
Recreation			
REC-1: Result in the physical deterioration of recreational resources	1	Class IV	No mitigation required
	2	Class III	No mitigation required
	3	Class III	No mitigation required
	4	Class III	No mitigation required
	5	Class III	No mitigation required
	6	Class III	No mitigation applied
Impact REC-2: Cause disruptions in designated recreation areas	1	Class IV	No mitigation required
	2	Class II	**REC-2a:** Coordinate Well Stimulation Treatment Schedule with Managing Officer(s) for Affected Recreation Areas **REC-2b:** Provide Noticing of Closures and Identify Alternative Recreation Areas
	3	Class II	Same mitigations as applied to Alternative 2 (**REC-2a** and **REC-2b**)
	4	Class II	Same mitigations as applied to Alternative 2 (**REC-2a** and **REC-2b**)
	5	Class II	Same mitigations as applied to Alternative 2 (**REC-2a** and **REC-2b**)
	6	Class I	No mitigation applied
Risk of Upset/Public and Worker Safety			
Impact RSK-1: Create a hazard to the public or environment through crude oil transport and reasonably foreseeable accidents and releases	1	Class I	**RSK-1a:** Increase the Number of CPUC Rail Inspectors **RSK-1b:** Expedite the Phase-out of Older Tank Cars **RSK-1c:** Implement New Accident Prevention Technology **RSK-1d:** Monitor and Enforce New Speed Limits **RSK-1e:** Monitor the Implementation of Trackside Safety Technology **RSK-1f:** Improve Emergency Preparedness and Response Programs **RSK-1g:** Provide Real-Time Shipment Information to Emergency Responders **RSK-1h:** Provide Additional Accident and Injury Data to the State

Table ES-5. Summary of Impacts for the Alternatives

Subject / Impact Criteria[1]	Alternative[2]	Impact Significance with Mitigation Incorporated[3]	Mitigation Measures
Impact RSK-1, *continued*	2	Class I	Same mitigations as applied to Alternative 1 (**RSK-1a** through **RSK-1h**)
	3	Class I	Same mitigations as applied to Alternative 1 (**RSK-1a** through **RSK-1h**)
	4	Class I	Same mitigations as applied to Alternative 1 (**RSK-1a** through **RSK-1h**)
	5	Class I	Same mitigations as applied to Alternative 1 (**RSK-1a** through **RSK-1h**)
	6	Class I	No mitigation applied
Impact RSK-2: Create a hazard to the public, workers, or environment through a reasonably foreseeable accidental release of hazardous materials due to a hose leak or connection leak while pumping well stimulation treatment fluids	1	Class II	**RSK-2a:** Reduce the Inventory/Volumes Handled with the Hazardous Chemicals **RSK-2b:** Conduct a Facility Siting Study or a Quantitative Risk Assessment **RSK-2c:** Ensure Mechanical Integrity Through Compliance with Regulation
	2	Class II	Same mitigations as applied to Alternative 1 (**RSK-2a** through **RSK-2c**)
	3	Class II	Same mitigations as applied to Alternative 1 (**RSK-2a** through **RSK-2c**)
	4	Class II	Same mitigations as applied to Alternative 1 (**RSK-2a** through **RSK-2c**)
	5	Class II	Same mitigations as applied to Alternative 1 (**RSK-2a** through **RSK-2c**)
	6	Class I	No mitigation applied
Impact RSK-3: Substantially increase the potential for major oil spills due to ship groundings and collisions	1	Class III	No mitigation required
	2	Class III	No mitigation required
	3	Class III	No mitigation required
	4	Class III	No mitigation required
	5	Class III	No mitigation required
	6	Class III	No mitigation applied

Table ES-5. Summary of Impacts for the Alternatives

Subject / Impact Criteria[1]	Alternative[2]	Impact Significance with Mitigation Incorporated[3]	Mitigation Measures
Impact RSK-4: Create a hazard to the public, workers, or environment through reasonably foreseeable accidental pressure changes during flowback activity caused by blocked pump discharge, sudden change in downhole condition, or human error	1	Class II	**RSK-4a:** Conduct a Process Hazard Analysis (PHA) Followed by a Layer of Protection Analysis (LOPA) to Ensure Installation of Proper Safety Interlocks
	2	Class II	Same mitigation as applied to Alternative 1 (**RSK-4a**)
	3	Class II	Same mitigation as applied to Alternative 1 (**RSK-4a**)
	4	Class II	Same mitigation as applied to Alternative 1 (**RSK-4a**)
	5	Class II	Same mitigation as applied to Alternative 1 (**RSK-4a**)
	6	Class I	No mitigation applied
Impact RSK-5: Generate risks to public safety by causing a flammable atmosphere in the flowback tank	1	Class II	**RSK-5a:** Prepare and Implement the Procedures to Avoid Pump Cavitation during all Well Stimulation Activities **RSK-5b:** Verify the Need of Installation of Flame Arresters on the Tank Vents **RSK-5c:** Prepare and Implement a Control of Ignition Sources Plan
	2	Class II	Same mitigations as applied to Alternative 1 (**RSK-5a** through **RSK-5c**)
	3	Class II	Same mitigations as applied to Alternative 1 (**RSK-5a** through **RSK-5c**)
	4	Class II	Same mitigations as applied to Alternative 1 (**RSK-5a** through **RSK-5c**)
	5	Class II	Same mitigations as applied to Alternative 1 (**RSK-5a** through **RSK-5c**)
	6	Class I	No mitigation applied
Impact RSK-6: Increase risks to public safety by exposing the public to accidental crude oil or produced gas releases from pipelines	1	Class I	**RSK-6a:** Increase Inspection of Mechanical Integrity **RSK-6b:** Improve Leak Detection Capability **RSK-6c:** Reduce Mainline Valve Spacing
	2	Class I	Same mitigations as applied to Alternative 1 (**RSK-6a** through **RSK-6c**)
	3	Class I	Same mitigations as applied to Alternative 1 (**RSK-6a** through **RSK-6c**)

Table ES-5. Summary of Impacts for the Alternatives

Subject / Impact Criteria[1]	Alternative[2]	Impact Significance with Mitigation Incorporated[3]	Mitigation Measures
Impact RSK-6, *continued*	4	Class I	Same mitigations as applied to Alternative 1 (**RSK-6a** through **RSK-6c**)
	5	Class I	Same mitigations as applied to Alternative 1 (**RSK-6a** through **RSK-6c**)
	6	Class I	No mitigation applied
Impact RSK-7: Expose workers and public to hazardous levels of airborne silica during the use of proppant	1	Class II	**RSK-7a:** Use Alternative Proppant (e.g., Sintered Bauxite, Ceramics, Resins) or Use Alternative Proppant Delivery System **RSK-7b:** Reduce Emissions from Dust-Causing Activities
	2	Class II	Same mitigations as applied to Alternative 1 (**RSK-7a** and **RSK-7b**)
	3	Class II	Same mitigations as applied to Alternative 1 (**RSK-7a** and **RSK-7b**)
	4	Class II	Same mitigations as applied to Alternative 1 (**RSK-7a** and **RSK-7b**)
	5	Class II	Same mitigations as applied to Alternative 1 (**RSK-7a** and **RSK-7b**)
	6	Class I	No mitigation applied
Surface Water Resources			
Impact SWR-1: Violate water quality standards or waste discharge requirements, provide substantial additional sources of polluted runoff, or otherwise substantially degrade or diminish surface water quality	1	Class IV (Direct) Class III (federal lands) and III (Indirect)	**SWR-1a:** Require Stormwater Pollution Prevention Plan **SWR-1b:** Surface Water Protection **SWR-1c:** Provide Adequate Flood Protection **SWR-1d:** Protect Surface Water Reservoirs **BIOT-2a:** Prevent Hazards to Fish and Wildlife
	2	Class II	**SWR-1a:** Require Stormwater Pollution Prevention Plan **SWR-1b:** Surface Water Protection **SWR-1c:** Provide Adequate Flood Protection **SWR-1d:** Protect Surface Water Reservoirs
	3	Class II	Same mitigations as applied to Alternative 2 (**SWR-1a** through **SWR-1d**)

Table ES-5. Summary of Impacts for the Alternatives

Subject / Impact Criteria[1]	Alternative[2]	Impact Significance with Mitigation Incorporated[3]	Mitigation Measures
Impact SWR-1, *continued*	4	Class II	Same mitigations as applied to Alternative 1 (**SWR-1a** through **SWR-1d, BIOT-2a**)
	5	Class II	Same mitigations as applied to Alternative 2 (**SWR-1a** through **SWR-1d, BIOT-2a**)
	6	Class I	No mitigation applied
Impact SWR-2: Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site	1	Class IV (Direct) Class II (federal lands) and IV (Indirect)	**SWR-2a:** Implement Erosion Control Plan
	2	Class II	Same mitigation as applied to Alternative 1 (**SWR-2a**)
	3	Class II	Same mitigation as applied to Alternative 1 (**SWR-2a**)
	4	Class II	Same mitigation as applied to Alternative 1 (**SWR-2a**)
	5	Class II	Same mitigation as applied to Alternative 1 (**SWR-2a**)
	6	Class I	No mitigation applied
Impact SWR-3: Substantially diminish surface water quantity	1	Class IV (Direct) Class II (federal lands) and IV (Indirect)	**SWR-3a:** Ensure Adequate Water
	2	Class II	Same mitigation as applied to Alternative 1 (**SWR-3a**)
	3	Class II	Same mitigation as applied to Alternative 1 (**SWR-3a**)
	4	Class II	Same mitigation as applied to Alternative 1 (**SWR-3a**)
	5	Class II	Same mitigation as applied to Alternative 1 (**SWR-3a**)
	6	Class I	No mitigation applied
Impact SWR-4: Create flood hazard by substantially altering existing drainage patterns, substantially increasing the rate or amount of surface runoff, impeding or redirecting flood flows, or exposing people or structures to flooding	1	Class IV (Direct) Class II (federal lands) and IV (Indirect)	**SWR-1c:** Provide Adequate Flood Protection
	2	Class II	Same mitigation as applied to Alternative 1 (**SWR-1c**)
	3	Class II	Same mitigation as applied to Alternative 1 (**SWR-1c**)
	4	Class II	Same mitigation as applied to Alternative 1 (**SWR-1c**)
	5	Class II	Same mitigation as applied to Alternative 1 (**SWR-1c**)
	6	Class I	No mitigation applied

Table ES-5. Summary of Impacts for the Alternatives

Subject / Impact Criteria[1]	Alternative[2]	Impact Significance with Mitigation Incorporated[3]	Mitigation Measures
Transportation and Traffic			
Impact TR-1: Generate additional truck traffic and disrupt traffic operations	1	Class V (Direct) Class III (Indirect)	No mitigation required
	2	Class I (transport of hazardous materials) or V	No mitigation available
	3	Class III for Project activities in Study Region 6 and for existing fields; Class II outside of existing oil and gas fields in Study Regions 1-5 where 10 or more wells are drilled by a single applicant within 1 square mile	**TR-1a:** Prepare Traffic Plan
	4	Class III for Project activities in Study Region 6 and for existing fields; Class II outside of existing oil and gas fields in Study Regions 1-5 where 10 or more wells are drilled by a single applicant within 1 square mile	Same mitigation as applied to Alternative 3 (**TR-1a**)
	5	Class III for Project activities in Study Region 6 and for existing fields; Class II outside of existing oil and gas fields in Study Regions 1-5 where 10 or more wells are drilled by a single applicant within 1 square mile	Same mitigation as applied to Alternative 3 (**TR-1a**)
	6	Class I outside of existing fields in Study Regions 1-5 where 10 or more wells are drilled by a single applicant within one square mile Class III in existing fields and Study Region 6	No mitigation applied
Impact TR-2: Inadvertently damage road rights-of-way	1	Class V (Direct) Class II (Indirect)	**TR-2a:** Repair Roadway Damage
	2	Class II	Same mitigation as applied to Alternative 1 (**TR-2a**)
	3	Class III for Project activities in Study Region 6 and for existing fields; Class II outside of existing oil and gas fields in Study Regions 1-5 where 10 or more wells are drilled by a single applicant within 1 square mile	Same mitigation as applied to Alternative 1 (**TR-2a**)

Table ES-5. Summary of Impacts for the Alternatives

Subject / Impact Criteria[1]	Alternative[2]	Impact Significance with Mitigation Incorporated[3]	Mitigation Measures
Impact TR-2, *continued*	4	Class III for Project activities in Study Region 6 and for existing fields; Class II outside of existing oil and gas fields in Study Regions 1-5 where 10 or more wells are drilled by a single applicant within 1 square mile	Same mitigation as applied to Alternative 1 (**TR-2a**)
	5	Class III for Project activities in Study Region 6 and for existing fields; Class II outside of existing oil and gas fields in Study Regions 1-5 where 10 or more wells are drilled by a single applicant within 1 square mile	Same mitigation as applied to Alternative 1 (**TR-2a**)
	6	Class I (as above for TR-1) Class III (as above for TR-1)	No mitigation applied
Impact TR-3: Cause traffic safety hazards for vehicles, bicyclists, and pedestrians	1	Class V (Direct) Class III (Indirect)	No mitigation required
	2	Class III	No mitigation required
	3	Class III for Project activities in Study Region 6 and for existing fields; Class II outside of existing oil and gas fields in Study Regions 1-5 where 10 or more wells are drilled by a single applicant within 1 square mile	**TR-1a:** Prepare Traffic Plan
	4	Class III for Project activities in Study Region 6 and for existing fields; Class II outside of existing oil and gas fields in Study Regions 1-5 where 10 or more wells are drilled by a single applicant within 1 square mile	Same mitigation as applied to Alternative 3 (**TR-1a**)
	5	Class III for Project activities in Study Region 6 and for existing fields; Class II outside of existing oil and gas fields in Study Regions 1-5 where 10 or more wells are drilled by a single applicant within 1 square mile	Same mitigation as applied to Alternative 3 (**TR-1a**)
	6	Class I outside of existing fields in Study Regions 1-55 where 10 or more wells are drilled by a single applicant within one square mile Class III in existing fields and Study Region 6	No mitigation applied

Table ES-5. Summary of Impacts for the Alternatives

Subject / Impact Criteria[1]	Alternative[2]	Impact Significance with Mitigation Incorporated[3]	Mitigation Measures
Impact TR-4: Transport hazardous materials	1	Class I	No mitigation available
	2	Class I	**TR-4a:** Know Spill Prevention Measures
	3	Class I	Same mitigation as applied to Alternative 2 (**TR-4a**)
	4	Class I	Same mitigation as applied to Alternative 2 (**TR-4a**)
	5	Class I	Same mitigation as applied to Alternative 2 (**TR-4a**)
	6	Class I	No mitigation applied
Impact TR-5: Change air traffic patterns	1	Class V (Direct) Class III (Indirect)	No mitigation required
	2	Class III	No mitigation required
	3	Class IV if no airports are nearby Class III if FAA notification under 14 CFR 77 is required	No mitigation required
	4	Class IV if no airports are nearby Class III if FAA notification under 14 CFR 77 is required	No mitigation required
	5	Class IV if no airports are nearby Class III if FAA notification under 14 CFR 77 is required	No mitigation required
	6	Class IV if no airports are nearby	No mitigation applied
Impact TR-6: Temporarily interfere with emergency response	1	Class V (Direct) Class III (Indirect)	No mitigation required
	2	Class III	No mitigation required
	3	Class II	**PUB-1a:** Assess Public Service Ratios and Ensure Adequate Compensation
	4	Class III for Project activities in Study Region 6 and for existing fields; Class II in Study Regions 1-5 outside of existing oil and gas fields where 10 or more wells are drilled by a single applicant within 1 square mile	**TR-1a:** Prepare Traffic Plan **TR-2a:** Repair Roadway Damage **TR-4a:** Know Spill Prevention Measures

Table ES-5. Summary of Impacts for the Alternatives

Subject / Impact Criteria[1]	Alternative[2]	Impact Significance with Mitigation Incorporated[3]	Mitigation Measures
Impact TR-6, *continued*	5	Class III for Project activities in Study Region 6 and for existing fields; Class II outside of existing oil and gas fields in Study Regions 1-5 where 10 or more wells are drilled by a single applicant within 1 square mile	Same mitigation as applied to Alternative 4 (**TR-1a, TR-2a, TR-4a**)
	6	Class I (as above for TR-1) Class III	No mitigation applied
Utilities and Service Systems			
Impact UTL-1: Adversely affect utilities and service systems due to population growth from Project-related development	1	Class III	No mitigation required
	2	Class IV (Direct) Class III (Indirect)	No mitigation required
	3	Class II	**PUB-1a:** Assess Public Service Ratios and Ensure Adequate Compensation
	4	Class III	No mitigation required
	5	Class III	No mitigation required
	6	Class III	No mitigation required
Impact UTL-2: Require new or expanded electrical or natural gas infrastructure	1	Class III	No mitigation required
	2	Class IV (Direct) Class III (Indirect)	No mitigation required
	3	Class III	No mitigation required
	4	Class III	No mitigation required
	5	Class III	No mitigation required
	6	Class III	No mitigation required
Impact UTL-3: Exceed existing municipal wastewater treatment provider capacities	1	Class III	No mitigation required
	2	Class IV (Direct) Class II (Indirect)	**UTL-3a:** Assess Wastewater Quality and Ensure Adequate Capacity to Process Wastewater at Municipal and Private Wastewater Treatment Plants
	3	Class III	No mitigation required

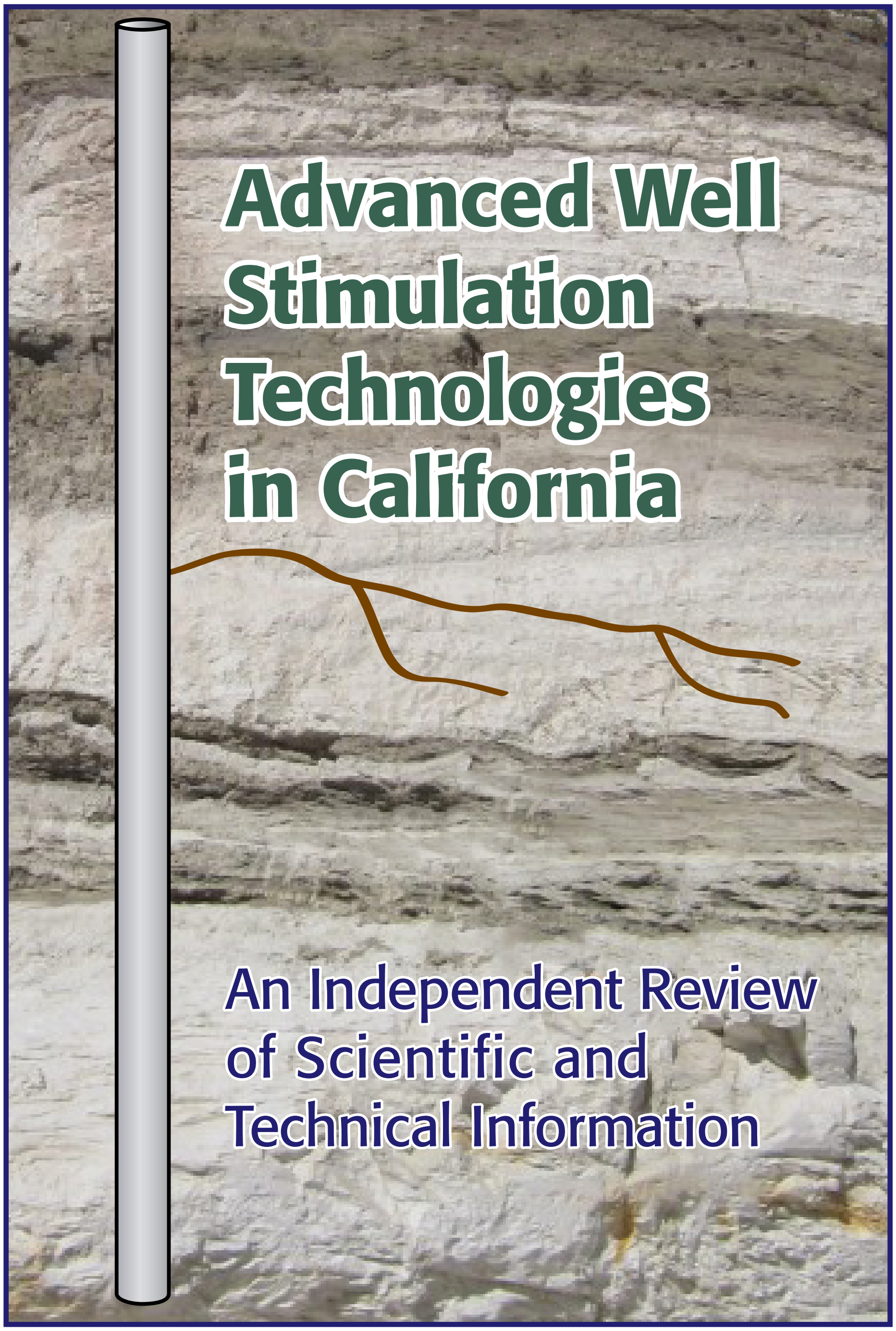
Table ES-5. Summary of Impacts for the Alternatives

Subject / Impact Criteria[1]	Alternative[2]	Impact Significance with Mitigation Incorporated[3]	Mitigation Measures
Impact UTL-3, *continued*	4	Class II	Same mitigation as applied to Alternative 2 (**UTL-3a**)
	5	Class II	Same mitigation as applied to Alternative 2 (**UTL-3a**)
	6	Class I	No mitigation applied
Impact UTL-4: Exceed permitted solid waste capacity of landfills	1	Class III	No mitigation required
	2	Class IV (Direct) Class II (Indirect)	**UTL-4a:** Assess Non-Hazardous Solid Waste Generation and Ensure Adequate Capacity to Accept Solid Waste at Municipal and Private Solid Waste Facilities
	3	Class III	No mitigation required
	4	Class II	Same mitigation as applied to Alternative 2 (**UTL-4a**)
	5	Class II	Same mitigation as applied to Alternative 2 (**UTL-4a**)
	6	Class I	No mitigation applied

1 - The occurrence of significant and unavoidable impacts (Class I) for some subject areas is contingent on site-specific conditions of where a proposed well stimulation treatment may occur. As example, if a proposed well stimulation site's future environmental review demonstrates that no cultural resources are present, no impacts would occur and no mitigation would be required. However, if the site does contain such resources, potential impacts could be either significant and unavoidable (Class I), less than significant with mitigation incorporated (Class II), less than significant (Class III), no impact (Class IV), or beneficial impact (Class V).

2 - Alternatives:
1 No Future Well Stimulation Treatments Alternative
2 No Future Well Stimulation Treatments Outside of Existing Oil and Gas Field Boundaries Alternative
3 Well Pad Consolidation Alternative
4 Urbanized Area Protection Alternative
5 Active Fault Zone Restrictions Alternative
6 No Project Alternative

3 - Class I = Significant and Unavoidable Impact; Class II = Less Than Significant Impact With Mitigation Incorporated; Class III = Less Than Significant Impact; Class IV = No Impact.



Executive Summary

California Council on Science and Technology
Lawrence Berkeley National Laboratory
Pacific Institute

July 2016

Attachment 3 - Advanced Well Stimulation Technologies in California Report

Advanced Well Stimulation Technologies in California

An Independent Review of Scientific and Technical Information

Executive Summary

California Council on Science and Technology
Lawrence Berkeley National Laboratory
Pacific Institute

Report updated July, 2016

Acknowledgments

This report has been prepared for the California Council on Science and Technology (CCST) with funding from the United States Bureau of Land Management.

Copyright

Copyright 2014 by the California Council on Science and Technology
ISBN Number: 978-1-930117-94-5
Advanced Well Stimulation Technologies in California: An Independent Review of Scientific and Technical Information, Executive Summary

About CCST

CCST is a non-profit organization established in 1988 at the request of the California State Government and sponsored by the major public and private postsecondary institutions of California and affiliate federal laboratories in conjunction with leading private-sector firms. CCST's mission is to improve science and technology policy and application in California by proposing programs, conducting analyses, and recommending public policies and initiatives that will maintain California's technological leadership and a vigorous economy.

Note

The California Council on Science and Technology (CCST) has made every reasonable effort to assure the accuracy of the information in this publication. However, the contents of this publication are subject to changes, omissions, and errors, and CCST does not accept responsibility for any inaccuracies that may occur.

For questions or comments on this publication contact:
California Council on Science and Technology
1130 K Street, Suite 280
Sacramento, CA 95814
916-492-0996
ccst@ccst.us
www.ccst.us

Layout by a Graphic Advantage! 3901 Carter Street #2, Riverside, CA 92501
www.agraphicadvantage.com

Executive Summary

California Council on Science and Technology (CCST) Steering Committee
Lawrence Berkeley National Laboratory (LBNL)
Pacific Institute (PI)
August 28, 2014

Background and Key Objectives

In the context of rapidly increasing oil production from low-permeability rocks, including hydrocarbon source rocks, elsewhere in the country, the Bureau of Land Management (BLM) as an owner of federal lands with potential for expanded oil exploration and production in California was interested in an up-to-date independent technical assessment of well stimulation technologies (WST), with a focus on hydraulic fracturing, employed in this state. WST increase the permeability of rocks around a well to allow or increase oil production. The three WST considered in this report include hydraulic fracturing, acid fracturing, and matrix acid stimulation as practiced in California.

The purpose of this report, commissioned in September 2013, is to provide BLM with the required independent technical assessment. (Appendix A provides BLM's charge to the California Council on Science and Technology (CCST).) This information will be used in future planning, leasing, and development decisions regarding oil and gas issues on the Federal mineral estate in California. The report provides a synthesis and assessment of the scientific and engineering information available up to February 2014 associated with hydraulic fracturing and other WST in onshore oil reservoirs in California.

This report addresses three key questions posed by BLM:

- **Key Question 1:** What are the past, current and potential future practices in well stimulation technologies including hydraulic fracturing, acid fracturing, and matrix acidizing in California?

- **Key Question 2:** Where will well stimulation technologies allow expanded production of oil onshore in California?

- **Key Question 3:** What are the potential environmental hazards of well stimulation technologies in California?

CCST Committee Process

A WST steering committee was assembled and vetted by CCST. Members were appointed based on technical expertise and a balance of technical viewpoints. (Appendix A provides information about CCST's steering committee.) In parallel, BLM contracted with Lawrence

Berkeley National Laboratory (LBNL) to support the analysis and develop the findings based on the literature review and analyses. Appendix B provides information about the LBNL review team, which authored Sections 2, 3, 4, and 5 of this report.

For each of the three key questions asked by the BLM, investigations conducted by LBNL and their contractors led to a series of findings, and based on these findings, the steering committee reached a series of consensus conclusions. These findings and conclusions are included below. The literature and analyses are described in the bulk of this report in Sections 2, 3, 4, and 5.

This report has also undergone extensive peer review. (Peer reviewers are listed in Appendix H, "California Council on Science and Technology Study Process.") Reviewers were chosen for their relevant technical expertise. Following the receipt of peer review comments in May 2014, this report was revised.

Method and Data Sets Available for the Report

This assessment is based on review and analysis of existing data and scientific literature. Preference is given to using the findings in peer-reviewed scientific literature. Peer-reviewed scientific literature is principally found in peer-reviewed scholarly journals. Certain institutions such as the National Academies of Sciences and United States federal regulatory agencies such as the United States Geological Survey also self-publish scientific papers that undergo a rigorous peer review process. Scientific papers that undergo independent peer review by a panel of experts are considered to provide information that is more likely to be accurate than non-peer reviewed literature. Peer review entails experts not involved in the work assessing the thoroughness, accuracy and relevance of the work. If the reviewers find omissions or errors in the work, they provide comments describing these to the authors of the paper and the editor of the publication. In order for the paper to be published, the authors must address these to the satisfaction of the editor. Because of this process, such papers are referred to as "peer-reviewed scientific literature."

During the conduct of this review, it was found that the body of relevant peer-reviewed literature — the source that meets the highest standard of scientific quality control — is very limited. For instance, there is little information on water demand in California for hydraulic fracturing. Consequently other material was considered, such as government data and reports including well records collected by California's Division of Oil, Gas and Geothermal Resources (DOGGR) and recent notices submitted pursuant to California Senate Bill 4 (SB 4, Pavley, Chapter 313, Statutes of 2013), and so-called "grey literature" if this literature was topically relevant and met scientific standards for inclusion. We also accessed and analyzed voluntary web-based databases such as FracFocus. In some cases where specific data on California were not available, analogues from other locations were used, while recognizing the limitations of the analogues. Much of the data available to analyze current practice in California come from voluntary sources plus six weeks of data from well stimulation notices required by SB4. Data from well stimulation notices submitted through January 15th, 2014, were considered. Data through the end of 2013 were considered from the other sources. Relevant scientific literature available as of February, 2014, was reviewed. A reference to a report from US EIA published in June 2014 was added during the peer review process because the updated assessment had a substantial bearing on our findings and conclusions.

Extensive efforts were made to survey all information relevant to this report, including peer-reviewed scientific literature, government-collected data, voluntary reporting by industry, and non-peer reviewed literature. Categories of non-peer reviewed literature considered admissible to the report were government reports, studies issued by universities and non-government organizations, textbooks, and papers from technical conferences. To be considered admissible to the report, literature needed to be based on data that drew traceable conclusions clearly supported by the data. Opinion-based materials were not included in the assessment.

Avenues for finding relevant literature and data included:

1. Keyword searches in databases of scientific literature;
2. Finding literature and data, regardless of peer-review status, referenced in other literature;
3. Soliciting data and literature submissions from the public via two webinars, a website, and a press release;
4. Discussions with outside experts in the field, consisting of informal dialogues and organized technical meetings;
5. Data mining of voluntary industry reporting to FracFocus.org;
6. Data mining of government-collected data; and
7. Internet keyword searches.

Further details on the process for reviewing data and literature for the report can be found in Appendix E, “Bibliography of Submitted Literature.”

We caution that official government records were not necessarily designed to answer all the questions posed by BLM to CCST. Records filed with DOGGR in the past do not comprehensively record well stimulation events. Voluntarily submitted data, such as those available on FracFocus, although very useful, are not required to be either complete or accurate. We describe the challenges with the quality of the data in order to transparently qualify the limitations in our conclusions.

More information pertinent to this assessment may exist, but was unavailable at the time of writing. This is particularly the case for research and development and exploration results. Oil companies and their service providers spend billions of dollars per year on research and development (IHS, 2013). This compares to hundreds of millions of dollars per year in Federal Government funding for all research related to fossil fuels, including coal (US Department of Energy, 2013). The resulting disparity in private versus publicly available information makes it particularly difficult to assess the prospects for further application of well stimulation in California in the future.

Furthermore, due to the timing of this report, the mandatory reporting requirements pursuant to California Senate Bill 4 (SB 4, Pavley, Chapter 313, Statutes of 2013) were only just becoming available for analysis in this study. Effective January 1, 2014, SB4 required that notices have to be submitted at least 30 days prior to each well stimulation operation, and that well stimulation records have to be filed within 60 days after stimulation. These well records will provide information on well stimulation locations, fluid volumes, and constituents, as well as the composition and disposition of flowback fluids. Such information will in the future allow a much improved assessment of potential hazards specific to California associated with well stimulation, including material and equipment supply for stimulation, disposal of stimulation fluids, and land-use changes. For our study, however, no well records had yet been submitted, and only a limited amount of well stimulation notices projecting future activity could be considered, submitted during a 6-week period between November 1, 2013 and January 15, 2014.

In future months, more disclosures required by SB4 will be filed, and the picture we obtained from the limited data available for this report may change. Some important data gaps will likely remain, for example: (1) the depth of the base of groundwater in the vicinity of well stimulations (which varies depending upon the definition of groundwater, the location, and other factors); (2) the means of delivery of stimulation fluids to and removal from well stimulation sites; (3) emissions from venting and flaring of gases from flowback fluids; and (4) the number of oil and gas wells that show indications of structural integrity impairment. Lack of data on structural integrity impairment of oil and gas well casing and cement limits the ability to identify the extent of the sub-surface migratory mechanisms through which fluids and gases can move from the well and the well bore into the environment.

Well Stimulation Technologies

Hydraulic fracturing creates fractures in reservoir rocks in order to enhance the flow of petroleum or natural gases to the well. This is accomplished by pumping fluids into a zone of the well until the fluid pressure is sufficient to break the rock. Then, small particles called “proppant” are pumped into the fracture to keep it from closing back down when the fluid pressure is reduced, e.g., during subsequent fluid production. The hydraulic fracturing fluid that returns up the well bore is called “flowback” fluid. Fluid removed from the well gradually changes from flowback fluid to “produced water”; the time at which a well changes from the hydraulic fracturing process to the production process is not precisely defined.

Acid fracturing accomplishes the same goal as hydraulic fracturing by injecting low pH fluids instead of proppants into a created fracture. This process is not intended to create new fractures via high fluid pressures. The acid is intended to non-uniformly etch the walls of the fracture so that some fracture conductivity is maintained after the fracture closes.

Matrix acidizing is the process of injecting strong acids into the formations around a well at pressures below the fracturing pressure of the rock. The most common acid systems used are hydrochloric acid (HCl) in carbonate formations, and hydrofluoric/hydrochloric acid (HF/HCl) mixtures in sandstone formations. Matrix acidizing in carbonates can create small channels or tubes called wormholes that can propagate as much as 20 feet into the formation. This can provide a true stimulation of a well, analogous to that of a small hydraulic fracturing treatment. Because of much smaller reaction rates, the acid dissolution in sandstones is limited to a much smaller distance, of less than one to perhaps two feet into the formation. Because of this limited penetration distance, the benefit of matrix acidizing in sandstones comes primarily from removing damaging solids that have reduced the near-well permeability. However, there are some instances of matrix acidizing using HF/HCl reported in the Monterey Formation in California that may have greater penetration because of the presence of natural fractures.

Below we summarize the findings and conclusions relevant to the three key questions asked by BLM. Despite cautions with respect to the quality of data, steering committee members were able to draw a set of consensus conclusions, with appropriate qualifications. The findings and conclusion below give pointers to the relevant sections in report where the detailed synthesis and assessment of technical information is provided.

Results

Key Question 1: What are the past, current and potential future practices in well stimulation technologies including hydraulic fracturing, acid fracturing, and matrix acidizing in California?

Many of the concerns about WST and hydraulic fracturing in particular arise because practices in other states have come under scrutiny and criticism. Over the last decade, application of horizontal drilling and hydraulic fracturing has allowed a substantial increase in production of oil from low-permeability rocks containing this resource, such as the Bakken Formation in Montana and North Dakota (Pearson et al., 2013; Hughes, 2013). This report critically evaluates the practices in California and the differences between the practice in California and the major hydraulic fracturing practice in other states. In the Bakken and the Eagle Ford, for example, oil is found in thin, but very extensive layers that have very low permeability because they are lacking many natural fractures in the rock. Producers drill long, horizontal wells and create permeability by creating networks of connected fractures. In California, reservoirs that are produced using hydraulic fracturing tend to be thick and not laterally extensive and they typically have higher initial permeability than the shale oil formations mentioned above. Consequently the practice in our state is significantly different than elsewhere.

Conclusion 1: Available data suggests that present day well stimulation practices in California differ significantly from practices used for unconventional shale reservoirs in states such as North Dakota and Texas. For example, California hydraulic fractures tend to use less water, the hydraulic fracturing fluids tend to have higher chemical concentrations, the wells tend to be shallower and more vertical, and the target geologies present different challenges. Therefore the impacts of hydraulic fracturing observed in other states are not necessarily applicable to current hydraulic fracturing practices in California.

Hydraulic fracturing in a variety of forms has been widely applied over many decades in California with records of application in at least 69 onshore oil fields identified through well-record searches in central and southern California out of more than 300 fields in the state. The vast majority (85%) of past and current recorded fracturing activities occur in the North and South Belridge, Lost Hills, and Elk Hills fields, located in the southwestern portion of the San Joaquin Valley, in Kern County. Data from FracFocus, Division of Oil, Gas and Geothermal Resources' (DOGGR's) well records, well stimulation notices filed from December 1, 2013 to January 15, 2014 pursuant to SB 4 requirements, and well-record searches suggest hydraulic fracturing is conducted in 100 to 150 wells per month. Well-record searches indicate that this rate has increased since the end of the most recent recession, but is the same as before the recession. For comparison, over one million hydraulic fracturing operations are estimated to have occurred throughout the United States, with over 100,000 of these in recent years. *(Sections 3.2.1, Historical Use of Hydraulic Fracturing, and 3.2.2, Current Use of Hydraulic Fracturing)*

Large-scale application of high-fluid-volume hydraulic fracturing has not found much application in California, apparently because it has not been successful, and for reasons discussed below is unlikely in the future (see Conclusion 3). The majority of the oil produced from fields in California is not in the low-permeability shale source rock (i.e., shale in the Monterey Formation), but rather from other more permeable geologic formations that often contain oil that has migrated from source rocks. These reservoirs do not resemble the low-permeability extensive, and continuous shale layers that are amenable to production with high volume hydraulic fracturing from long-reach horizontal wells. *(Section 4, Prospective Application of Well-Stimulation Technologies in California)*

According to DOGGR well data and SB 4 stimulation notices, most of the hydraulically fractured wells in California are vertical or near vertical. These shorter wells require less fluid for hydraulic fracturing applications than wells that have long lateral (i.e., horizontal) legs. More than 95% of the hydraulic fracture events in California employ a gel for the stimulation fluid as opposed to applications of "slickwater." Slickwater includes a friction reducer to allow injection of more stimulation fluid volume in a given time period. This is useful where the goal is to create a new network of fractures in rocks that are relatively brittle with low permeability. Gel is used in California because the main rocks targeted for stimulation are less brittle and more permeable than areas where slickwater is used. Additionally, gel is capable of carrying more proppant than slickwater to hold existing fractures open. Because of the predominance of stimulation in vertical and near-vertical wells, and the use of gel, the volumes of water used in hydraulic fracturing in California are much smaller than in oil source rock plays elsewhere.

The average amount of reported water used in the recent past and currently in California for each hydraulic fracturing operation is 490 to 790 m^3 (130,000 to 210,000 gallons) per well. These volumes are similar to the annual water use of 580 m^3 (153,000 gallons) in an average household in California over the last decade and are significantly less than the average 16,100 m^3 of water per well (4.25 million gallons) reported for the Eagle Ford shale tight oil play in Texas. Further, the volume per treatment length in California is 2.3 to 3.0 m^3/m (188 to 244 gallons per ft) based on FracFocus and notice data. This is much less than the 9.5 m^3/m (770 gallons per foot) used in the Eagle Ford formation. It is slightly below the 3.4 m^3/m (277 gallons/ft) for cross-linked gel used in the Bakken formation, in North Dakota, but considerably below the 13.2 m^3/m (1,063 gallons/ft) for slickwater used in that location. *(Section 3.2.3, Fluid Volume, and 3.2.4, Fluid Type)*

Conclusion 2: Acid fracturing is a small fraction of reported WST to date in California. Acid fracturing is usually applied in carbonate reservoirs, and these are rare in California. Matrix acidizing has been used successfully but rarely in California. These technologies are not expected to lead to major increases in oil and gas development in the state.

Acid fracturing is commonly limited to carbonate reservoirs, because the acid-mineral reaction rates in in a sandstone or siliceous shale rock as found in California are too slow to create significant etching of the fracture walls. For the process to work in such rocks as it does in carbonates, the acid-rock reaction rates would have to be increased by many orders of magnitude (4-8 orders). It is not reasonable to expect any innovation that would accomplish this. A few instances of acid fracturing in siliceous rock in California were reported in SB 4 well stimulation notices. However, given that acid fracturing of siliceous rocks is otherwise unknown, these may be cases of misreported matrix acidization.

As mentioned above, acid fracturing is generally applied only to carbonate reservoirs, which include those consisting of dolomite. The only onshore carbonate oil reservoirs identified in California are in the Santa Maria and possibly the Los Angeles basins.

The carbonate reservoirs occurring in a few fields in the Santa Maria Basin consist of naturally fractured dolomite. Reports of the use of acid fracturing in these reservoirs in California were not identified in the literature.

Hydrochloric acid mixed with hydrofluoric acid is generally reported as used for matrix acidizing of siliclastic reservoirs, which predominate in California. In these reservoirs, matrix acidizing is typically used to overcome the effects of formation damage (reduction in the rock permeability near the wellbore) that occurs during drilling and completion operations in conventional reservoirs. In the absence of formation damage, matrix acidizing can increase well productivity by only about 20%. In a very-low-permeability reservoir, this limited increase in productivity is far less than the stimulation level necessary to make oil or gas recovery economic.

By comparison, the large-scale fracturing treatments being applied in shale formations like the Eagle Ford or the Bakken increase well productivity by orders of magnitudes above the productivity of an unstimulated well. Thus, matrix acidizing technology is not expected to lead to dramatic increases in oil and gas development as has hydraulic fracturing technology in many shale formations.

Use of matrix acidizing is only reported in three onshore oil fields in California, which contrasts with the tens of fields identified where hydraulic fracturing has been used. Stimulation notices submitted to the State to date indicate matrix acidizing only in the Elk Hills Field. There were 26 matrix acid notices submitted and not withdrawn in the first six weeks of SB 4 permitting, as compared to 208 hydraulic fracture notifications.

All the notices specify use of "mud" acid, either by combining HCl and HF acids directly or by producing an HCl-HF acid mixture by reacting NH_4HF_2 (ammonium bifluoride) with an excess of HCl. The notices indicate an average matrix acidizing water volume per well of 109 m^3 (40,000 gallons), which represents a fraction of that needed for hydraulic fracturing. The average volume per treatment length implied by the notices is 1.7 m^3/m (137 gallons per ft). *(Section 3.3, Acid Fracturing, and 3.4, Matrix Acidizing)*

Key Question 2: Where will well stimulation technologies allow expanded production of oil onshore in California?

As shown in Figure ES-1, the current production from low-permeability portions of the Monterey Formation in California is modest compared to production from other low-permeability strata in the United States. Furthermore, the Monterey production level has remained fairly constant between 2000 and 2012, a trend quite different from oil shales such as the Eagle Ford and the Bakken formations. However, in 2011 the United States

Energy Information Administration (US EIA) estimated the Monterey Formation contains 2.45 billion cubic meters (m^3), (15.4 billion barrels) of recoverable tight oil. The report estimated this to be 64% of the recoverable oil from low-permeability rocks in the United States (US EIA, 2011). This estimate of recoverable tight oil in the Monterey Formation gained broad attention and raised the question whether California might experience the same type of rapid increase in oil production and development of associated infrastructure as has occurred elsewhere in the country, such as in Montana and North Dakota (e.g. Garthwaite, 2013). Our report examined the assumptions in the original EIA estimate and the likelihood for WST technology to expand production in California. We found the original EIA estimate to be based on a series of highly skewed assumptions that resulted in a very high estimate for the amount of recoverable oil in the Monterey. Notably, since this report was prepared, the EIA has revised their estimate of recoverable oil in the Monterey Formation downward to about one thirtieth of the original estimate (US EIA, 2014).

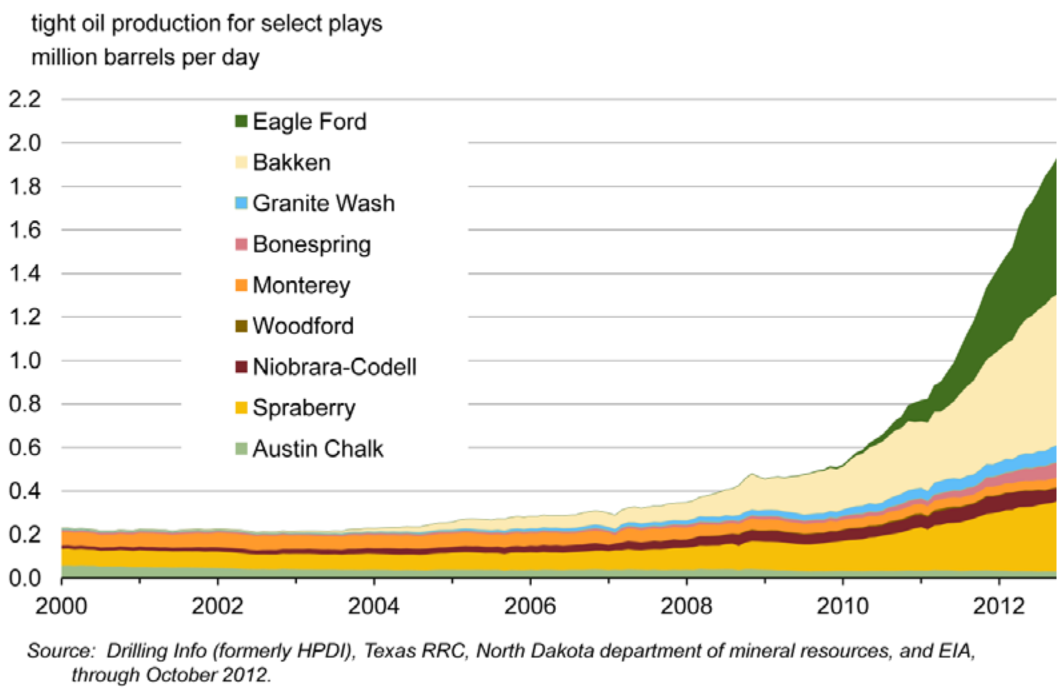


Figure ES-1. Oil production through time from selected low permeability ("tight") oil plays in the United States US EIA (2013).

Conclusion 3. The most likely scenario for expanded onshore oil production using WST in California is production in and near reservoirs that are currently using WST. Thus, existing and likely future production is expected to come from reservoirs containing oil migrated from source rocks, not from the Monterey Formation source rock. Credible estimates of the potential for oil recovery in and near 19 existing giant fields (> 1 billion barrels of oil) in the San Joaquin and Los Angeles basins

indicate that almost 10 billion barrels of additional oil might be produced but would require unrestricted application of current best-practice technology, including, but not restricted to WST. In 2011 the EIA estimated about 15 billion barrels of technically recoverable oil from new plays in the Monterey Formation source rock, but these estimates have been revised in 2014 to a value of 0.6 billion barrels. Neither of these estimates of unconventional oil resources in California source rocks are well constrained.

There are significant resources in existing oil fields, and estimates of these resources are relatively consistent. The United States Geological Survey (USGS) estimates that an additional 6.5 billion barrels and 3.2 billion barrels can be recovered from the largest fields in the San Joaquin and Los Angeles basins, respectively, using existing oil production technology (see Figures ES-2(A) and (B)). Figures ES-2(A), (B) and (C) show existing oil and gas fields in California and locations where expanded production might occur in the San Joaquin and Los Angeles basins, respectively. Some but not all of this expanded production requires WST. In California today, WST enables production in the diatomite reservoirs of the San Joaquin Valley and expanded production in similar reservoirs would likely also be enabled by WST. In contrast, WST may not be required to expand production in the Los Angeles Basin where its use is not common today.

New oil and gas production in regions removed from existing fields is more uncertain than increased production in existing oil and gas fields. There is a considerable amount of source rock, including the Monterey Formation and other geologic units within the deeper portions of major basins, which could potentially contain oil that has not migrated ("source" oil), and could perhaps be extracted using WST. However, there is little published information on these deep sedimentary sections, so it is difficult to estimate the potential recoverable reserves associated with these rocks. No reports of significant production of source oil from these rocks were identified.

The US EIA 2011 INTEK report has garnered considerable attention because of its large estimate of 2.45 billion (m^3), (15.4 billion barrels) of technically recoverable oil in Monterey Formation source rock. Very little empirical data is available to support this analysis and the assumptions used to make this estimate appear to be consistently on the high side. INTEK estimated that the average well in low-permeability source rock in the Monterey Formation would produce 87.5 thousand m^3 (550 thousand barrels) of oil. This amount greatly exceeds the production that has occurred to date from low-permeability rocks in known oil accumulations in this formation, with single-well oil production of only 10.7 and 22.4 thousand m^3 (67 and 141 thousand barrels) in the San Joaquin and Santa Maria basins, respectively. Consequently the INTEK estimate requires a four- to five-fold increase in productivity per well from an essentially unproven resource.

In addition, the Monterey Formation was formed by complex depositional processes and subsequently deformed in many tectonic events, resulting in highly heterogeneous as well as folded and faulted rocks that are difficult to characterize. INTEK posited production

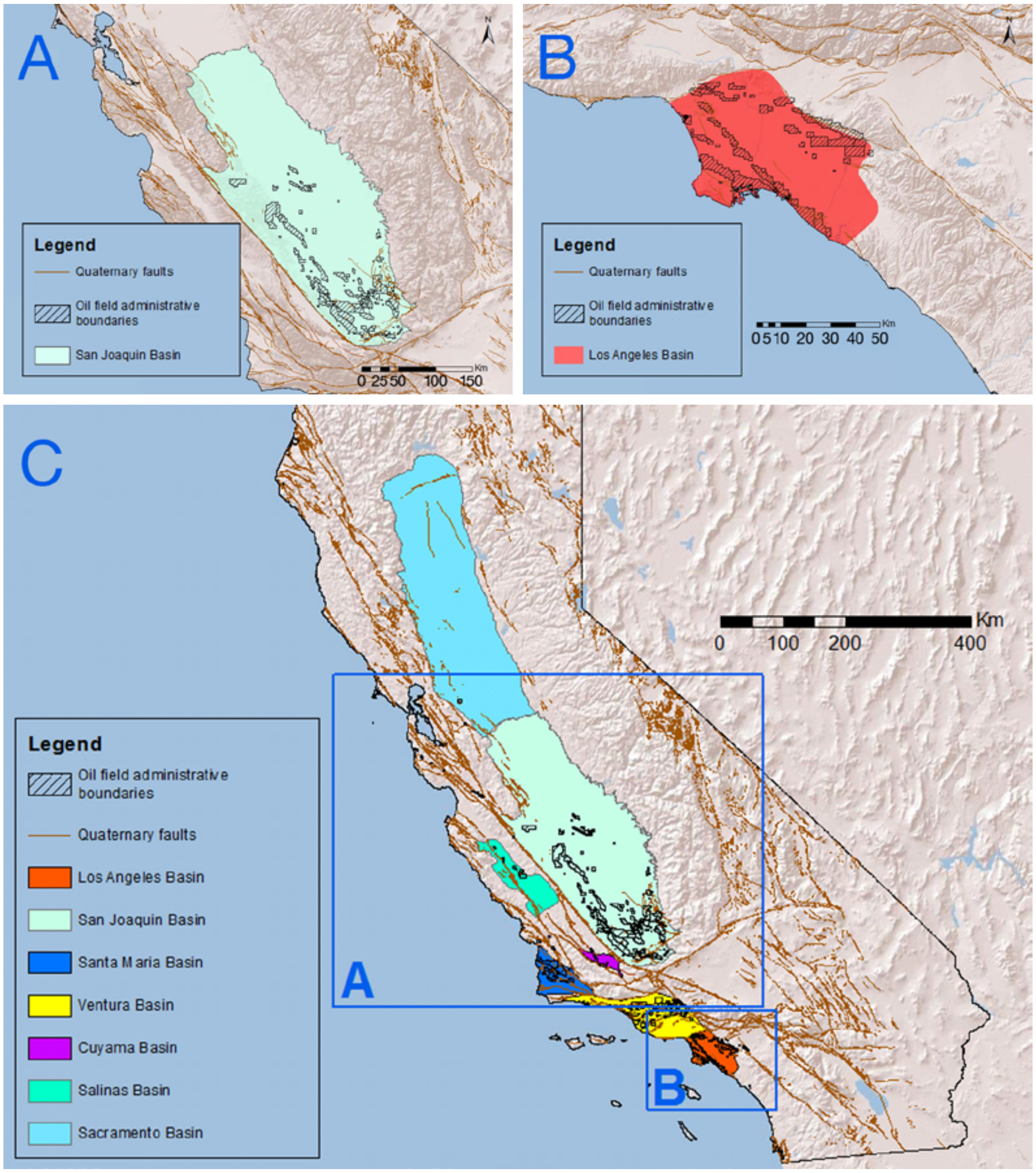


Figure ES-2. Maps of major sedimentary basins and associated oil fields in California.
(A) The San Joaquin Basin with outlines of producing oil fields. USGS estimates an additional 6.5 billion barrels of oil could be recovered from existing fields in the San Joaquin Basin.
(B) The Los Angeles Basin with outlines of producing oil fields. USGS estimates an additional 3.2 billion barrels of oil could be recovered from existing fields in the Los Angeles Basin.
(C) All major sedimentary basins and associated oil fields in California.
Data from DOGGR, Wright (1991), and Gautier (2014).

over an area of 4,538 km^2 (1,752 square miles), but this is almost the entire source rock area estimated in this report. (Note that the updated US EIA (2014b) report has reduced this areal extent significantly to 497 km^2 (192 square miles). There has not been enough exploration to know how much of the Monterey source rock has retained oil, or if the oil has largely migrated away, but it is unlikely the entire source rock area will be productive, given the extreme heterogeneity in the Monterey Formation. Finally, even if significant amounts of oil do remain in the Monterey Shale, and wells reach this oil, it still remains to be determined if hydraulic fracturing of Monterey source rock will result in economically viable production. For all these reasons, the INTEK estimate of recoverable oil in Monterey Formation source rock warranted skepticism. The EIA has recently issued a revised estimate (0.6 billion barrels) of this unconventional oil resource (US EIA, 2014b); this decrease is mainly due to a nine-fold reduction in the estimated potential resource area. The information and understanding necessary to develop a meaningful forecast, or even a suite of scenarios about possible recoverable unconventional oil in the Monterey shale, are not available.

While major production increases from oil shale source rock are considered highly uncertain, they are not impossible. High-volume proppant fracturing is the enabling technology for significant increases in development of low permeability reservoirs. If large-scale proppant fracturing can be shown to work in source rocks in California as it has in other low permeability plays in the United States, it would change the outlook for oil and gas production in the state. The oil and gas industry is constantly innovating, and research and development could improve the utility of proppant fracturing in the future. Deep test wells in source rock-shale plays have been drilled in California that with research and development may eventually prove successful. *(Section 4.5, Oil-Producing Sedimentary Basins in California, and 4.7, Review of the US EIA Estimate of Monterey Source Rock Oil)*

Key Question 3: What are the potential environmental hazards of well stimulation technologies in California?

This report focuses on what we refer to as the "direct" environmental impacts caused by application of WST. We define direct impacts as the impacts incurred by the act of using WST themselves, either a single application or the additive impacts of many applications. Direct impacts include, for example, those that might arise from the use of large volumes of water for stimulation, from the addition of chemicals in the WST fluids that may be toxic, or those related to injecting at high pressures into the subsurface to break the rock. Each well stimulation treatment requires the use of water, incurs transportation of materials, can cause emission of pollutants or greenhouse gases, and pumps chemically loaded water underground.

In this report we attempted to carefully assess the direct environmental, climate, and public health impacts of WST within the limits of data availability. The direct impacts in general have not been monitored, but some can be inferred from operations data and California practice. In other cases, it is not possible to make inferences and all that can be done is to review and summarize what has been observed in other states or the published literature. This information should be taken as background material, which can direct further monitoring and observation in California. We do not claim that what has been observed in other states is happening in California or directly applicable to California. The vast majority of California hydraulic fractures are conducted in shallower wells that tend to be vertical rather than horizontal, and use a relatively small amount of water that is more highly concentrated in chemicals in geologic settings that differ significantly from those in other states. Regulations are different in California and some practices in other states are not allowed in California.

WST applications can slow the decline of production in existing fields or increase that production. WST may allow production in new greenfield sites that could not be produced with more conventional technologies. We refer to all of this collectively as "WST-enabled production." Because WST can enable oil production, WST can have indirect environmental impacts in addition to the direct impacts of well stimulation. If well stimulation enables greater oil and gas production[1], which has additional environmental impacts, we refer to these as "indirect" impacts. The report identifies issues and impacts that may arise because of well stimulation-enabled production. Indirect impacts arise because oil and gas production involves building, supplying, and managing oil and gas well operations, including land clearing and construction, general truck traffic to bring and remove materials, energy operations at the wellheads, and wastewater management. The report identifies indirect issues and impacts that may arise because of well stimulation-enabled production; however, they receive only cursory treatment in the synthesis and assessment conducted here. As noted in the conclusions and the assessments below, there is evidence that the indirect impacts of WST-enabled oil and gas production may be significant, and we recommend that a more detailed analysis should be undertaken. The scientific literature indicates that indirect impacts should not be dismissed and will be the focus of future work. Indirect effects are beyond the scope of this study, but we provide key issues for future study at the end of this summary.

WST-enabled oil and gas production presents environmental, health and safety impacts that can be very different depending on the history of land use where it takes place. For example, environmental impacts of oil and gas production depend on whether it occurs in an existing oil and gas field versus a greenfield location, or if the surrounding area is urban, agricultural, or undeveloped. Local conditions also affect the environmental impacts of expanded production, such as the depth and quality of the local groundwater, availability of surface water, local air quality, distance to human population centers, and the proximity of sensitive species and habitats.

[1] *Although the focus of the report is on oil production, the fact is that oil contains natural gas in solution which can vaporize from the oil, and therefore we cannot avoid consideration of this "associated gas" along with oil.*

Important conditions that affect impacts associated with expanded production include:

- Quality and depth of groundwater;
- Local air quality;
- Proximity to population centers;
- Proximity to species and habitats;
- Volume of fluids requiring disposal; and
- Proximity to active faults.

In some cases, the line between direct and indirect effects is not absolutely clear. Wastewater disposal presents an illustrative example of an indirect impact, but some assessment was made in this report. Wastewater includes “flowback water,” which is the water used in a hydraulic fracturing operation that returns to the surface, as well as “produced water,” which comes up with the produced oil and gas and is subsequently separated and disposed of. Flowback water is directly attributable to WST, whereas produced water is an indirect effect of WST enabled production. After a hydraulic fracturing event, the fluid that comes out of the well changes gradually from flowback water to produced water. There is no formal distinction between the two fluids. In California, the volumes of water used in WST applications are currently a very small fraction of the total volume of produced water. We refer to this fluid as flowback/produced water, to make it clear we are discussing the combined direct and indirect issues. Produced water disposal in dedicated injection wells (Class II wells according to EPA’s regulation for underground injection) presents the possibility of triggering earthquakes. Given concerns about this issue, we briefly address some issues with flowback/produced water disposal.

Although the focus of this report is primarily on the direct impacts of WST, rather than the lifetime processes and environmental hazards of oil and gas production as a whole as enabled by the technologies, it seems likely that the major environmental effects of WST are not from the WST itself, but rather from new or expanded production enabled by WST. Direct impacts represent a very narrowly defined marginal change in risks associated only with actual conduct of the WST itself. The impacts associated with these technologies exist within the overall context of environmental risks associated with oil and gas development in general. For example, dozens of chemical constituents may be present in hydraulic fracturing fluids, but operators typically combine fluids associated with hydraulic fracturing with produced water streams, which, by themselves typically contain high concentrations of salt, trace elements, and hydrocarbons. The volumes of flowback water are extremely small relative to the volume of water produced along with the oil. The emissions associated with WST operations are a small fraction of emissions from the highly energy-intensive oil production industry.

A large number of other impacts associated with WST in California were not covered in this report including local and state economic and employment impacts; local, state, and federal tax and royalty payment impacts; increased industry research and technology investments resulting from expanded WST applications; and of particular importance to Californian, the impact of increased WST-driven production on the level of imported crude to the state from non-U.S. sources. The CCST steering committee recognizes the importance of these impacts which have had material effects in other states, but notes that they were not within the defined scope of the of this report.

Direct impacts on water supply, water quality, air quality, greenhouse gas emissions and induced seismicity are described below.

Water Supply

Conclusion 4: While current water demand for WST operations is a small fraction of statewide water use, it can contribute to local constraints on water availability, especially during droughts.

The upper estimate of current annual water demand for WST in California is 1.4 million m^3 (1,200 acre-feet), based on estimates of water use from notices filed with DOGGR; the lower estimate is 560 thousand m^3 (450 acre-feet) based on water volumes reported voluntarily to FracFocus. Ninety-five percent of water currently used is fresh water; the remainder is produced water. Most of this demand is in the southwestern San Joaquin Valley. Stimulation notices indicate the Belridge Water Storage District, supplied by the State Water Project, meets most of the demand in this area. The demand indicated by the notices represents less than 1% of this District's allocation. However, their allocation from the State Water Project can be cut in average and in drier years. The notices indicate use of well water for stimulation fluid as an alternative to supply from the District, but it is unclear under which conditions this would occur. If well water is used, it could draw down the groundwater table. *(Section 5.1.1, Quantities and Sources of Water Used for Well Stimulation in California)*

Water Quality

Conclusion 5: Of the chemicals reported for WST treatments in California for which toxicity information is available (compiled from the voluntary industry database, FracFocus), most are considered to be of low toxicity or non-toxic. However, a few reported chemicals present concerns for acute toxicity. These include biocides (e.g., tetrakis (hydroxymethyl) phosphonium sulfate; 2,2-dibromo-3-nitrilopropionamide; and glutaraldehyde), corrosion inhibitors (e.g. propargyl alcohol), and mineral acids (e.g. hydrofluoric acid and hydrochloric acid). Potential risks posed by chronic exposure to most chemicals used in WST are unknown at this time.

A list of chemicals used for hydraulic fracturing was developed from disclosures in FracFocus. These data are not required to be either complete or accurate. For matrix acidization, a list of chemicals used was developed from stimulation notices, which did not indicate any undisclosed chemicals. Information on acute oral toxicity was available for some of these chemicals. This toxicological assessment is limited, because it considers only oral toxicity as an indicator of potential impacts to human health, and does not consider other effects such as biological responses to acute and chronic exposure to many of the stimulation chemicals, eco-toxicological effects of fluid constituents, overall toxicological effects of fluids as a mixture of compounds (compared to single-chemical exposure), and potential time-dependent changes in toxicological impacts of fluid constituents, due to their potential degradation or transformations in the environment. Thus, further review of the constituents of injection fluids used in well stimulation jobs in California is needed, which additionally considers information that is now required to be submitted to DOGGR by operators, and some of the above mentioned toxicological effects.

After hydraulic fracturing fluids are injected, they return along with some formation water as flowback water and are subsequently either disposed off or sometimes used for other purposes (see Conclusion 7). At this time, it is not possible to evaluate flowback contaminants in California, because there is very limited information regarding the concentrations of these substances in flowback/produced waters from well stimulation operations in California. Flowback and produced water compositions vary considerably across regions, and their characteristics can change according to the fluids injected during well stimulation, the amount of fluids recovered at the surface, and over the duration of the flowback period. The chemistry of produced waters from unconventional oil production could potentially differ from that of conventional oil production due to differences in the target formations and interactions of fracturing fluids with formation rocks and water, although this does not generally appear to be the case based on the limited data that is available. More California-specific data will become available starting in 2014 as operators are now required to report the composition of waters recovered from well stimulation operations to DOGGR. *(Section 5.1.2, Chemistry of Fluids Related to Well Stimulation Operations)*

Conclusion 6: There are no publicly recorded instances of subsurface release of contaminated fluids into potable groundwater in California, but a lack of studies, consistent and transparent data collection, and reporting makes it difficult to evaluate the extent to which this may have occurred. Existing wells are generally considered as the most likely pathway for subsurface transport of WST and subsurface fluids (water, brines, gas). California needs to characterize this potential hazard in order to evaluate risk to groundwater resources. In California, hydraulic fracturing is occurring at relatively shallow depths and presents an inherent risk for fractures to intersect nearby aquifers if they contain usable water. Fracturing has occurred in many fields at a depth less than 600 m (2000 ft). Available research indicates 600 m is likely the maximum distance for vertical propagation of hydraulic fractures, although the maximum vertical length of a fracture may be less than 600 m

for fracturing in shallow formations because of the different stress conditions. California needs to develop an accurate understanding about the location, depth, and quality of groundwater in oil and gas producing regions in order to evaluate the risks of WST operations to groundwater. This information on groundwater must be integrated with additional information to map the actual extent of hydraulic fractures to assess whether and where water contamination from WST activities has been or will be a problem.

More complete information about the quality and location of groundwater resources relative to the depth at which hydraulic fracturing is occurring would make it possible to identify inherently hazardous situations that could and should be avoided. Data on the location and quality of groundwater must be obtained in order to assess risks from proposed hydraulic fracturing.

Hydraulic fracturing at shallow depths poses a greater potential risk to water resources because of its proximity to groundwater and the potential for fractures to intersect nearby aquifers. Geomechanical studies conducted for WST in other states have indicated that fracturing directly from the stimulated reservoir into groundwater is unlikely when well stimulation is applied in formations that are sufficiently far below overlying aquifers. However, according to FracFocus and DOGGR's GIS well data files, the depth of roughly half of the wells in California that have been stimulated using hydraulic fracturing lie within 610 m (2,000 feet) of the ground surface, where 600 m (1,969 feet) has been identified as a threshold for vertical disturbance by hydraulic fracturing. Based on well stimulation notices filed to date with DOGGR, much of the current and planned hydraulic fracturing operations in California occur at depths of less than 305 m (1,000 feet) below the ground surface. Because of the shallow depth of well stimulation and the typically lower injection volumes in California, the stress and damage behavior is very different from high-volume hydraulic fracturing elsewhere, meaning the separation distance of 600 m suggested may not be applicable to the conditions in this state. However, the potential for hydraulic fractures to intercept groundwater in these conditions warrants more careful investigation and monitoring (see Figure ES-3), including geomechanical studies and surveys of fracture extent relative to groundwater location, depth, and quality.

Even when well stimulation occurs well below groundwater levels, leakage paths along existing wells or other permeable pathways in the rock— either naturally existing or generated by hydraulic fractures propagating beyond the target reservoir— may cause contamination. Some studies in other regions outside California have found a correlation between the location of hydraulically-fractured production wells and elevated concentrations of methane, arsenic, selenium, strontium, and, to a lesser extent, total dissolved solids (TDS). However, there is no consensus as to whether these are naturally occurring, due to hydraulic fracturing, production well defects, abandoned wells, or a combination of mechanisms. Pathways due to compromised or failed structural integrity of cement in oil and gas wells and well bores are generally considered the most likely potential pathway for groundwater contamination. While well integrity is a concern for all types of wells, including conventional oil and gas exploration wells, the risk of long-term damage or deterioration may be higher for hydraulic fracturing operations because of higher induced pressure and multi-stage fracturing. California-specific studies of the proportion of wells that exhibit indications of compromised wellbore integrity and corresponding groundwater contamination have not been conducted. California needs to determine the locations and conditions of preexisting wells near hydraulic fracturing operations in order to assess potential leakage hazards. Continued monitoring and data collection are warranted to avoid potential risks.

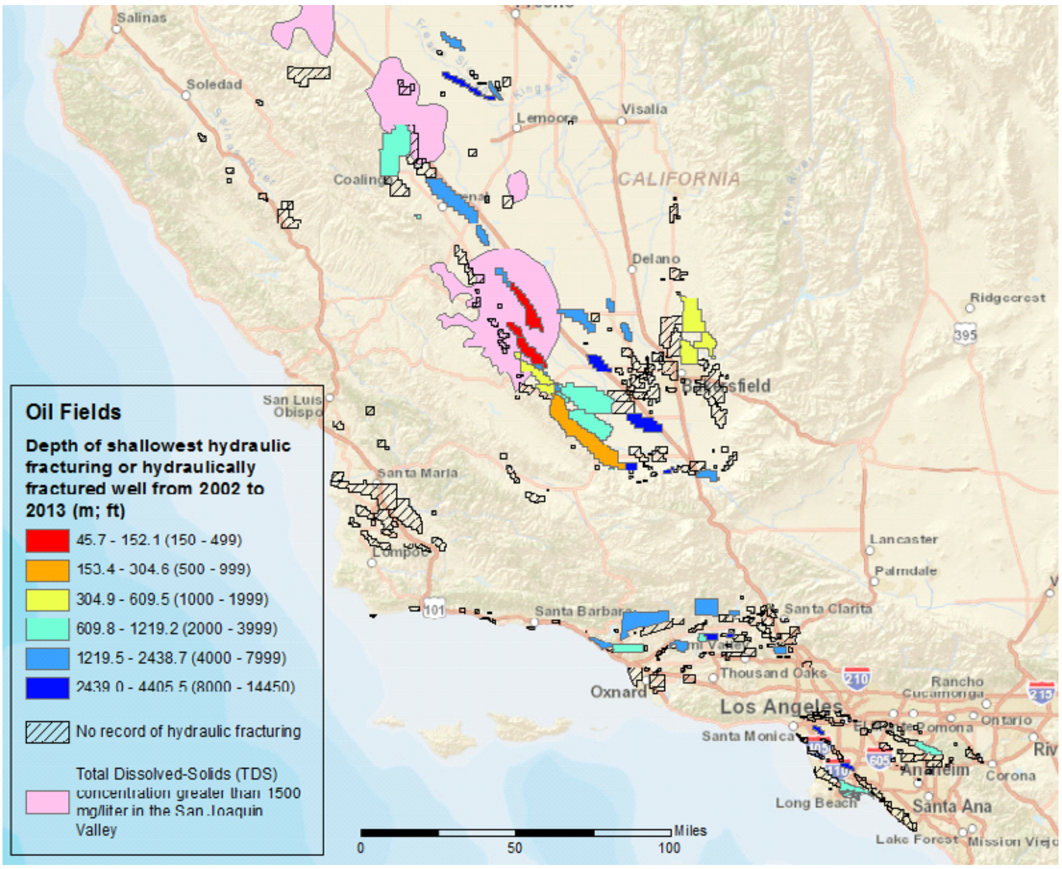


Figure ES-3. A map showing the shallowest hydraulic fracturing depth from the well stimulation notices or hydraulically fractured well total depth (measured depth from DOGGR for wells drilled after 2001 or true vertical depth from FracFocus) in each field. Pink areas show regions in the San Joaquin Valley where the shallow groundwater has total dissolved solids above California's short-term secondary maximum contaminant level for drinking water of 1,500 mg/L. Note the oil fields colored orange and yellow in the San Joaquin Valley, indicating shallow hydraulic fracturing, that are located in areas with better groundwater quality. Data from DOGGR 2014(a), DOGGR 2014(b), FracFocus (2013), and Bertoldi et al. (1991).

Conclusion 7: Current practice could allow flowback water to be mixed with produced water for use in irrigation. California needs to monitor the quality of flowback/produced water and review regulations on the appropriate use of flowback/produced water, based on its quality and the intended uses.

In California, there are documented cases of intentional and accidental surface releases of flowback fluids or chemicals associated with well stimulation. Detailed assessments are not available as to whether these releases contaminated surface water and/or groundwater, but this is a common pathway for surface and groundwater contamination. In other states, disposal of water in surface facilities causes more groundwater contamination than disposal by injection (Kell, 2011), and surface spills of various constituents have contaminated both groundwater and surface water.

Most flowback water is disposed of by Class II injection in California, but DOGGR does not distinguish between flowback and produced water. Current management practices in California also allow for the disposal of oil and gas wastewater, including the co-mingled well stimulation fluids, into unlined pits if the electrical conductivity (EC) is less than or equal to 1,000 micromhos per centimeter (μmhos/cm), chloride concentration is less than or equal to 200 milligrams per liter (mg/l), and boron concentration is less than or equal to 1 mg/l, with no testing required for, or limits on, other contaminants. Some produced water is permitted for irrigation, but data do not exist to determine if flowback fluid is included in that water. A more detailed assessment of wastewater disposal practices is needed to determine their levels of risk to surface water, groundwater, or agriculture. A lack of baseline data on groundwater quality is a major impediment to identifying or clearly assessing the key water-related risks associated with hydraulic fracturing and other well stimulation techniques. *(Section 5.1.3, Potential Release Pathways, and 5.1.4, Case Studies of Surface and Groundwater Contamination)*

Air Quality and Climate Impacts

Conclusion 8: Estimated marginal emissions of NOx, $PM_{2.5}$, VOCs directly from activities directly related to WST appear small compared to oil and gas production emissions in total in the San Joaquin Valley, where the vast majority of hydraulic fracturing takes place. However, the San Joaquin Valley is often out of compliance with respect to air quality standards and as a result, possible emission reductions remain relevant.

Three major sources of air pollutants include the use of diesel engines, flaring of gas, and the volatilization of flowback water. The first, diesel engines (used for transport and pumping of estimated fluid volumes required for WST) emit a small portion of total-emissions nitrogen oxides (NOx), particulate matter ($PM_{2.5}$), and volatile organic compounds (VOC) associated with other oil and gas production operations as a whole.

Emissions from flaring in California are uncertain, because of variability in flare combustion conditions and a lack of information regarding the frequency of flare-use during WST operations. However, current California Air Resource Board inventories of pollutant emissions from all flaring suggest that flares as a whole emit less than 0.1% of the VOCs and are not a major regional air quality hazard.

Emissions from volatilization of flow-back water constituents have not been measured but might be bracketed. The California Air Resource Board has conducted a “bottom-up” VOC emission inventory by adding up all known sources of emissions. It is unknown whether these sources included emissions from WST-related produced or flowback water. However, the sum of the emissions in the inventory matches well with “top-down” measurements taken from the air in the San Joaquin Valley. This agreement between “bottom-up” and “top-down” estimates of VOC emissions from oil and gas production indicates California’s inventory probably included all major sources.

The inventory indicates that VOC emissions from oil and gas evaporative sources, such as from flowback water, might occur from stimulation fluids produced back after the application of WST, are small compared to other emission sources in the oil and gas development process. Data suggest that emissions from oil and upstream operations in general contribute to roughly 10% of anthropogenic VOC ozone precursor emissions in the San Joaquin Valley.

Some of the potential air-quality impacts can be addressed by regulation and largely avoided. *(Section 5.2.1, Air Quality)*

Conclusion 9: Fugitive methane emissions from the direct application of WST to oil wells are likely to be small compared to the total greenhouse gas emissions from oil and gas production in California. This is because current California oil and gas operations are energy intensive. However, all greenhouse gas emissions are relevant under California’s climate laws, and many emissions sources can be addressed successfully with best-available control technology and good practice.

While WST will require additional energy use and could result in fugitive methane emissions, it is unlikely that these emissions will be large in comparison to other California oil and gas greenhouse gas emissions. California oil and gas production operations are generally energy intensive, due to steam-based thermal recovery operations and depleted oil fields with high water handling requirements. Therefore, greenhouse gas emissions from California oil and gas operations mostly result from energy consumption that releases CO_2. The California Air Resources Board (CARB) inventory indicates that methane emissions represent less than 10% of total greenhouse gas emissions, on a CO_{2e} basis, from all oil and gas production.

Greenhouse gas emissions due to WST activities would include the same three sources discussed above for air quality. For the same reasons listed above, these sources are likely to be small compared to other oil and gas production sources. Nevertheless, to help achieve California's climate goals, many significant sources of fugitive methane emissions associated with WST could be controlled through the requirement of green completions and by requiring vapor controls for flow-back water.

Emissions estimates from inventories are subject to uncertainty. Evidence across all scales (individual devices to continental atmospheric measurements) suggests that methane emissions from the natural gas and petroleum industries are likely larger than those expected from the US Environmental Protection Agency (EPA) inventories. More specifically to California, atmospheric measurement studies in Southern California indicate that state inventories of methane emissions from oil and gas production activities may be underestimated by a factor of about 5. Adjusting the CARB inventory by this factor would make the global warming potential of oil and gas production-related methane emissions larger, although still less than direct CO_2 emissions from fuel use.

New US EPA regulations requiring reduced emission completions (so called "green completions") for gas wells beginning in 2015 do not apply to the majority of wells in the San Joaquin Valley, as they are principally oil and associated gas wells. Similar control standards could be applied to oil wells in California.

While other regions are currently using WST for the production of oil (e.g., the Bakken formation of North Dakota) or gas (e.g., the Barnett shale of Texas), emissions from these regions may not be representative of emissions from California-specific application of WST. For example, the volume of fluid used for WST operations in California is typically lower than operations in other shale plays, potentially leading to lower evaporative emissions of methane from flowback fluid. *(Section 5.2.2, Climate Impacts)*

Seismic Risk

Conclusion 10: Hydraulic fracturing rarely involves large enough volumes of fluids injected at sufficient rate to cause induced seismicity of concern. Current hydraulic fracturing for oil and gas production in California is not considered to pose a significant seismic hazard. In contrast, disposal of produced water from oil and gas production in deep injection wells has caused felt seismic events in several states. Expanded oil and gas production due to extensive hydraulic fracturing activity in California would lead to increased injection volumes for disposal. If this produced water is disposed of by injection and not handled through an expansion of water treatment and re-use systems, it could increase seismic hazards.

Induced seismicity is a term used to describe seismic events caused by human activities. These include injection of fluids into the subsurface, when elevated fluid pore pressures can lower the frictional strengths of faults and fractures leading to seismic rupture.

Induced seismicity can produce felt or even damaging ground motions when large volumes of water are injected over long time periods into zones in or near potentially active earthquake sources. The relatively small fluid volumes and short time durations involved in most hydraulic fracturing operations themselves are generally not sufficient to create pore pressure perturbations of large enough spatial extent to generate induced seismicity of concern. Current hydraulic fracturing activity is not considered to pose a significant seismic hazard in California. To date, only one felt earthquake attributed to hydraulic fracturing in California has been documented, and that was an isolated, low-energy event.

In contrast to hydraulic fracturing, earthquakes as large as magnitude 5.7 have been linked to injection of large volumes of wastewater into deep disposal wells in the eastern and central United States. To date, compared to some other states, water disposal wells in California have been relatively shallow and volumes disposed per well relatively small. There are no published reports of induced seismicity caused by wastewater disposal related to oil and gas operations in California, and at present the seismic hazard posed by wastewater injection is likely to be low. However, possible correlations between seismicity and wastewater injection in California have not yet been studied in detail. Injection of much larger volumes of produced water from increased WST activity and the subsequent increase in oil and gas production could increase the hazard, particularly in areas of high, naturally-occurring seismicity. Therefore, given the active tectonic setting of California, it will be important to carry out quantitative assessments of induced seismic hazard and risk. The chance of inducing larger, hazardous earthquakes most likely could be reduced by following protocols similar to those that have been developed for other types of injection operations. Even though hydraulic fracturing itself rarely induces felt earthquakes, application of similar protocols could protect against potential worst-case outcomes resulting from these operations as well. *(Section 5.3, Potential Seismic Impacts)*

Indirect Environmental Effects of WST-Enabled Production

Conclusion 11: Based on Conclusions 1 through 10 above, the direct impacts of WST appear to be relatively limited for industry practice of today and will likely be limited in the future if proper management practices are followed. If the future brings significantly increased production enabled by WST, the primary impacts of WST on California's environment will be indirect impacts, i.e., those due to increases and expansion in production, not the WST activity itself. Indirect impacts of WST through WST-enabled production will vary depending on whether this production occurs in existing rural or urban environments or in regions that have not previously been developed for oil and gas — as well as on the nature of the ecosystems, wildlife, geology and groundwater in the vicinity.

The indirect effects of WST were not a focus of this study. However, an understanding of the future of WST in California is incomplete without consideration of the idea that WST and other advanced technologies can enable more and new production. Consequently, we provide here a few comments relevant to future study.

If new plays in formations such as the Monterey Formation source rocks prove to be attractive economic targets, the industry is likely to want to explore them and find WST and production technologies that work in these environments. Existing, or as yet unidentified technologies might be developed for these specific circumstances. Then, some years in the future — much like the unconventional gas plays that came into production because of high-volume hydraulic fracturing from horizontal wells — there could be novel technologies appropriate to novel plays in California. Such new technologies could have different environmental impacts over what is experienced today. To the extent that producers develop successful new methods, these technologies will deserve new scrutiny to ensure that they do not damage the environment of California.

Oil and gas production activities in general are known to present environmental, health, and safety risks via an array of industrial activities and technologies — including, but not limited to, drilling, truck traffic, land clearing, gas compressor stations, separator tanks, wastewater processing and disposal, and land subsidence. Our assessment of current WST practices in California suggests that the per-barrel impacts of producing oil with WST are comparable to the impacts of producing oil without WST. As a result, WST will mainly affect California's environment through indirect effects caused by an increase in production.

The intensity and extent of expanded production impacts will vary, depending on where operations occur: in new greenfield sites, existing rural fields, or in existing fields in dense, urban environments. Some locations for expanded production may present few new impacts and some may present unique challenges to public health and safety, because of high population densities, vulnerable demographics, and geographic proximity to oil and gas development activities and their corresponding environmental emissions.

Expanded WST-enable production in California oil and gas fields could have the indirect effect of increasing the risk of contamination to groundwater water systems, by exposing greater areas of groundwater to contaminants and increasing the number of adverse events. The overall risks, however, will depend on groundwater and geological characteristics and operating practices, including (especially) practices to dispose of produced/flowback water and ensure the integrity of well casings and wellbore cement. If the use of WST expands oil and gas production in California, strategies for better understanding and mitigating any increased groundwater risk should be considered during planning and implementation efforts. Similarly, expanded production could lead to an increase in VOC, methane, carbon dioxide and other associated air-pollutant emissions if other measures to reduce these emissions are not undertaken.

There is a large body of work showing that habitats are altered to the detriment of wildlife and vegetation in areas where oil and gas production occurs. While it is obvious that wildlife and vegetation will be impacted if well stimulation converts pristine areas to oil and gas fields, increasing the level of production in existing fields will also have negative impacts on organisms that inhabit the fields. *(Section 5, Potential Direct Environmental Effects of Well Stimulation)*

Summary

Hydraulic fracturing in a variety of forms has been widely applied over many decades in California. However, the practice of using well stimulation has mostly been different from the high-volume hydraulic fracturing (using long-reach horizontal wells) conducted elsewhere, such as in the Bakken formation in North Dakota or the Eagle Ford formation in Texas. In California, hydraulic fracturing tends to use less water, the hydraulic fracturing fluids tend to have higher chemical concentrations, the wells tend to be shallower and more vertical, and the target geologies present different challenges. This is because the majority of the oil produced from fields in California is not from oil source rocks (i.e., organic-rich shales in the Monterey Formation), but rather from porous sandstone and diatomite reservoirs, or from naturally fractured siliceous mudstones, porcelanites, and dolomitic mudstones, which contain oil that has migrated from source rocks. Consequently, the experiences in other states are largely not applicable to California.

As to the prospects for expanded oil production in California using hydraulic fracturing in the future, the likelihood of finding major new shale plays similar to what has occurred in other states is quite uncertain. However, about 5 to 16 billion barrels of oil from additional oil production, beyond currently reported reserves, could be produced through the application of currently used technology in existing oil fields of the San Joaquin and the Los Angeles Basins. Production from Monterey diatomite reservoirs the San Joaquin Basin depends heavily on hydraulic fracturing. New production in and around these existing production sites would likely also be amenable to production with hydraulic fracturing as well. New production in and around existing fields that currently does not depend on WST, such as in the Los Angeles Basin, could well continue to be produced without WST in the future.

Current water demand for well stimulation operations in California is a small fraction of statewide water use. Even so, it can contribute to local constraints on water availability, especially during extreme droughts, such as the drought California is currently experiencing. Most of the chemicals reported for hydraulic fracturing treatments in California are not considered to be acutely toxic, but a few reported chemicals do present concerns for acute toxicity. Groundwater contamination from hydraulic fracturing has not been observed in this state, but a lack of data about the location and quality of groundwater resources, lack of knowledge about existing wells which might provide leakage paths, and inconsistent monitoring of potential groundwater impacts, limit our ability to assess whether and where water contamination from hydraulic fracturing activities has been or will be a problem. In some cases, hydraulic fracturing is taking place in shallow wells, in regions where the quality and location of the groundwater is not specified. These situations lack the inherent safety provided by conducting hydraulic fracturing thousands of feet below potable groundwater resources, and thus deserve closer scrutiny.

Hydraulic fracturing as currently practiced in California does not present a risk for induced seismic events of significance. The duration and extent of pressure increases due to hydraulic fracturing is relatively small compared to what is normally required to produce a felt, let alone a damaging, earthquake. In contrast, disposal of produced water from oil and gas production in deep injection wells has caused felt seismic events across the United States. Protocols similar to those that have been developed for other types of injection wells, such as for geothermal injections, can be applied to limit this risk. The direct emissions of hydraulic fracturing are a small component of total air pollution and methane, but these emissions occur largely in the San Joaquin Valley, which is often out of compliance for air quality. Another consideration is that all greenhouse gas emissions are relevant under California's climate laws.

This review focuses on direct environmental impacts of WST, including direct impacts to water supply, water quality, air quality, greenhouse gas emissions, seismicity, ecology, traffic and noise, while indirect impacts of WST-enabled oil and gas production receive only cursory treatment. Based on this limited assessment, there is evidence that if the future brings significantly increased production enabled by WST, the primary impacts of WST on California's environment will be indirect impacts, i.e., those due to increases and expansion in production, not the WST activity itself. Impacts of WST-enabled production will vary depending on whether this production occurs in existing rural or urban environments or in regions that have not previously been developed for oil and gas and the nature of the ecosystems, wildlife, geology and groundwater in the vicinity.

References

Bertoldi, G.L., R.H. Johnston, K.D. Evenson, 1991. Ground water in the Central Valley, California; a summary report. United States Geological Survey Professional Paper: 1401-A.

Division of Oil, Gas and Geothermal Resources (DOGGR) (2014a), Interim Well Stimulation Treatment Notices Index. Retrieved from http://maps.conservation.ca.gov/DOGGR/iwst_index.html

Division of Oil, Gas and Geothermal Resources (DOGGR) (2014b), "All Wells" shapefile: Geographic Dataset Representing All Oil, Gas, and Geothermal Wells in California Regulated by the Division of Oil, Gas and Geothermal Resources. Updated January 15, 2014. http://www.conservation.ca.gov/dog/maps/Pages/GISMapping2.aspx

FracFocus (2013), Well Database. Data through December 31 2013 downloaded. http://www.fracfocusdata.org/DisclosureSearch/

Gautier, D.L. (2014). Potential for Future Petroleum Development in California. CCST presentation, January 23, 2014.

Garthwaite, J. (2013), Monterey Shale Shakes Up California's Energy Future, National Geographic, May 2013.

Hughes, J. D. (2013), *Drilling California: a Reality Check on the Monterey Shale*. Post Carbon Institute and Physicians Scientists and Engineers for Healthy Energy, Santa Rosa, CA. 49 pp. Retrieved from http://www.postcarbon.org/reports/Drilling-California_FINAL.pdf

Kell, S. (2011), *State Oil and Gas Agency Groundwater Investigations and Their Role in Advancing Regulatory Reforms, a Two-State Review: Ohio and Texas.* Groundwater Protection Council, http://www.gwpc.org/sites/default/files/State Oil %26 Gas Agency Groundwater Investigations.pdf

Pavley, F. (2013), California Senate Bill No. 4 (SB-4) Oil and gas: well stimulation, Chapter 313, http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201320140SB4

Pearson, C. M., L. Griffin, C. Wright, and L. Weijers (2013), Breaking Up Is Hard to Do: Creating Hydraulic Fracture Complexity in the Bakken Central Basin. In: *SPE 163827, SPE Hydraulic Fracturing Technology Conference,* pp. 1–15, Society of Petroleum Engineers, The Woodlands, Texas, USA.

US Energy Information Administration (EIA) (2011). Review of Emerging Resources: US Shale Gas and Shale Oil Plays. 82 p.

US Energy Information Administration (EIA) (2013), Outlook for shale gas and tight oil development in the U.S. 19 p.

US Energy Information Administration (EIA) (2014). Assumptions to the Annual Energy Outlook 2014. June 2014, 209 p.

Wright, T.L. (1991). Structural Geology and Tectonic Evolution of the Los Angeles Basin, California. In: *Active Margin Basins*, K.T. Biddle (ed), AAPG Memoir 52, 35–134.

California Council on Science and Technology

1130 K Street, Suite 280
Sacramento, CA 95814

(916) 492-0996
http://www.ccst.us

Lawrence Berkeley National Laboratory

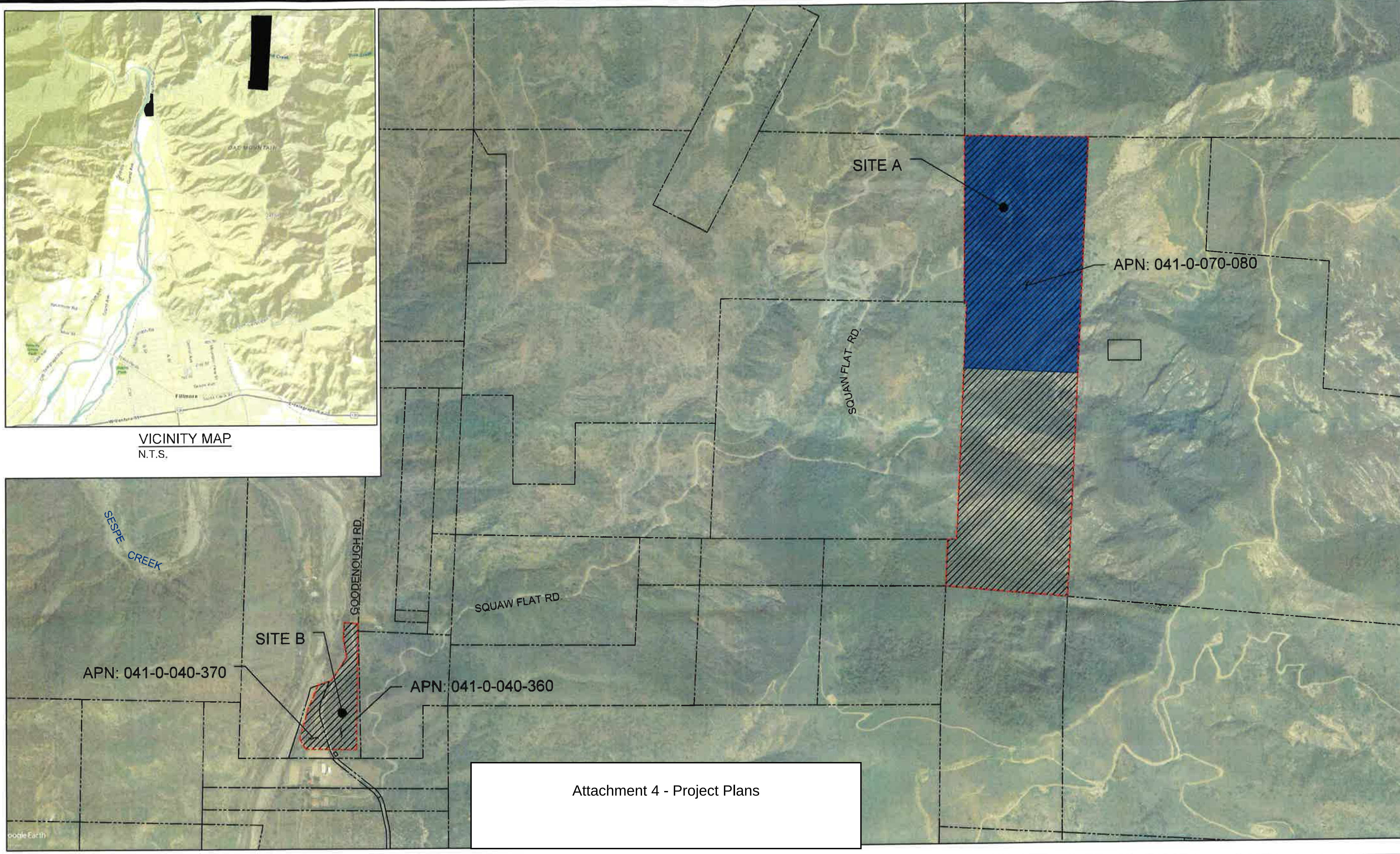
Earth Sciences Division
1 Cyclotron Road,
Mail Stop 74R316C,
Berkeley, CA 94720

(510) 486-6455
http://www.lbl.gov

Pacific Institute

654 13th Street, Preservation Park,
Oakland, CA 94612

(510) 251-1600
http://pacinst.org



VICINITY MAP
N.T.S.

Attachment 4 - Project Plans

LEGEND

— CURRENT CUP BOUNDARY

— CARBON MINERAL LEASE

1000 0 1000 2000
SCALE IN FEET

N

carbon
California Company
APPLICANT: CARBON CA COMPANY
279 QUAIL CT., SUITE B
SANTA PAULA, CA 93060

PREPARED BY:
SESPE
CONSULTING, INC.
374 Poli Street, Ste. 200 • Ventura, CA 93001
(805) 275-1515 www.sespeconsulting.com

CARBON
BASENBERG SITE PLAN
PL18-0058

SCALE HORIZ. AS SHOWN
VERT. AS SHOWN
DRAWN BY G.CAMUS
CHECKED BY J.F.

FIGURE NUMBER
1 OF 3

S:\CA19 – Carbon\Basenberg\CAD\CA19 – Carbon–Basenberg_08–20–17.dwg Aug 22, 2018, 9:23am GJC

LEGEND

— FLUID FLOWLINE
— GAS FLOWLINE
— GROSS FLOWLINE
— WELL PAD (1.11 AC.)

40 0 40 80
SCALE IN FEET

N

carbon
California Company
APPLICANT: CARBON CA COMPANY
279 QUAIL CT., SUITE B
SANTA PAULA, CA 93060

PREPARED BY:
SESPE
CONSULTING, INC.
374 Poli Street, Ste. 200 • Ventura, CA 93001
(805) 275-1515 www.sespeconsulting.com

CARBON
BASENBERG - PL18-0058
SITE A

SCALE: HORIZ. AS SHOWN
VERT. AS SHOWN
DRAWN BY G.CAMUS
CHECKED BY J.F.

FIGURE NUMBER
2 OF 3

S:\CA19 – Carbon\Basenberg\CAD\CA19 – Carbon-Basenberg_08-20-17.dwg Aug 22, 2018, 9:22am GJC

LEGEND

- - - - — CUP BOUNDARY

— - · - — PORTABLE TANK & EQUIPMENT STAGING AREA (1.0 AC.)

40 0 40 80
SCALE IN FEET

N

carbon
California Company
APPLICANT: CARBON CA COMPANY
279 QUAIL CT., SUITE B
SANTA PAULA, CA 93060

PREPARED BY:
SESPE
CONSULTING, INC.
374 Poli Street, Ste. 200 • Ventura, CA 93001
(805) 275-1515 www.sespeconsulting.com

CARBON
BASENBERG - PL18-0058
SITE B

SCALE: HORIZ. AS SHOWN
VERT. AS SHOWN
DRAWN BY G.CAMUS
CHECKED BY J.F.

FIGURE NUMBER
3 OF 3

S:\CA19 – Carbon\Basenberg\CAD\CA19 – Carbon-Basenberg_08-20-17.dwg Aug 22, 2018, 9:22am GJC

VENTURA COUNTY
AIR POLLUTION CONTROL DISTRICT
Memorandum

TO: Jennifer Scholl
Ventura County Resource Management Agency

DATE: January 30, 2018

FROM: Mike Villegas MV
Air Pollution Control Officer

SUBJECT: Recommended Greenhouse Gas (GHG) Threshold of Significance for Stationary Source Projects

Background:

Neither the Ventura County Air Pollution Control District (VCAPCD) nor Ventura County has formally adopted a threshold of significance applicable to GHG emissions from projects subject to review pursuant to the California Environmental Quality Act (CEQA) as part of the County's discretionary land use permitting authority. The County has, however, routinely applied a 10,000-MTCO2e/year[1] threshold of significance to such projects, in accordance with CEQA Guidelines section 15064.4(b)(2). VCAPCD has indicated concurrence with this numeric threshold, stating that "several air districts in California that have adopted or recommended a GHG emissions threshold of significance for a CEQA threshold of significance analysis related to stationary sources have all set the threshold at 10,000 MTCO2e/year, including air districts adjacent to Ventura County." Stationary source projects include land uses that would accommodate processes and equipment that emit GHG emissions and would require a VCAPCD permit to operate.

The 10,000-MTCO2e/year threshold of significance applied to the projects as recommended by the VCAPCD has been adopted by multiple agencies within the broader southern California region for use in evaluating discretionary projects involving stationary sources, including the South Coast Air Quality Management District (SQAQMD) [adopted by the SCAQMD Governing Board; December 5, 2008], San Diego County, and the Santa Barbara Air Pollution Control District (Santa Barbara County APCD CEQA Guidelines, adopted April 30, 2015). The SCAQMD exercises jurisdiction over 10,743 square miles with a population of 15 million in southern California, which includes the entirety of Orange County, and substantially developed portions of Los Angeles, San Bernardino, and Riverside Counties. The San Diego

[1] MTCO2e = metric tonnes carbon dioxide equivalent

Attachment 5 - January 30, 2018 VCAPCD Memorandum

County Air Pollution Control District exercises jurisdiction over 4,300 square miles with 3,064,436 inhabitants (2009). In comparison, Ventura County, at 2,200 square miles, is approximately half the size of San Diego County, and has a population of approximately 850,500 (2015), as well as having far fewer commercial and industrial land uses than any of its southern neighbors.

The 10,000-MTCO2e/year threshold is designed to capture at least 90 percent of the GHG emissions from stationary sources. SCAQMD staff originally developed this threshold by compiling the reported annual natural gas consumption for 1,297 permitted facilities for 2006 through 2007, and rank-ordering the facilities to estimate the 90th percentile of the cumulative natural gas usage for all permitted facilities. The data set was deemed to be the best information available at the time. Within the data set, approximately 10 percent of the facilities evaluated comprise more than 90 percent of the total natural gas consumption, which corresponds to 10,000 MTCO2e/year (the majority of combustion emissions are comprised of CO2).

Most GHG emissions from industrial facilities that require air district permits are generated from stationary sources, while a relatively small percent is generated by traffic, water usage, etc. related to these facilities. Therefore, although the GHG significance threshold was derived without considering offsite, indirect GHG emissions, the use of a 10,000-MTCO2e/year threshold for stationary-source projects is appropriate because it captures 90 percent or more of the GHG emissions from industrial projects located within the southern California region.

The 10,000-MTCO2e/year threshold adopted by SCAQMD is both low enough to capture a substantial amount of future industrial/stationary-source projects, while still high enough to intentionally exclude small projects which, in aggregate, will contribute only a relatively small amount to cumulative regional and statewide GHG emissions. The use of a threshold of 10,000 MTCO2e/year is also more appropriate than a zero threshold, because the former will assure that all feasible GHG mitigation will be implemented for a large majority of emissions, while not resulting in substantial administrative requirements for projects which individually produce only a nominal contribution towards cumulative regional and statewide GHG emissions.

Finally, the fact that Ventura County's GHG emissions base is small compared to the greater southern California region suggests that the application of a higher capture rate threshold (greater than 90 percent) is not appropriate here. For comparison, if the GHG emissions from Ventura County were folded into an inventory for the larger SCAQMD and/or San Diego County APCD regions, the additional data would have no appreciable effect on the percentage of GHG emissions captured by a 10,000-MTCO2e/year threshold for stationary-source projects in that larger region. Therefore, the VCAPCD considers a 10,000-MTCO2e/year threshold, as applied by both the SCAQMD and San

Diego County, to be a reasonable numeric threshold of significance for GHG emissions emitted from stationary sources.

GHG emissions are being targeted for reduction based on their cumulative effects on climate. All projects in California are equally subject to state laws, regulations and programs designed to reduce overall GHG emissions to sustainable levels. Therefore, a stricter or lower threshold of significance in Ventura County would disproportionately burden project proponents in the County without providing any meaningful benefits in mitigating climate change. Keeping the Ventura County GHG threshold consistent with neighboring jurisdictions keeps a level playing field. Since greenhouse gases are a global pollutant, it does not matter where the gases are emitted. So emissions from the Bay Area (which also has a 10,000-MTCO2e/year threshold for stationary sources which require air quality permits), or anywhere in the United States, are equivalent in their cumulative environmental impact. The United States Environmental Protection Agency (USEPA) initially set their major source threshold for GHGs at 100,000 tons per year. While this threshold was struck down by the U.S. Supreme Court, this was not due to the impacts or technical basis for the threshold but because it was inconsistent with the federal Clean Air Act requirements. In response to the threshold being vacated by the Court, USEPA proposed a 75,000-tpy CO2e Significant Emission Rate (SER) for GHGs. The SER establishes a *de minimis* level below which best available control technology (BACT) is not required for this pollutant.

It should be noted that the County of Santa Barbara adopted a lower GHG threshold of significance than was recommended or adopted by the various air pollution control agencies cited above. On May 19, 2015, the County of Santa Barbara adopted an even more stringent 1,000-MTCO2e threshold of significance for GHG emissions specifically for oil and gas projects. The Santa Barbara County Planning Commission voted 3-2 to recommend adoption of a 1,000-MTCO2e/year bright-line threshold, which would capture an even higher rate (99 percent) of future GHG gas emissions than the 10,000-MTCO2e/year threshold (90 percent), despite the fact that the 10,000-MTCO2e/year threshold was recommended by Santa Barbara Planning and Development staff. Thus, the County of Santa Barbara's decision to select a more stringent capture rate for oil and gas projects reflected a discretionary policy decision that was not based on scientific evidence weighing against the use of a 10,000-MTCO2e/year threshold.

Conclusion:

VCAPCD staff recommends a GHG threshold of significance of 10,000 MTCO2e for stationary source projects located within Ventura County. Further, VCAPCD staff encourages the use of GHG thresholds that are consistent throughout California. GHGs are global pollutants and unlike criteria air pollutants there are not regions where GHG emission mitigation measures are more or less significant/effective than in other regions.

Board of Supervisors Hearing
March 13, 2018

Mitigated Negative Declaration Addendum

Attachment 11

VCAPCD Memorandum
(Estimate of Drilling Emissions)

Renaissance Petroleum Project
Case No. PL14-0103
(Minor Modification of CUP LU05-0086)

Attachment 6 - September 6, 2017 VCAPCD Memorandum

VENTURA COUNTY
AIR POLLUTION CONTROL DISTRICT
Memorandum

TO: Brian Baca
Planning/RMA

DATE: September 6, 2017

FROM: Chuck Thomas, Manager CT
Planning/Rules/Incentives

SUBJECT: Renaissance Petroleum Project (PL14-0103)

As you requested, we've estimated daily air emissions from drilling one generic oil well and 15 daily employee commute trips associated with the proposed Renaissance Petroleum Project near Oxnard.

Oil Well Drilling: 90 lbs/day (NOx + ROG)
Assumptions: Tier 3 diesel engine: 3.0 grams/BHP-hr
1,000 gallons diesel fuel/day

15 Daily Employee Commute Trips: 0.06 lbs/day NOx; 0.06 lbs/day ROG
Assumptions: 15 employees, 30 one-way trips/day; 10 miles/one-way trip

If you have any questions, please contact me at chuck@vcapcd.org or 805/645-1427.

c: Mike Villegas, VCAPCD
Kerby Zozula, VCAPCD

Board of Supervisors Hearing
July 23, 2019

Mitigated Negative Declaration Addendum

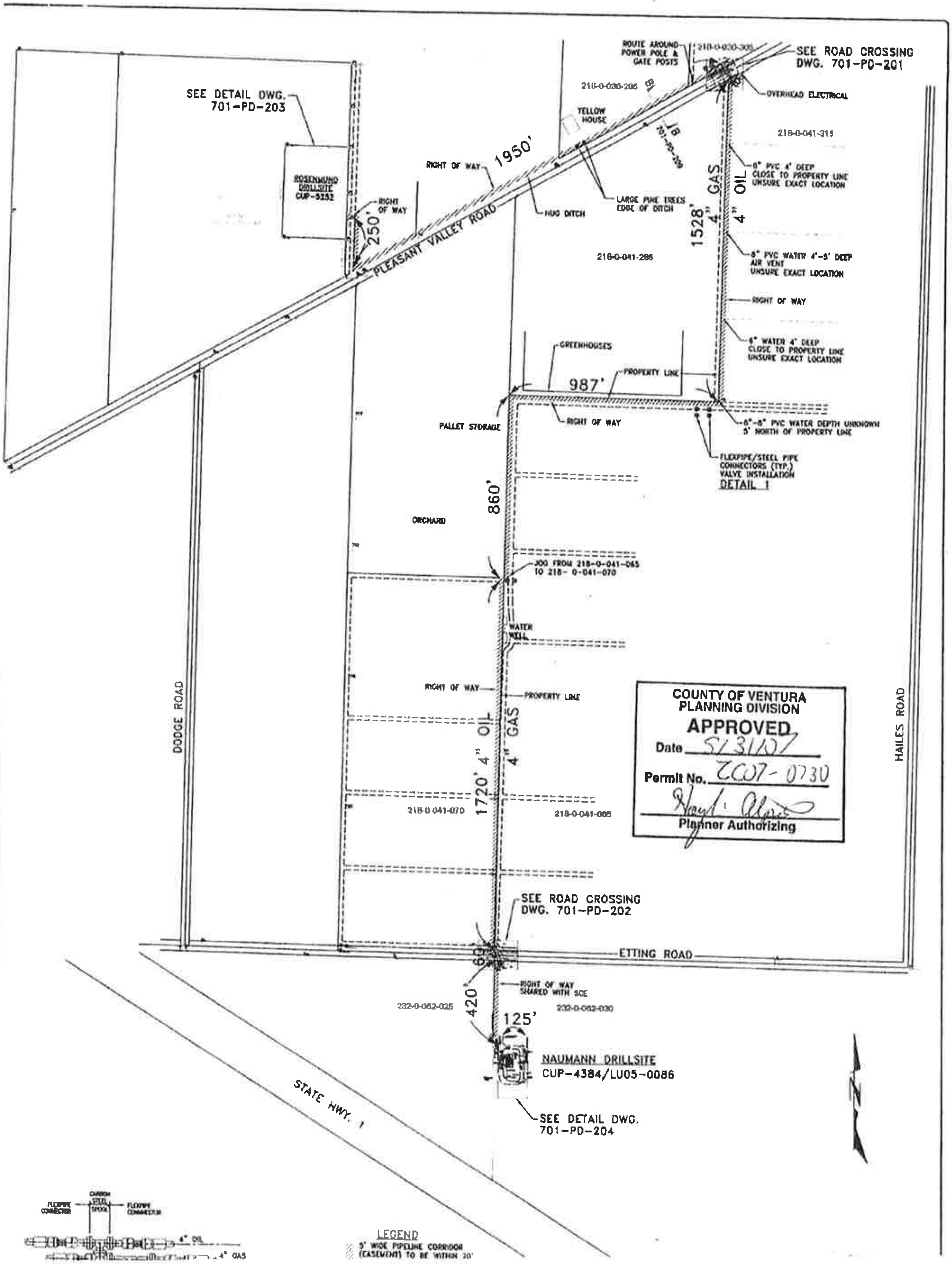
Attachment 1

Existing Gathering Pipelines_Cabrillo Oil Field

Renaissance Petroleum Project

Case No. PL14-0103
(Minor Modification of CUP 4384)

Attachment 7 - VCAPCD Calculation of Tanker Truck Emissions



SEE ROAD CROSSING
DWG. 701-PD-201
ROUTE AROUND POWER POLE & GATE POSTS
218-0-030-305
218-0-030-295
OVERHEAD ELECTRICAL
SEE DETAIL DWG.
701-PD-203
YELLOW HOUSE
218-0-041-315
ROSENMUND DRILLSITE CUP-5252
RIGHT OF WAY
1950'
6" PVC 4' DEEP CLOSE TO PROPERTY LINE UNSURE EXACT LOCATION
LARGE PINE TREES EDGE OF DITCH
RIGHT OF WAY
HUG DITCH
250'
PLEASANT VALLEY ROAD
1528' 4" GAS
4" OIL
218-0-041-285
8" PVC WATER 4'-5' DEEP AIR VENT UNSURE EXACT LOCATION
RIGHT OF WAY
6" WATER 4' DEEP CLOSE TO PROPERTY LINE UNSURE EXACT LOCATION
GREENHOUSES
PROPERTY LINE
987'
PALLET STORAGE
RIGHT OF WAY
6"-8" PVC WATER DEPTH UNKNOWN 5' NORTH OF PROPERTY LINE
FLEXPIPE/STEEL PIPE CONNECTORS (TYP.) VALVE INSTALLATION
DETAIL 1
860'
ORCHARD
JOG FROM 218-0-041-065 TO 218-0-041-070
WATER WELL
RIGHT OF WAY
PROPERTY LINE
DODGE ROAD
1720' 4" OIL
4" GAS
HAILES ROAD
218-0-041-070
218-0-041-065
COUNTY OF VENTURA
PLANNING DIVISION
APPROVED
Date 5/31/07
Permit No. ZC07-0730
Planner Authorizing
SEE ROAD CROSSING
DWG. 701-PD-202
ETTING ROAD
60'
RIGHT OF WAY SHARED WITH SCE
420'
232-0-062-025
232-0-062-030
125'
NAUMANN DRILLSITE
CUP-4384/LU05-0086
STATE HWY. 1
SEE DETAIL DWG.
701-PD-204
N
FLEXPIPE CONNECTOR
CARBON STEEL SPOOL
FLEXPIPE CONNECTOR
4" OIL
4" GAS
LEGEND
5' WIDE PIPELINE CORRIDOR (EASEMENT) TO BE WITHIN 20'

Board of Supervisors Hearing
July 23, 2019

Mitigated Negative Declaration Addendum

Attachment 2

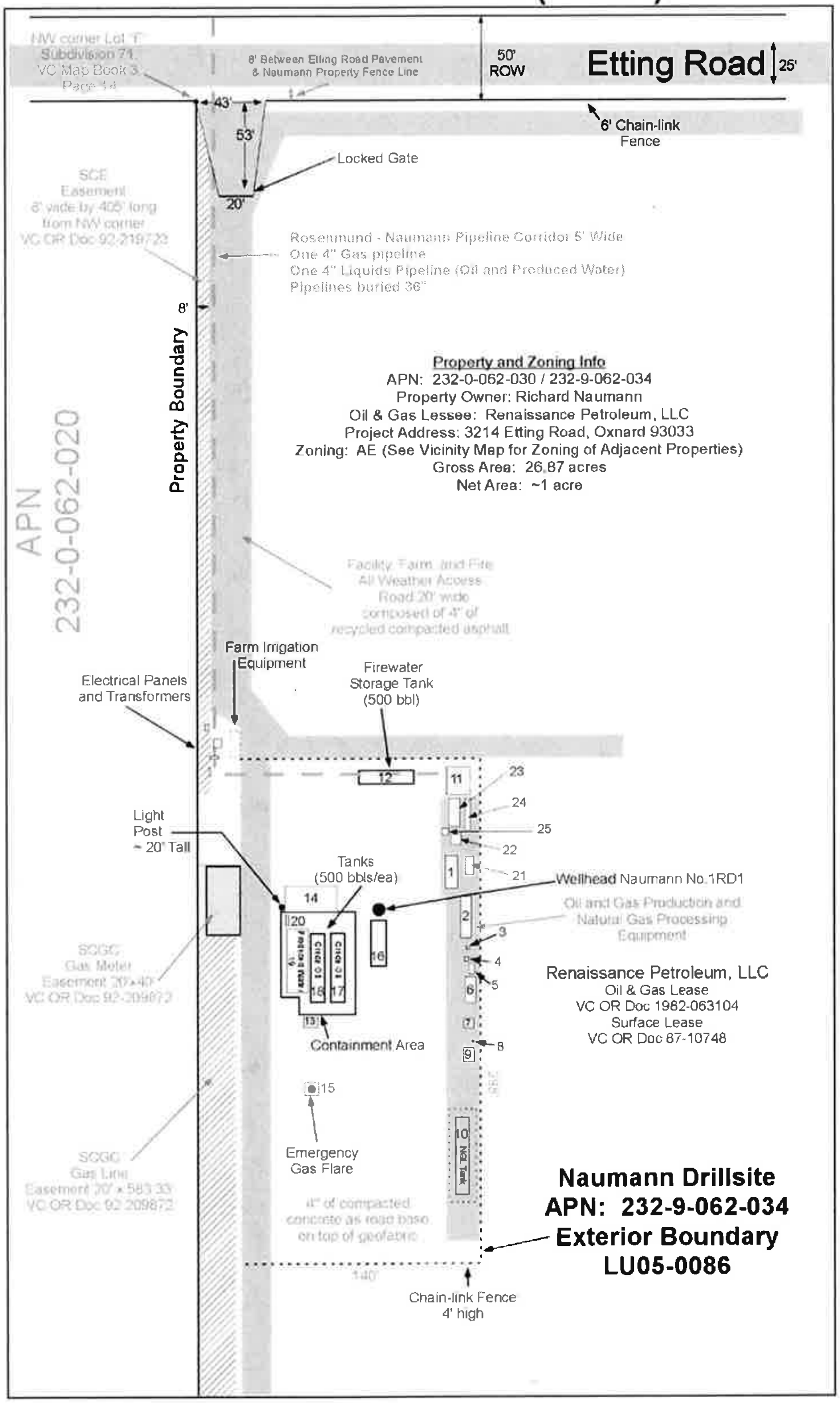
Site Plans

Renaissance Petroleum Project

Case No. PL14-0103

(Minor Modification of CUP 4384)

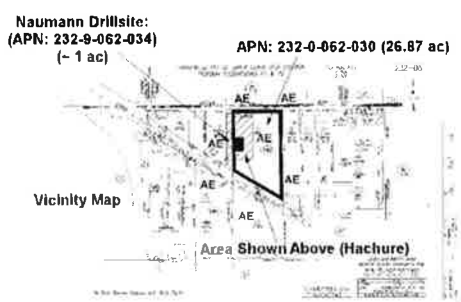
LU05-0086 Site Plan
Naumann Drillsite As-Is (7-2014)



Naumann Drillsite Equipment Inventory*

1. Gas Compressor
2. Gas Chiller
3. Inlet Gas Scrubber
4. Vertical Separator
5. Total Flow Gas Meter
6. 3 Phase Separator.
7. Flare Scrubber
8. Flare Meter
9. Air Compressor
10. NGL Tank
11. Pipeline Connections
12. Fire Water Tank
13. Vapor Recovery
14. LACT Skid
15. Emergency Gas Flare
16. Pumping Unit
17. Crude Oil Tank
18. Crude Oil Tank
19. Produced Water Tank
20. Loading Rack
21. Refrigeration Unit Skid
22. Glycol Contactor
23. Glycol Burner
24. Glycol Condenser
25. VSD Electrical Panels

* See addendum to VC Minor Mod dated 7-24-2014 for additional information



N
E

Scale

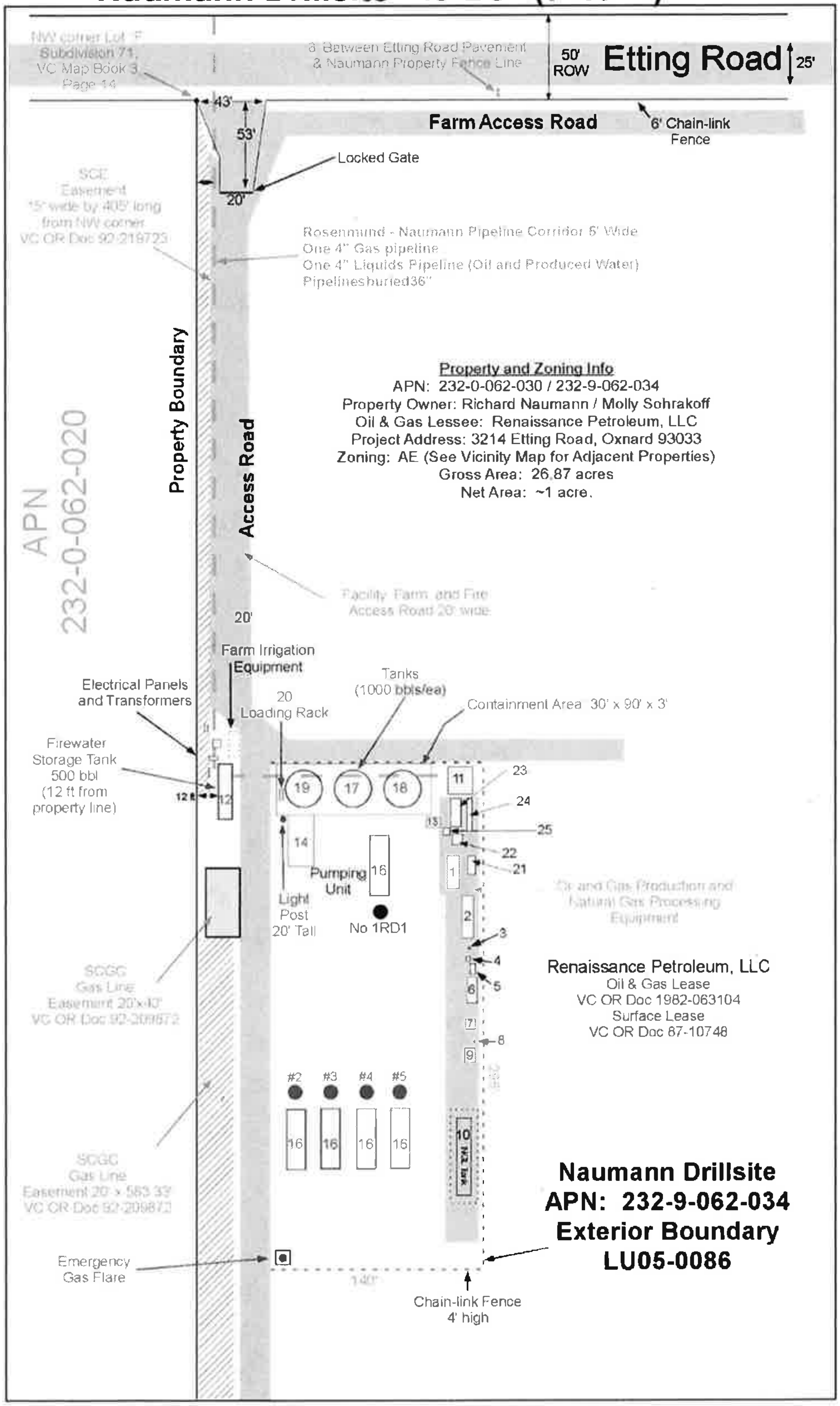
0' 60' 120'

1" = 30'

Renaissance Petroleum, LLC
Ventura County, CA
CUP LU05-0086
Naumann Drillsite
Site Plan "As-Is" 7-2014
rev. 1-2017

Prepared By:
Renaissance Petroleum, LLC
PO Box 20456
Bakersfield, CA 93390
661-324-9901

LU05-0086 Site Plan
Naumann Drillsite "To-Be" (7-2014)



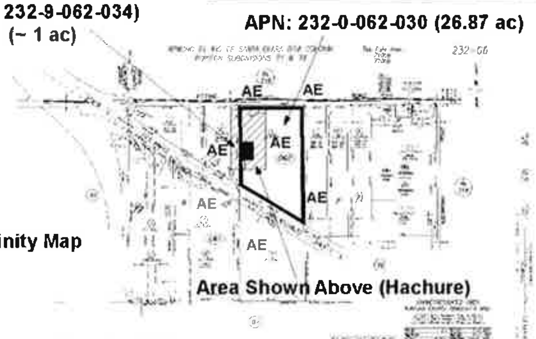
Naumann Drillsite Equipment Inventory*

1. Gas Compressor
2. Gas Chiller
3. Inlet Gas Scrubber
4. Vertical Separator
5. Total Flow Gas Meter
6. 3 Phase Separator.
7. Flare Scrubber
8. Flare Meter
9. Air Compressor
10. NGL Tank
11. Pipeline Connections
12. Fire Water Tank
13. Vapor Recovery
14. LACT Skid
15. Emergency Gas Flare
16. Pumping Unit
17. Crude Oil Tank
18. Crude Oil Tank
19. Produced Water Tank
20. Loading Rack
21. Refrigeration Unit Skid
22. Glycol Contactor
23. Glycol Burner
24. Glycol Condenser
25. VSD Electrical Panels

* See addendum to VC Minor Mod dated 7-24-2014 for additional information

Naumann Drillsite: (APN: 232-9-062-034) (~ 1 ac)

APN: 232-0-062-030 (26.87 ac)



Vicinity Map

Engineer: MWT ver 7-2014

N
E

Scale
0' 60' 120'
1" = 30'

Renaissance Petroleum, LLC
Ventura County, CA
CUP LU05-0086
Naumann Drillsite
Site Plan "To-Be" 7-2014
rev. 1-2017

Prepared By:
Renaissance Petroleum, LLC
PO Box 20456
Bakersfield, CA 93390
661-324-9901

Board of Supervisors Hearing
July 23, 2019

Mitigated Negative Declaration Addendum

Attachment 3

1986 Mitigated Negative Declaration

Renaissance Petroleum Project

Case No. PL14-0103
(Minor Modification of CUP 4384)

RESOURCE MANAGEMENT AGENCY

county of ventura

Planning Division

FINAL

MITIGATED NEGATIVE DECLARATION

A. PROJECT DESCRIPTION:

1. Entitlement: Conditional Use Permit No. 4384

2. Applicant: Cities Service Oil and Gas Corp.

3. Location: (see attached map): Between Etting Road and State Highway 1, approximately 1/2 mile east of Pleasant Valley Road; City of Oxnard Area of Interest.

4. Assessor Parcel No(s). 232-062-03

5. Parcel Size: 26.87 acres; Permit Area: 28,000 sq. ft.

6. General Plan Designation Agriculture (Open Space Element)

7. Existing Zoning: "A-E" (Agricultural Exclusive)

8. Project Description: Drilling of one exploratory oil/gas well and production if hydrocarbons are found.

9. Responsible Agencies: California Division of Oil and Gas

B. STATEMENT OF ENVIRONMENTAL FINDINGS

California State law requires that an Initial Study (environmental evaluation) be conducted to determine if this project could significantly affect the environment. An Initial Study was conducted by the Planning Division to evaluate the potential effect of this project on the environment. Based on the findings contained in the attached Initial Study it has been determined that this project could have a significant effect on the environment. Therefore, a Mitigated Negative Declaration has been prepared, pursuant to the provisions of California Environmental Quality Act (Sec. 15073). The potentially significant impacts can be satisfactorily mitigated through adoption of the following identified measures as conditions of approval.

C. POTENTIALLY SIGNIFICANT ENVIRONMENTAL IMPACTS IDENTIFIED AND PROPOSED MITIGATION MEASURES

1. #1 - Discussion of Impact

The subject site is currently planted in citrus (lemon) orchard, and is under an LCA Contract. The proposed two acre permit area will have to be cleared of all the lemon trees prior to the start of drilling and through the life of the permit, if production is reached.

Mitigation

a. The proposed two acre permit area will be reduced to 28,000 sq. ft. This area is adequate to drill one exploratory oil/gas well, and to install production if oil and/or gas is found.

b. Trees of the same variety shall be planted as close to the well as possible/practical when the well is abandoned, or completed.

c. Dust will be kept to an absolute minimum along access roads, and within the permit area.

D. PUBLIC REVIEW:

1. Legal Notice Method: Direct mailing to property owners within 300 feet of proposed project boundary.

2. Document Posting Period: October 31, 1986 to December 2, 1986

3. Environmental Report Review Committee Hearing Date: December 3, 1986

4. Place: Hall of Administration, Multi-Purpose Room, Room 344, Third Floor.

5. Time: 1:30 p.m.

Prepared by: James Caruso
Case Planner

Reviewed by: Robert K. Laughlin, Supervisor 10/22/86
Commercial/Industrial Land Use Section

The Environmental Report Review Committee recommends that the decision-making body find that this document has been completed in compliance with the California Environmental Quality Act.

Chair, Environmental Report Review Committee

12/5/86
Date

RKL:bb/J225

COUNTY OF VENTURA
RESOURCE MANAGEMENT AGENCY
800 S. VICTORIA AVENUE
VENTURA, CA 93009

CONSENT AGREEMENT FOR PROPOSED MITIGATION MEASURES WITH MITIGATED NEGATIVE DECLARATION

COUNTY OF VENTURA
RESOURCE MANAGEMENT AGENCY

ENTITLEMENT NO.: CUP-4384

I, Cities Service Oil & Gas Corp the applicant, hereby agree to the proposed Mitigation Measures which have been developed in conjunction with the preparation of a Mitigated Negative Declaration for the proposed project. I understand that these Mitigation Measures or substantially similar measures must be adopted as conditions of approval with this permit request in order to reduce identified potential environmental impacts to an acceptable level, and to avoid the necessity of preparing an Environmental Impact Report for this project.

The potentially significant environmental issues and the proposed Mitigation Measures are as follows:

1. #1 - Discussion of Impact

   The subject site is currently planted in citrus (lemon) orchard, and is under an LCA Contract. The proposed two acre permit area will have to be cleared of all the lemon trees prior to the start of drilling and through the life of the permit, if production is reached.

   Mitigation

   a. The proposed two acre permit area will be reduced to 28,000 sq. ft. This area is adequate to drill one exploratory oil/gas well, and to install production if oil and/or gas is found.

   b. Trees of the same variety shall be planted as close to the well as possible/practical when the well is abandoned, or completed.

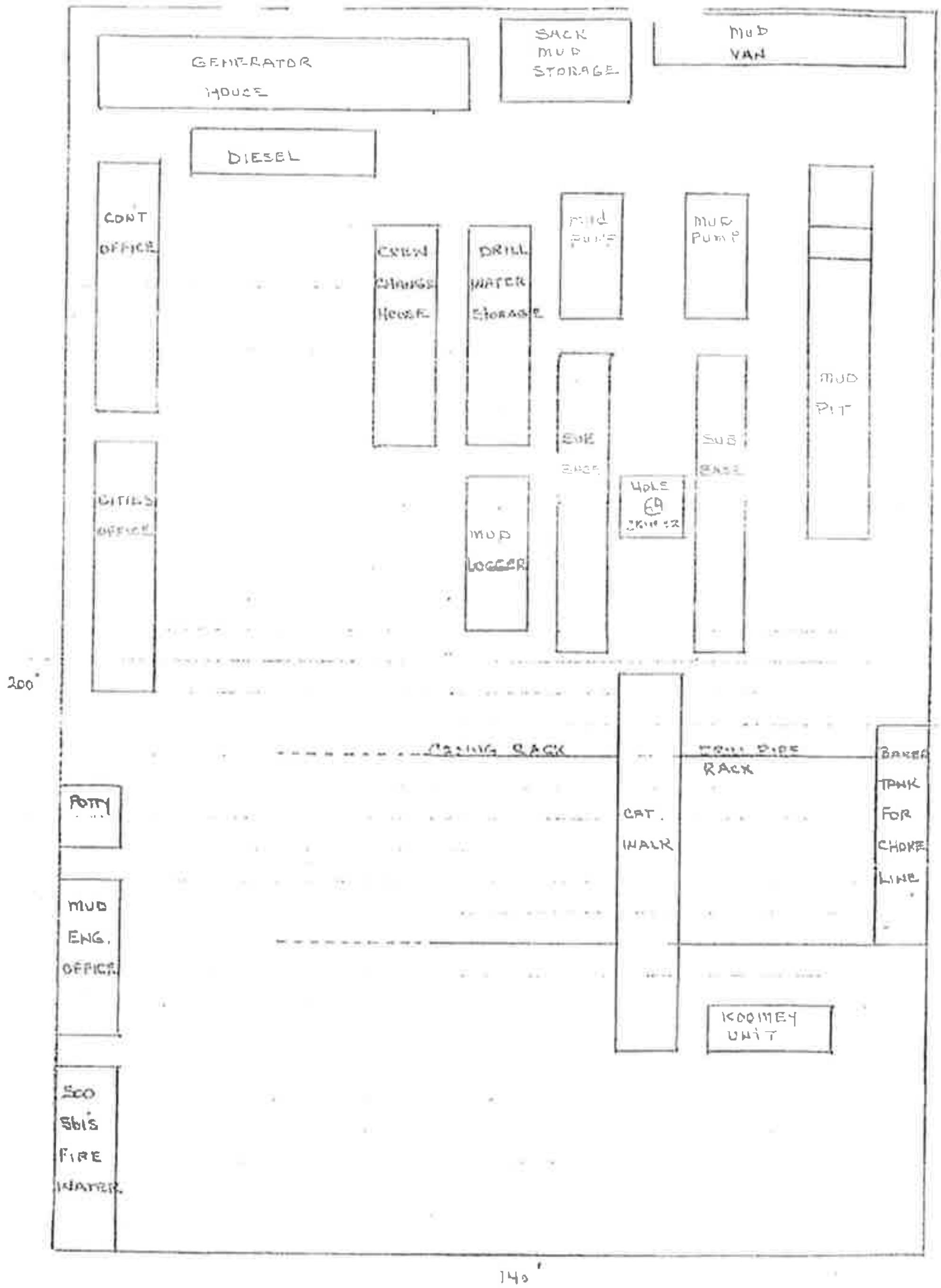
   c. Dust will be kept to an absolute minimum along access roads, and within the permit area.

Applicant's Signature	[signature]
Applicant's Address	P.O. Box 939
	Bakersfield, CA 93302
Date	December 2, 1986

JC:bb/J258

Ventura County
Resource
Management
Agency

CUP-4384



¼ ½ ¾

SCALE 1" = 20 Feet

Derrick Height = 157'

N

INITIAL STUDY

A. PROJECT INFORMATION

1. Project No.: Conditional Use Permit No: 4384

2. Name of Applicant: Cities Service Oil and Gas Co.

3. Project Location: Between Etting Rd and State Highway 1 approximately 1½ miles east of Pleasant Valley Rd

4. Project Description: Drilling of one exploratory oil and gas well (30-35 days) and the installation of production equipment if if production is reached.

B. ENVIRONMENTAL IMPACT CHECKLIST

PLANNING DIVISION	Impact? Yes	Impact? Maybe	Impact? No	Significant? Yes	Significant? Maybe	Significant? No
1. Land Use Will the project, individually or cumulatively, alter the planned land use of an area?	X					X
2. Growth Inducement Will the project, individually or cumulatively, induce growth in an area?			X			
3. Housing Will the project, individually or cumulatively, affect existing housing, or create a demand for additional housing?			X			
4. General Plan Consistency Will the project, individually or cumulatively, conflict with any environmental goal, objective, policy or program of the General Plan?			X			
5. Mineral and Oil Resources Will the project, individually or cumulatively, result in:						
a. The depletion of mineral or oil resources?		X				X
b. Hampering or precluding access to or the extraction of, mineral or oil resources?			X			

	Impact? Yes	Impact? Maybe	Impact? No	Significant? Yes	Significant? Maybe	Significant? No
b. An effect on existing parking facilities, or demand for new parking?			X			
c. An impact upon existing transportation systems?	X					X
d. Alterations to present patterns of circulation or movement of people and/or goods?			X			
e. Alterations to rail traffic?			X			
f. An increase in traffic hazards to motor vehicles, bicyclists or pedestrians?			X			
10. Flood Control						
Will the project, individually or cumulatively, result in or be impacted by:						
a. Changes to absorption rates, drainage patterns, or the route and/or amount of surface water runoff?			X			
b. The alteration to the course or flow of flood waters?			X			
c. The exposure of people, property or unique natural resources to hazards such as flooding or tsunami?			X			
d. An effect on a channel or stream regulated by the Flood Control District?			X			
e. Changes in currents, or the course of direction of water movements, in any body of water?			X			
*f. A flood plain indicated on the Ventura County Flood Insurance Rate Maps?			X			
11. Water Resources						
Will the project, individually or cumulatively, result in or be impacted by:						
a. A decrease of surface water quantity?			X			
b. The degradation of surface water quality?			X			
c. A decrease of groundwater quantity?			X			
d. The degradation of groundwater quality?			X			
e. A high groundwater table?	X					X

	Impact: Yes	Impact: Maybe	Impact: No	Significant?: Yes	Significant?: Maybe	Significant?: No
GENERAL SERVICES AGENCY						
18. **Recreation** — Will the project, individually or cumulatively, result in impacts on recreational opportunities or facilities?			X			
19. **Harbors** — Will the project, individually or cumulatively, result in an impact on harbors?			X			
AIRPORTS DEPARTMENT						
20. Will the project, individually or cumulatively, result in impacts on:						
a. Air traffic safety?	X					X
b. Existing airport facilities?	X					X
AGRICULTURAL DEPARTMENT						
21. **Agricultural Resources** — Will the project, individually or cumulatively, result in:						
a. The conversion of prime agricultural land to other uses?	X			X		
b. The loss of productive crop land or soils?	X			X		
c. An adverse effect on adjacent agricultural land?			X			
AREAS TO BE COMPLETED BY THE AGENCY RESPONSIBLE FOR ADMINISTERING THE PROJECT						
22. **Visual Effects** — Will the project, individually or cumulatively, result in the obstruction of a scenic resource or view open to the public, or will the project result in the creation of an aesthetically offensive site open to public view?	X					X
23. **Light and Glare** — Will the project, individually or cumulatively, produce light or glare?	X					X
24. **Noise and Vibrations** — Will the project, individually or or cumulatively, result in the exposure of people to increased noise or vibrations?	X					X
25. **Public Facilities and Utilities** — Will the project, individually or cumulatively, have an effect upon, or result in a need for new or altered services in any of the following areas:						
a. Sewers or sewage treatment plants?			X			

		Impact?			Significant?		
		Yes	Maybe	No	Yes	Maybe	No
c.	Introduction of new plant species into an area, or the introduction of a barrier to the normal replenishment of existing species?			X			
d.	Change in the diversity of species, numbers or habitat of any animal species which are locally sensitive or unique?			X			
e.	Disturbance or reduction in the numbers of any State or Federally listed rare, threatened or endangered animal species or their habitats?			X			
f.	Introduction of new animal species into an area?			X			
g.	Introduction of barriers to movement of any resident or migratory fish or wildlife species?			X			
h.	Introduction of factors adverse to the existing ecological balance?			X			
i.	Introduction of substances, human activity, structures or other factors that would damage, change or hamper an existing locally sensitive or unique ecosystem?			X			

C. DISCUSSION OF RESPONSES TO CHECKLIST

SEE
(~~Agency responses are~~ attached here.)

JC
Here are your originals
B.

IAGEM_NT AGENCY
of ventura

Planning Division

NOTICE OF PUBLIC REVIEW OF A
DRAFT MITIGATION NEGATIVE DECLARATION

TO CONCERNED PARTIES:

The Planning Division is currently processing the land use permit request described below. California State law requires that an Initial Study (environmental evaluation) be conducted to determine if this project could significantly affect the environment. Based on the Initial Study, it has been found that significant effects upon the environment could occur; however, mitigation meaures can be adopted which will reduce these impacts to acceptable levels. Therefore, a Mitigated Negative Declaration has been prepared, pursuant to the provisions of CEQA (Sec. 15073).

A. PROJECT DESCRIPTION:

1. Entitlement: Conditional Use Permit No. 4384
2. Applicant: Cities Service Oil and Gas Corp.
3. Location: (see attached map): Between Etting Road and State Highway 1, approximately 1½ miles east of Pleasant Valley Road, City of Oxnard Area of Interest, California.
4. Assessor Parcel No(s).: 232-062-03
5. Parcel Size: 28.67 acres.
6. General Plan Designation: "Agriculture" (Open Space Element).
7. Existing Zoning: "A-E" (Agricultural Exclusive).
8. Proposal: Drilling of 1 exploratory oil and gas well, and production if hydrocarbons are found.

B. PUBLIC REVIEW:

The public review period of the Draft Mitigated Negative Declaration is from October 31, 1986 to December 2, 1986. In addition, the Ventura County Environmental Report Review Committee will hold a public hearing on the adequacy of the Draft Mitigated Negative Declaration at 1:30 p.m. on December 3, 1986, in the Multi-Purpose Hearing Room, Room 344, Third Floor, Hall of Administration, 800 South Victoria Avenue, Ventura, CA 93009. You are welcome to attend this hearing, and to comment on the adequacy of the Draft Mitigated Negative Declaration. If you are unable to attend, written comments on this document may be submitted to James Caruso, Planning Division, Resource Management Agency, 800 South Victoria Avenue, Ventura, CA 93009.

Copies of this Draft Mitigated Negative Declaration may be reviewed or obtained at the above address. If you have any questions, please phone James Caruso at (805) 654-2453.

JC:jl/J349

Attachment:
Location Map

C. Discussion of Impacts

1. Land Use - The present land use in the area is agriculture (lemon orchard on site). Drilling of one exploratory well and installation of production equipment (pump, tanks, etc.) will necessarily remove land from agricultural production. The 28,000 square feet of land needed for drilling and production represents less than 0.01% of the 28 acre parcel on which the well is to be located. This figure is deemed to be insignificant.

2. Growth Inducement - Drilling of and production from one well has no growth inducing impacts.

3. Housing - No new employees of the applicant will be needed to complete this well. Therefore, no new housing will be needed.

4. General Plan Consistency - A review of the Ventura County General Plan indicates no conflict between the project and the General Plan.

5. Mineral and Oil Resources - The purpose of the proposed project is to locate and develop oil and gas resources. Therefore, if oil and/or gas is found, and pumped from the ground, the resource(s) will be depleted. However, the completion of one well will not significantly deplete the resource(s).

6. Solid Waste Facilities - The Ventura County Ordinance Code Section 8107-5.6.4 requires the proper handling and disposal of contaminants. Other materials such as broken concrete, paper, brush, etc., can be disposed of at appropriate landfill sites. The project shall produce such wastes in very small quantities, and therefore shall not have a significant effect on solid waste facilities.

7. Air

(a)(1) Based on the criteria contained in Ventura County's Guidelines for the Preparation of Air Quality Impact Analyses for determining a project's potential impact on air quality, the subject project will not have a significant adverse impact on air quality.

(a)(2) Due to the nature and location of the proposed project, and the small amount of earth (17 cu. yds.) to be moved to create the drilling pad, the project is not expected to cause local air quality impacts.

(a)(3) Oil well projects generally do not produce objectionable odors.

(b)(1) Agricultural spraying in the area may impact the project site. The degree of impact will depend on such factors as type and amount of material sprayed, method and frequency of spraying, distance of the drilling rig from areas sprayed, and wind direction and speed. Since the drilling operation is temporary, and agricultural spraying operations in the area infrequent, personnel at the drilling site are not expected to be adversely impacted by the application of pesticides on nearby crops.

(b)(2) Odors associated with agricultural spraying in the area may impact the project site. The degree of impact will depend on such factors as type and amount of material sprayed, method and frequency of spraying, distance of the drilling rig from areas sprayed, and wind direction and speed. Since the drilling operation is temporary, and agricultural spraying operations in the area infrequent, personnel at the drilling site are not expected to be adversely impacted by odors resulting from the application of pesticides on nearby crops.

8. Earth - The Public Works Agency comments that pursuant to the County's Zoning Ordinance Section 8107-5, the proposed project site would not impact, nor be impacted by, any earth characteristics that might be present. The proposed amount of grading identified is insignificant to County standards.

9. Transportation/Circulation - The Public Works Agency comments that the proposed project will impact the County's road system in the area. However, the Agency considers the impact to be insignificant since the roads are adequately developed to handle the amount and type of traffic identified in the environmental assessment.

   Consequently, the Agency will not require any mitigation.

10. Flood Control - The Public Works Agency comments that within the area of the proposed project site, the Agency's records show that the site has no historical evidence of being impacted by, or impacting, any flood storm water.

11. Water Resources - The Public Works Agency comments that pursuant to Section 8107-5.6.1 of the County's Zoning Ordinance, any impacts on surface and ground waters would be alleviated by the requirements of the ordinance.

    The Agency's records indicate the presence of high ground water table. However, the nature of the proposed project would not impact, or be impacted by, the level of the ground water.

12. Sanitation - The project will not utilize an individual disposal system

13. Water Supply - The project is not required to provide a long-term water supply.

14. Risk of Upset - The provisions of hazardous materials and zoning ordinances, require steps be taken to minimize the possibility of risk of upset. These ordinances reduce possible impacts to insignificant levels.

15. Human Health - See number 14 above

16. Fire Protection -

    (a) Two fire stations are located within five miles of the project site.

    (b) Adequate personnel and equipment are available at these stations.

    (c) The project is not located in a high fire hazard area.

    (d) The site is located 500 feet off a paved road. Adequate access for fire equipment is available.

    (e)(f) The provisions of the Uniform Fire Code adequately address these issues. No further mitigation is required. The applicant must apply for and obtain a Uniform Fire Permit.

17. Sheriff's Department -

    (a) The applicant proposes to secure the project by fencing.

    (b) Adequate roads are available to the site.

    (c) No locational impacts are evident from the project's location. Regular Sheriff patrols frequent the area.

18 **Recreation** - The project is not located near any recreational facilities, and shall not generate the need for additional recreational facilities.

19. **Harbors** - No harbor impacts are feasible from this project.

20. **Airports** - The project is located approximately two miles northwest of the end of the Point Mugu runways. The FAA requires a warning beacon be installed atop the drilling mast. This impact is insignificant.

21. **Agricultural Resources** - The subject site is currently planted in citrus (lemon) orchard, and is under an LCA Contract. The proposed two acre permit area will have to be cleared of all lemon trees prior to the start of drilling and through the life of the permit if production is reached.

    Mitigation

    a. The proposed two acre permit area shall be reduced to one acre or less. This area is adequate to drill one exploratory oil/gas well, and to install production equipment.

    b. Trees of the same variety shall be planted as close to the well as possible/practical when the well is abandoned or completed.

    c. Dust shall be kept to an absolute minimum along access roads and within the permit area by damping or chemical dust binding.

22. **Visual Effects** - Due to the surrounding orchard, the only phase of the project to be visible from public roads or neighboring property will be the drilling rig mast. This mast will be approximately 160 feet high and will remain in place for 30-35 days. This impact is deemed to be insignificant due to its temporary nature.

23. **Light and Glare** - This impact is insignificant due to the controlling provision of the Ventura County Ordinance Code Section 8107-5.6.7.

24. **Noise and Vibration** - Noise impacts are deemed to be insignificant due to the provisions of Ordinance Code Sections 8107-5.6.13 through 8107-5.6.21.

25. **Public Facilities and Utilities** - The project will have no interaction with any of the mentioned facilities with the possible exception of electrical transmission. According to APCD rules, the drilling phase and 90 days of the production phase can be powered by diesel-electric generators. After the initial 90 days of production, permanent grid power must be brought to the site. This single service extension is insignificant.

26. **Energy** - As noted above, a diesel-electric generator will power the drilling rig. The amount of fuel needed for this generator is relatively small. No significant impact is expected.

27. **Cultural/Ethnic Resources** - According to the Ventura County Archaeological Society, no impacts on cultural or ethnic resources are expected.

28. **Biological Resources** - The biological systems prevalent in the area have been given over entirely to permanent agriculture. The permit site, and all adjacent lands within approximately one-half mile, have been cleared of natural vegetation. The permit area itself will not act as a barrier to wildlife movement due to its size and the fact that it is surrounded on all sides by agricultural lands.

JC:j/L14

CITY OF
Oxnard

COMMUNITY DEVELOPMENT DEPARTMENT • 305 W. THIRD ST. • OXNARD, CA 93030 • (805) 984-4657

RICHARD J. MAGGIO, DIRECTOR

November 21, 1986

Mr. Robert Laughlin, Supervisor
Commercial/Industrial Land Use Section
Planning Division
Resource Management Agency
800 South Victoria Avenue
Ventura, California 93009

Dear Mr. Laughlin:

Subject: Draft Mitigated Negative Declaration for Conditional Use Permit (CUP) No. 4384 and Mitigation of Oil Development-Related Impacts on the Oxnard Plain

After reviewing the Draft Mitigated Negative Declaration for CUP 4384 and the history of similar types of proposed exploratory and production oil development projects over the past several years, it seems timely to state that we are becoming concerned about the total number of proposals for the area surrounding the City of Oxnard. I would like to take the opportunity to highlight our concerns and ask that you apply them to CUP 4384, as well as other applications, as appropriate. The concerns are as follows:

1. Visual Impacts--The City has several principal entranceways and many that might seem minor now, but will have greater importance in the future. Visual separation and screening of entranceways should be provided wherever possible by requiring that the actual drilling site be located as far as possible from the entranceway road and that existing or added plant material be used to as great an extent as practical to either screen the drilling equipment or interrupt its rectilinear profile. In addition, use of low-profile equipment instead of high-profile equipment, would be preferable.

2. Noise Impacts--It should be kept in mind that while many of the drill sites have been proposed for seemingly unoccupied areas, frequently either isolated houses or residential areas might actually be in relatively close proximity when viewed from the way that noise can travel in certain atmospheric and temperature conditions. Therefore, it is requested that consideration be given to providing noise attenuation devices that are sufficient to prevent disturbance of daytime or nighttime activities in nearby residences.

3. Dust and Particulate Impacts--Any increase of particulate matter in the atmosphere is of concern not only for public health reasons, but because of potentially negative impacts on adjacent crops. Therefore, it is hereby requested that all unpaved service roads, as well as the drill site area, be kept damp or that the use of chemical dust binders be required.

4. Odor--All reasonable steps should be taken to ensure that odors associated with either exploratory drilling or production cannot be detected beyond the actual permitted site boundary.

5. Site Size and Permitting--It is requested that only the site size actually needed be permitted and that separate permits be utilized for the exploratory drilling phase and, subsequently, for the production phase.

6. On-site Power Generation--Given that Ventura County has been designated by the EPA as a non-attainment area for ozone, it is thereby necessary to take every possible opportunity to reduce NO_x emissions from internal combustion (IC) engine generators. This can best be accomplished by requiring the use of grid power to drive the drilling rig if it is available within close proximity (i.e., one quarter mile). If grid power cannot be used because of the distance factor then it should be required that the IC engine generator be adjusted and operated in a manner that will produce the lowest practical emissions (LPE's).

7. Controlling Other Emissions Sources--To the extent feasible, the tanks used to support exploratory drilling operations should have vapor recovery systems and the utmost should be done to control other sources of fugitive emissions.

After you have reviewed the above, please give consideration to whether your agency's current oil development standards include all of the above requirements. If they do not, I would like to ask that consideration be given to amending the standards, or as an alternate that consideration be given to developing a more specific set of standards for the Oxnard Plain.

Very truly yours,

Matthew G. Winegar
City Planner

MGW:RJS:jly

cc: Tom Berg
David Mora
Richard Maggio

Board of Supervisors Hearing
July 23, 2019

Mitigated Negative Declaration Addendum

Attachment 4

Topical Response to Comment
DCOR (PL13-0046)

Renaissance Petroleum Project
Case No. PL14-0103
(Minor Modification of CUP 4384)

DCOR Oil and Gas Project, PL13-0046

Topical Response to Comment on the MND

Seismic Hazards and Produced Fluid Spills:

Discussion:

The San Cayetano Fault intersects the ground surface approximately 1.5 miles south of the drilling site for the proposed exploratory oil wells. This fault is classified as Active due to evidence of movement during the Holocene period (i.e. less than 11,000 years before present). This major fault trends east-west along the base of the Topatopa Mountains at the northern edge of the Santa Clara River valley. This north-dipping thrust fault forms the northern boundary of the thick accumulation of Pleistocene and Holocene sediments that underlie the valley.

Small magnitude earthquakes occur on or near the San Cayetano Fault. According to Olson (2012), the following earthquakes have been recorded in the vicinity of the project site and community of Piru.

Date	Magnitude (Richter scale)
2-14-1936	3.0
3-23-1938	3.5
2-20-1941	3.6
6-1-1946	4.1
4-20-1959	2.4
1-20-1960	2.5
5-21-1960	2.7
11-29-1987	2.1
2-23-1989	2.1
1-19-1994	2.9
9-13-1994	2.0
8-1-1995	2.8
6-7-2000	2.0
12-27-2008	2.2

Although Active, there is no definitive evidence of substantial movement (a large earthquake) or surface rupture along the San Cayetano Fault within the recent historic past (i.e. within the past 200 years). As reported in Olson (2012) and Dolan (2009), studies of displaced sedimentary rock units exposed in trenches excavated along the fault about 1 mile west of the community of Piru suggest that two major earthquakes occurred along this fault sometime after the year 1660 A.D. (i.e. in the last 450 years).

The hazard represented by the San Cayetano Fault is addressed in State Law (the Alquist-Priolo Act) and in the California Building Code. Proposed structures intended for human occupancy must be set back a minimum of 50 feet from the trace of the fault to avoid possible surface rupture. All above-ground structures must also be constructed in accordance with the Seismic Zone IV Building Code standards to resist ground shaking during an earthquake. Compliance with these standard State requirements is considered adequate to address seismic hazards.

With regard to the proposed project, any above ground structures will be required to meet Building Code standards. The proposed oil wells will be required to meet State construction standards enforced by the Division of Oil and Gas and Geothermal Resources (DOGGR). No evidence has been presented or is available to indicate that these standards are inadequate to protect the environment (including groundwater aquifers) from contamination by fluids produced from oil wells. There is no historic evidence that fault movement or earthquake shaking is a substantial risk of well leakage to the surface or to groundwater aquifers. Fault movement in past historic earthquakes (such as the 1933 Long Beach Earthquake) has resulted in well casings being sheared off below ground. This rare occurrence effectively seals and abandons the subject wells. Thus, DOOGR has no regulatory prohibition on drilling through the plane of an active fault to reach oil-bearing zones below. Many (if not most) of the oil fields in the Ventura and Los Angeles basins have been created by fault movement.

As indicated above, the San Cayetano Fault is estimated to have generated two major earthquakes in the last 450 years (with none in the last 200 years). It is highly speculative that a major earthquake would occur on this fault in the vicinity of the proposed project within the next 5 to 30 years. There is no substantial evidence that such an earthquake event will occur within the timeframe of the proposed project. Should a major quake occur there is no substantial evidence that a significant environmental impact will result from the presence of the proposed oil facilities.

The District 2 (Ventura Basin) office of DOGGR maintains a publically-available list of all produced fluid spills that have occurred in the District since 1994. This list documents 889 spill incidents that range from the loss of a tablespoon of crude oil to major pipeline breaks that involve the spillage of several thousand barrels of crude oil. Leaks of produced water and other fluids are also included in the list. As indicated in the chart below, most of the spills involve a minor amount of petroleum.

Quantity of oil spilled (Barrels)	**Number of incidents**	**% of total**
0 - 2	443	49.8
2-10	219	24.6
10-99	202	22.8
100 or greater	25	2.8
Total =	**889**	**100**

As indicated above, approximately 75 percent of the oil spills reported for the 20-year period of record spills involved 10 barrels of oil or less. Most of these incidents involve field maintenance issues such as flowline or tank corrosion. Only 25 oil spills in the 20-year period involved more than 100 barrels of crude oil (i.e. more than the equivalent of one oil tanker truck). The largest spills in the 1994-2013 record involve damage during the January 1994 Northridge Earthquake. During the earthquake, six breaks of 10-inch crude oil transmission pipelines occurred. This includes a pipeline break in the Valencia area of Los Angeles County that spilled an estimated 3,500 barrels of crude oil into the Santa Clara River.

The record assembled by DOGGR reflects a low level of oil spillage given the following factors:

- There are more than 30 oil fields in Ventura County
- Over 12,000 oil wells have been drilled in the Ventura Basin
- Over 2,000 wells are currently active
- There are 318 miles of oil transmission pipelines in Ventura County alone.
- There are several hundred miles of production flowlines within the oil fields
- There are hundreds of tanks and processing facilities in the oil fields

The operator of the facility where a spill has occurred is responsible for the clean-up of the spilled fluid under the direction of State agencies including DOGGR, the Regional Water Quality Control Board, and California Department of Fish and Wildlife. This oversight has assured adequate clean-up of affected lands.

The spillage events associated with the 1994 Northridge earthquake do not reflect widespread damage of oil field facilities in Ventura County. The only incident in the DOGGR list cited as "possibly due" to the earthquake that occurred in Ventura County involved a rupture of a tank in the Rincon Tank Farm. A total of 30 barrels of crude oil was spilled in that event.

The addition of the two oil wells and associated facilities included in the proposed project to the existing 2,000 active wells and associated production facilities would not substantially change the existing risk of oil spills in the Ventura Basin. The DCOR project would not involve any change in the risk of a transmission pipeline leak since no such pipeline is included in the proposal.

The issue of a major salt water leak from the Vintage, Ojai #36 well has been raised in public commentary. This well is located in the Ojai Field and was originally drilled in 1911-1914 to a depth of at least 2,408 feet. It was deepened in 1917-1918 to a total depth of 3,407 feet. In a report filed on June 13, 1917 with the California State Mining Bureau, the operator reported:

> *"Strata of salt water encountered containing heavy gas pressure which made flow of water about every 25 minutes."*

In February 2006, the Ojai #36 well began flowing salt water from the annulus of the casing. According to the DOGGR record, the flow of salt water was contained and the water hauled from the site. The operator plugged and abandoned the well under DOGGR supervision. DOGGR approved the plugging of the well on May 30, 2006. There is no known residual environmental effect of this incident.

The incident involving the Ojai #36 does not constitute substantial evidence that the proposed exploratory wells will suffer a casing failure. The failure of the casing in a well drilled in 1911 that is one of the 12,000 wells drilled in the Ventura Basin does not make it reasonably foreseeable that a similar fate awaits the proposed wells.

Summary:

No substantial evidence has been identified that the proposed exploratory wells would be damaged during an earthquake such that substantial environmental damage would result.

References:

Olson, Brian (2012), "Eastern San Cayetano Fault in the Piru Quadrangle", California Geological Survey Fault Evaluation Report #FER-257

Dolan, James (2009), "Paleoseismicity and Seismic Hazards of the San Cayetano Fault Zone."

Board of Supervisors Hearing
July 23, 2019

Mitigated Negative Declaration Addendum

Attachment 5

Board of Supervisors Letter
Response to Grand Jury Report on Oil Pipelines
02-07-17

Renaissance Petroleum Project
Case No. PL14-0103
(Minor Modification of CUP 4384)

RESOURCE MANAGEMENT AGENCY

county of ventura

Planning Division
Kimberly L. Prillhart
Director

February 7, 2017

Board of Supervisors
County of Ventura
800 South Victoria Avenue
Ventura, CA 93009

SUBJECT: Consideration of Supplemental Response to the FY 2015-2016 Ventura County Grand Jury Report on "Ventura County Crude Oil Pipelines."

RECOMMENDED ACTIONS

Staff recommends that the Board of Supervisors take the following actions:

1. Receive and File this supplemental response to the subject Grand Jury report "Ventura County Crude Oil Pipelines" (Exhibit 1) and direct that it be sent to the Grand Jury.

2. Provide direction on whether County staff should prepare any periodic report(s) on pipeline monitoring activities conducted by state and federal agencies.

FISCAL MANDATES/IMPACTS

Receiving this supplemental response to the subject Grand Jury report would not have a new fiscal impact. The costs associated with the preparation of this response are accommodated within the existing budget of the Resource Management Agency and the County Executive Office.

Should your Board direct that a periodic report on the ongoing regulatory oversight of crude oil and gas pipelines be prepared by County staff, there would be a fiscal impact as additional funds would be required for the staff time necessary to gather and organize information and report back to the Board. The annual County cost would depend on the scope of any reporting directed by the Board.

The Board of Supervisors directed that staff, in consultation with County Counsel, explore the potential for the recovery of County costs from pipeline operators to prepare periodic reports on pipeline safety. Pipeline operators (including oil and gas permittees) currently pay fees to state and federal agencies that fund safety inspection, monitoring and enforcement activities. The County may be pre-empted from levying a similar fee to fund a periodic report on the oversight of pipeline safety by these other agencies. In the case of County-permitted oil and gas operations, the County cannot unilaterally impose a new fee because the permittees are vested in the terms of the existing permits. In addition, the County does not exercise land use authority over most of the major pipelines in the County as they are located in the public right-of-way outside of the Coastal Zone. Given these factors, a non-County funding source for the contemplated periodic report has not been identified.

DISCUSSION

On July 19, 2016, your Board approved a response to the Grand Jury report titled "Ventura County Crude Oil Pipelines" (Exhibit 1). This supplemental letter outlines the regulatory jurisdiction of each agency regarding the safety and maintenance of crude oil and gas pipelines. Representatives from these agencies are scheduled to be at your Board meeting to present information regarding their responsibilities and programs related to pipeline monitoring and safety.

A. BACKGROUND

As indicated in the Board-approved July 19, 2016 response to the Grand Jury Report (Exhibit 1), your Board agreed with many of the findings made by the Grand Jury regarding regulatory oversight of crude oil and gas pipelines. The County response described the separation between the state and federal responsibilities for maintenance and monitoring of pipelines and the County's land use authority to grant permits for oil and gas facilities.

Recommendation R-01 of the Grand Jury report calls for the preparation of an annual report summarizing the state of crude oil pipelines located in Ventura County. In the July 19, 2016 response (Exhibit 1), your Board found that this issue required further analysis and would be addressed in a later report to the Board prepared by the County Executive Office and the Resource Management Agency. This Board letter includes the further analysis and constitutes the County's additional response to the annual report recommendation made by the Grand Jury.

B. HAZARDOUS LIQUID (CRUDE OIL) AND NATURAL GAS PIPELINE REGULATORY JURISDICTION

In its 2015-2016 report, the Grand Jury accurately stated that no single agency is responsible for the regulation of oil and gas pipelines within Ventura County. However, the agency responsible for oversight for each category of pipeline is clear and depends on the type of regulatory activity and the use of the subject pipeline. The categories of oversight and the responsible agency for each category are outlined below in Table 1.

Land Use Permitting Authority:

The County has the authority, pursuant to the Coastal and Non-Coastal Zoning Ordinances, to grant discretionary permits to authorize pipeline installation and use as a land use matter within unincorporated Ventura County, but not within the boundaries of any city located within Ventura County. Pipelines within the County's jurisdiction are generally permitted by the County as part of an oil and gas production facility. As part of the initial permitting of oil and gas pipelines, the County Planning Division evaluates the potential for adverse impacts on the environment as part of the environmental review conducted in accordance with the California Environmental Quality Act (CEQA). Note that a discretionary land use permit is not required for a pipeline located in a public road right-of-way (ROW) that is outside of the coastal zone portion of the unincorporated areas of the County. Such pipelines only require a ministerial encroachment permit issued by the County Public Works Agency.

Monitoring of Pipeline Maintenance and Safety:

The County does not have the authority to oversee the maintenance and safety of pipelines once permitted. This responsibility is held by state and federal agencies as outlined below in Table 1.

TABLE 1
Pipeline Monitoring Responsibility

Category	Type	Description	Responsible Agency
Transmission	Interstate (extending to multiple States)	Major collection lines that convey crude oil and natural gas collected from multiple operators to refinery facilities.	FEDERAL: U.S. Department of Transportation - Pipeline and Hazardous Materials Safety Administration (PHMSA) as exercised through the Office of Pipeline Safety.
Transmission	Intrastate (within California)		STATE: CAL FIRE - Office of the State Fire Marshal, Pipeline Safety Division (OSFM)
Oil Field Production	Gathering lines and flowlines	These pipelines convey produced fluid from oil wells to onsite storage and separation facilities.	STATE: Department of Conservation - State Division of Oil, Gas and Geothermal Resources (DOGGR)

Oil Field Production	Connection pipelines to Lease Automatic Custody Transfer (LACT) meter	These pipelines convey separated oil and gas to the transmission pipelines.	STATE: Department of Conservation - State Division of Oil, Gas and Geothermal Resources (DOGGR)

Although the pipelines themselves are not under direct County regulation, the County maintains a Geographical Information Systems (GIS) map of the pipelines within the County that are regulated by the CAL FIRE - Office of the State Fire Marshal, Pipeline Safety Division (OSFM) and those overseen by the U.S. Department of Transportation, Pipeline and Hazardous Materials Safety administration (PHMSA).

C. STATE AGENCIES RESPONSIBLE FOR TESTING AND INSPECTION OF HAZARDOUS LIQUID (CRUDE OIL) AND NATURAL GAS PIPELINES

As stated above in Section B, the County holds land use permitting authority over new or replacement pipelines that are located in the coastal zone, and new, relocated or modified pipelines located outside of the public road ROW in the non-coastal area. As part of the land use permitting process, the County conducts environmental review of proposed pipeline project pursuant to CEQA. The other two state agencies with regulatory oversight are both the OSFM and the Department of Conservation, Division of Oil and Gas and Geothermal Resources (DOGGR). Below is an overview of each agency, as outlined on their respective websites, their regulatory authority over pipelines, as well as legislative updates and ongoing process improvements that both OSFM and DOGGR are undergoing.

Overview - Office of the State Fire Marshall, Pipeline Safety Division:

In 1981, the California Legislature enacted the Hazardous Liquid Pipeline Safety Act with the intent that the OSFM shall exercise exclusive safety regulatory and enforcement authority over intrastate hazardous liquid pipelines. The OSFM currently regulates the safety of approximately 6,500 miles of intrastate hazardous liquid transportation pipelines. The OSFM's Pipeline Safety Division consists of engineers, analytical staff, and clerical support located in northern, central and southern California. Pipeline Safety Division staff inspect pipeline operators to ensure compliance with federal and state pipeline safety laws and regulations. The Pipeline Safety Division is also responsible for the investigation of spills, ruptures, fires, and pipeline incidents for cause and determination of probable violations.

Pipeline inspection and testing overseen by OSFM:

The requirements for pipeline integrity testing overseen by the OSFM are stated in Section 51013.5 (Exhibit 2) of the California Government Code. This section reads, in part, as follows:

§51013.5 - Required Testing

(a) Every newly constructed pipeline, existing pipeline, or part of a pipeline system that has been relocated or replaced, and every pipeline that transports a hazardous liquid substance or highly volatile liquid substance, shall be tested in accordance with Subpart E (commencing with Section §195.300) of Part §195 of Title 49 or the Code of Federal Regulations.

(b) Every pipeline not provided with properly sized automatic pressure relief devices or properly designed pressure limiting devices shall be hydrostatically tested annually.

(c) Every pipeline over 10 years of age and not provided with effective cathodic protection shall be hydrostatically tested every three years, except for those on the State Fire Marshal's list of higher risk pipelines, which shall be hydrostatically tested annually.

(d) Every pipeline over 10 years of age and provided with effective cathodic protection shall be hydrostatically tested every five years, except for those on the State Fire Marshal's list of higher risk pipelines which shall be hydrostatically tested every two years.

(e) Piping within a refined products bulk loading facility served by pipeline shall be tested hydrostatically at 125 percent of maximum allowable operating pressure utilizing the product ordinarily transported in that pipeline if that piping is operated at a stress level of 20 percent or less of the specified minimum yield strength of the pipe. The frequency for pressure testing these pipelines shall be every five years for those pipelines with effective cathodic protection and every three years for those pipelines without effective cathodic protection. If that piping is observable, visual inspection may be the method of testing.

The above measures apply to the 378 miles of intrastate oil transmission pipelines that traverse Ventura County. Based on information provided to the County Planning Division by the OSFM in May 2016, 360 of the 378 miles of pipeline in Ventura County were subject to an inspection or testing between 2011 and 2016. Of the remaining eighteen miles, fourteen miles were last inspected in 2002, three miles were last inspected in 2006, and a one-mile segment was repaired (and inspected) following a leak in 2009.

Legislative Updates:

California SB 295 (2015-2016 Reg. Sess.): Directed the OSFM to develop regulations requiring the annual inspection of all intrastate hazardous liquid pipelines and operators of intrastate hazardous liquid pipelines under their jurisdiction. Pipeline operators have until July 1, 2017 to submit required information to the OSFM for conducting the necessary inspections.

California AB 864 (2015-2016 Reg. Sess.): Directed the OSFM to develop regulations requiring an operator of an existing hazardous liquid pipeline near environmentally and ecologically sensitive areas in the coastal zone to submit a plan to retrofit pipelines to the OSFM by July 1, 2018 and complete the retrofit by January 1, 2020, with the best available technology. Best available technology includes, but is not limited to, installation of leak detection technologies, automatic shutoff systems, or remote controlled sectionalized block valves, or any combination of these technologies based on a risk analysis conducted by the operator to reduce the amount of oil released in an oil spill to protect state waters and wildlife. Public workshops are scheduled to solicit public comment on the AB 864 draft regulations at the following locations, dates, and times (past workshops may be viewed on the State Fire Marshal's Code Development webpage *osfm.fire.ca.gov/codedevelopment):*

1. California Natural Resources Agency – January 5, 2017 at 3:00 pm
   1416 9th Street, Public Hearing Auditorium 1st Floor
   Sacramento, CA 95814

2. County of Santa Barbara – February 2, 2017 at 4:30 pm
   105 E. Anapamu St. – Board Meeting Room, Fourth Floor
   Santa Barbara, CA 93101

3. City of Huntington Beach – February 16, 2017 at 3:00 pm
   2000 Main Street, City Council Chambers
   Huntington Beach, CA 92648

More detailed information on how to participate in the public workshops and submit comments can be found in the attached public workshop notices (Exhibit 12).

Regulatory/Process Improvements:

The goal of SB 295 and AB 864 is to prevent similar incidents like the 2015 Refugio Spill in Santa Barbara from occurring on intrastate hazardous liquid pipelines and to protect California's vital natural resources. To meet that goal, the OSFM formed a Pipeline Safety Regulations Workgroup comprised of non-governmental entities, local agencies, and industry representatives with expertise in the field to develop the new regulations. This workgroup has met regularly and engaged in extensive discussion and analysis resulting in proposed regulations that are essential to the successful implementation of both SB 295 and AB 864. The annual inspection regulations developed for SB 295 are completed and have been submitted to the Office of Administrative Law for final approval. As noted above, the AB 864 regulations are still in development, and open for public comment.

With the added safety and regulatory authority under SB 295 and AB 864, the OSFM will continue to conduct inspections to ensure pipelines transporting hazardous liquids in California meet State and federal requirements. The OSFM received approval to hire 11 additional pipeline safety engineer positions for Fiscal Year 2016-2017 to meet the increased inspection frequency of SB 295 and the review of operator plans and construction inspections for AB 864. The OSFM is in the process of filling these positions and believes that the regulations will meet the goals of SB 295 and AB 864.

<u>Overview - Department of Conservation, Division of Oil, Gas, & Geothermal Resources:</u>

DOGGR was formed in 1915 to address the needs of the state, local governments, and industry by regulating statewide oil and gas activities with uniform laws and regulations. DOGGR reviews and permits the drilling, operation, maintenance, and plugging and abandonment of onshore and offshore oil, gas, and geothermal wells, preventing damage to (1) life, health, property, and natural resources, (2) underground and surface waters suitable for irrigation or domestic use, and (3) oil, gas, and geothermal reservoirs. Its requirements are intended to encourage wise development of California's oil, gas, and geothermal resources while protecting the public and the environment.

DOGGR's programs include: well permitting and testing, safety and environmental inspections, oversight of production and injection projects, environmental lease inspections, idle-well testing, inspecting oilfield facilities, pipelines, and sumps, orphan well plugging and abandonment contracts, and subsidence monitoring.

Pipeline testing and inspections overseen by DOGGR:

Section 1774.1 of the California Code of Regulations (14 CCR Section 1774.1; Exhibit 3), establishes standards for pipeline testing and maintenance within oil fields. These regulations require mechanical integrity tests be performed *"on all active environmentally sensitive pipelines that are gathering lines, and all urban pipelines over 4 inches in diameter, every two years. Pipelines less than 10 years old are exempt from the two-year testing requirement."* The operator is required to make the tests results available to DOGGR. The operator is required to remove from service any pipeline that fails a mechanical integrity test.

The term "environmentally sensitive" is defined in 14 CCR Section 1760 as a production facility located within 300 feet of a public recreation area or building for human occupancy, or located within 200 feet of any officially recognized wildlife preserve or environmentally sensitive habitat, designated waterways, or other surface waters. The term "environmentally sensitive" also applies to any production facility which the State Oil and Gas Supervisor "*determines to be a significant threat to life, health, property or natural resources in the event of a leak, or that has a history of leaks.*"

DOGGR has recently required each operator to prepare and submit a Pipeline Management Plan in accordance with CCR Section 1774.2 (Exhibit 4) for each oil and gas facility in the Coastal District which includes all of Ventura County. These plans are currently being received and reviewed by DOGGR staff.

14 CCR Section 1774.1 also authorizes a County Board of Supervisors to petition the State Oil and Gas Supervisor to include other pipelines within their jurisdiction as "environmentally sensitive." This request must be in writing and based on the findings of a competent, professional evaluation that shows there is a probability of significant public danger or environmental damage if a leak were to occur.

Legislative Updates:

California AB 1420 (2015-2016 Reg. Sess.): Authorizes local health offices, if appropriate for a spill in a sensitive area, to require a responsible party to test, provide assistance, and fund relocation of residents, if necessary. The Resource Management Agency, Environmental Health Division will be the County entity to implement this local responsibility. DOGGR sent a Notice to Operators on December 22, 2015 (Exhibit 5) outlining the operator's responsibilities under the new Public Resource Code (PRC) Sections 3270.5 and 3270.6 enacted by this law.

Regulatory/Process Improvements:

DOGGR conducts annual environmental inspections of oil, gas and underground injection (UIC) wells and associated facilities. Although it is a goal of the southern office of the DOGGR Coastal District (Ventura County and a portion of northern Los Angeles County) to "inspect 100% of all Non-BLM wells, tanks, pipelines, and all other associated equipment on an annual basis" (Exhibit 6), every facility is not inspected in each year. To address this and other enforcement and regulatory oversight deficiencies, in October 2015, the California Department of Conservation adopted a Renewal Plan (Exhibit 7). This Plan is intended to overhaul the DOGGR regulatory program to refocus on the guiding principles of environmental protection and public health. In the Renewal Plan, Mr. David Bunn, who was appointed as Director of the Department of Conservation in June of 2015 states *"The Renewal Plan is an ongoing, four-year effort to correct past problems and to create a regulatory program that ensures public health and the environment are protected while we produce oil in California"*.

D. OIL COMPANY MAINTENANCE PROGRAMS

In response to the Grand Jury Report, Aera Energy (Aera) and Seneca Resources Corporation (Seneca) provided summaries of their regulatory compliance and facility maintenance efforts and submitted them to the County. These summaries are attached as

Exhibit 8. Aera's ongoing pipeline management overview states that in addition to regulatory requirements, they also have an extensive internal and external pipe corrosion program which, since the year 2000, has resulted in the replacement of approximately 1.2 million feet of piping (exceeding $100 million dollars in investment). The summary also states that in order to minimize internal corrosion in oil pipelines, they are using concrete lined piping that is resistant to internal corrosion. Aera has been implementing this standard since 2000 and have now replaced 80% of their oil service piping with internally concrete lined piping.

Seneca also provided a summary regarding their pipelines. Their report states that their 8.2 mile oil pipeline has 2 automatic shutdown valves that can be remotely closed and was last hydro tested in 2015. This pipeline is audited and inspected by the OSFM. Seneca's separate gas line is monitored 24/7 by a third-party contractor and has 2 automatic shutdown valves. This line is audited and inspected by U.S. Department of Transportation, Pipeline and Hazardous Materials Safety administration (PHMSA). Additionally, PRC Section 1774.2 requires Aera, Seneca, and all operators to have a Pipeline Management Plan in place. This regulatory requirement was the result of AB1960 which became effective in January 2011 and required the plans to be in place by January 2013. The plans must be updated within 90 days whenever pipelines are acquired, installed, altered, or when requested.

E. RESPONSE TO PUBLIC COMMENT

By letter dated July 18, 2016 (Exhibit 9), the Citizens for Responsible Oil and Gas (CFROG) provided comments to your Board regarding the County response to the Grand Jury on oil and gas pipeline regulation in Ventura County (Exhibit 1). Staff committed to responding to the CFROG letter as part of this report back. The attached January 19, 2017 staff memorandum (Exhibit 10) provides detailed responses to each of the issues raised in the CFROG letter. The County memorandum points out that the County cannot separately regulate the operation, maintenance and monitoring of oil field pipelines that are under the exclusive jurisdiction of DOGGR pursuant to Section 3106 of the Public Resources Code. Similarly, the County cannot exercise regulatory authority over the maintenance or monitoring of transmission pipelines that are under the exclusive jurisdiction of the OSFM.

The CFROG letter references Chapter 25 of the Santa Barbara County Code (referred to as "the County petroleum ordinance") as evidence that Ventura County can concurrently regulate oil and gas pipelines that are under the exclusive jurisdiction of DOGGR and the OSFM pursuant to state law. Yet, Chapter 25 of the Santa Barbara County Code specifically states that *"where there is conflict with State regulations or laws, such state regulations or laws shall prevail over any conflicting provisions of this chapter 25…"*. Thus, Santa Barbara County recognizes that state law pre-empts local regulations in the area of oil and gas pipeline regulation. County Planning staff confirmed this point with the Deputy Director of the Santa Barbara County Energy Division who oversees that County's oil and gas program.

The CFROG letter (Exhibit 9; marked comments 14 and 15) also raises the issue of the

County's responsibility to oversee the work of other agencies that monitor and regulate the maintenance of oil and gas pipelines. This issue is addressed in the County memorandum (Exhibit 10) and in the following discussion.

F. OIL SPILLS IN VENTURA COUNTY

DOGGR maintains a record of each oil spill within District 2. Table 2 below summarizes oil spill information provided by the DOGGR District 2 office in June 2016. The table shows there have been 45 pipeline leaks of various magnitude within the District 2 area from January 2010 to June 2016 (a 6.5-year period).

TABLE 2

DOGGR District 2 Pipeline Leaks 2010-2016

Oil volume (barrels)	# of incidents	Explanation
700	1	Crimson pipeline leak in City of Ventura. Cause under investigation.
200	1	Crimson pipeline struck by auger rig during Southern California Edison pole replacement along State Highway 118. (Leak did not occur in an oil field.)
25	1	Four-inch diameter gathering line leaked from corrosion.
24	1	Leak in sales line from Tank Battery.
15	1	Break of flowline from earth movement
10	1	Possible underground pipeline break.
9	1	Pinhole leak in pipeline due to corrosion.
Between 1 and 5	23	Minor pipeline leaks due primarily to corrosion.
1 or less	15	Minor pipeline leaks due primarily to corrosion.

As indicated in the above table, there have been seven pipeline leaks in which more than five barrels of oil were spilled in period from January 2010 to June 2016. The June 2016 Crimson pipeline leak in the City of Ventura accounted for more than half of the total volume of oil spilled during this period. The other major incident involved a construction accident that did not occur in an oilfield and was unrelated to pipeline operation. Two hundred barrels were spilled when an underground Crimson pipeline was struck by earth-moving equipment during the replacement of an Edison power pole. In sum, the number of leaks is relatively small given the 378 miles of major oil transmission lines in Ventura County and the hundreds of miles of oil well flow lines and oil field gathering lines in operation in Ventura County.

Although oil spills must always be prevented to the maximum extent feasible, the relative magnitude of the problem in Ventura County should also be considered. According to DOGGR records, over the six-and-a-half year period covered by the above table, approximately 1,100 barrels of crude oil were spilled out of the 58 million barrels of oil produced. The volume of the spilled oil represents 0.002 percent of the oil produced in Ventura County from 2010-2016.

G. REGULATION OF NATURAL GAS PIPELINES

Background:

The operation of interstate natural gas transmission pipelines in the United States is overseen by the federal Pipeline and Hazardous Materials Safety Administration (PHMSA). On behalf of PHMSA, the California Public Utilities Commission (CPUC) oversees the safety and maintenance of natural gas transmission pipelines within the State of California. The CPUC is responsible to ensure that the state's natural gas and liquid petroleum gas (LPG) pipeline systems are designed, constructed, operated, and maintained according to safety standards set by the CPUC and the federal government. The CPUC employs gas safety engineers trained and qualified by the federal government to enforce safety regulations. The CPUC conducts operation and maintenance compliance inspections, accident investigations, reviews utility company reports and records, conducts construction inspections, conducts special studies, and takes action in response to complaints and inquiries from the public on issues regarding gas pipeline safety. The CPUC also develops and adopts amendments to regulations in order to improve public safety.

The CPUC and PHMSA are tasked with ensuring that pipeline operators have established risk management programs designed in conformance with state and federal laws and regulations, and effective in enhancing public and employee safety.

The CPUC oversees the operation and safety practices of the five major investor-owned utilities who serve natural gas and LPG to the bulk of California residents and businesses. These include:

- Pacific Gas and Electric Company (PG&E)
- Southern California Gas Company (SoCalGas)
- San Diego Gas & Electric (SDG&E)
- Southwest Gas Corporation
- Southern California Edison (Avalon LPG).

The CPUC performs field and headquarter inspections and audits of practices and procedures developed by these gas utilities. The utilities also perform audits and report to the CPUC on an ongoing basis their practices, procedures, and progress on a variety of issues.

CPUC pipeline safety improvements:

The 2010 rupture of a PG&E natural gas pipeline in San Bruno, California, resulted in are assessment of CPUC safety and enforcement programs. The CPUC developed, and in 2012 adopted, the Natural Gas Safety Action Plan. This plan was developed to attain the following goals:

- Ensuring the Safety of the existing gas system
- Upgrading and replacing the gas system to make it safer
- Reforming the CPUC – making safety its first priority
- Instilling safety culture in gas operators

A Table outlining the specific tasks included in this Safety Plan is attached as Exhibit 11. These tasks include pipeline inspection, testing, replacement, facility improvements (such as automatic shut-off valves), and audits of operator safety procedures and emergency response plans.

Gas pipelines in Ventura County:

Approximately 240 miles of natural gas transmission pipelines traverse the County of Ventura as part of the Southern California Gas Company distribution system. Leading from these major transmission lines are thousands of miles of minor gas pipelines that connect the system to consumers.

The Resource Management Agency GIS mapping system includes the location of each of the gas transmission pipelines based on data provided by the CPUC.

The County of Ventura does not exercise land use authority over the installation, maintenance or safety monitoring of the natural gas transmission pipelines or the associated distribution system. The CPUC is the agency with authority over these facilities.

H. COUNTY OVERSIGHT OF STATE AND FEDERAL AGENCIES

The Grand Jury recommends that your Board require the preparation of an annual report that summarizes the state of the crude oil pipelines within all of Ventura County. This would require County staff to compile information obtained from DOGGR and the OSFM in an annual report to your Board. The information in an annual report could include an updated tabulation of spill incidents to include those that occurred in the previous year, a description of any identified causes for each incident, and a discussion of any new regulations under consideration by the various agencies that monitor pipelines. County staff could also develop draft regulatory changes that your Board could consider recommending to the state legislature. The compiled information would be made publicly available on the County website and be presented to your Board in a public hearing.

The cost of annual report preparation and its presentation to your Board depends on the ultimate scope of the data collection and coordination effort with the state and federal agencies, as well as to the extent of related legislative initiatives and any recommended changes to County regulations. It is anticipated that a minimum of 150 hours of staff time (at a cost of about $25,000) would be annually required to assemble, organize and evaluate the data; it is difficult to estimate the additional costs associated with the legislative review/regulatory changes and preparation of Board presentation materials.

County staff has been in contact with the management of DOGGR and the OSFM and staff from both of these agencies will be present at the hearing to make brief presentations on their pipeline inspection programs as well as current efforts underway to address increased pipeline oversight.

Local government agencies can and should provide comments to the state and federal authorities when deficiencies in a regulatory program are identified. Local governments should also comment on proposed regulatory changes such as California AB 2729 (2015-2016 Reg. Sess.) aimed at reducing the number of idle oil wells. Your Board provided a letter of comment to the state on this legislation on May 3, 2016 and the legislation was signed into law by the Governor on September 9, 2016.

I. SUMMARY

Although the number is modest, there have been a number of reported oil spills in Ventura County since 2010. In addition, recent efforts have been undertaken by several State agencies to further improve the safety of petroleum and natural gas pipelines within California. While the various state agencies collect information related to pipeline events and activities, the information is not assembled and provided in a single report. If the Board were to direct staff to prepare a report on an annual basis, how the effort would impact other project assignments would need to be addressed. The Planning Division's queue of other Board-directed priorities includes the General Plan Update, Subdivision Ordinance update, Local Coastal Program update, wildlife corridors, night-time sky ordinance, short-term rental ordinance, and medical marijuana ordinance, among others. Should the Board elect not to pursue the preparation of the annual report, Planning staff would continue to periodically contact DOGGR, CPUC and OSFM to obtain new information regarding the recently-implemented and ongoing regulatory safety improvements, continue to participate in the rule making process, and report back to the Board with issues of concern and recommendations for regulatory changes as needed.

Sincerely,

Kim L. Prillhart
Planning Director

Attachments:

Exhibit 1 – Response to FY 2015-2016 Grand Jury Final Report
Exhibit 2 – Government Code Section 51013.5 (Required Testing)
Exhibit 3 – CCR Section 1774.1 (Pipeline Inspection and Testing)
Exhibit 4 – CCR Section 1774.2 (Pipeline Management Plans)
Exhibit 5 – DOGGR 12-22-15 Notice to Operators
Exhibit 6 – DOGGR District 2 Guidelines for Environmental Inspections
Exhibit 7 – DOGGR Renewal Plan for Oil and Gas Regulation, October 2015
Exhibit 8 – Regulatory compliance summaries for Aera Energy and Seneca Resources
Exhibit 9 – July 18, 2016 letter by CFROG (marked copy)
Exhibit 10 – January 19, 2017 staff memorandum
Exhibit 11 – CPUC Natural Gas Safety Action Plan, 2012
Exhibit 12 – CAL FIRE Workshop notices

Board of Supervisors Hearing
July 23, 2019

Mitigated Negative Declaration Addendum

Attachment 6

Fluid Production Data for Wells Connected to Naumann Facility_2007-2016

Renaissance Petroleum Project

Case No. PL14-0103

(Minor Modification of CUP 4384)

Cabrillo Oil Field

Oil Production 2007-2016 (in barrels)

Data from DOGGR

(Note: Shaded years indicates that the well had not yet been drilled.)

Year	Rosenmund #1	Rosenmund #2	Rosenmund #3	Rosenmund #4	Rosenmund #5	Rosenmund #6	Rosenmund #7	Rosenmund #8	Nauman #1	Total
2016	0	4167	0	0	4337	6260	0	133	5014	19911
2015	0	5883	0	0	5390	6357	24	147	4913	22714
2014	0	6792	7	0	6666	7315	92	275	3231	24378
2013	0	9324	0	0	12018	8750	247	108	3467	33914
2012	0	16558	0	0	25990	13417	0	0	7253	63218
2011	0	20681	0	0	55011	7576			7919	91187
2010	0	27166	0	0	43115				10581	80862
2009	0	34231	0	0					14289	48520
2008	0	42693	0	0					7605	50298
2007	0	19898	0	0					8093	27991

2007-2016 Total Oil Production = 462993 BBLS

2007-2016 Average BO/Year = 46299.3 BBLS

2012-2016 Average BO/Year = 32827 BBLS

Peak Annual Production (2011) = 91187 BBLS

Board of Supervisors Hearing
July 23, 2019

Mitigated Negative Declaration Addendum

Attachment 7

Port Hueneme_Oxnard
Truck Traffic Study
2008

Renaissance Petroleum Project

Case No. PL14-0103

(Minor Modification of CUP 4384)

SOUTHERN CALIFORNIA
ASSOCIATION of GOVERNMENTS

Cities of Port Hueneme/Oxnard Truck Traffic Study

Final Report

June 5, 2008

IBI Group

Cities of Port Hueneme/Oxnard Truck Traffic Study

Final Report

June 5, 2008

Prepared for Southern California Association of Governments
by

IBI GROUP

Funding: The preparation of this report was financed in part through grants from the United States Department of Transportation (DOT).

The contents of this report reflect the views of the author, who is responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of SCAG or DOT. This report does not constitute a standard, specification or regulation.

TABLE OF CONTENTS

TABLE OF FIGURES

EXECUTIVE SUMMARY

The Cities of Port Hueneme and Oxnard Truck Traffic Study analyzes existing traffic conditions and identifies traffic impacts and areas of congestion caused by trucks traveling on local arterial roadways in the two cities. The study was commissioned by the Southern California Association of Governments (SCAG). A Technical Advisory Committee (TAC) was formed to steer the project, and includes representatives of the Cities of Port Hueneme and Oxnard, the Port of Hueneme, Naval Base Ventura County (NBVC), Caltrans District 7, the Ventura County Transportation Commission (VCTC), and the local trucking industry. The members of the Study TAC are:

- Akiko Yamagami, Southern California Association of Governments (SCAG)
- Michael Jones, SCAG
- Andres Santamaria, City of Port Hueneme
- Jason Samonte, City of Oxnard
- Anthony Taormina, Port of Hueneme
- Chris Birkelo, Port of Hueneme
- Michaela Brown, Naval Base Ventura County (NBVC)
- Vinod Kumar, California State Department of Transportation (Caltrans) District 7
- Robert Wong, California State Department of Transportation (Caltrans) District 7
- Kerry Forsythe, Ventura County Transportation Commission (VCTC)
- Greg Dineen, Greg Dineen & Associates Industry Transportation Consultant
- Seth Hammond, Specialty Crane and Rigging

The study included the collection of existing traffic data for general vehicle traffic and truck traffic traveling through the Cities of Port Hueneme and Oxnard. Written surveys were conducted at the Port of Hueneme and NBVC to obtain information on truck trip generation rates and distribution patterns for these land uses. Telephone surveys were also conducted with a small sample of private business located in the study area to obtain additional information regarding truck trip generation and travel patterns.

The data collection and analysis effort revealed that there are numerous sources of truck trips within the study area. The sources surveyed as part of this study (Port of Hueneme, NBVC, selected private business) comprise a small portion of the total number of truck trips traveling on roadways in Port Hueneme and Oxnard. However, the information obtained through the traffic analysis and the survey efforts is valuable for the two cities in identifying the most heavily used truck routes, areas and intersections in need of improvement to provide for better traffic flow, and additional steps that could be taken in the future to address potential increases in truck traffic volumes from new developments or expansions of existing operations.

Traffic Analysis Methodology

The traffic analysis presented in this report was conducted consistent with the adopted methodologies for the Ventura County Congestion Management Plan, the City of Port Hueneme, and the City of Oxnard. Traffic operations at signalized intersections are analyzed using the Intersection Capacity Utilization (ICU) methodology, which evaluates capacity in terms of the volume-to-capacity (V/C) ratio.

Existing Traffic Conditions

Existing traffic conditions were evaluated at 25 study intersections, using traffic counts collected in January 2008. Roadway average daily traffic (ADT) volumes were also collected at 13 locations along designated truck routes in the study area.

The five highest daily truck volumes are observed on the following roadway segments:

1. Rose Avenue – north of 5th Street
2. Rice Avenue – north of 5th Street
3. Rice Avenue – north of Hueneme Road
4. Victoria Avenue – north of 5th Street
5. Victoria Avenue – between Channel Islands Blvd and 5th Street

This pattern of truck traffic volumes shows that the highest volumes of truck traffic are typically observed on roadway segments located closer to US-101 interchanges and along the designated preferred truck routes.

The five roadway segments identified below have the highest percentage of truck traffic relative to total traffic volume of the 13 locations included in the traffic counts:

1. Rose Avenue – north of 5th Street
2. Rice Avenue – north of 5th Street
3. Hueneme Road – east of Saviers Road
4. Rice Avenue – between Hueneme Road and 5th Street
5. Ventura Road – north of Channel Islands Boulevard

The peak hour study intersection analysis identified the following intersections that do not operate at a satisfactory level of service, along with the identified peak hour:

1. Victoria Avenue and Channel Islands Boulevard – PM peak hour
2. Oxnard Boulevard/Saviers Road and Wooley Road – PM peak hour
3. Rose Avenue and Gonzales Road – PM peak hour
4. Rice Avenue and Gonzales Road – AM peak hour
5. Rice Avenue and US-101 Southbound Ramps – AM and PM peak hour

Many of these intersections are located along roadway segments that have the highest observed total traffic volumes and truck traffic volumes. Several intersections are located near the US-101 freeway, where traffic volumes are typically higher as automobiles and trucks attempt to access the freeway.

Study Area Truck Trips

Written questionnaires were developed to survey truck drivers at the Port of Hueneme and NBVC with the objective of collecting information directly from truck drivers regarding origins and destinations, the routes used to access the Port of Hueneme and NBVC, and the types of cargo carried by the trucks. The written survey was conducted over a period of multiple days at each location and both surveys had a response rate of about 90%.

The data collected through the questionnaire and historic gate counts provided by the Oxnard Harbor District show that the Port of Hueneme generates about 140 entering and 140 exiting truck trips on a daily basis during the spring season. These truck trips represent a small percentage of the overall number of trucks traveling on roadways within the study area. On Port Hueneme Road just east of Ventura Road, Port-related truck trips comprise about 25% of the total trucks traveling on this segment of roadway. The Port's share of total truck trips diminishes rapidly further away from the Port's main gate as truck trips are dispersed within the study area. The Hueneme Road and Rice Avenue corridors were observed to have the greatest use by trucks traveling to and from the Port of Hueneme

NBVC generates even fewer truck trips on a daily basis, with approximately 90 to 100 trucks entering and exiting the base's Victoria Gate during the surveyed time period. Victoria Avenue was the most commonly cited route for trucks traveling between the US-101 freeway and NBVC. These truck trips comprise about 5% of the total number of trucks that travel on Victoria Avenue on a daily basis.

A small sample of private businesses was also surveyed by telephone to supplement the data collected from the Port of Hueneme, NBVC, and traffic counts. The information collected from these private businesses shows utilization of existing truck routes, such as Hueneme Road and Rice Avenue is strong in the existing condition.

Impacts of Truck Traffic on Residential Neighborhoods

Existing truck routes can cause impacts on adjacent residential neighborhoods resulting from traffic congestion, noise, and vibration. The Cities of Port Hueneme and Oxnard have a well-defined network of truck routes that appears to adequately serve the Port of Hueneme, NBVC, and other private businesses in the area. There are a number of new residential developments in the planning or construction stages along study area truck routes within the Cities of Port Hueneme and Oxnard. These developments will expose more people to the existing traffic on the truck routes, and increase the magnitude of the impacts created when incompatible land uses are combined. Measures to reduce the impact of truck traffic on residential neighborhoods include encouraging truck drivers to utilize existing truck routes and requiring residential developers to provide acoustical design features such as pavement surfaces, sound barriers, setbacks, and sound-dampening materials.

Recommendations

A series of recommendations are identified for the Study Technical Advisory Committee (TAC) to consider to address existing traffic deficiencies present in the study area, improve the identification and use of existing truck routes, and to develop strategies for future improvements or studies that would be intended to maintain or enhance traffic operations for both trucks and general traffic in the study area.

Intersection and roadway improvements include increasing the capacity of the Victoria Avenue/Channel Islands Boulevard intersection, widening Hueneme Road to a full four lanes (two in each direction) for the full length between Ventura Road and Rice Avenue, and monitoring the traffic impacts that would be anticipated with the now-funded improvements to the US-101/Rice Avenue interchange.

Strategies to address residential neighborhood impacts include encouraging trucks traveling to and from major generators in the study area (Port of Hueneme, NBVC, private businesses) to utilize the established preferred truck routes on Hueneme Road/Rice Avenue and Victoria Avenue as much as possible to limit the potential impacts of high truck volumes on other streets near residential areas such as Ventura Road and Channel Islands Boulevard and designing residential neighborhoods to consider the potential impacts caused by trucks traveling on the adjacent truck route.

Truck driver's awareness and the use of designated truck routes may be improved by:

- Continuing to emphasize the use of Port Hueneme Road/Hueneme Road and Rice Avenue as the primary truck access corridors to the Port of Hueneme.
- Installing directional signage along Port Hueneme Road/Hueneme Road and Rice Avenue directing trucks exiting the Port of Hueneme main gate to access the US-101 freeway via this route.
- Exploring the feasibility of implementing traffic signal coordination along Port Hueneme Road/Hueneme Road between Ventura Road and Rice Avenue to improve traffic flow and truck travel times in the corridor.

- Continuing to pursue funding for the grade separation of Rice Avenue at the Union Pacific rail corridor immediately north of Fifth Street.
- Working with Caltrans District 7 to install signage along US-101 identifying Rice Avenue as a designated access truck route to the Port of Hueneme and identifying Victoria Avenue as a designated access truck route to NBVC Port Hueneme.

Recommended next steps include the following:

- Identify potential funding sources and the responsible agencies for implementing the recommendations identified in this report.
- Explore performing an analysis of future traffic conditions, truck trip generation rates, and the operation of the future study area roadway network.

1 INTRODUCTION

The Southern California Association of Governments (SCAG) and the Cities of Port Hueneme and Oxnard have commissioned this Truck Traffic Study to analyze existing traffic conditions and identify traffic impacts and congestion generated by truck trips traveling on local arterial roadways. Truck trips in the study area are generated by a variety of land uses located in the Cities of Port Hueneme and Oxnard. Some of these uses include the Port of Hueneme, the Naval Base Ventura County (NBVC), and numerous other private businesses such as agricultural uses, automobile distributors, sod farms, offshore oil operations, and community commercial uses. The study is focused on assessing the impacts caused by existing truck traffic in the study area and identifying strategies for addressing the identified impacts.

This report consists of the following sections:

1 Introduction
2 Traffic Analysis Methodology
3 Existing Traffic Conditions
4 Study Area Truck Trips (Origins and Destinations)
5 Impacts of Truck Traffic through Residential Neighborhoods
6 Recommendations

Section 1 provides an introduction to the report and background information. Section 2 describes the methodology used for various types of analysis presented in this study. Section 3 includes descriptions of the study area roadway network and existing operations. Section 4 is a compilation of the results of questionnaires, surveys, and observations of truck trip origins, destinations, and travel routes within the study area. Section 5 examines the potential to improve truck route corridors through signal timing coordination. In Section 6, the impacts of truck traffic through local residential neighborhoods are discussed. Section 7 presents an overall summary of the impacts of truck traffic on the roadway network, recommendations to mitigate these impacts, and a list of areas that merit further study.

1.1 BACKGROUND

Freight goods movement is a significant regional issue in Southern California that is growing in importance each year. Issues including traffic congestion, air quality, and noise must be addressed when considering the impacts of increased goods movement and truck traffic. While a large portion of the freight traffic in Southern California is generated by the Ports of Los Angeles and Long Beach, there are numerous other smaller sources of truck trips in Southern California. The Oxnard/Port Hueneme area is home to several of these smaller truck trip generators. These land uses include the Port of Hueneme, Naval Base Ventura County (NBVC) – Port Hueneme, as well as several private businesses comprised of automobile distributors, sod farms, agricultural uses, and off-shore oil operations.

The Port of Hueneme is the U.S. Port of Entry for California's central coast region. It serves niche markets that include the import and export of automobiles, fresh fruit and other produce. It is the only deep water harbor between Los Angeles and San Francisco, and serves as a primary support facility for the offshore oil industry.

Agency Coordination

The information presented in this report has been reviewed by the Technical Advisory Committee (TAC), which was formed to support the study effort. The Study TAC is comprised of the following staff representatives from the identified agencies:

- Akiko Yamagami, Southern California Association of Governments (SCAG)
- Michael Jones, SCAG
- Andres Santamaria, City of Port Hueneme
- Jason Samonte, City of Oxnard
- Anthony Taormina, Port of Hueneme
- Chris Birkelo, Port of Hueneme
- Michaela Brown, Naval Base Ventura County (NBVC)
- Vinod Kumar, California State Department of Transportation (Caltrans) District 7
- Robert Wong, California State Department of Transportation (Caltrans) District 7
- Kerry Forsythe, Ventura County Transportation Commission (VCTC)
- Greg Dineen, Greg Dineen & Associates Industry Transportation Consultant
- Seth Hammond, Specialty Crane and Rigging

2 TRAFFIC ANALYSIS METHODOLOGY

The traffic analysis summarized in this report is performed in accordance with the City of Port Hueneme, City of Oxnard, and Ventura County Congestion Management Program (CMP) traffic impact analysis guidelines. The methodology used in the technical analysis presented in this report is briefly described in this section.

2.1 SIGNALIZED INTERSECTION ANALYSIS

Traffic operations at signalized intersections are analyzed using the Intersection Capacity Utilization (ICU) methodology[1], which evaluates capacity in terms of the volume-to-capacity (V/C) ratio. The Ventura County CMP, the City of Port Hueneme, and the City of Oxnard have adopted the ICU methodology as the preferred method for assessing intersection level of service.

The ICU methodology measures the efficiency of traffic operations with a grading system called Level of Service (LOS). Evaluation of roadways and intersections involves the assignment of grades from A to F, with "A" representing the highest level of operating conditions and "F" representing extremely congested and restricted operations. The LOS is determined by measuring the ratio of volume-to-capacity (V/C) for each roadway and intersection. Each letter grade corresponds to a range of V/C values, which are described in detail in Table 2-1.

Threshold of Significance

The Cities of Port Hueneme and Oxnard have established level of service (LOS) "C" as the minimum acceptable LOS for intersections located in each city. Selected study intersections are also monitored by the Ventura County CMP, which defines the minimum acceptable level of service as LOS "E". For the purposes of this report, the more conservative LOS standard established by the Cities of Port Hueneme and Oxnard will be used as the governing measure regarding the minimum acceptable intersection LOS.

[1] All ICU analysis conducted for this study was completed using a traffic impact analysis software program known as TRAFFIX. TRAFFIX is a network-based interactive computer program that enables calculation of levels of service at signalized and unsignalized intersections for multiple locations and scenarios.

Table 2-1 Level of Service for Signalized Intersections

Level of Service	Description of Traffic Conditions	V/C Ratio
A	At level of service A there are no cycles that are fully loaded, and few are even close to loaded. No approach phase is utilized by traffic and no vehicle waits longer than one red indication. Typically, the approach appears quite open, turning movements are easily made, and nearly all drivers find freedom of operation.	0.00 – 0.60
B	Level of service B represents stable operation. An occasional approach phase is fully utilized and a substantial number are approaching full use. Many drivers begin to feel somewhat restricted within platoons of vehicles.	0.61 – 0.70
C	In level of service C stable operation continues. Full signal cycle loading is still intermittent, but more frequent. Occasionally drivers may have to wait through more than one red signal indication, and back-ups may develop behind turning vehicles.	0.71 – 0.80
D	Level of service D encompasses a zone of increasing restriction, approaching instability. Delay to approaching vehicles may be substantial during short peaks within the peak period, but enough cycles with lower demand occur to permit periodic clearance of developing queues, thus preventing excessive back-ups.	0.81 – 0.90
E	Level of service E represents the most vehicles that any particular intersection approach can accommodate. At capacity (V/C = 1.00) there may be long queues of vehicles waiting upstream of the intersection and delays may be great (up to several signal cycles).	0.91 – 1.00
F	Level of service F represents jammed conditions. Back-ups from locations downstream or on the cross street may restrict or prevent movement of vehicles out of the approach under consideration; hence, volumes carried are not predictable. V/C values are highly variable, because full utilization of the approach may be prevented by outside conditions.	>1.00

Source: Los Angeles County Congestion Management Program, 2000

3 EXISTING TRAFFIC CONDITIONS

Descriptions of the project study area arterial roadway network, truck routes, and major intersections are included in this section. Summaries of existing traffic volumes, the percentage of heavy vehicles, and arterial and intersection level of service are also presented.

3.1 PROJECT SETTING

The project study area was determined in consultation with the Project TAC. The study area was chosen based on the presence of corridors and intersections that carry a high percentage of trucks on a daily basis and that serve as essential connections between the US-101 freeway and local land uses.

The project study area is shown in Figure 3-1. The study area is located within the Cities of Port Hueneme and Oxnard, and is bordered by the US-101 freeway on the north, Victoria Avenue on the west, Hueneme Road on the south, and Rice Avenue on the east.

Study Area Roadways

Major roadways analyzed in the study include:

- **Victoria Avenue** – Victoria Avenue runs in a north-south direction and serves as the western border of the study area. The roadway currently has four lanes (two lanes in each direction) for a majority of its length in the study area. Selected locations near 5th Street and Channel Islands Boulevard have been widened to provide an additional lane in one or both directions of travel.
- **Channel Islands Boulevard** – Channel Islands Boulevard provides four lanes of travel between Victoria Avenue and Rose Avenue. Between Rose Avenue and Rice Avenue the street narrows to a single lane in each direction.
- **Ventura Road** – Ventura Road is a four-lane arterial roadway that travels north and south through both the City of Port Hueneme and the City of Oxnard in the study area. The roadway is located along the eastern edge of NBVC and intersects Hueneme Road just east of the main gate to the Port of Hueneme.
- **Hueneme Road** – Hueneme Road is an east-west arterial roadway that travels between the Port of Hueneme on the west and Naval Station Point Mugu on the east. It varies in width from two lanes to four lanes within the study area. Hueneme Road is the southern boundary of the study area for this study and is designated as a preferred access route for trucks in the City of Oxnard General Plan. The City of Oxnard is currently planning to widen a portion of Hueneme Road from Saviers Road to Arctucus Avenue from two lanes to four lanes.
- **Oxnard Boulevard** – Oxnard Boulevard is a major north-south arterial roadway in the City of Oxnard. The street is currently designated as State Route 1 (SR-1) or Pacific Coast Highway between Pleasant Valley Road and Interstate 101 (US-101). Oxnard Boulevard serves as a primary access route to Downtown Oxnard.
- **Vineyard Avenue** – Vineyard Avenue is designated as State Route 232 (SR-232) north of Oxnard Boulevard. Vineyard Avenue has six lanes north of Oxnard Boulevard to US-101 and four lanes of travel south and west of Oxnard Boulevard. Vineyard Avenue also serves as a main access point to Downtown Oxnard from US-101.

IBI GROUP	Cities of Port Hueneme and Oxnard Truck Traffic Study	Figure 3-1
	Project Study Area	

- **Rose Avenue** – Rose Avenue is a four-lane divided arterial that runs north and south. South of 5th Street, Rose Avenue functions as a local arterial, primarily serving local land uses. The roadway widens to six lanes near the US-101 freeway, and is bordered by retail and medical land uses.

- **Rice Avenue** – Rice Avenue forms the western boundary of the study area. The roadway is a four lane north-south roadway that is designated as a preferred access route to the Port of Hueneme. Rice Avenue currently provides a single lane of travel in each direction over the US-101 freeway, resulting in a traffic bottleneck in the northeast portion of the study area.

Truck Routes

The City of Oxnard General Plan Circulation Element identifies arterial roadway truck routes that serve the City and provide connections to the US-101 freeway. The truck routes are typically arterial roadways that serve as important roadways within the City of Oxnard, providing access to the US-101 freeway, the Port of Hueneme, and NBVC. All truck routes are located along arterial roadways that are designated as Secondary or Primary Arterials by the City of Oxnard. This distinction assists in focusing truck traffic on arterial roadways that provide greater traffic capacity, wider lanes, larger intersections, and design characteristics that are better able to accommodate large trucks when compared to smaller arterial roadways or local streets. Generally, the truck routes are so designated in an attempt to avoid residential neighborhoods and minimize potential traffic, noise, and vibration impacts. Study area truck routes are illustrated in Figure 3-2.

IBI GROUP

Cities of Port Hueneme and Oxnard Truck Traffic Study

Study Area Truck Routes

Figure 3-2

3.2 ARTERIAL ANALYSIS

ADT Count Volumes

The analysis of existing traffic conditions in the project study area is based on new traffic counts for roadway average daily traffic (ADT) volumes and peak hour intersection turning movements. All traffic counts include the collection of vehicle classification data to identify truck traffic volumes in the general traffic stream. Existing traffic counts were also collected from the City of Port Hueneme, the City of Oxnard, and Caltrans District 7 to supplement the new traffic counts conducted for this study effort. All collected traffic count data is provided in the Appendix of this report.

ADT counts were conducted on a single day on January 15, 2008 at the following locations:

1. Victoria Avenue – between Channel Islands Boulevard and 5th Street
2. Victoria Avenue – north of 5th Street
3. Ventura Road – between Hueneme Road and Channel Islands Boulevard
4. Ventura Road – north of Channel Islands Boulevard
5. Saviers Road - north of Channel Islands Boulevard
6. Oxnard Boulevard – north of 5th Street
7. Rose Avenue – north of 5th Street
8. Rice Avenue – between Hueneme Road and 5th Street
9. Rice Avenue – north of 5th Street
10. Hueneme Road - between Ventura Road and Saviers Road
11. Hueneme Road - between Saviers Road and Rice Road
12. Channel Islands Boulevard – between Victoria Avenue and Ventura Road
13. Channel Islands Boulevard – between Ventura Road and Rose Avenue

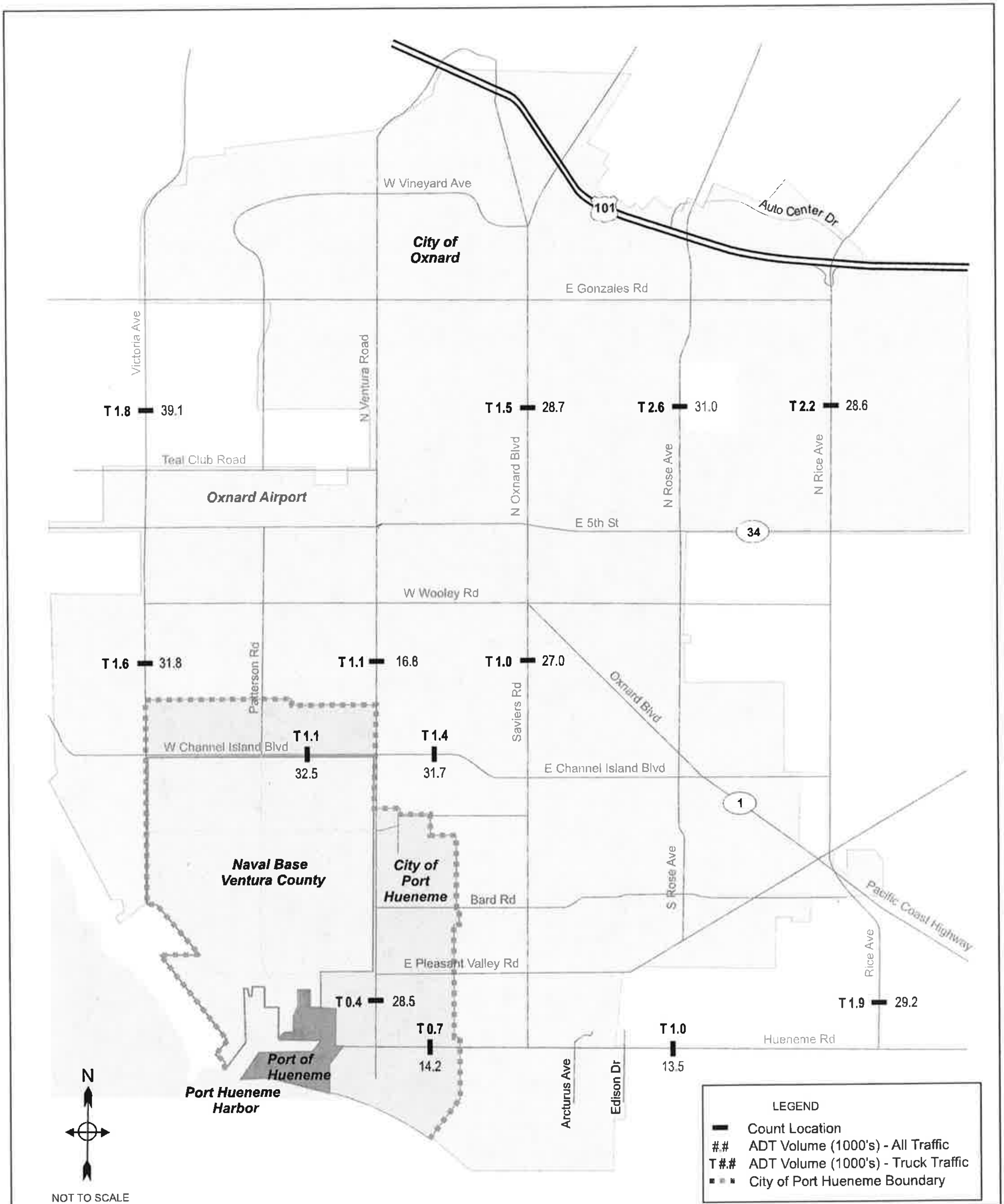
The ADT counts were conducted with vehicle classifications based on the Federal Highway Administration (FHWA) vehicle classification scheme. Under this program, vehicles are classified into categories depending on whether the vehicle carries passengers or commodities. Non-passenger vehicles are further subdivided by the number of axles and number of units. FHWA vehicle classes are summarized in Table 3-1.

Table 3-1 FHWA Vehicle Classifications

Class	Vehicle Type	Description
Class 1	Motorcycles	All two or three-wheeled motorized vehicles. This vehicle type may be reported at the option of the State.
Class 2	Passenger Cars	All sedans, coupes, and station wagons manufactured primarily for the purpose of carrying passengers and including those passenger cars pulling recreational or other light trailers.
Class 3	Other Two-Axle, Four-Tire Single Unit Vehicles	All two-axle, four-tire, vehicles, other than passenger cars. Included in this classification are pickups, panels, vans, and other vehicles such as campers, motor homes, ambulances, hearses, carryalls, and minibuses. Other two-axle, four-tire single-unit vehicles pulling recreational or other light trailers are included in this classification.
Class 4	Buses	All vehicles manufactured as traditional passenger-carrying buses with two axles and six tires or three or more axles. This category includes only traditional buses (including school buses) functioning as passenger-carrying vehicles. Modified buses should be considered to be a truck and should be appropriately classified.
Class 5	Two-Axle, Six-Tire, Single-Unit Trucks	All vehicles on a single frame including trucks, camping and recreational vehicles, motor homes, etc., with two axles and dual rear wheels.
Class 6	Three-Axle Single-Unit Trucks	All vehicles on a single frame including trucks, camping and recreational vehicles, motor homes, etc., with three axles.
Class 7	Four or More Axle Single-Unit Trucks	All trucks on a single frame with four or more axles.
Class 8	Four or Fewer Axle Single-Trailer Trucks	All vehicles with four or fewer axles consisting of two units, one of which is a tractor or straight truck power unit.
Class 9	Five-Axle Single-Trailer Trucks	All five-axle vehicles consisting of two units, one of which is a tractor or straight truck power unit.
Class 10	Six or More Axle Single-Trailer Trucks	All vehicles with six or more axles consisting of two units, one of which is a tractor or straight truck power unit.
Class 11	Five or fewer Axle Multi-Trailer Trucks	All vehicles with six or more axles consisting of two units, one of which is a tractor or straight truck power unit.
Class 12	Six-Axle Multi-Trailer Trucks	All six-axle vehicles consisting of three or more units, one of which is a tractor or straight truck power unit.
Class 13	Seven or More Axle Multi-Trailer Trucks	All vehicles with seven or more axles consisting of three or more units, one of which is a tractor or straight truck power unit.

Additional detail on the types of vehicle classifications established by FHWA is provided in the Appendix.

The traffic counts collected for this study assigned each vehicle that crossed the counting location into a specific classification. Roadway traffic volumes and count locations are shown graphically in Figure 3-3. For the purpose of this study, a "heavy truck" is a vehicle of Class 7 through Class 13. Table 3-2 summarizes the existing average daily traffic counts and identifies the total number of heavy trucks and percentage of the vehicles in relation to total traffic along each roadway segment.



IBI GROUP	Cities of Port Hueneme and Oxnard Truck Traffic Study	Figure 3-3
	Arterial General Vehicle and Heavy Truck Count Volumes	

Table 3-2 Existing Roadway Daily Traffic Counts

No.	Roadway	Location	ADT (veh/day) Total	Truck ADT (veh/day) Total	Percentage of Heavy Trucks
1	Victoria Ave	Between Channel Islands Blvd and 5th St	31,793	1,585	5.0%
2	Victoria Ave	North of 5th St	39,101	1,771	4.5%
3	Ventura Rd	Between Hueneme Rd and Channel Islands Blvd	28,538	428	1.5%
4	Ventura Rd	North of Channel Islands Blvd	16,834	1,101	6.5%
5	Saviers Rd	North of Channel Islands Blvd	27,001	995	3.7%
6	Oxnard Blvd	North of 5th St	28,696	1,477	5.1%
7	Rose Ave	North of 5th St	30,966	2,608	8.4%
8	Rice Ave	Between Hueneme Rd and 5th St	29,190	1,930	6.6%
9	Rice Ave	North of 5th St	28,610	2,187	7.6%
10	Hueneme Rd	Between Ventura Rd and Saviers Rd	14,190	719	5.1%
11	Hueneme Rd	Between Saviers Rd and Rice Ave	13,512	975	7.2%
12	Channel Islands Blvd	Between Victoria and Ventura Rd	32,519	1,065	3.3%
13	Channel Islands Blvd	Between Ventura Rd and Rose Ave	31,679	1,369	4.3%

Source: Daily traffic counts collected on January 15, 2008
Heavy trucks are vehicles of Class 7 through Class13.

The five highest daily truck volumes are observed on the following roadway segments:

1. Rose Avenue – north of 5th Street
2. Rice Avenue – north of 5th Street
3. Rice Avenue – between Hueneme Rd and 5th street
4. Victoria Avenue – north of 5th Street
5. Victoria Avenue – between Channel Islands Blvd and 5th Street

This pattern of truck traffic volumes shows that the highest volumes of truck traffic are typically observed on roadway segments located closer to US-101 interchanges and along the designated preferred truck routes.

The five roadway segments identified below have the highest percentage of truck traffic relative to total traffic volume of the 13 locations included in the traffic counts:

1. Rose Avenue – north of 5th Street
2. Rice Avenue – north of 5th Street
3. Hueneme Road – east of Saviers Road
4. Rice Avenue – between Hueneme Road and 5th Street
5. Ventura Road – north of Channel Islands Boulevard

The truck percentage data corresponds well with the total truck volumes. However, it is observed that the section of Ventura Road north of Channel Islands Boulevard does serve a high percentage of truck traffic compared to most of the other roadway segments studied in this report.

Traffic Signal Coordination

Traffic signal coordination is the practice of using a common cycle length[2] for a group of adjacent signals, and then setting the beginning of green for a route through the signals so that vehicles starting at one intersection are likely to receive a green indication when they arrive at successive signals after the first. Under certain circumstances, traffic signal coordination can reduce delay, unnecessary stops at traffic signals, vehicle emissions, and potential for accidents.

Within the study area there are existing coordinated signals on Rice Avenue between Fifth Street and Auto Center Drive, on Rose Avenue between Fifth Street and Auto Center Drive, and on Victoria Avenue between Channel Islands Boulevard and Doris Avenue.

[2] The cycle length for a signalized intersection is the time required to complete one full sequence of traffic movements.

3.3 INTERSECTION ANALYSIS

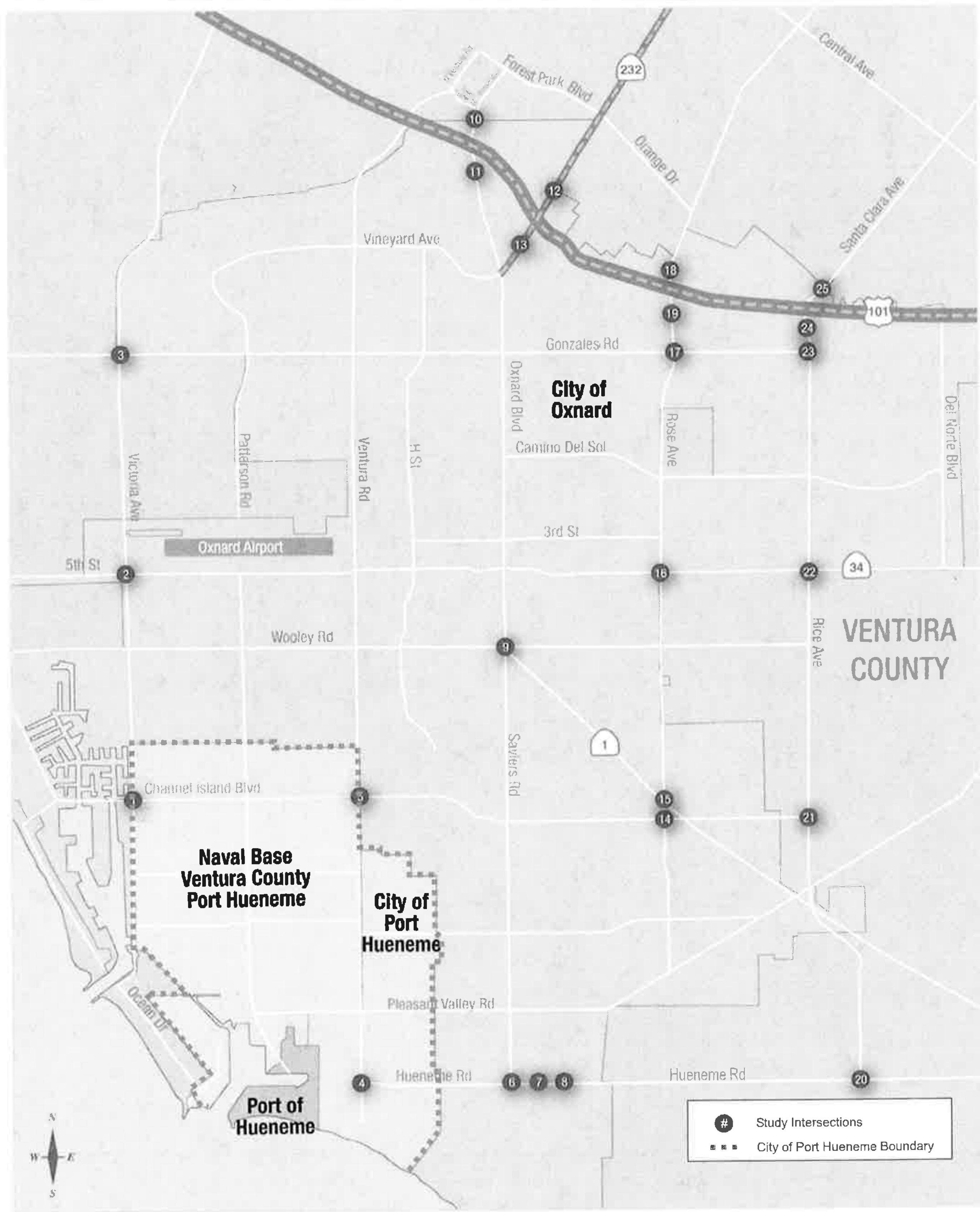
Study Intersections

Twenty-five intersections located within the boundaries of the study area were selected for inclusion in the traffic analysis. The intersection locations are shown in Figure 3-4, and the lane geometry at each intersection is illustrated in Figure 3-5. The study intersections were selected based on their location along major truck routes, their proximity to land uses that generate truck trips, the location of the intersection in relation to the US-101 freeway, and the potential to serve large numbers of heavy trucks.

Turning Movement Counts

The ADT count data was used to establish the peak period for vehicle traffic and to verify the appropriate time periods for conducting the intersection turning movement counts. The peak period intersection counts were then scheduled to take into account the peak hours for ambient traffic as well as the peak hours for truck trips in the project study area. The peak periods identified for this study were from 7:00 AM to 9:00 AM and from 3:00 PM to 6:00 PM. Intersection turning movement counts were completed on January 22, 2008 and January 29, 2008 at the following project study area intersections:

1. Victoria Avenue and Channel Islands Boulevard
2. Victoria Avenue and 5th Street
3. Victoria Avenue and Gonzales Road
4. Ventura Road and Port Hueneme Road
5. Ventura Road and Channel Islands Boulevard
6. Saviers Road and Hueneme Road
7. Arcturus Avenue and Hueneme Road
8. Edison Drive and Hueneme Road
9. Oxnard Boulevard/Saviers Road and Wooley Road
10. Oxnard Boulevard and Northbound US-101 Ramps
11. Oxnard Boulevard and Southbound US-101 Ramps
12. Vineyard Avenue and Northbound US-101 Ramps
13. Vineyard Avenue and Southbound US-101 Ramps
14. Rose Avenue and Channel Islands Boulevard
15. Rose Avenue and Oxnard Boulevard
16. Rose Avenue and 5th Street
17. Rose Avenue and Gonzales Road
18. Rose Avenue and Northbound US-101 Ramps
19. Rose Avenue and Southbound US-101 Ramps
20. Rice Avenue and Hueneme Road
21. Rice Avenue and Channel Islands Boulevard
22. Rice Avenue and 5th Street
23. Rice Avenue and Gonzales Road
24. Rice Avenue and US-101 Southbound Ramps
25. Rice Avenue/Santa Clara Avenue and Auto Center Drive

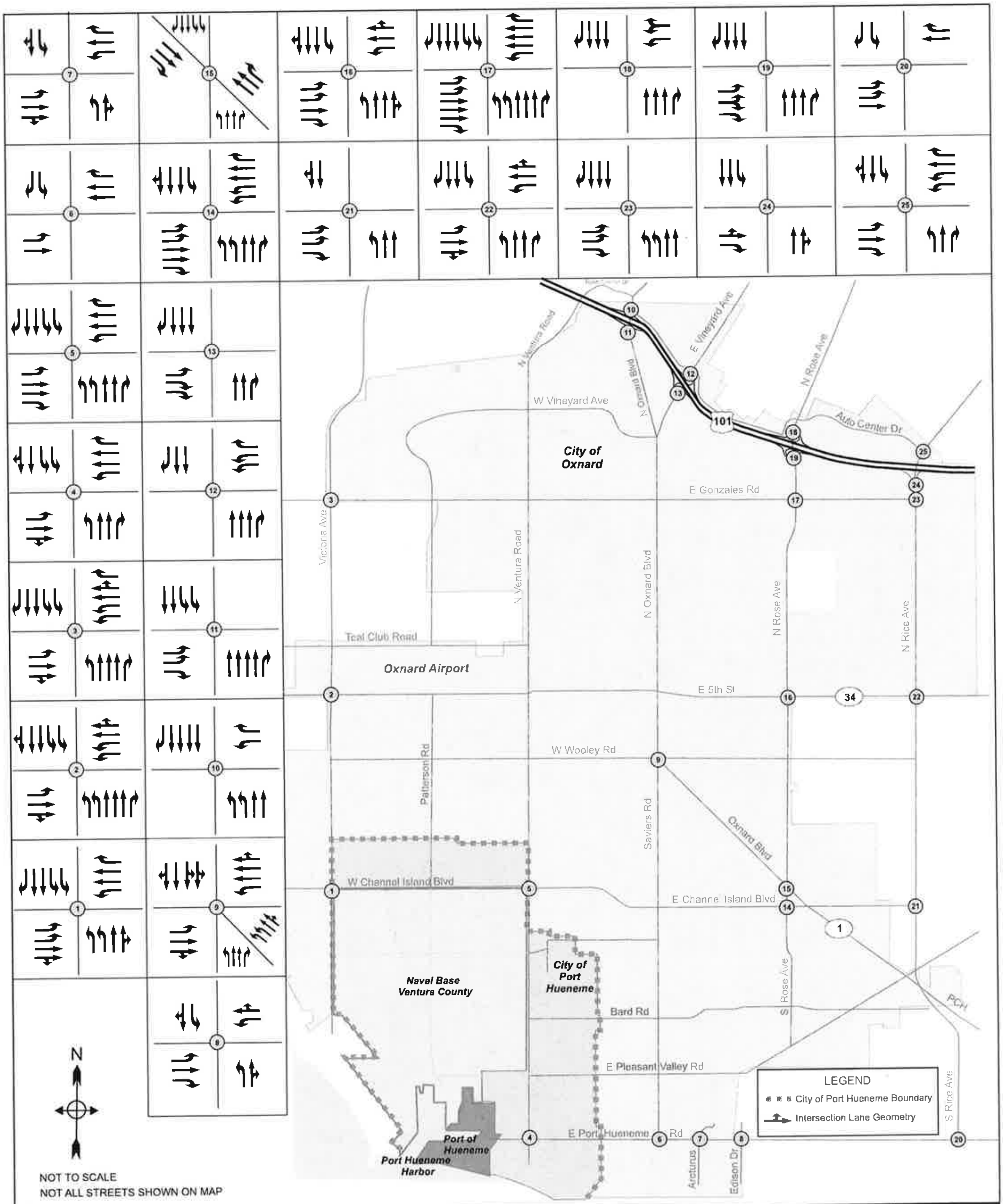


IBI GROUP

Cities of Port Hueneme and Oxnard Truck Traffic Study

Study Intersections

Figure 3-4



Cities of Port Hueneme and Oxnard Truck Traffic Study

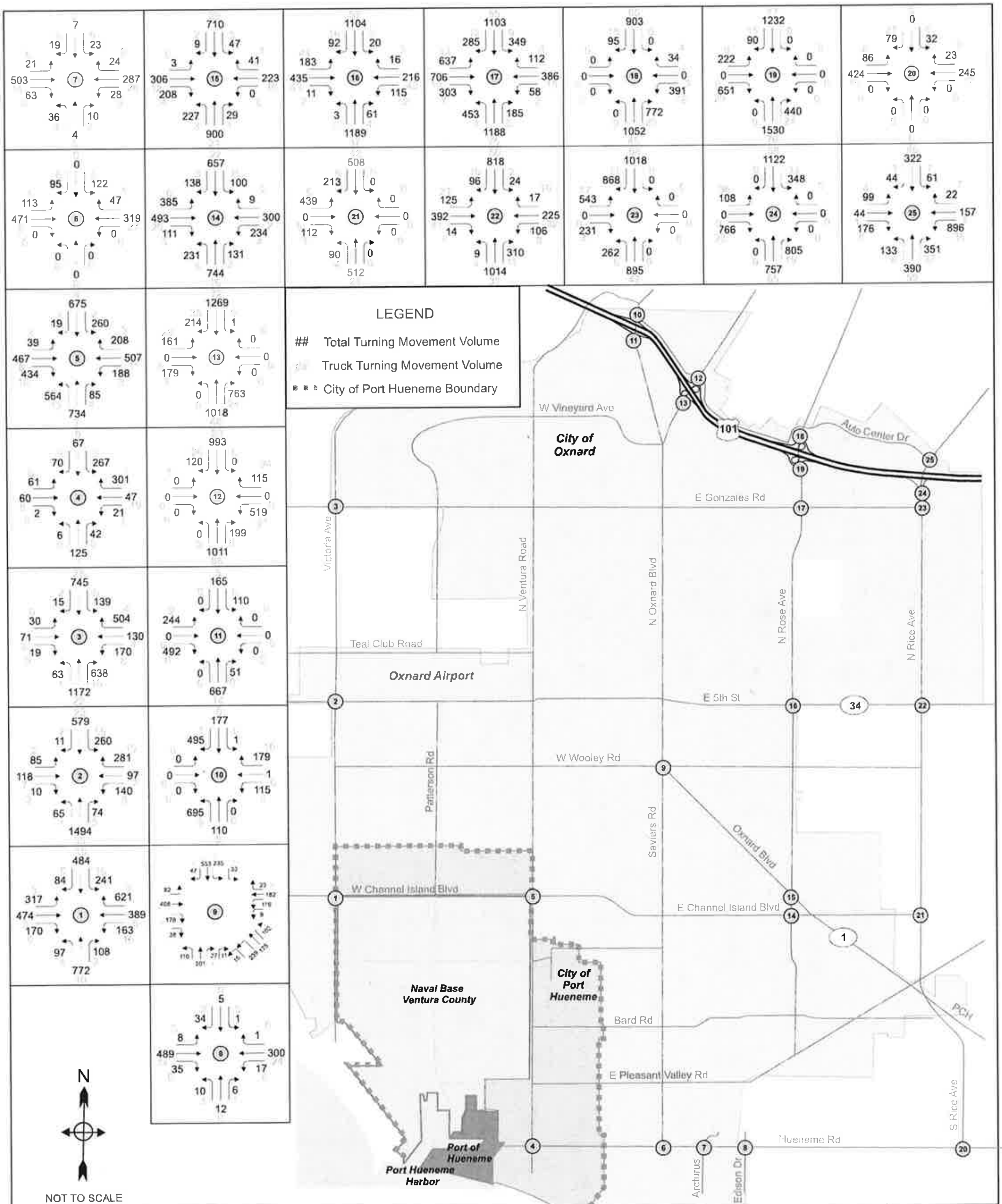
Study Intersection Lane Geometry

Figure 3-5

IBI GROUP

Intersection turning movement counts for trucks and cars were recorded separately. For the purposes of traffic analysis, truck counts have been converted to passenger car equivalent (PCE) volumes by applying a PCE factor of 2.0. This means that each heavy truck recorded by the traffic counts is incorporated into the analysis as two passenger cars. PCE values are used as a method to convert a mix of different vehicle types in a traffic stream to an equivalent traffic stream composed entirely of passenger cars. PCE conversion is important as larger and heavier trucks reduce the quality of traffic flow due to their size, weight and operational characteristics. A level of service analysis based on traffic volumes without applying the PCE factor for trucks could underestimate their impact.

Intersection turning movement counts for trucks and cars taken at all 25 study intersections are shown separately in Figure 3-6 and 3-7. Combined traffic counts by turning movement with PCE conversion factors applied for truck volumes are shown in Figure 3-8 and 3-9.

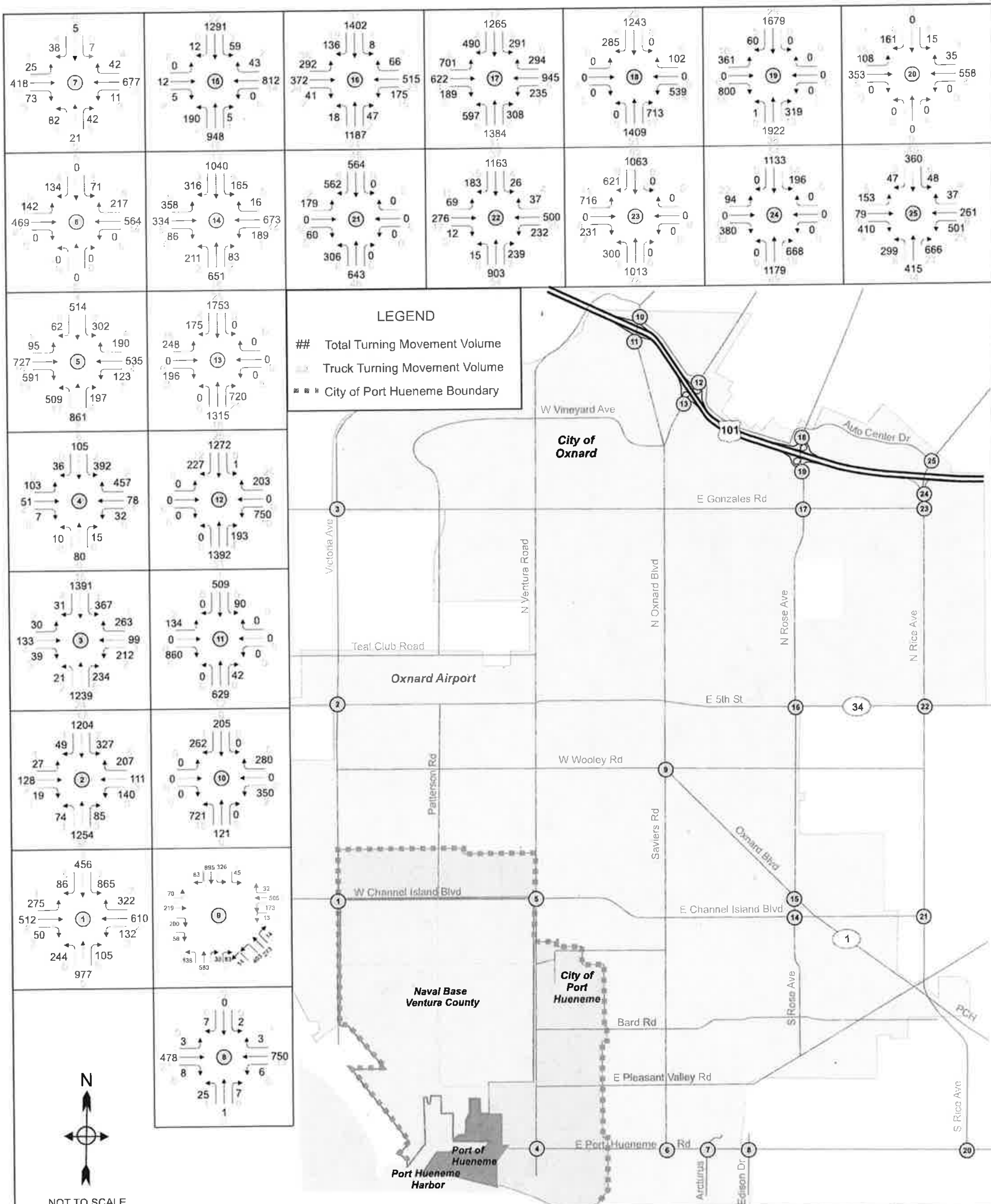


IBI GROUP

Cities of Port Hueneme and Oxnard Truck Traffic Study

Intersection Turning Movement Count Volumes - AM Peak

Figure 3-6

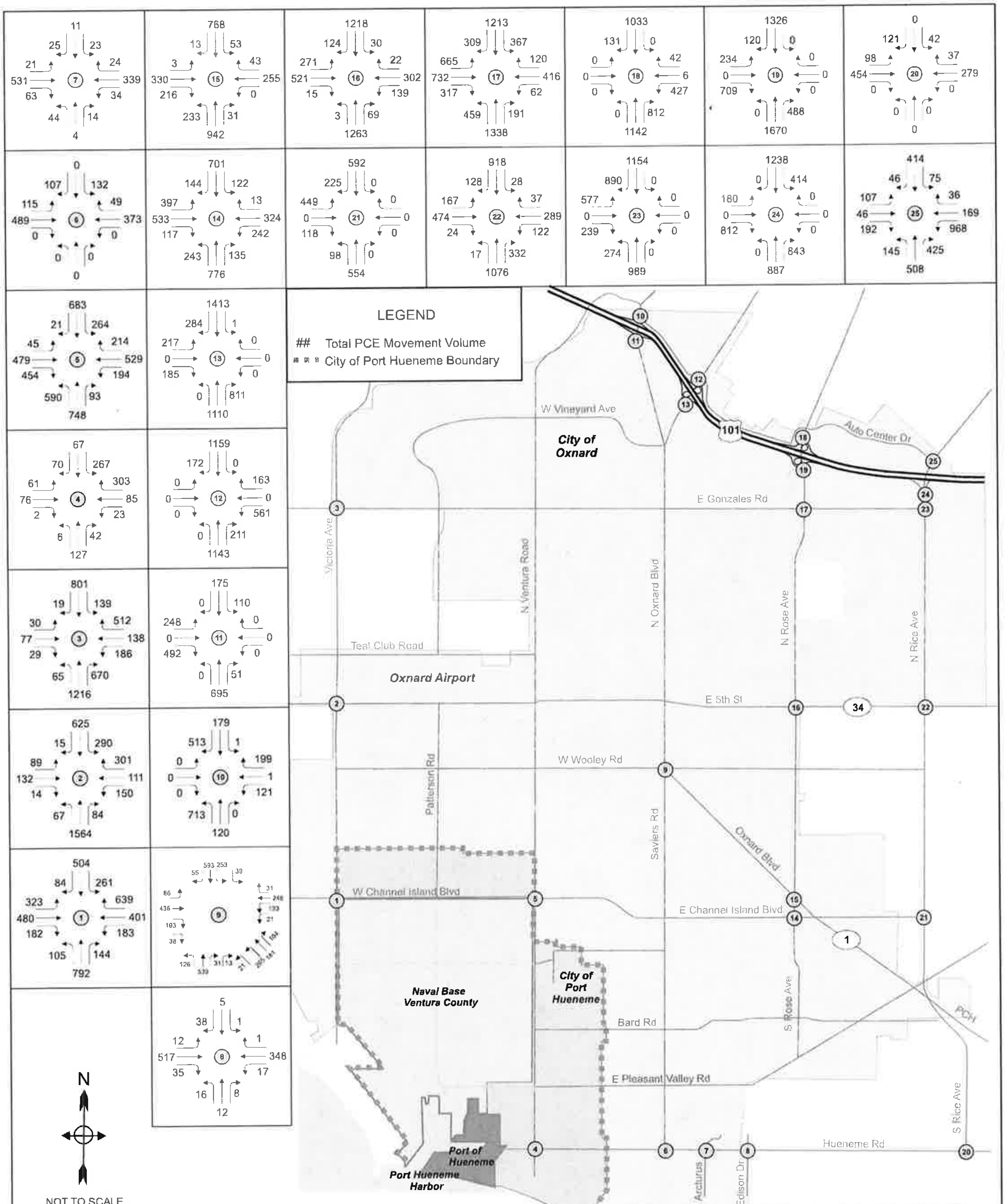


IBI GROUP

Cities of Port Hueneme and Oxnard Truck Traffic Study

Intersection Turning Movement Count Volumes - PM Peak

Figure 3-7

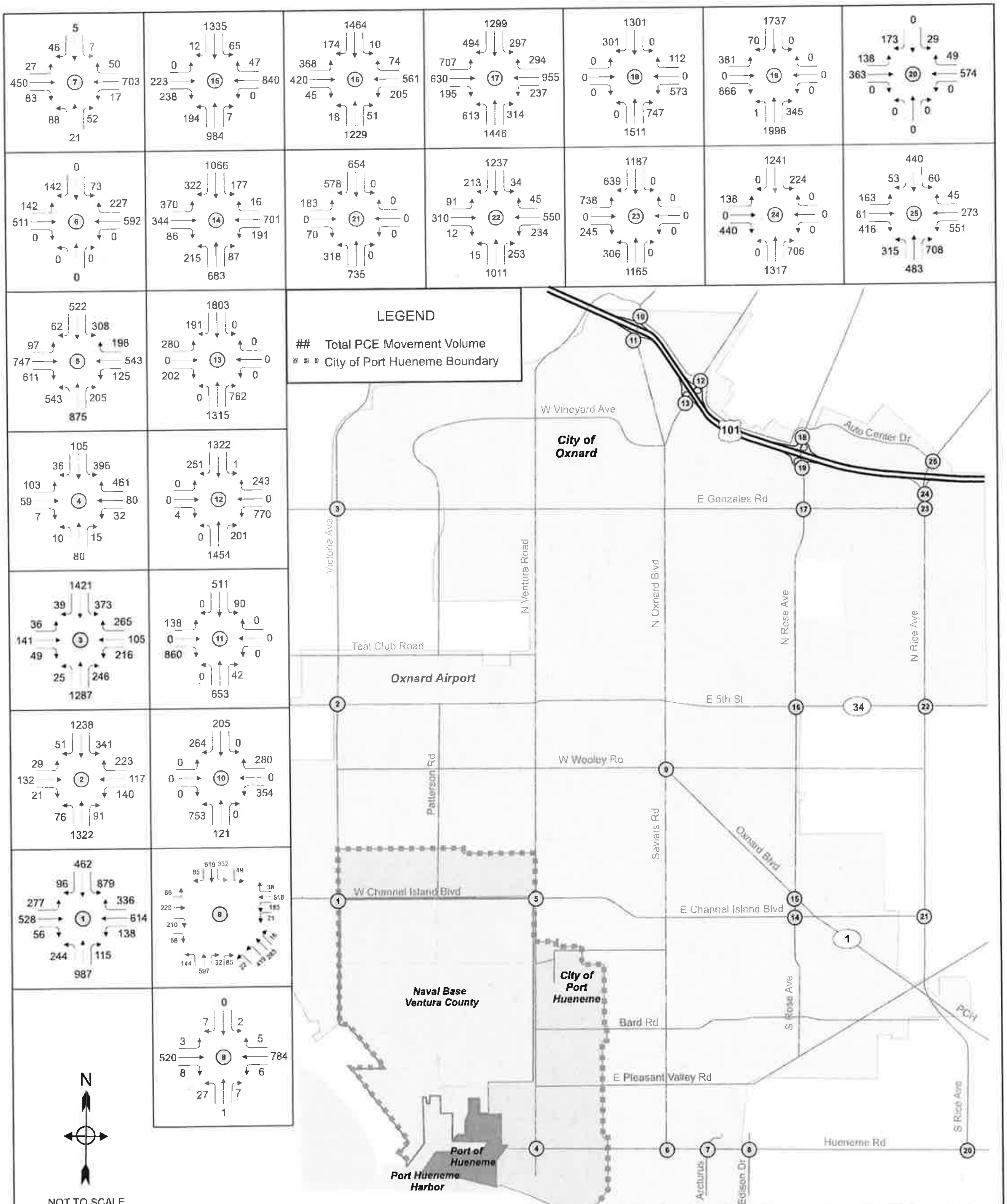


IBI GROUP

Cities of Port Hueneme and Oxnard Truck Traffic Study

Intersection Count Volumes With PCE Conversion - AM Peak

Figure 3-8



IBI GROUP

Cities of Port Hueneme and Oxnard Truck Traffic Study

Intersection Count Volumes With PCE Conversion - PM Peak

Figure 3-9

Intersection Level of Service (LOS) Results

Peak hour intersection level of service for the existing condition is analyzed for each of the 25 study intersections. Table 3-3 summarizes the results of the AM and PM peak hour existing conditions analysis.

Table 3-3 Existing (Year 2008) AM and PM Peak Hour LOS Summary

No.	Intersection	Weekday AM Peak		Weekday PM Peak	
		V/C	LOS	V/C	LOS
1	Victoria Ave and Channel Islands Blvd	0.78	C	0.90	D
2	Victoria Ave and 5th St	0.66	B	0.54	A
3	Victoria Ave and Gonzales Rd	0.64	B	0.59	A
4	Ventura Rd and Hueneme Rd	0.35	A	0.50	A
5	Ventura Rd and Channel Islands Blvd	0.67	B	0.68	B
6	Saviers Rd and Hueneme Rd	0.27	A	0.36	A
7	Arcturus Ave and Hueneme Rd	0.28	A	0.54	A
8	Edison Dr and Hueneme Rd	0.37	A	0.51	A
9	Oxnard Blvd/Saviers Rd and Wooley Rd	0.72	C	0.91	E
10	Oxnard Blvd and NB US-101 Ramps	0.38	A	0.49	A
11	Oxnard Blvd and SB US-101 Ramps	0.22	A	0.20	A
12	Vineyard Ave and NB US-101 Ramps	0.54	A	0.66	B
13	Vineyard Ave and SB US-101 Ramps	0.48	A	0.60	A
14	Rose Ave and Channel Islands Blvd	0.56	A	0.69	B
15	Rose Ave and Oxnard Blvd	0.49	A	0.80	C
16	Rose Ave and 5th St	0.71	C	0.74	C
17	Rose Ave and Gonzales Rd	0.69	B	0.88	D
18	Rose Ave and NB US-101 Ramps	0.39	A	0.53	A
19	Rose Ave and SB US-101 Ramps	0.57	A	0.69	B
20	Rice Ave and Hueneme Rd	0.48	A	0.42	A
21	Rice Ave and Channel Islands Blvd	0.57	A	0.67	B
22	Rice Ave and 5th St	0.59	A	0.64	B
23	Rice Ave and Gonzales Rd	0.82	D	0.60	A
24	Rice Ave and US-101 SB Ramps	0.91	E	0.86	D
25	Rice/Santa Clara Ave and Auto Center Dr	0.79	C	0.78	C

Source: ICU traffic analysis completed by IBI Group
D/E/F : Intersection LOS exceeds minimum acceptable LOS established by the Cities of Port Hueneme and Oxnard

The following intersections do not operate at a satisfactory level of service in the identified peak hour:

- Victoria Avenue and Channel Islands Boulevard (#1) – PM peak hour
- Oxnard Boulevard/Saviers Road and Wooley Road (#9) – PM peak hour
- Rose Avenue and Gonzales Road (#17) – PM peak hour
- Rice Avenue and Gonzales Road (#23) – AM peak hour
- Rice Avenue and US-101 Southbound Ramps (#24) – AM and PM peak hour

Many of these intersections are located along roadway segments that have the highest observed total traffic volumes and truck traffic volumes. Several intersections are located near the US-101 freeway, where traffic volumes are typically higher as automobiles and trucks attempt to access the freeway.

A separate analysis is provided based only on the auto traffic volumes observed at each intersection to assess the impacts of truck traffic on each intersection. The results are summarized in Table 3-4.

Table 3-4 Existing (2008) AM and PM Peak Hour LOS Summary – Autos Only

No.	Intersection	Weekday AM Peak		Weekday PM Peak	
		V/C (Delay)	LOS	V/C (Delay)	LOS
1	Victoria Ave and Channel Islands Blvd	0.76	C	0.89	D
2	Victoria Ave and 5th St	0.62	B	0.51	A
3	Victoria Ave and Gonzales Rd	0.62	B	0.57	A
4	Ventura Rd and Hueneme Rd	0.35	A	0.50	A
5	Ventura Rd and Channel Islands Blvd	0.65	B	0.67	B
6	Saviers Rd and Hueneme Rd	0.25	A	0.35	A
7	Arcturus Ave and Hueneme Rd	0.23	A	0.52	A
8	Edison Dr and Hueneme Rd	0.35	A	0.49	A
9	Oxnard Blvd/Saviers Rd and Wooley Rd	0.66	B	0.88	D
10	Oxnard Blvd and NB US-101 Ramps	0.36	A	0.48	A
11	Oxnard Blvd and SB US-101 Ramps	0.22	A	0.20	A
12	Vineyard Ave and NB US-101 Ramps	0.47	A	0.63	B
13	Vineyard Ave and SB US-101 Ramps	0.68	B	0.57	A
14	Rose Ave and Channel Islands Blvd	0.52	A	0.67	B
15	Rose Ave and Oxnard Blvd	0.53	A	0.78	C
16	Rose Ave and 5th St	0.62	B	0.67	B
17	Rose Ave and Gonzales Rd	0.65	B	0.87	D
18	Rose Ave and NB US-101 Ramps	0.35	A	0.49	A
19	Rose Ave and SB US-101 Ramps	0.52	A	0.65	B
20	Rice Ave and Hueneme Rd	0.44	A	0.39	A
21	Rice Ave and Channel Islands Blvd	0.52	A	0.61	B
22	Rice Ave and 5th St	0.53	A	0.61	B
23	Rice Ave and Gonzales Rd	0.79	C	0.54	A
24	Rice Ave and US-101 SB Ramps	0.79	C	0.76	C
25	Rice/Santa Clara Ave and Auto Center Dr	0.67	B	0.73	C

Source: ICU traffic analysis completed by IBI Group
D/E/F : Intersection LOS exceeds minimum acceptable LOS established by the Cities of Port Hueneme and Oxnard

In this scenario, the following intersections do not operate at an acceptable level of service:

- Victoria Avenue and Channel Islands Boulevard (#5) – PM peak hour
- Oxnard Boulevard/Saviers Road and Wooley Road (#9) – PM peak hour
- Rose Avenue and Gonzales Road (#17) – PM peak hour

The comparison between the above mentioned analyses show that level of service at two intersections is impacted due to truck traffic. Increase in volume to capacity ratio and associated level of service at these intersections is as follows:

- Rice Avenue and Gonzales Road (#23) – During AM peak hour v/c increases by 2.8 percent and LOS changes from LOS C to LOS D due to truck traffic.

- Rice Avenue and US-101 Southbound Ramps (#24) – During AM peak hour v/c increases by 12.4 percent and LOS changes from LOS C to LOS E due to truck traffic. During PM peak hour v/c increases by 10 percent and LOS changes from LOS C to LOS D due to truck traffic.

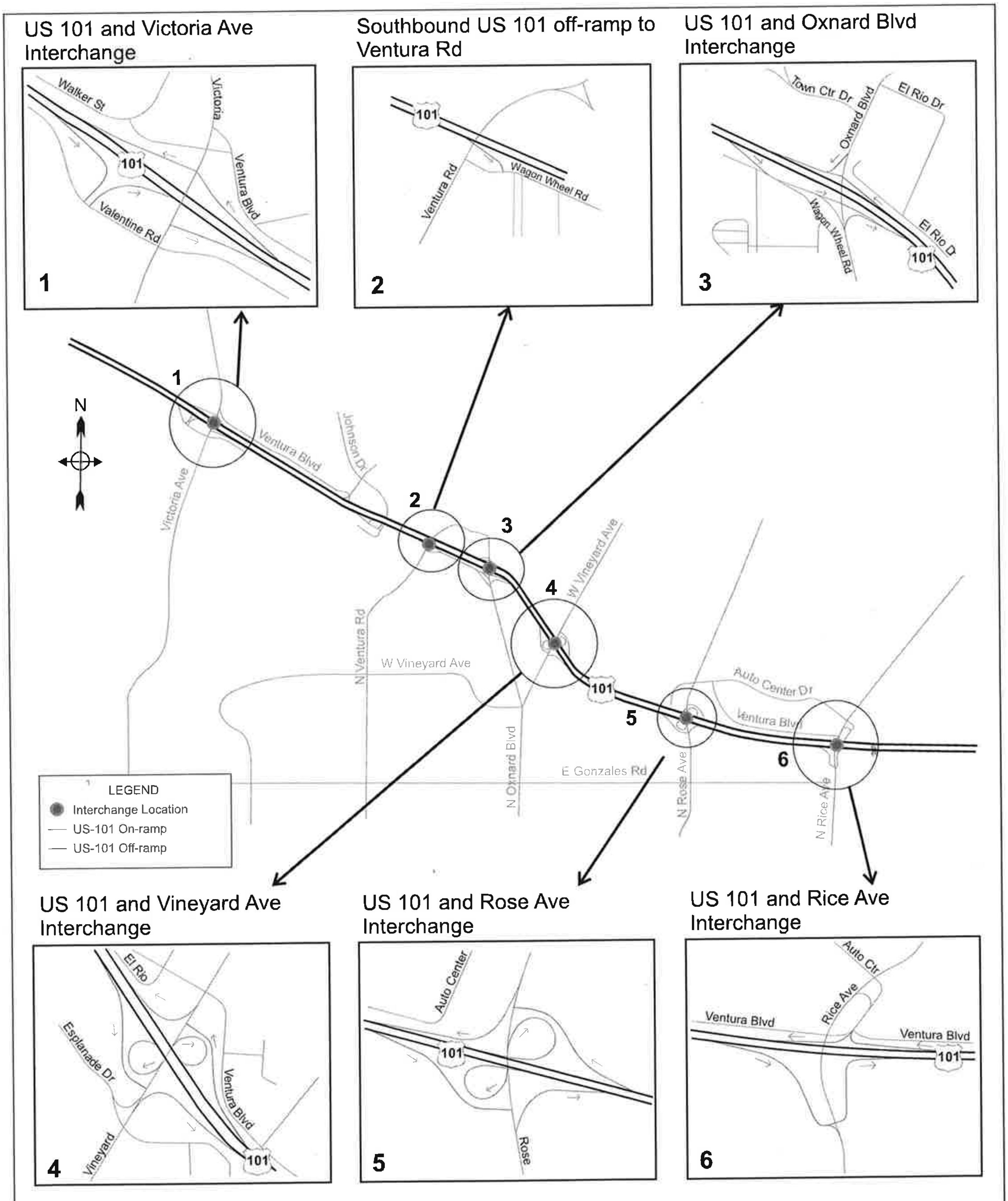
3.4 FREEWAY INTERCHANGE ASSESSMENT

The US-101 freeway is the only freeway in the study area, linking the Oxnard/Port Hueneme area to the Los Angeles Basin to the south and Ventura and Santa Barbara to the north. Trucks traveling to and from locations in the Oxnard/Port Hueneme area use the US-101 freeway as the primary access route to destinations outside of the study area. State Route 1 and State Route 126 also fulfill secondary roles as regional corridors for trucks traveling to and from the study area.

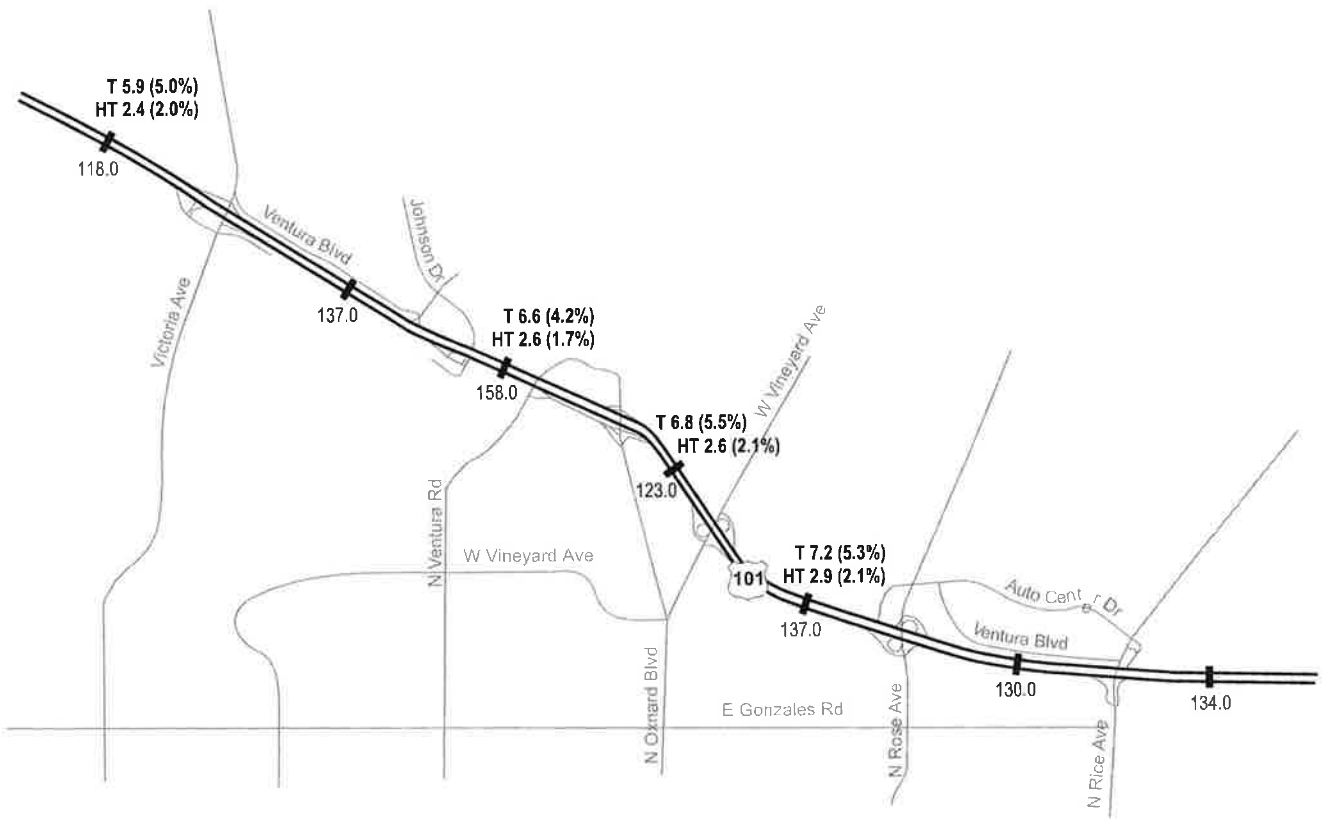
Given the important role of the US-101 freeway in serving regional truck traffic, it is essential that there be efficient and convenient connections between arterial streets and the freeway. Major freeway/arterial street interchanges in the study area are:

- US-101 at Victoria Avenue
- US-101 at Ventura Road (southbound exit only)
- US-101 at Oxnard Boulevard (State Route 1)
- US-101 at Vineyard Avenue (State Route 232)
- US-101 at Rose Avenue
- US-101 at Rice Avenue

Figure 3-10 identifies the existing interchanges and illustrates the location of on-ramps and off-ramps at each interchange. Truck and total vehicle traffic volumes on the US-101 freeway were collected from Caltrans for the year 2006, which is the most recent year available. Traffic volumes are shown in Figure 3-11.



IBI GROUP	Cities of Port Hueneme and Oxnard Truck Traffic Study	Figure 3-10
	Freeway Interchange Locations and Diagrams	



LEGEND

▬	Count Location
#.#	ADT Volume (1000's) - All Traffic
T #.#	ADT Volume (1000's) - All Truck Traffic
HT #.#	ADT Volume (1000's) - Truck Traffic with 3 or more Axles
(#.# %)	Percent of Total Daily Vehicle Volume

IBI GROUP

Cities of Port Hueneme and Oxnard Truck Traffic Study

US-101 Freeway Total Vehicle and Truck Daily Volumes (Year 2006)

Figure 3-11

A brief summary of the existing conditions at each interchange is provided below along with a discussion of the existing connectivity between the arterial street and the freeway. Several of the existing interchanges have been recently improved or expanded to better serve traffic. These improvements are also discussed below.

US-101 at Victoria Avenue

The US-101/Victoria Avenue interchange is located in the City of Ventura. While the interchange is outside of the city limits of the City of Oxnard, the street is a major north-south truck corridor in western Oxnard and serves as a major route for trucks traveling to and from the Port of Hueneme and NBVC. This location is a full interchange, providing on and off-ramps serving both directions of the US-101. The northbound on/off-ramps are a compact diamond design, while the southbound ramps are designed as hook ramps. Vehicles exiting and entering the northbound US-101 access Victoria Avenue directly. Vehicles exiting the southbound US-101 must first turn onto Valentine Road to access Victoria Avenue. Two southbound on-ramps are provided, one from Valentine Road for vehicles traveling south on Victoria Avenue and a second ramp on Victoria Avenue for vehicles traveling northbound on Victoria Avenue.

Victoria Avenue has five through traffic lanes at the interchange, with two southbound lanes and three northbound lanes. In addition to the through lanes, two southbound right turn lanes are provided to Valentine Road and the southbound freeway on-ramp. Dual northbound left turn lanes are provided for access to the northbound freeway on ramp. The off-ramps also provide substantial traffic capacity with three turning lanes provided for the southbound off-ramp and four turning lanes for the northbound off-ramp.

Adjacent land uses include commercial retail and residential uses to the northwest and northeast of the interchange. Land uses on the south side of the interchange include a hotel to the southeast, as well as commercial uses and agricultural uses to the southwest.

US-101 at Ventura Road

The US-101/Ventura Road interchange consists of a single southbound off-ramp, providing access to Wagon Wheel Road and Ventura Road. The design of southbound off-ramp is not conducive to serving large trucks given the steep grade of the off-ramp and tight right turn necessary to access Wagon Wheel Road from the off-ramp. Trucks traveling to the study area from the north would be better served accessing the street network from the Victoria Avenue and Oxnard Boulevard interchanges.

US-101 at Oxnard Boulevard

The US-101/Oxnard Boulevard interchange was recently reconfigured and enhanced to provide additional traffic capacity. The enhancement and reconfiguration created a full interchange with on and off-ramps serving both directions of the US-101 freeway. The new interchange is designed as a compact diamond interchange per Caltrans design standards. The Oxnard Boulevard interchange serves as an important gateway from the US-101 to the new Esplanade Shopping Center and Downtown Oxnard. Oxnard Boulevard is also currently designated as State Route 1 in the City of Oxnard, serving as a major regional traffic corridor. Given the recent completion of traffic capacity and safety improvements, the existing interchange is capable of serving truck traffic.

Adjacent land uses include the RiverPark development to the northwest, industrial uses to the northeast, the Esplanade Shopping Center to the southeast and industrial uses to the southwest. The RiverPark development is a 700-acre mixed-use development that includes a town center retail development/lifestyle center, about 1,800 homes and 1,000 apartment units. Construction of several of residential communities is underway.

Table 3-5 summarizes the volume of trucks observed to enter and exit the US-101 freeway at Oxnard Boulevard during the counts made in January 2008, and identifies the percentage of trucks in comparison to the total volume of vehicles entering and exiting the freeway at this location. Trucks identified as entering the freeway are traveling from Oxnard Boulevard to the northbound or southbound US-101. Trucks identified as exiting the freeway are using the off-ramps to exit the northbound and southbound US-101 to access Oxnard Boulevard.

Table 3-5 Truck Volumes Entering and Exiting US-101 at Oxnard Boulevard

Time Period	NB Trucks Entering Freeway	Percent of Total Volume	NB Trucks Exiting Freeway	Percent of Total Volume	SB Trucks Entering Freeway	Percent of Total Volume	SB Trucks Exiting Freeway	Percent of Total Volume
AM Peak Hour	10	1%	13	4%	0	n/a	2	<1%
PM Peak Hour	17	2%	2	<1%	0	n/a	2	<1%

Source: Intersection turning movement counts made in January 2008.
NB Trucks Entering Freeway: the number of trucks from Oxnard Boulevard that enter the northbound US-101 onramp.
NB Trucks Exiting Freeway: the number of trucks from northbound US-101 that exit to Oxnard Boulevard.

Trucks comprise a small percentage of the existing traffic volumes entering and exiting the US-101 freeway at Oxnard Boulevard. In many cases, trucks are less than 1% of the total volume entering or exiting the freeway.

US-101 at Vineyard Avenue

The US-101/Vineyard Avenue is also a full interchange that provides an important connection between the US-101 corridor and Downtown Oxnard. The interchange is a partial cloverleaf design. Vineyard Avenue is designated as State Route 232 north of Oxnard Boulevard. Vineyard Avenue is identified as a truck route by the City of Oxnard. The interchange is a recent design that is capable of serving truck traffic in the existing condition.

Adjacent land uses include residential and some undeveloped property to the northwest and commercial retail and office to the northeast of the interchange. Land uses on the south side of the interchange include commercial office uses to the southeast, and the Esplanade Shopping Center to the southwest. Vineyard Avenue serves as a major gateway to Downtown Oxnard along with Oxnard Boulevard.

Table 3-6 summarizes the volume of trucks observed to enter and exit the US-101 freeway at Vineyard Avenue, and identifies the percentage of trucks in comparison to the total volume of vehicles entering and exiting the freeway at this location. Trucks identified as entering the freeway are traveling from Vineyard Avenue to the northbound or southbound US-101. Trucks identified as exiting the freeway are using the off-ramps to exit the northbound and southbound US-101 to access Vineyard Avenue.

Table 3-6 Truck Volumes Entering and Exiting US-101 at Vineyard Avenue

Time Period	NB Trucks Entering Freeway	Percent of Total Volume	NB Trucks Exiting Freeway	Percent of Total Volume	SB Trucks Entering Freeway	Percent of Total Volume	SB Trucks Exiting Freeway	Percent of Total Volume
AM Peak Hour	32	10%	30	x	59	6%	31	9%
PM Peak Hour	16	4%	30	3%	29	3%	19	4%

Source: Intersection turning movement counts made in January 2008.
NB Trucks Entering Freeway: the number of trucks from Vineyard Avenue that enter the northbound US-101 onramp.
NB Trucks Exiting Freeway: the number of trucks from northbound US-101 that exit to Vineyard Avenue.

Trucks comprise a higher percentage of the existing traffic volumes entering and exiting the US-101 freeway at Vineyard Avenue when compared to Oxnard Boulevard. Truck volumes tend to be higher during the AM peak hour when compared to the PM peak hour, and a greater number of trucks are traveling southbound on the US-101 than northbound during this time period.

US-101 at Rose Avenue

The US-101/Rose Avenue interchange was recently reconfigured and enhanced to provide additional traffic capacity. The enhancement included the expansion and reconfiguration of the old interchange to increase the traffic capacity of the on and off-ramps, improve safety, and improve traffic flow. This interchange provides an important connection to the nearby Rose Shopping Center and Saint John's Regional Medical Center. The interchange is a partial cloverleaf design, providing on and off-ramps for both directions of the US-101 freeway. Rose Avenue is identified as a truck route by the City of Oxnard. The interchange is a recent design that is capable of serving truck traffic in the existing condition.

Adjacent land uses include residential to the northwest. The Oxnard Auto Center is located to the northeast of the interchange. Land uses on the south side of the interchange include the Rose Shopping Center to the southeast, additional retail and auto sales uses to the southwest, and the Saint John's Regional Medical Center further south along Rose Avenue.

Table 3-7 summarizes the volume of trucks observed to enter and exit the US-101 freeway at Rose Avenue during intersection turning movement counts made in January 2008, and identifies the percentage of trucks in comparison to the total volume of vehicles entering and exiting the freeway at this location. Trucks identified as entering the freeway are traveling from Rose Avenue to the northbound or southbound US-101. Trucks identified as exiting the freeway are using the off-ramps to exit the northbound and southbound US-101 to access Rose Avenue.

Table 3-7 Truck Volumes Entering and Exiting US-101 at Rose Avenue

Time Period	NB Trucks Entering Freeway	Percent of Total Volume	NB Trucks Exiting Freeway	Percent of Total Volume	SB Trucks Entering Freeway	Percent of Total Volume	SB Trucks Exiting Freeway	Percent of Total Volume
AM Peak Hour	38	4%	22	5%	39	7%	29	3%
PM Peak Hour	25	2%	22	3%	18	5%	43	4%

Source: Intersection turning movement counts made in January 2008.
NB Trucks Entering Freeway: the number of trucks from Rose Avenue that enter the northbound US-101 onramp.
NB Trucks Exiting Freeway: the number of trucks from northbound US-101 that exit to Rose Avenue.

Truck volumes entering and exiting the US-101 freeway at the Rose Avenue interchange are comparable to the numbers at the Vineyard Avenue interchange. However, overall traffic volumes at Rose Avenue are higher than those at Vineyard Avenue, so trucks make up a smaller percentage of the total traffic entering and exiting the freeway at this location.

US-101 at Rice Avenue

Unlike many of the other interchanges in the project study area, the US-101/Rice Avenue interchange has not been recently enhanced. The existing interchange is an old design that does not meet current Caltrans standards for interchange design. The northbound on and off-ramp is constrained by the proximity of Ventura Boulevard, which runs directly parallel to the northbound US-101 in this location. Truck access from northbound Rice Avenue to the northbound US-101 freeway is difficult due to the tight radius of the turn from Rice Avenue to Auto Center Drive and the on-ramp to the freeway. The southbound on-ramp also has a tight radius turn immediately prior to the freeway merge, limiting the speed of trucks entering the freeway and potentially resulting in a safety hazard caused by slow-moving trucks merging onto the freeway lanes. The capacity of the interchange is further constrained by the existing narrow Rice Avenue overpass, which provides for only one lane of travel in each direction. In the existing condition, the interchange is not configured to serve heavy volumes of truck traffic.

A Project Study Report (PSR) for improvements to the Rice Avenue interchange has been prepared by Caltrans. The interchange is set to receive funding under the Proposition 1B Trade Corridor Improvement Fund (TCIF), which includes about $2 billion for improvements to transportation facilities that are important goods movement corridors. Construction on the interchange improvements is scheduled to begin in 2010. The planned improvements would significantly improve the capacity, safety, and operation of the interchange.

Adjacent land uses include the Auto Center and some light industrial uses to the northwest. The northeast portion of the interchange is occupied by residential and agricultural uses. Land uses on the south side of the interchange include commercial office to the southwest and agricultural uses to the southeast.

Table 3-8 summarizes the volume of trucks observed to enter and exit the US-101 freeway at Rice Avenue during intersection turning movement counts made in January 2008, and identifies the percentage of trucks in comparison to the total volume of vehicles entering and exiting the freeway at this location. Trucks identified as entering the freeway are traveling from Rice Avenue to the northbound or southbound US-101. Trucks identified as exiting the freeway are using the off-ramps to exit the northbound and southbound US-101 to access Rice Avenue.

Table 3-8 Truck Volumes Entering and Exiting US-101 at Rice Avenue

Time Period	NB Trucks Entering Freeway	Percent of Total Volume	NB Trucks Exiting Freeway	Percent of Total Volume	SB Trucks Entering Freeway	Percent of Total Volume	SB Trucks Exiting Freeway	Percent of Total Volume
AM Peak Hour	45	10%	49	5%	52	5%	59	7%
PM Peak Hour	28	4%	35	4%	33	4%	52	11%

Source: Intersection turning movement counts made in January 2008.
NB Trucks Entering Freeway: the number of trucks from Rice Avenue that enter the northbound US-101 onramp.
NB Trucks Exiting Freeway: the number of trucks from northbound US-101 that exit to Rice Avenue.

Rice Avenue serves the highest number of trucks among the four interchanges profiled in this report. Trucks also comprise the highest percentage of the total volume of vehicles entering and exiting the US-101 freeway at the interchange. The data supports the observation that Rice Avenue is a major truck route in the study area. However, the truck volumes obtained for other interchanges at Vineyard Avenue and Rose Avenue show that these streets also play an important role in providing access for trucks to and from the US-101 freeway.

4 STUDY AREA TRUCK TRIPS (ORIGINS AND DESTINATIONS)

There are a variety of sources that generate truck trips in the study area. Prominent uses include the Port of Hueneme, NBVC, agricultural growers, automobile distributors, and the offshore oil industry. The daily operations, truck trip volumes, and travel patterns of each use are presented in this section.

4.1 PORT OF HUENEME TRUCK TRIPS

The Port of Hueneme is owned and operated by the Oxnard Harbor District. The Harbor District estimates that about $7 billion in cargo value moves through the Port of Hueneme on an annual basis. A significant portion of the cargo moving through the Port of Hueneme is comprised of automobiles and perishable agricultural goods (e.g. fruits). The Port is not a major cargo port like the Los Angeles and Long Beach Ports located in Los Angeles County. Instead, the port is focused on targeted cargo and goods markets such as automobiles and fruits which benefit from the quick access and limited delays associated with using a smaller, less congested port facility. The Port serves both fruit imports and exports. Agricultural goods imported through the Port also include liquid fertilizer. Major users of the Port include Del Monte Banana Company, Chiquita Banana Company, and Yara Fertilizer.

Several automobile manufacturers also import automobiles to the United States through the Port of Hueneme, including BMW, Volvo, Jaguar, Kia, and Hyundai. While the automobiles are off-loaded at the Port of Hueneme wharf, several of the auto manufacturers or auto distributors lease space on nearby NBVC property or at off-site locations. In most cases, automobiles are driven off the cargo ships in the Port, stored on site for a short period of time, and then driven off Port or NBVC property to off-site auto storage and distribution facilities located along Hueneme Road.

Historic Truck Volume Data

The Port of Hueneme provided data on total truck trips and vehicle trips entering the main Port gate for the period from 1998 through 2007. The information for the last five years is summarized in Table 4-1. The full information provided by the Port of Hueneme is included in the Appendix of the report.

Table 4-1 Port of Hueneme Main Gate Average Daily Entering Traffic Volumes

Month	2003		2004		2005		2006		2007	
	Trucks	Autos	Trucks	Autos	Trucks	Autos	Trucks	Autos	Trucks	Autos
January	184	*619*	124	*340*	122	*305*	163	*398*	147	*449*
February	201	*615*	121	*412*	137	*281*	148	*424*	148	*424*
March	197	*639*	131	*401*	137	*287*	148	*394*	139	*414*
April	206	*556*	106	*381*	161	*363*	157	*442*	146	*463*
May	147	*474*	110	*463*	163	*369*	131	*414*	145	*437*
June	163	*526*	127	*398*	137	*391*	118	*430*	130	*367*
July	130	*442*	148	*376*	116	*352*	140	*415*	119	*364*
August	88	*331*	83	*287*	137	*391*	143	*431*	114	*360*
September	81	*85*	76	*278*	116	*352*	117	*412*	109	*309*
October	102	*331*	110	*432*	128	*447*	127	*420*	118	*334*
November	119	*257*	149	*408*	138	*362*	132	*412*	154	*337*
December	113	*471*	136	*345*	122	*305*	145	*391*	130	*290*
Average Annual Daily ENTERING Trips	144	*445*	118	*377*	134	*350*	139	*415*	125	*379*
Average Annual Daily Truck Trips (ENTER and EXIT)	**288**		**236**		**268**		**278**		**250**	

Source: Port of Hueneme
Average weekday (Monday through Friday) volumes

The data provided by the Port of Hueneme indicates that the Port generated an annual average of 125 entering truck trips per day in the year 2007, or a total of about 250 entering and exiting trucks per day. The main gate traffic data also suggests that the average daily truck volumes at Port have remained relatively stable during the previous five years. This pattern appears to reaffirm observations about the role of the Port of Hueneme as a niche port that serves a defined market for goods, and has not experienced the increase in cargo volumes displayed at the Ports of Los Angeles and Long Beach.

Port of Hueneme Questionnaire

A questionnaire was developed in consultation with the Study TAC to obtain additional information regarding the number and type of trucks traveling to and from the Port of Hueneme. The objective of the questionnaire was to collect information directly from truck drivers regarding their origins and destinations, the routes they follow to travel between the Port facilities and the US-101 freeway, and the types of cargo that are commonly carried by the trucks. The questionnaire also provides truck trip generation rates for the Port, allowing for a comparison with the traffic data collected at nearby intersections and the main gate entry volumes provided by the Port. A sample of the survey is shown in Figure 4-1. The actual responses collected are provided in the Appendix of this report.

2008 Truck Survey

About this Survey: Your help in completing this survey is very important. Results from this survey will be used for a truck traffic study conducted by the Southern California Association of Governments to improve traffic flow and minimize congestion in vicinity of the Port of Hueneme. The more accurate the information you provide, the better we can identify measures to reduce congestion. The responses you give are kept strictly confidential and are used for research purposes only.

The purpose of this survey is to gather data for routes you choose to access destinations in Oxnard and Port Hueneme or US 101 freeway. Please follow the instructions below to complete the survey.

Truck and Route Information

Please provide the following information about the truck you are driving and routes you will take today.

1. **Trucking Company Name** *(If Applicable):* ______________________

2. **Truck Size / Gross Weight** *(Please Select One)*
   - ☐ Light - Heavy (8,500 - 14,000 lbs.)
   - ☐ Medium - Heavy (14,001 - 33,000 lbs.)
   - ☐ Heavy - Heavy (33,001 lbs. and above)
   - ☐ Oversize Load

3. **Number of Axles** *(Please Select One)*
   - ☐ Single Unit: Specify Number of Axle ______________________
   - ☐ Semi (All tractor-trailer combination): Specify Number of Axle ______________________
   - ☐ Other Specify the Type and Number of Axle: ______________________

4. **Type of Cargo you are carrying today:** ______________________

Coming From: ______________________

(Please provide Address /City/ Zip Code)

Going To: ______________________

(Please provide Address /City/ Zip Code)

Route you followed to reach Port of Hueneme if applicable. *(Please Select All Routes Used)*
- ☐ Rice Avenue
- ☐ Hueneme Road
- ☐ Rose Avenue
- ☐ Oxnard Boulevard
- ☐ Ventura Road
- ☐ Victoria Avenue
- ☐ Other Specify: ______________________

Route you plan to follow to access 101 Freeway if applicable. *(Please Select All Routes Used)*
- ☐ Hueneme Road to Rice Avenue
- ☐ Ventura Road to Channel Island Boulevard to Victoria Avenue
- ☐ Ventura Road to Gonzales Road to Oxnard Boulevard
- ☐ Other Specify: ______________________

Sponsored by: **Southern California Association of Governments (SCAG)** | **City of Port Hueneme** | **City of Oxnard** | **Port Hueneme** February 2008

Note: Spanish version of the questionnaire is located in the appendix

The surveys included questions regarding the trucking company, size of truck, type of cargo, origins and destinations, and the route that the truck driver planned to follow to travel between the Port and the US-101 freeway. The survey was provided to truck drivers in both English and Spanish versions.

The Port of Hueneme truck survey was conducted on weekdays (Monday through Friday) over a two week period from February 25, 2008 to March 7, 2008. The survey was administered by Port of Hueneme staff with the surveys distributed to truck drivers entering and exiting the Port. Surveys were conducted from 6:00 AM to 6:00 PM each day for a total of 10 days.

Port of Hueneme staff collected 1,245 responses over the 10-day survey period, which corresponds to an average of about 125 surveys per day. Historical truck volume data provided by the Port and summarized in Table 4-1 shows that the average number of trucks entering the Port at this time of year is about 140. Based on this estimated entering truck volume, the daily average of 125 written truck driver surveys per day corresponds to a response rate of about 90%.

The written truck trip distribution surveys asked a series of questions designed to obtain information from each driver regarding the following items:

- The typical size of the trucks and types of cargo carried
- The origin point of their trip to the Port of Hueneme
- Their destination after leaving the Port of Hueneme
- The streets they used to travel to the Port of Hueneme
- The streets they planned to travel after leaving the Port of Hueneme
- The data collected for each of the above items is summarized below.

Truck Size, Type, and Cargo

Truck size data was collected for each truck entering the Port of Hueneme. This information is summarized in Table 4-2.

Table 4-2 Truck Size Data and Gross Weight Data

Truck Size / Gross Weight	Percentage of Total	Trucks
Light - Heavy (8,500 - 14,000 lbs)	3.9%	47
Medium - Heavy (14,001 - 33,000 lbs)	7.4%	89
Heavy - Heavy (33,001 lbs and above)	84.3%	1,011
Oversize Load	4.4%	53
	Responses Received	1,200
	Declined to State/Not Available	45

Source: Port of Hueneme Truck Survey Data
The 1,245 responses were collected over a 10-day period.

About 84% of the trucks traveling through the Port of Hueneme gate were classified as heavy size or larger (greater than 33,001 pounds). Around 4% of the trucks reported carrying an oversize load. The remaining 12% of trucks surveyed were classified as medium or light weight.

Related to the truck size data, information was also collected regarding the number of axles for each truck. The axle data for the Port of Hueneme survey is summarized in Table 4-3. A significant majority of the trucks, 91%, were classified semi-trucks. These results are different from the data collected for the NBVC survey where the proportion of single unit and semi-trucks are similar.

Table 4-3 Truck Axle Data

Number of Axles	Percentage of Total	Trucks
Single	6.2%	76
Semi	90.7%	1,116
Other	3.2%	39
	Responses Received	1,231
	Declined to State/Not Available	14

Source: Port of Hueneme Truck Survey Data
The 1,245 responses were collected over a 10-day period.

The type of cargo carried by individual trucks leaving the Port of Hueneme gate was also collected. Types of cargo were grouped into six categories as summarized in Table 4-4.

Table 4-4 Type of Cargo

Type of Cargo	Percentage of Total	Trucks
Perishables	66.5%	674
Non Perishables	7.8%	79
Auto	2.2%	22
Equipment	9.4%	95
Fertilizer	5.9%	60
Oil	2.9%	29
Other	5.4%	55
	Responses Received	1,014
	Declined to State/Not Available	231

Source: Port of Hueneme Truck Survey Data
The 1,245 responses were collected over a 10-day period.

As expected, perishable goods form the major component of the cargo transported by truck from the Port of Hueneme. No other cargo category exceeds 10% of the total.

Truck Origins and Destinations

Truck trip origin and destination data for the Port of Hueneme has been grouped into five primary categories. Local trips are those starting or ending in Ventura County. Southern California trips include Los Angeles, San Diego and other points south of Ventura County. Northern and Central California origins and destinations include Santa Barbara, Santa Maria and points north. Locations outside of California were allocated into northern and southern categories based on a reasonable estimate of the route that the driver would follow to access the Interstate Highway System. For example, Las Vegas was categorized as a southern destination since most drivers with this destination reported accessing the US-101 freeway to travel south, reaching Las Vegas via Los Angeles. A substantial portion of the truck trips originate within the vicinity of the Port of Hueneme, whereas trip destinations are evenly spread across the local area, Southern California and Northern California. The greatest regional trip destinations are located north of Port of Hueneme inside and outside of California. Table 4-5 summarizes the truck trip origins. Reported truck trip destinations are summarized in Table 4-6.

Table 4-5 Truck Trip Origins

Trip Origin Location	Percentage of Total	Trucks
Local	48.0%	562
Southern CA	5.9%	69
Northern/Central CA	12.5%	146
South beyond CA	4.4%	52
North beyond CA	27.6%	324
Unknown	1.6%	19
	Responses Received	1,172
	Declined to State/Not Available	73

Source: Port of Hueneme Truck Survey Data
The 1,245 responses were collected over a 10-day period.

Table 4-6 Truck Trip Destinations

Trip Destination Location	Percentage of Trucks	Trucks
Local	21.2%	254
Southern CA	21.4%	257
Northern/Central CA	18.7%	224
South beyond CA	7.1%	85
North beyond CA	29.9%	358
Unknown	1.8%	21
	Answered Questions	1,199
	Skipped Questions	46

Source: Port of Hueneme Truck Survey Data
The 1,245 responses were collected over a 10-day period.

Truck Routes to and from US-101 Freeway

Truck drivers were asked to provide information on the streets that they use to travel between the Port of Hueneme and the US-101 freeway. The objective of this question is to identify the most commonly used routes by trucks traveling to and from Port of Hueneme. Truck trip distribution for inbound trips to the Port of Hueneme is summarized in Table 4-7. Truck trip distribution information for trips traveling outbound from Port of Hueneme is reported in Table 4-8.

The survey data collected from the Port of Hueneme truck drivers shows Hueneme Road and Rice Avenue as the prime routes used to reach the Port main gate and to access the US-101 freeway. The results also suggest that most trucks traveling to and from the Port utilize the truck routes designated by the Cities of Port Hueneme and Oxnard.

Table 4-7 Route Traveled to Access Port of Hueneme

Route	Percentage of Total	Trucks
Rice Avenue	54.0%	627
Hueneme Road	69.1%	802
Rose Avenue	2.5%	29
Oxnard Boulevard	2.3%	27
Ventura Road	8.5%	99
Victoria Avenue	7.1%	82
Other	6.9%	80
Responses Received		1,161
Declined to State/Not Available		84

Source: Port of Hueneme Truck Survey Data
The 1,245 responses were collected over a 10-day period.

Table 4-8 Route Traveled to Access US-101 Freeway

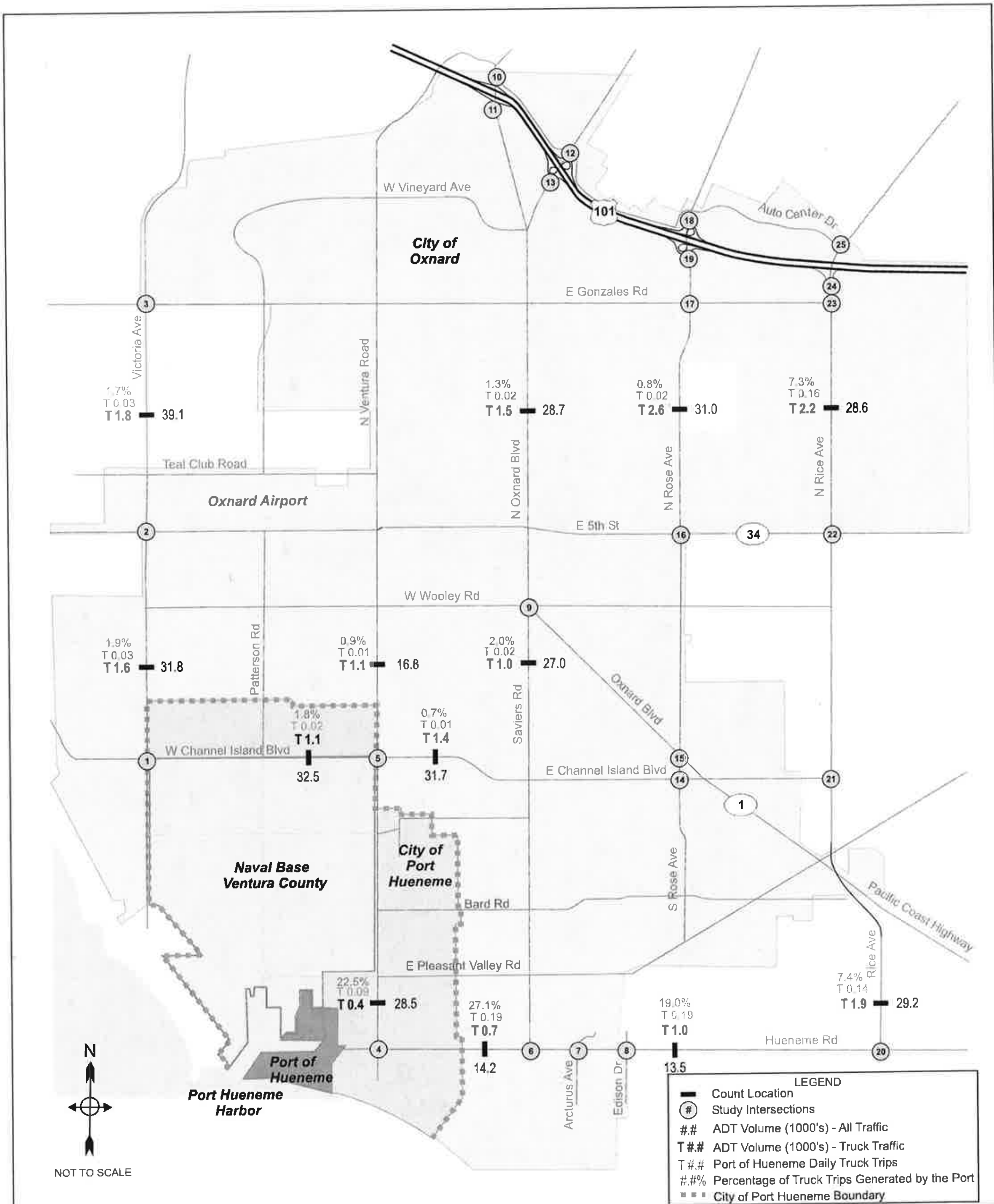
Route	Percentage of Total	Trucks
Hueneme Road to Rice Avenue	72.8%	786
Ventura Road to Channel Island Boulevard to Victoria Avenue	13.7%	148
Ventura Road to Gonzales Road to Oxnard Boulevard	3.5%	38
Other	17.8%	192
Responses Received		1,080
Declined to State/Not Available		165

Source: Port of Hueneme Truck Survey Data
The 1,245 responses were collected over a 10-day period.

Port of Hueneme Truck Trip Distribution

Based on the data collected through the Port of Hueneme Truck Questionnaire, it is estimated that the Port generates an average of 140 entering and 140 exiting trips per day in the spring season. This is consistent with the historic data provided by the Port for this time of year. The questionnaire responses related to travel routes were used to estimate the typical daily distribution of the Port generated truck trips through the study area network. The daily Port truck volumes, the total daily truck traffic count volumes, and the percentage of the total truck trips attributable to the Port of Hueneme on selected arterials are shown in Figure 4-2.

The data collected for this study suggest that the Port generates approximately 25% of the truck traffic on Hueneme Road and Ventura Road in the immediate vicinity of the Port, and this percentage diminishes rapidly with increased distance from the Port. Most of the trucks traveling to and from the Port of Hueneme utilize Hueneme Road and Rice Avenue, with a small percentage traveling along other City of Oxnard designated truck routes throughout the study area.



IBI GROUP	Cities of Port Hueneme and Oxnard Truck Traffic Study	Figure 4-2
	Estimated Daily Truck Trips Generated by the Port of Hueneme	

4.2 NAVAL BASE VENTURA COUNTY TRUCK TRIPS

Naval Base Ventura County (NBVC) encompasses Navy operations at both the Port Hueneme site and the Point Mugu site, which is locate southeast of the project study area. NBVC, Port Hueneme site, serves as a mobilization site for the Pacific Fleet as a result of good rail and truck access to the Port of Hueneme. The Port Hueneme site of NBVC is the focus of this study, as the Point Mugu site is located outside of the study area.

The Navy currently leases a portion of their Port Hueneme Base property to automobile distribution operators. In these cases, some automobiles are delivered to the Base via rail and then driven to off-site distribution facilities. Very few of the incoming vehicles are loaded onto auto carrier trucks and driven off-base on the trucks.

NBVC staff provided information regarding peak truck travel times into and out of the Base gates, peak days of the week for truck traffic and other relevant information. Based on the responses provided, it was determined that the Victoria Gate, located on the western side of NBVC along Victoria Avenue served a majority of the heavy trucks traveling to and from the base. Truck trips are typically generated both by military operations and commercial operators that are either delivering goods to military uses on NBVC or are leasing space on the base, such as Global Auto Processing Services (GAPS). Navy staff identified the peak truck trip generation time period as weekdays between 6:00 AM and 12:00 PM. Peak days for truck trips to and from NBVC are typically Monday through Thursday.

Naval Base Ventura County Questionnaire

A questionnaire was developed for the NBVC to obtain information from truck drivers regarding the number and types of trucks traveling to and from Base, as well as their origins and destinations. The NBVC survey was performed over a three day period from March 4 to March 6, 2008. Surveys were conducted between 6:00 AM and 6:00 PM each day. The surveys were conducted by a data collection firm experienced in survey administration and collection. Staff members were stationed at the NBVC Victoria Gate, and performed oral interviews with the driver as each truck entered for security inspection. Given the multiple destinations possible for trucks on the base, it was determined in consultation with Navy staff that administering the survey at the NBVC entrance would be the most effective method for conducting the survey and ensuring a return of the survey materials.

A total of 276 responses were collected for NBVC trucks over the three-day survey period, which corresponds to an average of 92 responses per day. It is estimated that the NBVC survey had about a 90% response rate. Some truck drivers refused to participate due to time conflicts and others declined on the second and third day of the survey if they were making repeat trips to the base. Repeat trips were typically made by UPS or FedEx delivery trucks. The NBVC Truck Driver Questionnaire is included as Figure 4-3.

2008 NBVC Truck Survey

About this Survey: Your help in completing this survey is very important. Results from this survey will be used for a truck traffic study conducted by the Southern California Association of Governments to improve traffic flow and minimize congestion in vicinity of the Port of Hueneme. The more accurate the information you provide, the better we can identify measures to reduce congestion. The responses you give are kept strictly confidential and are used for research purposes only.

The purpose of this survey is to gather data for routes you choose to access destinations in Oxnard and Port Hueneme or US 101 freeway. Please follow the instructions below to complete the survey.

Truck and Route Information

Please provide the following information about the truck you are driving and routes you will take today.

1. Trucking Company Name *(If Applicable):* ____________________

2. Truck Size / Gross Weight *(Please Select One)*

- ☐ Light - Heavy (8,500 - 14,000 lbs.)
- ☐ Medium - Heavy (14,001 - 33,000 lbs.)
- ☐ Heavy - Heavy (33,001 lbs. and above)
- ☐ Oversize Load

3. Number of Axles *(Please Select One)*

- ☐ Single Unit: Specify Number of Axle ____________________
- ☐ Semi (All tractor-trailer combination): Specify Number of Axle ____________________
- ☐ Other Specify the Type and Number of Axle: ____________________

4. Type of Cargo you are carrying today:

☐ Perishables ☐ Non-Perishable goods ☐ Construction ☐ Auto ☐ Other

Coming From *(What City):* ____________________

Going To *(What City, when leaving the Base):* ____________________

Route you followed to reach Port of Hueneme if applicable. *(Please Select All Routes Used)*

- ☐ Rice Avenue
- ☐ Hueneme Road
- ☐ Rose Avenue
- ☐ Oxnard Boulevard
- ☐ Ventura Road
- ☐ Victoria Avenue
- ☐ Other Specify: ____________________

Route you plan to follow to access 101 Freeway if applicable. *(Please Select All Routes Used)*

- ☐ Hueneme Road to Rice Avenue
- ☐ Ventura Road to Channel Island Boulevard to Victoria Avenue
- ☐ Ventura Road to Gonzales Road to Oxnard Boulevard
- ☐ Other Specify: ____________________

Sponsored by: **Southern California Association of Governments (SCAG)** | **City of Port Hueneme** | **City of Oxnard** | **Port Hueneme** February 2008

Note: Spanish version of the questionnaire is located in the appendix

NBVC Truck Trip Generation

An average of 92 surveys responses were collected per day over the three-day survey period. Assuming that each truck that enters the NBVC Victoria Gate also exits the base on the same day, an average of 184 truck trips are generated by NBVC out at the Victoria Gate on a daily basis. This is slightly less than the average daily trip generation rate observed for the Port of Hueneme. The time of day was noted for each NBVC survey response. Table 4-9 summarizes the time period data collected for truck entry movements to NBVC.

Table 4-9 NBVC Truck Driver Questionnaire Response Times

Hours	Number of Trucks	Percent of Total Trucks
6:00 AM - 8:00 AM	84	32%
8:01 AM - 10:00 AM	52	20%
10:01 AM - 12:00 PM	30	11%
12:01 PM - 2:00 PM	51	19%
2:01 PM - 4:00 PM	31	12%
4:01 PM - 6:00 PM	17	6%
	Total Responses	265
	Unknown Time	11

Source: NBVC Truck Survey Data
The 276 survey responses were collected over a three-day period.

Of the trucks surveyed, about half entered NBVC between the hours of 6:00 AM and 10:00 AM, with 32% traveling during the AM peak period of 6:00 AM to 8:00 AM. Only 6% of the trucks surveyed entered NBVC during the PM peak period between 4:00 PM and 6:00 PM.

NBVC Truck Trip Distribution

Most of the trucks traveling to and from the Port of Hueneme are related to goods shipped in and out of the Port. The trucks traveling to and from NBVC have a greater variety of trip purposes ranging from local package and food deliveries, construction activities, military applications, and goods movement. In the case of the NBVC survey, the information collected regarding the trucking company name and the origins and destinations of each truck become more important in order to draw conclusions about the types of trucks traveling through the NBVC Victoria Gate. The series of questions designed to obtain information from each driver included the following items:

- Trucking company name
- The typical size of the trucks and types of cargo carried
- The origin point of their trip to the Base
- Their destination after leaving the Base
- The streets they used to travel to the Base
- The streets they planned to travel after leaving the Base

The data collected for each of these items is summarized in the following section.

Truck Company, Size, Type, and Cargo

The analysis of the types of trucks traveling to and from NBVC included two components. The first element is a review of the trucking company name recorded as part of the survey. This information was then combined with responses received regarding the origin and destination of the truck to determine if the truck was a local delivery-related vehicle or truck that was engaged in more of freight-related activity such as auto transport. The trucks participating in the survey were allocated into two primary groups based on the company and origins and destinations. Local trucks are considered to be trucks making local deliveries (ex: FedEx, food and beverage companies, etc). These trips were observed to typically involve smaller trucks with origins and destinations in the Port Hueneme, Oxnard, Ventura, and Camarillo area. Regional trucks were typically larger trucks that were engaged in some form of goods movement (auto shipping, etc) or were making a larger delivery to NBVC facilities. Table 4-10 summarizes the trucking company data by local and regional sources.

Table 4-10 Trucking Company Data

Type of Trip	Percentage of Total	Responses Received
Local Delivery	35%	94
Regional/Goods-Freight Related	62%	168
Unknown	3%	8
	Reponses Received	270
	Declined to State	6

Source: NBVC Truck Survey Data
The 276 survey responses were collected over a three-day period.

The majority of trucks surveyed made regional trips, meaning that the driver reported an origin or destination outside of the Port Hueneme, Oxnard, and Ventura area.

Truck size data was also collected for each truck entering the NBVC Victoria Gate. This information is summarized in Table 4-11.

Table 4-11 Truck Size Data

Truck Size / Gross Weight	Percentage of Total	Trucks
Light (8,500 - 14,000 lbs)	20%	53
Medium (14,001 - 33,000 lbs)	39%	103
Heavy (33,001 lbs and above)	41%	107
Oversize Load	0%	0
	Responses Received	263
	Declined to State	13

Source: NBVC Truck Survey Data
The 276 survey responses were collected over a three-day period.

The majority of trucks traveling through the NBVC Victoria Gate were classified as medium size or larger (greater than 14,001 pounds). The remaining 20% of trucks surveyed were classified as light weight, and none reported carrying an oversize load. These results are different from the data collected from the Port of Hueneme survey, where the significant majority of trucks surveyed were classified as heavy (over 33,001 pounds).

Information was also collected regarding the number of axles for each truck. The axle data for the NBVC survey is summarized in Table 4-12.

Table 4-12 Number of Axles

Number of Axles	Percentage of Total	Trucks
Single Unit	43%	114
Semi (all tractor-trailer combinations)	56%	151
Other	1%	3
	Responses Received	268
	Declined to State	8

Source: NBVC Truck Survey Data
The 276 survey responses were collected over a three-day period.

Similar to the truck size data, the truck axle data suggests a greater diversity of truck types accessing NBVC when compared to the Port of Hueneme. The distribution between single unit trucks and semi-trucks is substantially closer in the NBVC survey results.

Cargo type data was also collected for each truck entering the NBVC Victoria Gate. The survey included five categories, with military cargo allocated to the "Other" category so as to avoid security issues. The cargo data from the NBVC survey is summarized in Table 4-13.

Table 4-13 Type of Cargo

Type of Cargo	Percentage of Total	Trucks
Perishables	16%	43
Non-Perishable goods	6%	17
Construction	6%	16
Auto	27%	72
Other	44%	116
	Responses Received	264
	Declined to State	12

Source: NBVC Truck Survey Data
The 276 survey responses were collected over a three-day period.

The NBVC data shows a greater percentage of trucks involved in the transport of autos when compared to the Port of Hueneme. Perishable goods, which are a major component of truck trips traveling to and from the Port of Hueneme, are a much smaller component of truck trips at NBVC. Additionally, many of the trucks classified into the perishables category were engaged in delivering items such as groceries or produce to the base retail outlets rather than shipping the goods as cargo. A substantial majority of the freight or goods related cargo accessing the NBVC Victoria Gate were observed to be auto transport related. This observation would be expected given the presence of Global Auto Processing Services (GAPS) operating on the base under a lease with the Navy.

Truck Origins and Destinations

Truck trip origin and destination data for NBVC has been grouped into five primary categories. Local trips are those starting or ending in Ventura County. Southern California trips include Los Angeles, San Diego and other points south of Ventura County. Northern and Central California origins and destinations include Santa Barbara, Santa Maria and points north. Locations outside of California were allocated into northern and southern categories based on a reasonable estimate of the route that the driver would follow to access the Interstate Highway System. For example, Las Vegas was categorized as a southern destination since most drivers with this destination reporting accessing the US-101 freeway to travel south, reaching Las Vegas via Los Angeles. Table 4-14 summarizes the truck trip origins. Reported truck trip destinations are summarized in Table 4-15.

Table 4-14 NBVC Truck Trip Origins

Coming From	Percentage of Total	Trucks
Local	42%	109
Southern California	37%	97
Northern / Central California	9%	24
South beyond California	3%	9
North beyond California	7%	17
Unknown	1%	3
	Responses Received	259
	Declined to State	17

Source: NBVC Truck Survey Data
The 276 survey responses were collected over a three-day period.

Table 4-15 Truck Trip Destinations

Going to	Percentage of Total	Trucks
Local	45%	114
Southern California	37%	94
Northern / Central California	10%	26
South beyond California	1%	3
North beyond California	2%	4
Unknown	6%	15
	Responses Received	256
	Declined to State	20

Source: NBVC Truck Survey Data
The 276 survey responses were collected over a three-day period.

When the NBVC survey data is compared to the survey data collected from the Port of Hueneme truck survey, some similarities and some differences between truck distribution patterns become apparent. Similarities include the percentage of local origins for trucks traveling to each facility. Both surveys reported between 40% and 50% of trip origins in local (Ventura County) area. In contrast, NBVC survey shows that a much higher percentage trucks traveling both to and from the base have an origin or destination in Southern California (about 37% for both directions of travel). The Port of Hueneme survey showed a much lower percentage of truck origins from Southern California (about 6%) and destinations in Southern California (about 21%). Destinations to the north, in Central California, Northern California, and beyond the State comprise a significant percentage of truck trips destinations for the Port of Hueneme (48.6%).

Truck Trip Distribution

Truck drivers were asked to provide information on the streets that they used to travel between the NBVC Victoria Gate and the US-101 freeway for their trip on the day of the survey. The objective of this question is to identify the most commonly used routes by trucks, particularly regional cargo trucks, traveling to and from NBVC. Truck drivers were asked to provide the origin of their trip to NBVC and the destination that they would be traveling to once they left NBVC. Truck trip distribution for inbound trips to NBVC is summarized in Table 4-16. Truck trip distribution information for trips traveling outbound from NBVC is reported in Table 4-17. The total responses for each route add up to more than 100 percent due to truck drivers reporting multiple routes. For example, a driver may follow a route along Hueneme Road and Rice Avenue to access US-101. In this case, both streets are reported in the survey.

Table 4-16 Route Traveled to Access NBVC

Route	Percentage of Total	Trucks
Rice Avenue	5%	12
Hueneme Road	5%	13
Rose Avenue	2%	5
Oxnard Boulevard	1%	2
Ventura Road	4%	11
Victoria Avenue	64%	167
Other	32%	82
	Responses Received	259
	Declined to State	17

Source: NBVC Truck Survey Data
The 276 survey responses were collected over a three-day period.

Table 4-17 Route Traveled to Access US-101 Freeway

Route	Percentage of Total	Trucks
Hueneme Road to Rice Avenue	5%	14
Victoria Avenue	54%	139
Ventura Road to Gonzales Road to Oxnard Boulevard	3%	7
Other	40%	103

Route	Percentage of Total	Trucks
Responses Received		257
Declined to State		19

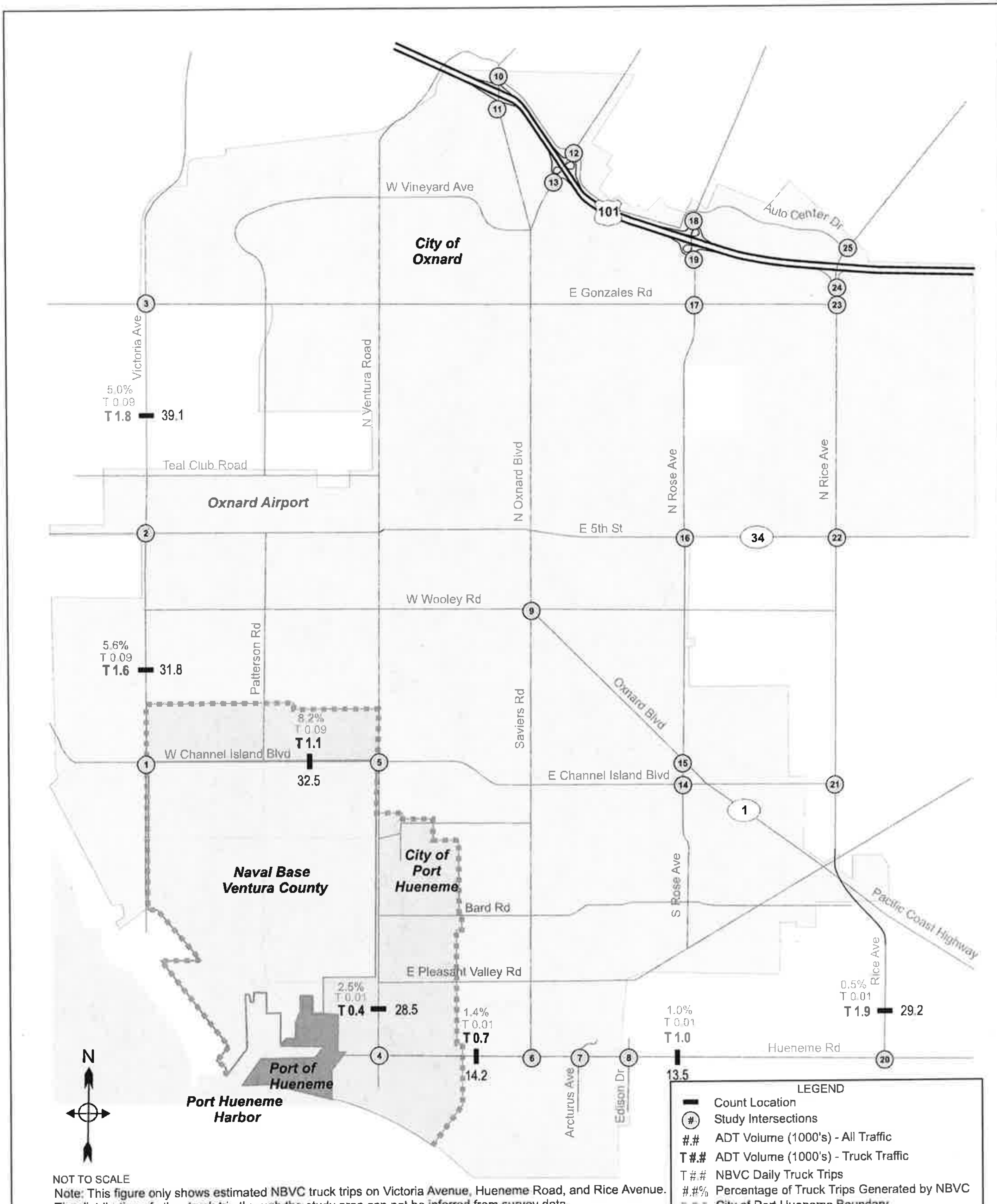
Source: NBVC Truck Survey Data
The 276 survey responses were collected over a three-day period.

The survey data collected from NBVC shows a much higher rate of use of Victoria Avenue to access the US-101 freeway compared to trucks traveling to and from the Port of Hueneme. The high percentage of routes classified as "Other" reflects the higher percentage of local trucks accessing the NBVC Victoria Gate compared to the Port of Hueneme. Many of the local truck trips, remaining in the Port Hueneme, Oxnard, and Ventura area did not report a specific route on their survey, so it is not possible to allocate these local trips to a specific corridor. However, the regional truck trips do show strong usage of the Victoria Avenue corridor for traveling between NBVC and the US-101 freeway.

NBVC Truck Trip Distribution

Based on the data collected through the NBVC Truck Questionnaire, it is estimated that the Base generates an average of 92 entering and 92 exiting trips per day in the spring season. The questionnaire responses related to travel routes were used to estimate the typical daily distribution of the NBVC generated truck trips through the study area network. The daily Base truck volumes, the total daily truck traffic count volumes, and the percentage of the total truck trips attributable to the Base on selected arterials are shown in Figure 4-4.

The data collected for this study suggest that most of the trucks traveling to and from the Base utilize Victoria Avenue, and the Base generates approximately 5% of the truck traffic volume on Victoria Avenue. About 40% of the truck traffic generated by NBVC has origins and destinations in the local area, and may utilize a variety of different truck routes. Less than 1% of the truck volume on Hueneme Road and Rice Road is estimated to be generated by the Base.



NOT TO SCALE

Note: This figure only shows estimated NBVC truck trips on Victoria Avenue, Hueneme Road, and Rice Avenue. The distribution of other truck trip through the study area can not be inferred from survey data.

IBI GROUP	Cities of Port Hueneme and Oxnard Truck Traffic Study	Figure 4-4
	Estimated Daily Truck Trips Generated by Naval Base Ventura County on Selected Routes	

4.3 TELEPHONE SURVEY RESULTS

Private businesses also generate daily truck trips throughout the Cities of Port Hueneme and Oxnard. Major generators include agricultural growers and distributors, automobile distributors, off-shore oil supply companies, and other uses. A small sample of private businesses were surveyed by telephone for this study to identify the number of truck trips generated by the businesses, the distribution of the trips on the surrounding street network and the peak time periods, days, and months of truck activity for each business.

The private business survey is not intended to be an exhaustive review of every business that generates truck trips. Instead, this information is intended to supplement the daily and peak hour traffic and truck volumes presented earlier in this report. The survey results provide a snapshot of selected land uses that generate truck trips and seek to provide the reader with an understanding of diversity of truck trip generation rates, the distribution of trucks on major streets in the study area, and the peak time periods when trucks would travel through the study area.

Port of Hueneme staff provided contact information for 16 different private companies that maintain operations in or near the study area. These companies either typically do business with the Port, generating truck trips between their base of operation and the Port, or operate businesses (agriculture, sod farms, automobile distribution) that generate a substantial number of truck trips on a daily basis. Several of the businesses generate truck trips that originate at the Port of Hueneme, for example Del Monte Foods picks up shipments of bananas at the Port and then transports them throughout the Western United States.

Automobile transport operations can provide one example of how the supply chain works and where truck trips associated with this activity enter the study area roadway network. Pacific Vehicle Processors is a major auto transport company operating in the study area. This business stores automobiles that are shipped into the Port of Hueneme at off-site private facilities located along Hueneme Road. In this case, automobiles are off-loaded from ships and then driven to the private off-site storage lot located along Hueneme Road. The trip from the Port to the private storage lot is an auto trip, not a truck trip, and is therefore not considered in this analysis. At the off-site storage facility, automobiles are then loaded onto trucks and transported to various destinations in the Western United States. The truck trip originates from the off-site facility rather than the Port of Hueneme.

A second example of an off-site business with operations that are interrelated to the Port of Hueneme is Channel Island Logistics. This business operates a produce storage and distribution operation located in study area along Hueneme Road. The operations conducted by Channel Islands Logistics generate truck trips that are of interest to this study effort. In this case, the truck trips generated by this business have two components. The first is a trip between the off-site location and the Port of Hueneme (as well as the return trip), where the trucks are picking up a load of produce cargo directly from the Port and transporting to the off-site storage/distribution facility. This trip is accounted for in the Port of Hueneme gate and survey data. The second component is the truck trip generated from the off-site facility to a regional destination outside of the study area. This trip would involve a potential greater impact to the study area roadway network since it would involve traveling a greater distance and involve accessing the US-101 freeway.

Making a distinction between the two types of private business truck trips identified above and those trips generated by the Port of Hueneme and NBVC is important in order to have an understanding of the various origin points that truck trips have in the study area. In this case, the regional truck trips generated by businesses like Pacific Vehicle Processors and Channel Island Logistics traveling to and from US-101 do not have origins on Port of Hueneme or NBVC property, but the activities maintained by the businesses that create the truck trips are directly related to cargo that enters the study area through the Port.

The third type of private business operating in the study area is an operation that generates a substantial number of truck trips on a daily basis, but is not related to the Port of Hueneme/NBVC activities. An example of this type of business is Southland Sod Farms, which maintains a large sod farm located west of the Hueneme Road and Rice Avenue intersection. Truck trips generated by this business utilize the same truck routes and roadways as truck trips generated by the Port of Hueneme and NBVC, but these truck trips have no relationship to the port area. There are numerous other private businesses in the study area that would also fall into this third category, from small generators such as grocery stores and big-box home improvement stores to other industrial land uses such as the distribution centers located along Rice Road in Oxnard.

Representatives from each of the 16 companies were contacted by IBI Group via telephone, and asked a series of survey questions designed to obtain information regarding the average number of daily truck trips generated by the business, the distribution of the truck trips, major destinations, and the peak hours, days, and months for truck operations. Fourteen of the contacted companies agreed to participate in the survey and provided answers to the survey questions. The companies that participated in the survey are:

1. AG RX
2. BMW North America
3. Channel Islands Logistics
4. Chiquita Fresh
5. Del Monte Fresh Produce
6. General Petroleum
7. Hoskins Brothers Trucking
8. OST Trucks and Cranes
9. Pacific Fruits-Bonita
10. Southland SOD Farms
11. T&T Truck and Crane Service
12. Terminal Freezers
13. Waggoners Trucking
14. Yara North America

The following companies were contacted via telephone about the survey, but declined to participate:

1. Pacific Vehicle Processors
2. Sysco Foods of Ventura

Table 4-18 summarizes the information collected from each of the contacted businesses. Figure 4-5 shows the approximate location of each company contacted for this survey. A sample of the survey is shown in Figure 4-6. The routes that each company reported to be used by their trucks are identified in Figures 4-7 through 4-20.

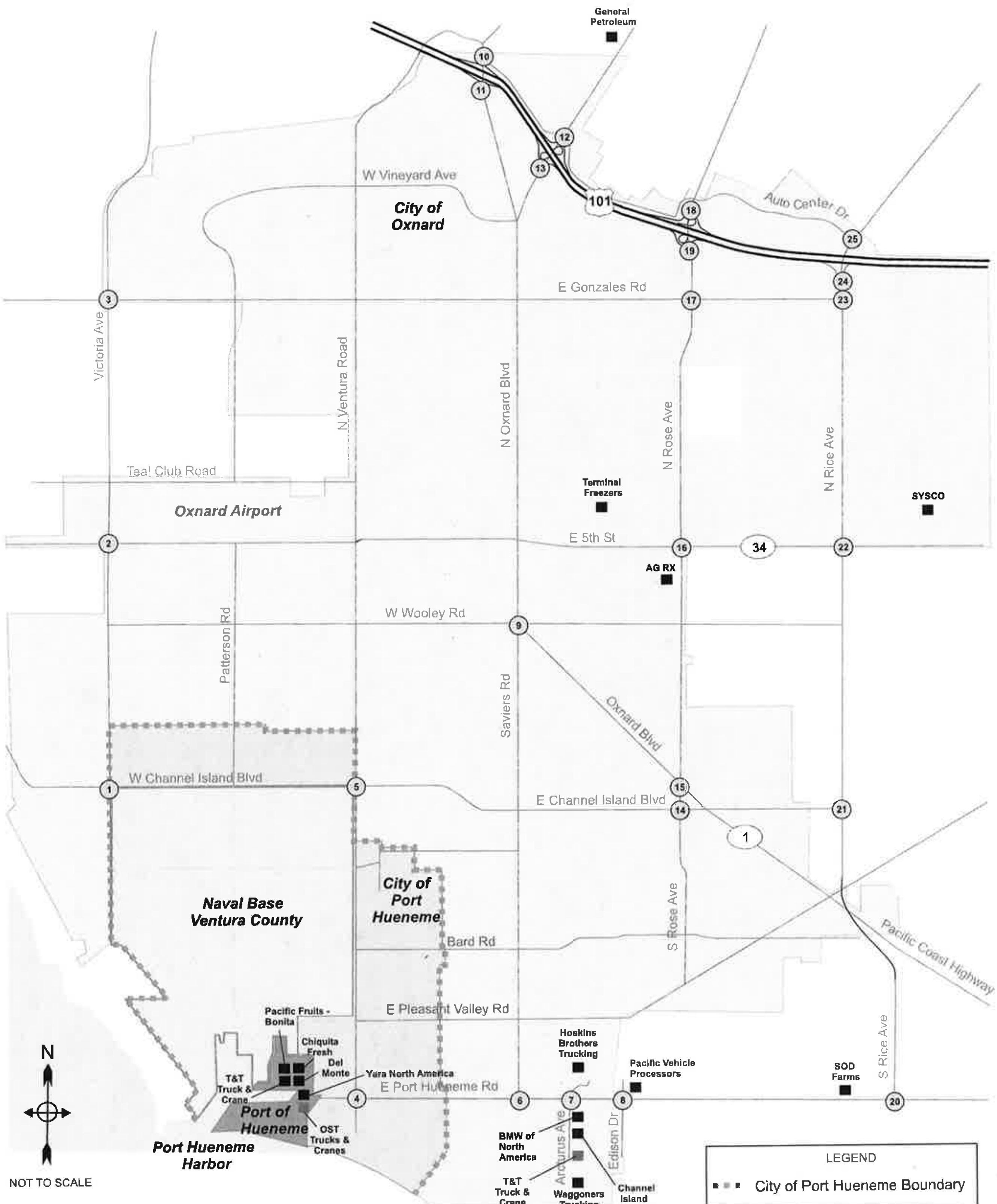
While a variety of routes are used by companies for travel to and from regional origins and destinations, the most common route used by drivers to access the US-101 is Hueneme Road to Rice Avenue. Companies also reported various other routes taken by drivers to access the 101 freeway, including Rose Avenue, Ventura Road, Las Posas Road and Pleasant Valley Road. About half of the companies reported that their drivers sometimes stop when getting on or off the US-101 freeway at a gas station, small shopping center or restaurant close to the freeway. On average, companies reported about 50 truck trips per day as a high estimate. The number of truck trips per day reported by each company ranged from 12 trips to a maximum of 100 trips.

Table 4-18. Telephone Survey Data Summary

Business Contacted	Type of Cargo	Origin/ Destination	Typical Route	Intermediate Stops	Peak Seasonal Activity	Peak Weekly Activity	Peak Activity Time Period	Typical Truck Size	Maximum Number Daily Truck Trips
Southland SOD Farms	Sod, Fertilizer	Greater LA area	North-Rice Avenue South- Hueneme Road to Lewis	Doughnut shop along Pleasant Valley right before freeway	Long peak May-Sept	Saturday morning Friday	2 am -5 am	18 wheeler 80,000 lbs	80 trucks 160 total trips
AG RX	Agricultural	Northern Santa Barbara County	Rose Avenue	Don't know	May-October but Mostly stable	No—Mon-Fri	Before 3:00pm	8-10 tons, 6 tons	50-60 max
Waggoners Trucking	BMW automobiles	Nine Western states	Rice Avenue	No stops	Sept-Dec	No	Afternoon	8 car hauler	50 trucks
Hoskins Brothers Trucking	Mostly Paper	North-Salinas Ventura South- Los Angeles	North and South- Hueneme to Rice, One truck takes Ventura	Las Posas by US-101	None	5 days/week Sat/Sun not busy	4am-7am and early afternoon around 3:00pm	3 axel-80,000 lbs.	12-13 a day
Channel Islands Logistics	Fresh Fruit	Western United States	50% take Rice 50% take Las Posas	Mac Valley Oil (Sturgis/Del Norte)	Nov/Dec-May	Mon, Tues, Fri	Mid Morning (9-11) Evening (3-5:30)	48-53 feet	70-80 max
Pacific Fruit Bonita	Agricultural	Western United States	Hueneme Road/Rice Avenue	Don't know	None	No	8-4, 7-8am loading and right after lunch	42-56 feet	25-30 trucks

Business Contacted	Type of Cargo	Origin/ Destination	Typical Route	Intermediate Stops	Peak Seasonal Activity	Peak Weekly Activity	Peak Activity Time Period	Typical Truck Size	Maximum Number Daily Truck Trips
Del Monte	Agricultural	Pacific Northwest	Hueneme Road to Rice Avenue	Direct	Dec-May	Mon, Tues, Fri	8am - 4:30pm	45-53 feet trailers	70-80 day, 400 week
Yara North America	Liquid Fertilizer	Throughout California	Hueneme Road to Rice Avenue	Hueneme Road, Mexican Rest. 2 miles east of Harbor	Spring, March-May/June	Mon-Fri, 24/7	No Peak Period 24/7, 6am-5pm	Tanker, 40 feet, Single/double Tanker	Slow time-15/day Busy time-70-100 Per day
T & T Truck & Crane Service	N/A	Multiple destinations	Ventura to Victoria or Hueneme to Rice	Shopping Center at 5th/Victoria	None	No, 7 days	No, 24/7	Class 8 semis - 5 axel	20 - 25
Chiquita Fresh	Agricultural - bananas	Multiple destinations	Hueneme Road to Rice Avenue	Don't know	Fall season	Monday & Friday	8 am - 5pm	18 wheeler semis	50 trucks
BMW North America	Automobiles	Western United States	Most trucks – Hueneme Road to Rice Avenue	Gas station on Rice near US-101	All months except September	Depends on arrival of shipments	24 hours – Local cargo loads during day and regional cargo at night.	53 foot trailers	38
Terminal Freezers	Frozen fruits and vegetables	Multiple Destinations	Rose to 101 (5th to Del Norte	MacValley Oil @ Sturgis/Del Norte	May to June (8 weeks)	Friday	6 am to 5 pm	45 foot refrigerated trailers	20

Business Contacted	Type of Cargo	Origin/ Destination	Typical Route	Intermediate Stops	Peak Seasonal Activity	Peak Weekly Activity	Peak Activity Time Period	Typical Truck Size	Maximum Number Daily Truck Trips
General Petroleum	Fuel, gasoline, diesel, chemica	Central and Southern California	Vineyard to US-101 or SR-126	Don't usually stop, only sometimes at donut shop near Vineyard/101	Summer	Middle of the week	5 am to 5 pm	3 axel fuel trucks, flat bed trucks	8 trucks – 16 trips maximum
OST Trucks & Cranes	Various	Multiple Destinations	Hueneme Road to Rice Avenue	No stops	None	Mon, Tues, Wed	8 am to 5 pm	50 foot trailers	50 to 60 maximum



Note: Facility locations are approximate and sites are not drawn to scale.

IBI GROUP	Cities of Port Hueneme and Oxnard Truck Traffic Study	Figure 4-5
	Locations of Private Companies that Participated in Telephone Survey	

Business: ____________________

Contact Person: ____________________

Phone Number: ____________________

Introduction: We are working with the City of Hueneme and the Port of Hueneme on a Truck Traffic Study. As part of the study we are conducting research on how trucks travel through the area surrounding Port of Hueneme. Port of Hueneme has provided your contact. The information you provide will be used only for the purpose of this study.

1. Type of Cargo handled through your facility?

2. Where are Origin / Destination located – local or regional?

3. Typical routes their drivers follow to:
   - To access 101 freeway – for outgoing trucks?
   - To reach their facility – for incoming trucks?

4. Do truck drivers like to stop for refreshments getting on/ off from the 101 freeway? Where?

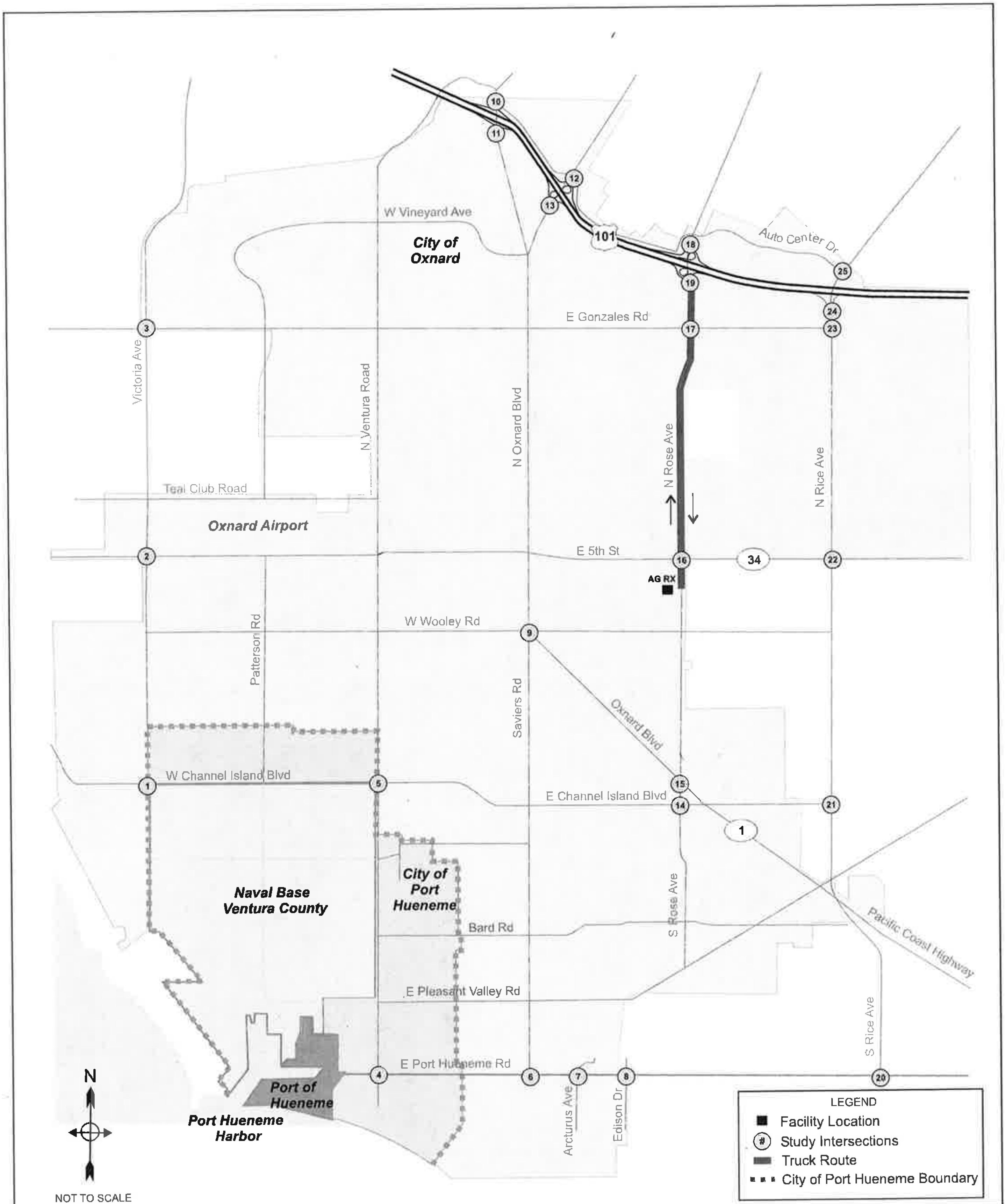
5. Seasonality? Peak activity period during the year?

6. Peak days of activities during the week?

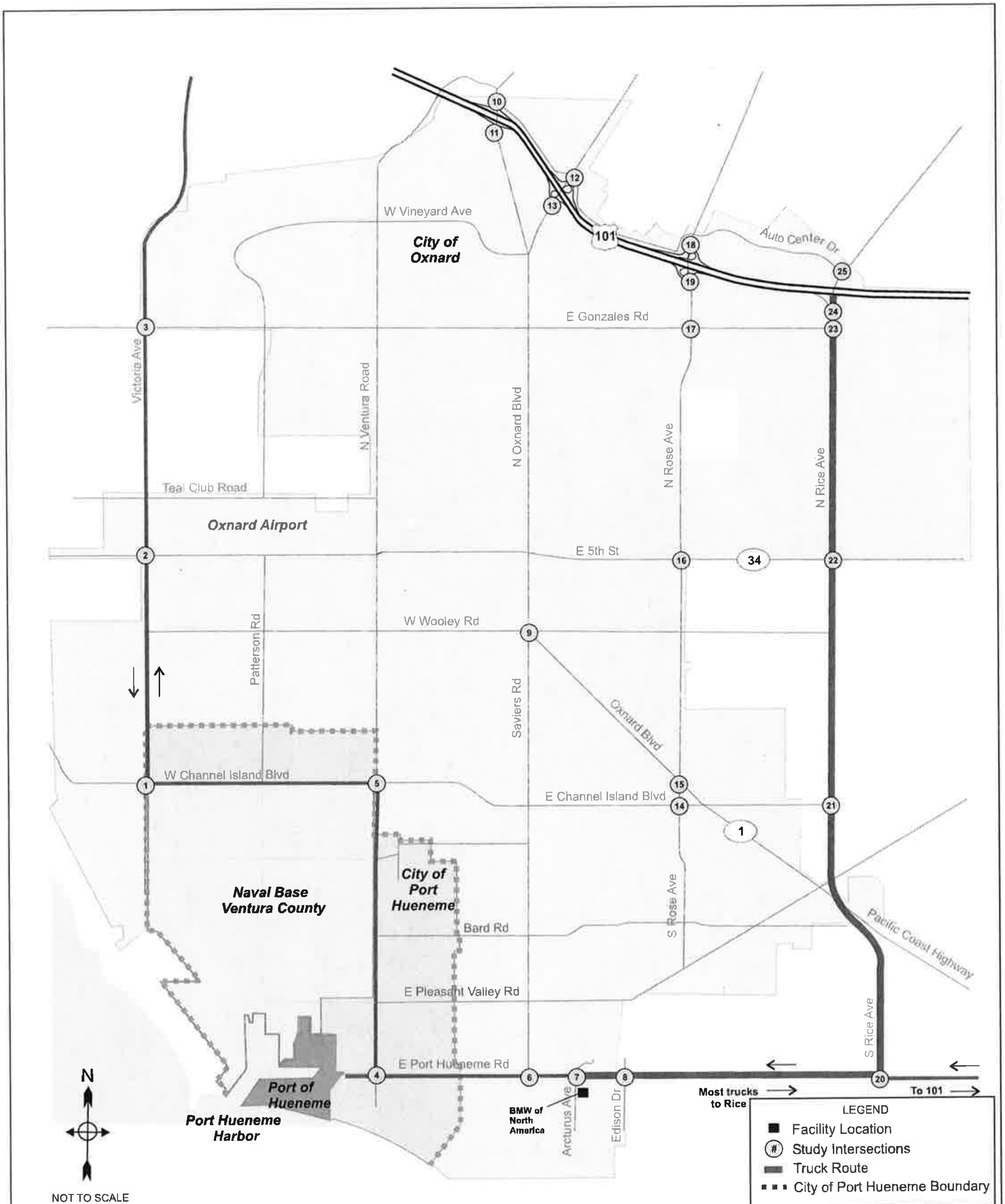
7. Peak time periods of activities during the day?

8. Typical Truck Size?

9. Average / maximum number of truck trips in a day?



IBI GROUP	Cities of Port Hueneme and Oxnard Truck Traffic Study	Figure 4-7
	Truck Routes - AG RX	

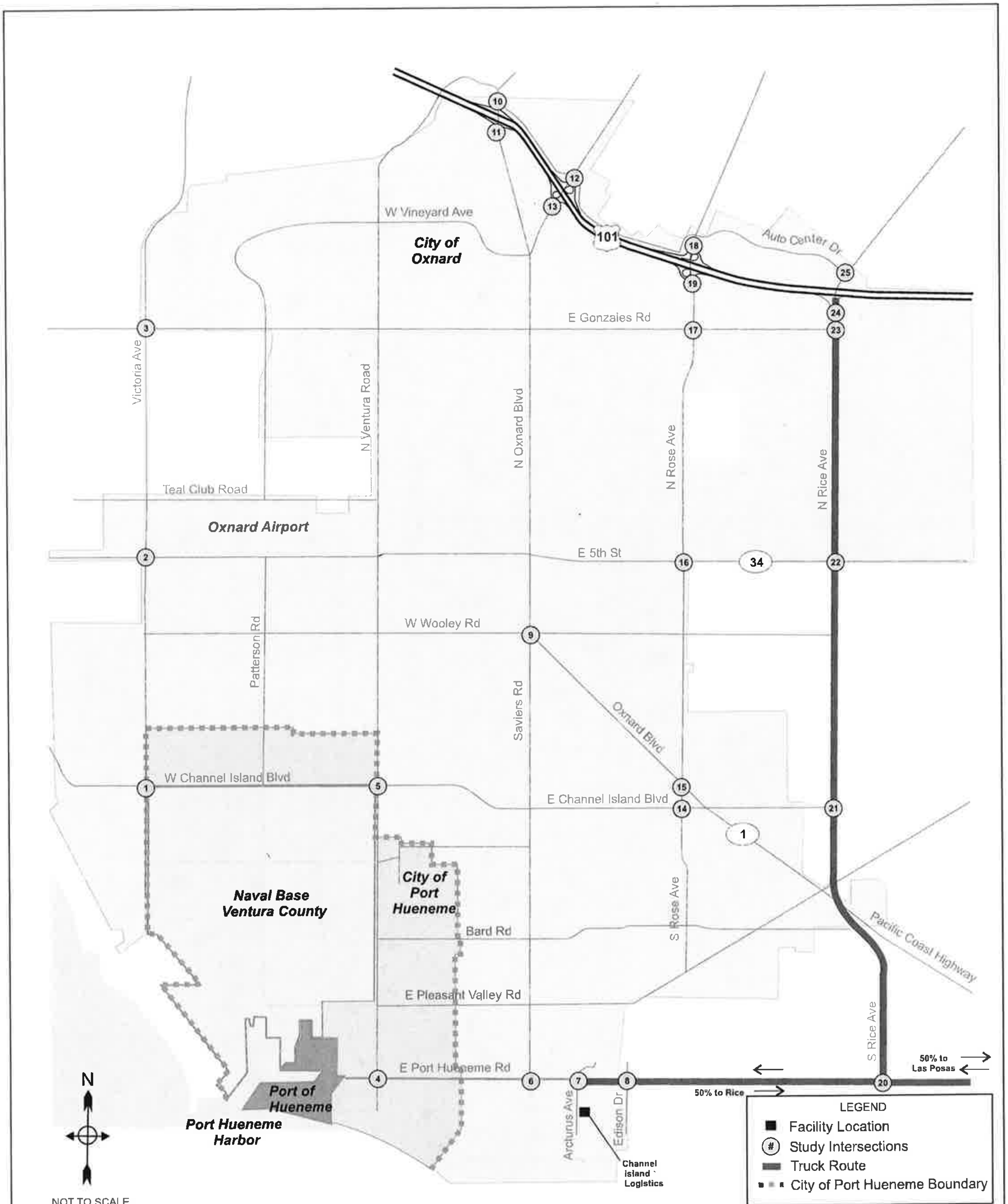


IBI GROUP

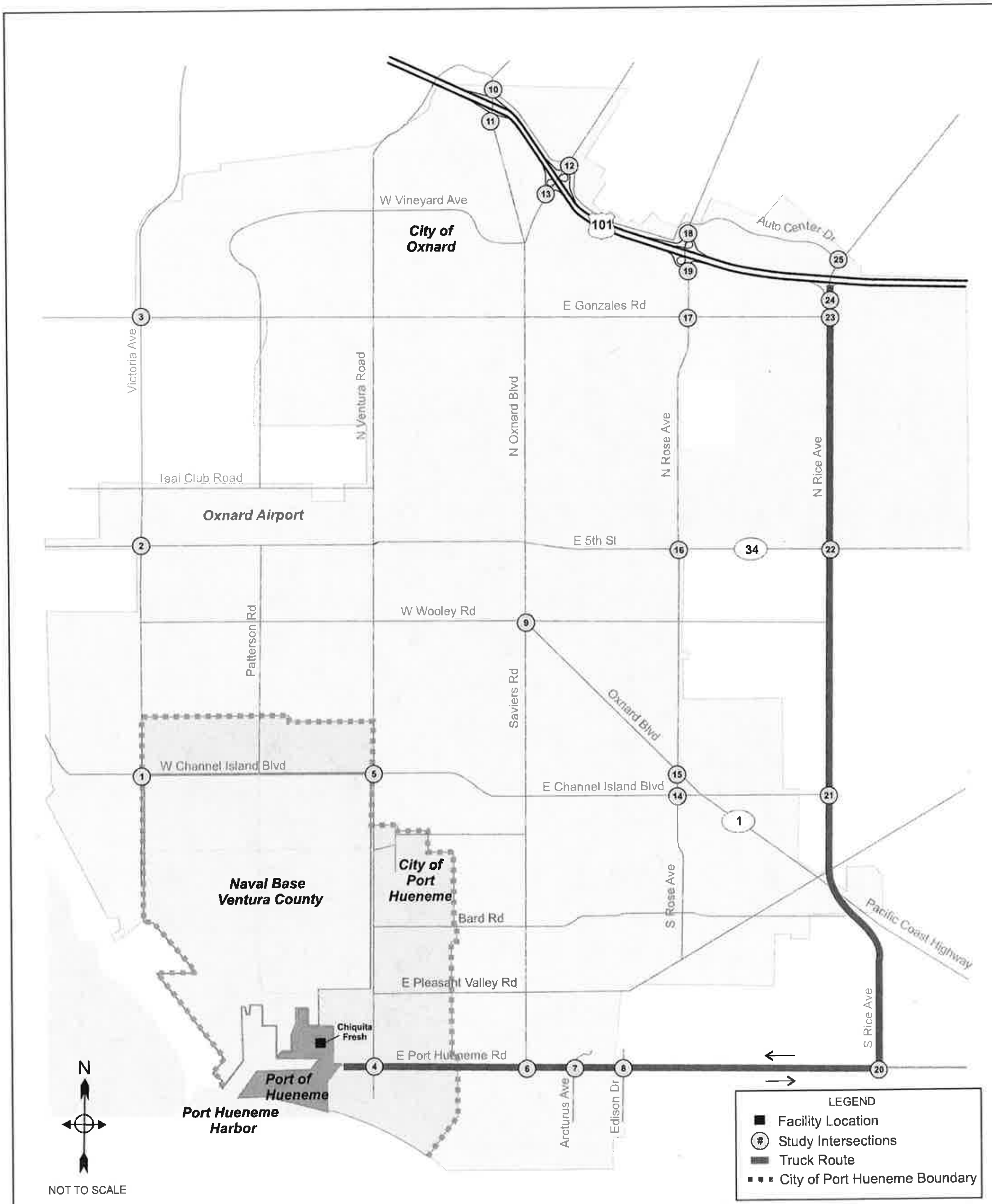
Cities of Port Hueneme and Oxnard Truck Traffic Study

Truck Routes - BMW North America

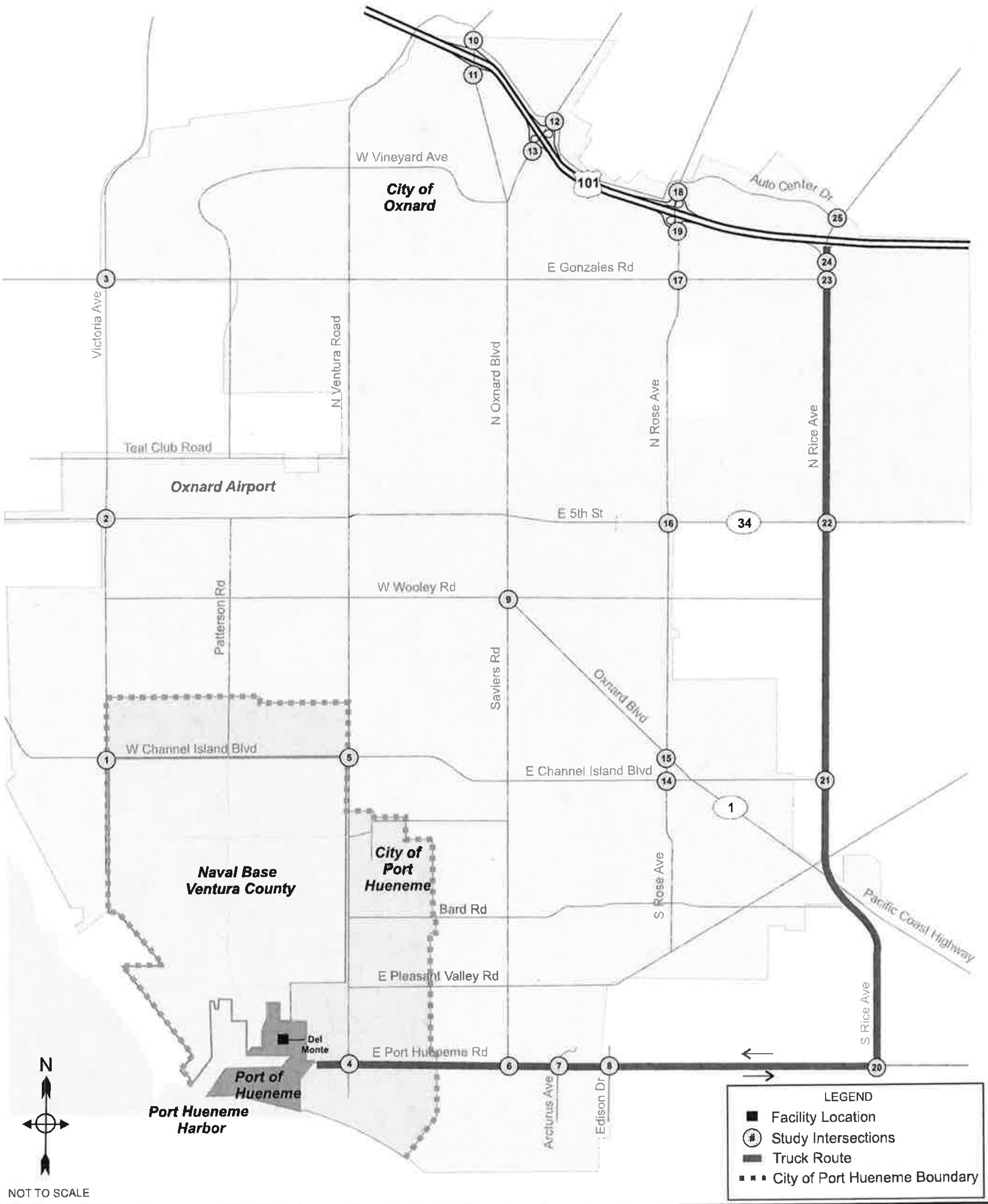
Figure 4-8



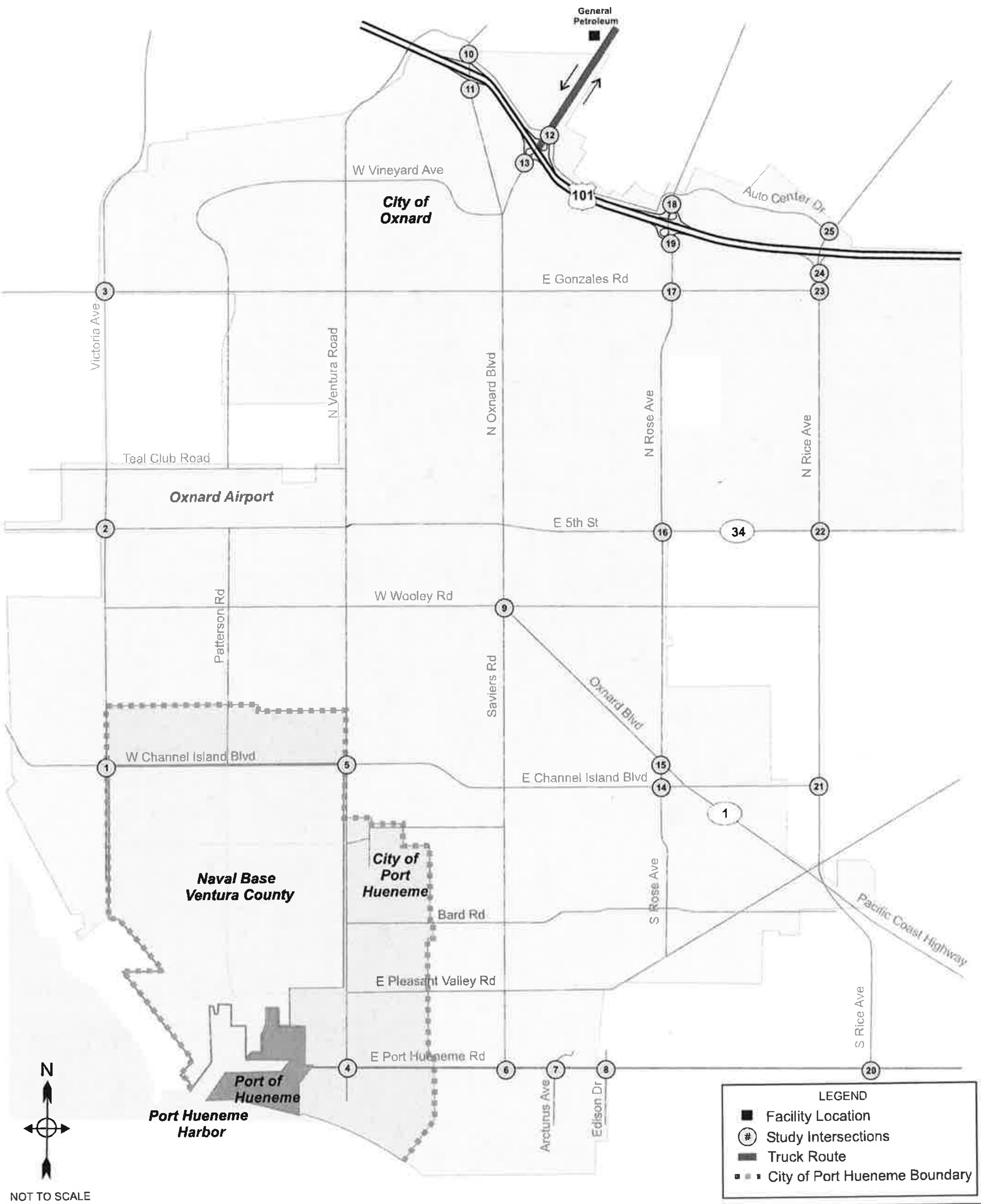
IBI GROUP	Cities of Port Hueneme and Oxnard Truck Traffic Study	Figure 4-9
	Truck Routes - Channel Islands Logistics	



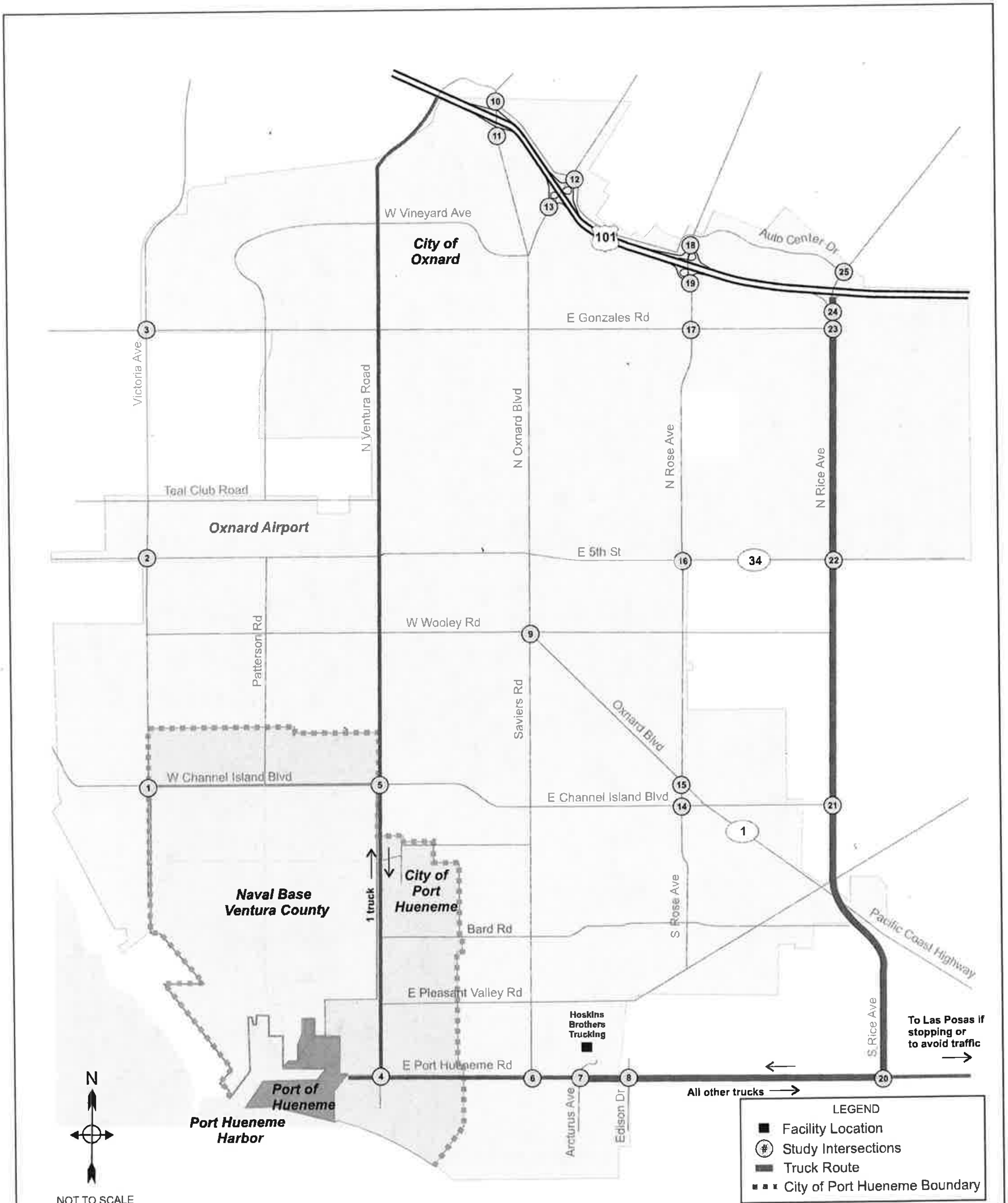
IBI GROUP	Cities of Port Hueneme and Oxnard Truck Traffic Study	Figure 4-10
	Truck Routes - Chiquita Fresh	



IBI GROUP	Cities of Port Hueneme and Oxnard Truck Traffic Study	Figure 4-11
	Truck Routes - Del Monte Fresh Produce	



IBI GROUP	Cities of Port Hueneme and Oxnard Truck Traffic Study	Figure 4-12
	Truck Routes - General Petroleum	

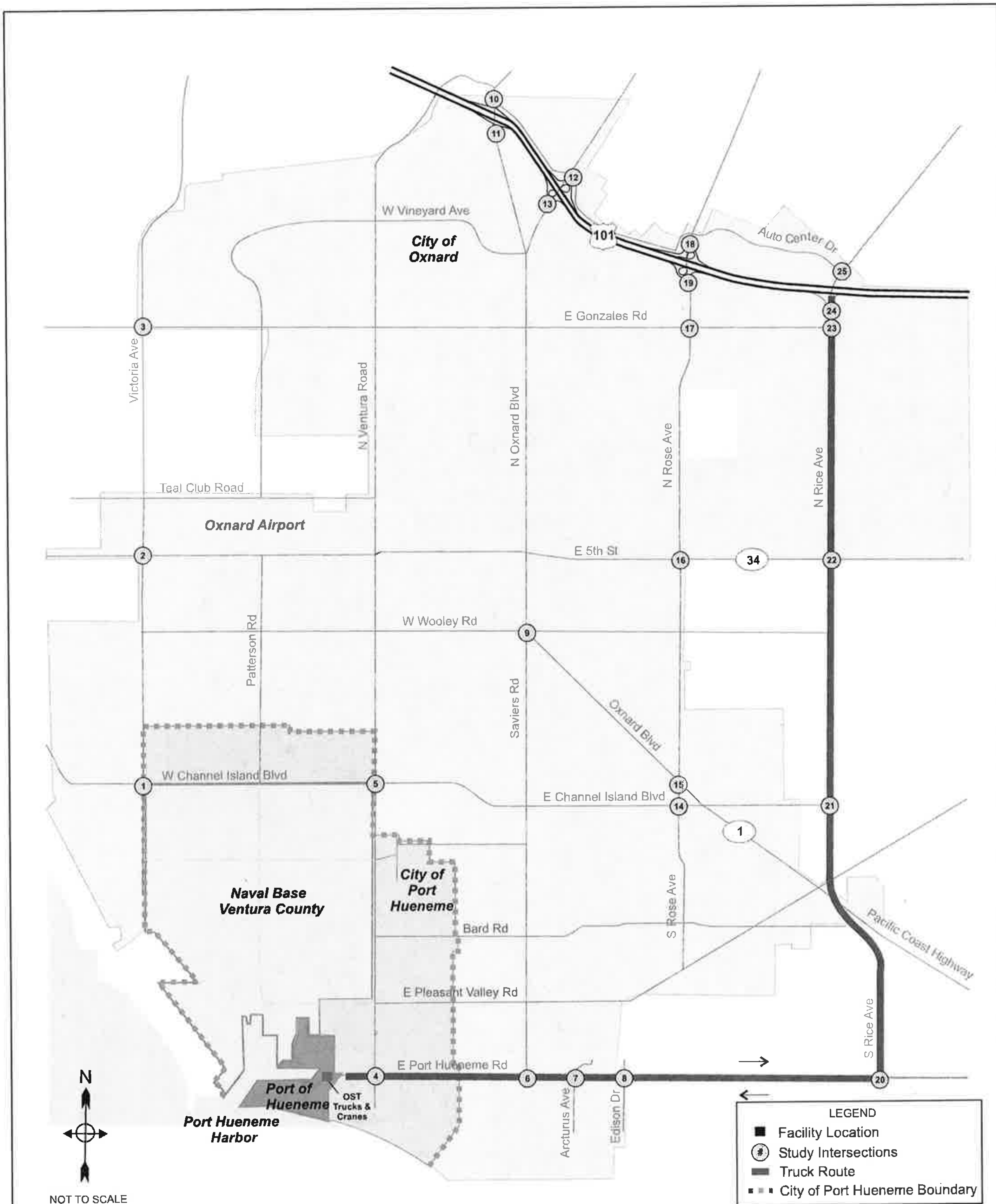


IBI GROUP

Cities of Port Hueneme and Oxnard Truck Traffic Study

Truck Routes - Hoskins Brothers Trucking

Figure 4-13

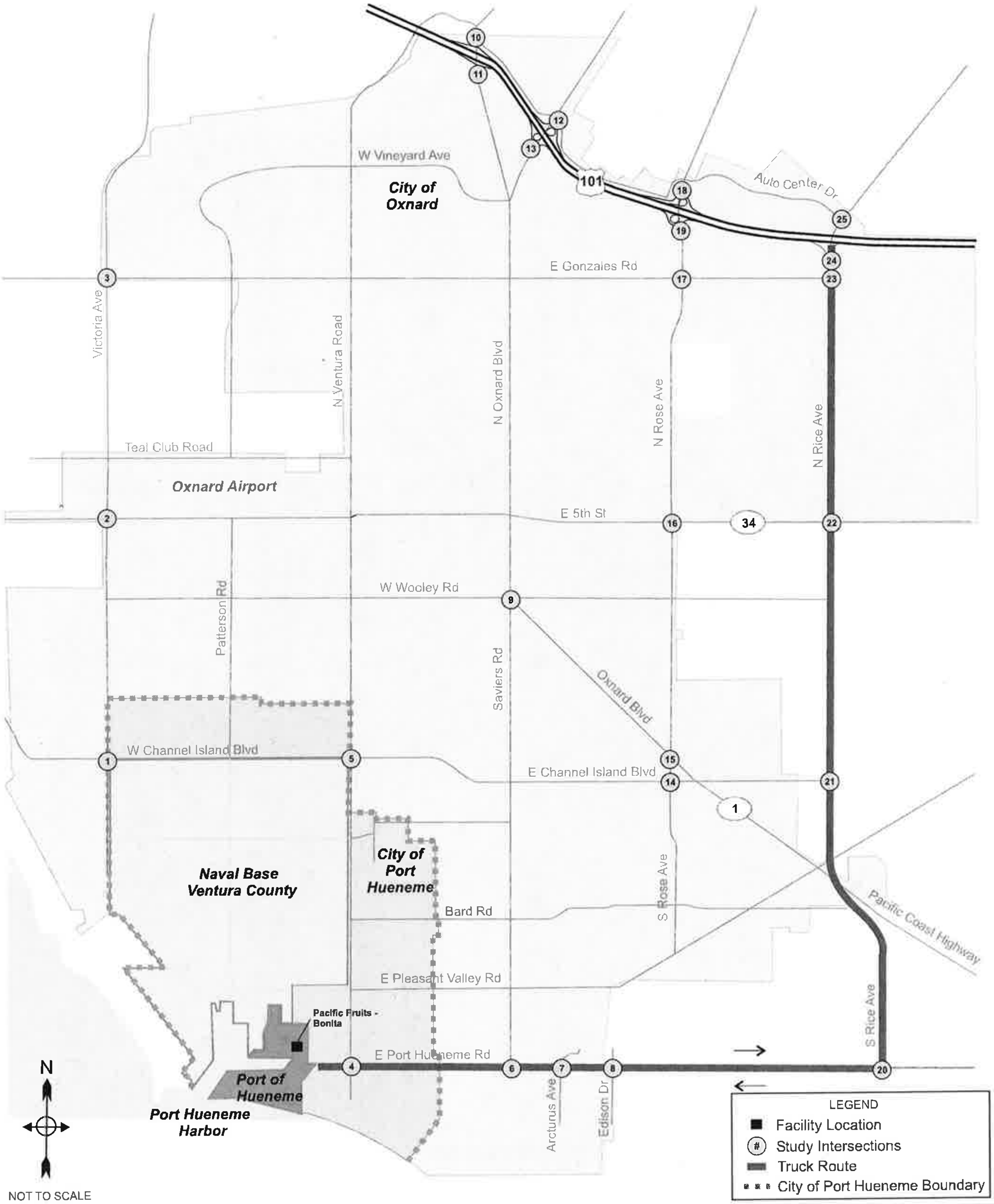


IBI GROUP

Cities of Port Hueneme and Oxnard Truck Traffic Study

Truck Routes - OST Trucks and Cranes

Figure 4-14

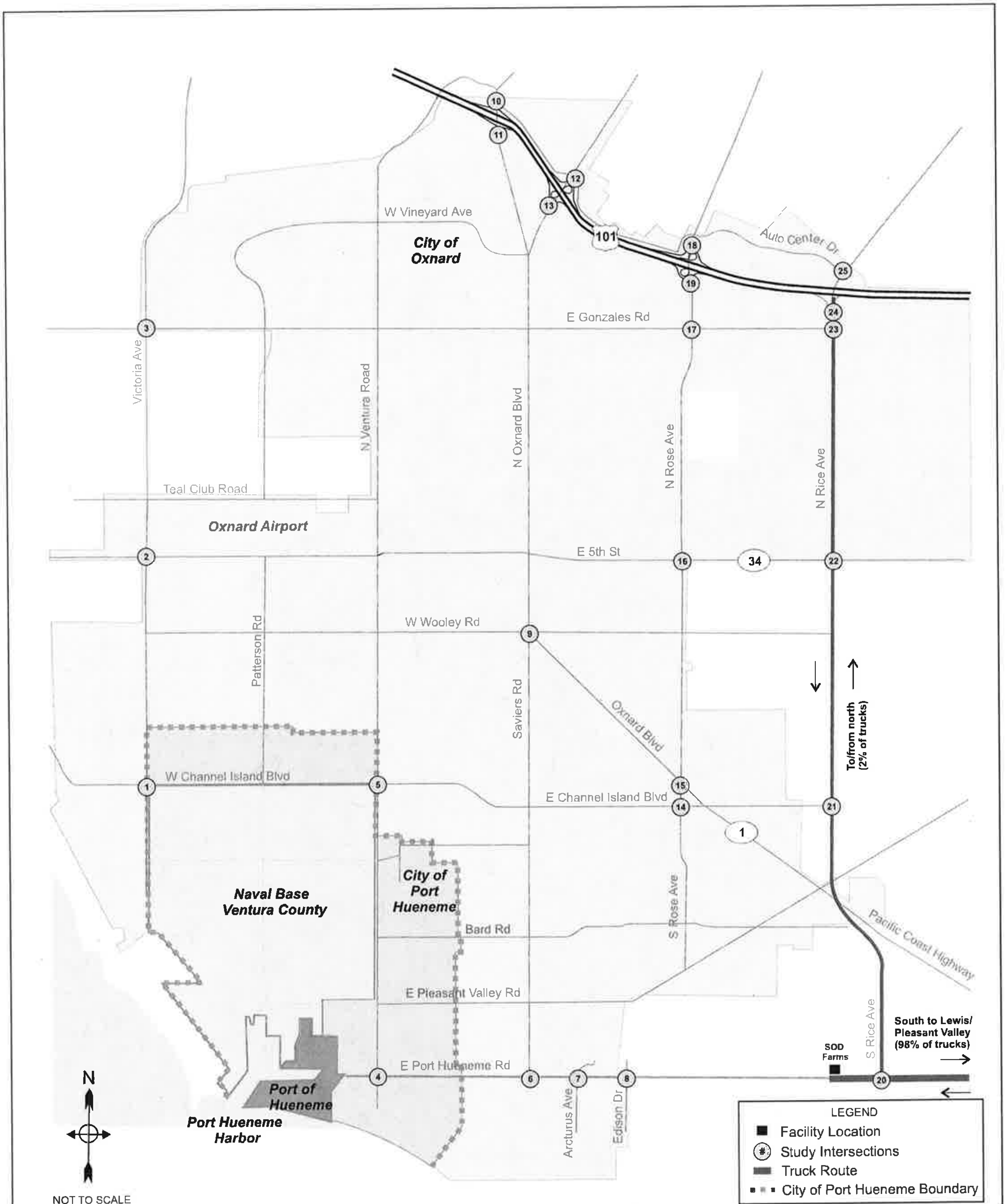


IBI GROUP

Cities of Port Hueneme and Oxnard Truck Traffic Study

Truck Routes - Pacific Fruits Bonita

Figure 4-15

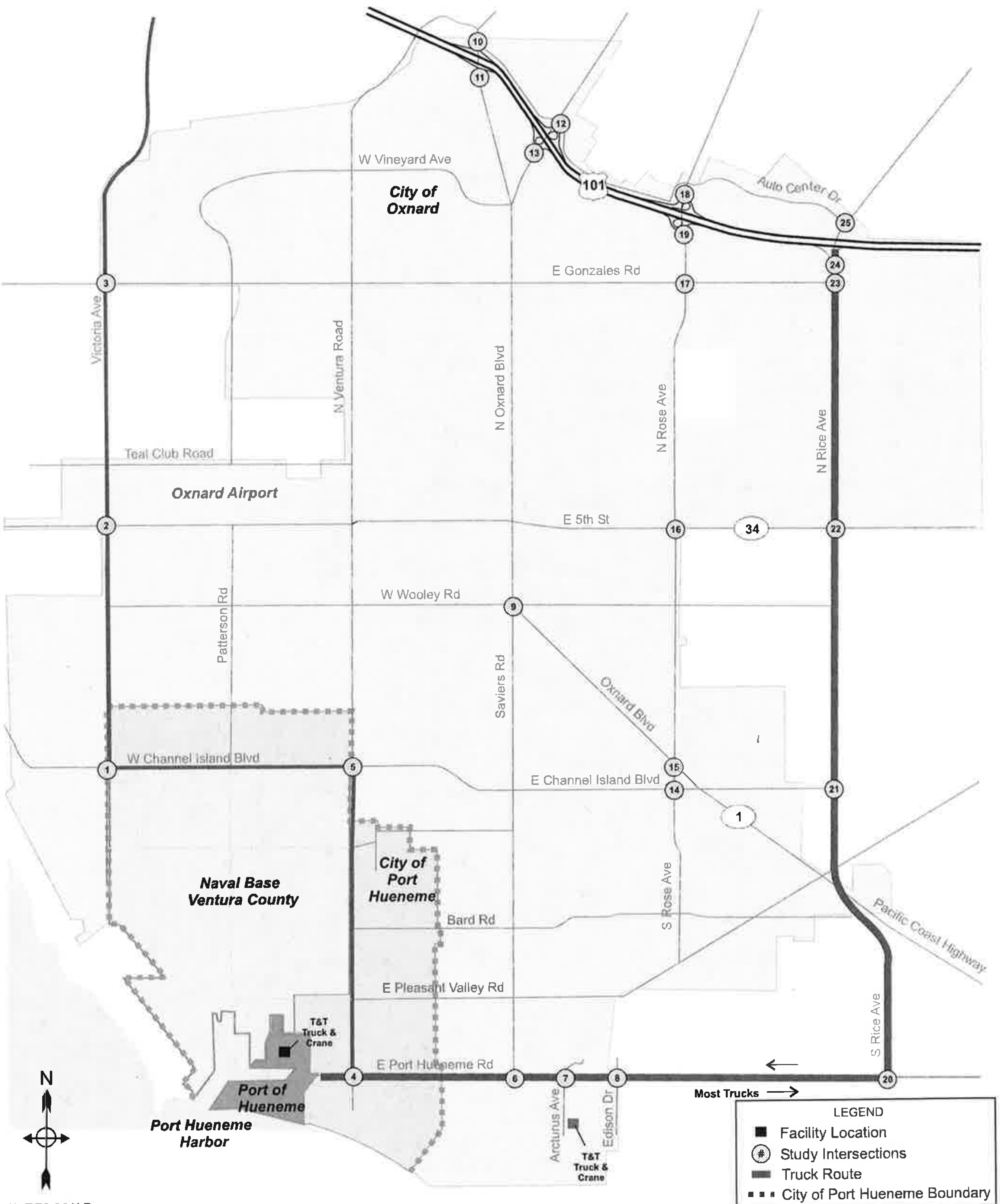


IBI GROUP

Cities of Port Hueneme and Oxnard Truck Traffic Study

Truck Routes - Southland SOD Farms

Figure 4-16

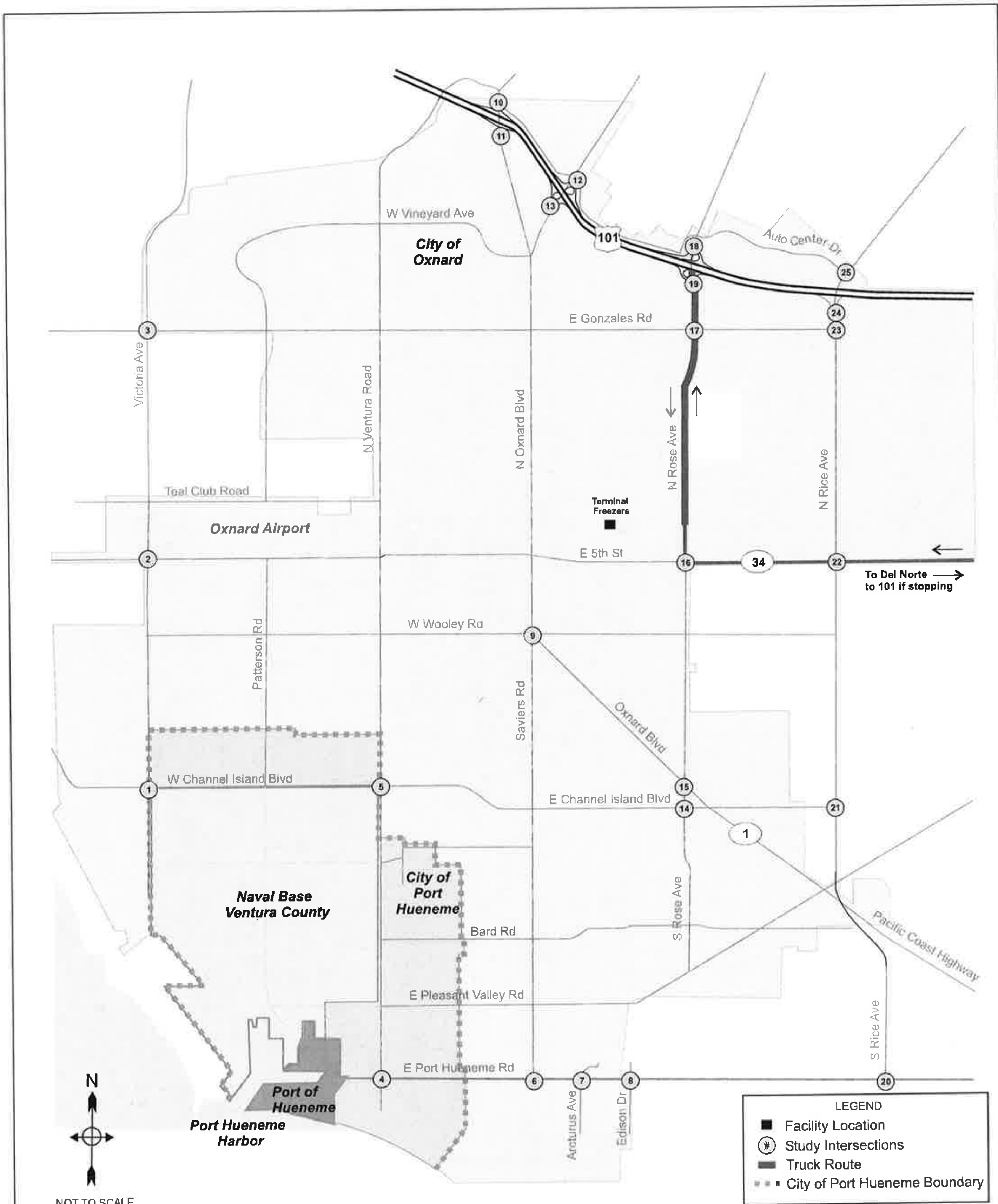


IBI GROUP

Cities of Port Hueneme and Oxnard Truck Traffic Study

Truck Routes - T & T Trucks and Cranes

Figure 4-17

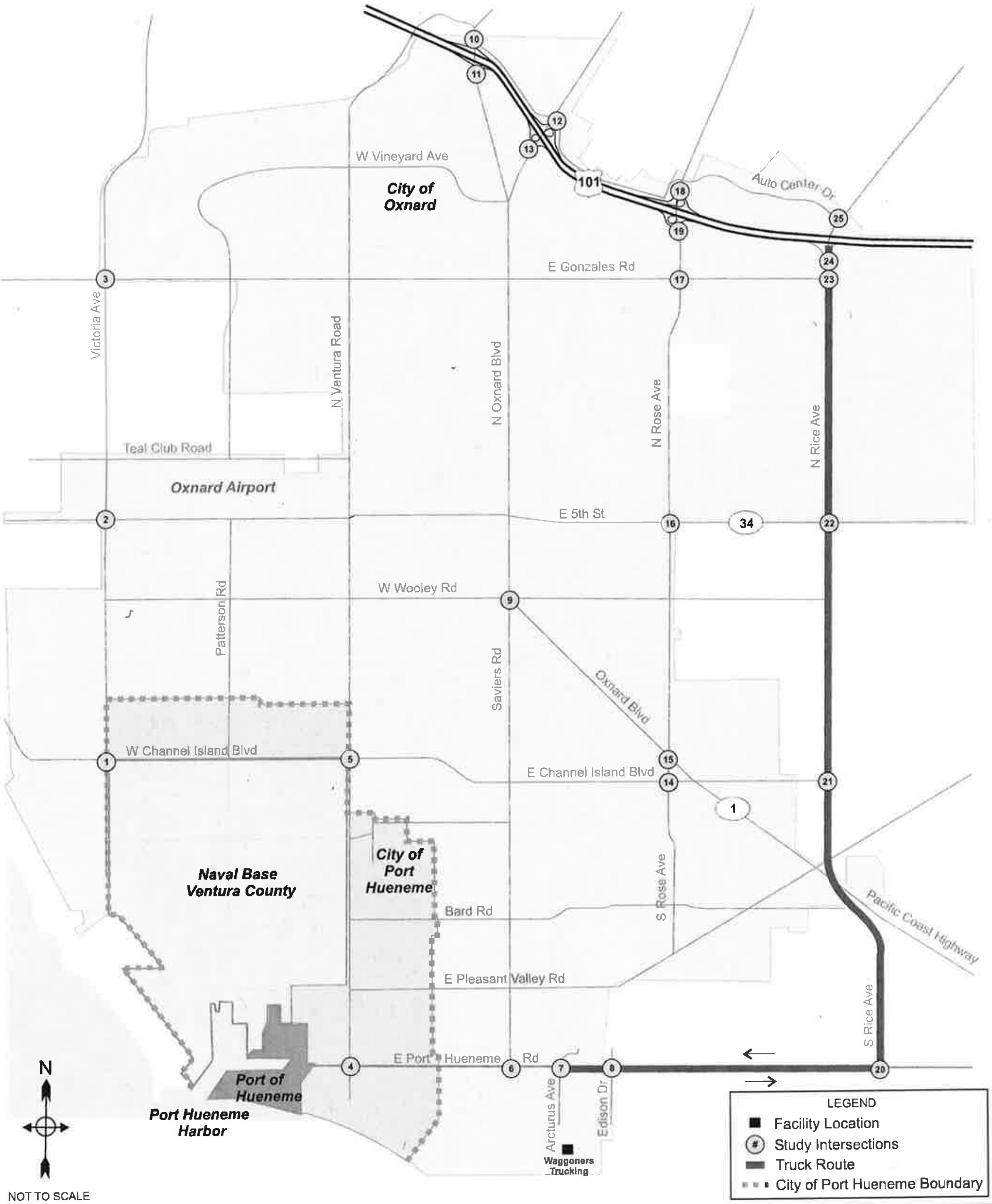


IBI GROUP

Cities of Port Hueneme and Oxnard Truck Traffic Study

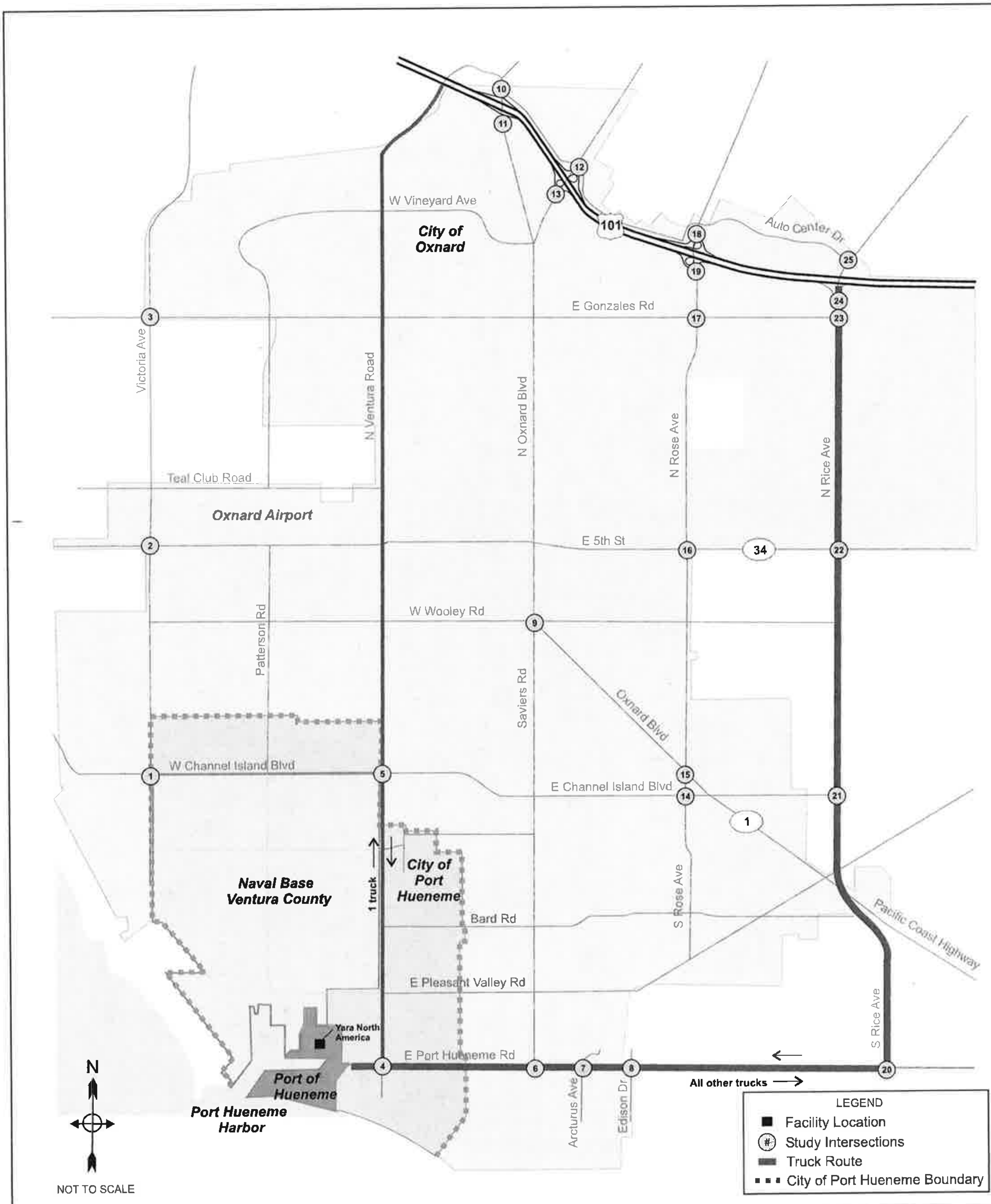
Truck Routes - Terminal Freezers

Figure 4-18



IBI GROUP | Cities of Port Hueneme and Oxnard Truck Traffic Study | Figure 4-19

Truck Routes - Waggoners Trucking



IBI GROUP	Cities of Port Hueneme and Oxnard Truck Traffic Study	Figure 4-20
	Truck Routes - Yara North America	

5 IMPACTS OF TRUCK TRAFFIC THROUGH RESIDENTIAL NEIGHBORHOODS

An established network of truck routes is important to ensure the efficient flow of trucks through a city and to reduce potential impacts from truck trips on sensitive land uses. The study area includes an extensive network of truck routes that provide access to the US-101 freeway and land uses that are generators of truck trips. The survey data collected from the Port of Hueneme, NBVC, and selected private businesses in the study area suggests that the existing designated study area truck routes are well utilized by trucks traveling to and from the US-101 freeway.

Figure 5-1 is an excerpt from the City of Oxnard General Plan Land Use Map that shows the large percentage of the study area that is zoned for residential use. This truck traffic study includes a review and evaluation of the impacts of truck traffic on residential neighborhoods in Port Hueneme and Oxnard. As the two cities continue to grow and develop, new residential development is occurring or is planned in areas that have historically been used for agricultural or other uses. There are several examples in both the City of Port Hueneme and the City of Oxnard of new residential developments along identified major truck routes such as Hueneme Road and Victoria Avenue. These developments will expose more people to the existing traffic on the truck routes, and increase the magnitude of the impacts created when incompatible land uses are combined.

The Recommendations section of this report identifies selected measures that could be implemented to further strengthen truck drivers' awareness and use of existing truck routes, along with recommendations related to land use design for residential or other sensitive land uses that may be planned adjacent to designated arterial roadway truck routes.

5.1 CITY OF OXNARD RESIDENTIAL DEVELOPMENT PROJECTS ALONG TRUCK ROUTES

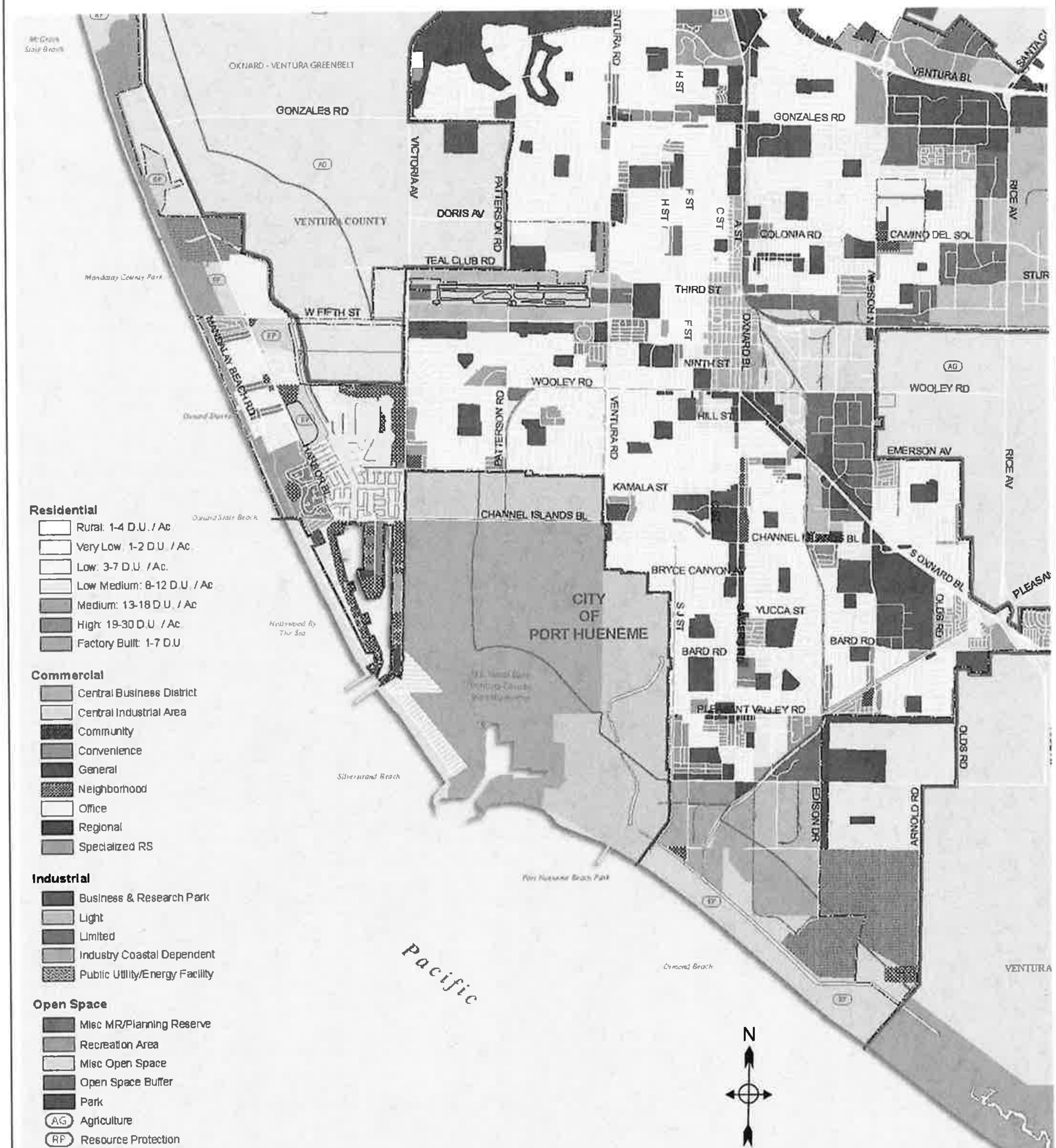
Residential development projects proposed or planned along roadways that serve as truck routes through the study area are noted in this section. Project information was obtained from the City of Oxnard Planning Division Development Project List dated January 2008.

Victoria Avenue

Victoria Avenue is a north-south designated truck route located along the western edge of the project study area. It travels through the City of Port Hueneme, the City of Oxnard, and unincorporated Ventura County. South of Channel Islands Boulevard, Victoria Avenue is bordered by the Naval Base Ventura County (NBVC) and Boat Landings Park. There are primarily residential uses adjacent to Victoria Avenue between Channel Islands Boulevard and 5th Street, and recreational and agricultural uses between 5th Street and the US-101 freeway.

There are three residential projects on Victoria Avenue within the City of Oxnard that are currently in the planning phases or under construction.

- The Seabridge project is being built on the southwest corner of Victoria Avenue and Wooley Road. It consists of 276 single family dwelling units, 432 multi-family dwelling units, 240 public docks, and a 16-acre park.
- The Orbela project includes 105 condominium units on the southeast corner of Victoria Avenue and 5th Street, and is currently under construction.
- Tucker Investments plans to build 112 condominium units on the northeast corner of Victoria Avenue and Hemlock Street.



IBI GROUP	Cities of Port Hueneme and Oxnard Truck Traffic Study	Figure 5-1
	City of Oxnard General Plan Land Use Map	

Hueneme Road

Hueneme Road is an east-west truck route that is located along the southern edge of the project study area. It is bordered by primarily residential uses and undeveloped land between Ventura Road and Cypress Road, and industrial and agricultural uses between Cypress Road and Rice Avenue.

There are three residential projects and one Specific Plan project on Hueneme Road that are currently in the planning phases or under construction.

- Paragon Communities is constructing 159 residential condominiums north of Hueneme Road between Saviers Road and Cypress Road.
- The Westwinds II project is located at 5482 Cypress Road and includes 48 condominium units. This approved project involves a General Plan Amendment.
- The proposed Paseo Nuevo project is located north of Hueneme Road and east of Cypress Road, and includes 60 residential condominiums in multi-family buildings.
- The Hearthside Homes Ormond Beach project site is located on approximately 300 acres north of Hueneme Road between Edison Drive and Olds Road. The Ormond Beach project includes the construction of up to 1,293 residential units of varying density, 50,000 square feet of retail, a commercial self storage facility, an elementary school, a high school, and 39,000 square feet of parks and community open space.

Pleasant Valley Road

Pleasant Valley Road is an east-west truck route that travels through the southern portion of the study area between the Naval Base Ventura County and the Highway 1/Rice Avenue interchange. Adjacent land uses are mainly low and medium density residential, with some general commercial and light industrial uses. There are two residential projects in the planning stages along Pleasant Valley Road.

- The Villa San Lorenzo project includes 16 condominium units on the southwest corner of Saviers Road and Pleasant Valley Road. This approved project is currently in the plan check stage.
- Tucker Investments has proposed to build 98 condominium units and 12 live/work units on the southwest corner of Rose Avenue and Pleasant Valley Road.

Channel Islands Boulevard

Channel Islands Boulevard is an east-west truck route that travels through the center of the project study area. Within the City of Port Hueneme, Channel Islands Boulevard is bordered by commercial and open space land uses. Between Ventura Road and Rice Avenue in the City of Oxnard, Channel Islands Boulevard is bordered by residential and commercial uses. The Cervantes Condo complex project is located south of Channel Islands Boulevard on Cheyenne Way, and includes three residential units.

Wooley Road

Wooley Road is an east-west truck route that travels through the center of the project study area. It is bordered by residential land uses between Victoria Avenue and "E" Street, and central business commercial and industrial uses between "E" Street and Rose Avenue. Shea Homes is constructing the Cottages project on a 5 acre site near the southeast corner of Wooley Road and Patterson Road. The Cottages project includes 52 detached condominiums.

5th Street

Fifth Street is an east-west truck route that travels through the center of the project study area. Oxnard Airport is located on the north side of 5th Street between Victoria Avenue and Ventura Road. Fifth Street is bordered by residential land uses between "H" Street and "D" Street, and central business commercial and industrial uses between "D" Street and Rice Avenue. The proposed Arbor View (Mira Loma) project includes 103 apartments and 188 townhouses with 51 affordable units on the south side of 5th Street just west of Ventura Road.

Gonzales Road

Gonzales Road is an east-west truck route in the northern portion of the study area. It is bordered by residential and commercial land uses. Shea Properties has proposed the East Village Apartments project on the southeast corner of Williams Drive and Gonzales Road, which would include 272 apartment units.

Rose Avenue

The portion of Rose Avenue north of Wooley Road within the project study area is designated as a truck route. Adjacent land use types include residential, industrial, and commercial. The Courts is a proposed project on the west side of Rose Avenue on Carmelita Court, and consists of 340 apartments, 101 single family dwellings, and 60 condominiums. A total of 362 units would be affordable, including 10 single family dwellings, 340 apartments, and 12 condominiums.

Oxnard Boulevard/Highway 1

Oxnard Boulevard/Highway 1 is a north-south truck route that travels through the center of the project study area. Adjacent land uses are primarily commercial and industrial, with some residential developments on the north side of the street between Rose Avenue and Rice Avenue. There are six residential projects on Oxnard Boulevard/Highway 1 that are currently in the planning phases or under construction.

- Gateway Walk has been approved for construction at 1250 S Oxnard Blvd. The project consists of 190 residential units, including 104 town homes, 28 three-story townhouses, 49 single family homes, and 9 commercial condos with 14 affordable units to be built onsite.
- One single family dwelling unit is under construction at 525 E. First St.
- The proposed Press Courier Lofts project is located at 3000 W Ninth St. and involves the conversion of an existing 52,000 square foot industrial building into 52 condominiums, including 4 affordable units.
- Two single family homes are proposed for 128 N Hayes Ave. on a vacant lot. The homes would be 1,616 and 1,522 square feet.
- Habitat for Humanity has proposed an affordable duplex project at 315 Cooper Rd., including one studio unit and one 1-3 bedroom unit.
- The Colonial House mixed use project is proposed at 747 and 711 N Oxnard Blvd. The project includes 40 residential units (6 affordable) with 16,000 square feet of commercial.

Ventura Road

Ventura Road is a north-south truck route that travels through the center of the project study area. The Oxnard Airport is located on the west side of Ventura Road between 5th Street and Teal Club Road.

Other land uses along Ventura Road are primarily residential with some community commercial and agricultural uses. Four new single family residences are proposed by Lauterbach and Associates as the Oneida Courts project on the west side of Ventura Road near Oneida Place.

5.2 TECHNOLOGICAL AND DESIGN PRACTICES TO REDUCE THE IMPACTS OF TRUCK TRAFFIC THROUGH RESIDENTIAL AREAS

If a project with a residential component is proposed near an existing truck route, there are design features that may be implemented to reduce noise and vibration impacts. Roads paved with rubberized asphalt have been shown to reduce road noise by as much as 12 decibels. Acoustical site design uses the placement of buildings, open space, nonresidential land uses, and barrier buildings to shield noise sensitive areas such as residential buildings from busy roadways. The strategic placement of rooms can also reduce noise impacts within a residential building. Other architectural design features that may be implemented to reduce noise impacts include:

- Permanent window seals
- Window mountings made of rubber, cork, or felt
- Reduced window sizes
- Increased window glass thickness
- Double-paned windows
- Window coatings
- Central air conditioning systems
- Sound-dampening insulation

6 RECOMMENDATIONS

The Cities of Port Hueneme and Oxnard truck traffic study provides an overview of existing traffic conditions and truck volumes at selected locations within the designated project study area. The study effort also included a survey process to obtain information regarding the generation and distribution of truck trips from the Port of Hueneme and NBVC, as well as a sampling of private businesses that operate in the study.

This section of the report identifies a series of recommendations for the Study TAC to consider to address existing traffic deficiencies present in the study area, improve the identification and use of existing truck routes, and strategies for future improvements or studies that would be intended to maintain or enhance traffic operations for both trucks and general traffic in the study area.

The recommendations outlined in this section are presented in the following groupings:

- Intersection and Roadway Improvements
- Strategies to Address Residential Neighborhood Impacts
- Improving Awareness and Use of Designated Truck Routes
- Next Steps

Intersection and Roadway Improvements

An unacceptable LOS was observed in the existing condition for either AM or PM peak hours at six intersections. Potential measures to improve the LOS have been identified at each intersection. In the interest of encouraging trucks to utilize these designated truck routes, it is recommended that traffic improvements be focused on existing truck corridors to improve traffic and flow and reduce congestion.

- Intersection of Victoria Avenue and Channel Islands Boulevard operates at LOS D (v/c of 0.898) during the PM peak hour. Existing northbound geometry at the intersection is dual left turn lanes, one through and one shared through/ right turn lane. Widening the northbound approach to provide two left turn lanes, two thru lanes, and one shared thru right turn lane will improve the level of service to LOS C (v/c of 0.783).

- Intersection of Oxnard Boulevard/Saviers Road and Wooley Road operates at unsatisfactory conditions under both the AM and PM peak hours. The area surrounding the intersection is built-out and there is no room to construct additional lanes. Discouraging trucks from using this intersection will improve the LOS in the AM peak hour from LOS F to LOS E and decrease the volume to capacity ratio from 1.07 to 1.03 (both being LOS F) in the PM peak hour. Note that this does not restore operations to satisfactory conditions per City of Oxnard standards. Directional signage can be used along Hueneme Road south of this intersection at Saviers Road to direct trucks to more preferred routes such as Rice Avenue.

- Intersection of Rose Avenue and Gonzales Road operates at LOS D (v/c of 0.882) during the PM peak hour. The improvements necessary to bring this intersection back to an acceptable level of service (LOS C or better) would likely result in significant right of way impacts as a fourth southbound through lane and a third eastbound left turn lane would need to be considered. This intersection is located in close proximity to the Rice Avenue corridor, which will be significantly improved as part of the now-funded interchange reconfiguration at the US-101 freeway. Improvements to the Rice Avenue interchange may divert some traffic from Rose Avenue to Rice Avenue, potentially reducing the impacts to this intersection. The City of Oxnard should revaluate this intersection after the completion of the Rice Avenue improvements.

- Intersection of Rice Avenue and Gonzales Road operates at LOS D (v/c of 0.822) during AM peak hour. By installing overlap signal phasing for existing southbound right turn lane, level of service would improve to LOS B (v/c of 0.642).

- Intersection of Rice Avenue and US-101 Southbound Ramps operates at LOS E (v/c of 0.912) during AM peak hour and LOS D (v/c of 0.858) during PM peak hour. Existing northbound geometry at the intersection is one through and one shared through/ right turn lane. A specific improvement is not identified for this location, as this intersection will be improved as part of the proposed reconfiguration of the interchange. The proposed reconfiguration was recently approved for funding through the Proposition 1B Trade Corridors Improvement Fund.

Order of magnitude cost estimates are identified for each of the proposed improvements identified above. Costs are capital dollars only and do not include estimates for right-of-way costs. Table 6-1 summarizes the cost estimate information.

Table 6-1 Order of Magnitude Cost Estimates for Recommended Intersection Improvements

Intersection	Proposed Improvement	Order of Magnitude Cost Estimate (Year 2008$)
Victoria Avenue and Channel Islands Boulevard	Widening the northbound approach to provide two left turn lanes, two thru lanes, and one shared thru right turn lane.	$200,000 to $300,000
Oxnard Boulevard and Saviers Road/Wooley Road	No feasible capacity improvement possible. Implement directional signage to discourage trucks from traveling through intersection.	< $10,000 for new signage
Rose Avenue and Gonzales Road	Future study of the intersection is recommended after completion of Rice Avenue/US-101 interchange improvements.	N/A
Rice Avenue and Gonzales Road	By installing overlap signal phasing for existing southbound right turn lane, level of service would improve to LOS B (v/c of 0.642)	$10,000 for signal modifications
Rice Avenue and US-101 Southbound Ramps	Not applicable. To be improved as part of US-101 interchange project.	N/A

Strategies to Address Residential Neighborhood Impacts

Two primary strategies are recommended to address concerns and potential impacts associated with trucks traveling on major arterial roadways and truck routes located adjacent to residential neighborhoods. These strategies are:

- Encourage trucks traveling to and from major generators in the study area (Port of Hueneme, NBVC, private businesses) to utilize the established preferred truck routes on Hueneme Road/Rice Avenue and Victoria Avenue as much as possible to limit the potential impacts of high truck volumes on other streets through residential areas such as Ventura Road and Channel Islands Boulevard. Measures could include the installation of directional signage, restrictions placed on heavy trucks prohibiting them from traveling certain arterials such as Channel Islands Boulevard, and capacity or traffic signal improvements to Victoria Avenue, Hueneme Road, and Rice Avenue to make these corridors more attractive to travel.

- Consider truck volumes on adjacent arterial roadways when designing adjacent residential neighborhoods. If residential developments are proposed along the preferred truck routes, the design of the neighborhoods should consider the potential impacts caused by trucks traveling on the adjacent truck route. Strategies to address this issue include larger setbacks for homes located along the truck route and/or the construction of walls between the truck routes and the residential neighborhood to reduce noise impacts.

These strategies are intended to serve as suggestions for the Cities of Port Hueneme and Oxnard to consider when approving new residential projects near existing truck routes. There are several well-established truck routes in the study area (Victoria Avenue, Hueneme Road, Rice Avenue), and these routes will continue to be utilized by truck traffic into the future. Ensuring that land uses developed adjacent to these corridors incorporate design features that are sensitive to the existing street and traffic context will be essential to minimize potential impacts associated with truck traffic.

Improving Knowledge and Use of Designated Truck Routes

The survey data collected from the Port of Hueneme, NBVC, and selected private businesses suggest that the existing designated truck routes in Port Hueneme and Oxnard are well utilized by a majority of trucks operating in the study area. However, the survey was not a comprehensive collection of all land uses that generate truck trips within the study area, and there may be instances of trucks traveling on routes that are not designated as truck routes. To address this condition, a series of recommendations have been identified to increase the awareness of truck routes for truck drivers traveling through Port Hueneme and Oxnard, and to implement specific measures to improve traffic flow along designated truck routes to encourage more use of the corridor by improving traffic flow and travel times. The recommended improvements are:

- Continue to emphasize the use of Port Hueneme Road/Hueneme Road and Rice Avenue as the primary truck access corridors to the Port of Hueneme. The existing designation of this route as the primary access corridor for the Port appears to be very successful in focusing truck traffic in this corridor. Additional steps should be taken by the Cities of Port Hueneme and Oxnard to work with local distribution, agriculture, and industrial uses to encourage these businesses to utilize these roadways to the extent feasible for their operations.

- Install directional signage along Port Hueneme Road/Hueneme Road and Rice Avenue directing trucks exiting the Port of Hueneme main gate to access the US-101 freeway via this route.

- Explore the feasibility of implementing traffic signal coordination along Port Hueneme Road/Hueneme Road between Ventura Road and Rice Avenue to improve traffic flow and truck travel times in the corridor.

- Continue to pursue grade separation at Rice Avenue at the Union Pacific rail corridor immediately north of Fifth Street. The City of Oxnard should continue to pursue this improvement. Train traffic operating in the rail corridor creates traffic congestion at the Rice Avenue/Fifth Street intersection, and eliminating this conflict would improve traffic safety and traffic operations for trucks traveling on Rice Avenue.

- Widen Hueneme Road to a full four lane divided arterial street for the full length between Ventura Road and Rice Avenue. Portions of this corridor are already improved to four lanes west of Saviers Road, and the City of Oxnard plans to widen the portion between Arcturus Avenue and Saviers Road to provide two lanes in each direction. Widening the full corridor would further improve traffic flow and enhance the connection to Rice Avenue not only for trucks traveling to and from the Port of Hueneme, but also for trucks origination from the private distribution, industrial, and agricultural uses located along Hueneme Road.

- Work with Caltrans District 7 to install signage along US-101 identifying Rice Avenue as a designated access truck route to the Port of Hueneme.

- Work with Caltrans District 7 to install signage along US-101 identifying Victoria Avenue as a designated access truck route to NBVC Port Hueneme.

Next Steps

As noted above, the analysis completed as part of this study provides a snapshot of existing traffic conditions and truck volumes in the study area. Specific recommendations are included to address existing traffic impacts that occur as a result of truck traffic in Port Hueneme and Oxnard. This study effort should be seen as a first step to a coordinated plan of action for addressing not only the existing condition for truck traffic, but potential future increases in truck and automobile traffic in the study area. Recommended next steps include the following:

- Identify potential funding sources and the responsible agencies for implementing the recommendations identified in this report.
- The recommended improvements identified in this report are tailored towards existing traffic impacts and deficiencies identified through the review of existing traffic data and truck trips. Analyze future traffic conditions, truck trip generation rates, and the operation of the future study area roadway network. The benefit of this approach would be to identify additional improvements that would supplement the recommendations identified in this report and address future increases in traffic volumes and truck volumes.
- Explore the feasibility of installing intelligent transportation system (ITS) improvements to track and direct truck trips between major traffic generators and the US-101 freeway. Funding sources for these types of improvement could include source tied to goods movement-related improvements (Proposition 1B Trade Corridor Improvement Fund), funding tied to Homeland Security improvements for the Port of Hueneme or NBVC, or local and regional sources (sales tax measures, regional funding grants, etc).

Board of Supervisors Hearing
July 23, 2019

Mitigated Negative Declaration Addendum

Attachment 8

VCAPCD Greenhouse Gas Emissions Estimates_PL14-0103

Renaissance Petroleum Project

Case No. PL14-0103

(Minor Modification of CUP 4384)

GHG emissions
stationary sources
(333 MT CO2e/year)

Renaissance Petroleum PL14-0103 Greenhouse Gas Emissions Calculations

VCAPCD Emission Factor Conversion

VCAPCD ROC emission factor	**2**	lb ROC/well/day	
ROC emissions increase	0.365	short tons ROC/well-year	
conversion to metric tonnes	0.9072	MT/short ton	MT = metric tonnes = 1,000 kg = 2,200 lb
ROC emissions increase per well	0.3311	MT ROC/well-year	

Direct Project GHG Emissions

number of wells	**4**	

Fugitive Methane Emissions

estimated ROC emissions	0.3311	MT ROC/well-year		
methane content of produced gas	67%	gas analysis 07/13/2005		
ROC content of produced gas	22%	gas analysis 07/13/2005		California average CH4 emissions per well (2005 data)
ratio of methane emission to ROC	3.04			
estimated methane emissions per project well	1.01	MT CH4/well-year	1.27	MT CH4/well year
estimated project methane emissions increase	**4.0**	MT CH4/year	**0.79**	ratio of project (worst case) to average

Fugitive CO2 Emissions

estimated ROC emissions	0.3311	MT ROC/well-year
ROC content of produced gas	22%	gas analysis 07/13/2005
CO2 content of produced gas	0%	gas analysis 07/13/2005
ratio of CO2 emissions to ROC	0.00	
estimated CO2 emissions per well	0.00	MT CO2/well-year
estimated project CO2 emissions increase	**0.0**	MT CO2/year

Flare Emissions

			Max input	
Average heat input	0.46	MMBtu/hr	51.0	MMBtu/hr
CO2 emission factor for methane combustion	117.0	lb CO2/MMBtu	117.0	lb CO2/MMBtu
CO2 emission factor for non-methane (ROC+ethane) combustion	139.0	lb CO2/MMBtu	139.0	lb CO2/MMBtu
flare maximum CO2 emission rate (combustion)	56.9	lb CO2/hr	6,325.4	lb CO2/hr
Maximum produced gas fuel flow rate through flare	377	cubic feet/hour	41,906	cubic feet/hour
Produced CO2 flow rate through flare	0.0	cubic feet CO2/hr	0.0	cubic feet CO2/hr
conversion factor (at STP)	0.1235	lb CO2/cubic foot CO2	0.1235	lb CO2/cubic foot CO2
total flare CO2 emission rate	56.9	lb CO2/hr	6,325.4	lb CO2/hr
estimated flare CO2 emissions increase	**226.4**	MT CO2/year	**25,186.4**	MT CO2/year

THC emission factor (uncombusted flare fuel)	0.14	lb total hydrocarbons/MMBtu (AP-42 Table 13.5-1)
methane fraction of total hydrocarbons (THC)	0.944	lb methane/lb THC emissions
flare combustion methane emission factor	0.13	lb CH4/MMBtu
flare combustion methane emission rate	0.061	lb CH4/hr
estimated flare methane emissions increase	**0.24**	MT CH4/year

ROC fraction of THC	0.056	lb ROC/lb THC
flare combustion ROC emission factor	0.0078	lb ROC/MMBtu
ROC emission rate	0.0036	lb ROC/hr
estimated flare combustion ROC emission increase	0.086	lb ROC/day

Global Warming Potential of Methane	Total Project Direct CO2e (CO2 + CH4) Emissions Increase (MT/year)
25	**333**
28	346
34	372
36	380
72	534
86	593
100	653

Flare Potential and Estimated NOx Emissions

Flare rated heat input	51	MMBtu/hr (permit/inspection file)	
NOx emission factor	0.068	lb NOx/MMBtu (AP-42 Table 13.5-1)	
Maximum flare hourly emission rate	3.468	lb NOx/hr	
Maximum flare daily emission rate	83.232	lb NOx/day	
Heating value of produced gas	1217	MMBtu/MMdscf	
2014 gas throughput	3.3	MMcf	
2014 heat input	4016.1	MMBtu	
Average daily heat input	11.0	MMBtu/day	0.46 MMBtu/hr
Average daily NOx emission rate	**0.75**	**lb NOx/day**	

Maximum hourly NOx for exempt flare (less than 1 MMBtu/hr heat input)	0.068	lb NOx/hr
	1.632	lb NOx/day

Produced gas mole percent to mass percent conversion
Mole % data from Capco Analytical Services gas analysis dated 07/13/05

Constituent	Moleculate Weight	Mole %	Molar Mass	mass %
Oxygen	31.9988	0.00	0	0.00%
Nitrogen	28.0134	1.10	0.308	1.52%
Carbon Dioxide	44.01	0.00	0	0.00%
Methane	16.043	84.56	13.57	**67.03%**
Ethane	30.07	6.33	1.903	9.40%
Propane	44.097	3.96	1.746	8.63%
Iso-Butane	58.124	0.78	0.453	2.24%
n-Butane	58.124	1.49	0.866	4.28%
Neo-Pentane	72.151	0	0	0.00%
Iso-Pentane	72.151	0.50	0.361	1.78%
n-Pentane	72.151	0.52	0.375	1.85%
Hexane plus *	86.178	0.767	0.661	3.27%
		Total molar mass	20.2	1.00
			ROC † %	**22.05%**

* Used molecular weight of hexane since expect it to be main component
† For this calculation, ROC is non-methane, non-ethane hydrocarbons

Pounds of CO2 emitted per million British thermal units (Btu) of energy for various fuels:

Coal (anthracite)	228.6
Coal (bituminous)	205.7
Coal (lignite)	215.4
Coal (subbituminous)	214.3
Diesel fuel and heating oil	161.3
Gasoline	157.2
Propane	139
Natural gas	117

Source: http://www.eia.gov/tools/faqs/faq.cfm?id=73&t=11

GHG estimated emissions
Oil tanker trucks
(357 MTCO2e/year)

PL14-0103 Renaissance Petroleum
Ventura County APCD Air District, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
User Defined Commercial	4.00	User Defined Unit	0.00	0.00	0
User Defined Commercial	0.00	User Defined Unit	0.00	0.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.6	**Precipitation Freq (Days)**	31
Climate Zone	8			**Operational Year**	2017
Utility Company	Southern California Edison				
CO2 Intensity (lb/MWhr)	702.44	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use - Per applicant

Vehicle Trips - Per applicant

Vehicle Emission Factors - Per applicant

Vehicle Emission Factors - Per applicant

Table Name	Column Name	Default Value	New Value
tblProjectCharacteristics	OperationalYear	2018	2017
tblVehicleEF	HHD	1.03	1.00
tblVehicleEF	LHD1	6.2090e-003	0.00
tblVehicleEF	LHD2	4.9020e-003	0.00
tblVehicleEF	MHD	0.02	0.00
tblVehicleEF	OBUS	0.01	0.00
tblVehicleEF	SBUS	0.91	0.00
tblVehicleTrips	CC_TL	7.30	0.00
tblVehicleTrips	CNW_TL	7.30	75.00
tblVehicleTrips	CNW_TTP	0.00	100.00
tblVehicleTrips	CW_TL	9.50	0.00
tblVehicleTrips	HW_TL	0.00	4.00
tblVehicleTrips	PR_TP	0.00	100.00
tblVehicleTrips	ST_TR	0.00	4.00
tblVehicleTrips	SU_TR	0.00	4.00
tblVehicleTrips	WD_TR	0.00	4.00

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					
2017	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	0.0000	0.0000
Maximum	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	0.0000	0.0000

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					
2017	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	0.0000	0.0000
Maximum	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	0.0000	0.0000

	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

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
		Highest		

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	0.0000	0.0000	4.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	7.0000e-005	7.0000e-005	0.0000	0.0000	8.0000e-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	0.0000	0.0000
Mobile	0.0538	0.3714	1.2379	3.9000e-003	0.1692	5.2200e-003	0.1945	0.0538	4.9300e-003	0.0587	0.0000	356.6994	356.6994	0.0147	0.0000	357.0679
Waste						0.0000	0.0000		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	0.0000	0.0000
Total	**0.0538**	**0.3714**	**1.2379**	**3.9000e-003**	**0.1692**	**5.2200e-003**	**0.1945**	**0.0538**	**4.9300e-003**	**0.0587**	**0.0000**	**356.6994**	**356.6994**	**0.0147**	**0.0000**	**357.0679**

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	0.0000	0.0000	4.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	7.0000e-005	7.0000e-005	0.0000	0.0000	8.0000e-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	0.0000	0.0000
Mobile	0.0538	0.3714	1.2379	3.9000e-003	0.1892	5.2200e-003	0.1945	0.0538	4.9300e-003	0.0587	0.0000	356.6994	356.6994	0.0147	0.0000	357.0679
Waste						0.0000	0.0000		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	0.0000	0.0000
Total	**0.0538**	**0.3714**	**1.2379**	**3.9000e-003**	**0.1892**	**5.2200e-003**	**0.1945**	**0.0538**	**4.9300e-003**	**0.0587**	**0.0000**	**356.6994**	**356.6994**	**0.0147**	**0.0000**	**357.0679**

	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	2/6/2017	2/5/2017	5	0	
2	Site Preparation	Site Preparation	2/6/2017	2/5/2017	5	0	
3	Grading	Grading	2/6/2017	2/5/2017	5	0	
4	Building Construction	Building Construction	2/6/2017	2/5/2017	5	0	
5	Paving	Paving	2/6/2017	2/5/2017	5	0	
6	Architectural Coating	Architectural Coating	2/6/2017	2/5/2017	5	0	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (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	4.00	231	0.29
Building Construction	Forklifts	2	6.00	89	0.20
Building Construction	Tractors/Loaders/Backhoes	2	8.00	97	0.37
Demolition	Concrete/Industrial Saws	1	8.00	81	0.73
Demolition	Rubber Tired Dozers	1	1.00	247	0.40
Demolition	Tractors/Loaders/Backhoes	2	6.00	97	0.37
Grading	Concrete/Industrial Saws	1	8.00	81	0.73
Grading	Rubber Tired Dozers	1	1.00	247	0.40
Grading	Tractors/Loaders/Backhoes	2	6.00	97	0.37
Paving	Cement and Mortar Mixers	4	6.00	9	0.56
Paving	Pavers	1	7.00	130	0.42
Paving	Rollers	1	7.00	80	0.38
Paving	Tractors/Loaders/Backhoes	1	7.00	97	0.37
Site Preparation	Graders	1	8.00	187	0.41
Site Preparation	Tractors/Loaders/Backhoes	1	8.00	97	0.37

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
Architectural Coating	1	0.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	5	0.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Demolition	4	10.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Grading	4	10.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Paving	7	18.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Site Preparation	2	5.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

3.2 Demolition - 2017

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	0.0000	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	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	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	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	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	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	0.0000	0.0000

3.2 Demolition - 2017

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	0.0000	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	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**	**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	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	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	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**	**0.0000**	**0.0000**

3.3 Site Preparation - 2017

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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	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	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	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	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	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	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	0.0000	0.0000

3.3 Site Preparation - 2017

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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	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	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	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	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	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	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	0.0000	0.0000

3.4 Grading - 2017

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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	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	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	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	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	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	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	0.0000	0.0000

3.4 Grading - 2017

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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	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	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**	**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	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	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	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**	**0.0000**	**0.0000**

3.5 Building Construction - 2017

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	0.0000	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	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	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	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	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	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	0.0000	0.0000

3.5 Building Construction - 2017

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	0.0000	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	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**	**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	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	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	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**	**0.0000**	**0.0000**

3.6 Paving - 2017

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	0.0000	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	0.0000	0.0000
Paving	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	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	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	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	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	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	0.0000	0.0000

3.6 Paving - 2017

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	0.0000	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	0.0000	0.0000
Paving	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	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	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	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	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	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	0.0000	0.0000

3.7 Architectural Coating - 2017

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	0.0000	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	0.0000	0.0000
Off-Road	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	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	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	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	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	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	0.0000	0.0000

3.7 Architectural Coating - 2017

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	0.0000	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	0.0000	0.0000
Off-Road	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	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**	**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	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	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	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**	**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	0.0536	0.3714	1.2379	3.9000e-003	0.1892	5.2200e-003	0.1945	0.0538	4.9300e-003	0.0587	0.0000	356.6994	356.6994	0.0147	0.0000	357.0679
Unmitigated	0.0538	0.3714	1.2379	3.9000e-003	0.1892	5.2200e-003	0.1945	0.0538	4.9300e-003	0.0587	0.0000	356.6994	356.6994	0.0147	0.0000	357.0679

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
User Defined Commercial	16.00	16.00	16.00	436,800	436,800
User Defined Commercial	0.00	0.00	0.00		
Total	16.00	16.00	16.00	436,800	436,800

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
User Defined Commercial	0.00	0.00	75.00	0.00	0.00	100.00	100	0	0
User Defined Commercial	0.00	0.00	75.00	0.00	0.00	100.00	100	0	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
User Defined Commercial	0.552019	0.046052	0.193997	0.131334	0.026004	0.007247	0.018140	0.016504	0.001080	0.000912	0.004204	0.000361	0.002146
User Defined Commercial	0.552019	0.046052	0.193997	0.131334	0.026004	0.007247	0.018140	0.016504	0.001080	0.000912	0.004204	0.000361	0.002146

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	0.0000	0.0000
Electricity Unmitigated						0.0000	0.0000		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	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	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 Commercial	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	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

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 Commercial	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	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

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
User Defined Commercial	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			
User Defined Commercial	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	0.0000	0.0000	4.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	7.0000e-005	7.0000e-005	0.0000	0.0000	8.0000e-005
Unmitigated	0.0000	0.0000	4.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	7.0000e-005	7.0000e-005	0.0000	0.0000	8.0000e-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	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	0.0000	0.0000	4.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	7.0000e-005	7.0000e-005	0.0000	0.0000	8.0000e-005
Total	**0.0000**	**0.0000**	**4.0000e-005**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**7.0000e-005**	**7.0000e-005**	**0.0000**	**0.0000**	**8.0000e-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	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	0.0000	0.0000	4.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	7.0000e-005	7.0000e-005	0.0000	0.0000	8.0000e-005
Total	**0.0000**	**0.0000**	**4.0000e-005**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**7.0000e-005**	**7.0000e-005**	**0.0000**	**0.0000**	**8.0000e-005**

7.0 Water Detail

7.1 Mitigation Measures Water

Board of Supervisors Hearing
July 23, 2019

Mitigated Negative Declaration Addendum

Attachment 9

NOx Flaring Emissions Estimates Spreadsheet for 2006-2016

Renaissance Petroleum Project

Case No. PL14-0103

(Minor Modification of CUP 4384)

Renaissance Petroleum

NOx Emissions from flaring

2006-2016

Year	Gas Production (MCF)	Gas volume flared (MCF)	Gas volume sold (MCF)	Energy factor (MMBTU/MCF)	Energy generated by flaring (MMBTU)	NOx emission factor (Pounds per MMBTU)	NOx emissions due to flaring (Pounds)
2016	47991.4	7256.6	40734.8	1.128	8185.4	0.068	556.6
2015	62601.7	1516.3	61085.4	1.128	1710.4	0.068	116.3
2014	85980.7	3373.3	82607.4	1.128	3805.1	0.068	258.7
2013	158385.0	8770.0	149615.0	1.128	9892.6	0.068	672.7
2012	229516.5	14648.5	214868.0	1.128	16523.5	0.068	1123.6
2011	301283.0	31974.0	269309.0	1.128	36066.7	0.068	2452.5
2010	173183.3	31034.7	142148.6	1.128	35007.1	0.068	2380.5
2009	135427.8	10959.2	124468.6	1.128	12362.0	0.068	840.6
2008	81837.8	3446.2	78391.6	1.128	3887.3	0.068	264.3
2007	62769.8	9338.2	53431.6	1.128	10533.5	0.068	716.3
2006	51074.2	3308.8	47765.4	1.128	3732.3	0.068	253.8
Total =	1390051.2	125625.8	1264425.4				9636.00

2006-2016 Average pounds per day NOx emissions = 2.40 (involves production from 9 wells at Rosenmund and Naumann)

% of gas sold = 91.0

Board of Supervisors Hearing
July 23, 2019

Mitigated Negative Declaration Addendum

Attachment 10

NOx Off-site Mobile Sources Emissions Spreadsheet

Renaissance Petroleum Project

Case No. PL14-0103
(Minor Modification of CUP 4384)

Renaissance Petroleum

NOx Emissions from off-site mobile sources

NOx emission rates from CalEEMod v2016.3.2*

Commuter Vehicle:	0.00045	lb NOx/vehicle-mile
Heavy Heavy Duty Truck:	0.1125	lb NOx/vehicle-mile

Commuter Emissions

Daily staff	2	
Daily trips	4	
Trip length	10	miles
Commuter Em	0.018	lb NOx/day

Produced Water Haul Truck Emissions

Traffic Source	Avg. Daily One-Way Truck Trips	Current Trip Length (miles)	NOx Emissions (lb NOx/day)	Maximum Potential Trip Length (miles)†	Maximum NOx Emissions (lb NOx/day)
Existing Production	3.3	3.8	1.4	30	11.1
Proposed Project Increase (4 wells)	1.5	3.8	0.6	30	5.1
Permitted Rosenmund Increase (7 wells)	2.5	3.8	1.1	30	8.4
Cumulative Increase (11 wells)	4.0	3.8	1.7	30	13.5

Crude Oil Haul Truck Emissions

Traffic Source	Avg. Daily One-Way Truck Trips	Trip Length† (miles)	NOx Emissions (lb NOx/day)	**TOTAL‡** Oil + Water NOx Emissions (lb NOx/day)
Existing Production	1.6	30	5.4	**6.8**
Proposed Project Increase (4 wells)	0.73	30	2.5	**3.1**
Permitted Rosenmund Increase (7 wells)	1.3	30	4.4	**5.5**
Cumulative Increase (11 wells)	2.0	30	6.8	**8.5**

* CalEEMod assumptions:
- Ventura County APCD
- Summer
- Operational Year 2017

† Distance from project site to US 101 as it enters the San Fernando Valley, leaving the SCC air basin

‡ Current water haul truck emissions (to local injection well) plus crude oil haul truck emissions

Board of Supervisors Hearing
July 23, 2019

Mitigated Negative Declaration Addendum

Attachment 11

VCAPCD Memorandum
(Estimate of Drilling Emissions)

Renaissance Petroleum Project
Case No. PL14-0103
(Minor Modification of CUP 4384)

VENTURA COUNTY
AIR POLLUTION CONTROL DISTRICT
Memorandum

TO: Brian Baca
Planning/RMA

DATE: September 6, 2017

FROM: Chuck Thomas, Manager CT
Planning/Rules/Incentives

SUBJECT: Renaissance Petroleum Project (PL14-0103)

As you requested, we've estimated daily air emissions from drilling one generic oil well and 15 daily employee commute trips associated with the proposed Renaissance Petroleum Project near Oxnard.

Oil Well Drilling: 90 lbs/day (NOx + ROG)
Assumptions: Tier 3 diesel engine: 3.0 grams/BHP-hr
1,000 gallons diesel fuel/day

15 Daily Employee Commute Trips: 0.06 lbs/day NOx; 0.06 lbs/day ROG
Assumptions: 15 employees, 30 one-way trips/day; 10 miles/one-way trip

If you have any questions, please contact me at chuck@vcapcd.org or 805/645-1427.

c: Mike Villegas, VCAPCD
Kerby Zozula, VCAPCD

Board of Supervisors Hearing
July 23, 2019

Mitigated Negative Declaration Addendum

Attachment 12

APCD Memoranda on Health Risk

1. October 3, 2018 Health Risk Assessment
2. October 4, 2018 Summary of Health Risk Representation and Health Risk Assessment

Renaissance Petroleum Project

Case No. PL14-0103
(Minor Modification of CUP 4384)

VENTURA COUNTY
AIR POLLUTION CONTROL DISTRICT
Memorandum

TO: Mike Villegas DATE: October 3, 2018

FROM: Ali Ghasemi,
Division Manager
Planning, Rules, & Incentive Programs

SUBJECT: Health Risk Assessment for Naumann Drill Site
(VCAPCD Permit No. 01383)

The Naumann Drill Site is operated by Renaissance Petroleum, LLC (RenPet). The facility is located at 3214 Etting Road, about one-third of a mile southeast of the City of Oxnard, near the intersection of Pleasant Valley Road and Highway 1, in the unincorporated area of Ventura County. The facility is in an agricultural area with the nearest sites being a greenhouse building, a residence, and the Oxnard Pacific Mobile Estates, about 138, 210, and 570 meters northwest of the facility, respectively.

The facility currently has one active oil well, two 500 barrel-capacity oil storage tanks, one 500 barrel-capacity Produced Water Tank (PWT), one oil loading operation, one Liquid Petroleum Gas (LPG) loading operation, one emergency flare, and one 0.25 MMBTU/HR glycol reboiler. The facility is proposing to install four additional oil wells and replace the two 500 barrel-capacity oil storage tanks with two 1000 barrel-capacity oil storage tanks.

According to the Ventura County Air Quality Assessment Guidelines (AQAG), in order to assess whether a project may have a significant adverse impact on air quality in Ventura County, staff has to make the air quality impact assessments for both criteria and toxics air contaminants. The operation from this facility will emit a number of toxic compounds that are carcinogenic and that have chronic and acute noncancer adverse health effects. The impact from toxics air contaminants (TACs) may be estimated by performing a health risk assessment (HRA). Per AQAG, the significant thresholds for TACs are specified below:

Toxics:

- Cancer Risk > 10 in a million
- Non-Cancer Risk (Chronic & Acute) Hazardous Index (HI) > 1

Staff has performed a HRA using AERMOD and Hotspots Analysis and Reporting Program version 2 (HARP2). HARP2 will calculate all four OEHHA Tiers and both the Derived Risk Calculations (as designated by OEHHA) and CARB's Risk Management Policy Inhalation Rates for Residential Cancer Risk Calculations. The residential cancer risk assumed a 30-year exposure and it included the following pathways: inhalation, home grown produce, dermal absorption, soil ingestion, and mother's milk. A deposition velocity of 0.02 m/s was assumed for non-inhalation pathways. The HRA also assumed default values in HARP2 for all pathways. The "RMP Using the Derived Method" risk calculation option was used for estimating cancer risk at residential receptors. To estimate chronic non-cancer risks at residential/worker receptors the "OEHHA Derived Method" risk calculation option was used. The worker cancer risk assumed a 25-year exposure and it included the inhalation, dermal absorption and soil ingestion pathways, 0.02 m/s deposition velocity, and default values in HARP2.

Staff has also estimated the facility's emissions based on maximum rated capacity of the equipment and/or maximum allowable permit limits.

Based on the above information and HRA results, the Maximum Exposed Individual Residential (MEIR) cancer risk was calculated to be 0.903 in a million at a residential receptor 210 meters northwest of the property. The Maximum Exposed Individual Worker (MEIW) cancer risk was calculated to be 0.125 in a million at a worker receptor (Greenhouse Building), 138 meters northwest of the property. The maximum chronic noncancer hazard index was 0.125, and the maximum acute non-cancer hazard index was 0.577 which both occurred at receptor (#56). Receptor #56 is located 8 meters from the eastern boundary of CUP 4384 (see attached map).

Equipment, Emissions, and Assumptions

VCAPCD Permit to Operate No. 01383 currently limits this facility to a maximum of one (1) oil well and an annual oil production limit of 365,000 barrels of oil per year (1,000 barrels of oil per day). As detailed below, the "future proposed" scenario assumes a total of five (5) oil wells with a crude oil production limit remaining at 365,000 barrels per year. Also, it should be noted that the facility's actual crude oil throughput in 2017 was approximately 23,000 barrels of oil per year, which represents about 6 percent of its maximum production rate.

For this project, the facility's criteria emissions were calculated using the facility's permit limits and/or maximum equipment capacity. The current Permit to Operate includes one (1) oil well, two 500 barrel-capacity storage tanks, and a crude oil production limit of 365,000 barrels per year. However, the emissions calculations were based on five (5) oil wells and two 1000 barrel-capacity storage tanks. The emergency flare combustion emissions were calculated based on the permit limit of 50.2 MMCF per year of annual gas burned. This represents approximately 13 percent of the emergency flare's rated annual capacity of 51.1 MMBTU's per hour, at 8,760 hours per year, using a natural gas heating value of 1128 BTU per cubic feet. The glycol reboiler combustion emissions were calculated based on full-time operation of 24 hours per day and 365 days per year (8,760 hours per year) at the glycol reboiler' s permitted capacity of 0.25 MMBTU's per hour. It has also accounted for the fugitive emissions from the glycol dehydrator portion of the glycol reboiler.

The air toxics emissions were calculated using the "proposed" emissions of VCAPCD Permit to Operate No. 01383, based on the information received from the County of Ventura Planning Division. The "proposed" Permit to Operate includes five (5) oil wells and larger 1,000 barrel-capacity storage tanks. As discussed below, no changes are proposed to the crude oil production limit of 365,000 barrels of oil per year and the limit of 50.2 MMCF annual gas burned in emergency flare. For this project, staff has also accounted for the fugitive emissions from the glycol dehydrator portion of the glycol reboiler.

The air toxics emission factors for the fugitive emissions, the glycol reboiler, and emergency flare were based on the San Joaquin Valley Air Pollution Control District (SJVAPCD) AB-2588 Hot Spots Air Toxics Profiles (attached).

For the fugitive emissions, SJVAPCD Toxic Profile ID 204 was used for benzene, toluene, and xylenes. Based on the natural gas testing at the Naumann Drill Site, hydrogen sulfide emissions were not detected and were not included in this calculation.

To calculate the emissions from the combustion of natural gas in the glycol reboiler and emergency flare, SJVAPCD Toxic Profile ID 9 was used for acetaldehyde, acrolein, benzene, ethyl benzene, formaldehyde, hexane, naphthalene, PAH's, propylene, toluene, and xylenes. The summary of devices and their emissions are listed in Table-1 below:

Table-1: Summary of Devices and Emissions

DEV ID	PROC DESC	POLLUTANT	Annual Emissions (lbs/yr)	Maximum Hourly Emissions (lbs/hr)
1	OIL WELLS (5 wells)	Benzene	12.78	0.0015
		Toluene	12.41	0.0014
		Xylene	25.55	0.0029
2	2-1000 BBL STORAGE TANKS	Benzene	3.64	0.0004
		Toluene	3.54	0.0004
		Xylene	7.29	0.0008
3	1-500 BBL PWT	Benzene	0.13	0.0000
		Toluene	0.13	0.0000
		Xylene	0.26	0.0000
4	OIL LOADING FACILITY	Benzene	14.70	0.0017
		Toluene	14.28	0.0016
		Xylene	29.40	0.0034
6	51.1 MMBTU/HR FLARE	Acetaldehyde	2.16	0.0019
		Acrolein	0.50	0.0005
		Benzene	7.98	0.0072
		Ethyl benzene	72.28	0.0652
		Formaldehyde	58.73	0.0530
		Hexane	1.46	0.0013
		Naphthalene	0.55	0.0005
		PAHs, Total	0.15	0.0001
		Propylene	122.48	0.1105

		Toluene	2.91	0.0026
		Xylene	1.46	0.0013
7	LPG TRUCK LOADING	Benzene	1.32	0.0002
		Toluene	1.29	0.0001
		Xylene	2.65	0.0003
8	GLYCOL DEHYDRATOR	Benzene	0.57	0.0001
		Toluene	0.55	0.0001
		Xylene	1.14	0.0001
8	.25 MMBTU/HR GLYCOL REBOILER	Acetaldehyde	0.09	0.0000
		Acrolein	0.02	0.0000
		Benzene	0.33	0.0000
		Ethyl benzene	3.00	0.0003
		Formaldehyde	2.44	0.0003
		Hexane	0.06	0.0000
		Naphthalene	0.02	0.0000
		PAHs, Total	0.01	0.0000
		Propylene	5.09	0.0006
		Toluene	0.12	0.0000
		Xylene	0.06	0.0000

<u>Stack Parameters</u>

The fugitive emissions, the tanks, and the loading racks are modeled as volume sources. The fuel burning equipment was modeled as point sources. The following stack parameters were used for each emission source.

Wells- Volume (5)

Release height	0 feet
Initial lateral dimension	3.49 feet
Initial vertical dimension	6.98 feet

Tanks-Volume (3)

Release height	16 feet
Initial lateral dimension	14.65 feet
Initial vertical dimension	29.3 feet

Loading Rack-Volume Source

Release height	3.5 feet
Initial lateral dimension	0.97 feet
Initial vertical dimension	1.64 feet

Emergency Flare-Point Source

Release height	25 feet
Stack diameter	0.25 feet
Stack gas velocity	3213 feet/min

Temperature	1500° F

Glycol Dehydrator-Reboiler-Volume

Release height	11 feet
Initial lateral dimension	7.44 feet
Initial vertical dimension	5.14 feet/min

Setting

The facility is located in an agricultural area. There are no nearby schools, hospitals, or other sensitive receptors. There is one residential property, a greenhouse building, and the Oxnard Pacific Mobile Estates located near the facility boundaries.

Receptor Locations

The cancer and non-cancer risks were calculated at gridded receptors located every 100 meters around the facility to a distance of 1000 meters, and at the receptors on the nearest residence, greenhouse building, and the Oxnard Pacific Mobile Estates.

Meteorological Data

The Oxnard Airport meteorological data was used in the health risk assessment.

Risk Results

The California Air Resources Board HARP2-Emission Inventory, Air Dispersion, and risk modules were used for emission inventory, dispersion modeling, and risk assessment. The HARP2 model implements the OEHHA Air Toxics Hot Spots Risk Assessment Guidelines and CARB's Risk Management Policy Inhalation Rates for Residential Cancer Risk Calculations.

The summary of the results is listed below:

Receptor Location	Lifetime Excess Cancer Risk	Chronic Noncancer Hazard Index	Acute Noncancer Hazard Index
Maximum Workplace (138 m)	0.125 in a million	0.005	0.123
Maximum Nearest Residence (210 m)	0.903 in a million	0.002	0.069
Oxnard Pacific Mobile Estates (570 m)	0.222 in a million	0.0003	0.034

The calculated risk impact due to the proposed project does not exceed the Ventura County Air Quality Assessment Guideline (AQAG) significance thresholds for cancer or non-cancer risk. Therefore, based on the above results, the toxics emissions resulted from this project would not result in a significant adverse impact.

VENTURA COUNTY
AIR POLLUTION CONTROL DISTRICT
Memorandum

TO: Kim L. Prillhart
Director, Ventura County Planning Division

DATE: October 4, 2018

FROM: Michael Villegas MV
Air Pollution Control Officer

SUBJECT: Summary of Health Risk Representation and Health Risk Assessment for Renaissance Petroleum, LLC – Naumann Drill Site, Ventura County APCD Permit to Operate No. 01383

Ventura County APCD staff conducted a health risk representation using the facility prioritization procedures for the air toxic emissions associated with Permit to Operate No. 01383 issued to the Renaissance Petroleum, LLC - Naumann Drill Site oilfield facility. This facility prioritization was conducted using the updated California Air Toxic Hot Spots Program Facility Prioritization Guidelines (CAPCOA Prioritization Guidelines, August 2016) developed by the California Air Pollution Control Officers Association (CAPCOA). This procedure is consistent with the revised Ventura County APCD Air Toxics "Hot Spots" Prioritization Procedures, which were approved by the Air Pollution Control Board on November 8, 2016.

Pursuant to the Ventura County APCD Prioritization Procedures and CAPCOA Prioritization Guidelines, operators of facilities with a "low" prioritization score (less than one) or an intermediate prioritization score (more than 1 and less than 10), are not subject to the requirement to perform a health risk assessment. Operators of facilities with a prioritization score of 10 or more are required to prepare a detailed health risk assessment. This is because prioritization results are only a conservative risk representation and a detailed health risk assessment would provide a more accurate representation with likely lower risk results.

The following "future" priority scores were calculated for the facility as proposed (four new oil wells and larger storage tanks) for cancer risk, non-carcinogenic short-term (acute) health risk, and non-carcinogenic long-term (chronic) health risk (Reference: Memo of September 28, 2018, from Michael Villegas to Kim Prillhart):

"Future/Proposed" Priority Score	Cancer Risk	Chronic Risk	Acute Risk
Fugitive Emissions	1.84	0.0489	0.0525
Flare & Glycol Reboiler Emissions	1.92	0.0481	0.5745
Total:	3.76	0.0970	0.6270

The results above indicate that all priority scores are less than ten; therefore, this facility is not considered to be a high priority facility and is not required to perform a detailed health risk assessment. According to the Ventura County APCD Air Toxics "Hot Spots" Prioritization Procedure, a prioritization score of 10 or greater is considered to be a high score that requires a detailed health risk assessment. Prioritization scores below ten indicate that the facility is not considered likely to have the potential to pose a significant health risk.

To illustrate why it is the standard practice of the APCD to not perform a detailed Health Risk Assessment (HRA) for a facility with a prioritization score of less than 10, staff prepared a HRA for the proposed "future" facility. This HRA is described in the memo of October 3, 2018 from Ali Ghasemi to me. The HRA provides results showing the maximum cancer risk is 0.903 in a million (well below the significance threshold of 10 in a million) and the maximum non-cancer hazard index (acute) is 0.123 (well below the significance threshold of 1.0).

Board of Supervisors Hearing
July 23, 2019

Mitigated Negative Declaration Addendum

Attachment 13

Ventura County Oil Fields – 2014 Annual Production, Well Statistics

Renaissance Petroleum Project

Case No. PL14-0103

(Minor Modification of CUP 4384)

VENTURA COUNTY OIL FIELDS - 2014 ANNUAL PRODUCTION - WELL STATISTICS

FIELD	OPERATOR(S)	OIL (BARRELS)	WATER (BARRELS)	GAS (MCF)	OG Active	OG Idle	UIC Active	UIC Idle	TOTAL
BARDSDALE	VPC, Vaquero, Thompco	170,049	570,291	295,997	49	24	4	3	80
BIG MOUNTAIN	Vintage Production California LLC (VPC)	28,992	70,884	115,191	11	2	0	1	14
CABRILLO	Renaissance Petroleum, LLC	24,378	57,007	89,354	7	2	0	0	9
CANADA LARGA	Hammond Canyon #2 Inc.	1,319	2,515	0	2	1	0	0	3
CHAFFEE CANYON	Concordia Resources Inc.	1,550	1,618	21,668	5	0	0	0	5
EUREKA CANYON	TEG Oil and Gas USA Inc.	2,138	29,112	320	8	0	1	0	9
FILLMORE	PRE Resources	583	4,578	255	2	0	0	0	2
HOLSER	Mirada Petroleum Inc.	18,383	20,591	26,343	15	0	2	0	17
HOPPER CANYON	DCOR, LLC	3,477	20,459	15,873	9	8	2	0	19
MONTALVO, WEST	Vintage Production California LLC	572,639	1,160,865	254,013	50	19	10	3	82
MOORPARK, WEST	Thompco Inc.	1,846	6,638	596	1	1	0	0	2
OAK PARK	Vintage Production California LLC	17,116	63,265	6,088	15	1	3	0	19
OAKRIDGE	Vintage Production California LLC	147,570	856,089	89,147	23	10	7	17	57
OJAI	Numerous Operators	264,077	1,278,743	1,349,444	186	58	13	6	263
OXNARD	Numerous Operators	336,359	768,140	15,769	60	48	52	33	193
RAMONA	Numerous Operators	42,709	49,834	100,508	89	24	3	1	117
RINCON	VPC, RILP, LBTH, Inc.	292,997	3,274,861	245,265	83	259	23	25	390
SAN MIGUELITO	Vintage Production California LLC	451,169	5,330,210	370,368	71	56	43	33	203
SANTA CLARA AVE	Vintage Production California LLC	53,044	195,452	38,901	20	11	2	1	34
SANTA SUSANA	Vintage Production California LLC	15,871	26,434	102,575	9	7	0	1	17
SATICOY	VPC, Peak Operator	39,774	92,605	43,504	17	17	3	6	43
SESPE	Seneca, Vaquero, Chemassist, TB Prop.	477,032	436,194	994,771	247	87	11	0	345
SHIELLS CANYON	VPC, Joro, Chemassist	81,063	313,685	358,583	48	3	3	0	54
SIMI	Seneca, C. Barnett	0	0	0	3	1	0	0	4
SOUTH MOUNTAIN	Numerous Operators	741,363	1,256,708	843,296	360	27	8	17	412
TAPO CANYON, SOUTH	Vintage Production California LLC	9,283	6,269	1,675	25	5	0	0	30

TAPO RIDGE	Vintage Production California LLC	528	755	748	2	0	0	0	2
TAPO, NORTH	Berco Oil	4,580	56,340	0	17	0	1	0	18
TEMESCAL	Ample Resources, DCOR	72,793	212,112	92,370	20	2	2	1	25
TIMBER CANYON	VPC, Ridgeway Corp.	31,586	6,581	101,695	29	3	0	1	33
TORREY CANYON	Vintage Production California LLC	118,353	152,427	171,660	46	12	0	7	65
VENTURA	Aera Energy LLC	5,089,921	46,939,666	2,837,593	548	275	469	102	1,394
WEST MOUNTAIN	Vintage Production California LLC	9,239	11,817	10,237	9	4	0	0	13
	VENTURA COUNTY TOTALS	**9,121,781**	**63,272,745**	**8,593,807**	**2086**	**967**	**662**	**258**	**3,973**

Board of Supervisors Hearing
July 23, 2019

Mitigated Negative Declaration Addendum

Attachment 14

APCD Memorandum (AQMP Emissions Inventory)

Renaissance Petroleum Project

Case No. PL14-0103

(Minor Modification of CUP 4384)

VENTURA COUNTY
AIR POLLUTION CONTROL DISTRICT
Memorandum

TO: Brian Baca
Planning/RMA

DATE: September 5, 2017

FROM: Chuck Thomas, Manager CT
Planning/Rules/Incentives

SUBJECT: 2016 Ventura County Air Quality Management Plan Base Year Emissions Inventory and Emissions Forecasts

Attached are Table A-7 and A-8 from Appendix A, Ventura County Emissions Inventory Documentation, of the 2016 Ventura County Air Quality Management Plan (AQMP) (February 2017). The 2016 AQMP presents Ventura County's strategy to attain the 2008 federal 8-hour ozone standard; as required by the federal Clean Air Act Amendments of 1990. Photochemical air quality modeling conducted by the South Coast Air Quality Management District indicates that Ventura County will attain the 2008 federal 8-hour ozone standard by 2020 using local, state, and federal clean air programs.

The 2016 AQMP was adopted by the Ventura County Air Pollution Control Board on February 14, 2017 and by the California Air Resources Board on March 23, 2017. Plan approval by the U.S. Environmental Protection Agency is pending.

Table A-7 presents the 2012 base year and future year emissions by summary category for reactive organic gases (ROG). Table A-8 presents 2012 base year and emissions forecasts by summary category for nitrogen oxides (NOx). ROG and NOx emissions chemically react in the atmosphere to form ozone, Ventura County's most serious air pollution problem.

The base year emissions inventory of ROG and NOx forms the basis for all future year emission projections and also establishes the emission levels against which progress in emission reductions are measured. Forecasted inventories are a projection of the base year inventory that reflects expected growth trends for each emissions source category and emission reductions due to adopted control measures. Emission inventories and projections of an area's ROG and NOx emissions are fundamental components of an ozone clean air plan and are the primary input to air quality models used to assess future year ozone levels and demonstrate attainment of the federal ozone standard.

Forecasts of future year ROG and NOx emissions are a product of two principal components: growth factors and control factors. The forecast methodology involves applying growth and control factors to 2012 base year emissions by pollutant-emitting process category. Growth and control factors are calculated by analyzing the 2012 actual emissions, future socioeconomic assumptions, and the future impact of district, state, and federal control strategies. Development of the Ventura County base year emissions inventory and forecasts for the 2016 AQMP was a joint effort of the Air District and the California Air Resources Board.

Table A-7 shows that countywide ROG emissions were 37.76 tons per day in 2012 and are projected to be 32.27 tons per day in 2035 (14.5% reduction). Similarly, Table A-8 shows that countywide NOx emissions were 40.55 tons per day in 2012 and are projected to be 23.93 tons per day in 2035 (41% reduction). Emissions in the Outer Continental Shelf (OCS) air basin are included in these total emissions.

Countywide ROG emissions associated with onshore oil and gas production were 1.48 tons per day in 2012 and are projected to be 1.05 tons per day in 2035 (29% reduction).

Countywide NOx emissions associated with onshore oil and gas production were 0.17 tons per day in 2012 and are projected to be 0.12 tons per day in 2035 (29% reduction).

Countywide ROG emissions associated with heavy-heavy duty diesel trucks of the type that transport produced crude oil and water were 0.16 tons per day in 2012 and are projected to be 0.03 tons per day in 2035 (81% reduction).

Countywide NOx emissions associated with heavy-heavy duty diesel trucks of the type that transport produced crude oil and water were 2.69 tons per day in 2012 and are projected to be 0.73 tons per day in 2035 (73% reduction).

If you have any questions regarding this issue, feel free to contact by email at chuck@vcapcd.org or by telephone at (805) 645-1427.

c: Mike Villegas, VCAPCD
Alan Ballard, VCAPCD

Base Year and Forecast Emissions Summaries

Tables A-7 and A-8 contain summaries of 2012 base year and forecast year ROG and NOx planning day emissions by summary category and air basin.

Table A-7
ROG Planning Emissions Forecast by Summary Category and Air Basin

Ventura County EIC Summary Category Name	ROG (tons/summer day) 2012	2018	2020	2025	2030	2035
SCC AIR BASIN						
STATIONARY SOURCES						
Fuel Combustion						
Electric Utilities	0.10	0.08	0.09	0.09	0.09	0.09
Cogeneration	0.00	0.00	0.00	0.00	0.00	0.00
Oil And Gas Production (Combustion)	0.03	0.02	0.02	0.02	0.02	0.02
Petroleum Refining (Combustion)	0.00	0.00	0.00	0.00	0.00	0.00
Manufacturing And Industrial	0.02	0.02	0.03	0.03	0.03	0.03
Food And Agricultural Processing	0.03	0.02	0.02	0.02	0.02	0.02
Service And Commercial	0.03	0.03	0.03	0.04	0.04	0.04
Other (Fuel Combustion)	0.01	0.01	0.01	0.01	0.01	0.01
Total Fuel Combustion	**0.22**	**0.20**	**0.20**	**0.20**	**0.20**	**0.21**
Waste Disposal						
Sewage Treatment	0.01	0.01	0.01	0.01	0.01	0.01
Landfills	0.11	0.13	0.13	0.14	0.16	0.17
Incinerators	0.00	0.00	0.00	0.00	0.00	0.00
Soil Remediation	0.00	0.00	0.00	0.00	0.00	0.00
Other (Waste Disposal)	0.74	0.78	0.79	0.80	0.82	0.84
Total Waste Disposal	**0.87**	**0.91**	**0.93**	**0.96**	**0.99**	**1.02**
Cleaning And Surface Coatings						
Laundering	0.04	0.05	0.05	0.05	0.05	0.05
Degreasing	1.87	2.05	2.11	2.18	2.25	2.31
Coatings And Related Process Solvents	0.85	1.01	1.06	1.11	1.15	1.19
Printing	0.27	0.35	0.38	0.40	0.42	0.43
Adhesives And Sealants	0.40	0.44	0.45	0.47	0.48	0.50
Other (Cleaning And Surface Coatings)	0.58	0.63	0.65	0.67	0.69	0.71
Total Cleaning And Surface Coatings	**4.01**	**4.52**	**4.70**	**4.88**	**5.04**	**5.20**
Petroleum Production And Marketing						
Oil And Gas Production	1.45	1.23	1.16	1.13	1.08	1.03
Petroleum Refining	0.00	0.00	0.00	0.00	0.00	0.00
Petroleum Marketing	1.38	1.06	1.03	0.96	0.92	0.92
Other (Petroleum Production And Marketing)	0.00	0.00	0.00	0.00	0.00	0.00
Total Petroleum Production And Marketing	**2.83**	**2.29**	**2.19**	**2.08**	**2.00**	**1.95**
Industrial Processes						
Chemical	0.07	0.09	0.10	0.11	0.12	0.12
Food And Agriculture	0.01	0.02	0.02	0.02	0.02	0.02
Mineral Processes	0.02	0.02	0.02	0.02	0.02	0.02
Metal Processes	0.01	0.00	0.00	0.00	0.00	0.00
Wood And Paper	0.10	0.13	0.15	0.16	0.16	0.17
Electronics	0.02	0.04	0.04	0.05	0.06	0.07
Other (Industrial Processes)	0.39	0.32	0.32	0.33	0.34	0.35
Total Industrial Processes	**0.62**	**0.61**	**0.65**	**0.69**	**0.72**	**0.76**
TOTAL STATIONARY SOURCES	**8.55**	**8.54**	**8.67**	**8.82**	**8.95**	**9.12**

Table A-7 (Cont.)
ROG Planning Emissions Forecast by Summary Category and Air Basin

Ventura County EIC Summary Category Name	ROG (tons/summer day) 2012	2018	2020	2025	2030	2035
AREAWIDE SOURCES						
Solvent Evaporation						
Consumer Products	4.64	4.53	4.59	4.68	4.77	4.87
Architectural Coatings And Related Process Solvents	2.31	2.41	2.45	2.51	2.57	2.62
Pesticides/Fertilizers	3.35	2.39	2.34	2.30	2.25	2.22
Asphalt Paving / Roofing	0.58	0.76	0.82	0.86	0.89	0.93
Total Solvent Evaporation	**10.88**	**10.09**	**10.20**	**10.34**	**10.48**	**10.65**
Miscellaneous Processes						
Residential Fuel Combustion	0.39	0.40	0.41	0.41	0.42	0.43
Farming Operations	0.12	0.12	0.12	0.12	0.12	0.12
Construction And Demolition	0.00	0.00	0.00	0.00	0.00	0.00
Paved Road Dust	0.00	0.00	0.00	0.00	0.00	0.00
Unpaved Road Dust	0.00	0.00	0.00	0.00	0.00	0.00
Fugitive Windblown Dust	0.00	0.00	0.00	0.00	0.00	0.00
Fires	0.01	0.01	0.01	0.01	0.01	0.01
Managed Burning And Disposal	0.14	0.13	0.13	0.13	0.12	0.12
Cooking	0.04	0.05	0.05	0.05	0.05	0.05
Other (Miscellaneous Processes)	0.00	0.00	0.00	0.00	0.00	0.00
Total Miscellaneous Processes	**0.69**	**0.70**	**0.71**	**0.72**	**0.72**	**0.73**
TOTAL AREAWIDE SOURCES	**11.57**	**10.80**	**10.91**	**11.05**	**11.20**	**11.38**
MOBILE SOURCES						
On-Road Motor Vehicles						
Light Duty Passenger (LDA)	3.54	1.74	1.47	1.09	0.90	0.71
Light Duty Trucks - 1 (LDT1)	0.99	0.50	0.42	0.29	0.20	0.11
Light Duty Trucks - 2 (LDT2)	1.36	0.77	0.64	0.48	0.38	0.28
Medium Duty Trucks (MDV)	1.23	0.89	0.76	0.51	0.39	0.29
Light Heavy Duty Gas Trucks - 1 (LHDV1)	0.29	0.23	0.21	0.16	0.13	0.06
Light Heavy Duty Gas Trucks - 2 (LHDV2)	0.03	0.03	0.02	0.01	0.01	0.01
Medium Heavy Duty Gas Trucks (MHDV)	0.07	0.03	0.03	0.02	0.02	0.02
Heavy Heavy Duty Gas Trucks (HHDV)	0.01	0.00	0.00	0.00	0.00	0.00
Light Heavy Duty Diesel Trucks - 1 (LHDV1)	0.03	0.03	0.03	0.02	0.01	0.01
Light Heavy Duty Diesel Trucks - 2 (LHDV2)	0.01	0.01	0.01	0.00	0.00	0.00
Medium Heavy Duty Diesel Trucks (MHDV)	0.08	0.04	0.03	0.01	0.01	0.01
Heavy Heavy Duty Diesel Trucks (HHDV)	0.16	0.04	0.04	0.03	0.03	0.03
Motorcycles (MCY)	0.67	0.56	0.53	0.48	0.44	0.42
Heavy Duty Diesel Urban Buses (UB)	0.01	0.01	0.01	0.00	0.00	0.00
Heavy Duty Gas Urban Buses (UB)	0.00	0.00	0.00	0.00	0.00	0.00
School Buses - Gas (SBG)	0.01	0.00	0.00	0.00	0.00	0.00
School Buses - Diesel (SBD)	0.00	0.00	0.00	0.00	0.00	0.00
Other Buses - Gas (OBG)	0.01	0.01	0.01	0.01	0.01	0.01
Other Buses - Motor Coach - Diesel (OBC)	0.00	0.00	0.00	0.00	0.00	0.00
All Other Buses - Diesel (OBD)	0.00	0.00	0.00	0.00	0.00	0.00
Motor Homes (MH)	0.02	0.01	0.01	0.00	0.00	0.00
Other (On-Road Motor Vehicles)	0.00	0.50	0.00	0.00	0.00	0.00
Total On-Road Motor Vehicles	**8.54**	**5.40**	**4.21**	**3.13**	**2.53**	**1.96**

Table A-7 (Cont.)
ROG Planning Emissions Forecast by Summary Category and Air Basin

Ventura County EIC Summary Category Name	ROG (tons/summer day) 2012	2018	2020	2025	2030	2035
Other Mobile Sources						
Aircraft	0.38	0.87	0.91	1.08	1.30	1.57
Trains	0.01	0.01	0.01	0.01	0.01	0.01
Ocean Going Vessels	0.04	0.04	0.04	0.05	0.05	0.06
Commercial Harbor Craft	0.09	0.09	0.09	0.10	0.10	0.11
Recreational Boats	3.06	2.26	2.04	1.55	1.19	0.99
Off-Road Recreational Vehicles	0.39	0.38	0.37	0.35	0.34	0.34
Off-Road Equipment	3.07	2.50	2.42	2.36	2.37	2.45
Farm Equipment	0.52	0.39	0.35	0.29	0.23	0.20
Fuel Storage And Handling	0.58	0.43	0.40	0.35	0.32	0.22
Total Other Mobile Sources	8.14	6.97	6.63	6.12	5.91	5.94
TOTAL MOBILE SOURCES	**16.68**	**12.37**	**10.84**	**9.25**	**8.44**	**7.91**
TOTAL SCC AIR BASIN	**36.81**	**31.70**	**30.42**	**29.12**	**28.59**	**28.41**
ERC Balance	-----	**1.72**	**1.72**	**1.72**	**1.72**	**1.72**
TOTAL SCC AIR BASIN	**36.81**	**33.42**	**32.14**	**30.84**	**30.31**	**30.13**
OCS AIR BASIN						
STATIONARY SOURCES						
Fuel Combustion						
Cogeneration	0.00	0.00	0.00	0.00	0.00	0.00
Oil And Gas Production (Combustion)	0.01	0.01	0.00	0.00	0.00	0.00
Service And Commercial	0.02	0.02	0.02	0.02	0.02	0.02
Total Fuel Combustion	**0.03**	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**
Waste Disposal						
Incinerators	0.00	0.00	0.00	0.00	0.00	0.00
Total Waste Disposal	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Cleaning And Surface Coatings						
Coatings And Related Process Solvents	0.00	0.00	0.00	0.00	0.00	0.00
Total Cleaning And Surface Coatings	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Petroleum Production And Marketing						
Oil And Gas Production	0.04	0.04	0.04	0.03	0.04	0.04
Petroleum Marketing	0.00	0.00	0.00	0.00	0.00	0.00
Total Petroleum Production And Marketing	**0.04**	**0.04**	**0.04**	**0.03**	**0.04**	**0.04**
TOTAL STATIONARY SOURCES	**0.07**	**0.07**	**0.06**	**0.06**	**0.06**	**0.06**
MOBILE SOURCES						
Other Mobile Sources						
Aircraft	0.05	0.14	0.14	0.14	0.15	0.16
Ships And Commercial Boats	0.02	0.02	0.02	0.02	0.02	0.02
Ocean Going Vessels	0.57	0.79	0.86	1.10	1.37	1.60
Commercial Harbor Craft	0.25	0.28	0.28	0.29	0.29	0.29
Total Other Mobile Sources	0.89	1.23	1.30	1.55	1.83	2.07
TOTAL MOBILE SOURCES	**0.89**	**1.23**	**1.30**	**1.55**	**1.83**	**2.07**
TOTAL OCS AIR BASIN	**0.96**	**1.30**	**1.37**	**1.61**	**1.89**	**2.14**
TOTAL VENTURA COUNTY	**37.76**	**34.72**	**33.50**	**32.44**	**32.21**	**32.27**

Notes:
Source: CEPAM v1.04 (June 2016)
Includes +0.5 tpd adjustment to On-Road Vehicles 2018 ROG for transportation conformity safety margin.
Data rounding may affect totals

Table A-8
NOx Planning Emissions Forecast by Summary Category and Air Basin

Ventura County EIC Summary Category Name	NOx (tons/summer day) 2012	2018	2020	2025	2030	2035
SCC AIR BASIN						
STATIONARY SOURCES						
Fuel Combustion						
Electric Utilities	0.48	0.46	0.47	0.49	0.50	0.51
Cogeneration	0.00	0.00	0.00	0.00	0.00	0.00
Oil And Gas Production (Combustion)	0.13	0.11	0.10	0.10	0.09	0.09
Petroleum Refining (Combustion)	0.00	0.00	0.00	0.00	0.00	0.00
Manufacturing And Industrial	0.27	0.32	0.34	0.35	0.36	0.37
Food And Agricultural Processing	0.47	0.31	0.30	0.27	0.24	0.22
Service And Commercial	0.32	0.31	0.31	0.32	0.33	0.34
Other (Fuel Combustion)	0.21	0.17	0.14	0.14	0.14	0.14
Total Fuel Combustion	**1.89**	**1.68**	**1.67**	**1.66**	**1.66**	**1.68**
Waste Disposal						
Sewage Treatment	0.01	0.01	0.01	0.01	0.01	0.01
Landfills	0.09	0.10	0.11	0.11	0.12	0.13
Incinerators	0.00	0.00	0.00	0.00	0.00	0.00
Soil Remediation	0.00	0.00	0.00	0.00	0.00	0.00
Other (Waste Disposal)	0.00	0.00	0.00	0.00	0.00	0.00
Total Waste Disposal	**0.10**	**0.11**	**0.12**	**0.12**	**0.13**	**0.14**
Cleaning And Surface Coatings						
Laundering	0.00	0.00	0.00	0.00	0.00	0.00
Degreasing	0.00	0.00	0.00	0.00	0.00	0.00
Coatings And Related Process Solvents	0.00	0.00	0.00	0.00	0.00	0.00
Printing	0.00	0.00	0.00	0.00	0.00	0.00
Adhesives And Sealants	0.00	0.00	0.00	0.00	0.00	0.00
Other (Cleaning And Surface Coatings)	0.00	0.00	0.00	0.00	0.00	0.00
Total Cleaning And Surface Coatings	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Petroleum Production And Marketing						
Oil And Gas Production	0.04	0.03	0.03	0.03	0.03	0.03
Petroleum Refining	0.00	0.00	0.00	0.00	0.00	0.00
Petroleum Marketing	0.00	0.00	0.00	0.00	0.00	0.00
Other (Petroleum Production And Marketing)	0.00	0.00	0.00	0.00	0.00	0.00
Total Petroleum Production And Marketing	**0.04**	**0.03**	**0.03**	**0.03**	**0.03**	**0.03**
Industrial Processes						
Chemical	0.00	0.00	0.00	0.00	0.00	0.00
Food And Agriculture	0.00	0.00	0.00	0.00	0.00	0.00
Mineral Processes	0.00	0.00	0.00	0.00	0.00	0.00
Metal Processes	0.00	0.00	0.00	0.00	0.00	0.00
Wood And Paper	0.00	0.00	0.00	0.00	0.00	0.00
Electronics	0.00	0.00	0.00	0.00	0.00	0.00
Other (Industrial Processes)	0.06	0.06	0.06	0.06	0.06	0.06
Total Industrial Processes	**0.06**	**0.06**	**0.06**	**0.06**	**0.07**	**0.07**
TOTAL STATIONARY SOURCES	**2.08**	**1.89**	**1.87**	**1.88**	**1.89**	**1.92**

Table A-8 (Cont.)
NOx Planning Emissions Forecast by Summary Category and Air Basin

Ventura County EIC Summary Category Name	NOx (tons/summer day) 2012	2018	2020	2025	2030	2035
AREAWIDE SOURCES						
Solvent Evaporation						
Consumer Products	0.00	0.00	0.00	0.00	0.00	0.00
Architectural Coatings And Related Process Solvents	0.00	0.00	0.00	0.00	0.00	0.00
Pesticides/Fertilizers	0.00	0.00	0.00	0.00	0.00	0.00
Asphalt Paving / Roofing	0.00	0.00	0.00	0.00	0.00	0.00
Total Solvent Evaporation	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Miscellaneous Processes						
Residential Fuel Combustion	0.86	0.59	0.54	0.54	0.54	0.55
Farming Operations	0.00	0.00	0.00	0.00	0.00	0.00
Construction And Demolition	0.00	0.00	0.00	0.00	0.00	0.00
Paved Road Dust	0.00	0.00	0.00	0.00	0.00	0.00
Unpaved Road Dust	0.00	0.00	0.00	0.00	0.00	0.00
Fugitive Windblown Dust	0.00	0.00	0.00	0.00	0.00	0.00
Fires	0.01	0.01	0.01	0.01	0.01	0.01
Managed Burning And Disposal	0.08	0.08	0.08	0.08	0.07	0.07
Cooking	0.00	0.00	0.00	0.00	0.00	0.00
Other (Miscellaneous Processes)	0.00	0.00	0.00	0.00	0.00	0.00
Total Miscellaneous Processes	**0.95**	**0.68**	**0.62**	**0.62**	**0.62**	**0.62**
TOTAL AREAWIDE SOURCES	**0.95**	**0.68**	**0.62**	**0.62**	**0.62**	**0.62**
MOBILE SOURCES						
On-Road Motor Vehicles						
Light Duty Passenger (LDA)	2.22	1.11	0.90	0.57	0.41	0.30
Light Duty Trucks - 1 (LDT1)	0.54	0.23	0.18	0.10	0.06	0.03
Light Duty Trucks - 2 (LDT2)	1.38	0.60	0.45	0.26	0.18	0.13
Medium Duty Trucks (MDV)	1.54	0.79	0.60	0.29	0.17	0.12
Light Heavy Duty Gas Trucks - 1 (LHDV1)	0.39	0.27	0.24	0.17	0.11	0.08
Light Heavy Duty Gas Trucks - 2 (LHDV2)	0.05	0.04	0.04	0.03	0.02	0.02
Medium Heavy Duty Gas Trucks (MHDV)	0.10	0.06	0.05	0.03	0.03	0.02
Heavy Heavy Duty Gas Trucks (HHDV)	0.02	0.01	0.01	0.01	0.02	0.02
Light Heavy Duty Diesel Trucks - 1 (LHDV1)	1.24	0.92	0.79	0.50	0.30	0.17
Light Heavy Duty Diesel Trucks - 2 (LHDV2)	0.36	0.23	0.19	0.10	0.04	0.02
Medium Heavy Duty Diesel Trucks (MHDV)	1.52	0.98	0.71	0.42	0.49	0.52
Heavy Heavy Duty Diesel Trucks (HHDV)	2.69	1.62	1.48	0.76	0.74	0.73
Motorcycles (MCY)	0.13	0.11	0.11	0.10	0.10	0.10
Heavy Duty Diesel Urban Buses (UB)	0.16	0.11	0.09	0.06	0.03	0.02
Heavy Duty Gas Urban Buses (UB)	0.01	0.01	0.01	0.01	0.01	0.01
School Buses - Gas (SBG)	0.01	0.00	0.00	0.00	0.00	0.00
School Buses - Diesel (SBD)	0.06	0.05	0.05	0.03	0.02	0.01
Other Buses - Gas (OBG)	0.02	0.02	0.01	0.01	0.01	0.01
Other Buses - Motor Coach - Diesel (OBC)	0.02	0.01	0.01	0.00	0.01	0.00
All Other Buses - Diesel (OBD)	0.04	0.02	0.02	0.01	0.01	0.01
Motor Homes (MH)	0.12	0.08	0.06	0.04	0.02	0.01
Other (On-Road Motor Vehicles)	0.00	0.00	0.00	0.00	0.00	0.00
Total On-Road Motor Vehicles	**12.62**	**7.29**	**6.01**	**3.50**	**2.76**	**2.33**

Table A-8 (Cont.)
NOx Planning Emissions Forecast by Summary Category and Air Basin

Ventura County EIC Summary Category Name	2012	2018	2020	2025	2030	2035
	NOx (tons/summer day)					
Other Mobile Sources						
Aircraft	0.20	0.46	0.48	0.57	0.69	0.84
Trains	0.16	0.17	0.17	0.16	0.16	0.15
Ocean Going Vessels	0.84	0.86	0.84	0.90	0.99	1.07
Commercial Harbor Craft	0.98	0.73	0.72	0.72	0.75	0.78
Recreational Boats	0.56	0.48	0.46	0.42	0.39	0.37
Off-Road Recreational Vehicles	0.01	0.01	0.01	0.02	0.02	0.02
Off-Road Equipment	3.43	2.89	2.66	2.03	1.74	1.66
Farm Equipment	2.60	2.09	1.90	1.44	1.10	0.85
Fuel Storage And Handling	0.00	0.00	0.00	0.00	0.00	0.00
Total Other Mobile Sources	**8.78**	**7.69**	**7.25**	**6.27**	**5.83**	**5.74**
TOTAL MOBILE SOURCES	**21.41**	**14.98**	**13.26**	**9.77**	**8.59**	**8.07**
TOTAL SCC AIR BASIN	**24.44**	**17.54**	**15.75**	**12.27**	**11.11**	**10.61**
ERC Balance	----	**0.82**	**0.82**	**0.82**	**0.82**	**0.82**
TOTAL SCC AIR BASIN	**24.44**	**18.36**	**16.57**	**13.09**	**11.93**	**11.43**
OCS AIR BASIN						
STATIONARY SOURCES						
Fuel Combustion						
Cogeneration	0.00	0.00	0.00	0.00	0.00	0.00
Oil And Gas Production (Combustion)	0.03	0.03	0.03	0.02	0.03	0.03
Service And Commercial	0.32	0.27	0.27	0.27	0.27	0.27
Total Fuel Combustion	**0.35**	**0.30**	**0.30**	**0.29**	**0.30**	**0.29**
Waste Disposal						
Incinerators	0.00	0.00	0.00	0.00	0.00	0.00
Total Waste Disposal	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Cleaning And Surface Coatings						
Coatings And Related Process Solvents	0.00	0.00	0.00	0.00	0.00	0.00
Total Cleaning And Surface Coatings	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Petroleum Production And Marketing						
Oil And Gas Production	0.00	0.00	0.00	0.00	0.00	0.00
Petroleum Marketing	0.00	0.00	0.00	0.00	0.00	0.00
Total Petroleum Production And Marketing	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
TOTAL STATIONARY SOURCES	**0.35**	**0.30**	**0.30**	**0.30**	**0.30**	**0.30**
MOBILE SOURCES						
Other Mobile Sources						
Aircraft	0.02	0.07	0.07	0.07	0.08	0.08
Ships And Commercial Boats	0.07	0.07	0.07	0.06	0.06	0.06
Ocean Going Vessels	13.21	13.89	12.54	10.60	9.82	9.63
Commercial Harbor Craft	2.46	2.53	2.51	2.45	2.44	2.42
Total Other Mobile Sources	**15.76**	**16.56**	**15.19**	**13.18**	**12.40**	**12.20**
TOTAL MOBILE SOURCES	**15.76**	**16.56**	**15.19**	**13.18**	**12.40**	**12.20**
TOTAL OCS AIR BASIN	**16.11**	**16.86**	**15.49**	**13.48**	**12.70**	**12.50**
TOTAL VENTURA COUNTY	**40.55**	**35.23**	**32.06**	**26.57**	**24.62**	**23.93**

Notes:
Source: CEPAM v1.04 (June 2016).
No external ARB Adjustments.
Data rounding may affect totals.

Board of Supervisors Hearing
July 23, 2019

Mitigated Negative Declaration Addendum

Attachment 15

VCAPCD Permit To Operate No. 01383

Renaissance Petroleum Project

Case No. PL14-0103

(Minor Modification of CUP 4384)

PERMIT TO OPERATE
Number 01383

Valid January 1, 2019 to December 31, 2019

This Permit Has Been Issued To The Following:

Company Name / Address:

Renaissance Petroleum, LLC
P.O. Box 20456
Bakersfield, CA 93390

Facility Name / Address:

Naumann Drill Site
3140 Etting Rd.
Oxnard, CA 93030

Permission Is Hereby Granted To Operate The Following:

1 - Oil Well (No. 1)
2 - 500 Barrel Crude Oil Storage Tanks (ID # 1 & 2)
1 - Oil Loading Facility. Loading facility may also be used to handle oil production from the Rosenmund Site, PO No. 07448
1 - 500 Barrel Produced Water Tank (#3)
1 - 15000 Gallon (357 bbl) Liquid Petroleum Gas (LPG) Pressure Vessel, collects gas liquids knocked out during sales processing (pressure vessel exempt from permitting requirements)
1 - Liquid Petroleum Gas (LPG) Truck Loading Facility, equipped with a balance type vapor recovery system with vapors from the truck returning to the pressure vessel
1 - Emergency Flare, rating estimated at 51.1 MMBTU/hr, height: 25', flare tip exhaust diameter: 3", electronic ignition, equipped with totalizing gas flow meter
1 - 0.25 MMBTU/hr Glycol Reboiler, part of Glycol Dehydrator system rated at 0.2 MMSCF per day with glycol vent piped to a natural draft condenser and then directly to vapor recovery system, or to Emergency Flare if necessary. Utilizing triethylene glycol (TEG).

This Permit Has Been Issued Subject To The Following Conditions:

1. Permitted Emissions

Permitted Emissions	Tons/Year	Pounds/Hour
Reactive Organics	4.73	7.08
Nitrogen Oxides	2.03	3.49
Particulate Matter	0.15	0.26
Sulfur Oxides	0.08	0.15
Carbon Monoxide	10.57	18.93

2. Annual crude oil throughput shall not exceed 365,000 BOPY combined for the 500 bbl C.O.S.T. (No. 1) and the 500 bbl C.O.S.T. (No. 2); and 365,000 BOPY at the oil loading facility. In order to comply with this condition, the permittee shall maintain monthly records of crude oil throughputs. The monthly records shall be summed for the previous 12 months. Crude oil throughput totals for any of these 12 month periods in excess of the specified limit shall be considered a violation of this condition. Prior to exceeding these

limits, the permittee shall apply for, and receive, a permit modification.

3. Gas consumption at the flare shall not exceed 50.2 million cubic feet (MMCF) per year for any planned flaring events. There is no limit for emergency use. Emergency use is defined as the disposal of process gases in the event of unavoidable process upsets. A planned flaring event includes, but is not limited to, routine flaring to comply with Rule 71.1; or flaring due to planned maintenance performed on wells, equipment, or pipelines by the operator or performed by another operator accepting the produced gas. If a process upset (emergency use) cannot be rectified in a reasonable amount of time, the use of the flare may be determined to be a planned flaring event.

   In order to demonstrate compliance with this condition, the permittee shall maintain monthly records of flare gas consumption. The permittee shall maintain records which differentiate between emergency usage and planned flaring events. The monthly records shall be summed for the previous 12 months. Flare gas combustion totals for planned flaring events for any of these 12 month rolling periods in excess of the specified limit shall be considered a violation of this permit.

4. Throughput at the LPG loading facility shall not exceed 15,000 barrels per year. Prior to exceeding this limit, the permittee shall apply for, and receive, a permit modification.

   In order to comply with this condition, the permittee shall maintain monthly records of LPG throughput. The monthly records shall be summed for the previous 12 months. LPG throughput totals for any of these 12 month periods in excess of the specified limit shall be considered a violation of this condition.

5. The following wells shall be free flowing or operated on electric motor driven artificial lift equipment: Naumann No. 1. This condition is applied as best available control technology (BACT).

6. Tanks shall comply with Rule 71.1, "Crude Oil Production and Separation". This includes, but is not limited to, the following requirements:

   a) Pursuant to Rule 71.1.B.1.a, tanks not listed above as being exempt from vapor recovery shall be equipped with a properly installed, maintained, and operated vapor recovery system. The vapor disposal portion of the vapor recovery system shall consist of a system that directs all vapors to a fuel gas system, a sales gas system, or to a permitted flare or a flare rated at less than 1.00 MMBTU per hour that combusts reactive organic compounds.

   b) Pursuant to Rule 71.1.D.2, for tanks not listed above as being exempt from vapor recovery, the vapor recovery requirements of

Rule 71.1.B.1.a shall not apply during maintenance operation on vapor recovery systems or tank batteries if the District Enforcement Section is notified verbally at least 24 hours prior to the maintenance operation, and if the maintenance operation will take no more than 24 hours to complete.

c) A tank's hatches and other inlet and outlet piping connections are components subject to the leak requirements of Rule 74.10, "Components at Crude Oil and Natural Gas Production and Processing Facilities".

7. The permittee shall comply with Rule 71.3, "Transfer of Reactive Organic Compound Liquids". This includes, but is not limited to, the following requirements:

   a) Pursuant to Rule 71.3.B.2.a, no person shall transfer ROC liquids into any ROC delivery vessel without utilizing a bottom-loaded vapor recovery system that prevents the displaced vapors during loading from being released into the atmosphere. The vapor recovery system shall be capable of collecting all ROC vapors, and shall have a vapor return or condensation system that connects to a gas pipeline recovery and distribution system or to a vapor disposal system with a control efficiency of at least 90 percent by weight.

   b) Pursuant to Rule 71.3.B.2.b.2, no person shall transfer ROC liquids into any ROC delivery vessel without utilizing a combination of overfill devices and/or procedures, submitted in writing to the APCD, that is at least as effective in preventing overfill spillage as the system in Rule 71.3.B.2.b.1. The permittee has submitted an alternative primary and secondary overfill protection system and shall comply with Rule 71.3.B.2.b.2 as discussed below.

   c) Pursuant to Rule 71.3.B.2.c, no person shall transfer ROC liquids into any ROC liquid delivery vessel without utilizing either a block and bleed valve system or other connectors with equivalent spill prevention characteristics.

   d) Pursuant to Rule 71.3.D.1, permittee shall annually monitor one complete loading operation for leaks and for proper operation of the loading equipment and delivery vessel vapor recovery and overfill protection systems. Permittee shall maintain records of the loading inspection as required by Rule 71.3.F.1. These records shall be maintained at the facility for the previous two years and made available to APCD personnel upon request.

8. In order to comply with the primary and secondary overfill protection system requirements of Rule 71.3, "Transfer of Reactive Organic Compound Liquids", permittee has submitted an alternative system and shall comply with Rule 71.3.B.2.b.2 by utilizing only delivery vessels equipped with a resettable turbine meter and the following procedure:

a) Determine the gravity of the oil.

b) Calculate the weight of the oil per barrel (use API Table 8).

c) Calculate the maximum net weight of the cargo, in barrels, that can legally be transported. This weight shall not exceed the capacity or weight limitation of any liquid delivery vessel.

d) Continuously observe the turbine meter in order to cease transfer at the calculated number of barrels.

e) Time each loading operation to determine an average time to fill a delivery vessel to legal weight. Utilize this time limit in conjunction with the turbine meter to prevent overfill.

9. All loading of LPG shall comply with Rule 71.3, "Transfer of Reactive Organic Compound Liquids". This includes, but is not limited to, the following requirements:

   a) The LPG facility shall be bottom loaded. (Rule 71.3.B.1)

   b) The LPG facility shall utilize a bottom-loaded vapor recovery system tha prevents the displaced vapors during loading from being released into the atmosphere. The vapor recovery system shall be capable of collecting all ROC vapors, and shall have a vapor return or condensation system that routes vapors back to the 15,000 gallon pressure vessel. (Rule 71.3.B.2.a)

   c) The LPG loading shall be conducted into a transport vessel with a sight glass metering system that is graduated in gallons. The operator shall monitor the loading at all times until the loading is complete in order to prevent overfill. (Rule 71.3.B.2.b)

   d) The LPG loading facility shall be equipped with a block and bleed system for spill prevention. (Rule 71.3.B.2.c)

   e) Pursuant to Rule 71.3.D.1, the permittee shall annually monitor one complete loading operation of leaks and for proper operation of the loading equipment and delivery vessel vapor recovery and overfill protection systems. Permittee shall maintain records of the loading inspection as required by Rule 71.3.F.1. These records shall be maintained at the facility for the previous two years and made available to APCD personnel upon request.

10. All hatches on the LPG loading vessel shall be closed during transfer operations.

11. The LPG truck loading system's inlet and outlet piping connections are components subject to the leak requirements of Rule 74.10, "Components at Crude Oil and Natural Gas Production and Processing Facilities".

12. The flare(s) shall be equipped with a totalizing gas meter. The meter shall be accurate to plus or minus five (5) percent as certified by the manufacturer in writing.

13. The flare stack shall be equipped with a continuous pilot or a functional, operating pilotless electronic ignition system when operating as a portion of the vapor recovery system or when controlling produced gas as required by Rule 71.1.

14. Permittee shall test the flare's ignition system monthly and shall maintain a monthly record of the flare's ignition system tests and maintenance activities, including the test date and operator's initials.

15. Flare Oxides of Sulfur (SOx) Emission Requirements:

    a) The sulfur content of the gas entering the flare shall not exceed 20 ppmvd, calculated as hydrogen sulfide (H2S) at standard conditions.
    b) Any flare gas hydrogen sulfide (H2S) pre-treatment system shall be operated whenever the flare is operated as necessary to comply with the 20 ppmvd limit above.
    c) Annual testing for sulfur compounds in the flare gas shall be conducted using H2S detector tubes, SCAQMD Method 307-94, or EPA Method 16, as applicable.

    These conditions are applied pursuant to Rule 54, "Sulfur Compounds". The recordkeeping and other requirements of Rule 54.C are not required if compliance with these conditions is maintained.

16. The glycol reboiler shall be fired on natural gas only. This condition is applied as Best Available Control Technology (BACT).

17. No natural gas consumption limit applies to the Glycol Reboiler.. The permitted emissions represent the theoretical maximum usage, therefore natural gas consumption records for the Glycol Reboiler are not required.

18. Permittee shall comply with all provisions of Rule 71.5, "Glycol Dehydrators". This includes, but is not limited to, the following requirements:

    a) The gas dehydration system's regenerator vents shall be controlled to reduce the emissions of ROC (Reactive Organic Compounds). Permittee has chosen to direct all glycol vent emissions into the vapor recovery system, or to the Emergency Flare if necessary.. Upon entry into the tank vapor recovery system, the glycol vent emissions are subject to Rule 71.1, "Crude Oil Production and Separation".

    b) The condensed hydrocarbon liquid stream from the glycol dehydration vent shall be stored and handled in a manner that will not cause or allow evaporation ROC into the atmosphere as required by Rule 71.5.B.2.

c) The glycol unit's emission control system shall be maintained in a leak-free condition as required by Rule 71.5.B.3.

d) Maintain a current file of glycol dehydrator information as required by Rule 71.5.D.1.

19. Pursuant to Rule 71.5.B.1.b, the flare that controls the ROC emissions from the glycol dehydrator shall have all of the following features, as a minimum:

a) Operate continually in a smokeless mode.

b) Electronic controlled ignition system with a malfunction alarm system if the pilot flame fails.

c) Liquid knock out system to condense any condensable vapors.

d) Sight glass ports, if the flame is not visible.

20. Permittee shall maintain records of monthly oil throughput at the crude oil storage tank(s). These records shall be maintained at the facility for the previous two years and made available to APCD personnel upon request.

21. Permittee shall maintain records of monthly oil throughput at the crude oil loading facility(s). These records shall be maintained at the facility for the previous two years and made available to APCD personnel upon request.

22. Permittee shall maintain monthly records of LPG throughput at the truck loading rack. The permittee shall also maintain records of loading facility inspections and reactive organic compound liquid transfers as detailed in Rule 71.3.F. These records shall be maintained at the facility for the previous two years and made available to APCD personnel upon request.

23. Permittee shall maintain monthly and rolling twelve month records of the volume (MMCF or MCF) of gas combusted in the flare. Monthly and twelve month rolling records shall be maintained for total flare usage and for planned flaring events (non-emergency use). Emergency use and planned flaring are defined above. The permittee shall maintain records which differentiate between emergency usage and planned flaring events. These records shall be maintained at the facility for the previous two years and made available to APCD personnel upon request.

24. Permittee shall comply with all provisions of Rule 74.10, "Components at Crude Oil Production and Natural Gas Production and Processing Facilities". Permittee shall submit an Operator Management Plan to the District Compliance Division for approval

and shall submit revisions to the plan as necessary. Permittee shall continue to implement the leak inspection and repair requirements of the Operator Management Plan.

25. Permittee shall comply with all applicable requirements of the California ARB "Greenhouse Gas Emission Standards for Crude Oil and Natural Gas Facilities" (CARB Oil and Gas Regulation).

    The vapor recovery and produced gas requirements of Rule 71.1 are more stringent than this CARB Oil and Gas Regulation and remain in effect. Many components, including components found on tanks, separators, wells, and pressure vessels that are subject to the leak detection and repair requirements of Rule 74.10 are exempt from the leak detection and repair requirements of this CARB Oil and Gas Regulation.

    Pursuant to Section 95674(b)(2) of the CARB Oil and Gas Regulation, permittee shall register the subject equipment at each facility with CARB as specified in Appendix A Table A6. Updates to the facility registration must be filed with CARB no later than January 1 of the calendar year after the year in which any information required by the CARB Oil and Gas Regulation has changed.

Within 30 days after receipt of this permit, the permittee may petition the Hearing Board to review any new or modified condition (Rule 22).

This permit, or a copy, shall be posted reasonably close to the subject equipment and shall be accessible to inspection personnel (Rule 19). This permit is not transferable from one location to another unless the equipment is specifically listed as being portable (Rule 20).

This Permit to Operate shall not be construed to allow any emission unit to operate in violation of any state or federal emission standard or any rule of the District.

KEZ

Kerby E. Zozula, Manager
Engineering Division

For:

Michael Villegas
Air Pollution Control Officer

Board of Supervisors Hearing
July 23, 2019

Mitigated Negative Declaration Addendum

Attachment 16

Noise Impact Assessment
6-20-13 Sespe Consulting, Inc. Report

Renaissance Petroleum Project

Case No. PL14-0103

(Minor Modification of CUP 4384)

**Note: This assessment was included in the materials submitted in support of an application for modification of CUP 3543, and is part of the public record.

SESPE
CONSULTING, INC.
468 Poli Street, Suite 2E • Ventura, CA 93001
Office (805) 275-1515 • Fax (805) 667-8104

Confidential – Attorney Client
Privileged Work Product

June 20, 2013

Kate Neiswender
Law Office of K. M. Neiswender
PO Box 24617
Ventura, CA 93002

Re: Noise Impact Assessment
Mirada Petroleum Corporation - Agnew Lease

Dear Ms. Neiswender:

This letter summarizes the Noise Impact Assessment (NIA) prepared for Mirada Petroleum Corporation's (Mirada) Agnew Lease (Facility) located off of Koenigstein Rd in unincorporated Ventùra County. This NIA has been prepared in support of an application for Minor Modification of Conditional Use Permit (CUP) 3543, which proposes to extend the CUP and allow the drilling of six (6) new oil wells over the next ten (10) years. This NIA addresses the potential noise impacts associated with the future oil well drilling activities at this Facility – it does not address ongoing oil production operations.

Project

The Facility is an active oil and gas production operation located approximately 1.5 miles north of the intersection of Koenigstein Road and Highway 150 in unincorporated Ventura County. The attached Figure 1 shows the location of the Facility.

The proposed Minor Modification requests two primary changes to CUP 3543:

- Extend the CUP, which is currently set to expire in November 2013, for an additional 25 years; and
- Allow for the drilling of six (6) new oil wells over the next ten (10) years.

The proposed wells will be drilled on the existing well pad, near the existing wells. When drilling a new well, it will be necessary for the Applicant to conduct drilling operations 24 hours per day. This NIA addresses the potential noise impacts from these future drilling activities during the day, evening, and nighttime. This NIA analyzes a hypothetical drilling operation that is meant to conservatively represent all six (6) future well drilling operations. In addition, a general mitigation is proposed that will be required for all six (6) of the future drilling activities.

Background Noise Monitoring

Starting on Tuesday May 7, 2013, a 24-hour ambient noise measurement was obtained in order to characterize background noise levels in the vicinity of the Facility. The location of the measurement is shown on Figure 2. The location of the measurement was chosen to best represent the noise environment at the nearby residences.

The measurement was obtained with a Type 2 Quest Soundpro SE/DL sound level meter set to record noise levels with a slow response and A-weighting. The noise measurements were logged in 1-minute increments and the noise meter was calibrated immediately prior to use. The noise measurement log is attached.

Table 1 summarizes the background noise levels in the vicinity of the Facility.

Table 1 – Background Noise Levels (dBA)

Parameter	Day	Evening	Night	Overall
Average Noise Level (L_{eq})	47.5	38.1	38.1	45.2
Peak Hour Noise Level (L_{eq}1H)	51.5	46.6	45.0	51.5
CNEL	---	---	---	48.8

The abbreviations and terms employed in Table 1 and elsewhere in this NIA are defined below:

- Timeframes – For the purposes of this NIA:
  - Day is 6 a.m. to 7 p.m.
  - Evening is 7 p.m. to 10 p.m.
  - Night is 10 p.m. to 6 a.m.
- A-Weighted Sound Level (dBA) - Sound pressure level measured using the A-weighting network, a filter which discriminates against low and very high frequencies in a manner similar to the human hearing mechanism at moderate sound levels. The A-weighted sound level is generally used when discussing environmental noise impacts.
- Equivalent Continuous Noise Level (L_{eq}) - The average noise level over a specified time period.
- One Hour Equivalent Continuous Noise Level (L_{eq}1H) - The average noise level over a one hour time period.
- Community Noise Equivalent Level (CNEL) - The long-term time average sound level, weighted as follows:
  - Daytime noise is not weighted;
  - Evening noise is weighted by +5 dB; and
  - Nighttime noise is weighted by +10 dB.

Significance Thresholds

The *Ventura County General Plan* (June 28, 2011) includes the following standards for noise generators proposed to be located near any noise sensitive use:

> *Noise generators, proposed to be located near any noise sensitive use, shall incorporate noise control measures so that ongoing outdoor noise levels received by the noise sensitive receptor, measured at the exterior wall of the building, does not exceed any of the following standards:*
>
> *a. L_{eq}1H of 55dB(A) or ambient noise level plus 3dB(A), whichever is greater during any hour from 6:00 a.m. to 7:00 p.m.*
>
> *b. L_{eq}1H of 50dB(A) or ambient noise level plus 3dB(A), whichever is greater during any hour from 7:00 p.m. to 10:00 p.m.*
>
> *a. L_{eq}1H of 45dB(A) or ambient noise level plus 3dB(A), whichever is greater during any hour from 10:00 p.m. to 6:00 a.m.*

Since drilling is a temporary activity, it may be appropriate to utilize the construction noise thresholds in the *County of Ventura Construction Noise Threshold Criteria and Control Plan* (July, 2010). The daytime construction thresholds, which allow for higher noise levels for shorter duration construction activities, are presented in Table 2. Note that the evening and night construction thresholds are the same as the General Plan evening and night thresholds.

Table 2: Daytime Construction Noise Thresholds

Construction Duration	Noise Thresholds (L_{eq}1H, dBA)
0 to 3 days	75 or Ambient + 3 dBA
4 to 7 days	70 or Ambient + 3 dBA
1 to 2 weeks	65 or Ambient + 3 dBA
2 to 8 weeks	60 or Ambient + 3 dBA
Longer than 8 weeks	55 or Ambient + 3 dBA

While the exact duration of a well drilling event depends on many factors, it generally takes about 2 weeks to drill a well. The Applicant proposes to drill 6 additional wells, resulting in a total drilling duration of 12 weeks spread over the next 10 years. As shown in Table 2, for durations over 8 weeks, the daytime construction noise threshold is equivalent to the General Plan daytime threshold.

Table 3 presents the noise thresholds applicable to this Facility. Since the ambient noise levels are below the fixed noise thresholds in all cases, the significance thresholds are not adjusted for ambient noise levels.

Table 3: Project Noise Thresholds (dBA)

Parameter	Day	Evening	Night
Peak hour (L_{eq}1H)	55	50	45

Noise Source Characterization

A drilling rig includes many noise producing components and each drilling rig can have different types and quantities of these components. As such, this NIA utilizes conservative assumptions to determine an overall drilling rig noise level that is representative of the different rigs that may be used at the Facility. For example, it is assumed that diesel generators are used to power the drilling rig rather than grid electricity. This results in a larger estimate of drilling rig noise because large diesel generators produce high noise levels.

This NIA relies on the extensive drilling rig noise characterization done for the *Whittier Main Oil Field Project Environmental Impact Report* (Whittier EIR, June 2011) to calculate noise impacts. The Whittier EIR, prepared by Marine Research Specialists, utilized a hypothetical drilling rig component list to determine the overall noise associated with the rig. Each component of the drilling rig was assigned a sound level and a usage fraction. The sound levels were based on a variety of sources, including other noise studies, manufacturer specifications, and government agency guidance. The usage fractions were assumed to be 90% for the majority of essential components, 20% for components associated with the crane, 500 one-second impulses per day for metal on metal noise, and 1,250 two-second impulses per day for other incidental noises (voices, backup alarms, annunciators, and drawline brakes). Table 4 shows the drilling rig components, sound levels, and usage fractions for the hypothetical drill rig in the Whittier EIR. For more information, including the source of each sound level assumption, refer to the Whittier EIR Noise Section.

Table 4: Drilling Rig Component Breakdown

Component	Usage Fraction	Sound Level at 50' (dBA)	Vertical Location
Mud Mixer	0.9	76	Ground Level
Mud Pumps and Diesel Engines (2)	0.9	69	Ground Level
Shackers (2)	0.5	69	Ground Level
60-ton Crane	0.2	81	Ground Level
Backup Alarms, Voices, Annunciators	0.030	94	Ground Level
Metal-on-Metal Noise	0.006	100	Ground Level
Metal-on-Metal Noise	0.006	100	Rig Floor (~20')
Metal-on-Metal Noise	0.006	100	Boards (~50')
Cutting Conveyor	0.9	69	Rig Floor (~20')
Drill Rig Engine	0.9	84	Ground Level
Drawworks Engine	0.9	74	Rig Floor (~20')
Drawline Brakes	0.030	80	Rig Floor (~20')
Note: Based on the *Whittier Main Oil Field Project Environmental Impact Report* (Whittier EIR, June 2011). Currently available at: http://www.cityofwhittier.org/depts/cd/mineralinfo/eirdraft.asp			

When these sources were combined in a computer model, the overall noise level is 85 dBA at 50 feet away from the rig (Whittier EIR). This noise level is used as the basis for calculations in this NIA. This noise level is conservative when compared to other estimates of drilling rig noise levels found in a variety of sources:

- 83 dBA at 50 feet in the Bureau of Land Management's *Draft RMPA/EIS for Federal Fluid Minerals Leasing and Development in Sierra and Otero Counties* (2001).
- 82 dBA at 50 feet in Arup Acoustics' *Plains Exploration and Production Company, Inglewood Oil Field, Noise Impact Study* (2004).
- 77 to 82 dBA at 50 feet in Los Angeles County's *Baldwin Hills EIR* (2009).
- 75 dBA at 50 feet in the Bureau of Land Management's *Noise Analysis for the Pinedale Anticline Oil and Gas Exploration and Development Project* (1999).

Noise Impact Calculation

Noise impacts associated with well drilling have been calculated utilizing the source data described above and a propagation calculation that determines how much the noise level is attenuated between the source and the receptor. The propagation calculation assumes that noise levels are reduced by 6 dBA per doubling of distance, which is the noise attenuation associated with hemispherical propagation. This is the industry standard propagation calculation and is included in the *County of Ventura Construction Noise Threshold Criteria and Control Plan*. See the attached Noise Impact Calculations for more information.

In addition to the noise attenuation from propagation, a separate terrain attenuation factor is included in the calculations. This primarily represents the shielding provided by the terrain, as shown by the cross sections in Figure 3. However, it is also meant to encompass attenuation due to atmospheric absorption, weather, ground impedance, and vegetation. A terrain attenuation of 15 dBA is assumed for Receptor 1 because the source is shielded up to a height of at least 20 feet by the intervening terrain. A terrain attenuation of 5 dBA is assumed for Receptors 2 and 3 because the source is only partially shielded from the perspective of these receptors. These estimates of attenuation are conservatively low for the high degree of shielding and other forms of attenuation present. For comparison, the Federal Highway Administration's *Noise Barrier Design Handbook* indicates that an attenuation of 10 - 15 dBA is expected from a well-designed noise barrier. The vegetated hill shielding the drilling rig for this Facility is expected to provide more attenuation than a noise barrier.

Based on the calculations described above and attached to this NIA, Table 5 presents the unmitigated noise impacts from drilling at the nearby receptors. The results are compared to the nighttime significance thresholds because they are the most conservative and because nighttime drilling will be necessary.

Table 5: Unmitigated Drilling Noise Impacts

Parameter	Receptor 1	Receptor 2	Receptor 3
Noise Impact	44.4	54.9	55.0
Nighttime Significance Threshold	45.0	45.0	45.0
Significant?	**No**	**Yes**	**Yes**
Required Mitigation	None	9.9	10

Mitigation

As shown in Table 5, 10 dBA of mitigation is required to reduce the nighttime impact at Receptors 2 and 3 to less than significant. Therefore, the following mitigation measure is provided:

NO-1: Prior to initiating well drilling operations, a sound barrier will be erected around the drilling rig. The sound barrier will be in place for the entire duration of drilling rig activities. The sound barrier must be sufficiently tall and appropriately located to break line of site between the primary drilling rig noise sources and the nearby residences. For the purposes of this mitigation, the primary drilling rig noise sources are assumed to be located between ground level (0 feet) and the drilling rig floor (about 20 feet). It is not practical or necessary to provide shielding for the upper reaches of the drilling rig mast.

Mitigation measure NO-1 is expected to provide **at least** 10 dBA of noise attenuation for Receptors 2 and 3 (see above estimate of noise barrier attenuation from the *Noise Barrier Design Handbook).* Table 6 presents the mitigated impacts and compares them to the nighttime threshold.

Table 6: Mitigated Drilling Noise Impacts

Parameter	Receptor 1	Receptor 2	Receptor 2
Mitigated Noise Impact	44.4	<44.9	<45.0
Nighttime Significance Threshold	45.0	45.0	45.0
Significant?	**No**	**No**	**No**

Conclusion

This NIA finds that the drilling activities proposed by this Project will have significant, but mitigable impacts on nearby receptors.

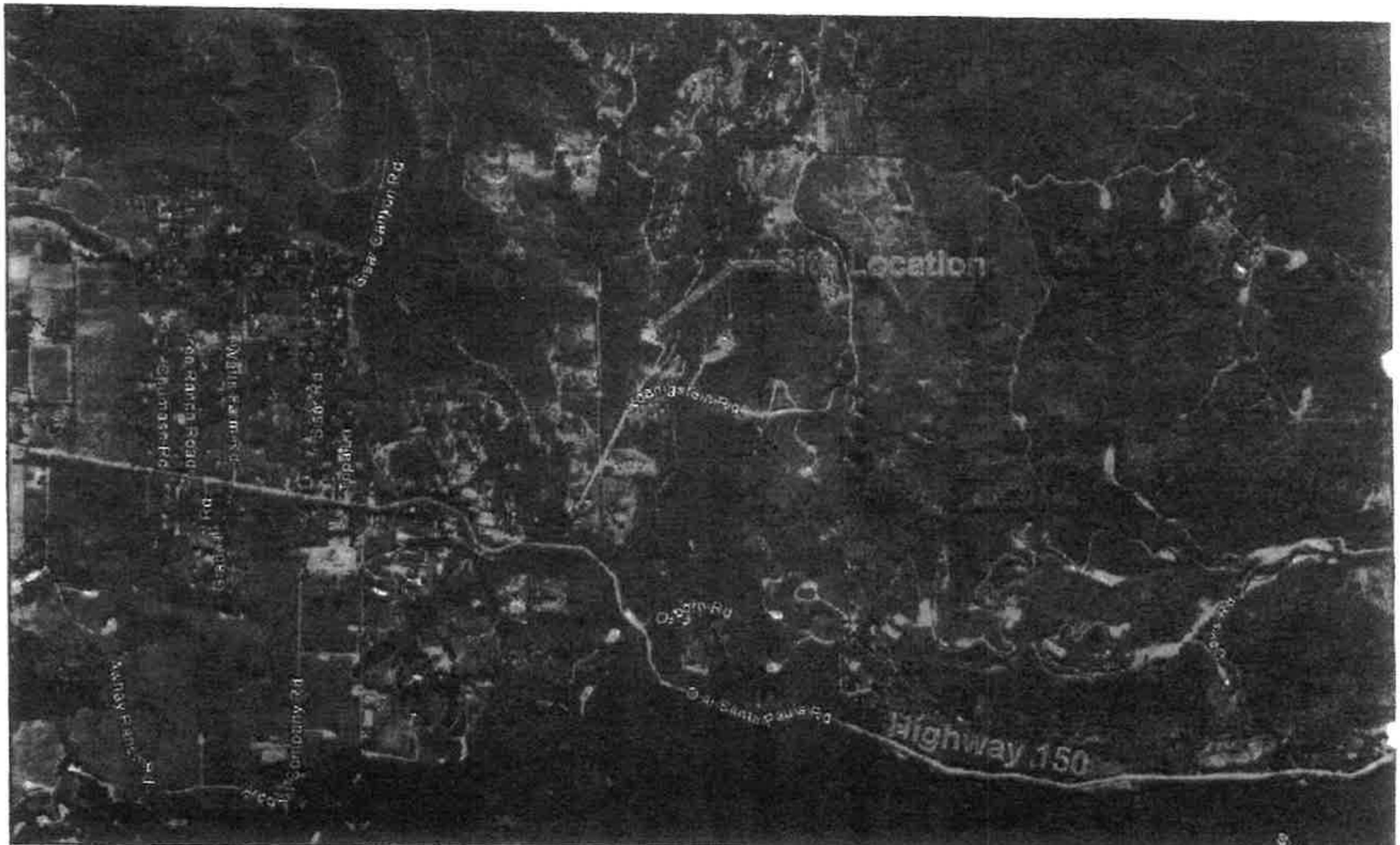
With mitigation, the noise impacts from drilling operations are less than significant when compared to the day, evening, and nighttime thresholds. Also, it should be reiterated that the drilling noise impacts will be infrequent (6 wells over 10 years) and short duration (about 2 weeks each well).

Please call John Hecht or me at (805) 275-1515 if you have any questions or if you need additional information.

Respectfully submitted.

Garrett Zuleger, P.E.
Project Manager I – Engineering
Sespe Consulting, Inc.

Attachments
1. Figures
   - Figure 1: Vicinity Map
   - Figure 2: Topographic Map
   - Figure 3: Source-Receptor Cross Sections
2. Noise Measurement Log
3. Noise Impact Calculations



SCALE AS SHOWN	DATE 06/2013

Site Location Map

Mirada Petroleum
Agnew Lease
Ventura County, California

SESPE
CONSULTING, INC
468 Poli Street, Suite 2E - Ventura, CA 93001
(805) 275-1515 www.sespeconsulting.com

FIGURE
1

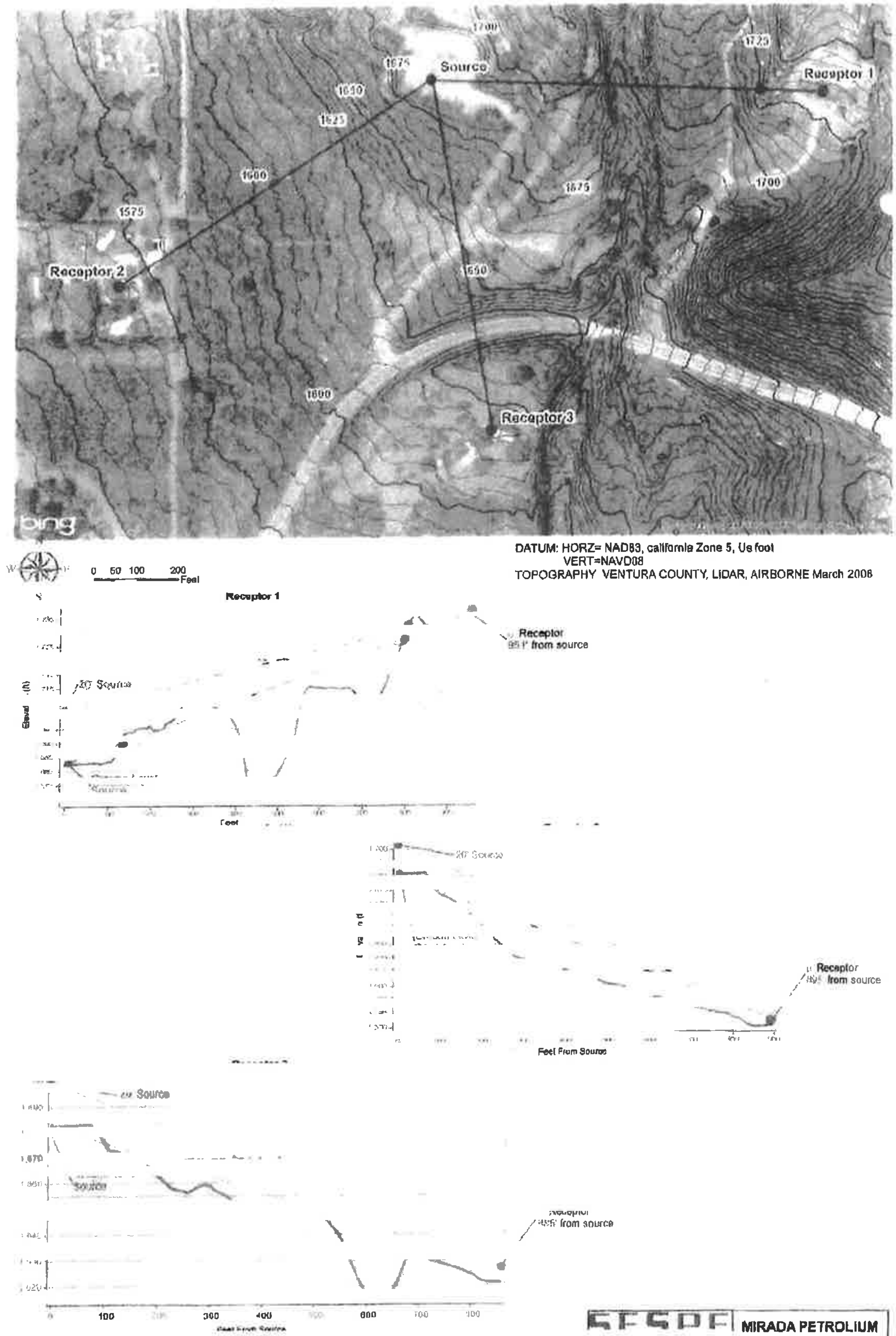
0 100 200 400 Feet
1 inch = 200 feet

DATUM: HORZ= NAD83 california Zone 5, Us foot
VERT=NAVD88
TOPOGRAPHY VENTURA COUNTY, LIDAR AIRBORNE March 2005

SESPE CONSULTING, INC.

MIRADA PETROLEUM

EXHIBIT 2
LOCATION



SESPE CONSULTING, INC.	MIRADA PETROLIUM
	EXHIBIT 3 LINE OF SIGHT

Noise Measurement Summary

Serial Number	BIJ090010	UNIT REV	R13B
Start Time	10:14:36 07-May-2013		
Run Length	24:00:00 5529600		

Microphone Information		
Description	Units	Value
Sensitivity	dB	29
Polarization	Volts	0
Meter Range	dB	120
Max Level	dB	140
Meas. Floor	dB	-20

Calibration Information			
Description		Units	Value
Pre-Cal	Level	dB	114
	Date		10:13:04 07-May-2013
Post-Cal	Level	dB	
	Date		
ReCert	Date		Unavailable

Configuration Information			
Description	Units	Meter 1	Meter 2
Integration Threshold	dB	OFF	OFF
Exchange Rate	dB	3	3
Criterion Level	dB	90	90
Upper Limit Level	dB	130	130
Projected Time	Hrs	8	8
Weighting		A	C
Time Response		SLOW	SLOW

Sespe's Calculations based on Logged Data

Parameter	Day	Evening	Night	Overall
Average Arithmetic SPL over period	55,746	6,407	6,505	33,165
Average Leq over Period	47.5	38.1	38.1	45.2
Median hour Leq during period	47.2	38.2	32.3	40.5
Peak hour Leq during period	51.5	46.6	45.0	51.5

Measurement	Units	Meter 1 Broadband	Meter 2 Broadband
Lavg	dB	45.2	56.8
Lmax	dB	76.4	85.9
Lmin	dB	27.2	32.6
Lpk	dB	110.4	108.5
TWA	dB	50	61.5
PTWA	dB	45.2	56.8
DOSE	%	0.01	0.14
PDOSE	%	0	0.05
SEL	dB	94.6	106.1
EXP	p2s	1	16

Measurement	Units	Value
LDN	dB	48.9
CNEL	dB	48.8
TAKTMAX (5sec)	dB	N/A
LC-A	dB	11.6

Exceedence	Units	Value
L02	dB	55.5
L10	dB	46.2
L25	dB	40.1
L50	dB	35.8

		Meter 1			Meter 2		
		Count	Percent	Time	Count	Percent	Time
Overload	(OL)	0	0	00:00:00	0	0	00:00:00
Under-Range	(UR)	2353867	42.56	10:12:59	248109	4.48	01:04:36
Upper Limit	(UL)	0	0	00:00:00	0	0	00:00:00

Exceedence Table

	0	1	2	3	4	5	6	7	8	9
0	76.4	57.5	55.5	54	52.7	51.5	50.3	49.1	48	47.1
10	46.2	45.4	44.8	44.3	43.7	43.3	42.8	42.4	42.1	41.8
20	41.5	41.2	40.9	40.6	40.4	40.1	39.9	39.6	39.4	39.2
30	39	38.8	38.6	38.4	38.3	38.1	37.9	37.7	37.6	37.4
40	37.2	37.1	36.9	36.8	36.6	36.5	36.4	36.2	36.1	35.9
50	35.8	35.7	35.6	35.5	35.3	35.2	35.1	34.9	34.8	34.6
60	34.4	34.3	34.1	33.9	33.7	33.4	33.2	32.9	32.7	32.5
70	32.3	32.1	31.8	31.6	31.4	31.2	30.9	30.7	30.4	30.2
80	30	29.8	29.6	29.4	29.2	29	28.8	28.7	28.5	28.4
90	28.3	28.2	28.2	28.1	28	27.9	27.8	27.8	27.7	27.5

Noise Measurement Log

Oil Well Drilling - Noise Impact Calculations

Receptor	Distance from Source (ft)	Source Noise Level at 50' (dBA)	Direct Propogation Noise Level (dBA)	Terrain Attenuation* (dBA)	Unmitigated Noise Level (dBA)
Receptor 1	951	85	59.4	15	**44.4**
Receptor 2	895	85	59.9	5	**54.9**
Receptor 3	885	85	60.0	5	**55.0**

Note: The propogation calculation is based on 6 dBA per doubling of distance, per the Ventura County *Construction Noise Threshold Critera and Control Plan* (July 2010). This guidance differs from the *Ventura County Initial Study Assessment Guidelines*, which recommends a propogation attenuation of 5 dBA per doubling of distance. The 6 dBA per doubling of distance is used because it is the actual propogation loss for hemispherical propogation and it is used throughout the industry.

* The terrain attenuation estimate primarily represents the shielding provided by the terrain (see Figure 3). However, atmospheric absorption, attenuation due to weather, ground impedance, and attenation due to vegetation also provide additional attenuation that is included in this estimate.

Board of Supervisors Hearing
July 23, 2019

Mitigated Negative Declaration Addendum

Attachment 17

5-21-19 Evaluation of GHG Emissions of Well Drilling

Renaissance Petroleum Project

Case No. PL14-0103
(Minor Modification of CUP 4384)

Baca, Brian

From:	Tyler Harris <tyler@vcapcd.org>
Sent:	Tuesday, May 21, 2019 12:07 PM
To:	Baca, Brian
Cc:	Nicole Collazo; aghasemi; Tyler Harris; Villegas, Michael
Subject:	[External] Oil Well Drilling GHG Emissions
Attachments:	GHG emissions from drilling one generic oil well.pdf

CAUTION: This email contains an attachment. If it looks suspicious or is not expected, DO NOT open and immediately forward to Spam.Manager@ventura.org.

Brian,

Per your request, please see below a summary of greenhouse gas (GHG) emissions from the drilling of a single generic oil well. The calculations are based on the assumption outlined in a memo to you from Chuck Thomas dated September 6, 2017, i.e. drilling will require combustion of 1,000 gallons of diesel fuel per day. Per our conversation, it will take 60 days to drill a single well. Emission factors and global warming potential (GWP) values obtained from EPA Emission Factors for Greenhouse Gas Inventories modified 9 March 2018.

For a single well, I estimate 615 metric tonnes (MT) of GHG expressed as carbon dioxide equivalents (CO2e). For a project with four wells, the total GHG emissions are estimated at 2,460 MT CO2e from the drilling operations. I have attached a PDF showing the calculations used to reach these estimates.

Commuter trip emissions are expected to be insignificant compared to the emissions from drilling equipment.

Please let me know if you have any questions.

Best regards,
Tyler

Tyler S. Harris
Air Quality Engineer
Ventura County Air Pollution Control District
669 County Square Drive 2nd Floor
Ventura, CA 93003
Phone: (805) 645-1407
Fax: (805) 645-1444
tyler@vcapcd.org

Please note my work schedule is Monday through Thursday 7:00 AM – 5:30 PM (4/10 schedule, off on Fridays). I telecommute on Wednesdays and monitor my email and voice mail regularly.

Emissions to drill one generic oil well

Fuel burned	1,000	gal diesel per day	(per Sept. 6, 2017 Memo from Chuck Thomas)
Average time to drill one well	60	days	
Total fuel burned	60,000	gallons diesel fuel	
CO_2 emission factor	10.21	kg CO_2/gallon burned	
CH_4 emission factor	0.00041	kg CH_4/gallon burned	
N_2O emission factor	0.00008	kg N_2O/gallon burned	
CO_2 emissions	612.6	MT CO_2/well	1MT = 1000 kg
CH_4 emissions	0.0246	MT CH_4/well	
N_2O emissions	0.0048	MT N_2O/well	
CH_4 GWP	25	MTCO_2e/MT CH_4	
N_2O GWP	298	MT CO_2e/MT N_2O	
Single well GHG emissions	**615**	MT CO_2e per well drilled	

Emission factors and GWP from EPA Emission Factors for Greenhouse Gas Inventories modified 9 March 2018
https://www.epa.gov/sites/production/files/2018-03/documents/emission-factors_mar_2018_0.pdf

United States Department of the Interior

FISH AND WILDLIFE SERVICE
HOPPER MOUNTAIN NATIONAL WILDLIFE REFUGE COMPLEX
CALIFORNIA CONDOR RECOVERY PROGRAM
P.O. Box 5839
Ventura, CA 93005
Tel: (805) 644-5185 Fax: (805) 644-1732

November 17, 2014

Gary Crissman
Operations Manager
Seneca Resources-West
4800 Corporate Ct.
Bakersfield, CA 93311
crissmang@srcx.com

Subject: Seneca Operations - No Condor Injury or Mortality

Dear Mr. Crissman,

This is to confirm that to our knowledge, no California condors have been injured or killed as a result of Seneca's operations. We appreciate Seneca's efforts to minimize and avoid conflicts between its operations in the Sespe oil field and the recovery of the California condor by routinely implementing the Service's July 18, 20013, Measures to protect the California Condor at Oil and Gas exploration, Development, and Production Facilities in Ventura County, California.

Please let me know if you need any additional information.

Sincerely,

Steve Kirkland

Steve Kirkland
California Condor Field Coordinator

Attachment 8 - November 17, 2014 USFWS
Letter to Seneca Resources