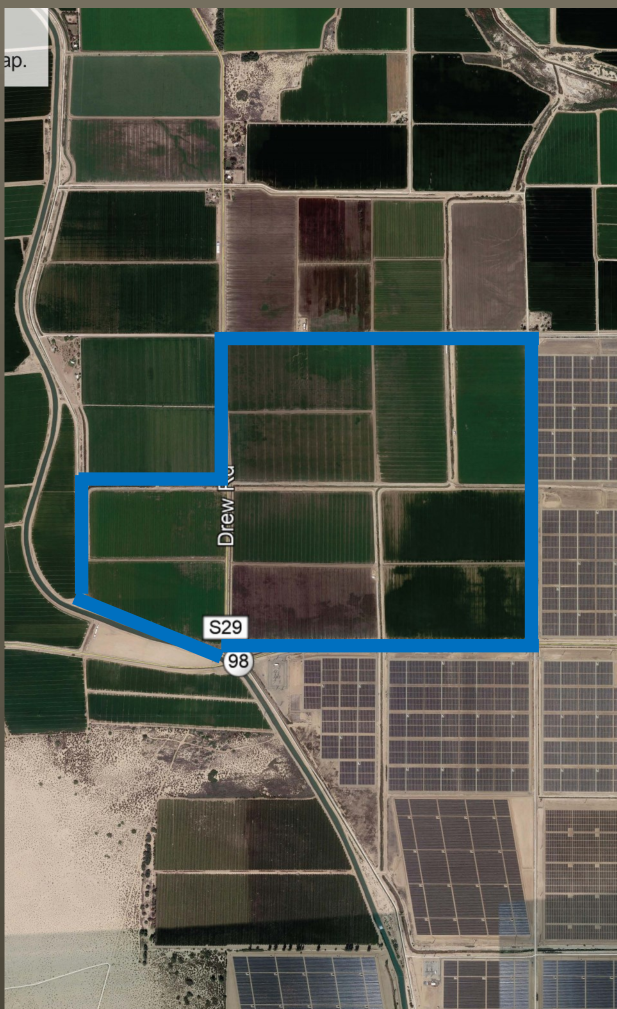
DREW SOLAR PROJECT

SCH. No. 2018051036



DRAFT ENVIRONMENTAL IMPACT REPORT

VOLUME I — APPENDICES A-D

Prepared for

IMPERIAL COUNTY CALIFORNIA 1907

May 2019

Prepared by

egi ericsson-grant inc.

VOLUME I – APPENDICES A-D

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APPENDIX A

NOTICE OF PREPARATION (NOP)
INITIAL STUDY
NOP COMMENT LETTERS

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Imperial County
Planning & Development Services Department
NOTICE OF PREPARATION OF DRAFT EIR FOR THE DREW SOLAR PROJECT
NOTICE OF PUBLIC SCOPING MEETING

The Imperial County Planning & Development Services Department intends to prepare an Environmental Impact Report (EIR) for the proposed Drew Solar Project, as described below. A public scoping meeting for the proposed EIR will be held by the Imperial County Planning & Development Services Department at 6:00 p.m. PDT on May 24, 2018. The scoping meeting will be held at the Board of Supervisors Chambers, 2nd Floor, County Administration Center located at 940 Main Street, El Centro, CA 92243. Comments regarding the scope of the EIR will be accepted at this meeting. Additionally, comments may be sent to the Planning and Development Services Department, 801 Main Street, El Centro, California 92243, attention Jim Minnick, Director.

SUBJECT: Drew Solar Project

PLANNING COMMISSION APPROVAL: Fall 2018

PROJECT LOCATION: Drew Solar, LLC is proposing to develop the Drew Solar Project, an approximately 100-megawatt (MW) solar photovoltaic energy generation facility, including energy storage and gen-tie transmission lines, in Imperial County, California. The Project would be located on approximately 762.8 net acres in southern Imperial County, California, approximately 6.5 miles southwest of the city of El Centro, California and 7.5 miles directly west of Calexico. Specifically, the Project is located in portions of Sections 7 and 9, Township 17 South (T17S), Range 13 East (R13E), San Bernardino Base and Meridian.

PROJECT DESCRIPTION: The Project would consist of the construction, operation and reclamation of a 762.8 net acre, approximately 100-MW solar potovoltaic energy project, including energy storage and gen-tie transmission lines on six parcels that include Assessor's Parcel Number (APN) 052-170-039-000, 052-170-037-000, 052-170-031-000, 052-170-032-000, 052-170-056-000, and 052-170-067-000. The Project (General Plan Amendment #17-0006, Zone Change #17-0007, Variance #17-0003, Initial Study #17-0035, and six Conditional Use Permits #17-0031, #17-0032, #17-0033, #17-0034, #17-0035, and #18-0001) proposes seven access points off of the surrounding County roads and three off of State Route SR 98 along the southern border of the Project. The Project would also include internal access roads and infrastructure including a security fence, an Operations and Maintenance building or buildings; auxiliary facilities such as raw water/fire water storage, treated water storage, evaporation ponds, storm water retention basins, water filtration buildings and equipment, and equipment control buildings, septic system(s) and parking. The Project will connect to the existing Drew Switchyard located on APN 052-190-039-000 to the south of SR 98 via up to two 230kV Gen-ties. The project may be constructed at one time over approximately 18 months, or it may be built out over an approximately 10-year period.

DESIGNATED AREA PLAN: The project area is designated as Agriculture by the Imperial County General Plan. Project parcels are zoned A-2, A-2-R and A-3.

BOARD OF SUPERVISORS DISTRICT: District 2, Supervisor Luis A. Plancarte

ANTICIPATED SIGNIFICANT EFFECTS: The EIR will analyze potential impacts associated with the following: Aesthetics; Agriculture and Forest Resources; Air Quality; Biological Resources; Cultural Resources; Geology/Soils; Greenhouse Gas Emissions/Climate Change; Hazards and Hazardous Materials; Hydrology and Water Quality; Land Use/Planning; Noise; Public Services; Tribal Cultural Resources; Transportation/Circulation; Utilities and Service Systems and Cumulative Impacts.

COMMENTS REQUESTED: The Imperial County Planning & Development Services Department would like to know your ideas about the effects this solar power plant project might have on the environment and your suggestions as to alternatives, mitigation or ways the project may be revised to reduce or avoid any significant environmental impacts. Your comments will guide the scope and content of environmental issues to be examined in the EIR. Your comments may be submitted in writing to: Jim Minnick, Director, Imperial County Planning & Development Services Department, 801 Main Street, El Centro, CA 92243. Available project information may be reviewed at this location.

NOTICE OF PREPARATION REVIEW PERIOD: May 17, 2018 through June 21, 2018.

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Initial Study & Environmental Analysis

For:

Drew Solar Project

GPA 17-0006/ZC 17-0007/V 17-0003/IS 17-0035

CUP 17-0031/CUP 17-0032/CUP 17-0033/CUP 17-0034/CUP 17-0035/CUP 18-0001

Prepared By:

COUNTY OF IMPERIAL

Planning & Development Services Department

801 Main Street
El Centro, CA 92243
(442) 265-1736
www.icpds.com

May 2018

TABLE OF CONTENTS

SECTION 1 - INTRODUCTION

A. PURPOSE

This document is a ☐ policy-level, ☒ project level Initial Study for evaluation of potential environmental impacts resulting from the proposed Drew Solar Project (Refer to Exhibits “A”, “B” and “C”).

B. CALIFORNIA ENVIRONMENTAL QUALITY ACT (CEQA) REQUIREMENTS AND THE IMPERIAL COUNTY’S GUIDELINES FOR IMPLEMENTING CEQA

As defined by Section 15063 of the California Environmental Quality Act (CEQA) Guidelines and Section 7 of the County’s “CEQA Regulations Guidelines for the Implementation of CEQA, as amended”, an **Initial Study** is prepared primarily to provide the Lead Agency with information to use as the basis for determining whether an Environmental Impact Report (EIR), Negative Declaration, or Mitigated Negative Declaration would be appropriate for providing the necessary environmental documentation and clearance for any proposed project.

☒ According to Section 15065, an **EIR** is deemed appropriate for a particular proposal if the following conditions occur:

- The proposal has the potential to substantially degrade quality of the environment.
- The proposal has the potential to achieve short-term environmental goals to the disadvantage of long-term environmental goals.
- The proposal has possible environmental effects that are individually limited but cumulatively considerable.
- The proposal could cause direct or indirect adverse effects on human beings.

☐ According to Section 15070(a), a **Negative Declaration** is deemed appropriate if the proposal would not result in any significant effect on the environment.

☐ According to Section 15070(b), a **Mitigated Negative Declaration** is deemed appropriate if it is determined that though a proposal could result in a significant effect, mitigation measures are available to reduce these significant effects to insignificant levels.

This Initial Study is prepared in conformance with the California Environmental Quality Act of 1970, as amended (Public Resources Code, Section 21000 et. seq.); Section 15070 of the State & County of Imperial’s Guidelines for Implementation of the California Environmental Quality Act of 1970, as amended (California Code of Regulations, Title 14, Chapter 3, Section 15000, et. seq.); applicable requirements of the County of Imperial; and the regulations, requirements, and procedures of any other responsible public agency or an agency with jurisdiction by law.

Pursuant to the County of Imperial Guidelines for Implementing CEQA, depending on the project scope, the County of Imperial Board of Supervisors, Planning Commission and/or Planning Director is designated the Lead Agency, in accordance with Section 15050 of the CEQA Guidelines. The Lead Agency is the public agency which has the principal responsibility for approving the necessary environmental clearances and analyses for any project in the County.

C. INTENDED USES OF INITIAL STUDY

This Initial Study is an informational document which is intended to inform County of Imperial decision makers, other responsible or interested agencies, and the general public of potential environmental effects of the proposed applications. The environmental review process has been established to enable public agencies to evaluate environmental consequences and to examine and implement methods of eliminating or reducing any potentially adverse impacts. While CEQA requires that consideration be given to avoiding environmental damage, the Lead Agency and other responsible public agencies must balance adverse environmental effects against other public objectives, including economic and social goals.

The Initial Study prepared for the project will be circulated for a period of 35 days for public and agency review and comments. At the conclusion, if comments are received, the County Planning & Development Services Department will prepare a document entitled "Responses to Comments" which will be forwarded to any commenting entity and be made part of the record within 10-days of any project consideration.

D. CONTENTS OF INITIAL STUDY

This Initial Study is organized to facilitate a basic understanding of the existing setting and environmental implications of the proposed applications.

SECTION 1

I. INTRODUCTION presents an introduction to the entire report. This section discusses the environmental process, scope of environmental review, and incorporation by reference documents.

SECTION 2

II. ENVIRONMENTAL CHECKLIST FORM contains the County's Environmental Checklist Form. The checklist form presents results of the environmental evaluation for the proposed applications and those issue areas that would have either a significant impact, potentially significant impact, or no impact.

PROJECT SUMMARY, LOCATION AND EVIRONMENTAL SETTINGS describes the proposed project entitlements and required applications. A description of discretionary approvals and permits required for project implementation is also included. It also identifies the location of the project and a general description of the surrounding environmental settings.

ENVIRONMENTAL ANALYSIS evaluates each response provided in the environmental checklist form. Each response checked in the checklist form is discussed and supported with sufficient data and analysis as necessary. As appropriate, each response discussion describes and identifies specific impacts anticipated with project implementation.

SECTION 3

III. MANDATORY FINDINGS presents Mandatory Findings of Significance in accordance with Section 15065 of the CEQA Guidelines.

IV. PERSONS AND ORGANIZATIONS CONSULTED identifies those persons consulted and involved in preparation of this Initial Study.

V. REFERENCES lists bibliographical materials used in preparation of this document.

VI. FINDINGS

SECTION 4

VIII. RESPONSE TO COMMENTS (IF ANY)

IX. MITIGATION MONITORING & REPORTING PROGRAM (MMRP) (IF ANY)

E. SCOPE OF ENVIRONMENTAL ANALYSIS

For evaluation of environmental impacts, each question from the Environmental Checklist Form is summarized and responses are provided according to the analysis undertaken as part of the Initial Study. Impacts and effects will be evaluated and quantified, when appropriate. To each question, there are four possible responses, including:

1. **No Impact:** A "No Impact" response is adequately supported if the impact simply does not apply to the proposed applications.
2. **Less Than Significant Impact:** The proposed applications will have the potential to impact the environment. These impacts, however, will be less than significant; no additional analysis is required.
3. **Less Than Significant With Mitigation Incorporated:** This applies where incorporation of mitigation measures has reduced an effect from "Potentially Significant Impact" to a "Less Than Significant Impact".
4. **Potentially Significant Impact:** The proposed applications could have impacts that are considered significant. Additional analyses and possibly an EIR could be required to identify mitigation measures that could reduce these impacts to less than significant levels.

F. POLICY-LEVEL or PROJECT LEVEL ENVIRONMENTAL ANALYSIS

This Initial Study will be conducted under a ☐ policy-level, ☒ project level analysis. Regarding mitigation measures, it is not the intent of this document to "overlap" or restate conditions of approval that are commonly established for future known projects or the proposed applications. Additionally, those other standard requirements and regulations that any development must comply with, that are outside the County's jurisdiction, are also not considered mitigation measures and therefore, will not be identified in this document.

G. TIERED DOCUMENTS AND INCORPORATION BY REFERENCE

Information, findings, and conclusions contained in this document are based on incorporation by reference of tiered documentation, which are discussed in the following section.

1. Tiered Documents

As permitted in Section 15152(a) of the CEQA Guidelines, information and discussions from other documents can be included into this document. Tiering is defined as follows:

"Tiering refers to using the analysis of general matters contained in a broader EIR (such as the one prepared for a general plan or policy statement) with later EIRs and negative declarations on narrower projects; incorporating by reference the general discussions from the broader EIR; and concentrating the later EIR or negative declaration solely on the issues specific to the later project."

Tiering also allows this document to comply with Section 15152(b) of the CEQA Guidelines, which discourages redundant analyses, as follows:

"Agencies are encouraged to tier the environmental analyses which they prepare for separate but related projects including the general plans, zoning changes, and development projects. This approach can eliminate repetitive discussion of the same issues and focus the later EIR or negative declaration on the actual issues ripe for decision at each level of environmental review. Tiering is appropriate when the sequence of analysis is from an EIR prepared for a general plan, policy or program to an EIR or negative declaration for another plan, policy, or program of lesser scope, or to a site-specific EIR or negative declaration."

Further, Section 15152(d) of the CEQA Guidelines states:

"Where an EIR has been prepared and certified for a program, plan, policy, or ordinance consistent with the requirements of this section, any lead agency for a later project pursuant to or consistent with the program, plan, policy, or ordinance should limit the EIR or negative declaration on the later project to effects which:

(1) Were not examined as significant effects on the environment in the prior EIR; or

(2) Are susceptible to substantial reduction or avoidance by the choice of specific revisions in the project, by the imposition of conditions, or other means."

2. <u>Incorporation by Reference</u>

Incorporation by reference is a procedure for reducing the size of EIRs/MND and is most appropriate for including long, descriptive, or technical materials that provide general background information, but do not contribute directly to the specific analysis of the project itself. This procedure is particularly useful when an EIR or Negative Declaration relies on a broadly-drafted EIR for its evaluation of cumulative impacts of related projects (*Las Virgenes Homeowners Federation v. County of Los Angeles* [1986, 177 Ca.3d 300]). If an EIR or Negative Declaration relies on information from a supporting study that is available to the public, the EIR or Negative Declaration cannot be deemed unsupported by evidence or analysis (*San Francisco Ecology Center v. City and County of San Francisco* [1975, 48 Ca.3d 584, 595]). This document incorporates by reference appropriate information from the "Final Environmental Impact Report and Environmental Assessment for the "County of Imperial General Plan EIR" prepared by Brian F. Mooney Associates in 1993 and updates.

When an EIR or Negative Declaration incorporates a document by reference, the incorporation must comply with Section 15150 of the CEQA Guidelines as follows:

- The incorporated document must be available to the public or be a matter of public record (CEQA Guidelines Section 15150[a]). The General Plan EIR and updates are available, along with this document, at the County of Imperial Planning & Development Services Department, 801 Main Street, El Centro, CA 92243 Ph. (760) 482-4236.
- This document must be available for inspection by the public at an office of the lead agency (CEQA Guidelines Section 15150[b]). These documents are available at the County of Imperial Planning & Development Services Department, 801 Main Street, El Centro, CA 92243 Ph. (760) 482-4236.
- These documents must summarize the portion of the document being incorporated by reference or briefly describe information that cannot be summarized. Furthermore, these documents must describe the relationship between the incorporated information and the analysis in the tiered documents (CEQA Guidelines Section 15150[c]). As discussed above, the tiered EIRs address the entire project site and provide background and inventory information and data which apply to the project site. Incorporated information and/or data will be cited in the appropriate sections.
- These documents must include the State identification number of the incorporated documents (CEQA Guidelines Section 15150[d]). The State Clearinghouse Number for the County of Imperial General Plan EIR is SCH #93011023.
- The material to be incorporated in this document will include general background information (CEQA Guidelines Section 15150[f]). This has been previously discussed in this document.

SECTION II. ENVIRONMENTAL CHECKLIST

1. **Project Title**: Drew Solar Project
2. **Lead Agency**: Imperial County Planning & Development Services Department
3. **Contact person and phone number**: Diana Robinson, Planner II, (442) 265-1736 x1751
4. **Address**: 801 Main Street, El Centro CA, 92243
5. **E-mail**: DianaRobinson@co.imperial.ca.us
6. **Project location**: The proposed Project site is located on six parcels (052-170-039-000, 052-170-067-000, 052-170-031-000, 052-170-032-000, 052-170-056-000, and 052-170-037-000) approximately 6.5 miles southwest of the City of El Centro, California and 7.5 miles directly west of Calexico, California. The geographic center of the Project roughly corresponds with 32° 41' 13" North and 115° 40' 8" West, at an elevation of 19 feet below sea level. The Project site is generally located south of Kubler Road, east of the Westside Main Canal, north of State Route 98, and west of Pulliam Road.
7. **Project sponsor's name and address**: Drew Solar, LLC, PO Box 317, El Centro, CA 92244
8. **General Plan designation**: Agriculture
9. **Zoning**: A-2 (General Agricultural Zone), A-2-R (General Agricultural Zone/Rural Zone) and A-3 (Heavy Agricultural)
10. **Description of project**: The Drew Solar project (Project) is a proposed solar photovoltaic (PV) energy-generating facility being developed by Drew Solar, LLC (DS, or Project Proponent) to sell its electricity and all renewable and environmental attributes to an electric utility purchaser(s) under long-term contracts to help meet California Renewable Portfolio Standard (RPS) goals. The Project site is comprised of six assessor's parcel numbers (APNs) totaling 762.8 net acres (exclusive of roads). The Project site is designated as Agriculture by the Imperial County General Plan Land Use Element, and the Project site parcels are comprised of lands zoned as A-2 (Agricultural, General), A-2-R (General Agricultural/Rural Zone), and A-3 (Agricultural, Heavy). The Project Proponent requests a Development Agreement with Imperial County to enable and control a phased build out of the Project.
11. **Surrounding land uses and setting**: The Project site is located in the southwestern portion of Imperial County in an area characterized by agricultural and solar fields. The Project site is bordered by the existing Centinela Solar Project to the east and the south and is on the north side of State Route (SR) 98 just opposite the existing Drew Switchyard. The rest of the area is predominantly agricultural with a few residences and agricultural buildings mixed in. The nearest single-family residence is located immediately west of the intersection of Drew Road and State Route 98.
12. **Other public agencies whose approval is required** (e.g., permits, financing approval, or participation agreement.): Imperial Irrigation District (IID), Imperial County Air Pollution Control District (ICAPCD), California Department of Transportation (Caltrans), California State Water Resources Control Board (SWRCB), California Department of Fish and Wildlife (CDFW), U.S. Army Corps of Engineers (USACOE), U.S. Fish and Wildlife Service (USFWS), Native American Heritage Commission (NAHC), Environmental Evaluation Committee (EEC), Imperial County Planning Commission (PC).

13. **Have California Native American tribes traditionally and culturally affiliated with the project area requested consultation pursuant to Public Resources Code section 21080.3.1?** Yes.

    If so has consultation begun? Letters sent via certified mail May 7, 2018.

    Note: Conducting consultation early in the CEQA process allows tribal governments, lead agencies, and project proponents to discuss the level of environmental review, identify and address potential adverse impacts to tribal cultural resources, and reduce the potential for delay and conflict in the environmental review process. (See Public Resources Code, Section 21083.3.2). Information may also be available from the California Native American Heritage Commission's Sacred Lands File per Public Resources Code, Section 5097.96 and the California Historical Resources Information System administered by the California Office of Historic Preservation. Please also note that Public Resources Code, Section 21082.3 (c) contains provisions specific to confidentiality.

ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED:

The environmental factors checked below would be potentially affected by this project, involving at least one impact that is a "Potentially Significant Impact" as indicated by the checklist on the following pages.

☒ Aesthetics	☒ Agriculture and Forestry Resources	☒ Air Quality
☒ Biological Resources	☒ Cultural Resources	☒ Geology /Soils
☒ Greenhouse Gas Emissions	☒ Hazards & Hazardous Materials	☒ Hydrology / Water Quality
☒ Land Use / Planning	☐ Mineral Resources	☒ Noise
☐ Population / Housing	☒ Public Services	☐ Recreation
☒ Transportation/Traffic	☒ Tribal Cultural Resources	☒ Utilities and Services Systems
☒ Mandatory Findings of Significance		

ENVIRONMENTAL EVALUATION COMMITTEE (EEC) DETERMINATION

After Review of the Initial Study, the Environmental Evaluation Committee has:

☐ Found that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.

☐ Found that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.

☒ Found that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

☐ Found that the proposed project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.

☐ Found that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE DE MINIMIS IMPACT FINDING: ☐ Yes ☐ No

EEC VOTES	YES	NO	ABSENT
PUBLIC WORKS	☐	☐	☐
ENVIRONMENTAL HEALTH SVCS	☐	☐	☐
OFFICE EMERGENCY SERVICES	☐	☐	☐
APCD	☐	☐	☐
AG	☐	☐	☐
SHERIFF DEPARTMENT	☐	☐	☐
ICPDS	☐	☐	☐

______________________________________ ____________________

Jim Minnick, Director of Planning/EEC Chairman Date:

PROJECT SUMMARY

A. Project Location: The proposed Project site is located approximately 6.5 miles southwest of the City of El Centro, California and 7.5 miles directly west of Calexico, California. The geographic center of the Project roughly corresponds with 32° 41' 13" North and 115° 40' 8" West, at an elevation of 19 feet below sea level. The Project site is generally located south of Kubler Road, east of the Westside Main Canal, north of State Route 98, and west of Pulliam Road (Exhibit A).

A. Project Summary: The proposed Project consists of a photovoltaic (PV) solar facility capable of producing approximately 100 megawatts (MW) alternating current (AC) energy storage and generation interconnection (gen-tie) transmission lines on 762.8 net acres. The ultimate energy output is dependent on several variables, including off-take arrangements and the evolving efficiency of PV panels, so it is possible that the Project could generate more or less than 100 MW. The Project Proponent requests a Development Agreement with Imperial County to enable and control a phased build out of the Project. The Project may be constructed at one time over approximately 18 months, or it may be built out over an approximately 10-year period. A conceptual phasing configuration is shown in Exhibit B. A Site Plan is provided in Exhibit C. The phased project would allow utilities greater flexibility in obtaining renewable energy to meet ratepayer needs. The Project Proponent is requesting that a Conditional Use Permit (CUP) be issued for each of the five phases of the Project as well as an additional sixth CUP for Phase 5 for energy storage in the area proposed to be conditionally rezoned to M-2 (Medium Industrial).

The Project Proponent has filed an application for a General Plan Amendment (GPA), a Zone Change, a Height Variance and six CUPs. Each of the six CUPs would include an Operations and Maintenance (O&M) building or buildings. The Project may also include additional auxiliary facilities such as raw water/fire water storage, treated water storage, evaporation ponds, storm water retention basins, water filtration buildings and equipment, and equipment control buildings, septic system(s) and parking. The Project will also include electric and vehicular crossings of State facilities, IID facilities and County facilities. The Project crossings will not interfere with the purpose of these Agencies' facilities (e.g. where a drain flows, the Project crossing will still allow the drain to flow). The Project will likely incorporate an energy storage component and each phase may have its own energy storage component as well as energy storage being housed within the inverters.

The construction equipment, materials, and labor involved in building the Project remain similar whether the project is constructed in phases over time or built out over an 18-month period. The 18-month buildout of the entire Project at once results in greater intensity of labor and equipment during the construction period. Each CUP of the project may have its own off-taker and operate independently from the other CUPs. The phases shown on the phasing plan are conceptual and will not be constructed in any particular order. The phases may be aggregated during construction and operations/maintenance so that multiple phases could be built at one time. All phases are anticipated to utilize proposed gen-tie lines that extend from the south end of the Project site across Drew Road and SR 98 into the existing Drew Switchyard located on APN 052-190-039. The phases are anticipated to use main Project switchyard; however, each phase may independently construct its own up to 230 kilovolt (kv) step up transformer and switchyard.

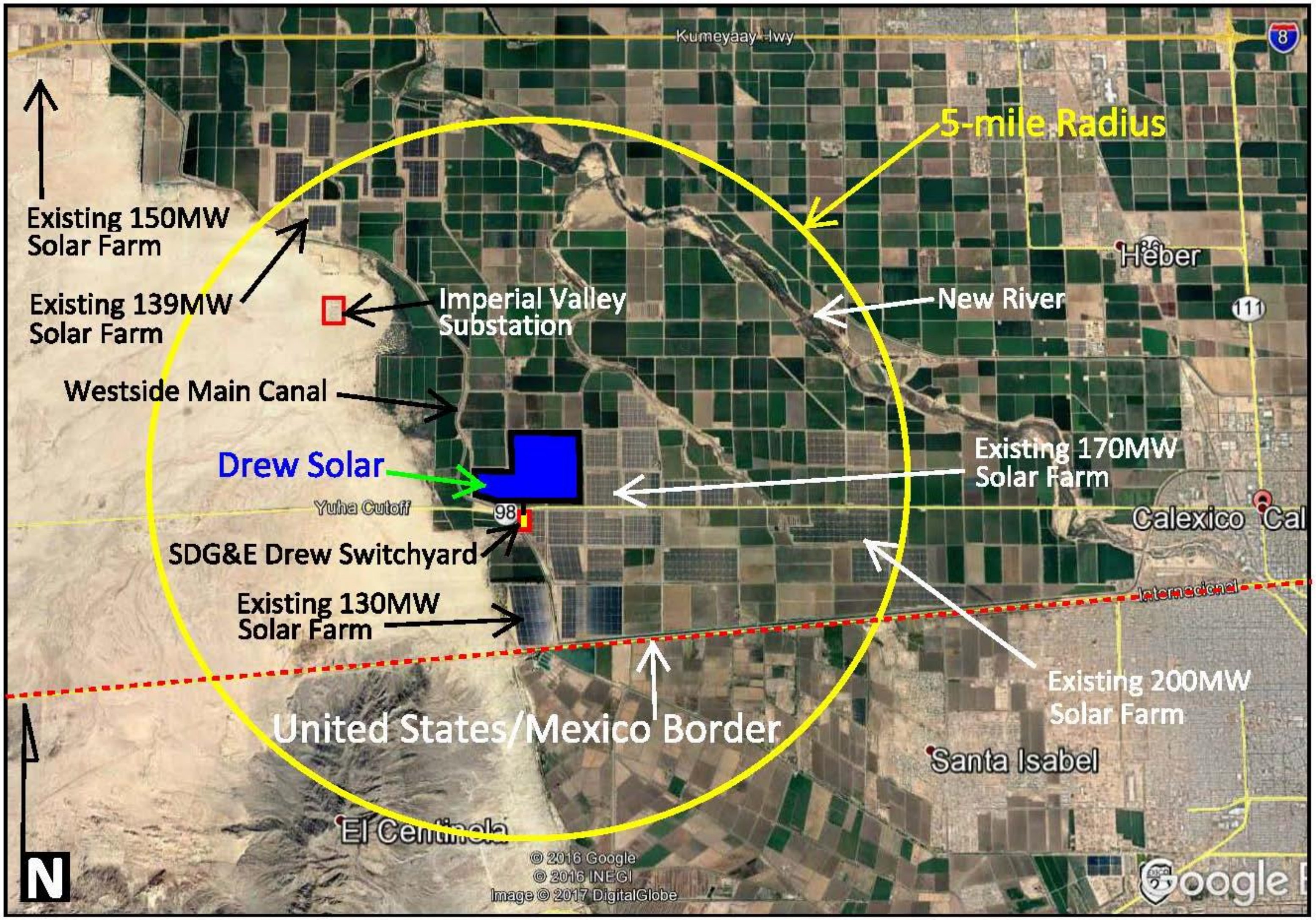
The Project also includes construction of generation interconnection (gen-tie) transmission lines extending from the south end of the Project site south across Drew Road and State Route 98 into the existing Drew Switchyard located on APN 052-190-039. The pole height of the gen-tie structures will range between 120 feet up to 180 feet.

B. Environmental Setting: The Project site is in an area characterized by agricultural and solar fields. The Project site is bordered by the existing Centinela Solar Project to the east and the south and is on the north side of State Route (SR) 98 just opposite the existing Drew Switchyard. The rest of the area is predominantly agricultural with a few residences and agricultural buildings mixed in.

D. Analysis: The project will result in potentially significant impacts with regards to aesthetics and agricultural resources. In addition, the Project is anticipated to result in potentially significant impacts unless mitigation is incorporated to the following: air quality, biological resources, cultural resources, geology and soils, greenhouse gases, hazards and hazardous materials, land use, noise, public services, tribal cultural resources, transportation/traffic, and utilities and services.

E. General Plan Consistency: The project proposes five CUPs in association with the proposed solar use and energy storage use as well as a Zone Change and a GPA. A sixth CUP is proposed in association with standalone energy storage. Approval of the requested entitlements will result in consistency of the Drew Solar Project with the General Plan.

Exhibit “A” - Vicinity Map



Date: 10/15/2017

Vicinity Map

Exhibit "B" – Phasing Plan

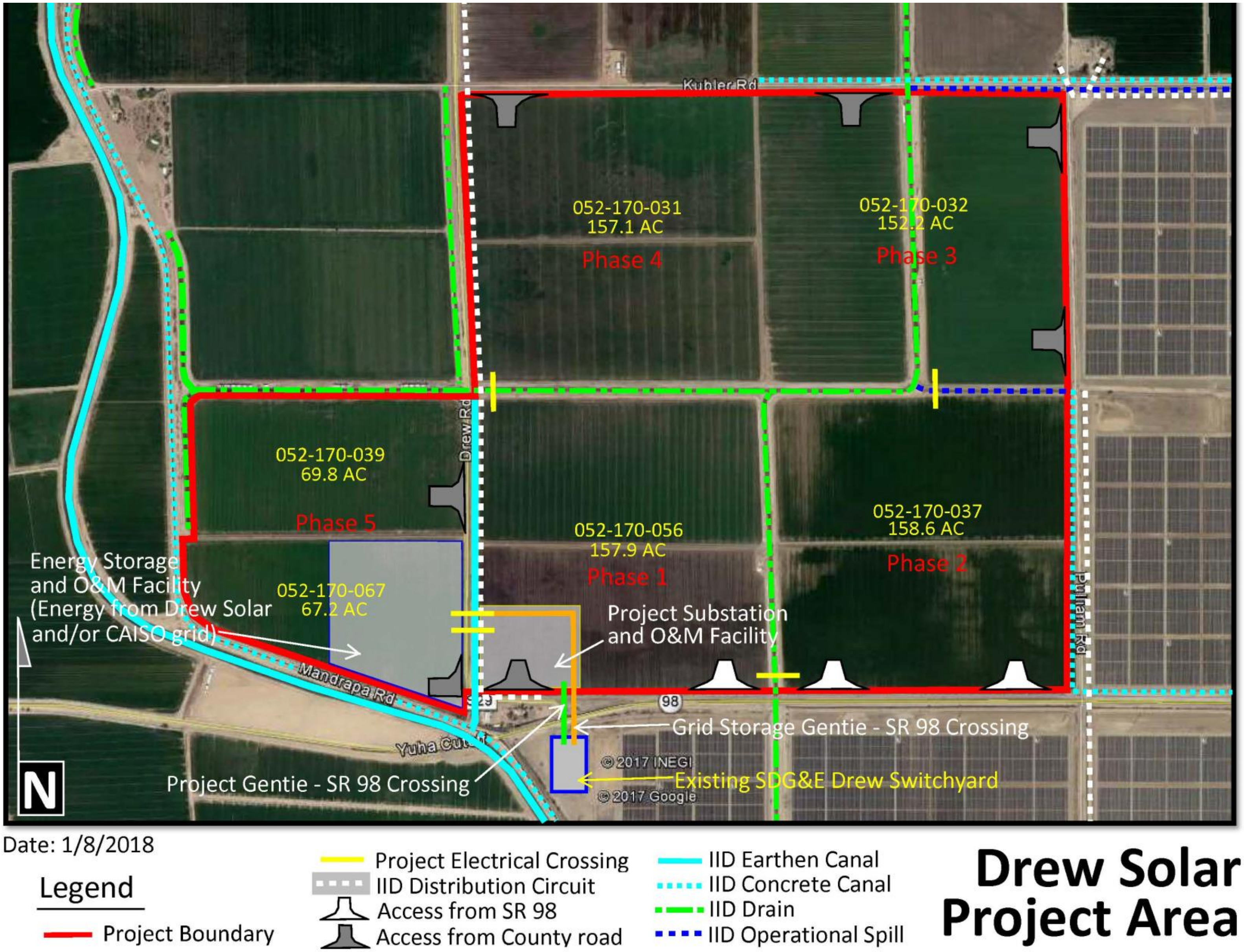
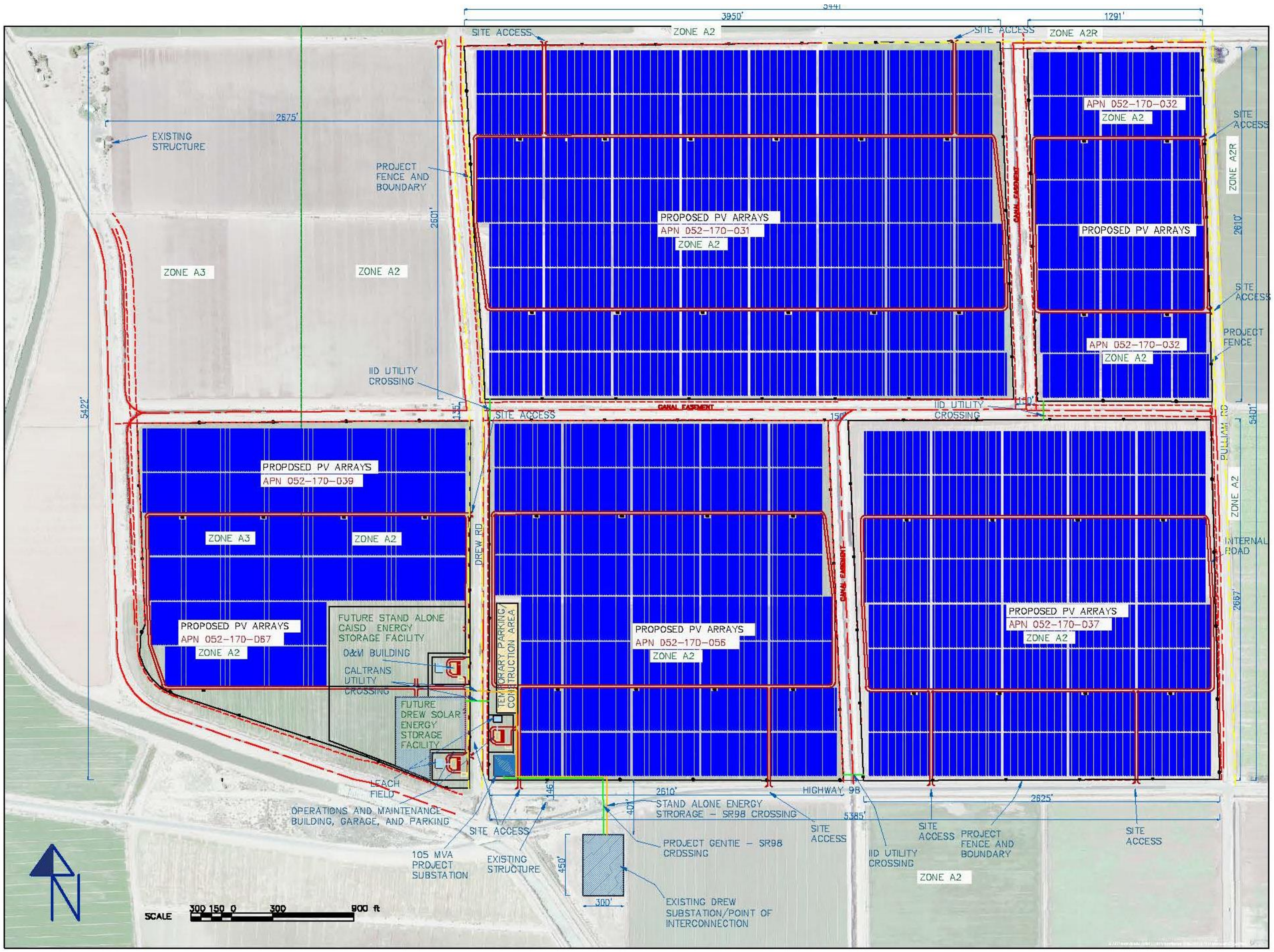


Exhibit "C" – Single-Axis Tracker Photovoltaic Site Plan



EVALUATION OF ENVIRONMENTAL IMPACTS:

1) A brief explanation is required for all answers except "No Impact" answers that are adequately supported by the information sources a lead agency cites in the parentheses following each question. A "No Impact" answer is adequately supported if the referenced information sources show that the impact simply does not apply to projects like the one involved (e.g., the project falls outside a fault rupture zone). A "No Impact" answer should be explained where it is based on project-specific factors as well as general standards (e.g., the project will not expose sensitive receptors to pollutants, based on a project-specific screening analysis).

2) All answers must take account of the whole action involved, including off-site as well as on-site, cumulative as well as project-level, indirect as well as direct, and construction as well as operational impacts.

3) Once the lead agency has determined that a particular physical impact may occur, then the checklist answers must indicate whether the impact is potentially significant, less than significant with mitigation, or less than significant. "Potentially Significant Impact" is appropriate if there is substantial evidence that an effect may be significant. If there are one or more "Potentially Significant Impact" entries when the determination is made, an EIR is required.

4) "Negative Declaration: Less Than Significant With Mitigation Incorporated" applies where the incorporation of mitigation measures has reduced an effect from "Potentially Significant Impact" to a "Less Than Significant Impact." The lead agency must describe the mitigation measures, and briefly explain how they reduce the effect to a less than significant level (mitigation measures from "Earlier Analyses," as described in (5) below, may be cross-referenced).

5) Earlier analyses may be used where, pursuant to the tiering, program EIR, or other CEQA process, an effect has been adequately analyzed in an earlier EIR or negative declaration. Section 15063(c)(3)(D). In this case, a brief discussion should identify the following:

   a) Earlier Analysis Used. Identify and state where they are available for review.

   b) Impacts Adequately Addressed. Identify which effects from the above checklist were within the scope of and adequately analyzed in an earlier document pursuant to applicable legal standards, and state whether such effects were addressed by mitigation measures based on the earlier analysis.

   c) Mitigation Measures. For effects that are "Less than Significant with Mitigation Measures Incorporated," describe the mitigation measures which were incorporated or refined from the earlier document and the extent to which they address site-specific conditions for the project.

6) Lead agencies are encouraged to incorporate into the checklist references to information sources for potential impacts (e.g., general plans, zoning ordinances). Reference to a previously prepared or outside document should, where appropriate, include a reference to the page or pages where the statement is substantiated.

7) Supporting Information Sources: A source list should be attached, and other sources used or individuals contacted should be cited in the discussion.

8) This is only a suggested form, and lead agencies are free to use different formats; however, lead agencies should normally address the questions from this checklist that are relevant to a project's environmental effects in whatever format is selected.

9) The explanation of each issue should identify:

   a) the significance criteria or threshold, if any, used to evaluate each question; and

   b) the mitigation measure identified, if any, to reduce the impact to less than significance

	Potentially Significant Impact **(PSI)**	Potentially Significant Unless Mitigation Incorporated **(PSUMI)**	Less Than Significant Impact **(LTSI)**	No Impact **(NI)**

I. ***AESTHETICS*** *Would the project:*

	PSI	PSUMI	LTSI	NI
a) Have a substantial adverse effect on a scenic vista or scenic highway?	☒	☐	☐	☐

Potentially Significant Impact. The Project site consists of agricultural fields historically planted with Bermuda Grass, alfalfa, kleingrass, wheat and Sudangrass. A portion of the Project site is bordered by SR 98. However, SR 98 is not a designated scenic highway. Views of Mount Signal to the southwest could be considered scenic. The Gen-Tie extending south to the Drew Switchyard would be on power poles ranging from 120 to 180 feet in height. Similar overhead infrastructure is currently visible on the horizon in the Project area. Therefore, adverse effects on a scenic vista are considered potentially significant.

	PSI	PSUMI	LTSI	NI
b) Substantially damage scenic resources, including, but not limited to trees, rock outcroppings, and historic buildings within a state scenic highway?	☐	☐	☐	☒

No Impact. The Project site includes six APNs owned by the Imperial Irrigation District (IID). The site is in agricultural production and does not contain any scenic resources including trees, rock outcroppings or historic buildings. Likewise, SR 98 is not a Scenic Highway. Therefore, no impact is anticipated and impacts to resources within a state scenic highway will not be discussed in the EIR.

	PSI	PSUMI	LTSI	NI
c) Substantially degrade the existing visual character or quality of the site and its surrounding?	☒	☐	☐	☐

Potentially Significant Impact. The Project includes development of approximately 762.8 net acres of agricultural land. The Project site is located in the southwestern portion of Imperial County in an area characterized by agricultural and solar fields. The Project site is bordered by the existing Centinela Solar Project to the east and the south and is on the north side of State Route (SR) 98 just opposite the Drew Switchyard. The rest of the area is predominantly agricultural with a few residences and agricultural buildings adjacent to the Project. The site is visible to travelers on along SR 98, Drew Road, Kubler Road, Pulliam Road and Mandrapa Road.

The Project will utilize PV modules. PV modules are generally non-reflective. Other features of the Project include and Operations and Maintenance (O&M) building or buildings; raw water/fire water storage, treated water storage, evaporation ponds, storm water retention basins, water filtration buildings and equipment, and equipment control buildings, septic system(s) and parking. The Project will include electric and vehicular crossings of State facilities, IID facilities and County facilities which could range between 120 and 180 feet in height.

The introduction of all of these features would be noticeable in varying degrees (dependent upon angle, set-back and height) to travelers along SR 98 and surrounding lands. Therefore, a potentially significant impact is identified for this issue area. Impacts to visual character and quality of the site will be addressed in the EIR.

	PSI	PSUMI	LTSI	NI
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	☐	☐	☒	☐

Less than Significant Impact. The Project site is currently agricultural land with no sources of light or glare. The Project includes a lighting system that will provide illumination for operation and maintenance personnel in both normal and emergency conditions. The proposed Project may also install security lighting and the building(s) may have exterior lighting on motion sensors. All lighting will be designed to provide the minimum illumination needed to achieve safety and security objectives and will be shielded and oriented to focus illumination on the desired areas, minimizing light spillover.

While PV technologies are generally non-reflective, intermittent glare may be created when the panels are at a specific angle during a specific time of day and viewed from a specific vantage point. A Glare Study was prepared for the Project to identify potential glare issues for PV panels on single-axis solar trackers from Key Observation Points. (POWER 2018). The study found that no glare will be visible at the KOPs from the proposed solar operations due to the orientation of the PV panes and their rotation limits. Therefore, light or glare impacts are considered less than significant but will be discussed in the EIR.

II. AGRICULTURE AND FOREST RESOURCES

In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Department of Conservation as an optional model to use in assessing impacts on agriculture and farmland. In determining whether impacts to forest resources, including timberland, are significant environmental effects, lead agencies may refer to information compiled by the California Department of Forestry and Fire Protection regarding the state's inventory of forest land, including the Forest and Range Assessment Project and the Forest Legacy Assessment project; and forest carbon measurement methodology provided in Forest Protocols adopted by the California Air Resources Board. --Would the project:

	PSI	PSUMI	LTSI	NI
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☒	☐	☐	☐

Potentially Significant Impact. The Project site contains primarily Farmland of Statewide Importance with some Prime Farmland in the southwestern portion of the site and a small amount in along Kubler Road to the north. According to the California Farmland Mapping and Monitoring Program (FMMP), Prime Farmland is defined as having the best combination of physical and chemical features able to sustain long-term agricultural production. Prime farmland has the soil quality, growing season, and moisture supply needed to produce sustained high yields. Farmland of Statewide Importance is similar to Prime Farmland but with minor shortcomings (e.g. as greater slopes, less ability to store soil moisture).

To be considered as "Prime Farmland" the land must have been used for production of irrigated crops at some time during the two update cycles prior to the mapping date. The California Department of Conservation (CDOC) Land Evaluation Site Assessment (LESA) model was prepared to evaluate the potential impacts from conversion of agricultural land to other purposes (RECON 2018c). Conversion of the agricultural lands to other uses may create a significant impact. This issue will be discussed in the EIR.

	PSI	PSUMI	LTSI	NI
b) Conflict with existing zoning for agricultural use, or a Williamson Act Contract?	☒	☐	☐	☐

Potentially Significant Impact. All of the six parcels that comprise the Project site are zoned either A-2, A-2-R or A-3. A solar project is an allowed use with a Conditional Use Permit. However, a Zone Change to M-2, Medium Industrial would be required to accommodate the proposed energy storage system. This could potentially conflict with surrounding agricultural designations. The Applicant is also seeking an amendment to the General Plan Renewable Energy and Transmission Element to allow for development of a renewable energy project that is not located adjacent to the existing RE Overlay Zone but shares a common boundary to an existing transmission source (i.e. the Drew Switchyard). The potential for conflicts with the surround agricultural uses will be considered.

None of the parcels are under a Williamson Act Contract nor are any of the parcels immediately adjacent to the Project site under Williamson Act Contract. However, there are several parcels within a half-mile to the northwest and east of the Project site that are under Williamson Act Contract. Therefore, the Project may conflict with existing zoning for agricultural use and nearby Williamson Act Contracts resulting in a potentially significant impact. This issue will be discussed in the EIR.

	PSI	PSUMI	LTSI	NI
c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code Section 51104(g))?	☐	☐	☐	☒

No Impact. Based on the Imperial County General Plan, Conservation and Open Space Element, mixed chaparral, pinyon-juniper habitats, and the montane hardwood-conifer forest are located in restricted areas of the County. Mixed chaparral and pinyon-juniper habitats are located in the extreme southwestern corner of the County and montane hardwood-conifer forest is in the extreme northwestern corner of Imperial County. Thus, there are no existing forest lands, timberlands, or timberland zoned Timberland Production either on or near the Project site that would conflict with existing zoning. This issue will not be discussed in the EIR.

	PSI	PSUMI	LTSI	NI
d) Result in the loss of forest land or conversion of forest land to non-forest use?	☐	☐	☐	☒

No Impact. There are no existing forest lands either on-site or in the immediate vicinity of the Project site. The proposed Project would not result in the loss of forest land or conversion of forest land to non-forest use. Therefore, no impact is identified for this issue area.

	PSI	PSUMI	LTSI	NI
e) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use?	☒	☐	☐	☐

Potentially Significant Impact. The proposed Project would temporarily convert approximately 762.8 net acres of land actively cultivated farmland to a non-agricultural use. The site is bordered by a solar facility on the east and south and would represent an expansion of an existing use. However, the conversion of land designated for agriculture to a solar facility represents a potentially significant impact that will be discussed in the EIR.

	Potentially Significant Impact **(PSI)**	Potentially Significant Unless Mitigation Incorporated **(PSUMI)**	Less Than Significant Impact **(LTSI)**	No Impact **(NI)**

III. AIR QUALITY

Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to the following determinations. Would the Project:

	PSI	PSUMI	LTSI	NI
a) Conflict with or obstruct implementation of the applicable air quality plan?	☐	☒	☐	☐

Potentially Significant Impact Unless Mitigation Incorporated. The Project site is located within the Salton Sea Air Basin (SSAB) and is subject to the Imperial County Air Pollution Control District (ICAPCD) Rules and Regulations. Approximately 844.2 gross acres would be disturbed in association with construction of the Drew Solar Project. An Air Quality and Greenhouse Gas Analysis was prepared for the proposed Project that examined the potential for construction activities to create temporary emissions of dust, fumes, equipment exhaust, and other air contaminants that may conflict with the ICAPCD Rules and Regulations (RECON 2018a). The proposed Project may conflict with or obstruct implementation of an applicable air quality plan. This is considered a potentially significant impact unless mitigation is incorporated.

	PSI	PSUMI	LTSI	NI
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	☐	☒	☐	☐

Potentially Significant Impact Unless Mitigation Incorporated. Currently, the SSAB is either in attainment or unclassified for all federal and state air pollutant standards with the exception of O_3 (8-hour) and total suspended particulate matter less than 10 microns in diameter (PM_{10}). Air pollutants transported into the SSAB from the adjacent South Coast Air Basin (Los Angeles, San Bernardino County, Orange County, and Riverside County) and from Mexicali (Mexico) substantially contribute to the non-attainment conditions in the SSAB. Thus, a potentially significant impact is identified for this issue area. Construction of the proposed Project may result in a cumulatively considerable net increase of one or more criteria pollutants as a result of point, and non-point source emissions for which the region is in nonattainment under applicable federal and state ambient air quality standards. Thus, a potentially significant impact is identified with regard to violating an air quality standard. Temporary construction air quality emissions have the potential to result in an increase of criteria pollutants. This is considered a potentially significant impact unless mitigation is incorporated. An Air Quality and Greenhouse Gas Analysis (RECON 2018a) was prepared for the proposed Project and these potential air quality impacts will be addressed in the EIR.

	PSI	PSUMI	LTSI	NI
c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?	☐	☒	☐	☐

Potentially Significant Impact Unless Mitigation Incorporated. Refer to item “b”, above.

	PSI	PSUMI	LTSI	NI
d) Expose sensitive receptors to substantial pollutants concentrations?	☐	☐	☒	☐

Potentially Significant Impact Unless Mitigation Incorporated. The Project site parcels and surrounding areas are currently agricultural land with scattered rural residences and other solar developments. Sensitive

	Potentially Significant Impact **(PSI)**	Potentially Significant Unless Mitigation Incorporated **(PSUMI)**	Less Than Significant Impact **(LTSI)**	No Impact **(NI)**

receptors in the vicinity of the Project site include a single-family residence immediately west of the intersection of the Drew Road and SR 98 and another single-family residence northwest of the intersection of Kubler Road and Pulliam Road. Therefore, impacts to sensitive receptors are considered potentially significant unless mitigation is incorporated. This impact will be discussed in the EIR.

	PSI	PSUMI	LTSI	NI
e) Create objectionable odors affecting a substantial number of people?	☐	☐	☒	☐

Less than Significant Impact. The proposed Project is the development of a solar facility. The nearest sensitive receptor is a single-family residence approximately 80 feet from the southern edge of the proposed grading area (50 feet form project site boundary). Any odors associated with construction activities would be transient and would cease upon completion. For these reasons, construction-related odor impacts are considered less than significant but, would be acknowledged in the EIR.

IV. *BIOLOGICAL RESOURCES* *Would the project:*

	PSI	PSUMI	LTSI	NI
a) 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 the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?	☐	☒	☐	☐

Potentially Significant Impact Unless Mitigation Incorporated. The Project site consists of agricultural land. A Biological Resources Report has been prepared for the Project site (DUDEK 2018a) which included the results of biological surveys conducted in 2017. Based on the agricultural activities occurring on the site, it is unlikely that any special-status plant species would be present. Burrowing owl, a special-status species, was observed in the during the biological surveys. Two other special-status wildlife species, California black rail and Yuma Ridgeways' rail, have a moderate potential to occur in the proposed Project site.

The burrowing owl is a BLM Sensitive Species, a U.S. Fish and Wildlife Service Bird of Conservation Concern and a California Department of Fish and Wildlife (CDFW) Species of Special Concern. The proposed Project could result in potentially significant impacts to burrowing owls (refer to item e] below) as well as California black rail and Yuma Ridgeways' rail unless mitigation is incorporated. A full discussion of the findings of the Biological Resources Report will be provided in the EIR.

	PSI	PSUMI	LTSI	NI
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?	☐	☒	☐	☐

Potentially Significant Impact Unless Mitigation Incorporated. During construction, the proposed Project will potentially impact three sensitive vegetation communities/regulated resources: arrow weed thickets alliance, tamarisk thickets and cattail marshes alliance. Therefore, a potentially significant impact unless mitigation is incorporated is identified for impacts to riparian habitat and sensitive natural communities. These impacts will be discussed in the EIR.

	PSI	PSUMI	LTSI	NI
c) 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?	☐	☒	☐	☐

Potentially Significant Impact Unless Mitigation Incorporated. A jurisdictional delineation was prepared for the proposed Project site (DUDEK 2018a). Based on the jurisdictional delineation, there are approximately 10.2 acres of waters, wetlands and riparian habitat regulated by the U.S. Army Corps of Engineers (ACOE), Regional Water Quality Control Board, and the California Department of Fish and Wildlife (CDFW) and approximately 5.4 acres under the exclusive jurisdiction of CDFW within the Project Area. The proposed Project will potentially permanently impact federal jurisdictional wetland waters under the jurisdiction of the ACOE pending a jurisdictional determination. This is considered a potentially significant impact unless mitigation is incorporated.

	PSI	PSUMI	LTSI	NI
d) Interfere substantially with the movement of any 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?	☐	☐	☒	☐

Less than Significant Impact. Wildlife corridors are linear features that connect large patches of natural open space and provide avenues for the migration of animals. The Project site is primarily surrounded by, and includes, extensive historical and present day agricultural practices. The Project site is also bordered on the east and south by operating solar facilities. Thus, the site has limited value as a potential wildlife corridor or habitat linkage for most wildlife species. As such, the Project site likely does not serve as an important wildlife corridor or habitat linkage for larger mammals and species that are limited to native habitats. Impacts are considered less than significant but would be acknowledged in the EIR.

	PSI	PSUMI	LTSI	NI
e) Conflict with any local policies or ordinance protecting biological resource, such as a tree preservation policy or ordinance?	☐	☒	☐	☐

Potentially Significant Impact Unless Mitigation Incorporated. The Imperial County General Plan Open Space and Conservation Element (Imperial County 1993) contains an Open Space Conservation Policy that requires detailed investigations to be conducted to determine the significance, location, extent, and condition of natural resources in the County, and to notify any agency responsible for protecting plant and wildlife before approving a project which would impact a rare, sensitive, or unique plant or wildlife habitat. In accordance with this policy, a Biological Resources Report was prepared for the Project site (DUDEK 2018a). The Imperial County General Plan Land Use Element Policy notes that the majority of the privately-owned land in the County is designated "Agriculture," which is also the predominate area where burrowing owls (*Athene cunicularia*) create habitats, typically in the brims and banks of agricultural fields. Consistent with these policies, focused burrowing owl surveys were conducted on-site within suitable habitat during this species' breeding season and early migration period. Potential for harm to, or damage to habitat of, burrowing owl is considered a potentially significant impact unless mitigation is incorporated. The results of Biological Resources Assessment, and burrowing owl surveys will be discussed in the EIR.

	PSI	PSUMI	LTSI	NI
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	☐	☐	☒	☐

Less than Significant Impact. BLM has adopted the Desert Renewable Energy Conservation Plan (DRECP), which provides protection and conservation of desert ecosystems while allowing for appropriate development of renewable energy Projects. Although the DRECP plan area includes the Project area, the DRECP currently only applies to renewable energy Projects on BLM-managed lands and therefore would not be applicable to the proposed Project. The proposed Project is not located within any other local, regional, or state conservation planning areas. Impacts of the Project on an adopted HCP, NCCP, or other approved local, regional, or state habitat conservation plan would be less than significant.

V. CULTURAL RESOURCES *Would the project:*

	PSI	PSUMI	LTSI	NI
a) Cause a substantial adverse change in the significance of a historical resource as defined in §15064.5?	☐	☐	☒	☐

Less than Significant Impact. Nine newly identified historic age cultural resources were recorded during the intensive pedestrian survey conducted on November 20, 2017 and February 21, 2018 (DUDEK 2018b). These new resources consist of irrigation canals and drainages. Based on historic aerials and available date stamps, the canals are historic in age (circa 1950s). All historic age canal/drainage resources evaluated as part of the Historic Resource Evaluation (DUDEK 2108c) are recommended not eligible for the NRHP and CRHR based on a lack of historical significance, and in some cases, a lack of integrity. Therefore, impacts to historical resources would be less than significant, but would be acknowledged in the EIR.

	PSI	PSUMI	LTSI	NI
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5?	☐	☒	☐	☐

Potentially Significant Impact Unless Mitigation Incorporated. The parcels that comprise the Project site have been extensively disturbed by decades of agricultural activities. Any archaeology that was present would have been disturbed by continuous agricultural activities and would no longer remain intact. However, there is a moderate potential for the inadvertent discovery of intact cultural deposits during earth moving activities related to the construction of the Project's generation interconnection (gen-tie). The gen-tie alignment is located outside of the agricultural fields on areas that have not been subject to the same extensive agricultural disturbances. Therefore, a potentially significant impact could occur to unknown archaeological resources unless mitigation is incorporated.

	PSI	PSUMI	LTSI	NI
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☒	☐	☐

Potentially Significant Impact Unless Mitigation Incorporated. Many paleontological fossil sites recorded in Imperial County have been discovered during construction activities. Paleontological resources are typically impacted when earthwork activities such as mass excavation cut into geological deposits (formations) with buried fossils. The site lies near the western boundary of the old meandering shoreline of ancient Lake Cahuilla. However, it is not known if any paleontological resources are located beneath and within the boundaries of the Project site or gen-tie alignment. A potentially significant impact unless mitigation is incorporated has been identified for paleontological resources and unique geologic features. This issue will be addressed in the EIR.

		PSI	PSUMI	LTSI	NI
d)	Disturb any human remains, including those interred outside of dedicated cemeteries?	☐	☒	☐	☐

Potentially Significant Impact Unless Mitigation Incorporated. As described in item “a)” above, it is not likely that human remains would be found on the Project site parcels based on years of disturbance associated with agricultural activities. Nevertheless, the potential exists for previously unknown human remains to be discovered during construction of proposed Project as well as the gen-tie. This is considered a potentially significant impact unless mitigation is incorporated and will be discussed in the EIR.

VI. *GEOLOGY AND SOILS* *Would the project:*

		PSI	PSUMI	LTSI	NI
a)	Expose people or structures to potential substantial adverse effects, including risk of loss, injury, or death involving:	☐	☒	☐	☐
i.)	Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42?	☐	☒	☐	☐

Potentially Significant Impact Unless Mitigation Incorporated. The southwest corner of the Project site lies within the State of California Alquist-Priolo Earthquake Fault Zone. This is an unnamed fault that was mapped after the 2010 7.2 Mw El Mayor-Cucapha Earthquake (LandMark 2017). Surface fault rupture at the Project site is considered to be low to moderate. This is considered a potentially significant impact unless mitigation is incorporated and will be discussed in the EIR.

		PSI	PSUMI	LTSI	NI
ii.)	Strong Seismic ground shaking?	☐	☒	☐	☐

Potentially Significant Impact Unless Mitigation Incorporated. The primary seismic hazard at the Project site is the potential for strong groundshaking during earthquakes along the Superstition Hills, Imperial, Cerro Prieto, and Laguna Salada faults. The Project site is considered likely to be subjected to moderate to strong ground motion from earthquakes in the region LandMark 2017). Therefore, exposure to strong seismic groundshaking is considered a potentially significant impact unless mitigation is incorporated and will be discussed in the EIR.

		PSI	PSUMI	LTSI	NI
iii.)	Seismic-related ground failure, including liquefaction and seiche/tsunami?	☐	☒	☐	☐

Potentially Significant Impact Unless Mitigation Incorporated. A Preliminary Geotechnical and GeoHazards Report (LandMark 2017) was prepared for the Project site to examine the potential for seismic-related ground failure. Secondary effects of seismic activity normally considered as possible hazards to a site include several types of ground failure. Conditions conducive to liquefaction, including shallow groundwater, loosely packed cohesionless soils, and groundshaking of sufficient intensity, all exist to some degree at the Project site. Liquefaction settlement and ground fissures were noted along the Westside Main Canal in the area of the Project site after the April 4, 2010 magnitude 7.2Mw El Mayor-Cucapah Earthquake. Several liquefaction-related failures to the embankment of the Westside Main Canal were also present west of the Project site. Therefore, damage due to liquefaction is considered a potentially significant impact unless mitigation is incorporated and will be discussed in the EIR.

The Project site is not near any large bodies of water. Thus, the threat of tsunami, secihes, or other seismically-induced flooding is considered unlikely. Therefore, no impact would occur as a result of seiche or tsunami.

	PSI	PSUMI	LTSI	NI
iv.) Landslides?	☐	☐	☐	☒

No Impact. The site exhibits a generally flat topography and no landslides exist within or near the site. Based on the topography across the site, the potential for landsliding is considered negligible LandMark 2017). Thus, no impact is identified for this issue area and it will not be discussed in the EIR.

	PSI	PSUMI	LTSI	NI
b) Result in substantial soil erosion or the loss of topsoil?	☐	☒	☐	☐

Potentially Significant Impact Unless Mitigation Incorporated. The majority of the soils within the boundaries of the Project site are Imperial Silty Clay, Wet and Imperial-Glenbar Silty Clay Loams, Wet 0 to 2 percent slopes. Other soils include Holtville Silty Clay, Wet, Meloland Very Fine Sandy Loam, Wet and Rositas Fine Sand, Wet 0 to 2 percent slopes (RECON 2018c) . Site preparation will be planned and designed to minimize the amount of earth movement required to the extent feasible. Soil erosion could result during construction in association with ground preparation activities (grading, trenching) and is considered a potentially significant impact unless mitigation is incorporated. Standard erosion control methods will be required in accordance with County standards including preparation, review and approval of a grading plan by the County Engineer. During operations, both dust and erosion would be controlled by the periodic application of chemical stabilization agents (soil binders) to exposed soil surfaces. Potential for erosion during construction and operations will be discussed in the EIR.

	PSI	PSUMI	LTSI	NI
c) Be located on a geologic unit or soil that is unstable or that would become unstable as a result of the project, and potentially result in on- or off-site landslides, lateral spreading, subsidence, liquefaction or collapse?	☐	☒	☐	☐

Potentially Significant Impact Unless Mitigation Incorporated. The Project site is dominantly underlain by clays that are not expected to collapse with the addition of water to the site. Regional subsidence due to geothermal resource activities has not been documented in the area west of the New River. Therefore, the risk of regional subsidence is considered low. Based on the flat topography of the Project site, landslides are not considered a threat (refer to item "a-iv" above). However, as noted under item "a-iii", conditions conducive to liquefaction may exist to some degree on the Project site. The soils could become unstable if a seismic event were to occur triggering liquefaction on site (LandMark 2017). Therefore, potential for liquefaction is considered a potentially significant impact unless mitigation is incorporated and will be discussed in the EIR.

	PSI	PSUMI	LTSI	NI
d) Be located on expansive soil, as defined in the latest Uniform Building Code, creating substantial risk to life or property?	☐	☒	☐	☐

Potentially Significant Impact Unless Mitigation Incorporated. Much of the near surface soils within the boundaries of the Project site consist of silty clays and clay having a moderate to high expansion potential. A site-specific geotechnical investigation will be required at the Project site to determine the extent and effect of the expansive soils. Therefore, risk of exposure to expansive soils is considered a potentially significant impact unless mitigation is incorporated and will be discussed in the EIR.

	PSI	PSUMI	LTSI	NI
e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?	☐	☒	☐	☐

Potentially Significant Impact Unless Mitigation Incorporated. The near surface soils within the boundaries of the Project site generally consist of silty clays having a low infiltration rate (LandMark 2017). Some areas of silty sand soils may be encountered on the Project site which have moderate infiltration rates. The near surface sandy soils are considered good in supporting on-site septic systems and leach fields for wastewater disposal. Site specific studies will be required to determine if County Environmental Health Standards are met in regard to soil percolation rates and separation of leach fields from the groundwater. Thus, the capability of soils to support on-site septic systems is considered a potentially significant impact unless mitigation incorporated and will be discussed in the EIR.

VII. *GREENHOUSE GAS EMISSIONS* *Would the project:*

	PSI	PSUMI	LTSI	NI
a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	☐	☐	☒	☐

Less than Significant Impact. The proposed Project has the potential to generate greenhouse gas (GHG) emissions during construction in association with travel required to and from the Project site by construction workers, delivery of materials, and operation of heavy equipment. In comparison, during operations, total daily trips would be few to none. In the long-term, the Project is expected to provide a benefit with respect to reduction of greenhouse gas emissions as a result of generation of renewable power in place of fossil fuels.

The Project's gross annual GHG emissions and the GHG emissions offset by the renewable energy generation of the solar facility would gradually decline as a result of federal, state, and local implementation measures (RECON 2081a). As emissions would not exceed the South Coast Air Quality Management District's (AQMD's) screening threshold, the Project would not result in a cumulatively considerable impact to GHG emissions and would not conflict with the State GHG reduction targets. However, greenhouse gas emissions will be discussed in the EIR.

	Potentially Significant Impact **(PSI)**	Potentially Significant Unless Mitigation Incorporated **(PSUMI)**	Less Than Significant Impact **(LTSI)**	No Impact **(NI)**
b) Conflict with an applicable plan or policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?	☐	☐	☒	☐

Less than Significant Impact. Refer to item "a", above. No GHG emission significance threshold has been adopted by the Imperial County Air Pollution Control District. Project GHG emissions were evaluated against the South Coast AQMD screening level of 3,000 MT CO2E. The Project's combined gross construction, operational, and decommissioning GHG emissions would be 366 MT CO2E in 2020 (RECON 2018a). When accounting for the GHG emissions offset by the renewable energy generation of the solar facility, the Project would result in a net total reduction of 73,829 MT CO2E in 2020. Therefore, the no impact would occur with regard to conflicting with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases. However, this issue will be acknowledged in the EIR.

VIII. HAZARDS AND HAZARDOUS MATERIALS *Would the project:*

	PSI	PSUMI	LTSI	NI
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☒	☐	☐

Potentially Significant Impact Unless Mitigation Incorporated. The Project would not use or store any appreciable quantities of hazardous chemicals on site during normal operations. Fuel that may be used on site during construction would be stored in secondary containment. The Project proposes an energy storage system with a technology yet to be determined. Batteries are one form of energy storage that can involve the use of materials that present a hazard/potential for explosion. Therefore, creation of a hazard to the public through the routine transport, use, or disposal of hazardous materials is considered a potentially significant impact unless mitigation is incorporated.

	PSI	PSUMI	LTSI	NI
b) Create a significant hazard to the public or the environment through reasonable foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☐	☒	☐

Less than Significant Impact. A Phase I Environmental Site Assessment prepared for the Project (LandMark 2018) indicated that all of the parcels comprising the site have been used for agriculture since the late 1930s. During a site reconnaissance, no operations that use, treat, store, dispose of, or generated hazardous materials or petroleum products were observed on the Project site. However, residues of currently available pesticides and currently banned pesticides such as DDT/DDE may be present in near surface soils in limited concentrations. The concentrations of these pesticides found on other Imperial Valley agricultural sites are typically less than 25% of the current regulatory threshold limit and are not consider a significant environmental hazard. Low concentration pesticide residues typical to agricultural crop applications may be present in near surface soils and are considered *de mimimus.* No further environmental study is warranted at this time. Therefore, impacts associated with the release of hazardous materials are considered less than significant but will be acknowledged in the EIR.

	PSI	PSUMI	LTSI	NI
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed	☐	☐	☐	☒

school?

No Impact. The Project site is not located within one-quarter mile of an existing school. No impact would occur.

d) Be located on a site, which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☐	☐	☒

No Impact. An Agency Database Record Search was undertaken of available compiled agency database records as part of the Phase I Environmental Assessment (LandMark 2018). Based on the information available, the Project site was not found on a hazardous materials list pursuant to California Government Code Section 65962.5. No impact is identified for this issue area.

e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒

No Impact. The Project site is not located within two miles of a public airport or a private airstrip. The Johnson Brothers Airport is approximately 5.75 miles east of the Project site and the Naval Air Facility El Centro is approximately 8 miles to the north. Thus, no impact is identified for these issue areas.

f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒

No Impact. See item e), above.

g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	☒

No Impact. As identified in the Seismic and Public Safety Element of the County of Imperial General Plan (County of Imperial, n.d.), the "Imperial County Emergency Plan" addressed the County's planned response to extraordinary emergency situations associated with natural disasters, technological incidents, and nuclear defense operations. The proposed circulation plan for the Project site will be required to provide emergency access points and safe vehicular travel. In addition, local building codes would be followed to minimize flood, seismic, and fire hazard. Thus, the proposed Project would not impair the implementation of, or physically interfere with, any adopted emergency response plans or emergency evacuation plans. No impact is identified for this issue area.

h) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	☐	☐	☐	☒

	Potentially Significant Impact **(PSI)**	Potentially Significant Unless Mitigation Incorporated **(PSUMI)**	Less Than Significant Impact **(LTSI)**	No Impact **(NI)**

No Impact. The Project site is not characterized as an urban/wildland interface. According to the Imperial County Natural Hazard Disclosure (Fire) Map prepared by the California Department of Forestry and Fire Protection (CDF 2000), the Project site does not fall into an area characterized as either: (1) a wildland area that may contain substantial forest fire risk and hazard; or (2) a very high fire hazard severity zone. Thus, the Project site would not expose people or structures to significant risk of loss injury or death involving wildland fire. No impact is identified for this issue area.

IX. *HYDROLOGY AND WATER QUALITY* *Would the project:*

	PSI	PSUMI	LTSI	NI
a) Violate any water quality standards or waste discharge requirements?	☐	☒	☐	☐

Potentially Significant Impact Unless Mitigation Incorporated. Water quality violations have the potential to occur during construction and operation of the Project. Prior to construction, the Project would file a Notice of Intent with the State Water Resources Control Board (SWRCB) to comply with the general permit for construction activities. In addition, the Project would be required to prepare and implement a Storm Water Pollution Prevention Plan (SWPPP) consistent with the requirements of the SWRCB. Once operational, panel washing activities are not anticipated to generate runoff or contain pollutants (e.g. grease, heavy metals) other than dust. Any runoff from panel washing would evaporate or percolate through the ground, as a majority of the surfaces in the solar field will remain pervious. Thus, violation of water quality standards is considered a potentially significant unless mitigation is incorporated. This issue will be discussed in the EIR.

	PSI	PSUMI	LTSI	NI
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?	☐	☐	☒	☐

Less than Significant Impact. The Project will require water during both construction (primarily dust control) and operation (panel washing). The Project plans to secure water rights from the IID under the IID's Interim Water Supply Policy for Non- Agricultural Projects. In the event this isn't feasible, the Project will truck water to the site for operation purposes. The water used during operation will be used for domestic use and fire protection. Water is typically procured from IID via a long term IWSP Water Supply Agreement with a service pipe connection to an adjacent IID raw water canal. The Project may also use water to wash the solar modules should it be determined to be beneficial to the Project. The Project anticipates a requirement of approximately 60 acre-feet per year during plant operation. Water for fire protection will be stored in an on-site 10,000-gallon tank onsite. The Project may also use an additional 10,000-gallon storage tank to store treated water for sanitary uses (Drew Solar 2018). Potable water will be trucked to the site.

A Water Supply Assessment (WSA) was prepared for the Drew Solar Project (Fuscoe 2018b) in accordance with SB 610 (Part 2.10 Div. 6 of the California Water Code) evaluating the amount of water supplies. The findings of the WSA with regard to water availability for the proposed Project were found to be less than significant and will be discussed in the EIR.

	Potentially Significant Impact **(PSI)**	Potentially Significant Unless Mitigation Incorporated **(PSUMI)**	Less Than Significant Impact **(LTSI)**	No Impact **(NI)**
c) 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?	☐	☒	☐	☐

Potentially Significant Impact Unless Mitigation is Incorporated. Although the Project site is relatively flat, the large amount of disturbed area presents potential for erosion/sediment issues. During construction, sedimentation and erosion can occur as a result of tracking from earthmoving equipment, erosion and subsequent runoff of soil and improperly designed stockpiles. Proper erosion and sediment control Best Management Practices (BMPs) are critical in preventing discharge to surface waters and drains. The Project would employ proper Stormwater Pollution Prevention Plan practices to minimize any discharges in order to meet the Best Available Technology/Best Conventional Technology (BAT/BCT) standard set forth in the Construction General Permit (CGP) (Fuscoe 2018a). Thus, potential for substantial erosion or siltation on or off-site would be potentially significant unless mitigation is incorporated.

	PSI	PSUMI	LTSI	NI
d) Substantially alter the existing drainage patterns of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?	☐	☐	☒	☐

Less than Significant Impact. The existing drainage characteristics of the site will remain substantially the same following implementation of the Project. The majority of the site will sheet flow through the pervious native soils toward the shallow ponding areas (Fuscoe 2018a). The Project will be designed to meet County of Imperial storage requirements for storm water runoff which will result in an impoundment of runoff in excess of the anticipated volume generated by the 100-year storm event. The Project would result in less than significant impacts with regard to flooding on- or off-site but will be discussed in the EIR.

	PSI	PSUMI	LTSI	NI
e) Create or contribute runoff water, which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	☐	☐	☒	☐

Less than Significant Impact. The proposed Project would not generate substantial amounts of runoff as described in item b), above. Water used for panel washing will continue to percolate through the ground as a majority of the surfaces on the Project site will remain pervious. Thus, the proposed Project will not substantially alter the existing drainage pattern of the site, substantially increase the rate of runoff, or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems. Therefore, a less than significant impact is identified for these issue areas.

	PSI	PSUMI	LTSI	NI
f) Otherwise substantially degrade water quality?	☐	☐	☒	☐

Less than Significant Impact. The Project is not anticipated to degrade water quality based on the required stormwater permit as well as Best Management Practices (BMPs). Refer to the discussion under item "a" above. This issue is considered less than significant.

	Potentially Significant Impact **(PSI)**	Potentially Significant Unless Mitigation Incorporated **(PSUMI)**	Less Than Significant Impact **(LTSI)**	No Impact **(NI)**
g) Place housing within a 100-year flood hazard area as mapped on a Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	☐	☐	☐	☒

No Impact. The Project does not include a residential component. Therefore, no homes would be constructed within a 100-year flood zone. No impact would occur.

h) Place within a 100-year flood hazard area structures which would impede or redirect the flood flows?	☐	☐	☒	☐

Less than Significant Impact. The Project site is within Federal Emergency Management Agency Flood Hazard Zone X. Thus, the Project site is not subject to inundation the 100-year storm event and none of the structures placed on the Project site would impeded or redirect flows within a 100-year flood hazard zone. This issue is considered less than significant but will be acknowledged in the EIR.

i) Expose people or structures to a significant risk of loss, injury, or death involving flooding, including flooding as a result of the failure of a levee or dam?	☐	☐	☒	☐

Less than Significant Impact. The proposed Project does not propose development within the banks of the New River or Greeson Drain which are the limits of mapped flood Zone A. The Project includes detention in shallow areas of ponding under arrays (approximately 1-foot deep) or in designated detention basins (2 to 4 feet deep) (Fuscoe 2018a). The Project substation, permanent Operations and Maintenance Building and construction trailers will not be located in proposed areas of ponding or detention.

There are no dams immediately upstream of the Project. Therefore, dam breakage is not a risk concerning the Project site. Therefore, a less than significant impact is identified with regard to flooding. However, this issue will be acknowledged in the EIR.

j) Inundation by seiche, tsunami, or mudflow?	☐	☐	☐	☒

No Impact. The Project site is approximately 28 miles from the Salton Sea which is the nearest large water body. Due to the distance, the Salton Sea does not pose a particularly significant danger of inundation from seiche or tsunami as related to the proposed Project site (Fuscoe 2018a).

The Project site is approximately four miles from Mount Signal, the nearest significantly sloped landscape. The Project site is not in any danger of inundation by mudflow. Thus, no impact is identified for these issues.

X. LAND USE AND PLANNING *Would the project:*

a) Physically divide an established community?	☐	☐	☐	☒

No Impact. The Drew Solar Project is located in Imperial County, California, approximately 6.5 miles southwest of the city of El Centro and 7.5 miles directly west of Calexico. The project represents an expansion of existing solar uses currently developed in the area. Thus, no impact is identified with regard to dividing an established community.

	Potentially Significant Impact **(PSI)**	Potentially Significant Unless Mitigation Incorporated **(PSUMI)**	Less Than Significant Impact **(LTSI)**	No Impact **(NI)**
b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (include, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	☒	☐	☐	☐

Potentially Significant Impact. The proposed Project site is currently zoned A-2 (General Agricultural Zone), A-2-R (General Agricultural Zone/Rural Zone), and A-3 (Heavy Agricultural). The Project will require: an Amendment to Imperial County's General Plan Land Use Element and Renewable Energy and Transmission Element; a Variance for power pole structures that are over 120 feet in height; A Zone Change to add the RE Overlay Zone to the project area and conditionally rezone Phase 5 to M-2 (Medium Industrial); five CUPs to develop solar energy generating systems including potential energy storage on lands zoned A-2, A-2-R, and A-3 per Title 9, Division 5: Zoning Areas Established, Chapter 8, Section 90508.02 and 90509.02; and one CUP to develop battery storage on lands currently zoned A-2 and A-3 proposed to be conditionally rezoned to M-2 (Medium Industrial), per Title 9, Division 5: Zoning Areas Established, Chapter 8, Section 90508.02 (A-2); and Chapter 9, Section 90509.02 (A-3).

Both the GPA and the Zone Change would be to the Renewable Energy Overlay Zone (Drew Solar 2018). Impacts associated with the allowed CUPs, GPA, Zone Change (RE Overlay and conditional zoning to M-2 on Phase 5), Initial Study and Variance would be addressed. Specifically, changing the zone within the allowed CUP for battery storage could present a conflict as it is considered "spot zoning". Therefore, conflicts with applicable land use plan, policy or regulation is considered a potentially significant impact.

c) Conflict with any applicable habitat conservation plan or natural community conservation plan?	☐	☐	☐	☒

No Impact. Imperial County is not within the jurisdiction of any adopted habitat conservation plan (HCP) or natural community conservation plan (NCCP), or other approved local, regional or state habitat conservation plan. Therefore, no impact to an HCP or NCCP would occur and this issue will not be examined in the EIR.

XI. *MINERAL RESOURCES* *Would the project:*

a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☐	☐	☒

No Impact. The Project site has been used for agriculture since the 1930's. According to the Conservation and Open Space Element of the County of Imperial General Plan (County of Imperial 2008), no known mineral resources occur within the Project parcels nor does are there any mapped mineral resources within the boundary of the site. Thus, no impact is identified with regard to mineral resources.

b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?	☐	☐	☐	☒

No Impact. Refer to item a), above.

	Potentially Significant Impact **(PSI)**	Potentially Significant Unless Mitigation Incorporated **(PSUMI)**	Less Than Significant Impact **(LTSI)**	No Impact **(NI)**

XII. *NOISE* *Would the project result in:*

a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☐	☐	☒	☐

Less than Significant Impact. Short-term noise levels would increase on the Project site, surrounding roadways and at nearby single-family residences during construction. The Noise Analysis prepared for the Drew Solar Project (RECON 2018d) determined that project construction noise levels would comply with the 75 dB(A) Leq(8h) noise level limit established by Imperial County General Plan Noise Element (County of Imperial 2015). In addition, operational noise levels would not exceed applicable property line noise level limits prescribed in the Noise Element. Ambient noise level increases attributable to project-generated traffic are anticipated to be less than 3 dB(A) along all roadways. Although noise level increases resulting from Project construction and operation would result in a less than significant impact with regard to the Imperial County General Plan Noise Element, these issues will be addressed in the EIR.

b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?	☐	☐	☒	☐

Less than Significant Impact. Project construction would include the use of vibration-generating construction equipment such as large bulldozers, loaded trucks, jackhammers, and mast impact pile drivers. Vibration levels at the nearest structure would be anticipated to reach up to 0.073 PPV the nearest structure (RECON 2018d). As vibration levels would not exceed the vibration level threshold of 0.2 PPV, groundborne noise and vibration impacts would be less than significant. However, this issue will be discussed in the EIR.

c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☒	☐

Less than Significant Impact. Long-term operational noise levels associated with the operation of the Project would include noise generated by inverters, transformers, solar panel tracker motors, substation(s), and the gen-tie. Noise associated with Project operation would attenuate to less than 50 dB(A) Leq within the boundary of the Project site. On-site noise would attenuate to 44 dB(A) Leq at the nearest single-family residence immediately (west of the intersection of Drew Road and SR-98) (RECON 2108d). While ambient noise levels in the Project vicinity would increase above levels without the Project, noise levels would not exceed applicable property line noise level limits from limits prescribed in the Imperial County General Plan Noise Element (County of Imperial 2015). This is considered a less than significant impact. However, the change in ambient noise levels will be discussed in the EIR.

d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☒	☐

Less than Significant Impact. Short-term construction noise levels were analyzed as part of the Noise Analysis prepared for the Drew Solar Project. As noted in item “a”, above, Project construction noise levels would comply with the 75 dB(A) Leq(8h) noise level limit established by Imperial County General Plan Noise Element (County of Imperial 2015). This is considered a less than significant impact. However, temporary or periodic increase in ambient noise levels will be discussed in the EIR.

	PSI	PSUMI	LTSI	NI
e) For a project located within an airport land use plan or where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒

No Impact. The Project site is not located within two miles of a public airport or a private airstrip. Thus, the Project site would not be exposed to excessive aircraft noise. As a solar facility, the Project is industrial in nature and therefore is not a noise sensitive land use. No impacts are identified with regard to airport noise and this issue will not be discussed in the EIR.

	PSI	PSUMI	LTSI	NI
f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒

No Impact. Refer to item e), above.

XIII. *POPULATION AND HOUSING* *Would the project:*

	PSI	PSUMI	LTSI	NI
a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and business) or indirectly (for example, through extension of roads or other infrastructure)?	☐	☐	☐	☒

No Impact. The Project does not propose the development of new housing on the Project site nor does it propose construction or extension of new roads (aside from internal access roads). The Project, by its nature as solar facility, would not induce growth. No impact would occur for this issue.

	PSI	PSUMI	LTSI	NI
b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒

No Impact. The proposed Project site is currently agricultural land with no residential structures within its boundaries. As a result, development of the proposed solar project would not displace substantial numbers of existing housing or people requiring construction of replacement housing elsewhere. No impact would occur for these issues.

	PSI	PSUMI	LTSI	NI
c) Displace substantial numbers of people necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒

No Impact. Refer to item b), above

	Potentially Significant Impact **(PSI)**	Potentially Significant Unless Mitigation Incorporated **(PSUMI)**	Less Than Significant Impact **(LTSI)**	No Impact **(NI)**

XIV. PUBLIC SERVICES

	PSI	PSUMI	LTSI	NI
a) 1) Fire Protection?	☐	☒	☐	☐

Potentially Significant Unless Mitigation Incorporated. The Project site is within the jurisdiction of the Imperial County Fire Department. The PV modules and ancillary equipment are constructed of fire-resistant material. Additionally, routine weed abatement and landscape maintenance will occur and the on-site buildings will have fire alarms. Water for fire protection will be stored in an on-site 10,000-gallon tank. As such, the Project represents a negligible increase in fire potential. A Fire Management Plan will be prepared in accordance with Fire Department requirements for access. Access to the Project site as well as nearby properties will not be hindered or restricted by the Project (Drew Solar 2018). Nevertheless, the Fire Department will be consulted and impacts to fire protection are anticipated to potentially significant unless mitigation is incorporated.

	PSI	PSUMI	LTSI	NI
2) Police Protection?	☐	☐	☒	☐

Less than Significant Impact. The Project site is within the jurisdiction of the Imperial County Sheriff's Department. The Project includes a number of security features including a chain-link fence up to 7 feet in height with 3-strand barb wire placed at the top, extending to a total of up to 8 feet (Drew Solar 2018). The fence will be monitored periodically to detect any intrusion into the property. Security lighting may also be installed and signs will be posted warning against trespassing/intrusion. Access to the site will be controlled, and gates will be installed at the roads entering the property. Operations personnel will also perform security functions when present. Thus, impacts to police protection are anticipated to be less than significant. However, the Sheriff's Department will be consulted and this issue will be discussed in the EIR.

	PSI	PSUMI	LTSI	NI
3) Schools?	☐	☐	☐	☒

No Impact. The proposed Project would not result in a substantial increase in population because it neither includes a residential component nor would it generate the need for new housing to accommodate workforce population. Based on the nature of the project as a solar facility, no increase in schools, parks, or other public facilities are anticipated. As such, the proposed Project would not have an adverse physical effect on the environment resulting from construction of a new school, park or other public facility. Therefore, no impact is identified for this issue area.

	PSI	PSUMI	LTSI	NI
4) Parks?	☐	☐	☐	☒

No Impact. Refer to item "a3" above.

	PSI	PSUMI	LTSI	NI
5) Other Public Facilities?	☐	☐	☐	☒

No Impact. Refer to item "a3: above.

XV. *RECREATION*

	PSI	PSUMI	LTSI	NI
a) Would the project increase the use of the existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☐	☒

No Impact. The proposed Project is a solar facility and would not create a demand for recreation or parks in the County. Thus, no impact is identified for these issues and recreation will not be discussed in the EIR.

	PSI	PSUMI	LTSI	NI
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse effect on the environment?	☐	☐	☐	☒

No Impact. The proposed Project is a solar facility and does not include recreational facilities or require the construction or expansion of recreational facilities. Therefore, no impact to recreational facilities would occur and this issue will not be discussed in the EIR.

XVI. *TRANSPORTATION / TRAFFIC* *Would the project:*

	PSI	PSUMI	LTSI	NI
a) Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?	☐	☐	☒	☐

Less than Significant Impact. The construction of the proposed Project would result in a temporary increase in traffic along area roadways including sections of Brockman Road, Forrester Road, Kubler Road, McCabe Road, and Pulliam Road. The segment of SR 98 between Drew Road and Clark Road as well as Interstate 8 between Drew Road and Imperial Avenue would also be used as construction travel routes. Once operational, the proposed Project would require very few maintenance worker trips. Additional workers would occasionally be required to access the site to clean the solar panels or to perform specific maintenance. Deliveries would occur irregularly. The Traffic Impact Study prepared for the Project examined project traffic under ten scenarios (LOS 2018). In each scenario, LOS was determined to be LOS C or better with no significant direct Project impacts. Therefore, the proposed Project is not anticipated to conflict with an applicable plan establishing measures of effectiveness for the performance of the circulation system. This impact is considered less than significant. However, traffic will be discussed in the EIR.

	PSI	PSUMI	LTSI	NI
b) Conflict with an applicable congestion management program, including but not limited to level of service standard and travel demand measures, or other standards established by the county congestions/management agency for designated roads or highways?	☐	☐	☒	☐

Less than Significant Impact. Refer to item a) above.

	PSI	PSUMI	LTSI	NI
c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?	☐	☐	☐	☒

No Impact. The proposed Project would not result in changes to existing air traffic patterns through an increase in traffic levels or change in location. Thus, no impact is identified for this issue area.

	PSI	PSUMI	LTSI	NI
d) Substantially increases hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☒	☐	☐

Potentially Significant Impact Unless Mitigation Incorporated. The Project proposes three access points off of SR 98 along the southern boundary of the site as well as seven access points off of County Road. These include two driveways of off Drew Road on the west and one off of Drew Road on the south; two driveways off of Kubler Road on the north; and two driveways off of Pulliam road on the east. Traffic volumes in the area are currently quite low, however vehicles often travel at a high rate of speed along these roads and SR 98. Access points will be examined with regard to increasing hazards due to the design and location of the proposed driveways. The Project may also result in damage to area roadways caused by heavy trucks transporting materials and equipment to the site. Cracks in the asphalt as well as potholes can result from high volumes of heavy trucks which can create a hazard for vehicles traveling on these roadways. Therefore, increased hazards due to a design feature as well as incompatible uses are considered a potentially significant impact unless mitigation is incorporated.

	PSI	PSUMI	LTSI	NI
e) Result in inadequate emergency access?	☐	☐	☒	☐

Less than Significant Impact. The Project currently proposes seven access points. Prior to approval, the final site plan must be reviewed by the Imperial County Fire Department and the Imperial County Sheriff's Department and meet all County design requirements for emergency access. The Project is not anticipated to hinder the ability of fire or law enforcement to access nearby properties. Thus, a less than significant impact is identified for this issue area. Nevertheless, the adequacy of emergency access will be discussed in the EIR.

	PSI	PSUMI	LTSI	NI
f) Conflicts with adopted policies, plans, programs, regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities?	☐	☐	☐	☒

No Impact. The proposed Project is located in a rural, sparsely populated portion of the County void of public transit, bike lanes and pedestrian facilities. Thus, development of a solar facility would not conflict with any adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities. Thus, no impact is identified for this issue area.

XVII. *TRIBAL CULTURAL RESOURCES*

	PSI	PSUMI	LTSI	NI
a) Would the project cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code Section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place or object with cultural value to a California Native American tribe, and that is:	☐	☒	☐	☐

a. **Potentially Significant Impact Unless Mitigation Incorporated.** In accordance with the requirements of AB 52, tribes who have submitted requests to consult will be contacted as part of the environmental review process for this project. Tribal cultural resources impacts are considered potentially significant unless mitigation is incorporated.

	PSI	PSUMI	LTSI	NI
1) Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as define in Public Resources Code Section 5020.1(k), or	☐	☒	☐	☐

Potentially Significant Impact Unless Mitigation Incorporated. Refer to item “a”, above.

	PSI	PSUMI	LTSI	NI
2) A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Code Section 5024.1. In applying the criteria set forth is subdivision (c) of Public Resource Code Section 5024.1, the lead agency shall consider the significance of the resource to a California Native American Tribe.	☐	☒	☐	☐

Potentially Significant Impact Unless Mitigation Incorporated. Refer to item “a”, above.

XVIII. *UTILITIES AND SERVICE SYSTEMS* *Would the project:*

	PSI	PSUMI	LTSI	NI
a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	☐	☒	☐	☐

Potentially Significant Impact Unless Mitigation Incorporated. The Project will collect wastewater from sanitary facilities such as sinks and toilets in the O&M building(s). This waste stream will be sent to an onsite sanitary waste septic system and leach field to be installed in compliance with standards established by Imperial County Environmental Health Services (Drew Solar 2018). Alternatively, the Project may be designed to direct these waste streams to an underground tank for storage until it is pumped out, on a periodic or as-needed basis, and transported for disposal at a licensed waste treatment facility. During periodic major maintenance events, portable restroom facilities may be provided to accommodate additional maintenance workers. Nevertheless, impacts with regard to development of an on-site septic system are considered potentially significant unless mitigation is incorporated. Impacts associated with development of the sanitary system will be discussed in the EIR.

	PSI	PSUMI	LTSI	NI
b) Require or result in the construction of new water or water treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☒	☐	☐

Potentially Significant Impact Unless Mitigation Incorporated. The Applicant plans to secure water rights from the IID under the IID’s Interim Water Supply Policy for Non-Agricultural Projects. In the event this isn’t feasible, the Project will truck water to the site for operation purposes. The water used during operation will be used for domestic use and fire protection. Water is typically procured from IID via a long term IWSP Water Supply Agreement with a service pipe connection to an adjacent IID raw water canal. The Project may also use water to wash the solar modules should it be determined to be beneficial to the Project. An onsite water treatment facility may be constructed. The impacts of providing on-site water treatment are considered potentially significant unless mitigation is incorporated and will be discussed in the EIR.

	PSI	PSUMI	LTSI	NI
c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☒	☐	☐

Potentially Significant Impact Unless Mitigation Incorporated. The onsite drainage patterns will be maintained to the greatest extent possible. However, it may be necessary to remove, relocate and/or fill in portions of the existing drainage ditches or delivery canals to accommodate the final panel layout for the Project. The final engineering design for these facilities will be reviewed by IID and the County to be sure that the purpose for the facilities (if still needed) will still be met. Therefore, impacts associated with construction of new storm water drainage facilities are considered potentially significant unless mitigation is incorporated.

	PSI	PSUMI	LTSI	NI
d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?	☐	☐	☒	☐

Less than Significant Impact. The proposed Project is anticipated to result in an increase in water demand/use during construction and operation. An estimated total of 1,200-acre-feet of water will be used for the Project dust control and other construction activities during the construction phase of the Project. During operation, the Project will use water only for periodic washing of the solar panels. The Project anticipates a requirement of approximately 60 acre-feet per year during plant operation (Drew Solar 2018). A Water Supply Assessment has been prepared for the Drew Solar Project indicating that the IID has adequate supply available to meet Project demands (Fuscoe 2018b). The findings of the WSA and existing usage will be discussed in the EIR. Impacts to water supply are anticipated to be less than significant.

	PSI	PSUMI	LTSI	NI
e) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☐	☐	☐	☒

No Impact. The Project will generate wastewater from sanitary facilities such as sinks and toilets in the O&M building(s). This waste stream will be sent to an onsite sanitary waste septic system and leach field to be installed in compliance with standards established by Imperial County Environmental Health Services. Thus, no impact to a wastewater provider would occur.

	PSI	PSUMI	LTSI	NI
f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☐	☒	☐

Less than Significant Impact. Some solid waste would be generated during demolition and construction of the proposed Project. Such materials would be hauled to an appropriate disposal facility. During operations of the proposed Project, waste generation will be minor. Solid wastes will be disposed of using a locally-

	Potentially Significant Impact (PSI)	Potentially Significant Unless Mitigation Incorporated (PSUMI)	Less Than Significant Impact (LTSI)	No Impact (NI)

licensed waste hauling service. Thus, a less than significant impact is identified for this issue.

g) Comply with federal, state, and local statutes and regulations related to solid waste?	☐	☐	☒	☐

Less than Significant Impact. Refer to item “f”, above.

Note: Authority cited: Sections 21083 and 21083.05, Public Resources Code. Reference: Section 65088.4, Gov. Code; Sections 21080(c), 21080.1, 21080.3, 21083, 21083.05, 21083.3, 21093, 21094, 21095, and 21151, Public Resources Code; Sundstrom v. County of Mendocino,(1988) 202 Cal.App.3d 296; Leonoff v. Monterey Board of Supervisors, (1990) 222 Cal.App.3d 1337; Eureka Citizens for Responsible Govt. v. City of Eureka (2007) 147 Cal.App.4th 357; Protect the Historic Amador Waterways v. Amador Water Agency (2004) 116 Cal.App.4th at 1109; San Franciscans Upholding the Downtown Plan v. City and County of San Francisco (2002) 102 Cal.App.4th 656.
Revised 2009- CEQA, Revised 2011- ICPDS, Revised 2016 – ICPDS, Revised 2017 - ICPDS

	Potentially Significant Impact **(PSI)**	Potentially Significant Unless Mitigation Incorporated **(PSUMI)**	Less Than Significant Impact **(LTSI)**	No Impact **(NI)**

SECTION 3 - III. MANDATORY FINDINGS OF SIGNIFICANCE

The following are Mandatory Findings of Significance in accordance with Section 15065 of the CEQA Guidelines.

	PSI	PSUMI	LTSI	NI
a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal, or eliminate important examples of the major periods of California history or prehistory?	☐	☒	☐	☐

Potentially Significant Impact Unless Mitigation Incorporated. Implementation of the proposed Project has the potential to result in potential to degrade the quality of the environment with regard to aesthetics, agricultural and forest resources, air quality, biological resources, cultural resources, geology and soils, hydrology and water quality, land use, transportation/traffic, public services, Tribal Cultural Resources and utilities and service systems. These issues will be further evaluated in the EIR.

	PSI	PSUMI	LTSI	NI
b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.)	☒	☐	☐	☐

Potentially Significant Impact. The proposed Project has the potential to result in a cumulatively considerable net increase of one or more criteria pollutants for which the Project region is in non-attainment under applicable federal and state ambient air quality standards. Therefore, a potentially significant cumulative impact may occur. An Air Quality Analysis has been prepared for the proposed Project and the conclusions will be discussed in the EIR.

	PSI	PSUMI	LTSI	NI
c) Does the project have environmental effects, which will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☒	☐	☐

Potentially Significant Impact Unless Mitigation Incorporated. The proposed Project has the potential to result in significant environmental effects which could directly or indirectly cause adverse effects on human beings. As demonstrated in this Initial Study, the proposed Project has the potential to result in potentially significant impacts unless mitigation is incorporated to agricultural and forest resources, air quality, biological resources, cultural resources, geology and soils, hydrology and water quality, land use, public services, transportation/traffic, Tribal Cultural Resources and utilities and service systems. These impact areas could result in direct or indirect adverse effects on human beings. Thus, these issues will be discussed in the EIR.

IV. PERSONS AND ORGANIZATIONS CONSULTED

This section identifies those persons who prepared or contributed to preparation of this document. This section is prepared in accordance with Section 15129 of the CEQA Guidelines.

A. COUNTY OF IMPERIAL

- Jim Minnick, Director of Planning & Development Services
- Michael Abraham, AICP, Assistant Director of Planning & Development Services
- Diana Robinson, Planner II
- Patricia Valenzuela, Project Planner
- Imperial County Air Pollution Control District
- Department of Public Works
- Fire Department
- Ag Commissioner
- Environmental Health Services
- Sheriff's Office

B. OTHER AGENCIES/ORGANIZATIONS

- **CDFW**
- **USFWS**
- **Cal Trans**

(Written or oral comments received on the checklist prior to circulation)

V. REFERENCES

County of Imperial 2015. County of Imperial General Plan. Noise Element. October 6, 2015. Available at Website url: http://www.icpds.com/?pid=835. Referenced in text as (Imperial County 2015).

2008. "Conservation and Open Space Element." January 29, 2008. (Imperial County 2008).

No date. Seismic and Public Safety Element. Referenced in text as (Imperial County n.d.).

California Department of Forestry and Fire Protection, 2000. Website http://www.fire.ca.gov/ab6/nhd13.pdf accessed March 15, 2011. Referenced in text as (CDF 2000).

Drew Solar LLC. 2018. "Project Description Drew Solar." January 8, 2018. Referenced in text as (Drew Solar 2018).

DUDEK 2018a. "Biological Resources Report for the Drew Solar Project Imperial County, California." April 2018. Referenced in text as (DUDEK 2018a).

2018b. "Cultural Resources Inventory Report for the Drew Solar Project, Imperial County, California." February 2018. Referenced in text as (DUDEK 2018b).

2018c. "Historic Resource Evaluation for the Drew Solar Project, Imperial County, California." January 9, 2018. Referenced in text as (DUDEK 2018c).

Fuscoe Engineering, Inc. 2018a. ''Conceptual Drainage Study and Storm Water Quality Analysis - Drew Solar". February 8, 2018. Referenced in text as (Fuscoe 2018a).

2018b. "Drew Solar Water Supply Assessment." February 2018. Referenced in text as (Fuscoe 2018b).

Landmark Consultants, Inc. 2018. "Phase I Environmental Site Assessment Report, Drew Solar Project." *January 18, 2018.* (LandMark 2018).

2017. "Preliminary Geotechnical and Geohazards Report, Drew Solar Site." November 14, 2017. Referenced in text as (LandMark 2017).

LOS Engineering. 2108. "Draft Traffic Impact Analysis, Drew Solar Farm, County of Imperial (SR-98 at Drew Road)." February 9, 2018. Referenced in text as (LOS 2018).

POWER Engineers. 2018. "Drew Solar Project Glare Study." February 8, 2018. Referenced in text as (POWER 2018).

RECON Environmental, Inc. 2018a. "Air Quality and Greenhouse Gas Analysis for the Drew Solar Project, Imperial County, California," February 14, 2018. Referenced in text as (RECON 2018a)

2018b. "Results of Burrowing Owl Survey Conducted for the Drew Solar Project, City of Calexico, Imperial County, California." April 10, 2018. Referenced in text as (RECON 2018b).

2018c. "Land Evaluation and Site Assessment Analysis for the Drew Solar Project, Imperial County, California". February 12, 2018. Referenced in text as (RECON 2018c).

2018d. "Noise Analysis for the Drew Solar Project, Imperial County, California.' February 13, 2018. Referenced in text as (RECON 2018d).

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NOP COMMENT LETTERS

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STATE OF CALIFORNIA
GOVERNOR'S OFFICE *of* PLANNING AND RESEARCH

EDMUND G. BROWN JR.
GOVERNOR

KEN ALEX
DIRECTOR

Notice of Preparation

RECEIVED
MAY 21 2018
IMPERIAL COUNTY
PLANNING & DEVELOPMENT SERVICES

May 17, 2018

To: Reviewing Agencies

Re: Drew Solar Project
SCH# 2018051036

Attached for your review and comment is the Notice of Preparation (NOP) for the Drew Solar Project draft Environmental Impact Report (EIR).

Responsible agencies must transmit their comments on the scope and content of the NOP, focusing on specific information related to their own statutory responsibility, within 30 days of receipt of the NOP from the Lead Agency. This is a courtesy notice provided by the State Clearinghouse with a reminder for you to comment in a timely manner. We encourage other agencies to also respond to this notice and express their concerns early in the environmental review process.

Please direct your comments to:

Diana Robinson
Imperial County
801 Main Street
El Centro, CA 92243

with a copy to the State Clearinghouse in the Office of Planning and Research. Please refer to the SCH number noted above in all correspondence concerning this project.

If you have any questions about the environmental document review process, please call the State Clearinghouse at (916) 445-0613.

Sincerely,

Scott Morgan
Scott Morgan
Director, State Clearinghouse

Attachments
cc: Lead Agency

Document Details Report
State Clearinghouse Data Base

SCH# **2018051036**
Project Title Drew Solar Project
Lead Agency Imperial County

Type **NOP** Notice of Preparation

Description The Drew Solar Project is a proposed approx 100 mw solar pv energy-generating facility including energy storage on six parcels totaling 762.8 net acres. The project includes a GPA, height variance, zone change, development agreement and six CUP. The project includes construction of generation interconnection (gen-tie) transmission lines extending south across Drew Rd and SR 98 into the existing Drew Switchyard. The project may be constructed at one time over approx 18 months, or it may be built out over an approx 10-year period.

Lead Agency Contact

Name Diana Robinson
Agency Imperial County
Phone 442-265-1736 x 1751 ***Fax***
email
Address 801 Main Street
City El Centro ***State*** CA ***Zip*** 92243

Project Location

County Imperial
City El Centro
Region
Cross Streets Pulliam Rd and SR 98
Lat / Long 32° 41' 13" N / 115° 40' 8" W
Parcel No. 052-170-039, 067, 031, 032, 056, 037
Township 17S ***Range*** 13E ***Section*** 7, 8 ***Base*** SBBM

Proximity to:

Highways SR 98
Airports
Railways
Waterways Westside Main Canal
Schools
Land Use PLU/GP: Ag; Z: A-2, A-2-R, A-3

Project Issues Aesthetic/Visual; Agricultural Land; Air Quality; Archaeologic-Historic; Biological Resources; Flood Plain/Flooding; Geologic/Seismic; Noise; Public Services; Septic System; Soil Erosion/Compaction/Grading; Toxic/Hazardous; Traffic/Circulation; Vegetation; Water Quality; Water Supply; Wetland/Riparian; Landuse; Cumulative Effects; Other Issues

Reviewing Agencies Resources Agency; Department of Conservation; Department of Parks and Recreation; Department of Water Resources; Office of Emergency Services, California; Department of Fish and Wildlife, Region 6; Native American Heritage Commission; Public Utilities Commission; California Energy Commission; State Lands Commission; California Highway Patrol; Air Resources Board, Major Industrial Projects; Caltrans, District 11; State Water Resources Control Board, Division of Drinking Water; State Water Resources Control Board, Division of Drinking Water, District 14; Regional Water Quality Control Board, Region 7; Colorado River Board

Date Received 05/17/2018 ***Start of Review*** 05/17/2018 ***End of Review*** 06/15/2018

Note: Blanks in data fields result from insufficient information provided by lead agency.

Print Form

Appendix C

Notice of Completion & Environmental Document Transmittal

Mail to: State Clearinghouse, P.O. Box 3044, Sacramento, CA 95812-3044 (916) 445-0613
For Hand Delivery/Street Address: 1400 Tenth Street, Sacramento, CA 95814

SCH # 2018051036

Project Title: Drew Solar Project

Lead Agency: Imperial County — Contact Person: Diana Robinson

Mailing Address: 801 Main Street — Phone: (442)265-1736 Extension 1751

City: El Centro — Zip: 92243 — County: Imperial

Project Location: County: Imperial — City/Nearest Community: El Centro

Cross Streets: Pulliam Road and State Route 98 — Zip Code: 92243

Longitude/Latitude (degrees, minutes and seconds): 32 °41 ′13 ″N / 115 °40 ′8 ″W — Total Acres: 844.3 gross 762.8 net

Assessor's Parcel No.: 052-170-039,067,031,032,056,037 — Section: 7 & 8 — Twp.: 17S — Range: 13E — Base: SBBM

Within 2 Miles: State Hwy #: SR 98 — Waterways: Westside Main Canal

Airports: None — Railways: None — Schools: None

Document Type:

CEQA: [X] NOP [ ] Early Cons [ ] Neg Dec [ ] Mit Neg Dec [ ] Draft EIR [ ] Supplement/Subsequent EIR (Prior SCH No.) ____ Other: ____

NEPA: [ ] NOI [ ] EA [ ] Draft EIS [ ] FONSI

Other: [ ] Joint Document [ ] Final Document [ ] Other: ____

Local Action Type:

[ ] General Plan Update [X] General Plan Amendment [ ] General Plan Element [ ] Community Plan
[ ] Specific Plan [ ] Master Plan [ ] Planned Unit Development [ ] Site Plan
[X] Rezone [ ] Prezone [X] Use Permit [ ] Land Division (Subdivision, etc.)
[ ] Annexation [ ] Redevelopment [ ] Coastal Permit [X] Other: Height Variance

Governor's Office of Planning & Research
MAY 17 2018
STATE CLEARINGHOUSE

Development Type:

[ ] Residential: Units ____ Acres ____
[ ] Office: Sq.ft. ____ Acres ____ Employees ____
[ ] Commercial: Sq.ft. ____ Acres ____ Employees ____
[X] Industrial: Sq.ft. ____ Acres 762.8 Employees 6
[ ] Educational: ____
[ ] Recreational: ____
[ ] Water Facilities: Type ____ MGD ____
[ ] Transportation: Type ____
[ ] Mining: Mineral ____
[X] Power: Type Solar MW 100
[ ] Waste Treatment: Type ____ MGD ____
[ ] Hazardous Waste: Type ____
[ ] Other: ____

Project Issues Discussed in Document:

[X] Aesthetic/Visual [X] Agricultural Land [X] Air Quality [X] Archeological/Historical [X] Biological Resources [ ] Coastal Zone [ ] Drainage/Absorption [ ] Economic/Jobs
[ ] Fiscal [X] Flood Plain/Flooding [ ] Forest Land/Fire Hazard [X] Geologic/Seismic [ ] Minerals [X] Noise [ ] Population/Housing Balance [X] Public Services/Facilities
[ ] Recreation/Parks [ ] Schools/Universities [X] Septic Systems [ ] Sewer Capacity [X] Soil Erosion/Compaction/Grading [ ] Solid Waste [X] Toxic/Hazardous [X] Traffic/Circulation
[X] Vegetation [X] Water Quality [X] Water Supply/Groundwater [X] Wetland/Riparian [ ] Growth Inducement [X] Land Use [X] Cumulative Effects [X] Other: Cultural Resources

Present Land Use/Zoning/General Plan Designation:

Present Land Use/General Plan: Agriculture; Zoning: A-2 (General Agricultural)A-2-R (General Agricultural/Rural)A-3(Heavy Ag)

Project Description: *(please use a separate page if necessary)*
The Drew Solar Project is a proposed approximately 100 megawatt solar photovoltaic energy-generating facility including energy storage on six parcels totaling 762.8 net acres. The Project includes a General Plan Amendment, height Variance, Zone Change, Development Agreement and six Conditional Use Permits. The Project includes construction of generation interconnection (gen-tie) transmission lines extending south across Drew Road and State Route 98 into the existing Drew Switchyard. The project may be constructed at one time over approximately 18 months, or it may be built out over an approximately 10-year period.

Note: The State Clearinghouse will assign identification numbers for all new projects. If a SCH number already exists for a project (e.g. Notice of Preparation or previous draft document) please fill in.

Revised 2010

NOP Distribution List

County: Imperial

SCH# 2018051036

Resources Agency

- Resources Agency
  Nadell Gayou
- Dept. of Boating & Waterways
  Denise Peterson
- California Coastal Commission
  Allyson Hitt
- Colorado River Board
  Lisa Johansen
- Dept. of Conservation
  Crina Chan
- Cal Fire
  Dan Foster
- Central Valley Flood Protection Board
  James Herota
- Office of Historic Preservation
  Ron Parsons
- Dept of Parks & Recreation
  Environmental Stewardship Section
- S.F. Bay Conservation & Dev't. Comm.
  Steve Goldbeck
- Dept. of Water Resources
  Resources Agency
  Nadell Gayou

Fish and Game

- Depart. of Fish & Wildlife
  Scott Flint
  Environmental Services Division
- Fish & Wildlife Region 1
  Curt Babcock
- Fish & Wildlife Region 1E
  Laurie Harnsberger
- Fish & Wildlife Region 2
  Jeff Drongesen
- Fish & Wildlife Region 3
  Craig Weightman
- Fish & Wildlife Region 4
  Julie Vance
- Fish & Wildlife Region 5
  Leslie Newton-Reed
  Habitat Conservation Program
- Fish & Wildlife Region 6
  Tiffany Ellis
  Habitat Conservation Program
- Fish & Wildlife Region 6 I/M
  Heidi Calvert
  Inyo/Mono, Habitat Conservation Program
- Dept. of Fish & Wildlife M
  William Paznokas
  Marine Region

Other Departments

- California Department of Education
  Lesley Taylor
- OES (Office of Emergency Services)
  Monique Wilber
- Food & Agriculture
  Sandra Schubert
  Dept. of Food and Agriculture
- Dept. of General Services
  Cathy Buck
  Environmental Services Section
- Housing & Comm. Dev.
  CEQA Coordinator
  Housing Policy Division

Independent Commissions, Boards

- Delta Protection Commission
  Erik Vink
- Delta Stewardship Council
  Anthony Navasero
- California Energy Commission
  Eric Knight
- Native American Heritage Comm.
  Debbie Treadway
- Public Utilities Commission
  Supervisor
- Santa Monica Bay Restoration
  Guangyu Wang
- State Lands Commission
  Jennifer Deleong
- Tahoe Regional Planning Agency (TRPA)
  Cherry Jacques

Cal State Transportation Agency CalSTA

- Caltrans - Division of Aeronautics
  Philip Crimmins
- Caltrans – Planning HQ LD-IGR
  Christian Bushong
- California Highway Patrol
  Suzann Ikeuchi
  Office of Special Projects

Dept. of Transportation

- Caltrans, District 1
  Rex Jackman
- Caltrans, District 2
  Marcelino Gonzalez
- Caltrans, District 3
  Susan Zanchi - North
- Caltrans, District 4
  Patricia Maurice
- Caltrans, District 5
  Larry Newland
- Caltrans, District 6
  Michael Navarro
- Caltrans, District 7
  Dianna Watson
- Caltrans, District 8
  Mark Roberts
- Caltrans, District 9
  Gayle Rosander
- Caltrans, District 10
  Tom Dumas
- Caltrans, District 11
  Jacob Armstrong
- Caltrans, District 12
  Maureen El Harake

Cal EPA

Air Resources Board

- Airport & Freight
  Jack Wursten
  - Transportation Projects
    Nesamani Kalandiyur
  - Industrial/Energy Projects
    Mike Tollstrup
- California Department of Resources, Recycling & Recovery
  Sue O'Leary
- State Water Resources Control Board
  Regional Programs Unit
  Division of Financial Assistance
- State Water Resources Control Board
  Cindy Forbes – Asst Deputy
  Division of Drinking Water
- State Water Resources Control Board
  Div. Drinking Water # 14
- State Water Resources Control Board
  Student Intern, 401 Water Quality Certification Unit
  Division of Water Quality
- State Water Resouces Control Board
  Phil Crader
  Division of Water Rights
- Dept. of Toxic Substances Control Reg. #____
  CEQA Tracking Center
- Department of Pesticide Regulation
  CEQA Coordinator

Regional Water Quality Control Board (RWQCB)

- RWQCB 1
  Cathleen Hudson
  North Coast Region (1)
- RWQCB 2
  Environmental Document Coordinator
  San Francisco Bay Region (2)
- RWQCB 3
  Central Coast Region (3)
- RWQCB 4
  Teresa Rodgers
  Los Angeles Region (4)
- RWQCB 5S
  Central Valley Region (5)
  - RWQCB 5F
    Central Valley Region (5)
    Fresno Branch Office
  - RWQCB 5R
    Central Valley Region (5)
    Redding Branch Office
- RWQCB 6
  Lahontan Region (6)
  - RWQCB 6V
    Lahontan Region (6)
    Victorville Branch Office
- RWQCB 7
  Colorado River Basin Region (7)
- RWQCB 8
  Santa Ana Region (8)
- RWQCB 9
  San Diego Region (9)
- Other Colorado River Board
- ____ Conservancy

Last Updated 2/01/18

STATE OF CALIFORNIA Edmund G. Brown Jr., Governor

NATIVE AMERICAN HERITAGE COMMISSION
Cultural and Environmental Department
1550 Harbor Blvd., Suite 100
West Sacramento, CA 95691
Phone (916) 373-3710

RECEIVED
MAY 25 2018
IMPERIAL COUNTY
PLANNING & DEVELOPMENT SERVICES

May 22, 2018

Diana Robinson
Imperial County
801 Main Street
El Centro, CA 92243

Also sent via e-mail: dianarobinson@co.imperial.ca.us

RE: SCH# 2018051036, Drew Solar Project, City of El Centro; Imperial County, California

Dear Ms. Robinson:

The Native American Heritage Commission has received the Notice of Preparation (NOP) for Draft Environmental Impact Report for the project referenced above. The California Environmental Quality Act (CEQA) (Pub. Resources Code § 21000 et seq.), specifically Public Resources Code section 21084.1, states that a project that may cause a substantial adverse change in the significance of an historical resource is a project that may have a significant effect on the environment. (Pub. Resources Code § 21084.1; Cal. Code Regs., tit.14, § 15064.5 (b) (CEQA Guidelines Section 15064.5 (b)). If there is substantial evidence, in light of the whole record before a lead agency, that a project may have a significant effect on the environment, an environmental impact report (EIR) shall be prepared. (Pub. Resources Code § 21080 (d); Cal. Code Regs., tit. 14, § 15064 subd. (a)(1) (CEQA Guidelines § 15064 (a)(1)). In order to determine whether a project will cause a substantial adverse change in the significance of a historical resource, a lead agency will need to determine whether there are historical resources with the area of project effect (APE).

CEQA was amended significantly in 2014. Assembly Bill 52 (Gatto, Chapter 532, Statutes of 2014) (AB 52) amended CEQA to create a **separate category of cultural resources**, "tribal cultural resources" (Pub. Resources Code § 21074) and provides that a project with an effect that may cause a substantial adverse change in the significance of a tribal cultural resource is a project that may have a significant effect on the environment (Pub. Resources Code § 21084.2). Please reference California Natural Resources Agency (2016) "Final Text for tribal cultural resources update to Appendix G: Environmental Checklist Form," http://resources.ca.gov/ceqa/docs/ab52/Clean-final-AB-52-App-G-text-Submitted.pdf. Public agencies shall, when feasible, avoid damaging effects to any tribal cultural resource. (Pub. Resources Code § 21084.3 (a)). **AB 52 applies to any project for which a notice of preparation or a notice of negative declaration or mitigated negative declaration is filed on or after July 1, 2015.** If your project involves the adoption of or amendment to a general plan or a specific plan, or the designation or proposed designation of open space, on or after March 1, 2005, it may also be subject to Senate Bill 18 (Burton, Chapter 905, Statutes of 2004) (SB 18). **Both SB 18 and AB 52 have tribal consultation requirements**. If your project is also subject to the federal National Environmental Policy Act (42 U.S.C. § 4321 et seq.) (NEPA), the tribal consultation requirements of Section 106 of the National Historic Preservation Act of 1966 (154 U.S.C. 300101, 36 C.F.R. § 800 et seq.) may also apply.

The NAHC recommends **lead agencies consult with all California Native American tribes** that are traditionally and culturally affiliated with the geographic area of your proposed project as early as possible in order to avoid inadvertent discoveries of Native American human remains and best protect tribal cultural resources. Below is a brief summary of portions of AB 52 and SB 18 as well as the NAHC's recommendations for conducting cultural resources assessments. **Consult your legal counsel about compliance with AB 52 and SB 18 as well as compliance with any other applicable laws**.

AB 52

AB 52 has added to CEQA the additional requirements listed below, along with many other requirements:

1. Fourteen Day Period to Provide Notice of Completion of an Application/Decision to Undertake a Project: Within fourteen (14) days of determining that an application for a project is complete or of a decision by a public agency to undertake a project, a **lead agency** shall provide formal notification to a designated contact of, or tribal representative of, traditionally and culturally affiliated California Native American tribes that have requested notice, to be accomplished by at least one written notice that includes:
   - **a.** A brief description of the project.
   - **b.** The lead agency contact information.
   - **c.** Notification that the California Native American tribe has 30 days to request consultation. (Pub. Resources Code § 21080.3.1 (d)).
   - **d.** A "California Native American tribe" is defined as a Native American tribe located in California that is on the contact list maintained by the NAHC for the purposes of Chapter 905 of Statutes of 2004 (SB 18). (Pub. Resources Code § 21073).

2. Begin Consultation Within 30 Days of Receiving a Tribe's Request for Consultation and Before Releasing a Negative Declaration, Mitigated Negative Declaration, or Environmental Impact Report: A **lead agency** shall begin the consultation process within 30 days of receiving a request for consultation from a California Native American tribe that is traditionally and culturally affiliated with the geographic area of the proposed project. (Pub. Resources Code § 21080.3.1, subds. (d) and (e)) and prior to the release of a negative declaration, mitigated negative declaration or environmental impact report. (Pub. Resources Code § 21080.3.1(b)).
   - **a.** For purposes of AB 52, "consultation shall have the same meaning as provided in Gov. Code § 65352.4 (SB 18). (Pub. Resources Code § 21080.3.1 (b)).

3. Mandatory Topics of Consultation If Requested by a Tribe: The following topics of consultation, if a tribe requests to discuss them, are mandatory topics of consultation:
   - **a.** Alternatives to the project.
   - **b.** Recommended mitigation measures.
   - **c.** Significant effects. (Pub. Resources Code § 21080.3.2 (a)).

4. Discretionary Topics of Consultation: The following topics are discretionary topics of consultation:
   - **a.** Type of environmental review necessary.
   - **b.** Significance of the tribal cultural resources.
   - **c.** Significance of the project's impacts on tribal cultural resources.
   - **d.** If necessary, project alternatives or appropriate measures for preservation or mitigation that the tribe may recommend to the lead agency. (Pub. Resources Code § 21080.3.2 (a)).

5. Confidentiality of Information Submitted by a Tribe During the Environmental Review Process: With some exceptions, any information, including but not limited to, the location, description, and use of tribal cultural resources submitted by a California Native American tribe during the environmental review process shall not be included in the environmental document or otherwise disclosed by the lead agency or any other public agency to the public, consistent with Government Code sections 6254 (r) and 6254.10. Any information submitted by a California Native American tribe during the consultation or environmental review process shall be published in a confidential appendix to the environmental document unless the tribe that provided the information consents, in writing, to the disclosure of some or all of the information to the public. (Pub. Resources Code § 21082.3 (c)(1)).

6. Discussion of Impacts to Tribal Cultural Resources in the Environmental Document: If a project may have a significant impact on a tribal cultural resource, the lead agency's environmental document shall discuss both of the following:
   - **a.** Whether the proposed project has a significant impact on an identified tribal cultural resource.
   - **b.** Whether feasible alternatives or mitigation measures, including those measures that may be agreed to pursuant to Public Resources Code section 21082.3, subdivision (a), avoid or substantially lessen the impact on the identified tribal cultural resource. (Pub. Resources Code § 21082.3 (b)).

7. Conclusion of Consultation: Consultation with a tribe shall be considered concluded when either of the following occurs:
   a. The parties agree to measures to mitigate or avoid a significant effect, if a significant effect exists, on a tribal cultural resource; or
   b. A party, acting in good faith and after reasonable effort, concludes that mutual agreement cannot be reached. (Pub. Resources Code § 21080.3.2 (b)).

8. Recommending Mitigation Measures Agreed Upon in Consultation in the Environmental Document: Any mitigation measures agreed upon in the consultation conducted pursuant to Public Resources Code section 21080.3.2 shall be recommended for inclusion in the environmental document and in an adopted mitigation monitoring and reporting program, if determined to avoid or lessen the impact pursuant to Public Resources Code section 21082.3, subdivision (b), paragraph 2, and shall be fully enforceable. (Pub. Resources Code § 21082.3 (a)).

9. Required Consideration of Feasible Mitigation: If mitigation measures recommended by the staff of the lead agency as a result of the consultation process are not included in the environmental document or if there are no agreed upon mitigation measures at the conclusion of consultation, or if consultation does not occur, and if substantial evidence demonstrates that a project will cause a significant effect to a tribal cultural resource, the lead agency shall consider feasible mitigation pursuant to Public Resources Code section 21084.3 (b). (Pub. Resources Code § 21082.3 (e)).

10. Examples of Mitigation Measures That, If Feasible, May Be Considered to Avoid or Minimize Significant Adverse Impacts to Tribal Cultural Resources:
    a. Avoidance and preservation of the resources in place, including, but not limited to:
       i. Planning and construction to avoid the resources and protect the cultural and natural context.
       ii. Planning greenspace, parks, or other open space, to incorporate the resources with culturally appropriate protection and management criteria.
    b. Treating the resource with culturally appropriate dignity, taking into account the tribal cultural values and meaning of the resource, including, but not limited to, the following:
       i. Protecting the cultural character and integrity of the resource.
       ii. Protecting the traditional use of the resource.
       iii. Protecting the confidentiality of the resource.
    c. Permanent conservation easements or other interests in real property, with culturally appropriate management criteria for the purposes of preserving or utilizing the resources or places.
    d. Protecting the resource. (Pub. Resource Code § 21084.3 (b)).
    e. Please note that a federally recognized California Native American tribe or a nonfederally recognized California Native American tribe that is on the contact list maintained by the NAHC to protect a California prehistoric, archaeological, cultural, spiritual, or ceremonial place may acquire and hold conservation easements if the conservation easement is voluntarily conveyed. (Civ. Code § 815.3 (c)).
    f. Please note that it is the policy of the state that Native American remains and associated grave artifacts shall be repatriated. (Pub. Resources Code § 5097.991).

11. Prerequisites for Certifying an Environmental Impact Report or Adopting a Mitigated Negative Declaration or Negative Declaration with a Significant Impact on an Identified Tribal Cultural Resource: An environmental impact report may not be certified, nor may a mitigated negative declaration or a negative declaration be adopted unless one of the following occurs:
    a. The consultation process between the tribes and the lead agency has occurred as provided in Public Resources Code sections 21080.3.1 and 21080.3.2 and concluded pursuant to Public Resources Code section 21080.3.2.
    b. The tribe that requested consultation failed to provide comments to the lead agency or otherwise failed to engage in the consultation process.
    c. The lead agency provided notice of the project to the tribe in compliance with Public Resources Code section 21080.3.1 (d) and the tribe failed to request consultation within 30 days. (Pub. Resources Code § 21082.3 (d)).

    This process should be documented in the Cultural Resources section of your environmental document.

The NAHC's PowerPoint presentation titled, "Tribal Consultation Under AB 52: Requirements and Best Practices" may be found online at: http://nahc.ca.gov/wp-content/uploads/2015/10/AB52TribalConsultation_CalEPAPDF.pdf

SB 18

SB 18 applies to local governments and requires **local governments** to contact, provide notice to, refer plans to, and consult with tribes prior to the adoption or amendment of a general plan or a specific plan, or the designation of open space. (Gov. Code § 65352.3). Local governments should consult the Governor's Office of Planning and Research's "Tribal Consultation Guidelines," which can be found online at: https://www.opr.ca.gov/docs/09_14_05_Updated_Guidelines_922.pdf

Some of SB 18's provisions include:

1. Tribal Consultation: If a local government considers a proposal to adopt or amend a general plan or a specific plan, or to designate open space it is required to contact the appropriate tribes identified by the NAHC by requesting a "Tribal Consultation List." If a tribe, once contacted, requests consultation the local government must consult with the tribe on the plan proposal. **A tribe has 90 days from the date of receipt of notification to request consultation unless a shorter timeframe has been agreed to by the tribe.** (Gov. Code § 65352.3 (a)(2)).
2. No Statutory Time Limit on SB 18 Tribal Consultation. There is no statutory time limit on SB 18 tribal consultation.
3. Confidentiality: Consistent with the guidelines developed and adopted by the Office of Planning and Research pursuant to Gov. Code section 65040.2, the city or county shall protect the confidentiality of the information concerning the specific identity, location, character, and use of places, features and objects described in Public Resources Code sections 5097.9 and 5097.993 that are within the city's or county's jurisdiction. (Gov. Code § 65352.3 (b)).
4. Conclusion of SB 18 Tribal Consultation: Consultation should be concluded at the point in which:
    a. The parties to the consultation come to a mutual agreement concerning the appropriate measures for preservation or mitigation; or
    b. Either the local government or the tribe, acting in good faith and after reasonable effort, concludes that mutual agreement cannot be reached concerning the appropriate measures of preservation or mitigation. (Tribal Consultation Guidelines, Governor's Office of Planning and Research (2005) at p. 18).

Agencies should be aware that neither AB 52 nor SB 18 precludes agencies from initiating tribal consultation with tribes that are traditionally and culturally affiliated with their jurisdictions before the timeframes provided in AB 52 and SB 18. For that reason, we urge you to continue to request Native American Tribal Contact Lists and "Sacred Lands File" searches from the NAHC. The request forms can be found online at: http://nahc.ca.gov/resources/forms/

NAHC Recommendations for Cultural Resources Assessments

To adequately assess the existence and significance of tribal cultural resources and plan for avoidance, preservation in place, or barring both, mitigation of project-related impacts to tribal cultural resources, the NAHC recommends the following actions:

1. Contact the appropriate regional California Historical Research Information System (CHRIS) Center (http://ohp.parks.ca.gov/?page_id=1068) for an archaeological records search. The records search will determine:
    a. If part or all of the APE has been previously surveyed for cultural resources.
    b. If any known cultural resources have been already been recorded on or adjacent to the APE.
    c. If the probability is low, moderate, or high that cultural resources are located in the APE.
    d. If a survey is required to determine whether previously unrecorded cultural resources are present.

2. If an archaeological inventory survey is required, the final stage is the preparation of a professional report detailing the findings and recommendations of the records search and field survey.
    a. The final report containing site forms, site significance, and mitigation measures should be submitted immediately to the planning department. All information regarding site locations, Native American human remains, and associated funerary objects should be in a separate confidential addendum and not be made available for public disclosure.

b. The final written report should be submitted within 3 months after work has been completed to the appropriate regional CHRIS center.

3. Contact the NAHC for:
   a. A Sacred Lands File search. Remember that tribes do not always record their sacred sites in the Sacred Lands File, nor are they required to do so. A Sacred Lands File search is not a substitute for consultation with tribes that are traditionally and culturally affiliated with the geographic area of the project's APE.
   b. A Native American Tribal Consultation List of appropriate tribes for consultation concerning the project site and to assist in planning for avoidance, preservation in place, or, failing both, mitigation measures.

4. Remember that the lack of surface evidence of archaeological resources (including tribal cultural resources) does not preclude their subsurface existence.
   a. Lead agencies should include in their mitigation and monitoring reporting program plan provisions for the identification and evaluation of inadvertently discovered archaeological resources per Cal. Code Regs., tit. 14, section 15064.5(f) (CEQA Guidelines section 15064.5(f)). In areas of identified archaeological sensitivity, a certified archaeologist and a culturally affiliated Native American with knowledge of cultural resources should monitor all ground-disturbing activities.
   b. Lead agencies should include in their mitigation and monitoring reporting program plans provisions for the disposition of recovered cultural items that are not burial associated in consultation with culturally affiliated Native Americans.
   c. Lead agencies should include in their mitigation and monitoring reporting program plans provisions for the treatment and disposition of inadvertently discovered Native American human remains. Health and Safety Code section 7050.5, Public Resources Code section 5097.98, and Cal. Code Regs., tit. 14, section 15064.5, subdivisions (d) and (e) (CEQA Guidelines section 15064.5, subds. (d) and (e)) address the processes to be followed in the event of an inadvertent discovery of any Native American human remains and associated grave goods in a location other than a dedicated cemetery.

Please contact me if you need any additional information at gayle.totton@nahc.ca.gov.

Sincerely,

Gayle Totton

Gayle Totton, M.A., PhD.
Associate Governmental Program Analyst
(916) 373-3714

cc: State Clearinghouse

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May 24, 2018

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MAY 24 2018
IMPERIAL COUNTY
PLANNING & DEVELOPMENT SERVICES

Via Email and U.S. Mail

Jim Minnick, Director
Imperial County Planning & Development Services
801 Main Street
El Centro, CA 92243
Email: JimMinnick@co.imperial.ca.us

Blanca Acosta, Clerk of the Board
Imperial County
940 West Main Street, Suite 209
El Centro, CA 92243
Email: BlancaAcosta@co.imperial.ca.us

Via Email Only

Diana Robinson, Planner II
Email: DianaRobinson@co.imperial.ca.us

Patricia Valenzuela, Planner IV
Email: PatriciaValenzuela@co.imperial.ca.us

Maria Scoville, Office Assistant III
Email: Mariascoville@co.imperial.ca.us

Re: Public Records Act Request – Drew Solar Project (SCH No. 2018051036)

Dear Mr. Minnick, Ms. Acosta, Ms. Robinson, Ms. Valenzuela, and Ms. Scoville:

We are writing on behalf of California Unions for Reliable Energy ("CURE") to request a copy of any and all records related to the Drew Solar Project (SCH No. 2018051036) ("Project"), proposed by Drew Solar, LLC, *since the date of our last request on January 2, 2017*. The Project includes construction, operation, and reclamation of an approximately 100-megawatt (MW) solar photovoltaic (PV) energy generation facility in the County of Imperial, California. This request includes, but is not limited to, any and all materials, applications, correspondence, resolutions, memos, notes, analyses, electronic mail messages, files, maps, charts, and/or any other documents related to the Project.

This request is made pursuant to the California Public Records Act. (Government Code §§ 6250, et seq.) This request is also made pursuant to Article I, section 3(b) of the California Constitution, which provides a Constitutional right of access to information concerning the conduct of government. Article I, section 3(b) provides that any statutory right to information shall be broadly construed to provide the greatest access to government information and further requires that any statute that limits the right of access to information shall be narrowly construed.

We will pay for any direct costs of duplication associated with filling this request up to $200. However, please contact me at (650) 589-1660 with a cost estimate before copying/scanning the materials.

Pursuant to Government Code Section 6253.9, if the requested documents are in electronic format and are 10 MB or less (or can be easily broken into sections of 10 MB or less), please email them to me as attachments.

My contact information is:

U.S. Mail
Sheila Sannadan
Adams Broadwell Joseph & Cardozo
601 Gateway Boulevard, Suite 1000
South San Francisco, CA 94080-7037

Email
ssannadan@adamsbroadwell.com

3813-003acp

Please call me at (650) 589-1660 if you have any questions. Thank you for your assistance with this matter.

Sincerely,

Sheila M. Sannadan
Legal Assistant

SMS:acp

3813-003acp

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DEPARTMENT OF TRANSPORTATION
DISTRICT 11
4050 TAYLOR STREET, MS-240
SAN DIEGO, CA 92110
PHONE (619) 688-6960
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MAY 29 2018

IMPERIAL COUNTY
PLANNING & DEVELOPMENT SERVICES

May 24, 2018

11-IMP-98
PM 22.19
Drew Road Project
NOP/DEIR
SCH# 2018051036

Ms. Diana Robinson, Planner IV
Imperial County Planning and Development Services
801 Main Street
El Centro, CA 92243

Dear Ms. Robinson:

The California Department of Transportation (Caltrans) has reviewed the Notice of Preparation (NOP) for the Drew Solar Project (SCH# 2018051036) adjacent to State Route 98 (SR-98) at Drew Road, west of Calexico and southeast of El Centro. The mission of Caltrans is to provide a safe, sustainable, integrated and efficient transportation system to enhance California's economy and livability. The Local Development-Intergovernmental Review (LD-IGR) Program reviews land use projects and plans to ensure consistency with our mission and state planning priorities.

Caltrans has the following comments:

Traffic Impact Study

A focused traffic analysis may be required as part of the project construction.

Access Point(s) on SR-98

For any access to a state highway, applicant must demonstrate there are no other reasonable alternatives.

A Traffic Management Plan (TMP) or construction traffic impact study may be required by the developer for approval by Caltrans prior to construction for any access to SR-98. The plans shall be prepared in accordance with Caltrans's *Manual of Traffic Controls for Construction and Maintenance Work Zones*. Traffic restrictions and pedestrian / bicycle detours may also need to be addressed. All work proposed within the (R/W) requires lane and shoulder closure charts. All roadway features (e.g., signs, pavement delineation, roadway surface, etc.) within the State R/W must be protected, maintained in a temporary condition, and/or restored. For more information, contact the District Traffic Manager, Camille Abou-Fadel, at (619) 718-7833.

If it is determined that traffic restrictions and detours are needed on or affecting State highways, a TMP or construction Traffic Impact Study may be required of the developer for approval by Caltrans prior to construction. TMPs must be prepared in accordance with Caltrans' *Manual on Uniform Traffic Control Devices.* Further information is available for download at the following web address:
http://www.dot.ca.gov/hq/traffops/signtech/mutcdsupp/pdf/camutcd2012/Part6.pdf

Hydrology

Any modification to the existing drainage and increase runoff to State facilities will not be allowed.

Glint Glare Analysis

Visual aspects of the project, including glint and glare, should be documented not to have any potential impacts to motorists driving on SR-98. Please provide the analysis to Caltrans when it becomes available.

Utilities Encroachment

The NOP identifies that the project is proposing construction of two (2) generation interconnection (gen-tie) transmission lines extending south across Drew Road and SR-98 into the existing Drew Switchyard. The following statements are general information for transmission line crossings on State highways. Please refer to Caltrans Encroachment Permits Manual (http://www.dot.ca.gov/hq/traffops/developserv/permits/encroachment_permits_manual/index.html) for guidance on utility encroachment.

Any traffic control for utility work will need to be addressed as part of Caltrans permit approval. Stoppage of traffic for placement of aerial lines, installation or removal of overhead conductors crossing a highway requires traffic control in accordance with policy shown in the Caltrans Standard Plans and the California Manual on Uniform Traffic Control Devices (MUTCD).

Transportation Permit for Hauling

Caltrans may, upon application and if good cause appears, issue a special permit to operate or move a vehicle or combination of vehicles or special mobile equipment of a size or weight of vehicle or load exceeding the maximum limitations specified in the California Vehicle Code. The Caltrans Transportation Permits Issuance Branch is responsible for the issuance of these special transportation permits for oversize/overweight vehicles on the State Highway System.

Please contact the Caltrans Transportation Permits Issuance Branch, Sacramento, CA (916) 322-1297. Additional information is provided online at: http://www.dot.ca.gov/trafficops/permits/index.html

Right-of-Way

Any work performed within Caltrans R/W will require discretionary review and approval by Caltrans and an encroachment permit will be required for any work within the Caltrans R/W prior to construction. As part of the encroachment permit process, the applicant must provide an approved final environmental document including the CEQA determination addressing any environmental impacts within the Caltrans's R/W, and any corresponding technical studies.

Additional information regarding encroachment permits may be obtained by contacting the Caltrans Permits Office at (619) 688-6158. Early coordination with Caltrans is strongly advised for all encroachment permits.

If you have any questions, please contact Mark McCumsey at (619) 688-6802 or by email at mark.mccumsey@dot.ca.gov

Sincerely,

JACOB ARMSTRONG, Branch Chief
Local Development and Intergovernmental Review Branch

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State of California • Natural Resources Agency
Department of Conservation
Division of Land Resource Protection
801 K Street • MS 14-15
Sacramento, CA 95814
(916) 324-0850 • FAX (916) 327-3430

Edmund G. Brown Jr., *Governor*
Kathryn M. Lyddan, *Division Director*

June 1, 2018

RECEIVED
JUN 04 2018
IMPERIAL COUNTY
PLANNING & DEVELOPMENT SERVICES

VIA EMAIL: DIANAROBINSON@CO.IMPERIAL.CA.US
Ms. Diana Robinson
Imperial County
Planning and Development Services Department
801 Main Street,
El Centro CA, 92243

Dear Ms. Robinson:

NOTICE OF PREPARATION OF AN ENVIRONMENTAL IMPACT REPORT FOR THE DREW SOLAR PROJECT, SCH# 2018051036

The Department of Conservation's (Department) Division of Land Resource Protection (Division) has reviewed the Notice of Preparation submitted by Imperial County (County) for the Drew Solar Project. The Division monitors farmland conversion on a statewide basis and administers the California Land Conservation (Williamson) Act and other agricultural land conservation programs. We offer the following comments and recommendations with respect to the proposed project's potential impacts on agricultural land and resources.

Project Description

The proposed project consists of a photovoltaic solar facility capable of producing approximately 100 megawatts of alternating current energy storage and generation interconnection transmission lines on 762.8 net acres. Generation interconnection transmission lines will extend from the south end of the project site south across Drew Road and State Route 98 into the existing Drew Switchyard. The project site is located on six parcels approximately 6.5 miles southwest of the City of El Centro, California and 7.5 miles directly west of Calexico, California.

The project site is: zoned agriculture, currently under agricultural production and is designated as Prime Farmland and Farmland of Statewide Importance according to the most recent Important Farmland Map produced by the Department of Conservation's Farmland Mapping and Monitoring Program[1].

Department Comments

The conversion of agricultural land represents a permanent reduction and significant impact to the State's agricultural land resources. Under CEQA, a lead agency should not approve a project if there are feasible alternatives or feasible mitigation measures available that would lessen the

[1] Department of Conservation, Farmland Mapping and Monitoring Program, California Important Farmland Finder, 2014, https://maps.conservation.ca.gov/DLRP/CIFF/

significant effects of the project.[2] All mitigation measures that are potentially feasible should be included in the Draft Environmental Impact Report (DEIR). A measure brought to the attention of the lead agency should not be left out unless it is infeasible based on its elements.

The Department advocates the use of permanent agricultural conservation easements on land of at least equal quality and size as mitigation for the loss of agricultural land. Conservation easements will protect remaining land resources and mitigate the project impacts in accordance with CEQA Guideline § 15370. The Department highlights agricultural conservation easements because of their acceptance and use by lead agencies as an appropriate mitigation measure under CEQA. Agricultural conservation easements are an available mitigation tool and should always be considered; however, the use of conservation easements is only one form of mitigation that should be considered. Any other feasible mitigation measures should also be considered.

Conclusion

The Department recommends the following discussion under the Agricultural Resources section of the DEIR:

- Type, amount, and location of farmland conversion resulting directly and indirectly from implementation of the proposed project.
- Impacts on any current and future agricultural operations in the vicinity; e.g., land-use conflicts, increases in land values and taxes, loss of agricultural support infrastructure such as processing facilities, etc.
- Incremental impacts leading to cumulative impacts on agricultural land. This would include impacts from the proposed project, as well as impacts from past, current, and likely future projects.
- Proposed mitigation measure for all impacted agricultural lands within the proposed project area.

Thank you for giving us the opportunity to comment on the Notice of Preparation of an Environmental Impact Report for the Drew Solar Project. Please provide this Department with notices of any future hearing dates as well as any staff reports pertaining to this project. If you have any questions regarding our comments, please contact Farl Grundy, Environmental Planner at (916) 324-7347 or via email at Farl.Grundy@conservation.ca.gov.

Sincerely,

Monique Wilber
Conservation Program Support Supervisor

[2] California Environmental Quality Act Statute and Guidelines, Association of Environmental Professionals, 2017, Section 21002, page 2.

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June 18, 2018

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Ms. Diana Robinson
Planner II
Planning & Development Services Department
County of Imperial
801 Main Street
El Centro, CA 92243

SUBJECT: NOP of a Draft EIR for the Drew Solar Project

Dear Ms. Robinson:

Pursuant to the Imperial County Planning & Development Services Department's Notice of Preparation of a Draft Environmental Impact Report for the Drew Solar Project, where the applicant, Drew Solar, LLC; proposes to develop a 100 MW solar energy-generating project, and potentially include a stand-alone battery energy storage facility, on six parcels totaling approximately 762 acres (Conditional Use Permit applications 17-0031 through 17-0035), located at the northwest intersection of Pulliman Road and State Route 98 in Imperial County, CA; The IID has reviewed the project information and and finds that the comments provided in the January 19, 2018 district letter (see attached letter) continue to apply.

Should you have any questions, please do not hesitate to contact me at 760-482-3609 or at dvargas@iid.com. Thank you for the opportunity to comment on this matter.

Respectfully,

Donald Vargas
Compliance Administrator II

Kevin Kelley – General Manager
Mike Pacheco – Manager, Water Dept
Enrique B. Martinez – Manager, Energy Dept
Charles Allegranza – Manager, Energy Dept., Operations
Jamie Asbury – Deputy Manager, Energy Dept., Operations
Carlos Vasquez – Deputy Manager, Energy Dept., Planning & Engineering
Vance Taylor – Asst. General Counsel
Robert Laurie – Asst. General Counsel
Carlos Vasquez - Planning and Engineering Manager, Energy Dept.
Enrique De Leon – Asst. Mgr., Energy Dept., Distr., Planning, Eng. & Customer Service
Michael P. Kemp – Superintendent, Regulatory & Environmental Compliance
Harold Walk Jr. – Supervisor, Real Estate
Randy Gray – ROW Agent, Real Estate
Jessica Lovecchio – Environmental Project Mgr. Sr., Water Dept

January 19, 2018

Mr. Richard Cabanilla
Planner IV
Planning & Development Services Department
County of Imperial
801 Main Street
El Centro, CA 92243

SUBJECT: Drew Road Solar Project CUP Applications Nos.17-0031 through 17-0035

Dear Mr. Cabanilla:

On January 11, 2018, the Imperial irrigation District received from the Imperial County Planning & Development Services Department, a request for agency comments on Conditional Use Permit applications nos. 17-0031 through 17-0035. The applicant, Drew Solar, LLC, proposes to develop a 100 MW solar energy-generating project in five phases, and potentially include a stand-alone battery energy storage facility, on six parcels owned by the IID totaling approximately 762 acres, located at the northwest intersection of Pullman Road and State Route. The generation interconnection transmission line proposed will run from the south end of the site traversing Drew Road and SR 98 into the existing Drew switching station.

The IID has reviewed the project information and has the following comment:

1. For temporary construction electrical service and permanent electrical service to the on-site substation and the battery storage facility, the applicant should contact the IID Customer Project Development Office at (760) 482-3300 and speak with the area's project manager. In addition to submitting a formal application for electrical service (available at the IID website http://www.iid.com/home/showdocument?id=12923), the applicant will be required to submit electrical loads, plan & profile drawings (hard copy and CAD files), project schedule, estimated in-service date and project's Conditional Use Permit. All associated fees, rights of way and environmental documentation is the responsibility of the applicant.

2. Please note that a circuit study may be required prior to IID committing to serve the project.

3. The IID water facilities that may be impacted include the Westside Main Canal, Wormwood Canal, Wormwood Lateral 1, Woodbine Lateral 7, Mt Signal Drain, Mt. Signal Drain No. 1A, Mt. Signal Drain No. 1, Carr Drain, and Carpenter Drain.

4. Taking into account that the project may impact IID drains with site runoff flows and discharge from proposed storm water detention facilities, a comprehensive IID hydraulic drain system analysis will be required to determine impacts and mitigation if the project discharges into IID's drain system. IID's hydraulic drainage system analysis includes an associated drain impact fee.

5. To ensure there are no impacts to IID water facilities, County of Imperial approved grading, drainage and fencing plans should be submitted to the IID Water Engineering Section prior to final project design as well as the projects' Storm Water Pollution Prevention Plan. IID Water Engineering can be contacted at (760) 339-9265 for further information.

6. To obtain water for the construction phase of the projects, the applicant should be advised to contact IID South End Division at (760) 482-9800.

7. The IID Water Department will require that the applicant secure with the district the necessary Water Supply Agreements for industrial use.

8. All new non-agricultural water supply requests are processed in accordance with the IID's Interim Water Supply Policy and Temporary Land Conversion Fallowing Policy. Policy documents are posted at http://www.iid.com/water/municipal-industrial-and-commercial-customers. For additional information regarding these water supply policies, applicant should contact the IID Water Supply Planning section at (760) 339-9755.

9. IID's canal or drain banks may not be used to access the project sites. Any abandonment of easements or facilities shall be approved by IID based on systems (Irrigation, Drainage, Power, etc.) needs.

10. Any construction or operation on IID property or within its existing and proposed right of way or easements including but not limited to: surface improvements such as proposed new streets, driveways, parking lots, landscape; and all water, sewer, storm water, or any other above ground or underground utilities; requires an encroachment permit, or encroachment agreement (depending on the circumstances). The permit application and its instructions are available at http://www.iid.com/home/showdocument?id=271. Additional information regarding encroachment permits or agreements can be provided by the IID Real Estate Section, which can be contacted at (760) 339-9239.

11. In addition to IID's recorded easements, IID claims, at a minimum, a prescriptive right of way to the toe of slope of all existing canals and drains. Where space is limited and depending upon the specifics of adjacent modifications, the IID may claim additional secondary easements/prescriptive rights of ways to ensure operation and maintenance of IID's facilities can be maintained and are not impacted and if impacted mitigated. Thus, IID should be consulted prior to the installation of any facilities adjacent to IID's facilities. Certain conditions may be placed on adjacent facilities to mitigate or avoid impacts to IID's facilities.

12. Any new, relocated, modified or reconstructed IID facilities required for and by the project (which can include but is not limited to electrical utility substations, electrical transmission and distribution lines, etc.) need to be included as part of the project's CEQA and/or NEPA documentation, environmental impact analysis and mitigation. Failure to do so will result in postponement of any construction and/or modification of IID facilities until such time as the environmental documentation is amended and environmental impacts are fully

mitigated. **Any and all mitigation necessary as a result of the construction, relocation and/or upgrade of IID facilities is the responsibility of the project proponent.**

13. Electrical service is a public utility of utmost importance in the implementation and success of a project and not assessing a project's potential impact on this environmental factor could adversely affect the project as well as the capability of the Imperial Irrigation District to provide electrical service in an efficient and timely manner. Hence, the IID suggests that electrical service be included under the Environmental Factor titled "Utilities/Service Systems" of the checklist. It is important to note that per CEQA Statute and Guidelines the Environmental Checklist under Appendix G is a sample form and may be tailored to satisfy individual agencies' needs and project circumstances and substantial evidence of potential impacts that are not listed on this form must also be considered. The sample questions in the checklist are intended to encourage thoughtful assessment of impacts, and do not necessarily represent thresholds of significance, thus the inclusion of the items we suggest would lead to a more thorough evaluation of a project.

Should you have any questions, please do not hesitate to contact me at 760-482-3609 or at dvargas@iid.com. Thank you for the opportunity to comment on this matter.

Respectfully,

Donald Vargas
Compliance Administrator II

Kevin Kelley – General Manager
Mike Pacheco – Manager, Water Dept.
Vicken Kasarjian – Manager, Energy Dept.
Charles Allegranza – Manager, Energy Dept., Operations
Jamie Asbury – Deputy Manager, Energy Dept., Operations
Vance Taylor – Asst. General Counsel
Robert Laurie – Asst. General Counsel
Carlos Vasquez - Planning and Engineering Manager, Energy Dept.
Enrique De Leon – Asst. Mgr., Energy Dept., Distr., Planning, Eng. & Customer Service
Michael P. Kemp – Superintendent, Real Estate & Environmental Compliance
Harold Walk Jr. – Supervisor, Real Estate
Randy Gray – ROW Agent, Real Estate
Jessica Lovecchio – Environmental Project Mgr. Sr., Water Dept.

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EL CENTRO, CA 92243-2850

TELEPHONE: (442) 265-1800
FAX: (442) 265-1799

IMPERIAL COUNTY CALIFORNIA 1907

AIR POLLUTION CONTROL DISTRICT

May 29, 2018

RECEIVED
JUN 20 2018
IMPERIAL COUNTY
PLANNING & DEVELOPMENT SERVICES

Mr. Jim Minnick
Planning Director
801 Main Street
El Centro, CA 92243

SUBJECT: Notice of Preparation (NOP) of a Draft Environmental Impact Report (DEIR) for the Drew Solar Project

Dear Mr. Minnick,

The NOP to prepare a Draft EIR for the Drew Solar Project has been reviewed by the Imperial County Air Pollution Control District (Air District). As you know, the Air District's established programs help to keep the quality of air in Imperial County from declining. The programs and the Rules and Regulations of the Air District in conjunction with the California Environmental Quality Act (CEQA), the most current CEQA Air Quality Handbook for Imperial County (CEQA Handbook), the Air Districts State Implementation Plans (SIP's) for Ozone, $PM_{2.5}$ and PM_{10} work together to assure air quality improves or does no degrade. Currently, the non-attainment status of "moderate" for ozone, "serious" for PM_{10}, and "moderate" for $PM_{2.5}$ are the driving criteria in establishing the thresholds for NOx, ROG, PM_{10}, SOx and CO. These thresholds and their significance are explained under Section 6 of the CEQA handbook, which describes the preparation of an Air Quality Analysis for an Environmental Impact Report (EIR) for nonrenewable projects.

When exploring the impacts of renewable projects, it is a common misconception to believe that these types of projects are not a significant source of air pollution. While it is true that renewable projects are typically cleaner projects during their operational phases, in most cases construction and cumulative impacts still exist. PM_{10} and NO_x emissions are the primary pollutants of concern for the construction and operational phases of these types of projects. This is due to the shorter construction periods of these types of renewable projects, which tend to cause high levels of NO_x emissions because of the use of large amounts of construction equipment, as well as high levels of PM_{10} during earthmoving activities.

Therefore, a **Tier I Preliminary Analysis** should be conducted in order to assess the level of significance of potential impacts. This analysis should include an overview containing a complete description of the project in its current existing conditions, what the proposed development will be, how that will change the existing conditions, and should also provide answers to the questions in the **White Paper**. These questions are designed to assess the project's level of significance before and after proposed mitigation, (White paper attached for your reference). Additionally, in order to identify NO_x emissions created during the construction phase of the renewable project, a **Construction Equipment List** detailing the equipment type, make, model, year, horsepower, hours of daily operation, date arrived onsite, and date removed from site should be provided to the Air District in Excel format. This is to ensure NO_x emissions during the construction period remained under the CEQA thresholds of significance.

In regards to cumulative impacts, which occur during the operational phase of renewable projects, PM_{10} is of main concern. Therefore, an **Operational Dust Control Plan (ODCP)** is required detailing how dust emissions will be controlled and maintained during the operational phase of the project. An initial site visit is required to confirm the elements of any draft ODCP before it can be finalized by the Air District. After this, continual site visits will typically occur on a yearly basis. Please note that an ODCP is intended to provide pertinent information specific to your operation for the reduction of fugitive dust emissions created by the ongoing operations at your facility.

Additionally, compliance with Regulation VIII is required for all construction activities, as well as notification 10 days prior to the commencement of all construction activities. Our rules and regulations can be found on our website at www.co.imperial.ca.us/AirPollution under the planning section. If any questions arise, please feel free to contact our office at (442) 265-1800.

Sincerely,

Axel Salas
APC Environmental Coordinator

Stephan C. Volker
Alexis E. Krieg
Stephanie L. Clarke
Jamey M.B. Volker (Of Counsel)

Law Offices of
Stephan C. Volker
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10.631.01

June 18, 2018

VIA EMAIL
JimMinnick@co.imperial.ca.us

Jim Minnick, Director
Imperial County Planning and Development Services
801 Main Street
El Centro, CA 92243

Re: Scoping Comments of Farms for Farming, Danny Robinson, Robco Farms, Inc., Joe Tagg and West-Gro Farms, Inc. on the Drew Solar Project (SCH# 2018051036)

Dear Mr. Minnick:

On behalf of Farms for Farming, Danny Robinson, Robco Farms, Inc., Joe Tagg and West-Gro Farms, Inc. (collectively, "Farms for Farming"), and pursuant to the California Environmental Quality Act ("CEQA"), Public Resources Code ("PRC") section 21000 *et seq*., and Imperial County's (the "County's") Notice of Preparation of Draft EIR for the Drew Solar Project ("NOP"), we respectfully submit the following scoping comments identifying issues that must be analyzed in the environmental impact report ("EIR") for the Drew Solar Project ("Drew Solar" or the "Project"), and opposing the Project as currently proposed. Please include these comments in the public record for Imperial County's (the "County's") consideration and decision on Drew Solar, LLC's permitting applications for the Project.

The Project would industrialize approximately 763 acres of farmland – *all* of which is either prime farmland or farmland of statewide importance – with a 100-megawatt ("MW") solar photovoltaic ("PV") electrical generation facility, an (undefined) energy storage system, an on-site substation, electrical gen-tie lines, inverters, transformers, new roads, fencing, retention basins, evaporation ponds, operations and maintenance buildings and other infrastructure. Those industrial facilities would remain, and preclude agricultural use of the Project parcels, for at least 35 years. Farms for Farming opposes this Project as an unnecessary industrialization of the County's irreplaceable farmland. The County has already allowed tens of thousands of acres of farmland to be converted to electrical generation and transmission uses, and is entertaining proposals for even more farmland-to-industry conversions, like the Big Rock Cluster Solar Project and the Citizens Imperial Solar Project. Enough is enough.

Farms for Farming urges the County to maintain the renewable energy overlay boundaries it set in October 2015, boundaries that *exclude* the proposed Project site. Farms for Farming encourages the County to analyze and adopt an alternative to the proposed Project programs to develop or incentivize the development of distributed PV generation projects in *already-disturbed areas*, particularly near energy demand centers. The County should abide by its own policy prescriptions and not approve any further renewable energy developments outside the overlay zone, especially not projects that would destroy productive and irreplaceable farmland or "result in any [other] significant environmental impacts." Imperial County General Plan, Renewable Energy and Transmission Element, Section IV(D), p. 35.

In further expression of these major concerns and others, Farms for Farming submits the following comments on the proposed Project and its required environmental review under CEQA.

I. THE PROPOSED SOLAR ENERGY GENERATION, TRANSMISSION AND STORAGE USES ARE FORBIDDEN BY THE IMPERIAL COUNTY GENERAL PLAN LAND USE ELEMENT.

A. The County May Not Approve a Conditional Use that Is Forbidden by the County General Plan.

The Project is inconsistent with the County General Plan, and thus its approval would violate the Planning and Zoning Law. As acknowledged in *Neighborhood Action Group v. County of Calaveras* ("*Neighborhood*") (1984) 156 Cal.App.3d 1176, 1184, the requirement that use permits be consistent with a county's general plan

> is necessarily to be implied from the hierarchical relationship of the land use laws. To view them in order: a use permit is struck from the mold of the zoning law ([Government Code section] 65901); the zoning law must comply with the adopted general plan (§ 65860); the adopted general plan must conform with state law (§§ 65300, 65302). The validity of the permit process derives from compliance with this hierarchy of planning laws. *These laws delimit the authority of the permit issuing agency to act and establish the measure of a valid permit*. . . . A permit action taken without compliance with the hierarchy of land use laws is *ultra vires* as to any defect implicated by the uses sought by the permit.

Id. (emphasis added).

Because Imperial County is a general law county, the foregoing settled law is dispositive. Since, as shown below, the proposed solar energy generation, storage and transmission uses are specifically forbidden under the Imperial County General Plan, the County lacks authority to approve those uses in contravention of the General Plan. Any "permit action taken without compliance with the hierarchy of land use laws is *ultra vires*." *Id*.

B. The Imperial County General Plan Forbids the Proposed Solar Energy Generation, Storage and Transmission Uses.

The Imperial County General Plan's Land Use Element specifically *forbids* the proposed solar uses within the "Agriculture" plan designation that applies to the entire Project site. May 2018 Initial Study & Environmental Analysis ("Initial Study"), p. 7 ("The Project site is designated as Agriculture by the Imperial County General Plan Land Use Element, and the Project site parcels are comprised [sic] of lands zoned as A-2 [Agricultural, General], A-2-R]General Agricultural/Rural Zone], and A-3 [Agricultural, Heavy]"). The Land Use Element directs that lands designated as "Agriculture" may not be developed with uses that do not preserve and protect agricultural production and related activities. It states in pertinent part as follows:

> **1. Agriculture.**
>
> This category is intended to preserve lands for agricultural production and related industries including aquaculture (fish farms), ranging from light to heavy agriculture. Packing and processing of agricultural products may also be allowed in certain areas, and other uses necessary or supportive of agriculture. . . .
>
> *Where this designation is applied, agriculture shall be promoted as the principal and dominant use to which all other uses shall be subordinate. Where questions of land use compatibility arise, the burden of proof shall be on the non-agricultural use to clearly demonstrate that an existing or proposed use does not conflict with agricultural operations and will not result in the premature elimination of such agricultural operations. No use should be permitted that would have a significant adverse effect on agricultural production*, including food and fiber production, horticulture, floraculture, or animal husbandry. . . .

Imperial County General Plan, Land Use Element (Revised 2015), page 48 (emphasis added).

It is clear from the foregoing language that lands designated as "Agriculture" in the General Plan must be used *only* for agriculture and related industries that support agricultural production. "Where questions of land use compatibility arise, the burden of proof shall be on the non-agricultural use to *clearly demonstrate* that an existing or proposed use does not conflict with agricultural operations and will not result in the premature elimination of such agricultural operations." *Id.* (emphasis added).

Here, it is undisputed that the proposed industrial-scale solar facility uses would eliminate and indefinitely prevent all agricultural use on nearly 800 acres of prime farmland and farmland of statewide importance. Initial Study, p. 11. As the California Department of Conservation has determined in both the Williamson Act and CEQA contexts, and reiterated in its November 1, 2011, and July 16, 2010 letters (attached hereto as Exhibits 1 and 2) to the Imperial County Planning and Development Services Department regarding other solar projects previously proposed for lands designated for Agriculture on the County General Plan, commercial solar uses are *completely incompatible* with agricultural uses.

Furthermore, the Project could impede agricultural operations elsewhere in the County and reduce employment, income, sales and tax revenue. As former Imperial County Agricultural Commissioner Valenzuela noted in her February 25, 2011 comments (attached hereto as Exhibit 3) on the DEIR for a similar solar project, "removal of any farmland out of production would have a *direct negative impact on employment, income, sales and tax revenue*" (emphasis added). As these projects convert more and more agricultural land to non-agricultural uses, more and more agriculture-serving businesses will be forced to close. And as the quantity and quality of agriculture-serving businesses decreases in the County, more and more farmers will find it uneconomical or impractical to keep farming and sell, lease or use their lands for non-agriculture purposes.

Because the proposed solar energy generation, storage and transmission uses would eliminate the potential for farming on the Project sites for at least 35 years[1] and "have a" potentially "significant adverse effect on agricultural production" elsewhere in the County, the Project is specifically forbidden by the General Plan.

II. THE PROPOSED ZONING CHANGE IS FORBIDDEN BY THE IMPERIAL COUNTY GENERAL PLAN LAND USE ELEMENT.

The Project would rezone from A-2 and A-3 to M-2 (Medium Industrial) the two Project parcels proposed for the energy storage component of the Project. Initial Study, pp. 7, 11. Such rezoning is explicitly prohibited by Imperial County's General Plan. Table 4 on page 64 of the Land Use Element – the Compatibility Matrix – shows that M-2 zoning is incompatible with the Agriculture land use designation. "[T]he zoning law must comply with the adopted general plan (§ 65860)." *Neighborhood*, 156 Cal.App.3d at 1184. "A permit action taken without compliance with the hierarchy of land use laws," such as proposed here, "is *ultra vires*." *Id*.

III. THE PROPOSED PROJECT CONTRAVENES THE IMPERIAL COUNTY GENERAL PLAN AGRICULTURAL ELEMENT.

Objective 1.8 of the County General Plan Agricultural Element "[a]llow[s] conversion of agricultural land to non-agricultural uses including renewable energy *only* where a *clear* and *immediate need can be demonstrated*, based on economic benefits, population projections and lack of other available land (including land within incorporated cities) for such non-agricultural

[1] See page 9 of the January 8, 2018 Project Description attached to the Initial Study.

uses." Imperial County General Plan, Agricultural Element (Revised 2015), page 30 (emphasis added). "Such conversion shall also be allowed only where such uses have been identified for non-agricultural use in . . . the County General Plan, and are *supported by a study to show a lack of alternative sites*." *Id* (emphasis added).

Here, as discussed, the County General Plan *forbids* the proposed non-agricultural uses on the Project parcels. Furthermore, in designating a renewable energy overlay zone, the County has already determined that alternative – and indeed, *preferable* – sites *do exist* for the proposed solar energy facilities.[2] Additionally, at least two circumstances render the proposed Project not only unnecessary, but plainly harmful.

First, statewide, Californians are "using less electricity."[3] As reported by the *Los Angeles Times*, and as evidenced by data compiled by the U.S. Energy Information Administration ("EIA") and California Energy Commission ("CEC"), California's "power plants are on track to be able to produce at least 21% more electricity than it needs by 2020." Exhibit 4 at 2 (quote); EIA, 2017, California Electricity Profile 2015;[4] CEC, 2017, Installed In-State Electric Generation Capacity by Fuel Type (MW).[5] With California's electricity usage flatlining, and rooftop solar and other distributed generation capacity increasing rapidly, there is less need than ever for industrial-scale projects like the proposed Drew Solar Project – and much less justification for the Project's massive environmental impacts. *Id*.

Second, wildfire risk in southern California is higher than previously estimated, and getting worse with global warming. This risk would both impact and be exacerbated by the Project, which would be located primarily in a "Moderate" fire hazard severity zone, as designated by the California Department of Forestry and Fire Protection ("CAL FIRE").[6] For example, as reported in the August 2017 Climate Change Vulnerability Assessment for adjacent

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[2] Less harmful renewable energy production alternatives to the Project also exist outside Imperial County, as demonstrated below in Section VI of these comments.

[3] Penn, I. and R. Menezes, February 5, 2017, "Californians are paying billions for power they don't need," *Los Angeles Times* (attached hereto as Exhibit 4, and also available here: http://www.latimes.com/projects/la-fi-electricity-capacity/).

[4] Available here: https://www.eia.gov/electricity/state/california/

[5] Available here:
http://www.energy.ca.gov/almanac/electricity_data/electric_generation_capacity.html/

[6] CAL FIRE, September 19, 2007, Imperial County Draft Fire Hazard Severity Zone in LRA (attached hereto as Exhibit 5, and also available here:
http://www.fire.ca.gov/fire_prevention/fhsz_maps_imperial)

San Diego County,[7] CalAdapt's wildfire tool estimates that under both a low-GHG-emissions scenario and a high-emissions scenario, substantially more land in the County will burn due to wildfire by 2099. San Diego County, Draft Climate Action Plan, Appendix D, p. 12. Under the low-emissions scenario, over 3,500 more acres are expected to burn *every year* by 2099. *Id.* Under a high-emissions scenario, the additional annual acreage scorched by wildfire increases to nearly 8,500. *Id*.

IV. THE EIR MUST PROVIDE A FULL AND ACCURATE PROJECT DESCRIPTION.

"An accurate, stable and finite project description is the *sine qua non* of an informative and legally sufficient EIR." *County of Inyo v. City of Los Angeles* (1977) 71 Cal.App.3d 185, 193. In addition, "[t]he data in an EIR must not only be sufficient in quantity, it must be presented in a manner calculated to adequately inform the public and decision makers, who may not be previously familiar with the details of the project." *Vineyard Area Citizens for Responsible Growth v. City of Rancho Cordova* ("*Vineyard*") (2007) 40 Cal.4th 412, 431.

The EIR must cure the Initial Study's failure to fully describe the project. For example, the Initial Study fails to identify the type of energy storage system proposed for the Project. To the contrary, it states that the "Project proposes an energy storage system with a technology to be determined." Initial Study, p. 27. The Initial Study also fails to clarify whether the proposed General Plan amendment would be to both the Land Use Element *and* the Renewable Energy and Transmission Element, or just the latter. *Compare* Initial Study, p. 32 ("The Project will require: an Amendment to Imperial County's General Plan Land Use Element and Renewable Energy and Transmission Element") *with* Initial Study, p. 32 ("Both the GPA and the Zone Change would be to the Renewable Energy Overlay Zone"). CEQA requires more in the EIR. *Vineyard*, 40 Cal.4th at 434.

V. THE EIR MUST ANALYZE THE FULL RANGE OF PROJECT IMPACTS.

The EIR must analyze the full range of potentially significant environmental impacts from the Project, including the following:

<u>*Fire Impacts*</u>: As discussed above, the Project site is in an area of moderate and increasing fire risk. The Project would add many known fire risks to the area, exacerbating that risk further. The EIR must fully analyze the Project's wildland fire impacts, including whether the local firefighting services, as well as on-site fire protection measures, are equipped for the type of

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[7] Available here:
http://www.sandiegocounty.gov/content/dam/sdc/pds/advance/cap/publicreviewdocuments/CAPfilespublicreview/Appendix%20D%20Climate%20Change%20Vulnerability%20Assessment.pdf

electrical and chemical fires the Project could cause, with electrical generation, transmission and battery storage components all on site.

Agricultural Impacts: As discussed above, the Project would eliminate and preclude agricultural operations on nearly 800 acres for at least 35 years. The EIR must analyze that direct impact, as well as the cumulative impact of destroying tens of thousands of acres of farmland over the past decade, along with any planned future farmland conversion. This persistent farmland elimination may well be the death knell for farming in County. As utility-scale energy projects convert more and more agricultural land to non-agricultural uses, more and more agriculture-serving businesses will be forced to close, due to both declining revenues and logistical problems. And as the quantity and quality of agriculture-serving businesses decrease in the County, more and more farmers will find it uneconomical or impractical to keep farming and be forced to sell, lease or use their lands for non-agriculture purposes, creating a vicious circle of shrinking farmbase and shrinking farm support services.

Greenhouse Gas Emissions: The EIR must analyze not only the greenhouse gas emissions from Project construction and operation, but also its life-cycle emissions. Without a lifecycle emissions analysis, the EIR could not support the Initial Study's assertion that in "the long-term, the Project is expected to provide a benefit with respect to reduction of greenhouse gas emissions." Initial Study, p. 26.

Biological Resource Impacts: The proposed Project site is potentially home to many sensitive plants and animals, including the burrowing owl and other bird species. The County and its consultants must thoroughly survey the area for these and other species and analyze the Project's impacts on them in the EIR. Among other impacts, the EIR must analyze the "pseudo-lake effect," which occurs when solar projects' reflective panels resemble water from above, and attract birds – especially migratory birds – searching for water. Once tricked, the birds can – and often do – dive into the solar panels as if they were water. This "pseudo-lake effect" is suspected to be a primary cause of migratory bird trauma and death at the Desert Sunlight PV facility in Riverside County.[8]

Land Use and Planning Impacts: As discussed, the Project would violate the Imperial County General Plan in at least three different ways, each of which is a significant impact requiring CEQA analysis. Initial Study at 2-22. The EIR must analyze these impacts.

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[8] Kagan, R.A, T.C. Vimer, P.W. Trail, and E.O. Espinoza, "Avian Mortality at Solar Energy Facilities in Southern California: A Preliminary Analysis," Report of the National Fish and Wildlife Forensics Laboratory (attached hereto as Exhibit 6).

VI. THE EIR MUST ANALYZE A FULL RANGE OF ALTERNATIVES.

CEQA requires EIRs to "describe a range of reasonable alternatives to the project . . . which would feasibly attain most of the basic objectives of the project but would avoid or substantially lessen any of the significant effects of the project, and evaluate the comparative merits of the alternatives." Guidelines § 15126.6(a). Alternatives that would lessen significant effects should be considered even if they "would impede to some degree the attainment of the project objectives, or be more costly." *Id*. § 15126.6(b). The range of alternatives considered must "foster informed decisionmaking and public participation." *Id*. § 15126.6(a). Alternatives may only be eliminated from "detailed consideration" when substantial evidence in the record shows that they either (1) "fail[] to meet most of the basic project objectives," (2) are "infeasibl[e]," or (3) do not "avoid significant environmental impacts." *Id*. § 15126.6(c).

Among other alternatives, the EIR should analyze programs to develop or incentivize the development of distributed photovoltaic ("PV") generation projects *near energy demand centers in already-disturbed areas*. These alternatives are not only feasible, they could generate far more energy than the Project, and with far fewer environmental impacts. For example, a recent study shows that installing PV and concentrating solar power ("CSP") technologies throughout California's built environment could substantially exceed the state's forecasted 2020 energy needs.[9] Another recent study estimates that deploying PV and CSP solely on developed land (built environment), land with salt-affected soils, and contaminated land and reservoirs in California's Central Valley "could meet [California's] projected 2025 needs for electricity consumption between 10-13 times over" (for PV technologies) and "over two times over with CSP technologies."[10] Exhibit 8 at 14479. Before the County could approve the Project, it would need to consider less-impactful alternatives like these in an EIR. CEQA § 21100; Guidelines § 15126.6.

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[9] Hernandez, R.R., M.K. Hoffacker, M.L. Murphy-Mariscal, G. Wu, and M.F. Allen, 2015, "Solar Energy Development Impacts on Land-Cover Change and Protected Areas," *Proceedings of the National Academy of Sciences*, 112(44) (attached hereto as Exhibit 7).

[10] Hoffacker, M.L., M.F. Allen, and R.R. Hernandez, 2017, "Land-Sparing Opportunities for Solar Energy Development in Agricultural Landscapes: A Case Study of the Great Central Valley, CA, United States," *Environmental Science & Technology* 51:14472-14482 (attached hereto as Exhibit 8).

For each of these reasons, Farms for Farming opposes the Project as currently proposed, and requests that the EIR analyze all of the impacts and alternatives discussed above.

Respectfully submitted,

Stephan C. Volker
Attorney for Farms for Farming, *et al.*

SCV:taf

Attachments: Exhibit 1 - John M. Lowrie, California Department of Conservation, Letter to Armando Villa re: Cancellation of Land Conservation (Williamson Act) Contract No. 2001-00706, November 1, 2011.

Exhibit 2 - Dan Otis, California Department of Conservation, Letter to Patricia Valenzuela re: Notice of Preparation for a DEIR for Imperial Solar Energy Center South, July 16, 2010.

Exhibit 3 - Connie L. Valenzuela, Imperial County Agricultural Commissioner, Letter to Armando Villa re: CUP 10-0035 8 Minutenergy Renewables, LLC, Calipatria Solar Farm II, February 25, 2011.

Exhibit 4 - Penn, I. and R. Menezes, February 5, 2017, "Californians are paying billions for power they don't need," *Los Angeles Times*.

Exhibit 5 - CAL FIRE, September 19, 2007, Imperial County Draft Fire Hazard Severity Zone in LRA, also available here: http://www.fire.ca.gov/fire_prevention/fhsz_maps_imperial.

Exhibit 6 - Kagan, R.A., T.C. Viner, P.W. Trail, and E.O. Espinoza, "Avian Mortality at Solar Energy Facilities in Southern California: A Preliminary Analysis," Report for the National Fish and Wildlife Forensics Laboratory, also available here: here: http://docketpublic.energy.ca.gov/PublicDocuments/09-AFC-07C/TN201977_20140407T161504_Center_Supplemental_Opposition_to_Motion.pdf.

Exhibit 7 - Hernandez, R.R., M.K. Hoffacker, M.L. Murphy-Mariscal, G. Wu, and M.F. Allen, 2015, "Solar Energy Development Impacts on Land-Cover Change and Protected Areas," *Proceedings of the National Academy of Sciences*, 112(44).

Exhibit 8 - Hoffacker, M.L., M.F. Allen, and R.R. Hernandez, 2017, “Land-Sparing Opportunities for Solar Energy Development in Agricultural Landscapes: A Case Study of the Great Central Valley, CA, United States,” *Environmental Science & Technology* 51:14472-14482.

EXHIBIT 1

DEPARTMENT OF CONSERVATION

Managing California's Working Lands

DIVISION OF LAND RESOURCE PROTECTION

801 K STREET • MS 18-01 • SACRAMENTO, CALIFORNIA 95814

PHONE 916 / 324-0850 • FAX 916 / 327-3430 • TDD 916 / 324-2555 • WEBSITE conservation.ca.gov

November 1, 2011

Mr. Armando G. Villa, Director
Imperial County
Department of Planning and Development Services
801 Main Street
El Centro, CA 92243

Dear Mr. Villa:

SUBJECT: Cancellation of Land Conservation (Williamson Act) Contract No. 2001-00706; Landowner: James R. & Barbara A. Smith; Applicant: 8 Minute Energy (Calipatria Solar Farm II); APN 022-170-005

The Department of Conservation (Department) monitors farmland conversion on a statewide basis and administers the California Land Conservation (Williamson) Act. The Department has reviewed the application submitted by the Imperial County Department of Planning and Development Services (County) regarding the referenced cancellation and offers the following recommendations.

Project Description

The petition proposes to cancel 563 acres of agricultural land subject to Williamson Act Contract in order to build a photovoltaic energy facility (Project) which will generate a total of 50 megawatts. The Project Site is located approximately one mile north of Calipatria, California within Imperial County and is bounded by Blair Road to the east, E. Peterson Road to the north, W. Lindsey Road to the south and the Southern Pacific Railroad to the west. The Calipatria State Prison is located to eth northeast of the project site. According to the petition, the applicant has submitted a Conditional Use Permit for a 40 year term.

Cancellation Findings

Government Code (GC) section 51282 states that tentative approval for cancellation may be granted only if the local government makes ***either*** one of the following findings:

1) Cancellation is **consistent** with purposes of the Williamson Act, (not addressed by the cancellation petition) ***or***
2) Cancellation is in the **public interest.**

The following are the requirements for the public interest findings required under GC section 51282 (above):

2) <u>Cancellation is in the Public Interest</u>

   For the cancellation to be in the public interest, the Board must make both of the following findings:

   a. Other public concerns substantially outweigh the objectives of the Williamson Act, and

   b. There is no *proximate, noncontracted land*[1] which is available and *suitable*[2] for the use proposed on the contracted land, or, development of the contracted land would provide more contiguous patterns of urban development than development of proximate noncontracted land.

<u>Department Comments on the Public Interest Cancellation Findings</u>
The Department has reviewed the petition and additional information supplied by the applicant, and offers the following comments with regards to the submitted public interest findings:

<u>a) Other public concerns substantially outweigh the objectives of the Williamson Act:</u>
Renewable energy is energy generated from sources such as the sun, wind, the ocean, and the earth's core. Solar photovoltaic electricity qualifies as a renewable energy source for the purposes of California's Renewables Portfolio Standards. In April, Governor Brown signed Senate Bill 2 (First Extraordinary Session) which extends the current 20% renewables portfolio standard target in 2010 to a 33% renewables portfolio standard by December 31, 2020. Through a number of legislative actions and/or policies, the State has placed an importance on renewable energy as well as preserving farmland.

There are many factors in determining whether the production of solar energy is of a higher public interest than the pre-existing agricultural use of the land. Some factors may include the quality of the soil, current agricultural production and the availability of reliable irrigation water. The Department has no comment regarding this particular finding.

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[1] "Proximate, noncontracted land" means land not restricted by contract, which is sufficiently close to land which is so restricted that it can serve as a practical alternative for the use which is proposed for the restricted land. (GC section 51282).

[2] "Suitable" for the proposed use means that the salient features of the proposed use can be served by the land not restricted by contract. Such nonrestricted land may be a single parcel or may be a combination of contiguous or discontiguous parcels. (GC section 51282).

b) *There is no available and suitable proximate non-contracted land for the use proposed on the contracted land:*
According to the petition, the property was chosen due to its close proximity to the electrical grid which has the capacity for the solar facility. The Department has no comment regarding this particular finding.

Cancellation Findings Conclusion
Imperial County Board of Supervisors could approve the cancellation application based on the required public interest findings only if the Board feels it has adequate amount of information and has built the record to meet the statuary requirements.

Compatible Use
The Department has determined that commercial solar facilities are an industrial use of the land and inconsistent with the intent of the Williamson Act and its protection of open space and agricultural resources. The suggestion that a solar facility is a compatible use as defined by the Williamson Act is misguided. The footprint of a solar facility and the fact that it does not allow for the continuation of agricultural operations or open space activities as the main operation of the land, make it inconsistent with many different sections of the Act. The Department views GC §51238, which cites the compatibility of gas, electric, water, communication, or agricultural labor housing facilities in an *agricultural preserve*, as referring to those structures which have minimal impact on the land, and which are necessary for the needs of a community. The Department has consistently interpreted this section to describe overhead power lines, electrical substations, underground communication lines, and water lines, all of which take up a minimal amount of land.

Additionally, the Williamson Act provides a preferential tax assessment on contracted land in exchange for limiting the land to agricultural or open space uses. Agricultural use means the use of the land for the purpose of producing an agricultural commodity for commercial purposes (GC§51201(a)). Open space is the use or maintenance of land in a manner that preserves its natural characteristics, beauty, or openness for the benefit and enjoyment of the public or for wildlife habitat (GC§51201(o)). A commercial solar facility does not meet the definition of an agricultural use and solar energy does not meet the definition of an agricultural commodity, which means any and all plant and animal products produced in this State for commercial purposes. Nor is it consistent with the definition of an open space use. In addition, GC§51242 requires that land enrolled in a Williamson Act contract be devoted to agricultural use. When a solar project displaces all of the agriculture, and replaces it with a use that has no agricultural utility, the land clearly ceases to be devoted to agriculture.

Neither the Legislature nor City Councils or Boards of Supervisors can override the restrictions included within the Williamson Act or the Constitutional provision enabling the Act. The construction of solar facilities removes and replaces agriculture or open space uses to have a significant impact on agricultural and open space lands, including grazing land. After a review of the proposal, the Department does not believe that the County can consider commercial solar facilities compatible with the Williamson Act contract.

Site Restoration Plan

Since solar technology is advancing rapidly over time, the amount of open land that is needed for the same amount of solar energy production may decrease significantly in the future. That same land may also one day be needed again for the production of food.

It is important that proposals for the conversion of agricultural land to solar energy projects include a detailed site restoration plan describing how the project proponents will restore the land back to its current condition including irrigation supplies if and when some or all of the solar panels are removed. This type of plan would be similar to SMARA-required restoration plans on proposed mining sites. The Department recommends that an acceptable site restoration plan be required by the County for the proposed project.

Thank you for the opportunity to provide comments on the proposed cancellation. Please provide our office with a copy of the Notice of Public Hearing on this matter ten (10) working days before the hearing and a copy of the published notice of the Board's decision within thirty (30) days of the tentative cancellation pursuant to GC section 51284. If you have any questions concerning our comments, please contact Sharon Grewal, Environmental Planner at (916) 327-6643.

Sincerely,

John M. Lowrie
Program Manager
Williamson Act Program

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EXHIBIT 2

DEPARTMENT OF CONSERVATION

DIVISION OF LAND RESOURCE PROTECTION

801 K STREET • MS 18-01 • SACRAMENTO, CALIFORNIA 95814

PHONE 916 / 324-0850 • FAX 916 / 327-3430 • TDD 916 / 324-2555 • WEBSITE conservation.ca.gov

July 16, 2010

VIA FACSIMILE (760) 353-8338
Ms. Patricia Valenzuela, Planner III
Imperial County Planning & Development Services
801 main Street
El Centro, CA 92243

Subject: Notice of Preparation for a DEIR for Imperial Solar Energy Center South - SCH# 2010061038

Dear Ms. Valenzuela:

The Department of Conservation's (Department) Division of Land Resource Protection (Division) has reviewed the Notice of Preparation (NOP) for a DEIR for Imperial Solar Energy Center South. The Division monitors farmland conversion on a statewide basis and administers the California Land Conservation (Williamson) Act and other agricultural land conservation programs. We offer the following comments and recommendations with respect to the proposed project's potential impacts on agricultural land and resources.

Project Description:

The project is located on Pullman Road and Anza Road in an unincorporated part of Imperial County on the US/Mexico Border. The project site is 903 acres of agricultural land. The site is designated Prime Farmland and Farmland of Statewide Importance per the Imperial County Farmland Mapping and Monitoring Program maps. The existing General Plan designation is Agriculture and the zoning is General Agriculture Rural Zone and Heavy Agriculture.

The project proposes the development of a solar energy center and would consist of ground mounted photovoltaic solar power generation system, supporting structures, an operations and maintenance building, substation, water treatment facility, plant control system, meteorological station, roads and fencing. The project also plans a 120-foot wide Right-of-Way from the project site, along BLM land, within BLM's designated Utility Corridor "N" to the Imperial Valley Substation.

Division Comments:

The initial study for the NOP stated that because solar generation facilities are an allowed use within the zone district and subject to a conditional use permit, they do not conflict with existing zoning for agriculture and thus no impact is identified. However, the entire purpose of going through the conditional use permit process is to trigger a thorough CEQA review of a project's potential impacts. The development of 903 acres of Prime Farmland and Farmland of Statewide Importance is a substantial amount of development and displacement of agricultural resources.

The Department of Conservation considers the construction of a solar facility that removes and replaces agriculture on agricultural lands to have a significant impact on those agricultural lands, including grazing land. While solar panels may be an allowed use under the County zoning and General Plan, they can and should be considered an impact under CEQA to the project site's agricultural resources.

Although direct conversion of agricultural land is often an unavoidable impact under California Environmental Quality Act (CEQA) analysis, mitigation measures must be considered. A principal purpose of an EIR is to present a discussion of mitigation measures in order to fully inform decision-makers and the public about ways to lessen a project's impacts. In some cases, the argument is made that mitigation cannot reduce impacts to below the level of significance because agricultural land will still be converted by the project, and, therefore, mitigation is not required. However, reduction to a level below significance is not a criterion for mitigation. Rather, the criterion is feasible mitigation that lessens a project's impacts. Pursuant to CEQA Guideline §15370, mitigation includes measures that "avoid, minimize, rectify, reduce or eliminate, or compensate" for the impact. For example, mitigation includes *"Minimizing impacts by limiting the degree or magnitude of the action and its implementation (§15370(b))"* or *"Compensating for the impact by replacing or providing substitute resources or environments (§15370(e))."*

All measures allegedly feasible should be included in the DEIR. Each measure should be discussed, as well as the reasoning for selection or rejection. A measure brought to the attention of the Lead Agency should not be left out unless it is infeasible based on its elements.

Finally, when presenting mitigation measures in the DEIR, it is important to note that mitigation should be specific, measurable actions that allow monitoring to ensure their implementation and evaluation of success. A mitigation consisting only of a statement of intention or an unspecified future action may not be adequate pursuant to CEQA.

<u>Project Impacts on Agricultural Land</u>

When determining the agricultural value of the land, the value of a property may have been reduced over the years due to inactivity, but it does not mean that there is no longer any agricultural value. The inability to farm the land, rather than the choice not to do so, is what could constitute a reduced agricultural value. The Division recommends the following discussion under the Agricultural Resources section of the Draft EIR:

- Type, amount, and location of farmland (Prime, Unique, and Farmland of Statewide Importance) conversion that may result directly and indirectly from project implementation and growth inducement, respectively.
- Impacts on current and future agricultural operations; e.g., land-use conflicts, increases in land values and taxes, etc.
- Incremental project impacts leading to cumulative impacts on agricultural land. This would include impacts from uses allowed with the proposed solar facility, as well as impacts from past, current, and likely projects in the future.

Under California Code of Regulations Section 15064.7, impacts on agricultural resources may also be both quantified and qualified by use of established thresholds of significance. As such, the Division has developed a California version of the USDA Land Evaluation and Site Assessment (LESA) Model. The California LESA model is a semi-quantitative rating system for establishing the environmental significance of project-specific impacts on farmland. The model may also be used to rate the relative value of alternative project sites. The LESA Model is available on the Division's website at:

http://www.consrv.ca.gov/DLRP/qh_lesa.htm

Solar Facility Mitigations and Reclamation Plan

If the solar facility is considered a temporary displacement of agricultural resources, then there should be some assurances that it will be temporary and will be removed in the future. Hence the need for a reclamation plan. The loss of agricultural land (even temporary) represents a reduction in the State's agricultural land resources. The Division has witnessed the negative impacts of non-operational wind power generation facilities and related equipment that have been left to deteriorate on agricultural land. For that reason, the Division offers a variety of permitting conditions the County might use for energy projects on agricultural land:

- Require a reclamation plan suited for solar facilities, based on the principles of the Surface Mining and Reclamation Act (SMARA). As part of this plan, a performance bond or other similar measure may be used.
  - A typical requirement would be for the soil to be restored to the same condition it was in prior to the solar facility's construction. Whatever project-related materials have been brought in, or changes made to the land (i.e. graveling, roads, compaction, equipment), would be removed once the solar facility (or portions of) is no longer active.
- Solar projects are generally considered to be "temporary". The County could require that a new permit must be applied for after a certain period of time. Because this is a new and unprecedented use for agricultural land, this would allow the County more flexibility in determining what conditional uses or conditions may be most appropriate in the longer term.
- Require permanent agricultural conservation easements on land of at least equal quality and size as partial compensation for the direct loss of agricultural land.
  - Conservation easements will protect a portion of those remaining agricultural land resources and lessen project impacts in accordance with California Environmental Quality Act (CEQA) Guideline §15370. The Department highlights this measure because of its acceptance and use by lead agencies as an appropriate mitigation measure under CEQA and because it follows an established rationale similar to that of wildlife habitat mitigation.

Mitigation via agricultural conservation easements can be implemented by at least two alternative approaches: the outright purchase of easements or the donation of mitigation fees to a local, regional or statewide organization or agency whose purpose includes the acquisition and stewardship of agricultural conservation easements. The proposed conversion of agricultural land should be deemed an impact of at least regional significance. Hence, the search for replacement lands can be conducted regionally or statewide, and need not be limited strictly to lands within the project's surrounding area. Mitigation for the loss of Prime Farmland is suggested at a 2:1 ratio due to its importance in the State of California. The use of conservation easements is only one form of mitigation, and any other feasible mitigation measures should also be considered. Mitigations for temporary solar projects can also be flexible, especially in cases where there is a reclamation plan in place that requires the land to be returned to an agricultural state.

The Department also has available a listing of approximately 30 “conservation tools” that have been used to conserve or mitigate project impacts on agricultural land. This compilation report may be requested from the Division at the address or phone number at the conclusion of this letter. Of course, the use of conservation easements is only one form of mitigation that should be considered. Any other feasible mitigation measures should also be considered.

Thank you for giving us the opportunity to comment on the Notice of Preparation for a DEIR for Imperial Solar Energy Center South project. Please provide this Department with a copy of the DEIR, the date of any hearings for this particular action, and any staff reports pertaining to it. If you have questions regarding our comments, or require technical assistance or information on agricultural land conservation, please contact Meri Meraz, Environmental Planner, at 801 K Street, MS 18-01, Sacramento, California 95814, or by phone at (916) 445-9411.

Sincerely,

Therese for

Dan Otis
Program Manager
Williamson Act Program

cc: State Clearinghouse

Imperial County Farm Bureau
1000 Broadway
El Centro, CA 92243
FAX (760) 352-0232

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EXHIBIT 3

Connie L. Valenzuela
Agricultural Commissioner
Sealer of Weights and Measures

Linda S. Evans
Assistant Agricultural Commissioner/
Asst. Sealer of Weights and Measures

IMPERIAL COUNTY
AGRICULTURAL COMMISSIONER
SEALER OF WEIGHTS AND MEASURES
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February 25, 2011

Armando G. Villa
Planning & Development Services Director
801 Main Street
El Centro, CA 92243

RE: CUP 10-0035 8 Minutenergy Renewables, LLC, Calipatria Solar Farm II

The project entails the construction, development and operation of a ground mounted 50 MW Photovoltaic solar energy facility. The proposed solar plant will convert approximately 563 acres of privately owned farmland to non-farm use. The project will be located approximately one mile north of Calipatria, California in Imperial County and is bounded by Blair Road to the east, E. Peterson Road to the north, W. Lindsey Road to the south, and the Southern Pacific Railroad to the west. Agricultural lands lie to the immediate north, south, east and west of the project. The Calipatria State Prison is located to the northeast of the project site. An algae farm (Earthrise Farms) is located adjacent to the northwest corner of the site across the Southern Pacific Railroad tracks.

The California Department of Conservation has classified the property as Farmland of Statewide Importance. This farmland supports crops that contribute directly to Imperial County's $1.45 billion gross agricultural production value. Temporary or permanent removal of any farmland out of production would have a direct negative impact on employment, income, sales and tax revenue.

During the construction phase and perhaps afterwards depending on whether this project will have some level of permanent staffing, neighboring agricultural operations would be impacted and restricted in their ability to use some pesticides or some pesticide application methods. Also, any complaints received by the construction site regarding nearby agricultural operations would need to be investigated; costs incurred to conduct investigations into incidents and complaints are not directly reimbursed by the state.

Since the project will be surrounded by farmland it will be exposed to higher than normal levels of dust and potential pesticide drift which will likely increase the cleaning requirements of the panels.

The land under the solar panels could harbor pests including noxious weeds, plant diseases, insects, and vertebrates which are detrimental to agriculture and could cause damage to adjacent fields and crops. This could be a problem if a cover crop is used for dust control and needs to be addressed or mitigated. In addition to direct crop damage caused by pests, if these solar panels are located next to or near any produce or organic fields, they could create food safety issues (i.e. E. coli in spinach caused by animal dropping getting into the field). Many produce growers today have to comply with Leafy Greens Agreements to ensure produce safety.

Sincerely,

Linda S. Evans for
Connie L. Valenzuela
Agricultural Commissioner
Sealer of Weights and Measures

RECEIVED

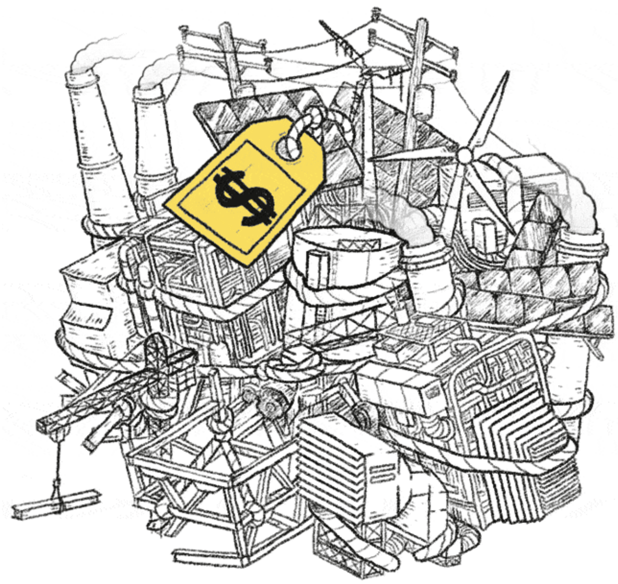
FEB 25 2011

IMPERIAL COUNTY
PLANNING & DEVELOPMENT SERVICES

EEC ORIGINAL PKG

EXHIBIT 4

Los Angeles Times (HTTP://WWW.LATIMES.COM/)



Californians are paying billions for power they don't need

We're using less electricity. Some power plants have even shut down. So why do state officials keep approving new ones?

By IVAN PENN (HTTP://WWW.LATIMES.COM/LA-BIO-IVAN-PENN-STAFF.HTML) and RYAN MENEZES (HTTP://WWW.LATIMES.COM/LA-BIO-RYAN-MENEZES-STAFF.HTML) | Reporting from Yuba City, Calif.

FEB. 5, 2017

Read the story

View the graphic (/projects/la-fi-electricity-capacity-graphic/)

The bucolic orchards of Sutter County north of Sacramento had never seen anything like it: a visiting governor and a media swarm — all to christen the first major natural gas power plant in California in more than a decade.

At its 2001 launch, the Sutter Energy Center was hailed as the nation's cleanest power plant. It generated electricity while using less water and natural gas than older designs.

A year ago, however, the $300-million plant closed indefinitely, just 15 years into an expected 30- to 40-year lifespan. The power it produces is no longer needed — in large part because state regulators approved the construction of a plant just 40 miles away in Colusa that opened in 2010.


"We are building more power plants in California than ever before. Our goal is to make California energy self-sufficient." - Gov. Gray Davis at the opening of Sutter Energy Center in 2001. (Carolyn Cole / Los Angeles Times)


Sutter Energy Center has been offline since 2016, after just 15 years of an expected 30- to 40-year lifespan. (David Butow / For The Times)

Two other large and efficient power plants in California also are facing closure decades ahead of schedule. Like Sutter, there is little need for their electricity.

California has a big — and growing — glut of power, an investigation by the Los Angeles Times has found. The state's power plants are on track to be able to produce at least 21% more electricity than it needs by 2020, based on official estimates. And that doesn't even count the soaring production of electricity by rooftop solar panels that has added to the surplus.

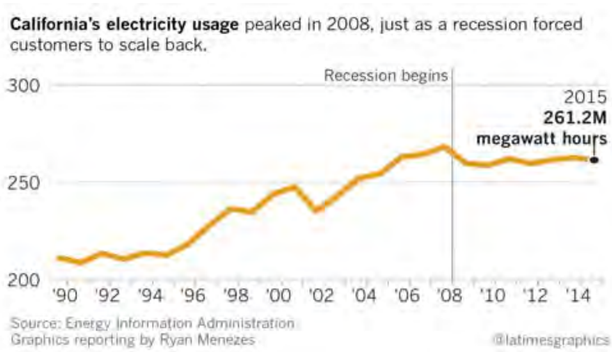
To cover the expense of new plants whose power isn't needed — Colusa, for example, has operated far below capacity since opening — Californians are paying a higher premium to switch on lights or turn on electric stoves. In recent years, the gap between what Californians pay versus the rest of the country has nearly doubled to about 50%.

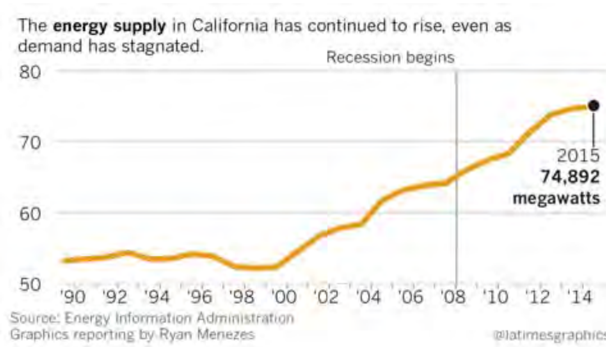
This translates into a staggering bill. Although California uses 2.6% less electricity annually from the power grid now than in 2008, residential and business customers together pay $6.8 billion more for power than they did then. The added cost to customers will total many billions of dollars over the next two decades, because regulators have approved higher rates for years to come so utilities can recoup the expense of building and maintaining the new plants, transmission lines and related equipment, even if their power isn't needed.

How this came about is a tale of what critics call misguided and inept decision-making by state utility regulators, who have ignored repeated warnings going back a decade about a looming power glut.

"In California, we're blinding ourselves to the facts," said Loretta Lynch, a former president of the California Public Utilities Commission, who along with consumer advocacy groups has fought to stop building plants. "We're awash in power at a premium price."

California regulators have for years allowed power companies to go on a building spree, vastly expanding the potential electricity supply in the state. Indeed, even as electricity demand has fallen since 2008, California's new plants have boosted its capacity enough to power all of the homes in a city the size of Los Angeles — six times over. Additional plants approved by regulators will begin producing more electricity in the next few years.





The missteps of regulators have been compounded by the self-interest of California utilities, Lynch and other critics contend. Utilities are typically guaranteed a rate of return of about 10.5% for the cost of each new plant regardless of need. This creates a major incentive to keep construction going: Utilities can make more money building new plants than by buying and reselling readily available electricity from existing plants run by competitors.

Regulators acknowledge the state has too much power but say they are being prudent. The investment, they maintain, is needed in case of an emergency — like a power plant going down unexpectedly, a heat wave blanketing the region or a wildfire taking down part of the transmission network.

"We overbuilt the system because that was the way we provided that degree of reliability," explained Michael Picker, president of the California Public Utilities Commission. "Redundancy is important to reliability."

Some of the excess capacity, he noted, is in preparation for the retirement of older, inefficient power plants over the next several years. The state is building many new plants to try to meet California environmental standards requiring 50% clean energy by 2030, he said.

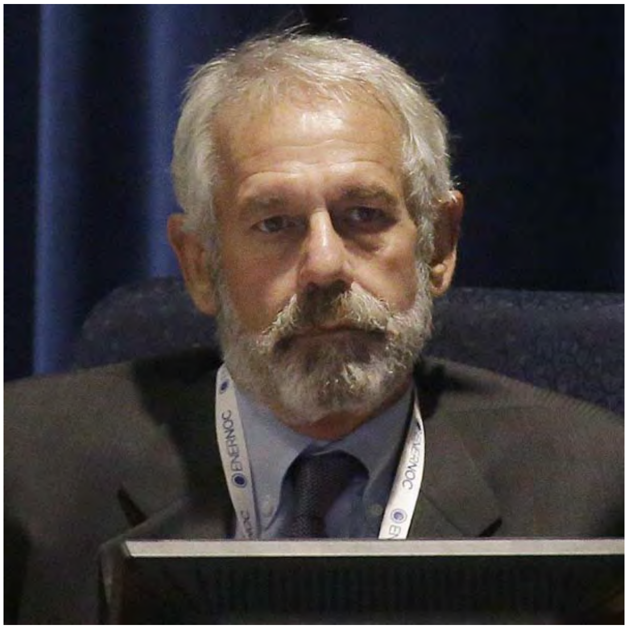
In addition, he said, some municipalities — such as the Los Angeles Department of Water and Power — want to maintain their own separate systems, which leads to inefficiencies and redundancies. "These are all issues that people are willing to pay for," Picker said.

Critics agree that some excess capacity is needed. And, in fact, state regulations require a 15% cushion. California surpasses that mark and is on pace to exceed it by 6 percentage points in the next three years, according to the Western Electricity Coordinating Council, which tracks capacity and reliability. In the past, the group has estimated the surplus would be even higher.

Michael Picker, current president of California's Public Utilities Commission, said the state's excess power supply is a strategic decision to ensure reliability. Loretta Lynch, who held the same position from 2002 to 2005, has been a critic of overbuilding since she chaired the regulatory agency. (Associated Press)

Even the 15% goal is "pretty rich," said Robert McCullough of Oregon-based McCullough Research, who has studied California's excess electric capacity for both utilities and regulators. "Traditionally, 10% is just fine. Below 7% is white knuckle. We are a long way from white-knuckle time" in California.

Contrary to Picker's assertion, critics say, customers aren't aware that too



much capacity means higher rates. "The winners are the energy companies," Lynch said. "The losers are businesses and families."

The over-abundance of electricity can be traced to poorly designed deregulation of the industry, which set the stage for blackouts during the energy crisis of 2000-2001.

Lawmakers opened the state's power business to competition in 1998, so individual utilities would no longer enjoy a monopoly on producing and selling electricity. The goal was to keep prices lower while ensuring adequate supply. Utilities and their customers were allowed to buy electricity from new, unregulated operators called independent power producers.

The law created a new exchange where electricity could be bought and sold, like other commodities such as oil or wheat.

Everyone would benefit. Or so the thinking went.

In reality, instead of lowering electricity costs and spurring innovation, market manipulation by Enron Corp. and other energy traders helped send electricity prices soaring.

That put utilities in a bind, because they had sold virtually all their natural gas plants. No longer able to produce as much of their own electricity, they ran up huge debts buying power that customers needed. Blackouts spread across the state.

State leaders, regulators and the utilities vowed never to be in that position again, prompting an all-out push to build more plants, both utility-owned and independent.

"They were not going to allow another energy crisis due to a lack of generation," said Alex Makler, a senior vice president of Calpine, the independent power producer that owns the Sutter Energy plant not far from Sacramento.

But the landscape was starting to change. By the time new plants began generating electricity, usage had begun a decline, in part because of the economic slowdown caused by the recession but also because of greater energy efficiency.

The state went from having too little to having way too much power.

"California has this tradition of astonishingly bad decisions," said McCullough, the energy consultant. "They build and charge the ratepayers. There's nothing dishonest about it. There's nothing complicated. It's just bad planning."

> California has this tradition of astonishingly bad decisions.
>
> — Robert McCullough, energy consultant

The saga of two plants — Sutter Energy and Colusa — helps explain in a microcosm how California came to have too much energy, and is paying a high price for it.

Sutter was built in 2001 by Houston-based Calpine, which owns 81 power plants in 18 states.

Sutter Energy Center, now closed, made money only if Calpine Corp. found customers for the plant's power. Other large, natural gas plants in the state also face early closures. (David Butow / For The Times)

Colusa Generating Station opened in 2010. Pacific Gas & Electric will charge ratepayers more than $700 million over the plant's lifespan, to cover its operating costs and the profit guaranteed to public utility companies. (Rich Pedroncelli / AP)

Independents like Calpine don't have a captive audience of residential customers like regulated utilities do. Instead, they sell their electricity under contract or into the electricity market, and make money only if they can find customers for their power.

Sutter had the capacity to produce enough electricity to power roughly 400,000 homes. Calpine operated Sutter at an average of 50% of capacity in its early years — enough to make a profit.

But then Pacific Gas & Electric Co., a regulated, investor-owned utility, came along with a proposal to build Colusa.

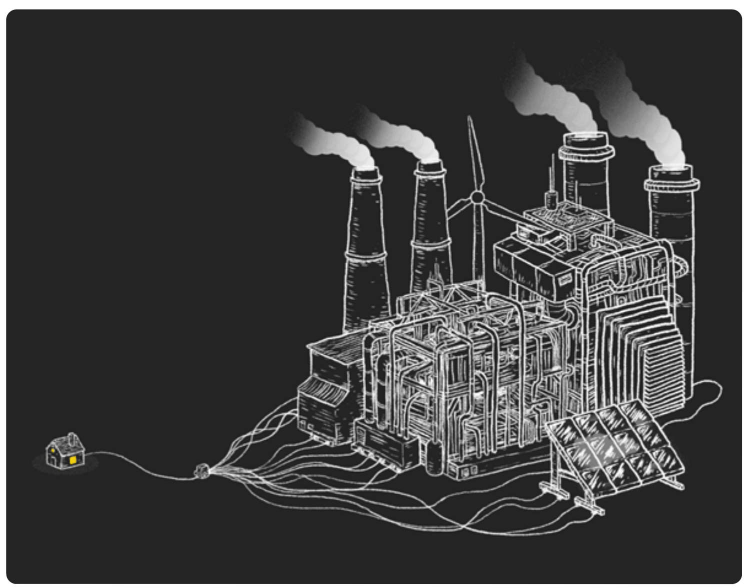
It was not long after a statewide heat wave, and PG&E argued in its 2007 request seeking PUC approval that it needed the ability to generate more power. Colusa — a plant almost identical in size and technology to Sutter — was the only large-scale project that could be finished quickly, PG&E said.

More than a half-dozen opponents, including representatives of independent power plants, a municipal utilities group and consumer advocates filed objections questioning the utility company. Wasn't there a more economical alternative? Did California need the plant at all?

They expressed concern that Colusa could be very expensive long-term for customers if it turned out that its power wasn't needed.

That's because public utilities such as PG&E operate on a different model.

If electricity sales don't cover the operating and construction costs of an independent power plant, it can't continue to run for long. And if the independent plant closes, the owner — and not ratepayers — bears the burden of the cost.



(/projects/la-fi-electricity-capacity-graphic/) (/projects/la-fi-electricity-capacity-graphic/) (/projects/la-fi-electricity-capacity-graphic/) California's energy supply: From blackouts to glut (/projects/la-fi-electricity-capacity-graphic/)

View the interactive graphic (/projects/la-fi-electricity-capacity-graphic/)

In contrast, publicly regulated utilities such as PG&E operate under more accommodating rules. Most of their revenue comes from electric rates approved by regulators that are set at a level to guarantee the utility recovers all costs for operating the electric system as well as the cost of building or buying a power plant — plus their guaranteed profit.

Protesters argued Colusa was unnecessary. The state's excess production capacity by 2010, the year Colusa was slated to come online, was projected to be almost 25% — 10 percentage points higher than state regulatory requirements.

The looming oversupply, they asserted, meant that consumers would get stuck with much of the bill for Colusa no matter how little customers needed its electricity.

And the bill would be steep. Colusa would cost PG&E $673 million to build. To be paid off, the plant will have to operate until 2040. Over its lifetime, regulators calculated that PG&E will be allowed to charge more than $700 million to its customers to cover not just the construction cost but its operating costs and its profit.

Pacific Gas & Electric's Colusa Generating Station has operated at well below its generating capacity — just 47% in its first five years. (Rich Pedroncelli / AP)

The urgent push by PG&E "seems unwarranted and inappropriate, and potentially costly to ratepayers," wrote Daniel Douglass, a lawyer for industry groups that represent independent power producers.

The California Municipal Utilities Assn. — whose members buy power from public utilities and then distribute that power to their customers — also complained in a filing that PG&E's application appeared to avoid the issue of how Colusa's cost would be shared if it ultimately sat idle. PG&E's "application is confusing and contradicting as to whether or not PG&E proposes to have the issue of stranded cost recovery addressed," wrote Scott Blaising, a lawyer representing the association. ("Stranded cost" is industry jargon for investment in an unneeded plant.)

The arguments over Colusa echoed warnings that had been made for years by Lynch, the former PUC commissioner.

A pro-consumer lawyer appointed PUC president in 2000 by Gov. Gray Davis, Lynch consistently argued as early as 2003 against building more power plants.

"I was like, 'What the hell are we doing?' " recalled Lynch.

She often butted heads with other commissioners and utilities who pushed for more plants and more reserves. Midway though her term, the governor replaced her as president — with a former utility company executive.

One key battle was fought over how much reserve capacity was needed to guard against blackouts. Lynch sought to limit excess capacity to 9% of the state's electricity needs. But in January 2004, over her objections, the PUC approved a gradual increase to 15% by 2008.

"We've created an extraordinarily complex system that gives you a carrot at every turn," Lynch said. "I'm a harsh critic because this is intentionally complex to make money on the ratepayer's back."

With Lynch no longer on the PUC, the commissioners voted 5-0 in June 2008 to let PG&E build Colusa. The rationale: The plant was needed, notwithstanding arguments that there was a surplus of electricity being produced in the market.

PG&E began churning out power at Colusa in 2010. For the nearby Sutter plant, that marked the beginning of the end as its electricity sales plummeted.

In the years that followed, Sutter's production slumped to about a quarter of its capacity, or just half the rate it had operated previously.

Calpine, Sutter's owner, tried to drum up new business for the troubled plant, reaching out to shareholder-owned utilities such as PG&E and other potential buyers. Calpine even proposed spending $100 million to increase plant efficiency and output, according to a letter the company sent to the PUC in February 2012.

PG&E rejected the offer, Calpine said, "notwithstanding that Sutter may have been able to provide a lower cost."

Asked for comment, PG&E said, "PG&E is dedicated to meeting the state's clean energy goals in cost-effective ways for our customers. We use competitive bidding and negotiations to keep the cost and risk for our customers as low as possible." It declined to comment further about its decision to build Colusa or on its discussions with Calpine.

Without new contracts and with energy use overall on the decline, Calpine had little choice but to close Sutter.

During a 2012 hearing about Sutter's distress, one PUC commissioner, Mike Florio, acknowledged that the plant's troubles were "just the tip of the proverbial iceberg." He added, "Put simply, for the foreseeable future, we have more power plants than we need."

Colusa, meanwhile, has operated at well below its generating capacity — just 47% in its first five years — much as its critics cautioned when PG&E sought approval to build it.

Sutter isn't alone. Other natural gas plants once heralded as the saviors of California's energy troubles have found themselves victims of the power glut. Independent power producers have announced plans to sell or close the 14-year-old Moss Landing power plant at Monterey Bay and the 13-year-old La Paloma facility in Kern County.

> "
>
> Put simply, for the foreseeable future, we have more power plants than we need.
>
> — Mike Florio, former PUC commissioner

Robert Flexon, chief executive of independent power producer Dynegy Inc., which owns Moss Landing, said California energy policy makes it difficult for normal market competition. Independent plants are closing early, he said, because regulators favor utility companies over other power producers.

"It's not a game we can win," Flexon said.

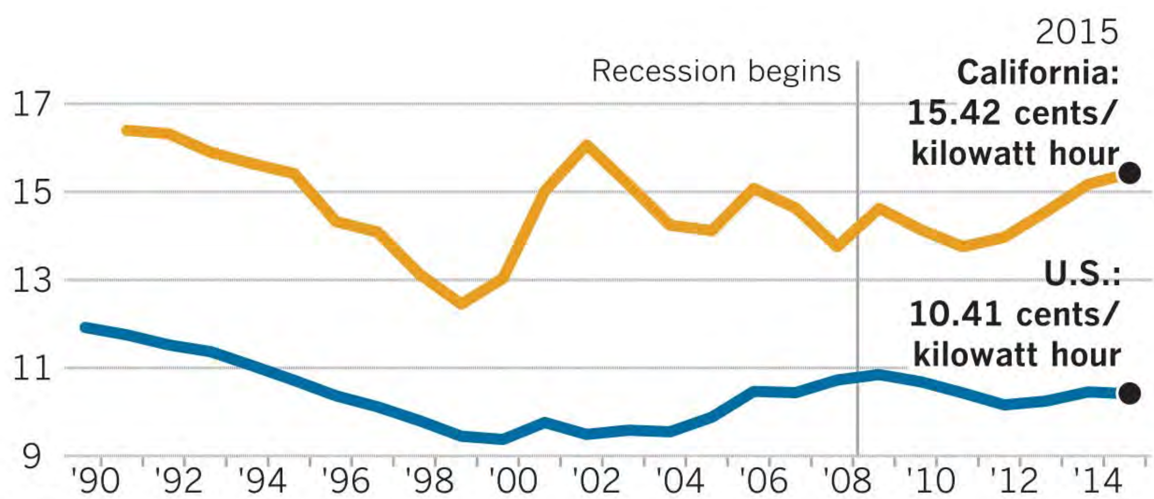
Since 2008 alone — when consumption began falling — about 30 new power plants approved by California regulators have started producing electricity. These plants account for the vast majority of the 17% increase in the potential electricity supply in the state during that period.

Hundreds of other small power plants, with production capacities too low to require the same level of review by state regulators, have opened as well.

Most of the big new plants that regulators approved also operate at below 50% of their generating capacity.

So that California utilities can foot the bill for these plants, the amount they are allowed by regulators to charge ratepayers has increased to $40 billion annually from $33.5 billion, according to data from the U.S. Energy Information Administration. This has tacked on an additional $60 a year to the average residential power bill, adjusted for inflation.

Another way of looking at the impact on consumers: The average cost of electricity in the state is now 15.42 cents a kilowatt hour versus 10.41 cents for users in the rest of the U.S. The rate in California, adjusted for inflation, has increased 12% since 2008, while prices have declined nearly 3% elsewhere in the country.



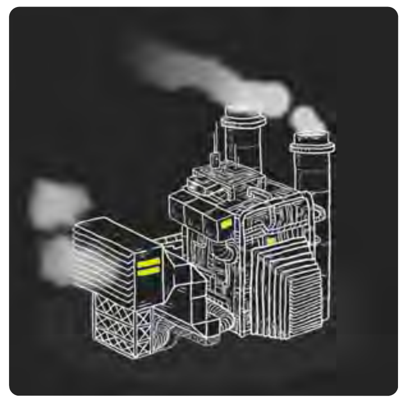
Note: cost of power figures are adjusted for inflation.
Source: Energy Information Administration
Graphics reporting by Ryan Menezes
@latimesgraphics

California utilities are "constantly crying wolf that we're always short of power and have all this need," said Bill Powers, a San Diego-based engineer and consumer advocate who has filed repeated objections with regulators to try to stop the approval of new plants. They are needlessly trying to attain a level of reliability that is a worst-case "act of God standard," he said.

Even with the growing glut of electricity, consumer critics have found that it is difficult to block the PUC from approving new ones.

In 2010, regulators considered a request by PG&E to build a $1.15-billion power plant in Contra Costa County east of San Francisco, over objections that there wasn't sufficient demand for its power. One skeptic was PUC commissioner Dian Grueneich. She warned that the plant wasn't needed and its construction would lead to higher electricity rates for consumers — on top of the 28% increase the PUC had allowed for PG&E over the previous five years.

The PUC was caught in a "time warp," she argued, in approving new plants as electricity use fell. "Our obligation is to ensure that our decisions have a legitimate factual basis and that ratepayers' interest are protected."



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California's energy supply: From blackouts to glut (/projects/la-fi-electricity-capacity-graphic/)

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Her protests were ignored. By a 4-to-1 vote, with Grueneich the lone dissenter, the commissioners approved the building of the plant.

Consumer advocates then went to court to stop the project, resulting in a rare victory against the PUC. In February 2014, the California Court of Appeals overturned the commission, ruling there was no evidence the plant was needed.

Recent efforts to get courts to block several other PUC-approved plants have failed, however, so the projects are moving forward.

Contact the reporters (mailto:ivan.penn@latimes.com; ryan.menezes@latimes.com?subject=The Power Boom). For more coverage follow @ivanlpenn (https://twitter.com/ivanlpenn) and @ryanvmenezes (https://twitter.com/ryanvmenezes)

Times data editor Ben Welsh contributed to this report. Illustrations by Eben McCue. Graphics by Priya Krishnakumar and Paul Duginski. Produced by Lily Mihalik

EXHIBIT 5

FRAP
Fire and Resource Assessment Program
California Department of Forestry and Fire Protection

IMPERIAL COUNTY

DRAFT FIRE HAZARD SEVERITY ZONES IN LRA

FIRE HAZARD SEVERITY ZONES

- LRA Very High
- LRA High
- LRA Moderate
- LRA Unzoned
- Other Very High
- Other High
- Other Moderate
- Other Unzoned
- Incorporated Cities

Projection Albers, NAD 1927
Scale 1: 150,000
at 46" x 35.5"
September 19, 2007

Government Code 51175-89 direct the California Department of Forestry and Fire Protection (CAL FIRE) to map areas of very high fire hazard within Local Responsibility Areas (LRA). Mapping of the areas, referred to as Very High Fire Hazard Severity Zones (VHFHSZ), is based on relevant factors such as fuels, terrain, and weather. VHFHSZ maps were initially developed in the mid-1990s but are now being updated based on improved science, mapping techniques, and data.

The California Building Commission adopted the Wildland-Urban Interface codes in late 2005 to be effective in 2008. These new codes include provisions to improve the ignition resistance of buildings, especially from firebrands. The updated fire hazard severity zones will be used by building officials to determine appropriate construction materials for new buildings in the Wildland-Urban Interface. The updated zones will also be used by property owners to comply with natural hazards disclosure requirements at time of property sale and 100 foot defensible space clearance. It is likely that the fire hazard severity zones will be used for updates to the safety element of general plans.

This map has been created by CAL FIRE's Fire and Resource Assessment Program (FRAP) using data and models describing development patterns, **potential** fuels over a 30-50 year time horizon, expected fire behavior, and expected burn probabilities to quantify the likelihood and nature of vegetation fire exposure (including firebrands) to new construction. Details on the project and specific modeling methodology can be found at http://frap.cdf.ca.gov/projects/hazard/methods.htm.

The version dated September 17, 2007 of the map shown here represents draft VHFHSZs within LRA, for review and comment by local government.

An interactive system for viewing map data is hosted by the UC Center for Fire at http://firecenter.berkeley.edu/fhsz/

Questions can be directed to;

Kathleen Schori (Northern Region) (530) 472-3121 kathleen.schori@fire.ca.gov.
Sass Barton (Southern Region) (559) 243-4130 sass.barton@fire.ca.gov.

Obtain FRAP maps, data, metadata and publications on the Internet at http://frap.cdf.ca.gov
For more information, contact CAL FIRE-FRAP, PO Box 944246, Sacramento, CA 94244-2460, (916) 327-3939.

Arnold Schwarzenegger, Governor,
State of California
Mike Chrisman, Secretary for Resources,
The Resources Agency
Ruben Grijalva, Director,
Department of Forestry and Fire Protection

MAP ID: FHSZL06_1_MAP
DATA SOURCES
CAL FIRE Fire Hazard Severity Zones (FHSZL06_1)
CAL FIRE State Responsibility Areas (SRA05_4)
CAL FIRE Incorporated Cities (Incorp07_2)
PLSS (1:100,000 USGS, Land Grants with CAL FIRE grid)

EXHIBIT 6

Avian Mortality at Solar Energy Facilities in Southern California: A Preliminary Analysis

Rebecca A. Kagan, Tabitha C. Viner, Pepper W. Trail, and Edgard O. Espinoza
National Fish and Wildlife Forensics Laboratory

Executive Summary

This report summarizes data on bird mortality at three solar energy facilities in southern California: Desert Sunlight, Genesis, and Ivanpah. These facilities use different solar technologies, but avian mortality was documented at each site. Desert Sunlight is a photovoltaic facility, Genesis employs a trough system with parabolic mirrors, and Ivanpah uses a power tower as a focal point for solar flux.

FINDINGS

Trauma was the leading cause of death documented for remains at the Desert Sunlight and Genesis sites. Trauma and solar flux injury were both major causes of mortality at the Ivanpah site. Exposure to solar flux caused singeing of feathers, which resulted in mortality in several ways. Severe singeing of flight feathers caused catastrophic loss of flying ability, leading to death by impact with the ground or other objects. Less severe singeing led to impairment of flight capability, reducing ability to forage and evade predators, leading to starvation or predation. Our examinations did not find evidence for significant tissue burns or eye damage caused by exposure to solar flux.

Cause of Death	Ivanpah	Genesis	Desert Sunlight	Total
Solar Flux	47	0	0	47
Impact trauma	24	6	19	49
Predation trauma	5	2	15	22
Trauma of undetermined cause	14	0	0	14
Electrocution	1	0	0	1
Emaciation	1	0	0	1
Undetermined (remains in poor condition)	46	17	22	85
No evident cause of death	3	6	5	14
Total	141	31	61	233

These solar facilities appear to represent "equal-opportunity" hazards for the bird species that encounter them. The remains of 71 species were identified, representing a broad range of ecological types. In body size, these ranged from hummingbirds to pelicans; in ecological type from strictly aerial feeders (swallows) to strictly aquatic feeders (grebes) to ground feeders (roadrunners) to raptors (hawks and owls). The species identified were equally divided among resident and non-resident species, and nocturnal as well as diurnal species were represented. Although not analyzed in detail, there was also significant bat and insect mortality at the Ivanpah site, including monarch butterflies. It appears that Ivanpah may act as a **"mega-trap,"** attracting insects which in turn attract insect-eating birds, which are incapacitated by solar flux injury, thus attracting predators and creating an entire food chain vulnerable to injury and death.

			Foraging Zone			**Residency Status**	
SITE	No. Remains	Identifiable Remains	Air	Terr	Water	Resident	Migrant
Ivanpah	141	127	28	85	14	63	64
Genesis	31	30	12	12	6	20	10
Desert Sun	61	56	7	22	27	18	38
TOTALS	233	213	47	119	47	101	112

CONCLUSIONS AND RECOMMENDATIONS

In summary, three main causes of avian mortality were identified at these facilities: impact trauma, solar flux, and predation. Birds at all three types of solar plants were susceptible to impact trauma and predators. Predation was documented mostly at the photovoltaic site, and in many cases appeared to be associated with stranding or nonfatal impact trauma with the panels, leaving birds vulnerable to resident predators. Solar flux injury, resulting from exposures to up to 800º F, was unique to the power tower facility. Our findings demonstrate that a broad ecological variety of birds are vulnerable to morbidity and mortality at solar facilities, though some differential mortality trends were evident, such as waterbirds at Desert Sunlight, where open water sources were present; and insectivores at Ivanpah, where insects are attracted to the solar tower.

Specific hazards were identified, including vertically-oriented mirrors or other smooth reflective panels; water-like reflective or polarizing panels; actively fluxing towers; open bodies of water; aggregations of insects that attracted insectivorous birds; and resident predators. Making towers, ponds and panels less attractive or accessible to birds may mitigate deaths. Specific actions should include:

Monitoring/detection measures:

1) Install video cameras sufficient to provide 360 degree coverage around each tower to record birds (and bats) entering and exiting the flux

2) For at least two years (and in addition to planned monitoring protocol), conduct daily surveys for birds (at all three facilities), as well as insects and bats (in the condenser building at Ivanpah) around each tower at the base of and immediately adjacent to the towers in the area cleared of vegetation. Timing of daily surveys can be adjusted to minimize scavenger removal of carcasses as recommended by the TAC. Surveys in the late afternoon might be optimal for bird carcasses, and first light for bat carcasses.

3) Use dogs for monitoring surveys to detect dead and injured birds that have hidden themselves in the brush, both inside and outside the perimeter of the facility

4) To decrease removal of carcasses, implement appropriate raven deterrent actions

Bird Mortality Avoidance Measures:

1) Increase cleared area around tower at Ivanpah to decrease attractive habitat; at least out to fence

2) Retrofit visual cues to existing panels at all three facilities and incorporate into new panel design. These cues should include UV-reflective or solid, contrasting bands spaced no further than 28 cm from each other

3) Suspend power tower operation during peak migration times for indicated species

4) Avoid vertical orientation of mirrors whenever possible, for example tilt mirrors during washing

5) Properly net or otherwise cover ponds

6) Place perch deterrent devices where indicated, eg. on tower railings near the flux field

7) Employ exclusionary measures to prevent bats from roosting in and around the condenser facility at Ivanpah.

It must be emphasized that we currently have a very incomplete knowledge of the scope of avian mortality at these solar facilities. Challenges to data collection include: large facilities which are difficult to efficiently search for carcasses; vegetation and panels obscuring ground visibility; carcass loss due to scavenging; rapid degradation of carcass quality hindering cause of death and species determination; and inconsistent documentation of carcass history.

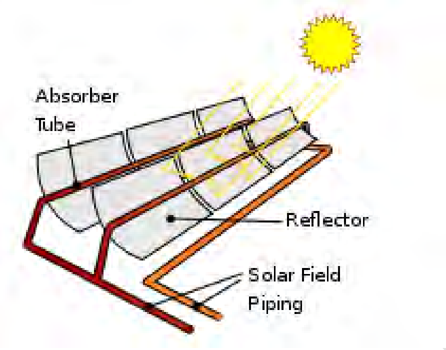
To rectify this problem, video cameras should be added to the solar towers to record bird mortality and daily surveys of the area at the base of and immediately adjacent to the towers should be conducted. At all the facilities, a protocol for systematic, statistically-rigorous searches for avian remains should be developed, emphasizing those areas where avian mortality is most likely to occur. Investigation into bat and insect mortalities at the power tower site should also be pursued.

Finally, there are presently little data available on how solar flux affects birds and insects. Studies of the temperatures experienced by objects in the flux; of the effects of high temperatures on feather structure and function; and of the behavior of insects and birds in response to the flux and related phenomena (e.g. "light clouds") are all essential if we are to understand the scope of solar facility effects on wildlife.

Introduction

The National Fish and Wildlife Forensics Laboratory was requested to determine cause of death for birds found at facilities that generate electricity from solar energy. Solar generating facilities can be classified into three major types: photovoltaic sites, trough systems and solar power towers. There is much written about these systems so this report will not include any technical details, but simply mention the differences and their potential impact on birds.

1) **Photovoltaic systems** directly convert the sun's light into electricity. The perceived threat to birds is associated with the presence of water ponds which attract birds and from traumatic impact with the photovoltaic cells. An example of this type of solar power plant is Desert Sunlight Solar Farm (AKA First Solar).



2) **Trough systems** are composed of parabolic mirrors which focus and reflect the sun to a tube that converts the heat from the sun into electricity. The perceived threat to birds is associated with the presence of water ponds which attract birds and from traumatic impact with the trough structures. An example of this type of solar power plant is Genesis Solar Energy Project.

3) **Solar power towers** use thousands of mirrors to reflect the solar energy to a tower, where water in a boiler is converted to steam, generating the electricity. The perceived threat to birds is associated traumatic impact with the mirrors and the danger associated with the heat produced by the mirrors. An example of this type of solar power plant is Ivanpah Solar Electric Generating System.

Methods

Carcasses were collected at the different solar power plant sites by either US Fish and Wildlife Service employees or by energy company staff. The collection of the carcasses was opportunistic; that is, not according to a pre-determined sampling schedule or protocol. There was no attempt to quantify the number of carcasses that scavengers or predators removed from the solar facilities' grounds, or to compare the distribution of carcasses inside and outside the boundaries of the solar facility sites.

Additionally, three USFWS/-OLE staff, including two Forensics Lab staff (EOE and RAK), visited the Ivanpah Solar plant from October 21 – 24, 2013. Their on-site observations are included in this report.

A total of 233 birds collected from three different facilities were examined; 141 from a solar thermal power tower site (Ivanpah, Bright Source Inc.), 31 from a parabolic trough site (Genesis, NextEra Energy Inc.) and 61 from a photovoltaic (PV) panel site (Desert Sunlight, First Solar Inc.). Nine of the Ivanpah birds were received fresh; 7 of those were necropsied during a site visit by a Forensics Laboratory pathologist (RAK). The rest of the birds were received frozen and allowed to thaw at room temperature prior to species identification and necropsy. Species determination was made by the Forensics Laboratory ornithologist (PWT) for all birds either prior to necropsy or, for those necropsied on-site, from photos and the formalin-fixed head. All data on carcass history (location of the carcass, date of collection and any additional observations) were transcribed, although these were not available for all carcasses.

As part of the gross pathological examination, whole carcasses were radiographed to help evaluate limb fractures and identify any metal foreign bodies. Alternate light source examination using an Omnichrome Spectrum 9000+ at 570 nm with a red filter helped rule in or out feather burns by highlighting subtle areas of feather charring (Viner et al., 2014). All birds or bird parts from Ivanpah without obvious burns were examined with the alternate light source, as well as any bird reportedly found near a power line and a random sub-sample of the remaining birds from Genesis and Desert Sunlight (Viner, T. C., R. A. Kagan, and J. L. Johnson, 2014, Using an alternate light source to detect electrically singed feathers and hair in a forensic setting. Forensic Science International, v. 234, p. e25-e29).

Carcass quality varied markedly. If carcasses were in good post mortem condition, representative sections of heart, lung, kidney, liver, brain and gastrointestinal tract as well as any tissues with gross lesions were collected and fixed in 10% buffered formalin. Full tissue sets were collected from the fresh specimens. Formalin-fixed tissues were routinely processed for histopathology, paraffin-embedded, cut at 4 µm and stained with hematoxylin and eosin. Tissues from 63 birds were examined microscopically: 41 from Ivanpah, 1 from Genesis and 21 from Desert Sunlight.

Birds with feather burns were graded based on the extent of the lesions. Grade 1 birds had curling of less than 50% of the flight feathers. Grade 2 birds had curling of 50% or more of the flight feathers. Grade 3 birds had curling and visible charring of contour feathers (Figure 1).

Figure 1: Three grades of flux injury based on extent and severity of burning. Grade 1 (top); Yellow-rumped Warbler with less than 50% of the flight feathers affected (note sparing of the yellow rump feathers). Grade 2 (middle); Northern Rough-winged Swallow initially found alive but unable to fly, with greater than 50% of the flight feathers affected. Grade 3 (bottom); MacGillivray's Warbler with charring of feathers around the head, neck, wings and tail.

Bird Species Recovered at Solar Power Facilities

Tables 1-4 and Appendix 1 summarize 211 identifiable bird remains recovered from the three solar facilities included in this study. These birds constitute a taxonomically diverse assemblage of 71 species, representing a broad range of ecological types. In body size, these species ranged from hummingbirds to pelicans; in ecological type from strictly aerial feeders (e.g. swifts and swallows) to strictly aquatic feeders (pelicans and cormorants) to ground feeders (roadrunners) to raptors (hawks and owls). The species identified were equally divided among resident and non-resident species. Nocturnal as well as diurnal species were represented.

In Tables 1-4 and Appendix 1, bird species are categorized into very general ecological types by foraging zone and residency status. Foraging Zones were "air" (a significant portion of foraging activity performed in the air), "terrestrial" (including foraging both in vegetation and on the ground), and "water" (foraging associated with water, including waders as well as aquatic birds). Residency Status was "resident" (for breeding or year-round residents) and "migrant" (for both passage migrants and non-breeding-season residents). For a number of species, the appropriate classification for residency status was uncertain, due to a lack of detailed knowledge of the sites. The present classification is based on published range maps, and is subject to revision as more information becomes available.

This dataset is not suitable for statistical analysis, due to the opportunistic and unstandardized collection of avian remains at the facilities, and the lack of baseline data on bird diversity and abundance at each site. Nevertheless, a few conclusions can be noted. First, these data do not support the idea that these solar facilities are attracting particular species. Of the 71 bird species identified in remains, only five species were recovered from all three sites. These five were American Coot, Mourning Dove, Lesser Nighthawk, Tree Swallow, and Brown-headed Cowbird, again emphasizing the ecological variety of birds vulnerable to mortality at the solar facilities. Over two-thirds (67%) of the species were found at only a single site

(Appendix 1). That being said, the Desert Sunlight facility had particularly high mortality among waterbirds, suggesting a need to render the ponds at that site inaccessible or unattractive to these species.

The diversity of birds dying at these solar facilities, and the differences among sites, suggest that there is no simple "fix" to reduce avian mortality. These sites appear to represent "equal-opportunity" mortality hazards for the bird species that encounter them. Actions to reduce or mitigate avian mortality at solar facilities will need to be designed on a site-specific basis, and will require much more data on the bird communities at each site, and on how mortality is occurring. Carefully-designed mortality studies might reveal significant patterns of vulnerability that are not evident in these data.

Table 1. Summary data on avian mortality at the three solar sites included in this study. See summary for discussion of Foraging Zone and Residency Status categories.

				Foraging Zone			**Residency Status**	
SITE	**No. Species**	**No. Remains**	**Identifiable Remains**	**Air**	**Terr**	**Water**	**Resident**	**Migrant**
Ivanpah	49	141	127	26	85	14	63	64
Genesis	15	31	30	12	12	6	20	10
Desert Sun	33	61	56	7	22	27	18	38
TOTALS	71	233	213	47	119	47	101	112

Table 2. Species identified from avian remains at the Desert Sunlight photovoltaic solar facility. MNI = minimum number of individuals of each species represented by the identifiable remains. In some cases (e.g. Cinnamon/Blue-winged Teal), closely related species could not be distinguished based on the available remains, but the Foraging Zone and Residency Status could still be coded, due to the ecological similarities of the species involved. Total identified birds = 56.

DESERT SUNLIGHT		Zone	Residency	MNI
Pied-billed Grebe	*Podilymbus podiceps*	water	migrant	1
Eared Grebe	*Podiceps nigricollis*	water	migrant	3
Sora	*Porzana carolina*	water	migrant	1
American Avocet	*Recurvirostra americana*	water	migrant	1
Cinnamon/Blue-winged Teal	*Anas discors/clypeata*	water	migrant	1
Western Grebe	*Aechmophorus occidentalis*	water	migrant	9
Brown Pelican	*Pelecanus occidentalis*	water	migrant	2
Double-crested Cormorant	*Phalacrocorax auritus*	water	migrant	2
Black-crowned Night-Heron	*Nycticorax nycticorax*	water	migrant	1
Yuma Clapper Rail	*Rallus longirostris*	water	resident	1
American Coot	*Fulica americana*	water	migrant	5
Mourning Dove	*Zenaida macroura*	terr	resident	3
White-winged Dove	*Zenaida asiatica*	terr	resident	1
Lesser Nighthawk	*Chordeiles acutipennis*	air	resident	2
Common Poorwill	*Phalaenoptilus nuttallii*	air	resident	1
Costa's Hummingbird	*Calypte costae*	air	resident	1
Ash-throated Flycatcher	*Myiarchus cinerascens*	air	resident	1
Black-throated/Sage Sparrow	*Amphispiza sp.*	terr	resident	1
Black Phoebe	*Sayornis nigricollis*	air	resident	1
Loggerhead Shrike	*Lanius ludovicianus*	terr	resident	2
Common Raven	*Corvus corax*	terr	resident	1
Horned Lark	*Eremophila alpestris*	terr	migrant	1
Tree Swallow	*Tachycineta bicolor*	air	migrant	1
Townsend's Warbler	*Setophaga townsendi*	terr	migrant	2
Common Yellowthroat	*Geothlypis trichas*	terr	migrant	1
Savannah Sparrow	*Passerculus sandwichensis*	terr	migrant	1
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*	terr	migrant	1
Wilson's Warbler	*Cardellina pusilla*	terr	migrant	2
Western Tanager	*Piranga ludoviciana*	terr	migrant	2
Black-headed Grosbeak	*Pheucticus melanocephalus*	terr	migrant	1
Great-tailed Grackle	*Quiscalus mexicanus*	terr	resident	2
Brown-headed Cowbird	*Molothrus ater*	terr	resident	1

Table 3. Species identified from avian remains at the Genesis trough system solar facility. Total identified birds = 30.

GENESIS		Zone	Residency	MNI
Eared Grebe	*Podiceps nigricollis*	water	migrant	2
Great Blue Heron	*Ardea herodias*	water	migrant	1
American Kestrel	*Falco sparverius*	air	resident	1
Ring-billed Gull	*Larus delawarensis*	water	migrant	2
California Gull	*Larus californianus*	water	resident	1
White-winged Dove	*Zenaida asiatica*	terr	resident	1
Lesser Nighthawk	*Chordeiles acutipennis*	air	resident	2
Say's Phoebe	*Sayornis saya*	air	resident	2
Tree Swallow	*Tachycineta bicolor*	air	migrant	2
Cliff Swallow	*Petrochelidon pyrrhonota*	air	resident	5
Hermit Warbler	*Setophaga occidentalis*	terr	migrant	1
Black-headed Grosbeak	*Pheucticus melanocephalus*	terr	migrant	1
Chipping Sparrow	*Spizella passerina*	terr	resident	1
Bullock's Oriole	*Icterus bullockii*	terr	resident	2
Brown-headed Cowbird	*Molothrus ater*	terr	resident	6

Table 4. Species identified from avian remains at the Ivanpah power tower solar facility. Total identified birds = 127

IVANPAH		Zone	Residency	MNI
Cinnamon Teal	*Anas cyanoptera*	water	migrant	4
Cooper's Hawk	*Accipiter cooperii*	air	migrant	1
Red-shouldered Hawk	*Buteo lineatus*	terr	migrant	1
American Kestrel	*Falco sparverius*	air	resident	1
Peregrine Falcon	*Falco peregrinus*	air	resident	1
American Coot	*Fulica americana*	water	migrant	7
Sora	*Porzana carolina*	water	migrant	1
Spotted Sandpiper	*Actitis maculatus*	water	migrant	2
Greater Roadrunner	*Geococcyx californianus*	terr	resident	5
Yellow-billed Cuckoo	*Coccyzus americanus*	terr	migrant	1
Mourning Dove	*Zenaida macroura*	terr	resident	11
Barn Owl	*Tyto alba*	terr	resident	1
Lesser Nighthawk	*Chordeiles acutipennis*	air	resident	3
Common Poorwill	*Phalaenoptilus nuttallii*	air	resident	1
White-throated Swift	*Aeronautes saxatalis*	air	resident	1
Allen's/Rufous Hummingbird	*Selasphorus sp.*	air	migrant	1
Northern Flicker	*Colaptes auratus*	terr	resident	1
Ash-throated Flycatcher	*Myiarchus cinerascens*	air	resident	1
Loggerhead Shrike	*Lanius ludovicianus*	terr	resident	3
Warbling Vireo	*Vireo gilvus*	terr	migrant	1
Common Raven	*Corvus corax*	terr	resident	2
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*	air	migrant	2
Tree Swallow	*Tachycineta bicolor*	air	migrant	2
Verdin	*Auriparus flaviceps*	terr	resident	3
Blue-gray Gnatcatcher	*Polioptila caerulea*	terr	resident	1
Northern Mockingbird	*Mimus polyglottos*	terr	resident	1
American Pipit	*Anthus rubescens*	terr	migrant	4
Orange-crowned Warbler	*Oreothlypis celata*	terr	migrant	1
Lucy's Warbler	*Oreothlypis luciae*	terr	resident	1
Black-throated Gray Warbler	*Setophaga nigrescens*	terr	migrant	1
Yellow-rumped Warbler	*Setophaga coronata*	air	migrant	14
Townsend's Warbler	*Setophaga townsendi*	terr	migrant	2
Yellow Warbler	*Setophaga petechia*	terr	migrant	1
Black-and-white Warbler	*Mniotilta varia*	terr	migrant	1
Wilson's Warbler	*Cardellina pusilla*	terr	migrant	2
MacGillivray's Warbler	*Oporornis tolmei*	terr	migrant	1
Western Tanager	*Piranga ludoviciana*	terr	migrant	2
Lazuli Bunting	*Passerina amoena*	terr	migrant	1
Blue Grosbeak	*Passerina caerulea*	terr	resident	1
Green-tailed Towhee	*Pipilo chlorurus*	terr	migrant	1
Brewer's Sparrow	*Spizella breweri*	terr	resident	3
Chipping Sparrow	*Spizella passerina*	terr	resident	3
Black-throated Sparrow	*Amphispiza bilineata*	terr	resident	3
Savannah Sparrow	*Passerculus sandwichensis*	terr	migrant	2
White-crowned Sparrow	*Zonotrichia leucophrys*	terr	migrant	6

IVANPAH		Zone	Residency	MNI
Pine Siskin	*Spinus pinus*	terr	migrant	1
House Finch	*Carpodacus mexicanus*	terr	resident	13
Brown-headed Cowbird	*Molothrus ater*	terr	resident	1
Great-tailed Grackle	*Quiscalus mexicanus*	terr	resident	3

Cause of Death of Birds Found at the Solar Power Plants

Photovoltaic facility (Desert Sunlight):

Sixty-one birds from 33 separate species were represented from Desert Sunlight. Due to desiccation and scavenging, a definitive cause of death could not be established for 22 of the 61 birds (see Table 5). Feathers could be examined in all cases, however, and none of the 61 bird remains submitted from the PV facility had visible evidence of feather singeing, a clear contrast with birds found at Ivanpah.

Blunt force impact trauma was determined to have been the cause of death for 19 Desert Sunlight birds including two Western Grebes (*Aechmophorus occidentalis*) and one each of 16 other species. Impact (blunt force) trauma is diagnosed by the presence of fractures and internal and/or external contusions. In particular, bruising around the legs, wings and chest are consistent with crash-landings while fractures of the head and/or neck are consistent with high-velocity, frontal impact (such as may result from impacting a mirror).

Predation was the immediate cause of death for 15 birds. Lesions supporting the finding of predation included decapitation or missing parts of the body with associated hemorrhage (9/15), and lacerations of the skin and pectoral muscles. Eight of the predated birds from Desert Sunlight were

Figure 2: Predation trauma (top) resulting in traumatic amputation of the head and neck (American Avocet) and impact trauma (bottom) causing bruising of the keel ridge of the sternum (Brown Pelican).

grebes, which are unable to easily take off from land. This suggests a link between predation and stranding and/or impact resulting from confusion of the solar panels with water (see Discussion).

Parabolic trough facility (Genesis):

Thirty-one birds were collected from this site. There were 15 species represented. Those found in the greatest numbers were Brown-headed Cowbirds and Cliff Swallows, though no more than 6 individuals from any given species were recovered. Overall, carcass quality was poor and precluded definitive cause of death determination in 17/31 birds (Table 5). Identifiable causes of death consisted of impact trauma (6/31) and predation trauma (2/31). Necropsy findings were similar to those at Desert Sunlight with fractures and hemorrhage noted grossly. Predation trauma was diagnosed in two birds, a Cliff Swallow and a Ring-billed Gull.

Power tower facility (Ivanpah):

Ivanpah is the only facility in this study that produces solar flux, which is intense radiant energy focused by the mirror array on the power-generating tower. Objects that pass through this flux, including insects and birds, encounter extreme heat, although the extent of heating depends on many variables, including the duration of exposure and the precise location in the flux beam.

From Ivanpah, 141 birds were collected and examined. Collection dates spanned a period of one year and five months (July 2012 to December 2013) and included at least seven months of construction during which time the towers were not actively fluxing (2013). There were 49 species represented (Table 4). Those found in the greatest numbers were Yellow-rumped Warblers (*Setophaga coronata;* 14), House Finches (*Carpodacus mexicanus*; 13), Mourning Doves (*Zenaida macroura*; 11) and American Coots (*Fulica americana*; 7). Yellow-rumped Warblers and House Finches were found exclusively at the power tower site.

Solar flux injury was identified as the cause of death in 47/141 birds. Solar flux burns manifested as feather curling, charring, melting and/or breakage and loss. Flight feathers of the tail and/or wings were invariably affected. Burns also tended to occur in one or more of the following areas; the sides of the body (axillae to pelvis), the dorsal coverts, the tops and/sides of the head and neck and the dorsal body wall (the back). Overlapping portions of feathers and light-colored feathers were often spared (Figures 3 and 4).

Figure 3: contour feather from the back of a House Finch with Grade 3 solar flux injury. The feather has curling and charring limited to the exposed tip.

Figure 4: Feather from a Peregrine Falcon with Grade 2 solar flux injury. Note burning of dark feather bands with relative sparing of light bands.

The yellow and red rumps of Yellow-rumped Warblers and House Finches respectively remained strikingly unaffected (See Figure 1). Charring of head feathers, in contrast, was generally diffuse across all color patterns. A pattern of spiraling bands of curled feathers across or around the body and wings was often apparent.

Table 5. Cause of death (COD) data

Cause of Death	Ivanpah	Genesis	Desert Sunlight	Total
Solar Flux	47	0	0	47
Impact trauma	24	6	19	49
Predation trauma	5	2	15	22
Trauma of undetermined cause	14	0	0	14
Electrocution	1	0	0	1
Emaciation	1	0	0	1
Undetermined (remains in poor condition)	46	17	22	85
No evident cause of death	3	6	5	14
Total	141	31	61	233

Eight birds were assigned a feather damage Grade of 1 with curling of less than 50% of the flight feathers. Six of these had other evidence of acute trauma (75%). Five birds were Grade 2, including three birds that were found alive and died shortly afterwards. Of these birds, 2 (the birds found dead) also had evidence of acute trauma. Twenty-eight birds were Grade 3; with charring of body feathers. Of these birds, 21/28

(28%) had other evidence of acute trauma. Remaining carcasses (6) were incomplete and a grade could not be assigned.

Twenty-nine birds with solar flux burns also had evidence of impact trauma. Trauma consisted of skull fractures or indentations (8), sternum fractures (4), one or more rib fractures (4), vertebral fractures (1), leg fracture (3), wing fracture (1) and/or mandible fracture (1). Other signs of trauma included acute macroscopic and/or microscopic internal hemorrhage. Location found was reported for 39 of these birds; most of the intact carcasses were found near or in a tower. One was found in the inner heliostat ring and one was found (alive) on a road between tower sites. The date of carcass collection was provided for 42/47. None were found prior to the reported first flux (2013).

Figure 5: The dorsal aspect of the wing from a Peregrine Falcon (the same bird as shown in Figure 4) with Grade 2 lesions. Note extensive curling of feathers without visible charring. This bird was found alive, unable to fly, emaciated and died shortly thereafter. These findings demonstrate fatal loss of function due to solar flux exposure in the absence of skin or other soft tissue burns.

Among the solar flux cases, a variety of bird species were affected though all but one (a raptor) was a passerine (Appendix 2). House Finches and yellow-rumped Warblers were most often represented (10/47 and 12/47 respectively). For the birds in which species could be determined (41/47), insects were a major dietary component in all but two species. These were an unidentified hummingbird (*Selasphorus*) species (known to include insects in the diet) and a Peregrine Falcon (a species that feeds on small birds).

Four birds were reportedly found alive and taken to a wildlife rehabilitation center where they died one to a few days later (exact dates were not consistently provided). Three had Grade 2 feather burns and one had Grade 3 feather burns. None had other evidence of trauma. Body condition was reduced in all of the birds (two considered thin and two emaciated) based on a paucity of fat stores and depletion of skeletal muscling. The four birds were of four different species and consisted of three passerines and one raptor.

The second most commonly diagnosed cause of death at the Ivanpah facility was impact (or blunt force) trauma (24/141 birds). Necropsy findings were as previously described at the Desert Sunlight facility. Impact marks were reported on heliostat mirrors adjacent to the carcasses in 5 cases and mirrors were described as being vertically-oriented in 5 cases. Specific carcass locations were reported for 18 of the birds. Those birds were found in a variety of areas; below heliostats (8/18), in or near tower and powerblock buildings (4/18), on roads (2/18), below power lines (2/18), in the open (1/18) and by a desert tortoise pen (1/18).

Predation was determined to be the cause of death for five of the birds. A coot and a Mourning Dove were found with extensive trauma and hemorrhage to the head and upper body consisting of lacerations, crush trauma and/or decapitation. One of the birds (an American Coot) was found near a kit fox shelter site. One bird (Northern Mockingbird) was found near the fence line and the third (a Mourning Dove) in an alley way. Two more birds (an unidentified sparrow and an American Pipit) were observed being eaten by one of the resident Common Ravens.

Discussion of Cause of Death of Birds Found at the Solar Power Plants

Impact trauma:

Sheet glass used in commercial and residential buildings has been well-established as a hazard for birds, especially passerines (Klem 1990, 2004, 2006; Loss et al. 2014). A recent comprehensive review estimated that between 365-988 million birds die annually by impacting glass panels in the United States alone (median estimate 599 million; Loss et al. 2014). Conditions that precipitate window strike events include the positioning of vegetation on either side of the glass and the reflective properties of the window. Glass panels that reflect trees and other attractive habitat are involved in a higher number of bird collisions.

The mirrors and photovoltaic panels used at all three facilities are movable and generally directed upwardly, reflecting the sky. At the Ivanpah facility, when heliostats are oriented vertically (typically for washing or installation, personal communication, RAK) they appear to pose a greater risk for birds. Of the eight birds reported found under a heliostat, heliostats were vertically-oriented in at least 5 cases. (D Klem Jr., DC Keck, KL Marty, AJ Miller Ball, EE Niciu, and CT Platt. 2004. Effects of window angling, feeder placement, and scavengers on avian mortality at plate glass. Wilson Bulletin, 116(1):69-73; D Klem Jr. 2006. Glass: A deadly conservation issue for birds. Bird Observer 34(2):73-81; D Klem Jr. 1990.

Collisions between birds and windows: mortality and prevention. Journal of Field Ornithology 61:120–128; Loss, S.R., T. Will, S.S.Loss, and P.P. Marra. 2014. Bird-building collisions in the United States: Estimates of annual mortality and species vulnerability. Condor 116: 8-23). Studies with aquatic insects have found that vertically-oriented black glass surfaces (similar to solar panels) produced highly polarized reflected light, making them highly attractive (Kriska, G., P. Makik, I. Szivak, and G. Horvath. 2008. Glass buildings on river banks as “polarized light traps” for mass-swarming polarotactic caddis flies. Naturwissenschaften 95: 461-467).

A desert environment punctuated by a large expanse of reflective, blue panels may be reminiscent of a large body of water. Birds for which the primary habitat is water, including coots, grebes, and cormorants, were over-represented in mortalities at the Desert Sunlight facility (44%) compared to Genesis (19%) and Ivanpah (10%). Several factors may inform these observations. First, the size and continuity of the panels differs between facilities. Mirrors at Ivanpah are individual, 4 x 8’ panels that appear from above as stippling in a desert background (Figure 6). Photovoltaic panels at Desert Sunlight are long banks of adjacent 27.72 x 47.25” panels (70 x 120 cm), providing a more continuous, sky/water appearance. Similarly, troughs at Genesis are banks of 5 x 5.5’ panels that are up to 49-65 meters long.

Figure 6: The Ivanpah Solar Electric Generating System as seen via satellite. The mirrored panels are 5 x 8 feet.

There is growing concern about "polarized light pollution" as a source of mortality for wildlife, with evidence that photovoltaic panels may be particularly effective sources of polarized light in the environment (see Horvath et al. 2010. Reducing the maladaptive attractiveness of solar panels to polarotactic insects. Conservation Biology 24: 1644-1653, and ParkScience, Vol. 27, Number 1, 2010; available online at: http://www.nature.nps.gov/parkscience/index.cfm?ArticleID=386&ArticleTypeID=5; as well as discussion of this issue in the Desert Sunlight Final Environmental Impact Statement, Chapter 4, pp. 14-15).

Variables that may affect the illusory characteristics of solar panels are structural elements or markings that may break up the reflection. Visual markers spaced at a distance of 28 cm or less have been shown to reduce the number of window strike events on large commercial buildings (City of Toronto Green Development Standard; Bird-friendly development guidelines. March 2007). Mirrors at the Ivanpah facility are unobscured by structures or markings and present a diffuse, reflective surface. Photovoltaic panels at Desert Sunlight are arranged as large banks of small units that are 60 x 90 cm. The visually uninterrupted expanse of both these types of heliostat is larger than that which provides a solid structure visual cue to passerines. Parabolic troughs at Genesis have large, diffusely reflective surfaces between seams that periodically transect the bank of panels at 5.5' intervals. Structures within the near field, including the linear concentrator and support arms, and their reflection in the panels and may provide a visual cue to differentiate the panel as a solid structure.

The paper by Horvath et al cited above provides experimental evidence that placing a white outline and/or white grid lines on solar panels significantly reduced the attractiveness of these panels to aquatic insects, with a loss of only 1.8% in energy-producing surface area (p. 1651). While similar detailed studies have yet to be carried out with birds, this work, combined with the window strike results, suggest that significant reductions in avian mortality at solar facilities could be achieved by relatively minor modifications of panel and mirror design. This should be a priority for further research.

Finally, ponds are present on the property of the Desert Sunlight and Genesis facilities. The pond at Genesis is netted, reducing access by migratory birds, while the pond at Desert Sunlight is open to flighted wildlife. Thus, birds are both attracted to the water feature at Desert Sunlight and habituated to the presence of an accessible aquatic environment in the area. This may translate into the misinterpretation of a diffusely reflected sky or horizonal polarized light source as a body of water.

Stranding and Predation:

Predation is likely linked to panel-related impact trauma and stranding. Water birds were heavily over-represented in predation mortalities at Desert Sunlight. Of the 15 birds that died due to predation, 14 make their primary habitat on water (coots, grebes, a cormorant, and an avocet). A single White-winged Dove was the only terrestrial-based predation mortality in the submitted specimens. This is in contrast to blunt trauma mortalities at Desert Sunlight in which 8 of the 19 birds determined to have died of impact trauma were water species.

Locations of the birds when found dead were noted on several submissions. Of the birds that died of predation for which locations were known, none were located near ponds. The physiology of several of these water birds is such that locomotion on land is difficult or impossible. Grebes in particular have very limited mobility on land and require a run across water in order to take off (Jehl, J. R., 1996. Mass mortality events of Eared Grebes in North America. Journal of Field Ornithology 67: 471-476). Thus, these birds likely did not reach their final location intentionally. Ponds at the PV and trough sites are fenced, prohibiting terrestrial access by predators. Birds on the water or banks of the pond are inaccessible to resident predators. Therefore, it is unlikely that the birds were captured at the pond and transported by a predator into the area of the panels. Attempts to land or feed on the panels because of their deceptive appearance may have injured the birds to the point that they could not escape to safety, or inadvertently stranded the birds on a substrate from which they could not take flight. We believe that an inability to quickly flee after striking the panels and stranding on the ground left these birds vulnerable to opportunistic predators. At least two types of predators, kit foxes and ravens, have been observed in residence at the power tower and PV facilities and ravens have been reported at the trough site (personal communication and observation, RAK). Additionally, histories for multiple birds found at the tower site document carcasses found near kit fox shelters or being eaten or carried by a raven.

Solar Flux:

Avian mortality due to exposure to solar flux has been previously explored and documented (McCrary, M. D., McKernan, R. L., Schreiber, R. W., Wagner, W. D., and Sciarrotta, T. C. Avian mortality at a solar energy power plant. Journal of Field Ornithology, 57(2): 135-141). Solar flux injury to the birds of this report, as expected, occurred only at the power tower facility. Flux injury grossly differed from other sources of heat injury, such as electrocution or fire. Electrocution injury requires the bridging of two contact points and is, therefore, seen almost exclusively in larger birds such as raptors. Contact points tend to be on the feet, carpi and/or head and burns are often found in these areas. Electrocution causes deep tissue damage as opposed to the surface damage of fire or solar flux. Other sequelae include amputation of limbs with burn marks on bone, blood vessel tears and pericardial hemorrhage. Burns from fires cause widespread charring and melting of feathers and soft tissues and histopathologic findings of soot inhalation or heat damage to the respiratory mucosa. None of these were characteristics of flux injury. In the flux cases small birds were over-represented, had burns generally limited to the feathers and internal injuries attributable to impact. Flux injury inconsistently resulted in charring, tended to affect feathers along the dorsal aspects of the wings and tail, and formed band-like patterns across the body (Divincenti, F. C., J. A. Moncrief, and B. A. Pruitt. 1969. Electrical injuries: a review of 65 cases. The Journal of Trauma 9: 497-507).

Proposed mechanisms of solar flux-related death follow one or a combination of the following pathways:

- impact trauma following direct heat damage to feathers and subsequent loss of flight ability
- starvation and/or thermoregulatory dysfunction following direct heat damage to feathers
- shock
- soft tissue damage following whole-body exposure to high heat
- ocular damage following exposure to bright light.

Necropsy findings from this study are most supportive of the first three mechanisms.

Loss of feather integrity has effects on a bird's ability to take off, land, sustain flight and maneuver. Tail feathers are needed for lift production and maneuverability, remiges are needed for thrust and lift and feathers along the propatagium and coverts confer smoothness to the avian airfoil. Shortening of primary flight feathers by as little as 1.6 cm with loss of secondary and tertiary remiges has been shown to eliminate take-off ability in house sparrows further demonstrating the importance of these feathers (Brown, R. E., and A. C. Cogley, 1996. Contributions of the propatagium to avian flight: Journal of Experimental Zoology 276: 112-124). Loss of relatively few flight feathers can, therefore, render a bird unable or poorly-able to fly. Birds encountering the flux field at Ivanpah may fall as far as 400 feet after feather singeing. Signs of impact trauma were often observed in birds with feather burns and are supportive of sudden loss of function (Beaufrere, H., 2009. A review of biomechanic and aerodynamic considerations of the avian thoracic limb. Journal of Avian Medicine and Surgery 23: 173-185).

Birds appear to be able to survive flux burns in the short term, as evidenced by the collection of several live birds with singed feathers. Additionally, Forensic Lab staff observed a falcon or falcon-like bird with a plume of smoke arising from the tail as it passed through the flux field. Immediately after encountering the flux, the bird exhibited a controlled loss of stability and altitude but was able to cross the perimeter fence before landing. The bird could not be further located following a brief search (personal observation, RAK and EOE). Birds that initially survive the flux exposure and are able to glide to the ground or a perch may be disabled to the point that they cannot efficiently acquire food, escape predators or thermoregulate. Observations of emaciation in association with feather burns in birds found alive is supportive of debilitation subsequent to flux exposure. More observational studies and follow-up are required to understand how many birds survive flux exposure and whether survival is always merely short-term. As demonstrated by the falcon, injured birds (particulary larger birds), may be ambulatory enough to glide or walk over the property line indicating a need to include adjacent land in carcass searches.

There was evidence of acute skin burns on the heads of some of the Grade 3 birds that were found dead. But interestingly, tissue burn effects could not be demonstrated in birds known to have survived short periods after being burned. Hyperthermia causing instantaneous death manifests as rapid burning of tissue, but when death occurs a day or later there will be signs of tissue loss, inflammation, proteinic exudate and/or cellular death leading to multisystemic organ failure. The beginnings of an inflammatory response to injury can be microscopically observed within one to a few hours after the insult and would have been expected in any of the four birds found alive. Signs of heat stroke or inhalation of hot air should have been observable a day or more after the incident. Rather, in these cases extensive feather burns on the body largely appeared to be limited to the tips of the feathers with the overlapping portions insulating the body as designed. This, in conjunction with what is likely only a few seconds or less spent in the flux, suggests that skin or internal organ damage from exposure to high temperatures in solar flux may not be a major cause of the observed mortality.

Ocular damage following light exposure was also considered but could not be demonstrated in the submitted birds. In the four birds that initially survived, there were no signs of retinal damage, inflammation or other ocular trauma. Given the small sample size, this does not preclude sight impairment as a possible sequela but clinical monitoring of survivors would be needed to draw more definitive conclusions.

Other/Undetermined:

Powerline electrocution was the cause of death for one bird (a juvenile Common Raven) at the Ivanpah facility. Electrocution at these solar facilities is a potential hazard but, thus far, appears to be an uncommon cause of death.

Smashed birds (13/233) were found at all three locations. Detailed carcass collection information was provided for 6; all were found on roads. Though poor carcass quality in all cases precluded definitive cause death determination, circumstances and carcass condition suggest vehicle trauma as the cause of deaths. The relatively low numbers of vehicle collisions may be attributed to slow on-site vehicle speeds and light traffic. Vehicle collisions, therefore, do not appear to be a major source of mortality and would be expected to decrease as construction ends.

There was a large number of birds (85/233) for which a cause of death could not be determined due to poor carcass condition. The arid, hot environment at these facilities leads to rapid carcass degradation which greatly hinders pathology examination. Results were especially poor for birds from the Genesis facility, where the cause of death(s) for 23/31 (74%) could not be determined. These results underscore the need for carcasses to be collected soon after death. More frequent, concerted carcass sweeps are advised.

Insect mortality and solar facilities as "mega-traps"

An ecological trap is a situation that results in an animal selecting a habitat that reduces its fitness relative to other available habitats (Robertson, B.A. and R.L. Hutto. 2006. A framework for understanding ecological traps and an evaluation of existing evidence. Ecology 87: 1075-1085; Robertson, B.A., J.S. Rehage, and Sih, A. 2013. Ecological novelty and the emergence of evolutionary traps. Trends in Ecology and Evolution 28: 552-560).

A wide variety of circumstances may create ecological traps, ranging from subtle (songbirds attracted to food resources in city parks, where they are vulnerable to unnaturally high populations of predators) to direct (birds are attracted to oil-filled ponds, believing it to be water, and become trapped). It appears that solar flux facilities may act as "**mega-traps,"** which we define as artificial features that attract and kill species of multiple trophic layers. The strong light emitted by these facilities attract insects, which in turn attract insect-eating birds, which are incapacitated by solar flux injury, thus attracting predators and creating an entire food chain vulnerable to injury and death.

OLE staff observed large numbers of insect carcasses throughout the Ivanpah site during their visit. In some places there were hundreds upon hundreds of butterflies (including monarchs, *Danaus plexippus*) and dragonfly carcasses. Some showed singeing, and many appeared to have just fallen from the sky. Careful observation with binoculars showed the insects were active in the bright area around the boiler at the top of the tower. It was deduced that the solar flux creates such a bright light that it is brighter than the surrounding daylight. Insects were attracted to the light and could be seen actively flying the height of the tower. Birds were also observed feeding on the insects. At times birds flew into the solar flux and ignited. Bird carcasses recovered from the site showed the typical singed feathers. The large populations of insects may also attract indigenous bat species, which were seen roosting in structures at the base of the power tower.

Monarch butterflies in North America – both east and west of the Rocky Mountains – have been documented to be in decline (see the North American Monarch Conservation Plan, available at: http://www.mlmp.org/Resources/pdf/5431_Monarch_en.pdf). Proposed causes include general habitat loss and specific loss of milkweed, upon which the butterflies feed and reproduce. Considering the numerous monarch butterfly carcasses seen at the Ivanpah facility, it appears that solar power towers could have a significant impact on monarch populations in the desert southwest. Analysis of the insect mortality at Ivanpah, and systematic observations of bird/insect interactions around the power tower, is clearly needed.

Bird species affected by solar flux include both insectivores (e.g. swallows, swifts, flycatchers, and warblers) and raptors that prey on insect-feeding birds. Based on observations of the tower in flux and the finding of large numbers of butterflies, dragonflies and other insects at the base of the tower and in adjacent buildings it is suspected that the bright light generated by solar flux attracts insects, which in turn attracts insectivores and predators of insectivores. Waterbirds and other birds that feed on vegetation were not found to have solar flux burns. Birds were observed perching and feeding on railings at the top of the tower, apparently in response to the insect aggregations there.

Further, dead bats found at the Ivanpah site could be attracted to the large numbers of insects in the area. Nineteen bats from the condenser area of the power tower facility have been submitted to NFWFL for further evaluation. These bats belong to the Vespertilionidae and Molossidae families, which contain species considered by the Bureau of Land Management to be sensitive species in California. Preliminary evaluation revealed no apparent singing of the hair, and analysis is ongoing.

Solar flux and heat associated with solar power tower facilities

Figure 7 Ivanpah solar power facilities http://ivanpahsolar.com/about

Despite repeated requests, we have been unsuccessful in obtaining technical data relating to the temperature associated with solar flux at the Ivanpah facility. The following summarizes the information we have gathered from other sources.

The Ivanpah solar energy generating facility consists of mirrors that reflect sunlight to a tower. In the tower sits a boiler that generates steam which then powers a turbine.

At the top of a 459 foot tall tower sits a boiler (solar receiver) that is heated by the sun rays reflected by 300,000 mirrors, called solar heliostats. When the concentrated sunlight strikes the boiler tubes, it heats the water to create superheated steam. The high temperature steam is then piped from the boiler to a turbine where electricity is generated (http://ivanpahsolar.com/about visited on 01/20/2014).

If all the solar heliostats are focused on the solar tower the beams multiply the strength of sunlight by 5000 times, and this generates temperatures at the solar tower in excess of 3600° Fahrenheit (> 1982° Celsius). Since steel melts at 2750° Fahrenheit (1510° Celsius), only a percentage of heliostats are focused on the solar receiver so that) the optimal temperature at the tower is approximately 900° Fahrenheit (~482° Celsius) ("How do they do it" Wag TV for Discovery Channel, Season 3, Episode 15, "Design Airplane Parachutes, Create Solar Power, Make Sunglasses" Aired August 25, 2009).

Figure 8: Seville solar power facility (http://inhabitat.com/sevilles-solar-power-tower)

A solar steam plant in Coalinga that also uses heliostat technology for extracting oil is on record stating that the steam generator is set to about 500° Celsius. (http://abclocal.go.com/kDSn/story?section=news%2Fbusiness&id=8377469 Viewed Jan 21, 2013)

Temperatures measured by the authors at the edge of the solar complex on the surface of a heliostat were approximately 200° Fahrenheit (~93° Celsius). Therefore, there is a gradient of temperature from the edge of the solar field to the tower that ranges from 200° to 900° Fahrenheit.

There is a phenomenon that occurs when the heliostats are focused on the tower and electricity is being generated. The phenomenon can be described as either a circle of clouds around the tower or, at times, a cloud formed on the side that is receiving the solar reflection. It appears as though the tower is creating clouds. Currently we propose two hypotheses of why this "cloud" is formed. The first hypothesis is simply the presumption that the high heat associated with towers is condensing the air, and forming the

Figure 9: Tower 1 (bright white) is shown under power. Tower 2 (black) is not operating.

clouds. The second hypothesis is that this phenomenon does not represent clouds at all rather it is a place in space where the heliostats that are not being used to generate heat are focused. Under this scenario, it is a place where the mirrors focus the excess energy not being used to generate electricity.

Ivanpah employees and OLE staff noticed that close to the periphery of the tower and within the reflected solar field area, streams of smoke rise when an object crosses the solar flux fields aimed at the tower. Ivanpah employees used the term "streamers" to characterize this occurrence.

When OLE staff visited the Ivanpah Solar plant, we observed many streamer events. It is claimed that these events represent the combustion of loose debris, or insects. Although some of the events are likely that, there were instances in which the amount of smoke produced by the ignition could only be explained by a larger flammable biomass such as a bird. Indeed OLE staff observed birds entering the solar flux and igniting, consequently becoming a streamer.

OLE staff observed an average of one streamer event every two minutes. It appeared that the streamer events occurred more frequently within the "cloud" area adjacent to the tower. Therefore we hypothesize that the "cloud" has a very high temperature that is igniting all material that traverses its field.
One possible explanation of this this phenomenon is that the "cloud" is a convergent location where heliostats are "parked" when not in use. Conversely it undermines the condensation hypothesis, given that birds flying through condensation clouds will not spontaneously ignite.

Temperatures required to burn feathers

Many of the carcasses recovered from the Ivanpah Solar plant after the plant became operational showed singing of feathers as shown in Figure 10.

Figure 10: Singed feathers from a Northern Rough-winged Swallow

In order to investigate at what temperature feathers burn/singe, we exposed feathers to different air temperatures. Each feather was exposed to a stream of helium and air for 30 seconds. The results indicate that at 400° Celsius (752° Fahrenheit) after 30 seconds the feather begins to degrade. But at 450° and

Figure 11: Results of exposing feathers to different temperatures (in degrees Celsius)

500° Celsius (842° and 932° Fahrenheit respectively) the feathers singed as soon as they made contact with the superheated air (Figure 11). Therefore, when singed birds are found, it can be inferred that the temperatures in the solar flux at the time a bird flew through it was at least 400° Celsius (752° Fahrenheit). This inference is consistent with the desired operating temperature of a power tower solar boiler (482° Celsius).

The fact that a bird will catch on fire as it flies through the solar flux has been confirmed by a Chevron engineer who works at the Coalinga Chevron Steam plant, a joint venture of Chevron and BrightSource Solar. (http://abclocal.go.com/kDSn/story?section=news%2Fbusiness&id=8377469 Viewed Jan 21, 2013)

Conclusions and Recommendations

In summary, three main causes of avian mortality were identified at these facilities; impact trauma, predation and solar flux. Birds at all three types of solar plants were susceptible to impact trauma and predators. Solar flux injury was unique to the power tower facility. Solar facilities, in general, do not appear to attract particular species, rather an ecological variety of birds are vulnerable. That said, certain mortality and species trends were evident, such as waterbirds at Desert Sunlight, where open water sources were present.

Specific hazards were identified, including vertically-oriented mirrors or other smooth reflective panels; water-like reflective or polarizing panels; actively fluxing towers; open bodies of water; aggregations of insects that attracted insectivorous birds; and resident predators. Making towers, ponds and panels less attractive or accessible to birds may mitigate deaths. Specific actions include placing perch-guards on power tower railings near the flux field, properly netting or otherwise covering ponds, tilting heliostat mirrors during washing and suspending power tower operation at peak migration times.

Visual cues should be retrofitted to existing panels and incorporated into new panel design. These cues may include UV-reflective or solid, contrasting bands spaced no further than 28 cm from each other. This arrangement has been shown to significantly reduce the number of passerines hitting expanses of windows on commercial buildings. Spacing of 10 cm eliminates window strikes altogether. Further exploration of panel design and orientation should be undertaken with researchers experienced in the field (Daneil Klem Jr. of Muhlenberg College) to determine causes for the high rate of impact trauma, and designs optimized to reduce these mortalities.

Challenges to data collection included rapid degradation of carcass quality hindering cause of death and species determination; large facilities which are difficult to efficiently search for carcasses; vegetation and panels obscuring ground visibility; carcass loss due to scavenging; and inconsistent documentation of carcass history. Searcher efficiency has been shown to have varying influences on carcass recovery with anywhere from 30% to 90% detection of small birds achieved in studies done at wind plants (Erickson et al., 2005). Scavengers may also remove substantial numbers of carcasses. In studies done on agricultural fields, up to 90% of small bird carcasses were lost within 24 hours (Balcomb, 1986; Wobeser and Wobeser, 1992). OLE staff observed apparently resident ravens at the Ivanpah power tower. Ravens are efficient scavengers, and could remove large numbers of small bird carcasses from the tower vicinity. (Erickson, W. P., G. D. Johnson, and D. P. Young, Jr., 2005, A summary and comparison of bird mortality from anthropogenic causes with an emphasis on collisions: U S Forest Service General Technical Report PSW, v. 191, p. 1029-1042; Balcomb, R., 1986, Songbird carcasses disappear rapidly from agricultural fields: Auk, v. 103, p. 817-820; Wobeser, G., and A. G. Wobeser, 1992, Carcass disappearance and estimation of mortality in a simulated die-off of small birds: Journal of Wildlife Diseases, v. 28, p. 548-554.)

Given these variables it is difficult to know the true scope of avian mortality at these facilities. The numbers of dead birds are likely underrepresented, perhaps vastly so. Observational and statistical studies to account for carcass loss may help us to gain a better sense of how many birds are being killed. Complete histories would help us to identify factors (such as vertical placement of mirrors) leading to mortalities. Continued monitoring is also advised as these facilities transition from construction to full operation. Of especial concern is the Ivanpah facility which was not fully-functioning at the time of the latest carcass submissions. In fact, all but 7 of the carcasses with solar flux injury and reported dates of collection were found at or prior to the USFWS site visit (October 21-24, 2013) and, therefore, represent flux mortality from a facility operating at only 33% capacity. Investigation into bat and insect mortalities at the power tower site should also be pursued.

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Appendix 1. List of all 71 species recovered from the three solar energy sites. In this table, remains of closely related taxa that could not be definitively identified (e.g. Cinnamon/Blue-winged Teal and Black-throated/Sage Sparrow) are assigned to the biogeographically more likely taxon. In all such cases, the possible taxa are ecologically similar. All of these species are MBTA-listed.

SPECIES		Zone	Residency	Sites	MNI
Cinnamon Teal	*Anas cyanoptera*	water	migrant	DS,IV	5
Pied-billed Grebe	*Podilymbus podiceps*	water	migrant	DS	1
Western Grebe	*Aechmorphorus occidentalis*	water	migrant	DS	9
Eared Grebe	*Podiceps nigricollis*	water	migrant	DS,GN	5
Brown Pelican	*Pelecanus occidentalis*	water	migrant	DS	2
Double-crested Cormorant	*Phalacrocorax auritus*	water	migrant	DS	2
Great Blue Heron	*Ardea herodias*	water	migrant	GN	1
Black-crowned Night-Heron	*Nycticorax nycticorax*	water	migrant	DS	1
Cooper's Hawk	*Accipiter cooperii*	air	migrant	IV	1
Red-shouldered Hawk	*Buteo lineatus*	terr	migrant	IV	1
American Kestrel	*Falco sparverius*	air	resident	GN,IV	2
Peregrine Falcon	*Falco peregrinus*	air	resident	IV	1
American Coot	*Fulica americana*	water	migrant	DS, IV	12
Yuma Clapper Rail	*Rallus longirostris yumanensis*	water	resident	DS	1
Sora	*Porzana carolina*	water	migrant	DS,IV	2
American Avocet	*Recurvirostra americana*	water	migrant	DS	1
Spotted Sandpiper	*Actitis maculatus*	water	migrant	IV	2
Ring-billed Gull	*Larus delawarensis*	water	migrant	GN	2
California Gull	*Larus californianus*	water	resident	GN	1
Greater Roadrunner	*Geococcyx californianus*	terr	resident	IV	5
Yellow-billed Cuckoo	*Coccyzus americanus*	terr	migrant	IV	1
Mourning Dove	*Zenaida macroura*	terr	resident	DS, IV	14
White-winged Dove	*Zenaida asiatica*	terr	resident	DS,GN	2
Barn Owl	*Tyto alba*	terr	resident	IV	1
Lesser nighthawk	*Chordeiles acutipennis*	air	resident	DS,GN,IV	7
Common Poorwill	*Phalaenoptilus nuttallii*	air	resident	DS,IV	2
White-throated Swift	*Aeronautes saxatalis*	air	resident	IV	1
Costa's Hummingbird	*Calypte costae*	air	resident	DS	1
Allen's/Rufous Hummingbird	*Selasphorus sp.*	air	migrant	IV	1
Northern Flicker	*Colaptes auratus*	terr	resident	IV	1
Ash-throated Flycatcher	*Myiarchus cinerascens*	air	resident	DS,IV	2
Say's Phoebe	*Sayornis saya*	air	resident	GN	2
Black Phoebe	*Sayornis nigricollis*	air	resident	DS	1
Loggerhead shrike	*Lanius ludovicianus*	terr	resident	DS,IV	5
Warbling Vireo	*Vireo gilvus*	terr	migrant	IV	1
Common Raven	*Corvus corax*	terr	resident	DS,IV	3
Horned Lark	*Eremophila alpestris*	terr	migrant	DS	1
Tree Swallow	*Tachycineta bicolor*	air	migrant	DS,GN,IV	5

SPECIES		Zone	Residency	Sites	MNI
Cliff Swallow	*Petrochelidon pyrrhonota*	air	resident	GN	5
No. Rough-winged Swallow	*Stelgidopteryx serripennis*	air	migrant	IV	2
Verdin	*Auriparus flaviceps*	terr	resident	IV	3
Blue-gray Gnatcatcher	*Polioptila caerulea*	terr	resident	IV	1
Northern Mockingbird	*Mimus polyglottos*	terr	resident	IV	1
American Pipit	*Anthus rubescens*	terr	migrant	IV	4
Orange-crowned Warbler	*Oreothlypis celata*	terr	migrant	IV	1
Lucy's Warbler	*Oreothlypis luciae*	terr	resident	IV	1
Yellow-rumped Warbler	*Setophaga coronata*	air	migrant	IV	14
Black-throated Gray Warbler	*Setophaga nigrescens*	terr	migrant	IV	1
Hermit Warbler	*Setophaga occidentalis*	terr	migrant	GN	1
Townsend's warbler	*Setophaga townsendi*	terr	migrant	DS,IV	4
Yellow Warbler	*Setophaga petechia*	terr	migrant	IV	1
Black-and-white Warbler	*Mniotilta varia*	terr	migrant	IV	1
MacGillivray's Warbler	*Oporornis tolmei*	terr	migrant	IV	1
Wilson's Warbler	*Cardellina pusilla*	terr	migrant	DS,IV	4
Common Yellowthroat	*Geothlypis trichas*	terr	migrant	DS	1
Western Tanager	*Piranga ludoviciana*	terr	migrant	DS,IV	4
Black-headed Grosbeak	*Pheucticus melanocephalus*	terr	migrant	DS,GN	2
Lazuli Bunting	*Passerina caerulea*	terr	migrant	IV	1
Blue Grosbeak	*Passerina caerulea*	terr	resident	IV	1
Green-tailed Towhee	*Pipilo chlorurus*	terr	migrant	IV	1
Brewer's Sparrow	*Spizella breweri*	terr	resident	IV	3
Chipping Sparrow	*Spizella passerina*	terr	resident	GN,IV	4
Black-throated Sparrow	*Amphispiza bilineata*	terr	resident	DS,IV	4
Savannah Sparrow	*Passerculus sandwichensis*	terr	migrant	DS,IV	3
White-crowned Sparrow	*Zonotrichia leucophrys*	terr	migrant	IV	6
Pine Siskin	*Spinus pinus*	terr	migrant	IV	1
House Finch	*Carpodacus mexicanus*	terr	resident	IV	13
Great-tailed Grackle	*Quiscalus mexicanus*	terr	resident	DS,IV	5
Brown-headed Cowbird	*Molothrus ater*	terr	resident	DS,GN,IV	8
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*	terr	migrant	DS	1
Bullock's Oriole	*Icterus bullockii*	terr	resident	GN	2

Species recovered from one site: 47
two sites: 18
three sites: 5

Appendix 2. Species with solar flux burns

Common Name	Scientific name	
Yellow-rumped warbler	*Setophaga coronata*	12
House finch	*Carpodacus mexicanus*	10
Chipping sparrow	*Spizella passerina*	2
Unidentified warbler	*Parulidae*	2
Verdin	*Auriparus flaviceps*	2
Great-tailed grackle	*Quiscalus mexicanus*	2
Lucy’s warbler	*Oreothlypis luciae*	1
Wilson's warbler	*Cardellina pusilla*	1
MacGillivray's warbler	*Oporornis tolmei*	1
Black-throated gray warbler	*Setophaga nigrescens*	1
Townsend's warbler	*Setophaga townsendi*	1
Orange-crowned warbler	*Oreothlypis celata*	1
Blue-gray gnatcatcher	*Polioptila caerulea*	1
Unidentified swallow	*Hirundinidae*	1
Northern rough-winged swallow	*Stelgidopteryx serripennis*	1
Warbling vireo	*Vireo gilvus*	1
Unidentified hummingbird	*Selasphorus sp.*	1
Unidentified passerine	Passeriformes	1
Unidentified finch	*Carpodacus sp.*	1
Lazuli bunting	*Passerina caerulea*	1
Unidentified sparrow	*Spizella species*	1
Unidentified blackbird	*Icteridae*	1
Peregrine falcon	*Falco peregrinus*	1

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EXHIBIT 7

Correction

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Correction for "Solar energy development impacts on land cover change and protected areas," by Rebecca R. Hernandez, Madison K. Hoffacker, Michelle L. Murphy-Mariscal, Grace C. Wu, and Michael F. Allen, which appeared in issue 44, November 3, 2015, of *Proc Natl Acad Sci USA* (112:13579–13584; first published October 19, 2015; 10.1073/pnas.1517656112).

The authors note that on page 13579, right column, first full paragraph, lines 12–16, the following statement published incorrectly: "If up to 500 GW of USSE may be required to meet United States-wide reduction of 80% of 1990 greenhouse gas emissions by 2050, 71,428 km^2 of land may be required (roughly the land area of the state of South Carolina) assuming a capacity factor of 0.20 (an average capacity factor for PV; Table S1)." The statement should instead appear as: "For example, up to 500 GW of USSE may be required to meet United States-wide reduction of 80% of 1990 greenhouse gas emissions by 2050 (33). This requires about 14,285 km^2 of land [roughly the area of the state of Connecticut, (9)], underscoring the possible vast area requirements for energy needs in the United States." Additionally, the authors note ref. 33 was omitted from the published article. The full reference appears below.

9. Hernandez RR, Hoffacker MK, Field CB (2014) Land-use efficiency of big solar. *Environ Sci Technol* 48(2):1315–1323.
33. Mai T, et al. (2012) Exploration of high-penetration renewable electricity futures. *Vol. 1 of Renewable Electricity Futures Study*, eds Hand MM et al. (National Renewable Energy Laboratory, Golden, CO).

www.pnas.org/cgi/doi/10.1073/pnas.1602975113

Solar energy development impacts on land cover change and protected areas

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Edited by B. L. Turner, Arizona State University, Tempe, AZ, and approved September 16, 2015 (received for review September 4, 2015)

Decisions determining the use of land for energy are of exigent concern as land scarcity, the need for ecosystem services, and demands for energy generation have concomitantly increased globally. Utility-scale solar energy (USSE) [i.e., ≥1 megawatt (MW)] development requires large quantities of space and land; however, studies quantifying the effect of USSE on land cover change and protected areas are limited. We assessed siting impacts of >160 USSE installations by technology type [photovoltaic (PV) vs. concentrating solar power (CSP)], area (in square kilometers), and capacity (in MW) within the global solar hot spot of the state of California (United States). Additionally, we used the Carnegie Energy and Environmental Compatibility model, a multiple criteria model, to quantify each installation according to environmental and technical compatibility. Last, we evaluated installations according to their proximity to protected areas, including inventoried roadless areas, endangered and threatened species habitat, and federally protected areas. We found the plurality of USSE (6,995 MW) in California is sited in shrublands and scrublands, comprising 375 km^2 of land cover change. Twenty-eight percent of USSE installations are located in croplands and pastures, comprising 155 km^2 of change. Less than 15% of USSE installations are sited in "Compatible" areas. The majority of "Incompatible" USSE power plants are sited far from existing transmission infrastructure, and all USSE installations average at most 7 and 5 km from protected areas, for PV and CSP, respectively. Where energy, food, and conservation goals intersect, environmental compatibility can be achieved when resource opportunities, constraints, and trade-offs are integrated into siting decisions.

concentrating solar power | conservation | greenhouse gas emissions | land use | photovoltaics

The need to mitigate climate change, safeguard energy security, and increase the sustainability of human activities is prompting the need for a rapid transition from carbon-intensive fuels to renewable energy (1). Among renewable energy systems, solar energy has one of the greatest climate change mitigation potentials with life cycle emissions as low as 14 g CO_2-eq·kW·h^{-1} [compare this to 608 g CO_2-eq·kW·h^{-1} for natural gas (2)]. Solar energy embodies diverse technologies able to capture the sun's thermal energy, such as concentrating solar power (CSP) systems, and photons using photovoltaics (PV). In general, CSP is economically optimal where direct normal irradiance (DNI) is 6 kW·h·m^{-2}·d^{-1} or greater, whereas PV, able to use both diffuse and DNI, is economically optimal where such solar resources are 4 kW·h·m^{-2}·d^{-1} or greater. Solar energy systems are highly modular ranging from small-scale deployments (≤1 MW; e.g., residential rooftop modules, portable battlefield systems, solar water heaters) to centralized, utility-scale solar energy (USSE) installations (≥1 MW) where a large economy of scale can meet greater energy demands. Nonetheless, the diffuse nature of solar energy necessitates that large swaths of space or land be used to collect and concentrate solar energy into forms usable for human consumption, increasing concern over potential adverse impacts on natural ecosystems, their services, and biodiversity therein (2–5).

Given the wide range of siting options for USSE projects, maximizing land use efficiency and minimizing land cover change is a growing environmental challenge (6–8). Land use efficiency describes how much power or energy a system generates by area (e.g., watts per square meter, watt-hours per square meter, respectively). For example, USSE installations have an average land use efficiency of 35 W·m^{-2} based on nameplate capacity under ideal conditions (9). The ratio of the realized generation of an installation to maximum generation under ideal conditions over a period is the capacity factor. Using these two terms, we can quantify land requirements for USSE at larger spatial scales. If up to 500 GW of USSE may be required to meet United States-wide reduction of 80% of 1990 greenhouse gas emissions by 2050, 71,428 km^2 of land may be required (roughly the land area of the state of South Carolina) assuming a capacity factor of 0.20 (an average capacity factor for PV; Table S1). This underscores the possible vast area requirements for meeting energy needs in the United States and elsewhere. Increasing the land use efficiency of each installation—e.g., decreasing space between rows of PV modules or CSP mirrors—and prudent siting decisions that incorporate the weighting of environmental trade-offs and synergies can reduce land cover change impacts broadly (10).

Land cover change owing to solar energy has received increasing attention over concerns related to conflicts with biodiversity goals (2–4) and greenhouse gas emissions, which are released when

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Significance

Decisions humans make about how much land to use, where, and for what end use, can inform innovation and policies directing sustainable pathways of land use for energy. Using the state of California (United States) as a model system, our study shows that the majority of utility-scale solar energy (USSE) installations are sited in natural environments, namely shrublands and scrublands, and agricultural land cover types, and near (<10 km) protected areas. "Compatible" (≤15%) USSE installations are sited in developed areas, whereas "Incompatible" installations (19%) are classified as such owing to, predominantly, lengthier distances to existing transmission. Our results suggest a dynamic landscape where land for energy, food, and conservation goals overlap and where environmental cobenefit opportunities should be explored.

Author contributions: R.R.H. designed research; R.R.H. and M.K.H. performed research; R.R.H. and M.K.H. contributed new reagents/analytic tools; R.R.H. and M.K.H. analyzed data; and R.R.H., M.K.H., M.L.M.-M., G.C.W., and M.F.A. wrote the paper.

The authors declare no conflict of interest.

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biomass, including soil, is disturbed or removed during the lifetime of a power plant (11, 12). Siting USSE installations in places already impacted by humans (e.g., parking lots, rooftops) reduces the likelihood that adverse environmental impacts will occur and can exceed generation demands for renewable energy goals in places with moderate- to high-quality solar resources (8, 10, 13), including California. When sites within the built environment are inaccessible, siting that minimizes land use and land cover change within areas acting as carbon sinks, avoids extirpation of biodiversity, and does not obstruct the flow of ecosystem services to residents, firms, and communities, can serve to mitigate adverse environmental impacts (2, 3, 9, 10, 14, 15). Siting within the built environment also reduces the need for complex decision making dictating the use of land for food or energy (16).

Recent studies have underscored the role that proximity of threats to protected areas plays in meeting conservation goals (16–20). Protected areas may preclude habitat loss within boundaries; however, a prevailing cause of degradation within protected areas is land use and land cover change in surrounding areas. Specifically, protected areas are effective when land use nearby does not obstruct corridor use, dispersion capabilities, nor facilitate invasions of nonnative species through habitat loss, fragmentation, and isolation—including those caused by renewable energy development. Quantifying both internal and external threats is necessary for assessing vulnerability of individual protected areas to conversion and landscape sustainability overall. Siting decisions can be optimized with decision support tools (10, 14) that differentiate areas where direct (e.g., land cover change) and proximate effects (e.g., habitat fragmentation) are lowest on the landscape.

Several studies have made predictions regarding which specific land cover types may be impacted by solar energy development (7, 21); however, few studies have evaluated actual siting decisions and their potential or realized impact on land cover change (9, 11). In this study, our objectives were to (*i*) evaluate potential land cover change owing to development of utility-scale PV and CSP within the state of California (United States) and describe relationships among land cover type and the number of installations, capacity, and technology type of USSE; (*ii*) use the decision support tool, the Carnegie Energy and Environmental Compatibility (CEEC) model (10), to develop a three-tiered spatial environmental and technical compatibility index (hereafter called Compatibility Index; "Compatible," "Potentially Compatible," and "Incompatible") for California that identifies environmentally low-conflict areas using resource constraints and opportunities; and (*iii*) compare utility-scale PV and CSP installation locations with the Compatibility Index and their proximity to protected areas to quantify solar energy development decisions and their impact on land cover change (see *Supporting Information* for details).

We selected the state of California as a model system owing to its relatively early, rapid, and ambitious deployment of solar energy systems, 400,000 km^2 of land area (greater than Germany and 188 other countries), large human population and energy demands, diverse ecosystems comprising 90% of the California Floristic Province biodiversity hot spot, and its long-standing use in elucidating the interrelationship between land and energy (9, 10, 22, 23).

Results

We identified 161 planned, under construction, and operating USSE installations throughout 10 land cover types (Figs. 1 and 2) among 16 total in the state of California (Table S2). Broadly, PV installations are concentrated particularly in the Central Valley and the interior of southern California, whereas CSP power plants are sited exclusively in inland southern California (Figs. 1 and 2). For all technology types, the plurality of capacity (6,995 MW) is found in shrubland and scrubland land cover type, necessitating 375 km^2 of land (Table 1). This area is approximately two times greater than USSE development occurring within cultivated croplands, representing 4,103 MW of capacity within 118 km^2. Over 2,000 MW of existing or proposed USSE capacity is sited within the built environment, particularly within relatively lower density areas.

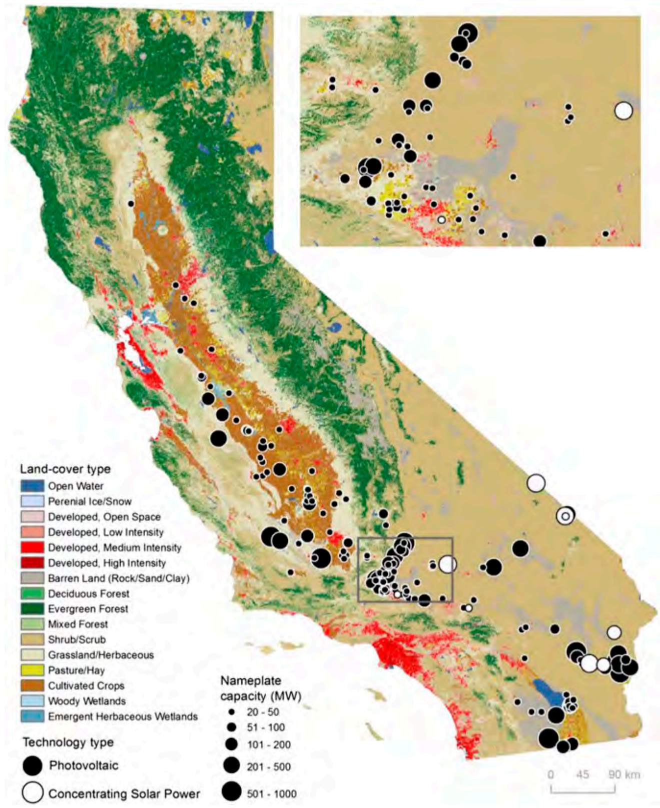

Fig. 1. Map showing land cover types across California and the size and location of USSE installations.

PV power plants are found in 10 land cover types; the plurality of capacity is sited within shrubland/scrublands (6,251 MW; Table 1), representing 26.0% of all PV installations (Fig. 2). Capacity for utility-scale PV installations is also represented within cultivated croplands (3,823 MW), barren land (2,102 MW), developed (2,039 MW), and grassland/herbaceous (1,483 MW) land cover types. Within the developed land cover types, open space is most used (1,205 MW) for utility-scale PV capacity. For CSP, 1,000 MW are located within 34 km^2 of barren land land cover types, and conjointly within shrubland/scrublands (744 MW, 32 km^2).

Using the decision support tool, CEEC (Fig. 3), we identified 22,028 and 77,761 km^2 of Compatible and Potentially Compatible area, respectively, in California for developing PV (Fig. S1). Generation-based potential within Compatible areas—comprising 5.4% of California's area—is 8,565 TW·h·y^{-1} for fixed-tilt modules and up to 11,744 TW·h·y^{-1} for dual-axis modules. For CSP technologies, we found 6,274 and 33,489 km^2 of Compatible and Potentially Compatible area. Generation-based potential for CSP within Compatible areas—comprising 1.5% of California's area—is 5,947 TW·h·y^{-1}.

USSE installations vary in the environmental compatibility of their actual or proposed site (Fig. 4 *A* and *B*). The majority (71.7%) of PV USSE installations are in Potentially Compatible areas, whereas 11.2% are located in Compatible areas. PV installations classified as Incompatible are due to distances from existing transmission infrastructure exceeding 10 km (45.9%), slope exceeding the recommended threshold (41.9%), and to a

Table 1. USSE installations and land cover type

Land cover type	Nameplate capacity, MWdc				Area, km^2			
	PV	%	CSP	%	PV	%	CSP	%
Barren land (rock/sand/clay)	2,102	12	**1,000**	**48**	77	11	**34**	**45**
Cultivated crops	3,823	22	280	14	110	15	8	11
Developed (all)	2,039	12	50	2	70	10	1	1
Developed, high intensity	50	0	0	0	1	0	0	0
Developed, medium intensity	624	4	0	0	17	2	0	0
Developed, low intensity	160	1	0	0	9	1	0	0
Developed, open space	1,205	7	50	2	43	6	1	1
Emergent herbaceous wetlands	60	0	0	0	1	0	0	0
Grass/herbaceous	1,483	9	0	0	72	10	0	0
Pasture/hay	1,397	8	0	0	37	5	0	0
Shrubland/scrubland	**6,251**	**36**	744	36	**343**	**48**	32	43

The nameplate capacity [in megawatts (MWdc)], footprint (in square kilometers), and number of photovoltaic (PV) and concentrating solar power (CSP) USSE installations (>20 MW) in California (in planning, under construction, operating) by land cover type. Bold data represent the greatest value among all land cover types.

lesser degree, owing to development on endangered and threatened species habitat (9.7%) and federally preserved land (3.2%; Fig. 4 *A* and *B*). For CSP installations, 55.5% are located in either Compatible or Potentially Compatible areas. Siting incompatibilities for CSP were either due to slope (25.0%) or distance from transmission lines (75.0%). PV and CSP installations on Compatible areas range in capacity between 20 and 200 MW, and are located within the Central Valley and inland southern California regions, excepting one PV facility in Yolo County (Fig. 4*A*). PV facilities on Incompatible land are found throughout all of California and, excepting one facility (250 MW; San Luis Obispo County), are 200 MW in capacity or less.

PV and CSP USSE installations average 7.2 ± 0.9 and 5.3 ± 2.3 km, respectively, from the closest protected area (Fig. 5). Federally protected areas are the nearest protected area type (7.8 ± 1.0) to land use and land cover change for PV development, whereas both endangered and threatened species habitat (5.7 ± 2.4) and federally protected areas (5.3 ± 2.3) are nearest for CSP development. Of PV installations, 73.7% were less than 10 km and 47.4% were less than 5 km away from the nearest protected area. Of CSP installations, 90.0% were less than 10 km away and 60.0% were less than 5 km away from the nearest protected area.

Discussion

Evaluation of siting decisions for USSE is increasingly relevant in a world of mounting land scarcity and in which siting decisions are as diverse as their deployment worldwide. For example, China has emphasized utility-scale, ground-mounted PV and residential, small-scale solar water heating installations (24), whereas Germany is notable for achieving up to 90% development within the built environment (25). In California, a large portion of USSE installations is sited far from existing transmission infrastructure. New transmission extensions are expensive, difficult to site due to social and environmental concerns, and require many years of planning and construction. Such transmission-related siting incompatibilities not only necessitate additional land cover change but also stand in the way of cost-efficient and rapid renewable energy deployment.

Environmental regulations and laws, which vary drastically from one administrative area to the next, may also cause incongruities in siting decisions. Inherent ambiguities of such policies allows for further inconsistencies. A study in southern Italy (11) found that two-thirds of authorizations for USSE were within environmentally "unsuitable" areas as defined by municipal and international criteria (e.g., United Nations Educational, Scientific and Cultural Organization sites), with adverse implications for land cover change-related CO_2 emissions. Studies (7, 21) including our own reveal that regulations and policies to date have deemphasized USSE development in California, the United States, and North America, respectively, within the built environment and near population centers in favor of development within shrublands and scrublands. California's shrublands and scrublands comprise, in part, the California Floristic Province, a biodiversity hot spot known for high levels of species richness and endemism and where 70% or more of the original extent of vegetation has been lost due to global environmental change-type threats, including land cover change (26, 27). In biologically rich areas like this, land cover change has the potential to greatly impact ecological value and function. Globally, the extent of shrubland and scrubland is vast; therefore, in areas where biodiversity is low, goods and services of shrublands may include diverse recreational opportunities, culturally and historically significant landscapes, movement corridors for wildlife, groundwater as a drinking source, and carbon (sequestration), which may also be adversely impacted by land cover conversion (28).

Proximity impacts result from the fragmentation and degradation of land near and between protected areas, reducing ecological flows of energy, organisms, and goods (16–20). In a study of 57

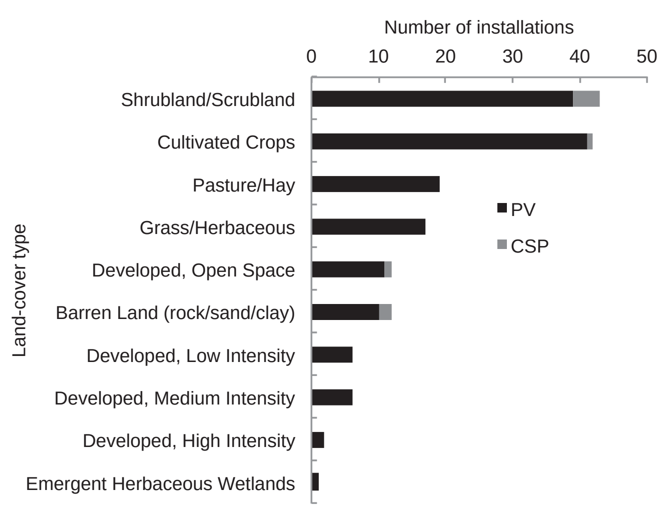

Fig. 2. Number of photovoltaic (PV) and concentrating solar power (CSP) installations (planned, under construction, operating) by land cover type in California; represented in order of most installations to least for both technologies.

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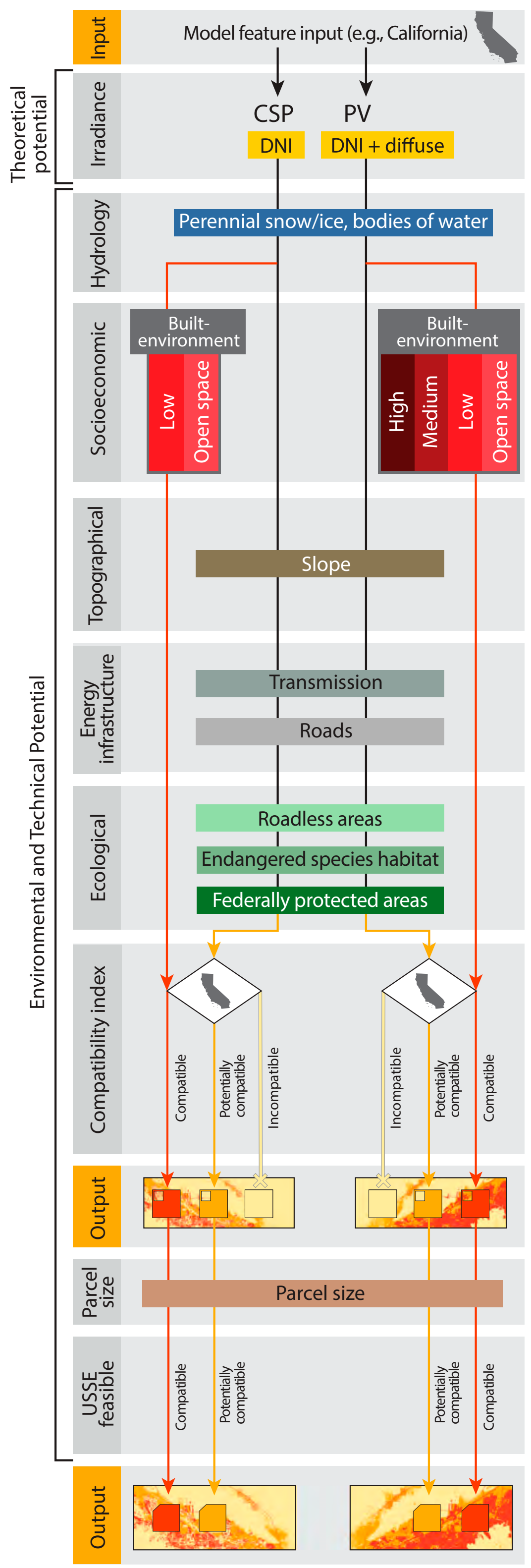

Fig. 3. Workflow of the Carnegie Energy and Environmental Compatibility (CEEC) model, a decision support tool, showing model inputs (resource opportunities and constraints), Environmental and Technical Compatibility Index, and model outputs.

US protected areas, Hansen et al. (16) found such zones extended an average of 18 times (in area) beyond the park area (e.g., Mojave National Preserve, three times protected area, i.e., ~30 km radially beyond preserve boundary). Additionally, Hamilton et al. (17) used distances of 5, 25, and 75 km from all US protected area boundaries to represent three spatial scales (i.e., buffers) of proximity impacts owing to US land cover and land use change. Last, the US Fish and Wildlife Service's Partners for Fish and Wildlife Program, seeks to reduce adverse proximity impacts by augmenting protected areas with private land restoration, targeting land within a maximum distance of 75 km from existing protected areas. Thus, our results confirm USSE development in California engenders important proximity impacts, for example, encompassing all three spatial scales from Hamilton et al. (17) and decreasing land available for US Fish and Wildlife Service partner restoration programs.

Industrial sectors—including energy and agriculture—are increasingly responsible for decisions affecting biodiversity. Concomitantly, target-driven conservation planning metrics (e.g., percentage of remaining extant habitat does not fall below 40%), geospatial products (e.g., decision support tools), and the monetization of carbon and ecosystem services are increasing and may be effective in compensating for the lack of target-driven regulation observed in policy (29).

Last, development decisions may overlook environmental resources unprotected by policies but valued by interest groups [e.g., important bird areas, essential connectivity areas, vulnerability of caliche (i.e., mineralized carbon) in desert soils, biodiversity hot spots, percent habitat loss]. Several elements of the environment providing ecosystem services that humans depend upon remain widely unprotected by laws and regulations and vastly understudied. By integrating land conservation value earlier in the electricity procurement and planning process, preemptive transmission upgrades or expansions to low-impact regions could improve the incentive to develop in designated zones, avoiding future incompatible development. However, zones themselves must also be carefully designated. The landscape-scale Desert Renewable Energy Conservation Plan initially provided a siting framework—including incidental take authorizations of endangered and threatened species—for streamlining solar energy development within the 91,000 km^2 of mostly desert habitat in public and private lands and designated as the Development Focus Area (DFA). After accounting for unprotected environmental attributes like biodiversity, Cameron et al. (14) identified ~7,400 km^2 of relatively low-value conservation land within the Mojave Desert Ecoregion (United States) that can meet California's 33% renewable portfolio standard for electricity sales seven times over. Since this publication, the Desert Renewable Energy Conservation Plan's DFA has now been restricted to only public lands, which some argue to be more intact, and to the ire of certain local interest groups and government agencies. Hernandez et al. (10) developed a satellite-based decision support tool, the CEEC model, that showed that generation-based technical potential of PV and CSP within the built environment could meet California's total energy demand 4.8 and 2.7 times over, respectively. Development decisions may also overlook synergistic environmental cobenefit opportunities. Environmental cobenefit opportunities include the utilization of degraded or contaminated lands, colocation of solar and agriculture, hybrid power systems, and building-integrated PV (2).

This study found that nearly 30% of all USSE installations are sited in croplands and pastures; signifying perhaps an increasing affinity for using agricultural lands for renewable energy, specifically within the Central Valley of California, renowned for agricultural productivity globally. The growing demand for food, affordable housing, water, and electricity puts considerable pressure on available land resources, making recent land use decisions in this region a noteworthy case study for understanding the food–energy–water nexus that should be explored. Opportunities to minimize land use change include colocating renewable energy systems with food production and converting degraded and salt-contaminated lands, unsuitable for agriculture, to sites for

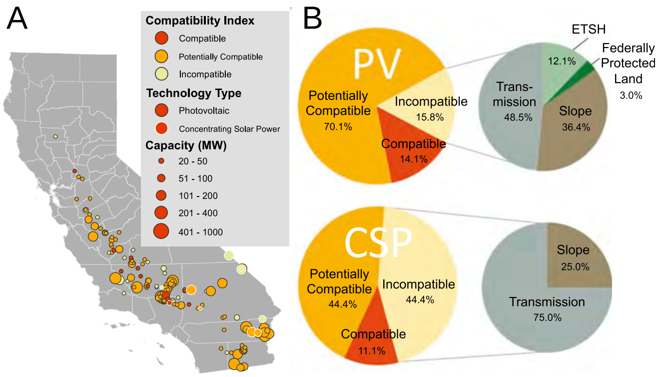

Fig. 4. (*A*) Map of California showing utility-scale solar energy (USSE) (planned, under construction, operating) installations' compatibility by technology [i.e., photovoltaic (PV), concentrating solar power (CSP)], site, and capacity (in megawatts). (*B*) Percentage of USSE installations sited in Compatible, Potentially Compatible, and Incompatible areas. For USSE installations in incompatible sites, we provide the percentage of each incompatibility type.

renewable energy production. Using unoccupied spaces such as adjacent to and on top of barns, parking lots, and distribution centers in agricultural areas is another win–win scenario. In sub-Saharan Africa, integrating solar energy into a drip irrigation system has enhanced food security by conserving water, enhancing reliability of power, and conserving land and space (30). As the development of renewable energy and the production of food are expected to grow, so will the need to understand and evaluate their interactions with the land supporting this expansion in other landscapes.

Conclusion

A growing body of studies underscores the vast potential of solar energy development in places that minimize adverse environmental impacts and confer environmental cobenefits (2, 10, 14, 15, 21). Our study of California reveals that USSE development is a source of land cover change and, based on its proximity to protected areas, may exacerbate habitat fragmentation resulting in direct and indirect ecological consequences. These impacts may include increased isolation and nonnative species invasions, and compromised movement potential of species tracking habitat shifts in response to environmental disturbances, such as climate change. Furthermore, we have shown that USSE development within California comprises siting decisions that lead to the alteration of natural ecosystems within and close to protected areas in lieu of land already impacted by humans (7, 21). Land use policies and electricity planning that emphasizes the use of human-impacted places, complies with existing environmental regulations at the federal, state, and municipal level, and considers environmental concerns over local resource constraints and opportunities, including those of communities, firms, and residents, may prove an effective approach for avoiding deleterious land cover change. Empirical analyses using decision support tools, like CEEC, can help guide development practices toward greater environmental compatibility through improved understanding of the impacts of policy and regulatory processes to date.

Methods

To achieve our objectives, we (*i*) created a multiinstitution dataset of 161 USSE installations in the state of California and compared these data to land cover data; (*ii*) developed a spatial Compatibility Index (i.e., Compatible, Potentially Compatible, and Incompatible) for California using the CEEC model that identifies environmentally low-conflict areas for development, integrating environmental and technical resource constraints and opportunities; (*iii*) compared USSE installation locations with the Compatibility Index to enumerate the number of installations sited within each area type; and (*iv*) compared USSE installation locations with their proximity to protected areas, including Inventoried Roadless Areas, Endangered and Threatened Species Habitat, and Federally Protected Areas (*Supporting Information*). All analyses were conducted using ArcGIS (10.x) and R (R: A Language and Environment for Statistical Computing).

To evaluate land cover change owing to USSE development, we collected data on PV and CSP USSE installations in California that vary in development stage (i.e., planned, under construction, operating) and range in nameplate capacity, selecting a subset of all USSE that range from 20 to 873 MW, 20 MW being a legislative capacity threshold for transmission connection affecting development action. Data for each installation included nameplate capacity under standard test conditions (in megawatts), land footprint (in square kilometers), technology type, and point location (latitude, longitude). Data were collected exclusively from official government documents and records (see *Supporting Information* for details). We define the land footprint as the area directly affected during the construction, operation, and decommissioning phases of the entire power plant facility, excluding existing transmission corridors, land needed for raw material acquisition, and land for generation of energy required for manufacturing. Installations that did not meet data quality criteria (e.g., lacking exact location) were excluded, resulting in a total of 161 USSE installations (see *Supporting Information* for details). Data were collected beginning in 2010 and updated until May 2014. Installations in our dataset vary in their development stage and therefore include installations that may change in attribute or may never reach full operation. Given that we are interested in decisions regarding siting, we included siting data for planned installations, despite their potential uncertainty, as these reflect the most current siting practices that may not be fully represented in decisions for installations that are already under construction or operating.

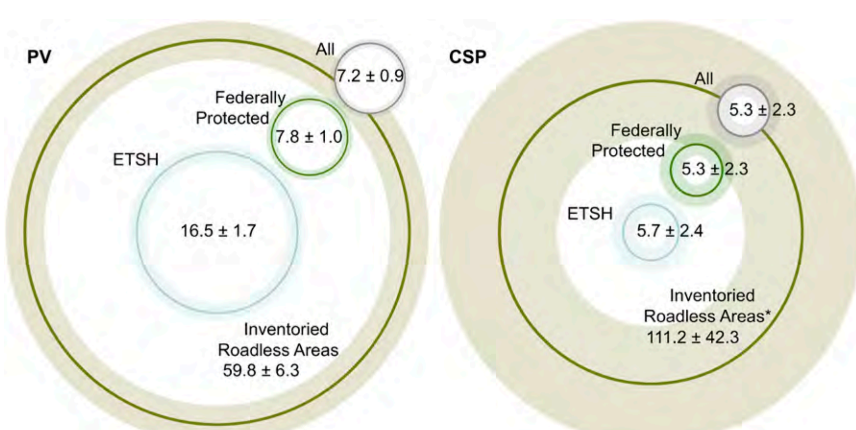

Fig. 5. Proximity of PV and CSP USSE installations to Endangered and Threatened Species Habitat, Federally Protected Areas, Inventoried Roadless Areas, and the closest for all protected area types. Circles are to scale, relatively (with the exception of Inventoried Roadless Areas for CSP), showing 95% confidence intervals (shaded area).

To evaluate land cover change by USSE development, we compared the point location of each USSE power plant from our dataset (by their latitude and longitude) to the land cover type according to the National Land Cover Dataset (NLCD) (30-m resolution) and allocated the reported total footprint of the installation as land cover change within this land cover type. All 16 land cover types, as described by the NLCD, are represented in California, including developed areas within the built environment (Table S3). Developed areas are further classified according to imperviousness of surfaces: open-space developed (<20% disturbed surface cover; e.g., large-lot single-family housing units, golf courses, parks), low-intensity developed (20–49% disturbed cover), medium-intensity developed (50–79% disturbed cover), and high-intensity developed (80–100% disturbed cover; e.g., apartment complexes, row houses, commercial and industrial facilities).

The CEEC model (10) is a decision support tool used to calculate the technical potential of solar electricity generation and characterize site suitability by incorporating user-specified resource opportunities and constraints (Fig. 3 and Tables S2–S5). The CEEC model uses the National Renewable Energy Laboratory's satellite-based diffuse/direct normal radiation and direct normal radiation models, which estimate average daily insolation (in kilowatt-hours per square meter per day) over 0.1° surface cells (~10 km in size), to identify areas with annual average solar resources adequate for PV ($\geq$4 $kW{\cdot}h{\cdot}m^{-2}{\cdot}d^{-1}$) and CSP ($\geq$6 $kW{\cdot}h{\cdot}m^{-2}{\cdot}d^{-1}$) technologies, respectively (Table S1).

Among these areas, bodies of open water and perennial ice and snow were excluded as potential sites. We indexed the resulting area for solar energy infrastructure—independently for PV and CSP—as follows: Compatible, Potentially Compatible, and Incompatible (*Supporting Information*). Because solar energy potential within California's developed areas can meet the state's current energy consumptive demand 2.7 times over, decrease or eliminate land cover change, and reduce environmental impacts (10), we defined all four developed land cover classes as Compatible, excepting CSP in high and medium intensity as, to date, CSP technologies have not been deployed there owing to the relatively lower modularity of CSP.

Potentially Compatible areas augment site selections beyond Compatible areas. As slopes of 3% and 5% or less are most suitable for CSP and PV installations, respectively—owing to reduced costs and impact associated with surface grading—we used the National Elevation Dataset (varies from 3- to 30-m resolution; US Geological Survey) to exclude areas without these criteria. To minimize costs and impacts linked to new construction activities and materials, Potentially Compatible areas were also restricted to areas within 10 and 5 km of transmission lines (California Energy Commission) and roads (TIGER), respectively (*Supporting Information*, Fig. 3, and Table S4). We excluded areas where road construction is prohibited ("Federal Roadless Areas"; US Department of Forest and Agriculture), critical habitat of threatened and endangered species (US Fish and Wildlife Service), and federally protected areas (i.e., GAP Statuses 1 and 2, Protected Areas Database of the United States, US Geological Survey; Table S1). We reported generation-based potential for PV and CSP at the utility-scale, i.e., within areas identified as Compatible and Potentially Compatible and within areas meeting a minimum parcel size as needed for a 1-MW installation. Incompatible areas are not classified as Compatible and Potentially Compatible areas. To quantify impacts of solar energy development decisions, we spatially characterized the number, capacity, technology type, and footprint of USSE power plants dataset within the Compatibility Index and analyzed the reasons for incompatibility.

To quantify impact of proximity to protected areas from USSE development, we calculated the distance between each USSE facility data point (by technology type) to the nearest protected area by type (i.e., inventoried roadless areas, critical habitat of threatened and endangered species, and federally protected areas) using the "Near (Analysis)" in ArcGIS, and subsequently calculated the average of all distances (by protected area type) and 95% confidence intervals. For "all" protected area types, we used the shortest distance between each USSE facility data point and the three protected area types, and subsequently calculated the average of these shortest distances and 95% confidence intervals.

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EXHIBIT 8

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Article

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Land-Sparing Opportunities for Solar Energy Development in Agricultural Landscapes: A Case Study of the Great Central Valley, CA, United States

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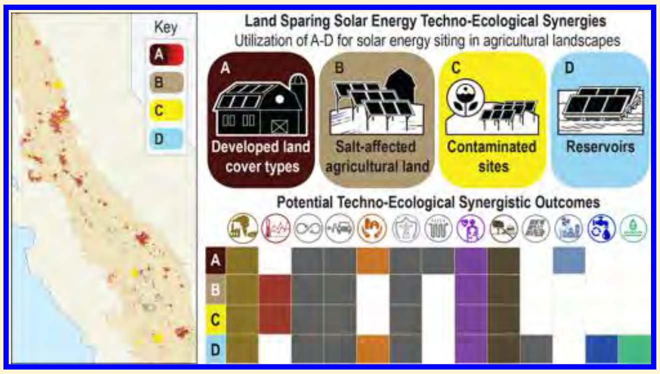
S *Supporting Information*



ABSTRACT: Land-cover change from energy development, including solar energy, presents trade-offs for land used for the production of food and the conservation of ecosystems. Solar energy plays a critical role in contributing to the alternative energy mix to mitigate climate change and meet policy milestones; however, the extent that solar energy development on nonconventional surfaces can mitigate land scarcity is understudied. Here, we evaluate the land sparing potential of solar energy development across four nonconventional land-cover types: the built environment, salt-affected land, contaminated land, and water reservoirs (as floatovoltaics), within the Great Central Valley (CV, CA), a globally significant agricultural region where land for food production, urban development, and conservation collide. Furthermore, we calculate the technical potential (TWh year^{-1}) of these land sparing sites and test the degree to which projected electricity needs for the state of California can be met therein. In total, the CV encompasses 15% of CA, 8415 km^2 of which was identified as potentially land-sparing for solar energy development. These areas comprise a capacity-based energy potential of at least 17 348 TWh year^{-1} for photovoltaic (PV) and 2213 TWh year^{-1} for concentrating solar power (CSP). Accounting for technology efficiencies, this exceeds California's 2025 projected electricity demands up to 13 and 2 times for PV and CSP, respectively. Our study underscores the potential of strategic renewable energy siting to mitigate environmental trade-offs typically coupled with energy sprawl in agricultural landscapes.

■ INTRODUCTION

In the 21st century, agricultural landscapes are a complex nexus in which land, energy, and water are increasingly limited and interconnected.[1−4] Food production is intrinsically dependent on the diminishing supply of fresh water and viable land.[5,6] The pumping of water for irrigation, dependent on declining aquifers,[7] and other agricultural activities necessitates vast amounts of energy.[8] In the United States, the most agriculturally productive country globally, expenses related to energy (e.g., fertilizer production and equipment manufacture and use) are one of the primary limitations of food production, while U.S. dependency on foreign energy imports imposes additional limitations.[4] Additionally, organic emissions and those from carbon-intensive energy sources pose serious health and environmental risks to farming communities and geographically nested urban population centers.[9−12] In response to such limitations and risks,[4] solar energy is increasingly adopted by farmers and other agricultural stakeholders in ways that may spare land (e.g., building integrated photovoltaics [PVs]) for food and fiber production or, conversely, place additional pressure on arable land by displacing such land for energy production.[13,14]

Unlike conventional energy sources, solar energy can be integrated into pre-existing agricultural infrastructure and under-utilized spaces without adversely affecting commodity production or space required for such activities (e.g., edges of fields, corners of center pivot irrigation fields, and barn rooftops).[13,15,16] Farms require energy to support machinery, electric fencing, pumping and water filtration for irrigation,

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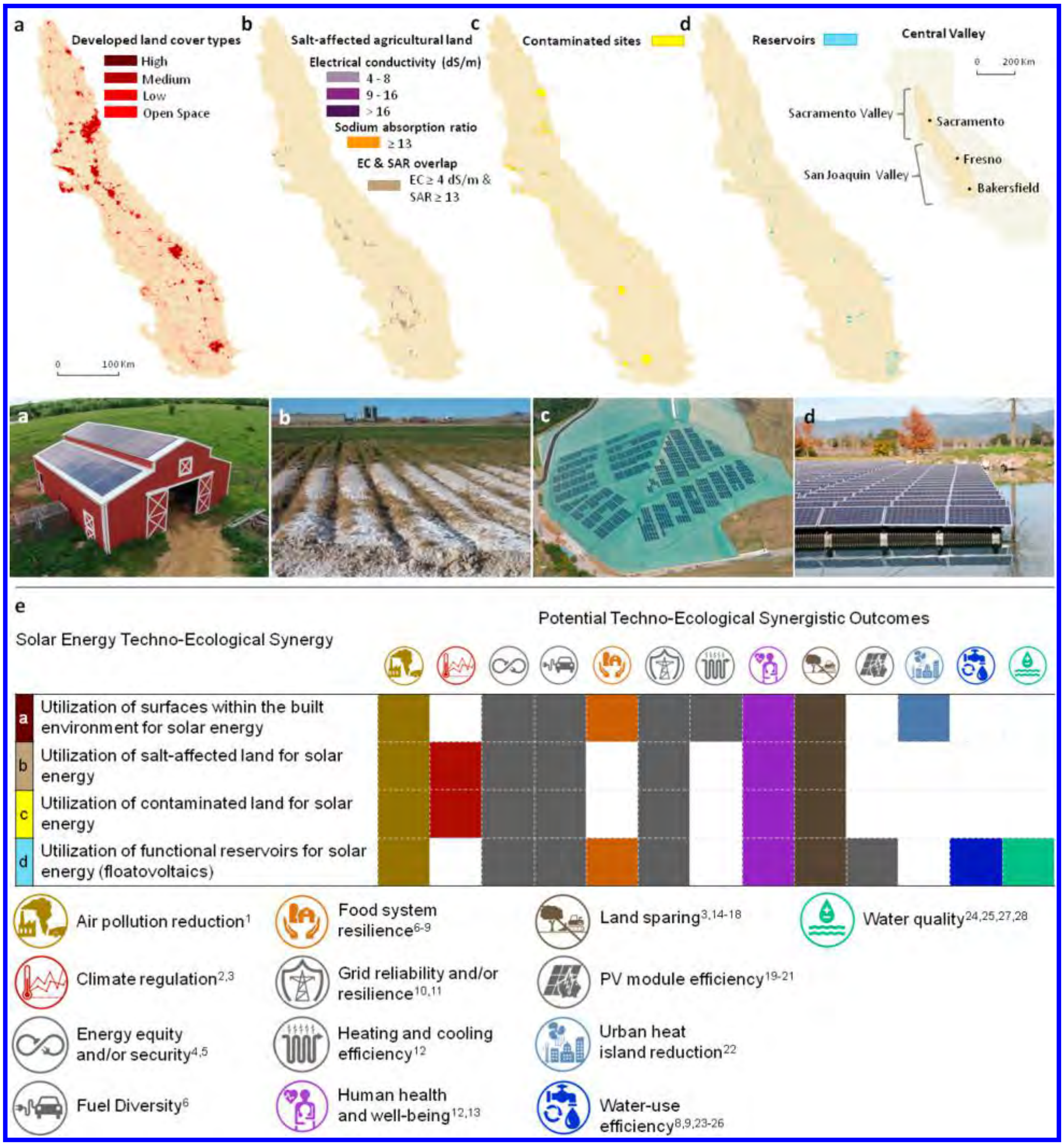

Figure 1. Land sparing solar energy siting opportunities within a 21st century agricultural landscape, i.e., California's Central Valley including within and over (a) the built environment, (b) salt-affected soils, (c) contaminated land, and (d) reservoirs. Contaminated sites are shown accurately according to their actual area but not shape. We posit that these land-sparing siting opportunities for solar energy development may also function individually (e) as a techno-ecological synergy (TES), a framework for engineering mutually beneficial relationships between technological and ecological systems that engender both techno-centric outcomes (gray icons) as well as support for sustainable flows of ecosystem goods and services (colored icons). Numbers refer to citations that provide justification for all potential techno-ecological synergistic outcomes. Larger versions of the map images are available in Figure S4. Photograph credit from left to right: (a) Cromwell Solar in Lawrence, Kansas by Aron Cromwell; (b) Donald Suarez, USDA Salinity Laboratory; (c) Carlisle Energy; (d) Far Niente Winery. All photographs are used with permission. Maps were made using ESRI ArcGIS Desktop (version 10.4) software.

drying and storing crops, lighting, powering heaters, and cooling livestock farmhouses. Previous studies have shown that on-farm solar schemes can provide farmers with reduced electricity pricing while requiring minimal water inputs (relative to other energy sources), thereby improving overall food availability and affordability.[2,13,14]

However, when large solar industrial complexes are developed on natural or prime agricultural lands, nontrivial land-use and land-cover change (LULCC) may result.[17−19] In California, Hernandez et al. (2015) found 110 km^2 of cultivated cropland and 37 km^2 of pasture was converted into use for ground-mounted utility-scale solar energy (USSE, ≥ 1 megawatt [MW]). In the municipality of Leece, Italy; De

Marco et al. (2014) found that 51% of solar energy installations greater than 20 kW in capacity (n = 42) are sited in unsuitable areas, notably natural and agricultural areas, including century-old olive grooves.[19] Reversion of a site used for solar energy generation back to agriculture is typically unlikely, complicated by long-term application of herbicides, stabilizers, gravel, chemical suppressants, and soil compaction from power plant construction and maintenance activities. Further, land lease agreements and payback periods often exceed 15 years.[20]

The sustainability of energy, food, and water resources and the preservation of natural ecosystems are determined, in part, by how efficiently humans utilize land.[21] While most research has focused on the negative environmental impacts of ground-mounted USSE installations,[17,22] there is increasing attention on the design and enterprise of solar energy that produce both technological outcomes favorable for humans (e.g., energy security and fuel diversity) and benefits supporting ecosystem goods and services, including land sparing.[23] In this study, we define land sparing as siting decisions for solar energy infrastructure that obviate the need for LULCC that may have otherwise occurred within prime agricultural land and natural environments, respectively, including intermediates between these land-cover types. We posit that this framework, known techno-ecological synergy (TES), proposed by Bakshi et al. (2015),[24] and other studies suggest that several potential techno-ecological outcomes may be concomitantly achieved when nonconventional surfaces within agricultural landscapes are used for siting solar energy. Specifically, the utilization of geographically nested (1) urban population centers, i.e., the built environment (i.e., developed areas characterized by impermeable surfaces and human occupation), (2) land with salt-affected soils, (3) contaminated land, and (4) reservoirs may serve as recipient environments for solar energy infrastructure. These sites may also confer techno-ecological outcomes necessary for meeting sustainability goals in landscapes characterized by complex, coupled human and natural systems, such as those within agricultural landscapes. We explore these potential techno-ecological outcomes first, emphasizing the critical role these recipient environments may play in land sparing, which is the focus of our analysis (Figure 1).

Built Environments for Synergistic Solar Energy Development. Modern agricultural landscapes span 40% of Earth's surface[25] and are characterized by complex, heterogeneous mosaics in which natural, agricultural, and built-up elements, infrastructure, and policies intersect.[19,26,27] Areas characterized as the built environment within agricultural landscapes have considerable potential to accommodate solar energy development: a TES that may spare land for agricultural production and conservation locally,[17,21,28] reduce urban heat island effects,[29] and enhance human health and well-being, energy efficiency, and cost savings to consumers[30] (Figure 1). In the state of California (CA), installing small solar energy technology and USSE, including photovoltaic (PV) and concentrating solar power (CSP) technologies, throughout the built environment could meet the state's projected 2020 energy needs 3 to 5 times over.[17] Integrated PV (e.g., on rooftops, vertical walls, and over parking lots) has the lowest land footprint relative to all other energy sources (0 ha [ha]/TWh/year), incurring no LULCC, thus making developed areas environmentally optimal for PV systems. Additionally, solar panels within urban areas may lower local temperatures from increased surface albedo.[29] Integrating solar energy installations within such human-dominated environments generates cost savings directly from generation but also precludes energy losses from transmission and additional construction (e.g., grading, roads, and transmission) and raw material needs (e.g., grid connections, office facilities, and concrete) required for displacive ground-mounted USSE systems. For example, innovative ways of integrating PV technology, such as panels on or alongside transportation corridors (e.g., solar road panels[31] and photovoltaic noise barriers) and clear modules replacing windows will only increase its appeal within the built environment.[15,16,32,33]

Salt-Affected Lands for Synergistic Solar Energy Development. Naturally occurring high concentrations of salt (saline soils; Ca^{2+}, Mg^{2+}, Na^{+}, K^{+}, Cl^{-}, $SO_4{}^{2-}$, and $HCO_3{}^{-}$) or sodium (sodic soils; Na^{+}, Ca^{2+}, Mg^{2+}, Na^{+}, K^{+}, $HCO_3{}^{-}$, $CO_3{}^{-}$, Cl^{-}, and $SO_4{}^{2-}$) combined with poor irrigation and farming practices can lead to dramatic losses in crop yield and, in severe cases, the cessation of agricultural productivity. An excess quantity of dissolved salt or sodium minerals in soil and water inhibits food production, threatens water quality, and facilitates sedimentation problems and soil erosion. Plant growth is limited by salinity due to the osmotic effect in which excess salts (e.g., chloride [Cl^{-}] and sulfate [$SO_4{}^{2-}$]) tightly attach to water molecules, inhibiting plant roots from absorbing "available" water due to the high passage resistance of the electric current. Different salts can affect growth uniquely where plant success is dependent on both the salt compound makeup and the individual plant's tolerance. A high sodium ratio (proportion of sodium [Na^{+}] relative to calcium [Ca^{2+}] and magnesium [Mg^{2+}]) is related to soil dispersion influenced by an excess of cations (Na^{+}) attaching to clay particles causing soil swelling and expansion. Overtime, sodic soils begin to solidify and lose their structure as they fluctuate between dry and moist periods, reducing soil permeability. Salinization impacts about 19.5% (45 million ha) of irrigated land, 2.1% (32 million ha) of dryland agriculture globally,[34] and costs the United States approximately \$12 billion a year.[35] Developing solar energy on salt-affected land may reduce air pollution (e.g., when substituted for carbon-intensive energy sources), while a concomitant restoration of biophysical capacity of salt-affected land (e.g., composted municipal solar waste amendments[36] and native halophytic vegetation out-planting) may support climate regulation. Techno-centric outcomes of solar energy on salt-affected land may include energy equity, fuel diversity, and grid reliability.[37−39] Heckler[40] estimates soil lost to salt degradation will continue to increase at a yearly rate of about 0.8−16%, underscoring the potential long-term opportunity of salt-affected land as a potential land-sparing TES of solar energy (Figure 1).

Contaminated Land for Synergistic Solar Energy Development. Reclaiming land to provide sustainable energy has numerous potential techno-ecological outcomes including addressing public health risks, supporting climate regulation (e.g., following reclamation activities), and mitigating air pollution when solar energy generation is substituted for carbon-intensive sources of energy (Figure 1). Contaminated lands include brownfields, federal or nonfederal superfunds, and lands identified by the Resource Conservation and Recovery Act (RCRA), the Abandoned Mine Lands Program, and the Landfill Methane Outreach Program. Brownfields are areas previously designated for industrial or commercial use in which there are remnants of hazardous substances, pollutants, or contaminants. Superfund sites involve the most severely

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hazardous wastes requiring federal or state government attention. The RCRA ensures toxic waste storage facility sites responsibly and properly treat, store, or dispose of hazardous waste where cleanup expectations and requirements are determined by individual state governments. Once responsibly reclaimed, a process typically facilitated by government efforts, the land can be repurposed for commercial or industrial development. Contaminated sites typically left idle for extended periods of time, have low economic value, and are challenging to cultivate,[41,42] none of which undermine their potential for solar energy development. Examples of toxic wastelands that have been repurposed for solar energy development projects include sites formerly involving chemical and explosive manufacturing, steel production, tar and chemical processing, geothermal heating and cooling, and garbage disposal.[43] In the United States, the RE-Powering Initiative encourages renewable energy development on contaminated lands, and since the inception of the program, 1124 MW of renewable energy capacity is produced on 171 contaminated land sites.[44]

Floatovoltaics for Synergistic Solar Energy Development. Irrigation is the largest source of water consumption globally.[45,46] Brauman et al. (2013) found extensive variability in crop water productivity within global climatic zones indicating that irrigated croplands have significant potential to be intensified (i.e., food produced [kcal] per unit of water [L]) through improved water management.[47] The siting of solar energy panels that float on the surface of water bodies, such as reservoirs and irrigation canals, may minimize evaporation, reduce algae growth, cool water temperatures, and improve energy efficiency by reducing PV temperatures through evaporative cooling (Figure 1). There are vast opportunities for floatovoltaic deployment; collectively, lakes, ponds, and impoundments (water bodies formed by dams) cover more than 3% of the earth's surface area.[48] Reservoirs allow for relatively seamless solar energy integration compared with natural bodies of water, such as rivers, because their surfaces are relatively placid. This reduces the likelihood that panels will collide with each other or drift and break apart, allowing for easy maintenance. Additionally, unlike rivers and lakes, reservoirs are often located where energy demands are relatively high. Floatovoltaics integrate well into agricultural systems by allaying competition with land resources and providing energy and water savings. Farmers increasingly rely on agricultural ponds as water storage for irrigation, livestock, and aquaculture.[48] On-farm reservoirs are often wide but shallow making them more susceptible to water loss through evaporation.[49] Algae growth, a nutrient pollutant, is another costly nuisance for irrigation ponds that can clog pumps, block filters, and produce odors,[50] conditions attributed to further water losses that can be expensive and challenging for farmers to address. Solar panels reduce light exposure and lower water temperatures, minimizing algae growth and the need to filter water.[51−53] Finally, when solar panels are placed over cool water instead of land, PV module efficiency may increase 8−10%[54] where increased thermal transfer limits resistance on the circuit allow the electrical current to move faster.[55,56]

The Central Valley: A Model System for Land-Energy Interactions. The Central Valley (CV) is an ideal region in which to study land sparing benefits of solar energy TESs and to inform on broader issues related to the intersection between energy and land.[57] Located in one of the world's five mediterranean climate regions, California is valued as the largest agricultural producer within the United States, responsible for over half of the country's fruits and nuts, and is productive year-round.[58,59] This region also includes, in part, the California Floristic Province, an area supporting high concentrations of native and endemic species.[60] Over the last 150 years, the CV has experienced expansive LULCC owing to agricultural and urban development, which has accelerated habitat loss and fragmentation in areas of native prairies, marshes, vernal pools, oak woodlands, and alkali sink scrublands.[61] Within the last 30 years, LULCC has also occurred within agricultural land owing to energy development and urbanization, a large percent of which were considered prime farmlands.[61]

To date, there are few studies assessing the potential of solar energy within agricultural landscapes in ways that may concomitantly facilitate synergistic outcomes on technological and ecological systems beyond avoided emissions.[62,63] In this study, we sought to (1) evaluate the land sparing potential of solar energy development across four nonconventional land-cover types: the built environment, salt-affected land, contaminated land, and water reservoirs, as floatovoltaics, within the Great Central Valley (CV, CA) and (2) quantify the theoretical and technical (i.e., generation-based) potential of PV and CSP technologies within the CV and across these potential solar energy TESs to determine where technical potential for development is greatest geographically. Further, we sought to (3) determine the spatial relationship of land sparing areas with natural areas, protected areas, and agricultural regions designated as important to determine the proximity of these opportunities to essential landscapes that may have otherwise be selected for energy siting and development. Next, we (4) analyze the spatial density of contaminated sites within 10 km of the most populated CV cities to elucidate relationships between attributes (number and size) of nearby contaminated sites potentially favorable for solar energy generation and urban development centers because urban density is an explicative factor determining electricity consumption for cities.[64] Lastly, we (5) test the degree to which current and projected (2025) electricity needs for the state of California can be met across all four potential land sparing opportunities.

■ METHODS

Theoretical and Technical Solar Energy Potential for PV and CSP Technologies. The theoretical, or capacity-based, solar energy potential is the radiation incident on Earth's surfaces that can be utilized for energy production, including solar energy.[65] We used two satellite-based radiation models developed by the National Renewable Energy Laboratory (NREL) and Perez et al.[66] to estimate the theoretical solar energy potential of PV and CSP technologies operating at their full, nominal capacity over 0.1° surface cells (∼10 km in size).

Photovoltaic technologies use both direct and indirect radiation, while CSP uses only direct-beam radiation. Therefore, the radiation model we used for CSP capacity-based energy estimates is representative of direct normal irradiance (DNI) only, whereas the PV model incorporates both DNI and diffuse irradiance. Areas with DNI values of less than 6 kWh m^{-2} day^{-1} were not considered economically adequate for CSP deployment and therefore excluded from solar potential estimates (Figure S1).

To evaluate the technical, or generation-based, solar energy potential within identified areas for land-sparing PV development, we multiplied the theoretical potential by a capacity

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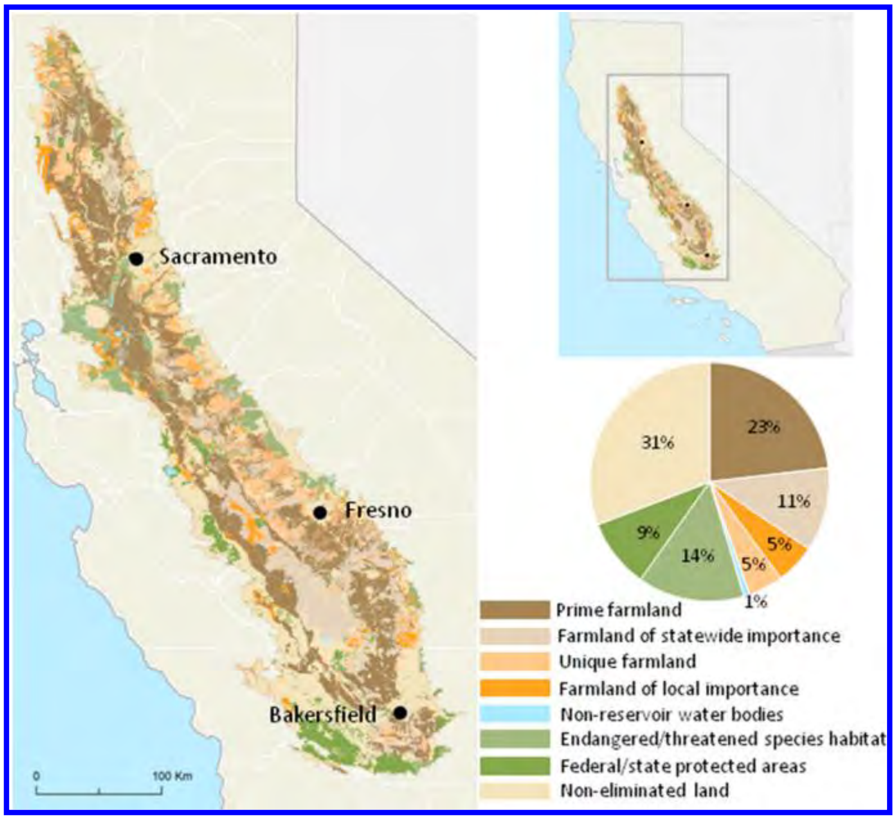

Figure 2. Map of California showing land-cover types eliminated when identifying solar energy potential over salt-affected soil. The pie graph depicts the relative proportion of area that each land cover type makes up within the Central Valley, which is not visible in the map due to overlap (e.g., areas identified as both endangered species habitat and state-protected). Land-cover types include: important farmlands (prime, unique, and of state-wide or local importance), nonreservoir bodies of water, endangered and threatened species habitat, federally and state-protected land, and non-eliminated land that was further evaluated for solar energy potential. The map was made using ESRI ArcGIS Desktop (version 10.4) software.

factor. The capacity factor values are derived from a satellite-based, spatially explicit capacity factor model[67] that has identical cells as the radiation models described above. The PV capacity factor model comprises estimates for three primary technology subtypes including fixed mount, south facing with a 25° tilt (TILT25); one-axis tracking, rotating east−west with a ± 45° maximum tracking angle (AX1FLAT); and two-axis tracking, rotating east−west and north−south of the sun across the horizon (AX2). For CSP generation-based calculations, we incorporated a five DNI class value scheme resembling estimates for a trough system.[68] Full details are provided in the Supplementary Methods.

Next, we calculated solar energy potential for both small and large-scale solar energy projects, where a minimum parcel size of 28 490 m^2 and 29 500 m^2 were required for PV and CSP facilities, respectively, producing 1 MW or more. These values are based on the average USSE land-use efficiency of 35.1 and 33.9 W m^{-2} for PV and CSP, respectively.[69] All CSP installations are utility-scale, and therefore, only these data are reported.

Solar Energy Potential of Land Sparing Opportunities in the Central Valley. We delineated the CV (58 815 km^2) based on the Great Central Valley Region[70] (Figure 1), composed of the geographic subdivisions of the Sacramento Valley, San Joaquin Valley, and all Outer South Coast Ranges encompassed within the San Joaquin Valley polygon. We overlaid the PV and CSP radiation models with the four land sparing land-cover types within the CV and calculated total area (km^2) and solar energy potentials (TWh $year^{-1}$). Across the salt-affected land solar energy TESs, we eliminated lands protected at the federal and state levels and threatened and endangered species habitats (Figure 2). Furthermore, all water bodies (e.g., wetlands and rivers), occurring in salt affected areas, with the exception of reservoirs, were removed as they may function as essential habitats for birds and other wildlife. Salt-affected soils within farmlands identified as primary, unique, or of state-wide or local importance[71] were also not included in the final estimates for solar energy potential. See the Supplementary Methods for explicit details on data and analysis for each land-cover type.

Spatial Relationships between Synergies and across Land-Cover Types. To ensure that energy potentials were not double-counted (e.g., salt-affected lands within the built environment), we calculated the spatial overlap across three solar energy TESs. Specifically, we observed overlap of land sparing potential among the built environment, salt-affected regions, and reservoirs. We did not include Environmental Protection Agency (EPA) contaminated sites because such data is not absolutely spatially explicit, but instead, each site is modeled circularly, in known total area, outward from a centroid based on known latitude and longitude coordinates, which may not represent each site's actual boundaries. Overlap between contaminated sites and land classified as salt-affected may be the most unlikely as most actions at these sites focus on preventing human contact.[41] Nonetheless, we did count 17 (189.5 km^2), 3 (2.5 km^2), and 740 (332.8 km^2) contaminated sites that may potentially overlap with salt-affected land, reservoirs, and the built environment, respectively, but we did

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Table 1. Contaminated Site Attributes across the Ten Most-Populated Cities Within the Central Valley, CA

city	city population	city area (km^2)	contaminated sites within city	contaminated sites within 10 km of city	contaminated site area within 10 km (km^2)
Fresno	494 665	112	38	58	21
Sacramento	466 488	98	83	140	47
Bakersfield	347 483	142	10	32	8
Stockton	291 707	62	53	95	35
Modesto	201 165	37	19	55	28
Elk Grove	153 015	42	27	71	52
Visalia	124 442	36	36	46	9
Concord	122 067	31	9	60	107
Roseville	118 788	5	8	60	75
Fairfield	105 321	37	10	26	34

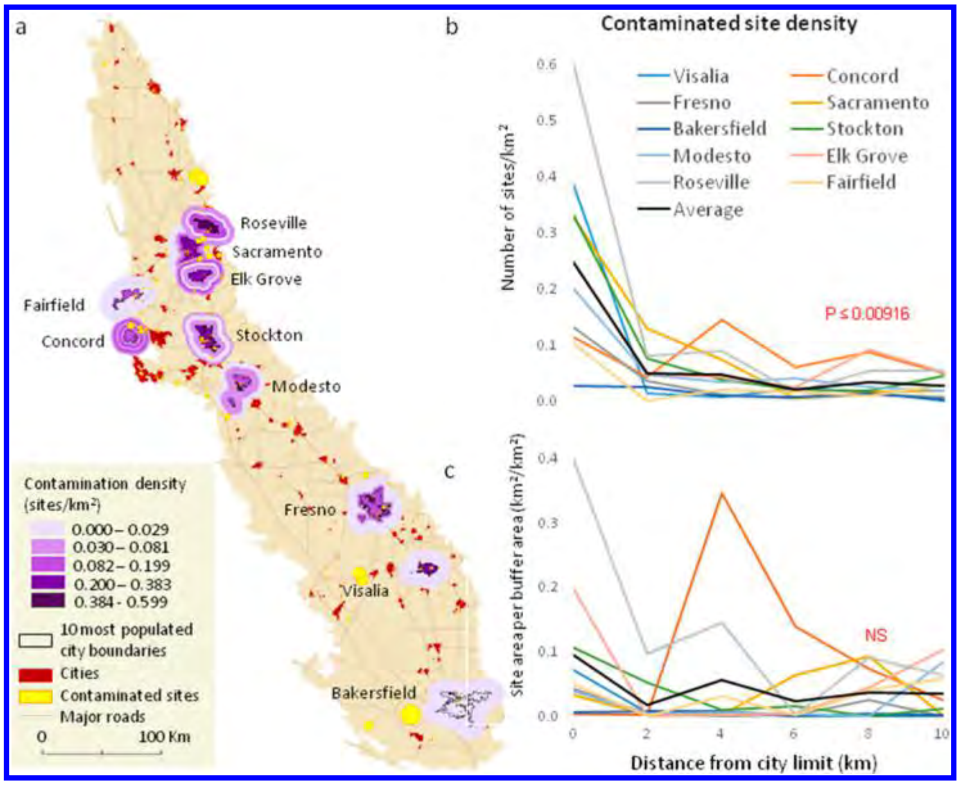

Figure 3. (a) Density of contaminated sites (circular points representing their total area but not shape; number of sites per square kilometer) within the Central Valley's (beige polygon) 10 most-populated cities: (1) within city limits (black line) and (2) across 0−2, 2−4, 4−6, 6−8, and 8−10 km buffers beyond city borders (purple buffers). Graphs show (b) the density of contaminated sites (sites per square kilometer) and (c) the total area of sites as a function of distance from city limits of the 10 most-populated cities in California's Central Valley. Land within each city boundary has a significantly greater number of contaminated sites based on total count (posthoc Tukey test, $P \leq 0.00916$) than buffer classes beyond the city perimeter (number of sites per square kilometer). No significant relationship exists between contamination site area and distance from urban cores. The map was made using ESRI ArcGIS Desktop (version 10.4) software.

not account for this overlap in the final values. We also enumerated spatial relationships between synergistic sites and other land-cover types throughout our analysis to determine the proximity of these opportunities to essential landscapes that may have otherwise been selected for energy siting and development.

Spatial Density and Proximity of Contaminated Lands to Human Populations. To elucidate relationships between attributes (number and size) of nearby contaminated sites potentially favorable for solar energy generation and urban development centers, we first identified the 10 most-populated cities within the Central Valley. We added 5 buffer distances around the perimeter of each city at 2 km increments up to 10 km (i.e., 2, 4, 6, 8, and 10 km). Within cities and each of these buffered rings (e.g., area between 4 and 6 km beyond city limits), we calculated the area and divided the number and area of contaminated sites that fall within each buffer by its associated area (site km^{-2} and site area [km^2] km^{-2}). We included any sites located outside of the CV within 10 km of the city analyzed. Contaminated sites that were in a 10 km radius of more than one of the 10 highly populated city were included in each density analysis. We used generalized linear models (GLMs) to test the effects of distance class on contaminated site metrics (i.e, count and area) and to observe if sites are generally located near, further away, or have no association with urban development centers, which serve as a proxy for electricity demand. Contaminated sites that were within a 10 km radius of multiple cities were observed

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Table 2. Number of Times over PV and CSP Solar Energy Technologies Can Meet California'S Projected Electricity Consumption Needs for 2025 (321 TWh) Based on Land-Sparing Opportunities within the Central Valley, CA: (1) Developed, (2) Salt-Affect Soil, (3) Reservoirs, and (4) Contaminated Sites[a]

		PV				CSP	
		distributed and USSE		USSE only		USSE	
land-cover type[b]		capacity-based (times over)	generation-based (times over)	capacity-based (times over)	generation-based (times over)	capacity-based (times over)	generation-based (times over)
Central Valley		378.6	68.1−83.4	378.6	68.1	398.2	129.7
DNI ≥ 6 kWh m^{-2} day^{-1}		–	–	–	–	135.4	46.9
developed	high intensity	2.8	0.5−0.60	1.5	0.3	–	–
	medium intensity	10.8	1.9−2.35	7.5	1.3−1.6	–	–
	low intensity	9.3	1.7−2.02	1.6	0.3−0.4	0.2	0.1
	open space	19.2	3.5−4.2	6.2	1.1−1.4	1.9	0.7
salt-affected soil	EC ≥ 4 and ≤8	0.6	0.1	0.6	0.1	0.2	0.1
	EC > 8 and ≤16	0.8	0.1−0.2	0.8	0.1−0.2	0.3	0.1
	EC > 16	0.1	0.0	0.1	0.0	0.0	0.0
	SAR ≥ 13	0.2	0.0	0.2	0.0	0.0	0.0
	overlap (EC ≥ 4 and SAR ≥ 13)	3.9	0.7−0.9	3.9	0.7−0.9	1.4	0.4
reservoirs		0.7	0.1−0.2	0.6	0.1	–	–
contaminated		7.1	1.3−1.6	7.0	1.3−1.6	3.0	1.0
total		55.4	9.9−12.1	30.1	5.4−6.6	7.0	2.4
overlapping areas		1.3	0.2−0.3	0.6	0.1	0.1	0.0
total (accounting for overlapping areas)		54.1	9.7−11.8	29.5	5.3−6.5	6.9	2.4

[a]Capacity-based potential is representative of the full energy potential offered from the sun, whereas the generation-based potential estimates the energy potential given current technology capabilities including three PV system types (tilt, one-axis tracking, and two-axis tracking panels) and a CSP trough technology. [b]Total energy potentials account for overlaps in land-cover types to avoid double-counting.

separately and therefore accounted for more than once. See the Supplementary Methods for further details.

RESULTS AND DISCUSSION

We found that 8415 km^2 (equivalent to over 1.5 million American football fields) and 979 km^2 (approximately 183 000 American football fields) of non-conventional surfaces may serve as land-sparing recipient environments for PV and CSP solar energy development, respectively, within the great CV and in places that do not conflict with important farmlands and protected areas for conservation (Figure 1 and Tables 1 and Supplementary Table 1). This could supply a generation-based solar energy potential of up to 4287 TWh $year^{-1}$ for PV and 762 TWh $year^{-1}$ for CSP, which represents 2.8 (CSP) − 14.4% (PV) of the CV area. We accounted for 203 km^2 of overlap across the built-environment, reservoirs, and salt-affected areas, the latter after eliminating land classified as protected areas (federal and state), critical and threatened habitats, and important farmlands from salt-affected soils.

In total, the CV encompasses 58 649 km^2 of CA, about 15% of the total land area in the state, and has a theoretical potential of 121 543 and 127 825 TWh annually for PV and CSP, respectively (Table S1). Considering areas with solar radiation high enough to economically sustain a CSP solar energy facility (locations with a DNI of 6 kWh m^{-2} $year^{-1}$), less than one-third (~19 000 km^2) of the CV is suitable for CSP deployment, and a capacity-based potential of about 44 000 TWh $year^{-1}$.

Among the potential solar energy TESs we studied, the built environment offers the largest land sparing potential in area with the highest solar energy potential for PV systems (Figure 1a), representing between 57% (USSE only) and 76% (small-scale to USSE) of the total energy potential for PV. If only USSE PV systems are considered for development, roughly half of the total built environment is suitable, a constraint owing to areas not meeting minimum parcel requirements for a one MW installation (28 490 m^2 or greater). Specifically, installing PV systems across the built environment could provide a generation-based potential of 2413 TWh $year^{-1}$ utilizing fixed-tilt modules and up to 3336 TWh $year^{-1}$ for dual-axis modules (Table S2). Using CSP technology, both the low-intensity developed and the open spaces within the built environment could yield 242 TWh $year^{-1}$ of generation-based solar energy potential (Table S1). For CSP, the built environment represents 30% of all energy opportunity for the land-sparing solar energy TESs we studied.

Land with salt-affected soils, another potential land sparing solar energy TES, comprises 850 km^2 of the CV, excluding areas identified as important for agriculture and conservation (Figure 2). This remaining salt-affected land makes up 1.5% of the CV region. Generally, regions with high concentrations of salt also have unsuitable levels of sodium. Indeed, we found that 70% of sodic and saline soils overlap; occurring in the same place (Table S2). Geographically, most salt-affected land sparing opportunities suitable for solar energy development are within the interior region of the CV, away from the built environment (Figure 1c).

We found that 2% (1098 km^2) of the CV is composed of contaminated lands with a generation-based potential of 407 and 335 TWh $year^{-1}$ for PV and CSP, respectively. A total of 60% of these sites are clustered within and near (<10 km) the 10 most-populated cities, a buffer area composed of 21% of the CV (inclusive of buffer areas of cities extending beyond the CV border; Figure 3a and Table 1). We found that across the top 10 most-populated cities, population was significantly positively related to the number of contamination sites (GLM, t value of 2.293, P = 0.025916). We also found that land within each city

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boundary has a significantly greater number of contaminated sites based on total count (post-hoc Tukey test, $P \leq 0.00916$; Figures 3b and S2) than buffer classes beyond the city perimeter (number of sites per square kilometer; Figure 3b). We found no statistical relationship between contamination site area and distance from urban cores (Figure 3c). Note that in addition to the 953 contaminated sites quantified for solar energy potential, 51 more sites are included in the density analysis that reside outside of the CV boundary but are within 10 km of cities and 46 of the contaminated sites (Table 1) are accounted for multiple times because they are within the 10 km radius of multiple cities. Lastly, contaminated lands are particularly attractive for USSE projects, and indeed, 412 and 411 of the 953 contaminated sites from the EPA data set pass the minimum area requirement for supporting utility-scale PV and CSP technologies, respectively (Figure 3). Although our emphasis here was relationships between contaminated sites and urban development cores, more-robust analyses exploring spatial relationships between contaminated sites and population at the regional scale may be useful.

Reservoirs comprise 100 km^2 of available surface area for solar energy, just 0.2% of the total land area in the CV. The integration of fixed-tilt PV panels across all reservoir surface area would provide a generation-based energy potential of 39 TWh year^{-1} (Table S1). There are roughly 4300 reservoirs within the CV, 2427 (56%) and 986 (23%) of which are classified as water storage and reservoirs, respectively (Figure S3). These water body types are the greatest targets for floatovoltaic development, and together, they make up roughly 66% of the total surface area of all reservoirs in the CV. While 66% of reservoirs identified in the CV are highest priority, the remaining 38% are treatment, disposal, and evaporator facilities, aquaculture, and unspecified reservoirs (Figure S3). In CA, farmers and water pump stations consume 19 TWh of electricity annually;[72] based on estimated energy potential for floatovoltaics, reservoirs provide enough surface area to supply 2 times the electricity needs of farmers or water pump stations for CA (19 TWh).[72]

California's projected annual electricity consumption needs for 2025, based on moderate assumptions, is 321 TWh.[73] The land-sparing solar energy TESs we explore in this study could meet CA's projected 2025 needs for electricity consumption between 10−13 times over with PV technologies and over two times over with CSP technologies (Table 2). In fact, each land-sparing TES individually can be used to meet the state's energy needs with the exception of reservoirs, which would provide enough surface area to produce electricity to meet 10−20% of CA's 2025 demands. However, reservoirs do offer enough surface area and potential to meet electricity needs within California's agriculture sector (i.e., 19 TWh annually).[72] CSP systems are confined to limited areas within the CV and therefore offer relatively less energy potential than PV; yet still, contaminated lands alone offer adequate space for CSP technologies to meet projected electricity needs for 2025.

Our study found contaminated sites are clustered within or near highly populated cities, many with populations that are projected to rapidly expand owing to urban growth. Thus, contaminated sites may serve as increasingly desirable recipient environments for solar energy infrastructure within the CV of California and agricultural landscapes elsewhere. The mission of the Environmental Protection Agency's (EPA) RE-Powering initiative is to increase awareness of these contaminated sites by offering tools, guidance, and technical assistance to a diverse community of stakeholders. Already, this program has facilitated development from 8 renewable energy projects in 2006 to nearly 200 today.[44] Across the United States alone, there are over 80 000 contaminated sites across 175 000 km^2 of land identified as having renewable energy potential, emphasizing the opportunity to repurpose under-utilized space. Given the globally widespread policy-based adoption of managing hazards in place, allowing for the less than complete remediation of environmental hazards on contaminated sites; the benefits of this TES must be weighed against risks assessed from indefinite oversight and monitoring.[41]

There are few studies or cost−benefit analyses on solar energy over functional water bodies that empirically and quantitatively assess the potential for synergistic outcomes related to water (e.g., water quality), energy, and land. Farmers frequently build water reservoirs to cope with limits on water allotment during drought periods,[74] offering opportunities for dual-use space for solar panels. Although floatovolaics are increasing in popularity, particularly in Asia, where the largest floating solar installation exists,[75] more-comprehensive environmental impact assessments are needed to quantify beneficial outcomes (e.g., reductions in evaporative loss) and address risks. One concern is that avian species may perceive PV modules as water, known as the "lake effect," leading to unintended collisions and possibly injury or mortality.

In 2015, installed capacity of solar energy technologies globally reached 220 GW driven by relatively high average annual growth rates for PV (45.5%, 1990−2015) and CSP (11.4%) compared with other renewable energy systems.[76,77] At these rates, trade-offs between land for energy generation and food production in an era of looming land scarcity may be high[9] when developed without consideration of impacts to land, including food and natural systems. For example, in the United States alone, an area greater than the state of Texas is projected to be impacted by energy development and sprawl, making energy the greatest driver of LULCC at a pace double the historic rate of residential and agricultural development by 2040.[28] California aims to derive half of its electricity generation (160 TWh) from renewable energy sources by 2030, and we show that the CV region can supply 100% of electricity needs from solar energy without compromising critical farmlands and protected habitats.

The extent to which agricultural landscapes can sustain increasing demand for agricultural products and transition to becoming a major solution to global change type threats instead of contributing to them depends on several factors; however, the manner in which land, energy, and water resources are managed within such landscapes is arguably the decisive factor.[4,78] Our study reveals that the great CV of California could accommodate solar energy development on nonconventional surfaces in ways that may preclude loss of farmland and nearby natural habitats that also support agricultural activities by enhancing pollinator services (e.g., wild bees) and crop yields.[79,80] Given the diffuse nature of solar energy, advances in battery storage would likely only enhance the economic and environmental appeal of the four solar energy TES we evaluated.[81,82] The realization of this potential may also confer other techno-ecological synergistic outcomes (as characterized in Figure 1), and additional research could be conducted to improve the certainty and accuracy of these potential benefits. For example, the degree to which realization of solar energy potential in agricultural landscapes on nonconventional surfaces contributes to food system resilience[83] by alleviating competi-

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tion of valuable land among farmers, raising property values, generating clean energy for local communities, enhancing air quality, and providing new job opportunities[14,62] remains largely unexplored.

Other factors impacting the sustainability of agricultural landscapes include the level of funding to support research and development, collaboration across public and private sectors to advance technology and innovation, and policies that bolster decisions and action leading to appropriate renewable energy siting. Research efforts have increasingly focused on identifying where and how renewable energy systems can be sustainably integrated into complex landscapes with environmentally vulnerable ecosystems,[21,22,84−86] but less emphasis has been on decisions with agricultural landscapes[19,78,84,85] despite its importance to food security and nutrition. In the US, the National Science Foundation is prioritizing the understanding of food, energy, and water interactions, identifying it as the most pressing problem of the millennium, but land has remained underemphasized in these programs.[87] Policies that result in cash payments to growers and solar energy developers for land sparing energy development could facilitate, indirectly, the conservation of important farmlands and natural areas. Federal policy could provide the financial support to state and local governments to protect natural and agriculturally critical areas, and decisions can be tailored at these administrative levels to accommodate the land use and water rights unique to the region.

California's Great Central Valley is a vulnerable yet indispensable region for food production globally. Our analysis reveals model options for sustainable solar energy development via use of nonconventional surfaces, i.e., the built environment, salt-affected land, contaminated land, and water reservoirs, as floatovoltaics. These land sparing solar energy development pathways may be relevant to other agricultural landscapes threatened by trade-offs associated with renewable energy development and sprawl.

■ ASSOCIATED CONTENT

Supporting Information

The Supporting Information is available free of charge on the ACS Publications website at DOI: 10.1021/acs.est.7b05110.

> Detailed information about methods and data used for analysis in this study. Figures showing the effect of distance from the 10 most-populated cities, water reservoirs in the Central Valley, theoretical solar radiation potential, and maps of land-sparing solar energy. Tables showing utility-scale solar energy potential and photovoltaic energy potential.(PDF)

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Notes

The authors declare no competing financial interest.

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Environ. Sci. Technol. 2017, 51, 14472−14482

APPENDIX B

GLARE STUDY

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DREW SOLAR PROJECT
GLARE STUDY

May 22, 2018 | Prepared by POWER Engineers for Drew Solar, LLC

PROJECT CONTACT:

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Manager of Applied Technologies
(208) 914-1667
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POWER ENGINEERS

Drew Solar Project Glare Study

PREPARED FOR: *DREW SOLAR, LLC*

PREPARED BY: *POWER ENGINEERS, INC.*

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ACRONYMS AND ABBREVIATIONS

AR	anti-reflective
KOP	Key Observation Point
MW	megawatts
POWER	POWER Engineers, Inc.
Project	Drew Solar Project
PV	photovoltaic
SGHAT	Solar Glare Hazard Analysis Tool

1.1 INTRODUCTION

POWER Engineers, Inc. (POWER) has performed this Glare Study for the proposed Drew Solar Project (Project) to identify potential glare impacts to motorists and surrounding residences. This study was commissioned by DUDEK on behalf of Drew Solar, LLC. The Project is located approximately 6.5 miles southwest of the city of El Centro in Imperial County, California (see Figure 1). Drew Solar, LLC has indicated that the proposed Project will utilize either single-axis tracking or fixed photovoltaic (PV) technologies. Based on direction provided by DUDEK, this study assumed the use of single-axis tracking PV solar technology with anti-reflective coating and analysis was performed for all PV panel glass surfaces. Additional analysis will be required to determine glare behaviors of dual-axis tracking technologies. Specifically, this study does the following:

- Identifies sensitive viewers within one mile of the Project (see Section 3.1).
- Characterizes typical glare behavior experienced from the solar project throughout the day and year (see Section 3.2).
- Evaluates when and where glare may be visible to sensitive viewers (see Section 4.0).

2.0 DEFINITIONS AND DESCRIPTIONS

The following definitions and descriptions are important for understanding the methodology and results of the study:

Anti-reflective Coating – Anti-reflective Coating, also known as AR coating, is a surface treatment to solar panel glass designed to reduce reflected light and increase panel efficiencies. AR Coating methods may vary by manufacturer. This study assumes both form and function are in original working conditions through the life of the project.

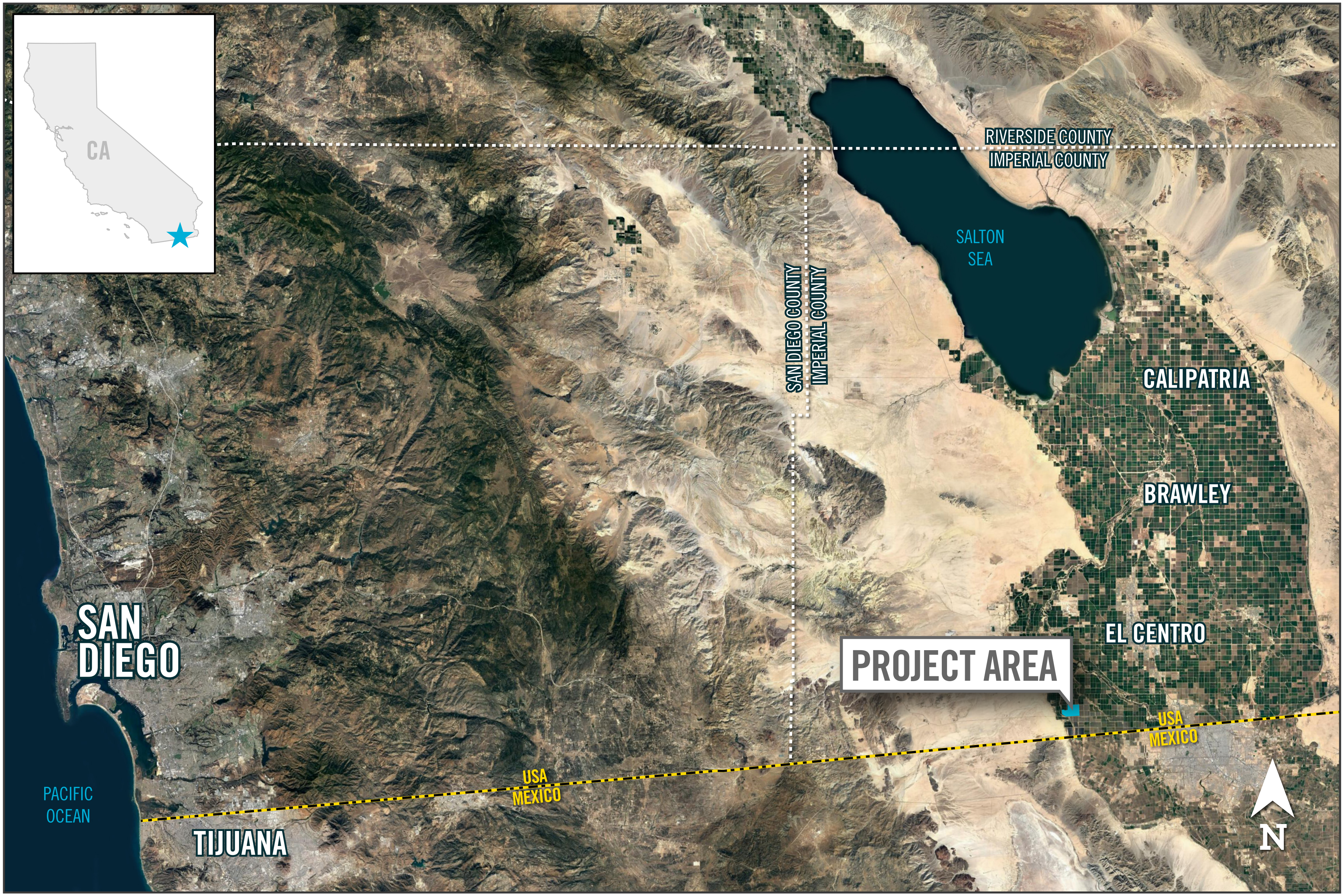
Photovoltaic Panel – Photovoltaic panels, also known as PV panels, are designed to absorb solar energy and retain as much of the solar spectrum as possible in order to produce electricity.

Single Axis Solar Tracker – Single axis solar trackers are designed to maximize the efficiency of a PV panel operation. PV panels mounted to a single axis tracker rotate around a fixed axis allowing PV panels to track the sun's east/west position throughout the day (see Figure 2).

Glare – A continuous source of brightness, relative to diffuse or surface scattered lighting. For purposes of this study, glare is caused by the sun reflecting off solar panels (see Figure 3).

Key Observation Points (KOP) – KOPs refer to locations with sensitivity to potential glare. For this study, KOPs included roadways and residential structures within one mile of the Project (see Section 3.1).

GlareGauge – The GlareGauge tool uses Solar Glare Hazard Analysis Tool (SGHAT) technology. Developed by Sandia National Laboratories, this tool is a web-based application that predicts the potential for solar glare and ocular impacts from solar technologies (see https://share.sandia.gov/phlux/). The GlareGauge tool and SGHAT technologies have become the Federal Aviation Administration standard for analyzing solar glare for both terrestrial and aerial viewers.



Prepared By,

POWER ENGINEERS

Drew Solar Glare Analysis

Figure 1 - Project Location Map

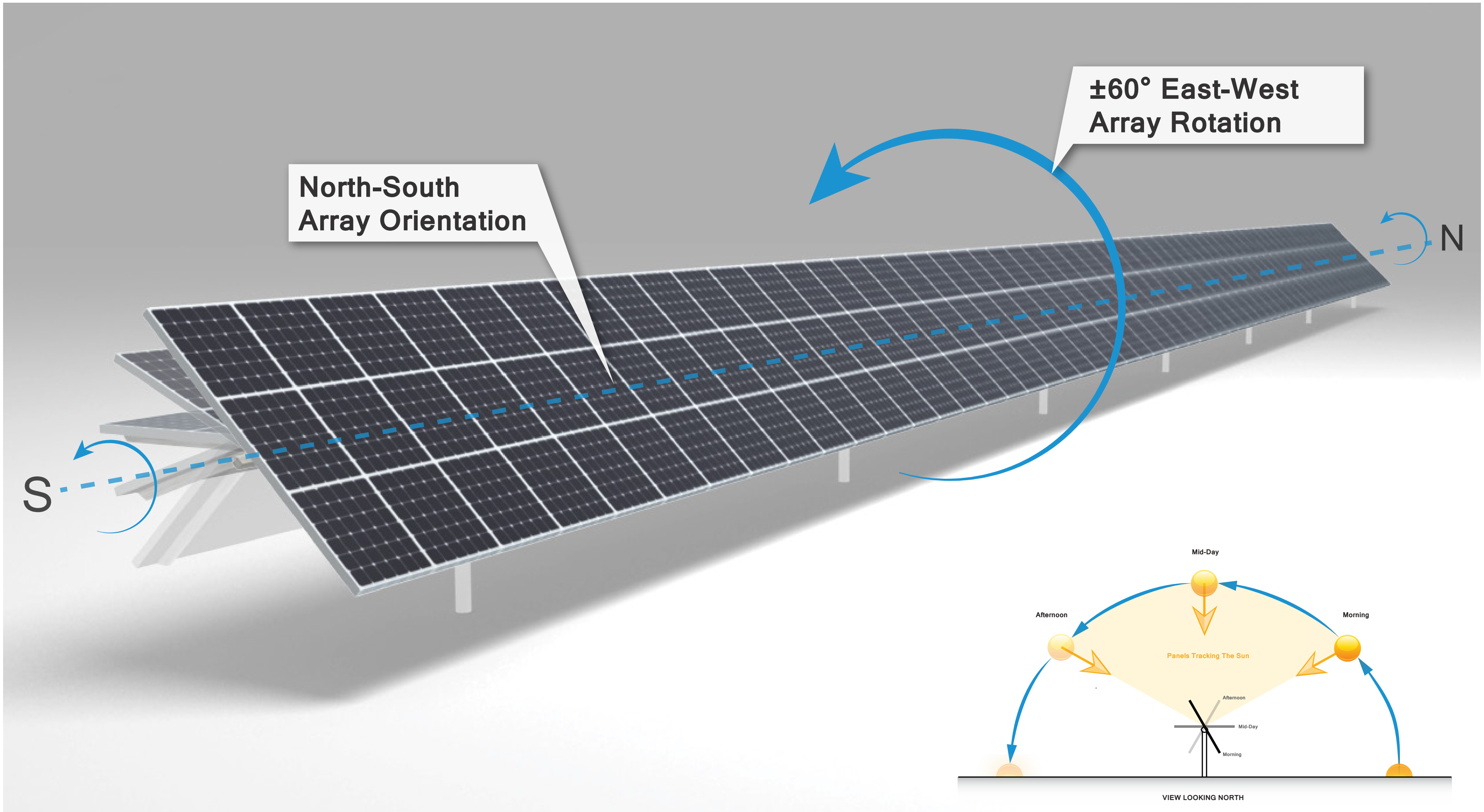


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Figure 2 - Single Axis Solar Tracker

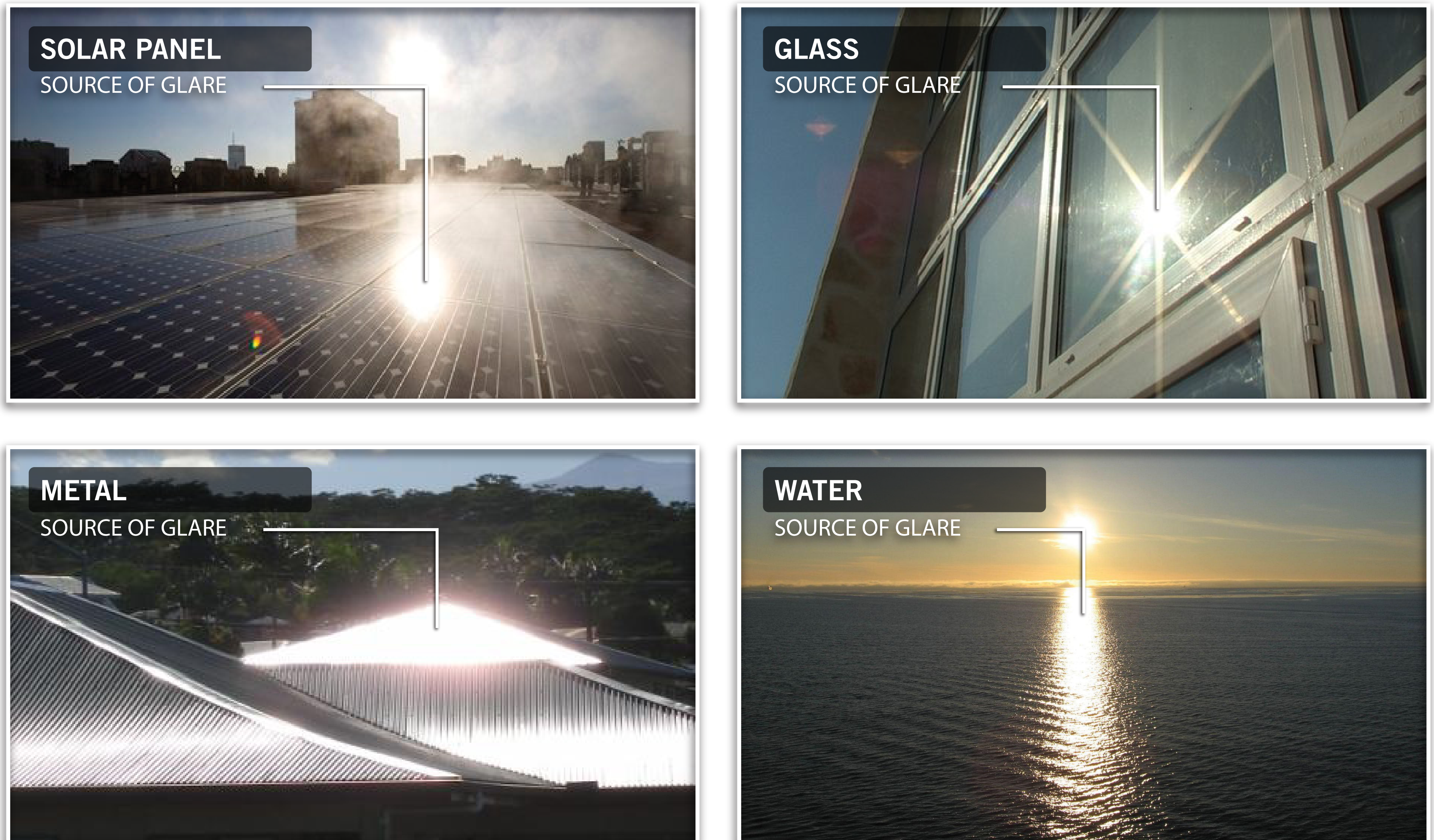


Figure 3 - Examples of Glare

3.0 METHODOLOGY

POWER used the following methodology to determine the location and duration of potential glare:

Identify Potential Glare Issues – This study focused on potential issues where glare may be visible from nearby roadways or residences. POWER prepared the study based on these locations (see Section 3.1).

Characterize Glare Behavior – POWER utilized the GlareGauge tool to determine when and where solar glare may occur throughout the year (see https://share.sandia.gov/phlux/). Technical specifications of proposed solar equipment were provided by DUDEK and include panel dimensions, type, angle, orientation, and placement (see Section 3.2).

Evaluate – Once glare was characterized, visual analysts documented the occurrence and hazard level of potential glare (see Section 3.3).

3.1 Identify Potential Glare Issues

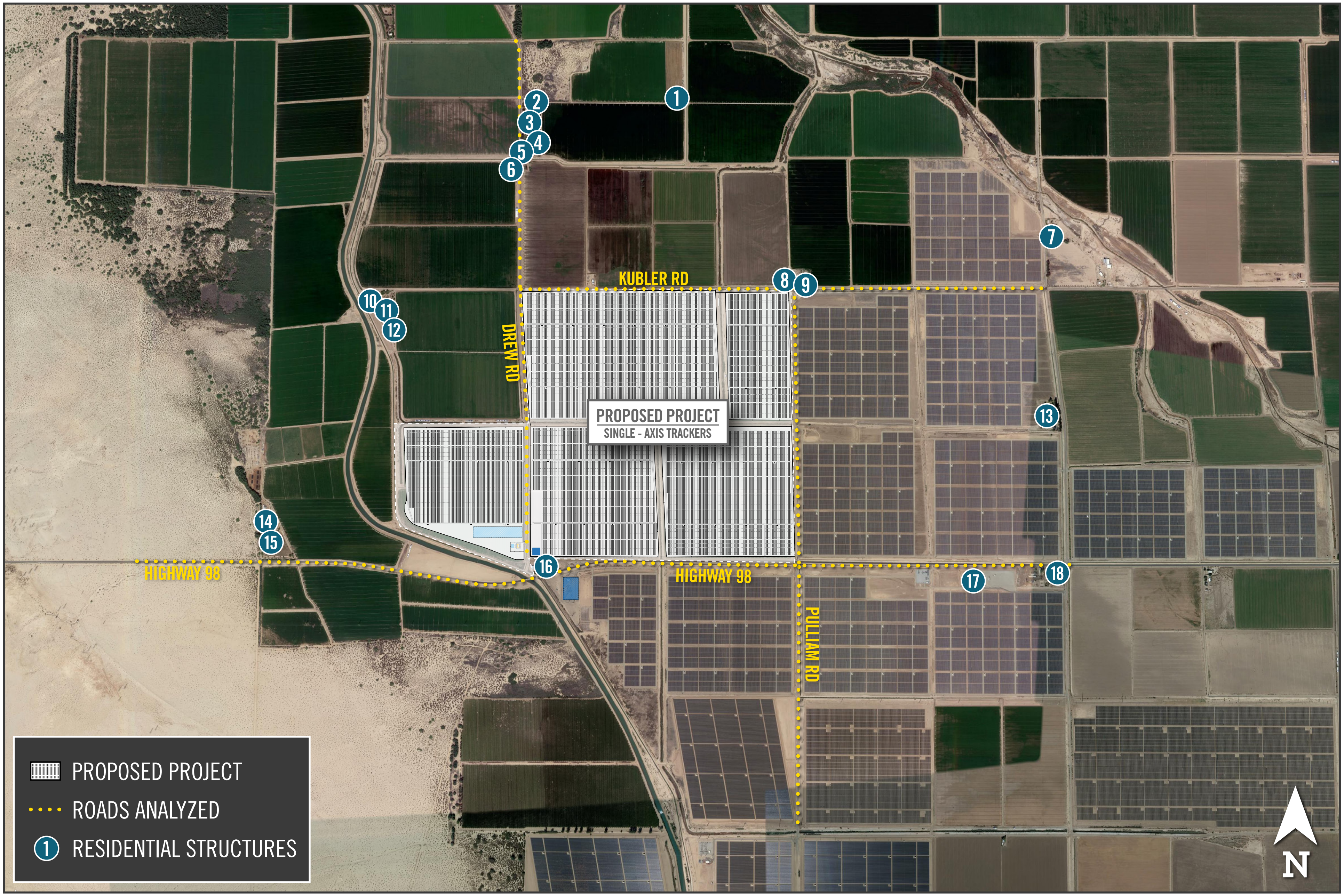
The proposed Project was analyzed to evaluate and document any occurrences of glare that would potentially cause distractions to nearby residences and motorists. Due to the angle of the sun and the tracking process of a single-axis PV system, during normal operating conditions the typical trajectory of potential glare rises the farther away it gets from the surface of the PV panel. As such, the farther away an observer is from the site, the lower their potential of seeing glare from that location. This study utilized a one-mile threshold for analysis. If potential glare is reported at the one-mile threshold, further analysis may be performed.

Google Earth aerial imagery was used to identify any major structures within one mile of the Project. Proposed solar operations were then studied from Key Observation Points (KOPs) identified at 17 surrounding residential structures and four roadways adjacent the site (see Figure 4). Single point locations were analyzed for each identified structure. The centerline of each identified roadway was analyzed up to one mile from the Project. Due to the typical trajectory of potential glare, an elevated viewer at a given KOP has a higher potential of seeing glare than a non-elevated viewer. Viewer heights studied were chosen to represent worst case scenarios for both residential and motorist views. Each KOP is described below:

- **Surrounding Residential Structures:**
    - Distance from Project: 0-1.0 mile
    - Viewer Height: 8 feet above ground

- **State Route 98:**
    - Location relative Project: South
    - Viewer Height: 6-10 feet above ground
    - Direction of Travel: East/West

- **Drew Road:**
    - Location relative Project: West
    - Viewer Height: 6-10 feet above ground
    - Direction of Travel: North/South



Prepared By,

POWER ENGINEERS

Drew Solar Glare Analysis

Figure 4 - Key Observation Points

- **Pulliam Road:**
  - Location relative Project: East
  - Viewer Height: 6-10 feet above ground
  - Direction of Travel: North/South

- **Kubler Road:**
  - Location relative Project: North
  - Viewer Height: 6-10 feet above ground
  - Direction of Travel: East/West

3.2 Characterize Glare Behavior

POWER utilized the GlareGauge tool to determine when and where solar glare may occur throughout the year (see https://www.forgesolar.com/). Technical specifications of proposed solar equipment were provided by DUDEK and are described below:

Photovoltaic Solar Panels:

- Single Axis Trackers
- Panel Orientation: North/South
- Panel Rotation Limits: ± 60 degrees
- Coating/Texture: Smooth Glass with AR Coating
- Rack Height: 4 feet above grade

3.3 Glare Evaluation – GlareGauge Analysis

To identify the occurrence of glare, POWER utilized the GlareGauge tool licensed by ForgeSolar. The GlareGauge tool is a web based glare assessment tool, allowing input of viewer position, solar facility location, solar technology, and elevation data. The GlareGauge tool provides a quantified assessment of when and where glare may occur throughout the year from a solar installation, as well as identifying the potential effects on the human eye if glare does occur. Glare was analyzed at one minute intervals throughout the entire year to determine when and where glare may be visible to nearby residences and motorists. Glare was analyzed with PV rotational limits of 60 degrees facing east and west. Refer to Section 4.0 and Appendix A for glare results.

4.0 RESULTS

After review of the Glare Gauge tool analysis, POWER determined no glare will be visible at the KOPs evaluated from the proposed solar operations due to the orientation of the PV panels and their rotational limits. The 60 degree rotational limits cause any resulting glare to be redirected above and away from all sensitive viewers throughout the day and year. For a detailed description of the GlareGauge analysis results, see Appendix A.

5.0 SOURCES

ForgeSolar GlareGauge Web Application. Accessed 2017.
https://www.forgesolar.com/tools/glaregauge.

Files provided by DUDEK:
Draft Drew Solar PD_Dudek.pdf
DrewSolar_SitePlan(FS-18ft)_110817(EX).dwg
11030AltaSht1-3.dwg
11030AltaSht4.dwg
11030AltaSht5.dwg
11030AltaSht6-16.dwg

APPENDIX A GLARE RESULTS

FORGESOLAR GLARE ANALYSIS

Project: Drew Solar
Single axis Trackers

Site configuration: Drew Solar - 60 Deg Limit
Analysis conducted by Andy Stephens (andy.stephens@powereng.com) at 17:56 on 11 Dec, 2017.

U.S. FAA 2013 Policy Adherence

The following table summarizes the policy adherence of the glare analysis based on the 2013 U.S. Federal Aviation Administration Interim Policy 78 FR 63276. This policy requires the following criteria be met for solar energy systems on airport property:

- No "yellow" glare (potential for after-image) for any flight path from threshold to 2 miles
- No glare of any kind for Air Traffic Control Tower(s) ("ATCT") at cab height.
- Default analysis and observer characteristics (see list below)

ForgeSolar does not represent or speak officially for the FAA and cannot approve or deny projects. Results are informational only.

COMPONENT	STATUS	DESCRIPTION
Analysis parameters	PASS	Analysis time interval and eye characteristics used are acceptable
Flight path(s)	PASS	Flight path receptor(s) do not receive yellow glare
ATCT(s)	N/A	No ATCT receptors designated

Default glare analysis and observer eye characteristics are as follows:

- Analysis time interval: 1 minute
- Ocular transmission coefficient: 0.5
- Pupil diameter: 0.002 meters
- Eye focal length: 0.017 meters
- Sun subtended angle: 9.3 milliradians

FAA Policy 78 FR 63276 can be read at https://www.federalregister.gov/d/2013-24729

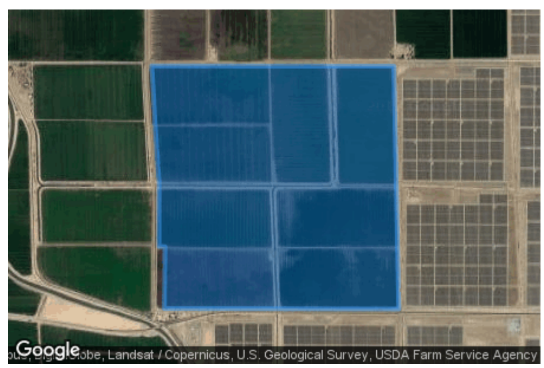
SITE CONFIGURATION

Analysis Parameters

DNI: peaks at 1,000.0 W/m^2 Time interval: 1 min
Ocular transmission coefficient: 0.5
Pupil diameter: 0.002 m Eye focal length: 0.017 m Sun subtended angle: 9.3 mrad
Site Config ID: 12020.2069

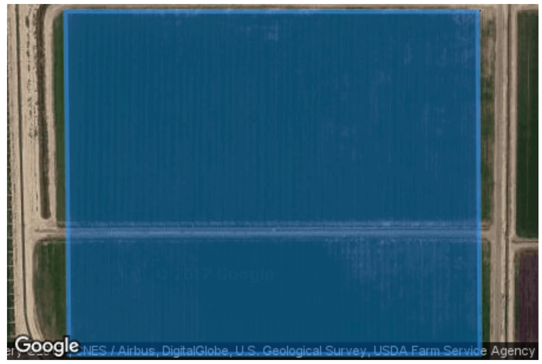
PV Array(s)

Name: PV array 1
Axis tracking: Single-axis rotation Tracking axis orientation: 180.0°
Tracking axis tilt: 0.0°
Tracking axis panel offset: 0.0°
Limit tracking rotation? Yes
Max tracking angle: 60.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: 8.43 mrad



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	32.686857	-115.673836	-20.82	4.00	-16.82
2	32.687363	-115.673836	-19.41	4.00	-15.41
3	32.690907	-115.674121	-23.68	4.00	-19.68
4	32.694487	-115.674362	-16.76	4.00	-12.76
5	32.694473	-115.656799	-17.19	4.00	-13.19
6	32.679622	-115.656445	-16.63	4.00	-12.63
7	32.679660	-115.673448	-17.13	4.00	-13.13
8	32.683444	-115.673407	-18.74	4.00	-14.74
9	32.683453	-115.673836	-18.40	4.00	-14.40

Name: PV array 2
Axis tracking: Single-axis rotation Tracking axis
orientation: 180.0°
Tracking axis tilt: 0.0°
Tracking axis panel offset: 0.0°
Limit tracking rotation? Yes
Max tracking angle: 60.0°
Rated power: -
Panel material: Smooth glass with AR coating
Reflectivity: Vary with sun
Slope error: 8.43 mrad



Vertex	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
1	32.686891	-115.682108	-20.47	4.00	-16.47
2	32.681668	-115.682044	-17.53	4.00	-13.53
3	32.681668	-115.674577	-16.18	4.00	-12.18
4	32.686888	-115.674620	-22.87	4.00	-18.87

Motorist Receptor(s)

Name: 98 East Bound
Description: Threshold height: 5
ft Direction: 90.43°
Glide slope: 0.0°
Pilot view restricted? No

Point	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
Threshold	32.679443	-115.668998	-16.65	5.00	-11.65
Two-mile	32.679226	-115.634608	-15.81	4.16	-11.65

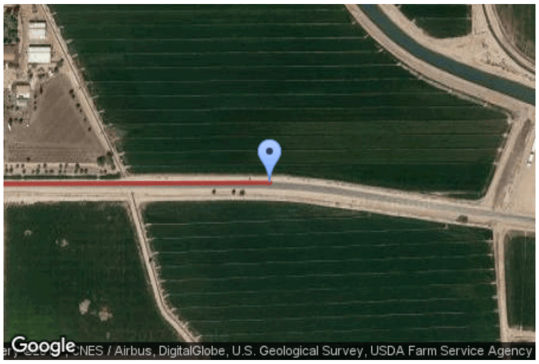
Name: 98 East Bound Left

Description:

Threshold height: 5 ft Direction:

269.71° Glide slope: 0.0°

Pilot view restricted? No



Point	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
Threshold	32.679443	-115.686679	-11.19	5.00	-6.19
Two-mile	32.679297	-115.721069	75.22	-81.41	-6.19

Name: 98 West Bound

Description: Threshold height: 5

ft Direction: 270.29° Glide

slope: 0.0°

Pilot view restricted? No

Point	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
Threshold	32.679263	-115.634665	-16.24	5.00	-11.24
Two-mile	32.679409	-115.669055	-17.00	5.76	-11.24

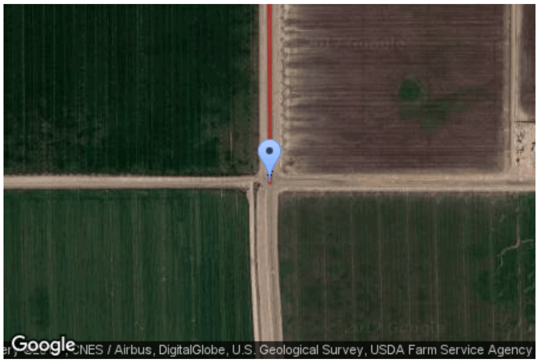
Name: Drew North Bound

Description: Threshold height: 5

ft Direction: 359.77° Glide

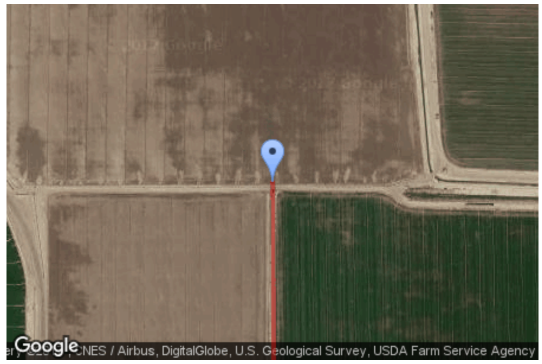
slope: 0.0°

Pilot view restricted? No



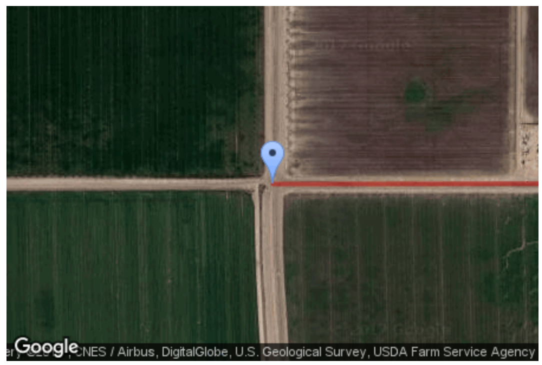
Point	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
Threshold	32.694642	-115.674663	-20.67	5.00	-15.67
Two-mile	32.723554	-115.674801	-26.43	10.76	-15.67

Name: Drew South Bound
Description: Threshold height: 5
ft Direction: 179.74° Glide
slope: 0.0°
Pilot view restricted? No



Point	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
Threshold	32.723556	-115.674818	-26.35	5.00	-21.35
Two-mile	32.694644	-115.674662	-20.67	-0.68	-21.35

Name: Kubler East Bound
Description: Threshold height: 5
ft Direction: 89.91°
Glide slope: 0.0°
Pilot view restricted? No



Point	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
Threshold	32.694649	-115.674706	-20.69	5.00	-15.69
Two-mile	32.694695	-115.640309	-17.22	1.53	-15.69

Name: Kubler West Bound
Description:
Threshold height: 5 ft Direction:
269.73° Glide slope: 0.0°
Pilot view restricted? No

Point	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
Threshold	32.694740	-115.640266	-15.71	5.00	-10.71
Two-mile	32.694603	-115.674662	-20.65	9.95	-10.71

Name: Pulliam North Bound

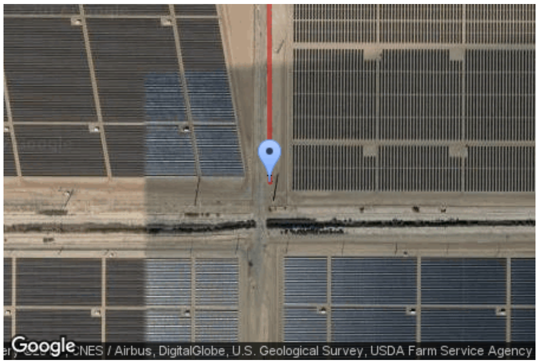
Description:

Threshold height: 5 ft Direction:

359.71°

Glide slope: 0.0°

Pilot view restricted? No



Point	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
Threshold	32.665246	-115.656166	-16.35	5.00	-11.35
Two-mile	32.694158	-115.656340	-18.96	7.61	-11.35

Name: Pulliam South Bound

Description:

Threshold height: 5 ft Direction:

179.36°

Glide slope: 0.0°

Pilot view restricted? No

Point	Latitude (°)	Longitude (°)	Ground elevation (ft)	Height above ground (ft)	Total elevation (ft)
Threshold	32.694649	-115.656381	-17.25	5.00	-12.25
Two-mile	32.665738	-115.655996	-16.23	3.98	-12.25

Discrete Observation Receptors

Name	ID	Latitude (°)	Longitude (°)	Elevation (ft)	Height (ft)
OP 1	1	32.705497	-115.664003	-18.31	8.00
OP 2	2	32.705084	-115.673836	-14.69	8.00
OP 3	3	32.000000	-115.673895	788.95	8.00
OP 4	4	32.703353	-115.673678	-20.67	8.00
OP 5	5	32.702574	-115.674282	-14.13	8.00
OP 6	6	32.701565	-115.675172	-21.01	8.00
OP 7	7	32.697602	-115.639295	-15.56	8.00
OP 8	8	32.695078	-115.656906	-17.68	8.00
OP 9	9	32.695015	-115.655614	-19.11	8.00
OP 10	10	32.693981	-115.684587	-16.08	8.00
OP 11	11	32.693313	-115.683428	-16.31	8.00
OP 12	12	32.692591	-115.683117	-17.33	8.00
OP 13	13	32.687570	-115.639772	-11.78	8.00
OP 14	14	32.681371	-115.691421	-1.80	8.00
OP 15	15	32.680807	-115.691147	-4.80	8.00
OP 16	16	32.679190	-115.672742	-10.39	8.00
OP 17	17	32.678323	-115.644536	-14.51	8.00
OP 18	18	32.678901	-115.638968	-14.84	8.00
OP 19	19	32.679154	-115.670757	-16.57	6.00
OP 20	20	32.678739	-115.672774	-9.23	6.00
OP 21	21	32.678360	-115.674727	-9.67	6.00
OP 22	22	32.678215	-115.676658	-11.28	6.00
OP 23	23	32.678432	-115.678697	-14.33	6.00
OP 24	24	32.678685	-115.680585	-12.73	6.00
OP 25	25	32.678937	-115.682387	-12.95	6.00
OP 26	26	32.679136	-115.684254	-13.64	6.00
OP 27	27	32.679389	-115.685756	-13.81	6.00
OP 28	28	32.679544	-115.674126	-14.71	6.00
OP 29	29	32.680465	-115.674287	-15.67	6.00
OP 30	30	32.681888	-115.674255	-16.03	6.00
OP 31	31	32.683053	-115.674250	-18.33	6.00
OP 32	32	32.685081	-115.674191	-19.16	6.00
OP 33	33	32.686963	-115.674201	-20.64	6.00
OP 34	34	32.688910	-115.674276	-21.67	6.00
OP 35	35	32.690572	-115.674427	-23.37	6.00
OP 36	36	32.692052	-115.674534	-22.67	6.00
OP 37	37	32.693497	-115.674641	-21.12	6.00

GLARE ANALYSIS RESULTS

Summary of Glare

PV Array Name	Tilt (°)	Orient (°)	"Green" Glare min	"Yellow" Glare min	Energy kWh
PV array 1	0.0	180.0	0	0	-
PV array 2	0.0	180.0	0	0	-

Total annual glare received by each receptor

Receptor	Annual Green Glare (min)	Annual Yellow Glare (min)
98 East Bound	0	0
98 East Bound Left	0	0
98 West Bound	0	0
Drew North Bound	0	0
Drew South Bound	0	0
Kubler East Bound	0	0
Kubler West Bound	0	0
Pulliam North Bound	0	0
Pulliam South Bound	0	0
1	0	0
2	0	0
3	0	0
4	0	0
5	0	0
6	0	0
7	0	0
8	0	0
9	0	0
10	0	0
11	0	0
12	0	0
13	0	0
14	0	0
15	0	0
16	0	0
17	0	0
18	0	0

Receptor	Annual Green Glare (min)	Annual Yellow Glare (min)
19	0	0
20	0	0
21	0	0
22	0	0
23	0	0
24	0	0
25	0	0
26	0	0
27	0	0
28	0	0
29	0	0
30	0	0
31	0	0
32	0	0
33	0	0
34	0	0
35	0	0
36	0	0
37	0	0

Results for: PV array 1

Receptor	Green Glare (min)	Yellow Glare (min)
98 East Bound	0	0
98 East Bound Left	0	0
98 West Bound	0	0
Drew North Bound	0	0
Drew South Bound	0	0
Kubler East Bound	0	0
Kubler West Bound	0	0
Pulliam North Bound	0	0
Pulliam South Bound	0	0
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
OP 7	0	0
OP 8	0	0

Receptor	Green Glare (min)	Yellow Glare (min)
OP 9	0	0
OP 10	0	0
OP 11	0	0
OP 12	0	0
OP 13	0	0
OP 14	0	0
OP 15	0	0
OP 16	0	0
OP 17	0	0
OP 18	0	0
OP 19	0	0
OP 20	0	0
OP 21	0	0
OP 22	0	0
OP 23	0	0
OP 24	0	0
OP 25	0	0
OP 26	0	0
OP 27	0	0
OP 28	0	0
OP 29	0	0
OP 30	0	0
OP 31	0	0
OP 32	0	0
OP 33	0	0
OP 34	0	0
OP 35	0	0
OP 36	0	0
OP 37	0	0

98 East Bound

0 minutes of yellow glare 0 minutes of green glare

98 East Bound Left

0 minutes of yellow glare 0 minutes of green glare

98 West Bound

0 minutes of yellow glare 0 minutes of green glare

Drew North Bound

0 minutes of yellow glare 0
minutes of green glare

Drew South Bound

0 minutes of yellow glare 0
minutes of green glare

Kubler East Bound

0 minutes of yellow glare 0
minutes of green glare

Kubler West Bound

0 minutes of yellow glare 0
minutes of green glare

Pulliam North Bound

0 minutes of yellow glare 0
minutes of green glare

Pulliam South Bound

0 minutes of yellow glare 0
minutes of green glare

Residential Receptor: OP 1

0 minutes of yellow glare 0
minutes of green glare

Residential Receptor: OP 2

0 minutes of yellow glare 0
minutes of green glare

Residential Receptor: OP 3

0 minutes of yellow glare 0
minutes of green glare

Residential Receptor: OP 4

0 minutes of yellow glare

0 minutes of green glare

Residential Receptor: OP 5

0 minutes of yellow glare 0
minutes of green glare

Residential Receptor: OP 6

0 minutes of yellow glare 0
minutes of green glare

Residential Receptor: OP 7

0 minutes of yellow glare 0
minutes of green glare

Residential Receptor: OP 8

0 minutes of yellow glare 0
minutes of green glare

Residential Receptor: OP 9

0 minutes of yellow glare 0
minutes of green glare

Residential Receptor: OP 10

0 minutes of yellow glare 0
minutes of green glare

Residential Receptor: OP 11

0 minutes of yellow glare 0
minutes of green glare

Residential Receptor: OP 12

0 minutes of yellow glare 0
minutes of green glare

Residential Receptor: OP 13

0 minutes of yellow glare 0
minutes of green glare

Residential Receptor: OP 14

0 minutes of yellow glare 0
minutes of green glare

Residential Receptor: OP 15

0 minutes of yellow glare 0
minutes of green glare

Residential Receptor: OP 16

0 minutes of yellow glare 0
minutes of green glare

Residential Receptor: OP 17

0 minutes of yellow glare 0
minutes of green glare

Motorist Receptor: OP 18

0 minutes of yellow glare 0
minutes of green glare

Motorist Receptor: OP 19

0 minutes of yellow glare 0
minutes of green glare

Motorist Receptor: OP 20

0 minutes of yellow glare 0
minutes of green glare

Motorist Receptor: OP 21

0 minutes of yellow glare 0
minutes of green glare

Motorist Receptor: OP 22

0 minutes of yellow glare 0
minutes of green glare

Motorist Receptor: OP 23

0 minutes of yellow glare 0
minutes of green glare

Motorist Receptor: OP 24

0 minutes of yellow glare 0 minutes of green glare

Motorist Receptor: OP 25

0 minutes of yellow glare 0 minutes of green glare

Motorist Receptor: OP 26

0 minutes of yellow glare 0 minutes of green glare

Motorist Receptor: OP 27

0 minutes of yellow glare 0 minutes of green glare

Motorist Receptor: OP 28

0 minutes of yellow glare 0 minutes of green glare

Motorist Receptor: OP 29

0 minutes of yellow glare 0 minutes of green glare

Motorist Receptor: OP 30

0 minutes of yellow glare 0 minutes of green glare

Motorist Receptor: OP 31

0 minutes of yellow glare 0 minutes of green glare

Motorist Receptor: OP 32

0 minutes of yellow glare 0 minutes of green glare

Motorist Receptor: OP 33

0 minutes of yellow glare 0
minutes of green glare

Motorist Receptor: OP 34

0 minutes of yellow glare 0
minutes of green glare

Motorist Receptor: OP 35

0 minutes of yellow glare 0
minutes of green glare

Motorist Receptor: OP 36

0 minutes of yellow glare 0
minutes of green glare

Motorist Receptor: OP 37

0 minutes of yellow glare 0
minutes of green glare

Results for: PV array 2

Receptor	Green Glare (min)	Yellow Glare (min)
98 East Bound	0	0
98 East Bound Left	0	0
98 West Bound	0	0
Drew North Bound	0	0
Drew South Bound	0	0
Kubler East Bound	0	0
Kubler West Bound	0	0
Pulliam North Bound	0	0
Pulliam South Bound	0	0
OP 1	0	0
OP 2	0	0
OP 3	0	0
OP 4	0	0
OP 5	0	0
OP 6	0	0
OP 7	0	0

Receptor	Green Glare (min)	Yellow Glare (min)
OP 8	0	0
OP 9	0	0
OP 10	0	0
OP 11	0	0
OP 12	0	0
OP 13	0	0
OP 14	0	0
OP 15	0	0
OP 16	0	0
OP 17	0	0
OP 18	0	0
OP 19	0	0
OP 20	0	0
OP 21	0	0
OP 22	0	0
OP 23	0	0
OP 24	0	0
OP 25	0	0
OP 26	0	0
OP 27	0	0
OP 28	0	0
OP 29	0	0
OP 30	0	0
OP 31	0	0
OP 32	0	0
OP 33	0	0
OP 34	0	0
OP 35	0	0
OP 36	0	0
OP 37	0	0

98 East Bound

0 minutes of yellow glare 0 minutes of green glare

98 East Bound Left

0 minutes of yellow glare 0 minutes of green glare

98 West Bound

0 minutes of yellow glare 0
minutes of green glare

Drew North Bound

0 minutes of yellow glare 0
minutes of green glare

Drew South Bound

0 minutes of yellow glare 0
minutes of green glare

Kubler East Bound

0 minutes of yellow glare 0
minutes of green glare

Kubler West Bound

0 minutes of yellow glare 0
minutes of green glare

Pulliam North Bound

0 minutes of yellow glare 0
minutes of green glare

Pulliam South Bound

0 minutes of yellow glare 0
minutes of green glare

Residential Receptor: OP 1

0 minutes of yellow glare 0
minutes of green glare

Residential Receptor: OP 2

0 minutes of yellow glare 0
minutes of green glare

Residential Receptor: OP 3

0 minutes of yellow glare

0 minutes of green glare

Residential Receptor: OP 4

0 minutes of yellow glare 0
minutes of green glare

Residential Receptor: OP 5

0 minutes of yellow glare 0
minutes of green glare

Residential Receptor: OP 6

0 minutes of yellow glare 0
minutes of green glare

Residential Receptor: OP 7

0 minutes of yellow glare 0
minutes of green glare

Residential Receptor: OP 8

0 minutes of yellow glare 0
minutes of green glare

Residential Receptor: OP 9

0 minutes of yellow glare 0
minutes of green glare

Residential Receptor: OP 10

0 minutes of yellow glare 0
minutes of green glare

Residential Receptor: OP 11

0 minutes of yellow glare 0
minutes of green glare

Residential Receptor: OP 12

0 minutes of yellow glare 0
minutes of green glare

Residential Receptor: OP 13

0 minutes of yellow glare 0
minutes of green glare

Residential Receptor: OP 14

0 minutes of yellow glare 0
minutes of green glare

Residential Receptor: OP 15

0 minutes of yellow glare 0
minutes of green glare

Residential Receptor: OP 16

0 minutes of yellow glare 0
minutes of green glare

Residential Receptor: OP 17

0 minutes of yellow glare 0
minutes of green glare

Residential Receptor: OP 18

0 minutes of yellow glare 0
minutes of green glare

Motorist Receptor: OP 19

0 minutes of yellow glare 0
minutes of green glare

Motorist Receptor: OP 20

0 minutes of yellow glare 0
minutes of green glare

Motorist Receptor: OP 21

0 minutes of yellow glare 0
minutes of green glare

Motorist Receptor: OP 22

0 minutes of yellow glare

0 minutes of green glare

Motorist Receptor: OP 23

0 minutes of yellow glare 0
minutes of green glare

Motorist Receptor: OP 24

0 minutes of yellow glare 0
minutes of green glare

Motorist Receptor: OP 25

0 minutes of yellow glare 0
minutes of green glare

Motorist Receptor: OP 26

0 minutes of yellow glare 0
minutes of green glare

Motorist Receptor: OP 27

0 minutes of yellow glare 0
minutes of green glare

Motorist Receptor: OP 28

0 minutes of yellow glare 0
minutes of green glare

Motorist Receptor: OP 29

0 minutes of yellow glare 0
minutes of green glare

Motorist Receptor: OP 30

0 minutes of yellow glare 0
minutes of green glare

Motorist Receptor: OP 31

0 minutes of yellow glare 0
minutes of green glare

Motorist Receptor: OP 32

0 minutes of yellow glare 0
minutes of green glare

Motorist Receptor: OP 33

0 minutes of yellow glare 0
minutes of green glare

Motorist Receptor: OP 34

0 minutes of yellow glare 0
minutes of green glare

Motorist Receptor: OP 35

0 minutes of yellow glare 0
minutes of green glare

Motorist Receptor: OP 36

0 minutes of yellow glare 0
minutes of green glare

Motorist Receptor: OP 37

0 minutes of yellow glare 0
minutes of green glare

Assumptions

"Green" glare is glare with low potential to cause an after-image (flash blindness) when observed prior to a typical blink response time. "Yellow" glare is glare with potential to cause an after-image (flash blindness) when observed prior to a typical blink response time. Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.

Glare analyses do not account for physical obstructions between reflectors and receptors. This includes buildings, tree cover and geographic obstructions.

The glare hazard determination relies on several approximations including observer eye characteristics, angle of view, and typical blink response time. Actual values may differ.

Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid based on aggregated research data. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.

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APPENDIX C

DRAFT TRAFFIC IMPACT ANALYSIS

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Drew Solar Farm
County of Imperial (SR-98 at Drew Road)
August 9, 2018

Draft Traffic Impact Analysis

Prepared for:

Drew Solar, LLC
PO Box 317
El Centro, CA 92244

Prepared by Justin Rasas (RCE 60690), a principal with:

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11622 El Camino Real, Suite 100, San Diego, CA 92130
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Job #1734

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Appendices

1.0 Introduction

The purpose of this study is to determine and analyze potential traffic impacts for the proposed Drew Solar Project. The project is a solar photovoltaic energy-generating and energy storage facility of approximately 100 megawatts of electricity on approximately 855 gross acres and 762.8 net acres of lands that have been used for agriculture. The project is located approximately 6.5 miles southwest of the city of El Centro and approximately 7.5 miles west of Calexico, California. The location of the project is shown in **Figure 1**. A site plan is included in **Figure 2**.

This report describes the existing roadway network in the vicinity of the project site. It includes a review of the existing and proposed traffic activities for weekday peak AM and PM periods and daily traffic conditions. The format of this study includes the following chapters:

1.0 Introduction
2.0 Study Methodology
3.0 Existing Conditions
4.0 Project Description
5.0 Cumulative Projects
6.0 Existing Year 2017 + Project Conditions
7.0 Existing Year 2017 + Project Construction + Cumulative Conditions
8.0 Near-Term 2019 Conditions
9.0 Near-Term Year 2019 + Project Conditions
10.0 Near-Term Year 2019 + Project + Cumulative Conditions
11.0 Long-Term Year 2027 Conditions
12.0 Long-Term Year 2027 + Project Conditions
13.0 Long-Term Year 2027 Cumulative Projects
14.0 Long-Term Year 2027 + Project + Cumulative Conditions
15.0 Horizon Year 2060 Conditions
16.0 Conclusions and Recommendations
17.0 References

Figure 1: Project Location

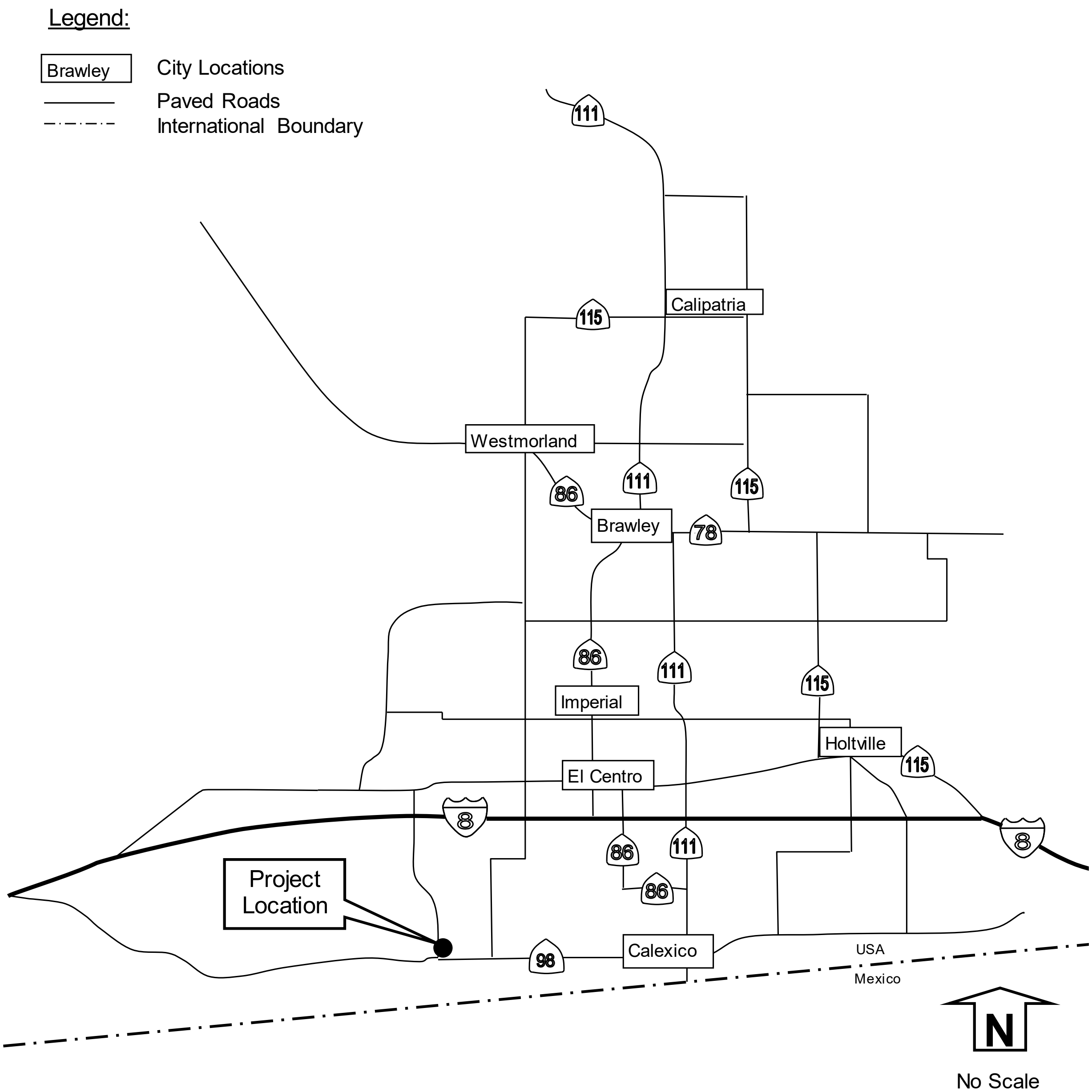
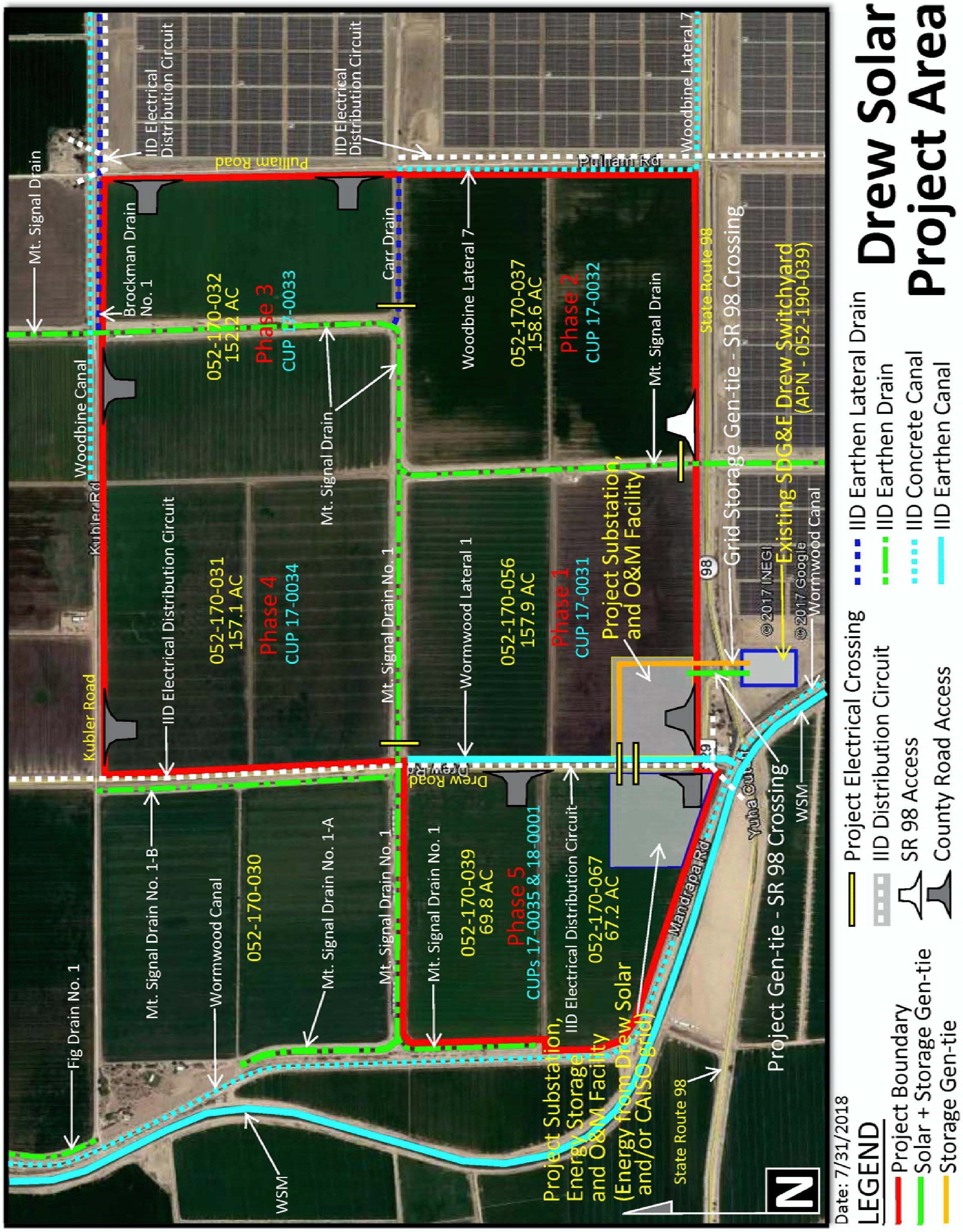


Figure 2: Site Plan



2.0 Traffic Analysis Methodology and Significance Criteria

The parameters by which this traffic study was prepared included the determination of what intersections and roadways are to be analyzed, the scenarios to be analyzed and the methods required for analysis. The criteria for each of these parameters are included herein.

2.1 Study Area Criteria

The study area is determined based on the County of Imperial Department of Public Works *Traffic Study and Report Policy* dated March 12, 2007, revised June 29, 2007 and approved by the Board of Supervisors of the County of Imperial on August 7, 2007 ("Traffic Study and Report Policy"). "Any project that has the potential to degrade an existing road section, an existing signalized intersection, or an existing unsignalized intersection to below the existing level of service or to cause it to be lower than a level of service (LOS) "C" during any peak hour, using the HCM Methods of analysis on any individual, existing traffic movement." Traffic Study and Report Policy, 4-5. The project study area was determined based on similar solar projects in the same general area. The following intersections and project driveways on SR-98 were analyzed as part of this study:

1) Forrester Road/I-8 WB Ramp (un-signalized)
2) Forrester Road/I-8 EB Ramp (un-signalized)
3) Forrester Road/McCabe Road (un-signalized)
4) Kubler Road/Pulliam Road (un-signalized)
5) Kubler Road/Brockman Road (un-signalized)
6) SR-98/Drew Road (un-signalized)
7) SR-98/Pulliam Road (un-signalized)
8) SR-98/Project Driveway (currently does not exist)

Along with the following roadway and State Route segments:

1) Brockman Road from McCabe Road to Kubler Road
2) Forrester Road from I-8 to McCabe Road
3) Kubler Road from Pulliam Road to Brockman Road
4) McCabe Road from Brockman Road to Forrester Road
5) Pulliam Road from Kubler Road to SR-98
6) SR-98 between Drew Road and Pulliam Road
7) SR-98 between Pulliam Road and Brockman Road

And, the following Freeway (also referred to as Interstate) segments:

1) I-8 between Dunaway Road and Drew Road
2) I-8 between Forrester Road and Imperial Avenue

2.2 Scenario Criteria

The number of scenarios to be analyzed is based on the methodology outlined in the County's Traffic Study and Report Policy. Excerpts from the Traffic Study and Report Policy showing the scenario criteria are included in **Appendix A**. Based on the aforementioned methodology source and to account for the possibility that the project may be phased, the following scenarios were analyzed:

1) Existing 2017 Conditions
2) Existing 2017 + Project Conditions
3) Existing 2017 + Project + Cumulative Conditions
4) Near-Term Year 2019 Conditions
5) Near-Term Year 2019 + Project Conditions
6) Near-Term Year 2019 + Project + Cumulative Conditions
7) Long-Term Year 2027 Conditions
8) Long-Term Year 2027 + Project Conditions
9) Long-Term Year 2027 + Project + Cumulative Conditions
10) Horizon Year 2060 Conditions

Please note that there is not a separate analysis of phased construction of the project because such phasing is captured within the bookend analysis provided by near- and long-term project forecasts.

2.3 Traffic Analysis Criteria

The traffic analyses herein utilize the *2010 Highway Capacity Manual* (HCM) published by the Transportation Research Board National Research Council. Specifically, the operations analysis is based on Level of Service (LOS) evaluation criteria. The operating conditions of the study intersections are measured using the HCM LOS designations ranging from A through F where LOS A represents the best operating condition and LOS F denotes the worst operating condition. The individual LOS criteria for each roadway component are described below.

2.3.1 Intersections

The study intersections were analyzed based on the **operational analysis** outlined in the HCM. This process defines LOS in terms of **average control delay** per vehicle, which is measured in seconds. LOS at the intersections were calculated using the computer software program Synchro 10 (Trafficware Corporation). The HCM LOS for the range of delay by seconds for un-signalized and signalized intersections is described in **Table 1**.

TABLE 1: INTERSECTION LEVEL OF SERVICE DEFINITIONS (HCM 2010)

Level of Service	Un-Signalized (TWSC and AWSC) Control Delay (seconds/vehicle)	Signalized Control Delay (seconds/vehicle)
A	0-10	≤ 10
B	> 10-15	> 10-20
C	> 15-25	> 20-35
D	> 25-35	> 35-55
E	> 35-50	> 55-80
F	> 50	> 80

TWSC: Two Way Stop Control. AWSC: All Way Stop Control. Source: Highway Capacity Manual 2010 (exhibit 19-1 for two way stop control, exhibit 20-2 for all way stop control, and exhibit 18-4 for signalized intersections).

According to the California Department of Transportation's (Caltrans) *Guide for the Preparation of Traffic Impact Studies,* December 2002 ("Caltrans Guide"), the accepted methodology for un-signalized intersections is that contained in the most current edition of the HCM (excerpts included in **Appendix B)**. Therefore, all of the study interchanges with un-signalized intersections were analyzed using the most currently used edition of the HCM.

2.3.2 Roadway and State Route Segments

The roadway and State Route segments were analyzed based on the functional classification of the roadway using the Imperial County Standard Street Classification capacity lookup table (copy included in **Appendix C**). The capacity for State Route 98 in the project vicinity is based on a "Local Collector" as noted in the Imperial County *Circulation and Scenic Highways Element* dated January 29, 2008 ("Circulation Element"). The roadway segment capacity and LOS standards used to analyze roadway segments are summarized in **Table 2**.

TABLE 2: ROADWAY SEGMENT DAILY CAPACITY AND LOS (IMPERIAL COUNTY)

Circulation Element Road Classification	CROSS SECTION	LOS A	LOS B	LOS C	LOS D	LOS E
Expressway	154/210	<30,000	<42,000	<60,000	<70,000	<80,000
Prime Arterial	106/136	<22,200	<37,000	<44,600	<50,000	<57,000
Minor Arterial	82/102	<14,800	<24,700	<29,600	<33,400	<37,000
Major Collector (Collector)	64/84	<13,700	<22,800	<27,400	<30,800	<34,200
Minor Collector (Local Collector)	40/70	<1,900	<4,100	<7,100	<10,900	<16,200
Local County (Residential)	40/60	*	*	<1,500	*	*
Local County (Residential Cul-de-Sac or Loop Street)	40/60	*	*	<200	*	*
Major Industrial Collector – (Industrial)	76/96	<5,000	<10,000	<14,000	<17,000	<20,000
Industrial Local	44/64	<2,500	<5,000	<7,000	<8,500	<10,000

Source: Imperial County Department of Planning & Development Services *Circulation and Scenic Highways Element* January 29, 2008. Notes: *Levels of service are not applied to residential streets since their primary purpose is to serve abutting lots, not carry through traffic. Levels of service normally apply to roads carrying through traffic between major trip generators and attractors.

2.3.3 Freeway Segments

The freeway segments, covering Interstate 8, were analyzed based on a multilane highway LOS criteria using a Volume to Capacity (V/C) ratio as outlined in the HCM. The V/C ratio is the ratio of traffic to the roadway capacity that provides a measure of how much roadway capacity is being used. The methodology accepted by Caltrans for the analysis of freeway sections is to use the most current edition of the HCM as noted on page 5 of the Caltrans Guide. The freeway LOS operations are based on the Caltrans Guide V/C ratios summarized below in **Table 3**. Relevant excerpts from the Caltrans Guide are included in **Appendix D**.

TABLE 3: FREEWAY LEVEL OF SERVICE

Measure of Effectiveness	LOS A	LOS B	LOS C	LOS D	LOS E
Max Volume/Capacity Ratio	0.30	0.50	0.71	0.89	1.00

Source: Caltrans' *Guide for the Preparation of Traffic Impact Studies,* December 2002.

2.4 Significance Criteria

The significance criteria for traffic impacts are based on the Imperial County Planning & Development Services Department LOS standard as outlined in the "Circulation Element". "The County's goal for an acceptable traffic service standard on an Average Daily Traffic (ADT) basis and during AM and PM peak periods for all County-Maintained Roads shall be LOS C for all street segment links and intersections." Circulation Element, 55. Excerpts from the *Circulation and Scenic Highways Element* are included in **Appendix E**. The determination of direct or cumulative traffic impacts is defined by the significance criteria outlined in **Table 4**, which was obtained from several EIRs for projects located in Imperial County. Copies of traffic significance criteria from these project EIRs are included in **Appendix F**.

TABLE 4: SIGNIFICANCE CRITERIA

Existing	Existing + Project	Existing + Project + Cumulative Projects	Impact Type
	Intersections		
LOS C or better	LOS C or better	LOS C or better	None
LOS C or better	LOS D or worse	NA	Direct
LOS D	LOS D and adds 2.0 seconds or more of delay	LOS D or worse	Cumulative
LOS D	LOS E or F	NA	Direct
LOS E	LOS F	NA	Direct
LOS F	LOS F and delay increases by ≥ 10.0 seconds	LOS F	Direct
Any LOS	Project does not degrade LOS and adds < 2.0 seconds of delay	Any LOS	None
Any LOS	Project does not degrade LOS but adds 2.0 to 9.9 seconds of delay	LOS E or worse	Cumulative
	Segments		
LOS C or better	LOS C or better	LOS C or better	None
LOS C or better	LOS C or better and v/c > 0.02	LOS D or worse	Cumulative
LOS C or better	LOS D or worse	NA	Direct (1)
LOS D	LOS D and v/c > 0.02	LOS D or worse	Cumulative
LOS D	LOS E or F	NA	Direct
LOS E	LOS F	NA	Direct
LOS F	LOS F and v/c increases by >0.09	LOS F	Direct
Any LOS	LOS E or worse & v/c 0.02 to 0.09	LOS E or worse	Cumulative
Any LOS	LOS E or worse and v/c < 0.02	Any LOS	None

Notes: LOS: Level of Service. (1) Exception: post-project segment operation is LOS D and intersections along segment are LOS D or better resulting in no significant impact. NA: Not Applicable.

2.5 Study Limitations

The findings and recommendations of this report were prepared in accordance with generally accepted professional traffic and transportation engineering principles and practice, and California Environmental Quality Act (CEQA) based on substantial evidence. No other warranty, express or implied, is made.

3.0 Existing Conditions

This section describes the study area street system, peak hour intersection volumes, daily roadway volumes, and existing LOS.

3.1 Existing Street System

The existing roadway system and classifications are described below. The classifications are based on the Imperial County's Circulation Element and valid as of the date of the Project's Notice of Preparation of the EIR. Excerpts are included in **Appendix G**.

Brockman Road between McCabe Road and Kubler Road has a classification of Major Collector in the Circulation Element. This roadway is currently constructed as a 2 lane undivided roadway.

Forrester Road between I-8 and McCabe Road has a classification of Prime Arterial in the Circulation Element. This roadway is currently constructed as a 2 lane undivided roadway.

Interstate 8 (I-8) between Drew Road and Imperial Avenue is constructed as a 4 lane divided interstate highway with 2 lanes in each direction.

Kubler Road between Pulliam Road and Brockman Road has a classification of Minor Collector in the Circulation Element. This roadway is currently constructed as a 2 lane undivided roadway.

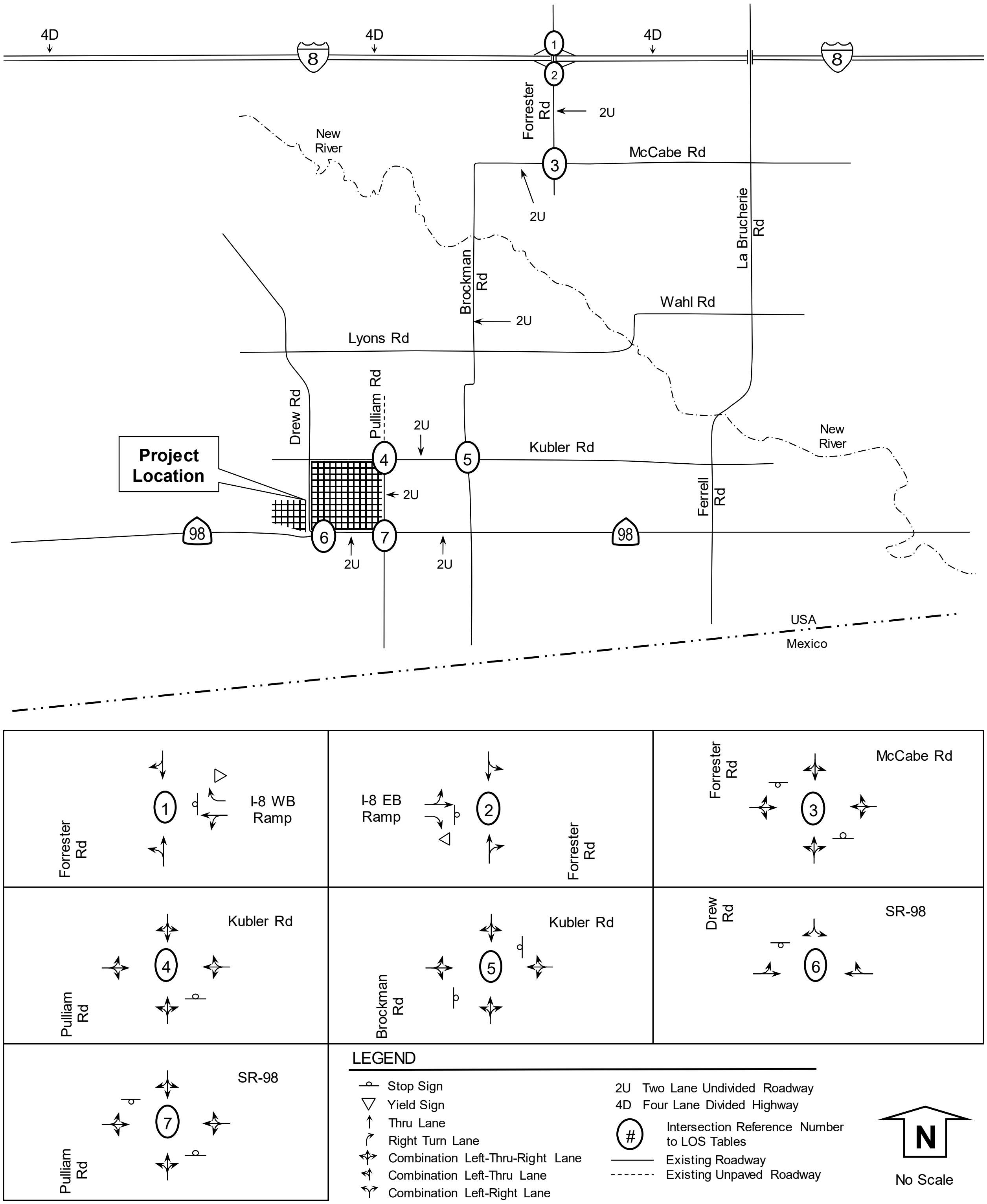
McCabe Road between Brockman Road and Forrester Road has a classification of Major Collector in the Circulation Element. This roadway is currently constructed as a 2 lane undivided roadway.

Pulliam Road between Kubler Road and SR-98 has a classification of Minor Collector in the Circulation Element. This roadway is currently constructed as a 2 lane undivided roadway.

State Route (SR-98) between Drew Road and Clark Road has a classification of State Highway in the Circulation Element. This roadway is currently constructed as a 2 lane undivided roadway.

The existing roadway conditions are shown in **Figure 3**.

Figure 3: Existing Roadway Conditions



3.2 Existing Traffic Volumes and LOS Analyses

Existing peak hour intersection volumes (with count dates) were collected from 6:00 to 8:00 AM and from 4:00 to 6:00 PM for this study:

1) Forrester Road/I-8 WB Ramp (Tuesday 11/4/2017)
2) Forrester Road/I-8 EB Ramp (Tuesday 11/4/2017)
3) Forrester Road/McCabe Road (Tuesday 11/4/2017)
4) Kubler Road/Pulliam Road (Tuesday 11/4/2017)
5) Kubler Road/Brockman Road (Tuesday 11/4/2017)
6) SR-98/Drew Road (Tuesday 11/4/2017)
7) SR-98/Pulliam Road (Tuesday 11/4/2017)
8) SR-98/Project Driveway (currently does not exist)

Twenty-four hours of data were collected for the following roadway segments:

1) Brockman Road from McCabe Road to Kubler Road (Tuesday 11/4/2017)
2) Forrester Road from I-8 to McCable Road (Tuesday 11/4/2017)
3) Kubler Road from Pulliam Road to Brockman Road (Tuesday 11/4/2017)
4) McCabe Road from Brockman Road to Forrester Road (Tuesday 11/4/2017)
5) Pulliam Road from Kubler Road to SR-98 (Tuesday 11/4/2017)

In addition, the data was obtained from Caltrans for the Freeway (Interstate) and State Route segments below. Please note that the latest available Caltrans data from 2016 was factored up to a year 2017 volume using a 1.8% annual growth factor [details included in Section 8.0 of this TIA].

1) I-8 between Dunaway Road and Drew Road
2) I-8 between Forrester Road and Imperial Avenue
3) SR-98 between Drew Road and Pulliam Road
4) SR-98 between Pulliam Road and Brockman Road

Existing AM, PM, and daily volumes are shown on **Figure 4**. Count data are included in **Appendix H**. The intersection, segment, and freeway LOS are shown in **Tables 5, 6, and 7** respectively. Intersections LOS calculations are included in **Appendix I**.

Figure 4: Existing Volumes

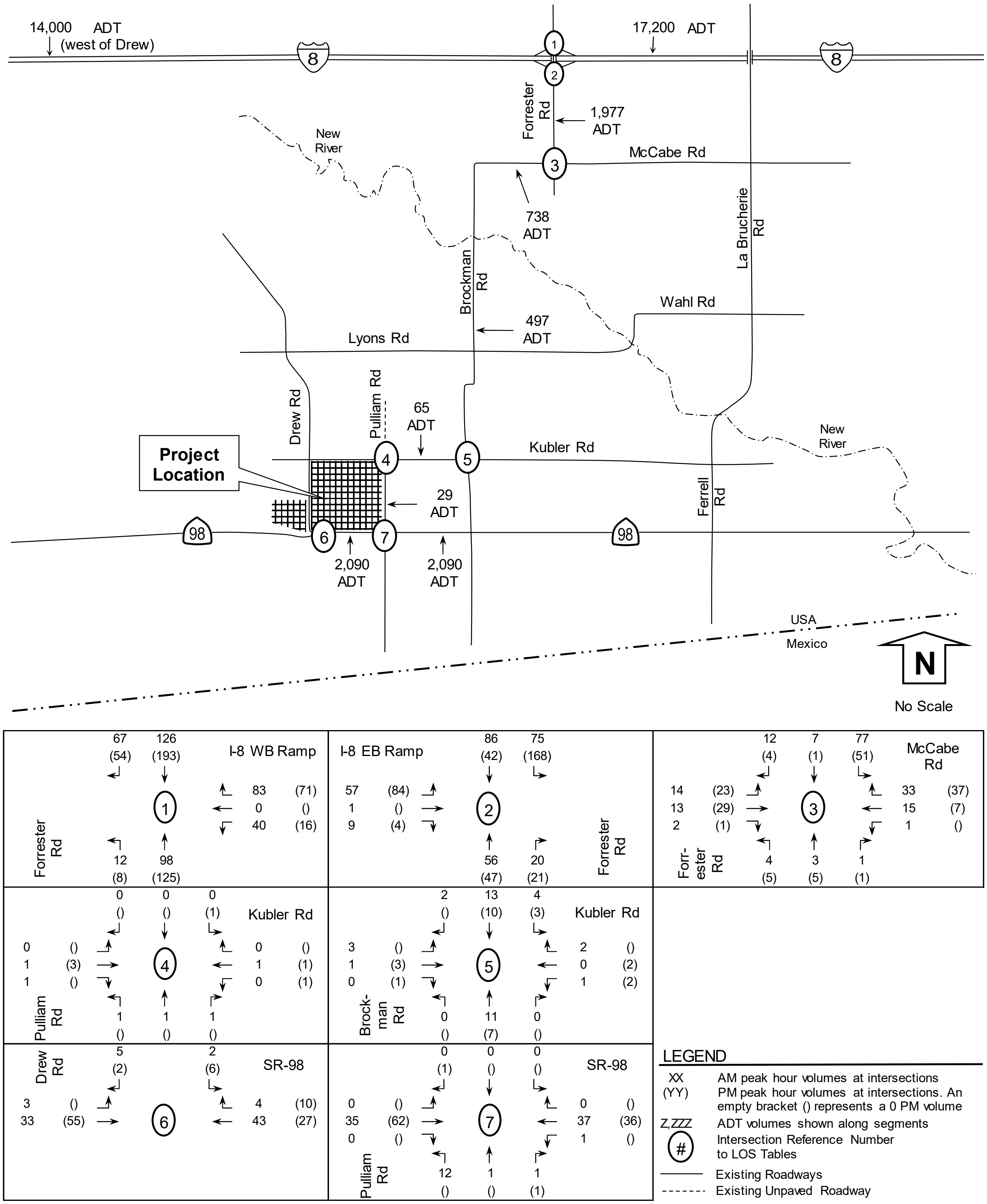


TABLE 5: EXISTING INTERSECTION LOS

Intersection & (Control)[1]	Movement	Peak Hour	Year 2017 Delay[2]	Year 2017 LOS[3]
1) Forrester Rd at I-8 WB Ramp (U)	Minor Leg	AM	9.7	A
		PM	9.6	A
2) Forrester Rd at I-8 EB Ramp (U)	Minor Leg	AM	11.1	B
		PM	13.6	B
3) Forrester Rd at McCabe Rd (U)	Minor Leg	AM	9.5	A
		PM	9.5	A
4) Pulliam Rd at Kubler Rd (U)	Minor Leg	AM	8.6	A
		PM	8.6	A
5) Brockman Rd at Kubler Rd (U)	Minor Leg	AM	8.9	A
		PM	9.0	A
6) Drew Rd at SR-98 (U)	Minor Leg	AM	8.7	A
		PM	8.9	A
7) Pulliam Rd at SR-98 (U)	Minor Leg	AM	9.0	A
		PM	8.6	A

Notes: 1) Intersection Control - (S) Signalized, (U) Unsignalized. 2) Delay - HCM Average Control Delay in seconds.
3) LOS: Level of Service. Minor Leg: approach LOS of minor/lesser roadway. All: combined LOS for all approaches.

TABLE 6: EXISTING ROADWAY AND STATE ROUTE LOS

Segment	Classification (as built)	Year 2017 Daily Volume	# of lanes	LOS C Capacity	V/C	LOS
Brockman Road						
McCabe Rd to Kubler Rd	Major (2U)	497	2	7,100	0.07	A
Forrester Road						
I-8 to McCabe Rd	Prime (2U)	1,977	2	7,100	0.28	B
Kubler Road						
Brockman Rd to Ferrell Rd	Minor (2U)	65	2	7,100	0.01	A
McCabe Road						
Brockman Rd to Forrester Rd	Major (2U)	738	2	7,100	0.10	A
Pulliam Road						
Kubler Rd to SR-98	Minor (2U)	29	2	7,100	0.00	A
SR-98						
Drew Rd to Pulliam Rd	State Highway (2U)	2,090	2	7,100	0.29	B
Pulliam Rd to Brockman Rd	State Highway (2U)	2,090	2	7,100	0.29	B

Notes: Classification based on 1/29/08 Circulation and Scenic Highways Element. 2U = 2 lane undivided roadway. Daily volume is a 24 hour volume. LOS: Level of Service. LOS based on actual number of lanes currently constructed. V/C: Volume to Capacity ratio.

TABLE 7: EXISTING FREEWAY LOS

Freeway Segment	I-8 Dunaway Rd to Drew Rd				I-8 Forrester Rd to Imperial Ave			
Forecasted Year 2017								
ADT	14,000				17,200			
Peak Hour	A M		P M		A M		P M	
Direction	EB	WB	EB	WB	EB	WB	EB	WB
Number of Lanes	2	2	2	2	2	2	2	2
Capacity (1)	4,700	4,700	4,700	4,700	4,700	4,700	4,700	4,700
K Factor (2)	0.1346	0.1346	0.1631	0.1631	0.1346	0.1346	0.1631	0.1631
D Factor (3)	0.4770	0.5230	0.4958	0.5042	0.4770	0.5230	0.4958	0.5042
Truck Factor (4)	0.8712	0.8712	0.8712	0.8712	0.8376	0.8376	0.8376	0.8376
Peak Hour Volume	1,032	1,131	1,299	1,321	1,318	1,446	1,661	1,689
Volume to Capacity	0.220	0.241	0.276	0.281	0.281	0.308	0.353	0.359
LOS	A	A	A	A	A	B	B	B

Notes: (1) Capacity of 2,350 pcphpl from CALTRANS' Guide for the Preparation of Traffic Impact Studies, December 2002. (2) Latest K factor from Caltrans (based on 2015 report), which is the percentage of AADT in both directions. (3) Latest D factor from Caltrans (based on 2015 report), which when multiplied by K and ADT will provide peak hour volume. (4) Latest truck factor from Caltrans (based on 2016 report).

Under existing conditions, the study intersections, roadways, State Route, and freeway were calculated to operate at LOS B or better.

4.0 Project Description

The project is a solar photovoltaic energy-generating and energy storage facility of approximately 100 megawatts of electricity on approximately 855 gross acres and 762.8 net acres of lands that have been used for agriculture. The project site is located approximately 6.5 miles southwest of the city of El Centro and approximately 7.5 miles west of Calexico, California.

4.1 Project Trip Generation and Phases/Phasing

The project trip generation consists of a construction phase and operations phase. The construction phase will have the highest number of trips followed by an operations phase with significantly fewer trips. This section describes the construction and operations trip generation. Traffic details for the project are included in **Appendix J**.

The project may be constructed at one time taking approximately 18 months or it may be completed over a ten-year period. Under the development agreement, the Conditional Use Permit (CUP) will be valid for 40 years with up to 10 years to commence construction. If construction is to commence immediately after approvals, the project could have the highest concentration of workers in year 2019. If delayed due to market forces, the project could have the highest concentration of construction workers in year 2027. The project may also be phased (e.g., 20 MW constructed at a time or 1/5 of the overall project) that would result in a lower concentration of construction workers and less trip generation. However, to be conservative, the entire project (100 MW) was analyzed under year 2019 and year 2027 conditions assuming an 18-month construction period.

4.1.1 Project Construction Trip Generation

Construction of the project includes site preparation, foundation construction, delivery of equipment and supplies, erection of major equipment and structures, installation of control systems, and start-up/testing. These construction activities are expected to require approximately 18 months.

According to the applicant, the construction workforce may reach the highest concentration in late 2019 (for the near-term scenario) with an average of 250 workers per day. Based on the applicant's experience, about 75% of the workers follow a 4 day at 10 hours per day (4-10 shift) schedule, about 25% follow a 5 day at 8 hours per day (5-8 shift) schedule, and roughly 25% of the workers carpool. The workers also have different start and end times between the 4-10 and 5-8 shift schedules. The 4-10 shift workers typically arrive between 6am and 7am (work starts at 7am) and depart sometime between 5pm and 6pm while the 8-5 shift workers typically arrive between 7 and 8am and depart between 4pm and 5pm.

Deliveries of equipment and supplies are anticipated to average about 10 daily truck trips per day. The HCM adjustment for heavy vehicles, such as trucks is through the application of a Passenger Car Equivalent (PCE) factor. Applying a PCE factor of 3 to the 10 daily truck trips, the PCE is 60

ADT with 6 AM peak hour trips (3 inbound and 3 outbound) and 6 PM peak hour trips (3 inbound and 3 outbound).

This analysis is based on the higher concentration (75%) of 4-10 shift workers that arrive between 6am and 7am and depart sometime between 5pm and 6pm. The combined worker and construction truck traffic is calculated at 436 ADT with 147 AM peak hour trips (144 inbound and 3 outbound) and 147 PM peak hour trips (3 inbound and 144 outbound) as shown in **Table 8**.

TABLE 8: PROJECT CONSTRUCTION TRIP GENERATION

Proposed Construction Related Traffic	ADT	6-7 AM		7-8 AM		4-5 PM		5-6 PM	
		IN	OUT	IN	OUT	IN	OUT	IN	OUT
Construction Workers on 4-10 Shift (75% of 250)[1]	282	141	0	0	0	0	0	0	141
Construction Workers on 5-8 Shift (25% of 250)[2]	94	0	0	47	0	0	47	0	0
Equipment and Construction Trucks (with PCE)[3]	60	3	3	3	3	3	3	3	3
Total Traffic During Peak Construction Period	436	144	3	50	3	3	50	3	144
Daily and Higher Peak Hour Used For Analysis	**436**	**144**	**3**					**3**	**144**

Notes: 1) Applicant estimates the 4 days at 10 hrs/day (4-10s) shift to include about 188 workers (75% of the total 250 peak work force) with about 25% carpooling (47) and riding with the 75% (141), thus the inbound is 141 trips and the ADT is 282. 2) Applicant estimates the 5 days at 8 hrs/day (5-8) shift to include about 62 workers (25% of the total 250 peak work force) with about 25% carpooling (15) and riding with the 75% (47), thus the inbound is 47 and the ADT is 94. 3) Approx. 10 daily trucks with a Passenger Car Equivalent (PCE) factor of 3 applied to each truck equals 60 ADT (10 trucks x 2 x 3 PCE = 60 ADT) that are anticipated to have a frequency of about 1 in and 1 out per hour for a peak period volume of 6 (with PCE).

4.1.2 Project Operations and Maintenance Trip Generation

According to the applicant, the operations phase is expected to generate approximately 4 to 10 trips per day from maintenance and security personnel. Based on this information, the operations and maintenance personnel are estimated to generate up to 20 ADT with approximately 2 AM and 2 PM peak hour trips. Therefore, the higher and more conservative construction trip generation is used to determine potential project impacts.

4.2 Construction Trip Distribution and Assignment

The Applicant estimates that approximately 80% of the labor pool for the construction workforce is anticipated to come from a combination of existing residents and workers that will temporarily reside within Imperial County ("Local Workforce"). The Local Workforce is anticipated to travel from Calipatria, Westmorland, Brawley, Imperial, El Centro, Holtville, and Calexico. The distribution of the construction workforce by cities/communities was based on the concentration of populations per the Census 2010 from the U.S. Census Bureau (http://2010.census.gov/2010census). The percentage of the Local Workforce by city/community and county is shown in **Table 9**.

TABLE 9: CONSTRUCTION WORKFORCE SOURCES BASED ON CENSUS 2010 POPULATIONS (80% LOCAL)

80% LOCAL WORKFORCE	2010 Census Population	Percentage of Total	Percentage of Construction Employees (80% from within Imperial County)
Calipatria	7,705	5%	4%
Westmorland	2,225	2%	1%
Brawley	24,953	18%	15%
Imperial	14,758	11%	9%
El Centro	42,598	31%	25%
Holtville	5,939	4%	3%
Calexico	38,572	28%	23%
Total	**136,750**	**100%**	**80%**

Source: Population data from U.S. Census Bureau (http://2010.census.gov/2010census).

The remaining construction workforce and deliveries will come from outside Imperial County ("Non-Local Workforce") and is estimated to be from San Diego County (15%) and Riverside County (5%). Based on the aforementioned Census information, the regional construction distribution is shown in **Figure 5**. The local distribution accounted for the project driveways throughout the project site. The local area distribution is shown in **Figure 6**. The peak (year 2019) construction trip assignment based on the aforementioned distribution is shown in **Figure 7**.

Figure 5: Regional Construction Distribution

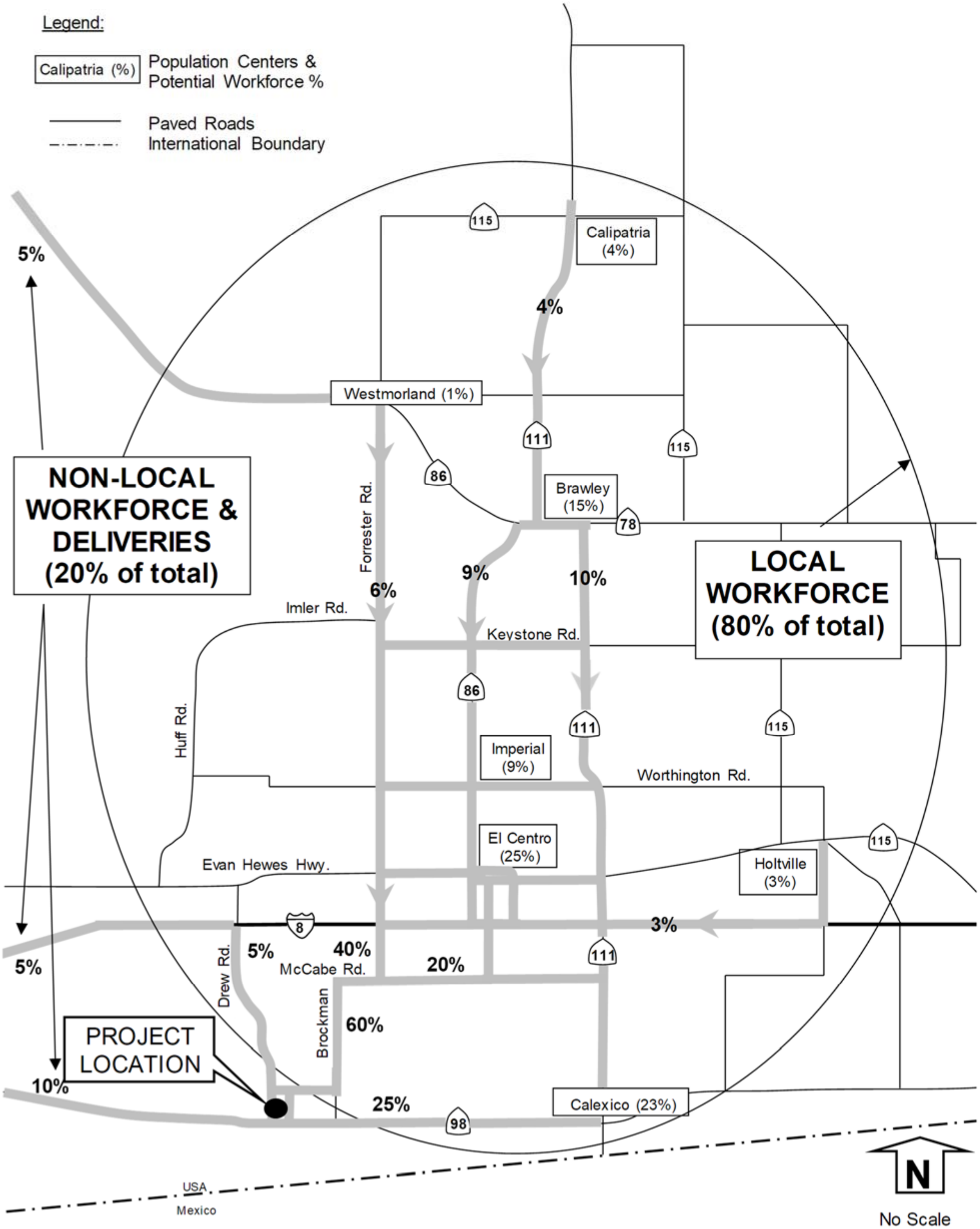


Figure 6: Local Project Construction Distribution

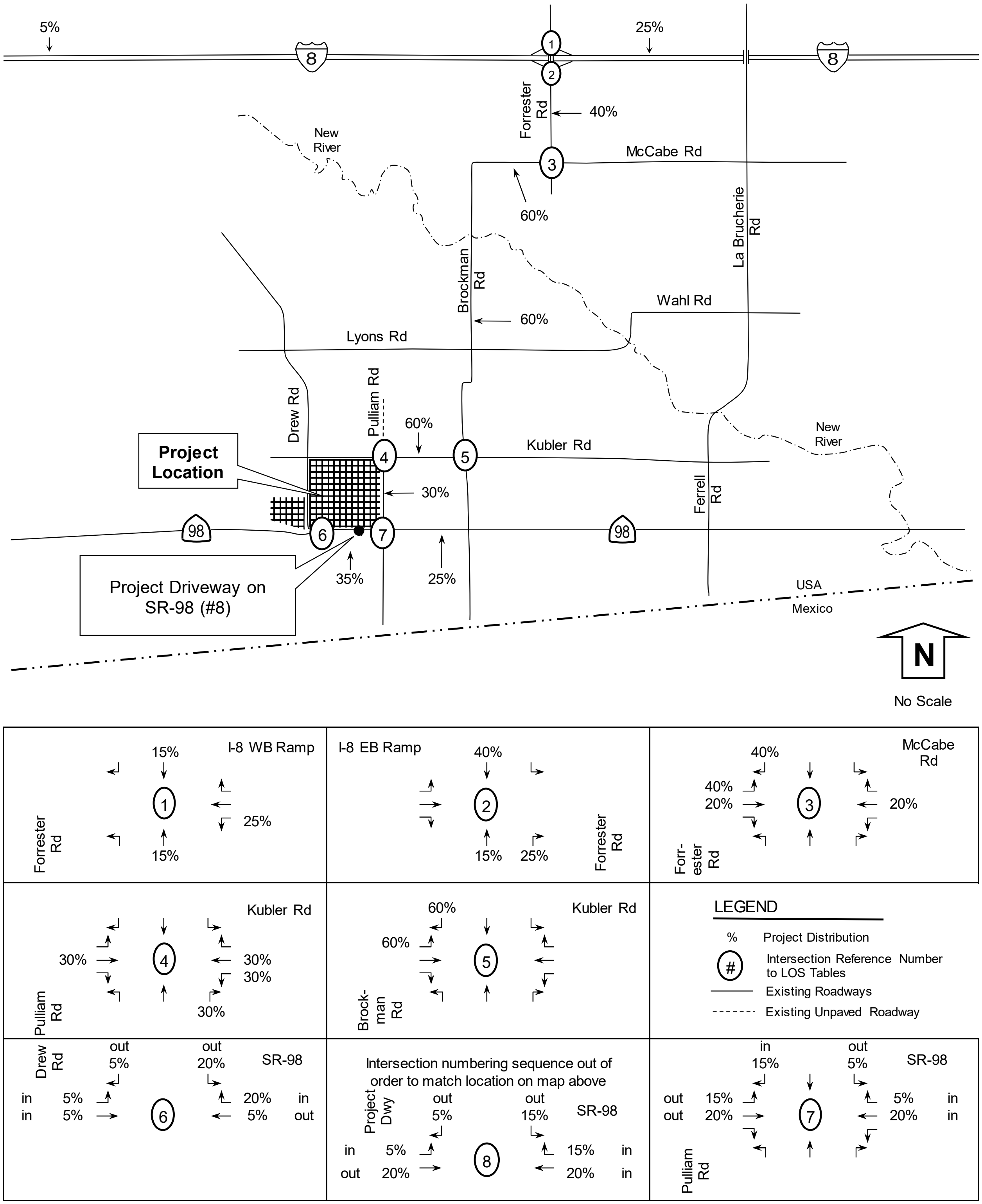
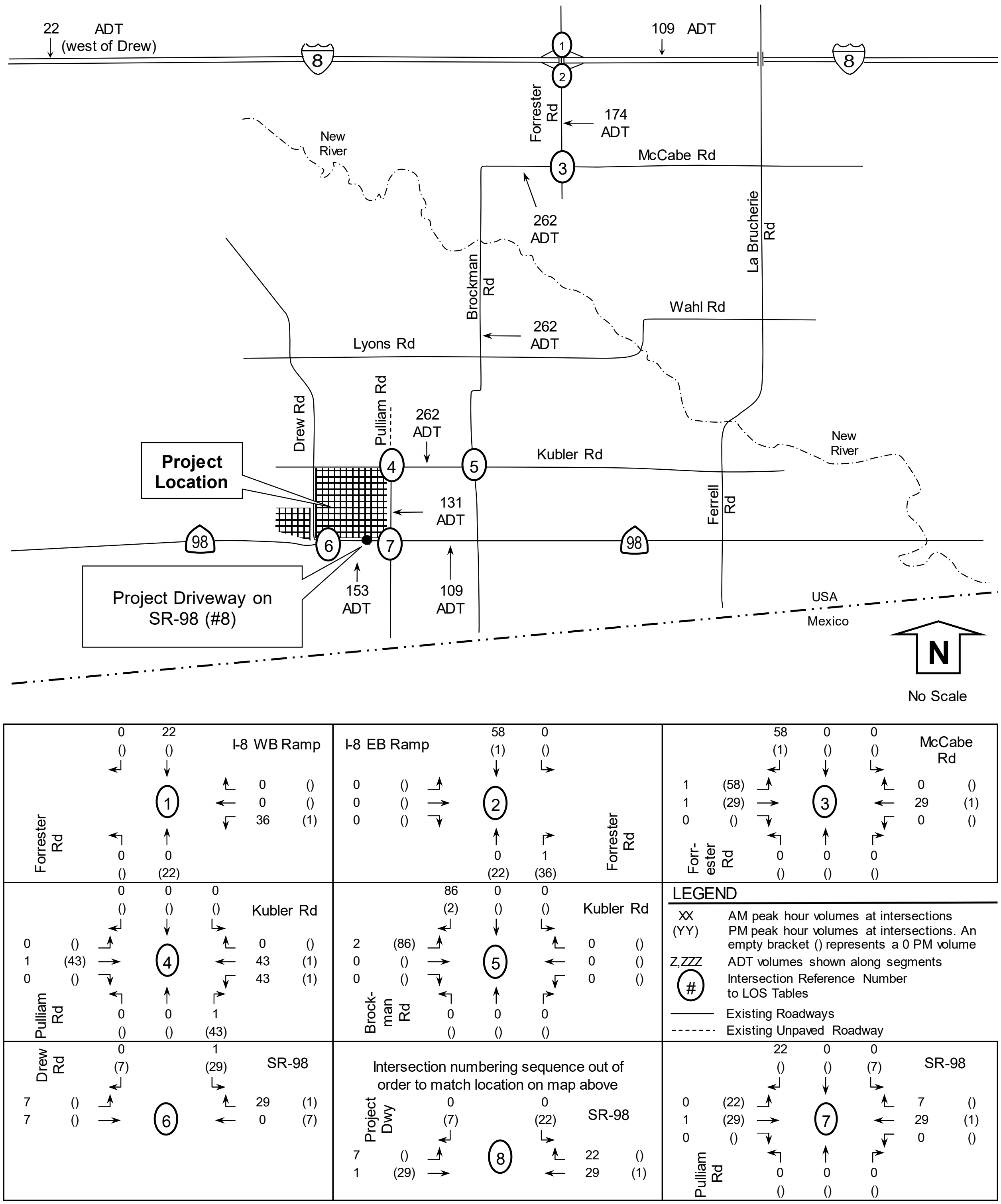


Figure 7: Project Construction Traffic



5.0 Cumulative Projects (Past, Existing & Reasonably Foreseeable New Development)

Information on cumulative projects was obtained from the County of Imperial staff in November 2017. A County of Imperial map showing planned solar farm projects is included in **Appendix K**. Please note that the Acorn solar project has been identified by County staff as being withdrawn at the time of this analysis. The cumulative list below describes the cumulative projects in the immediate area around the project site (i.e. projects that are generally located south of I-8 and west of Clark Road). Some of the cumulative projects have completed technical studies including traffic generation information; however, several have not. For the projects that do not have detailed traffic generation information, an estimate was calculated based on traffic generation information for similar projects and are noted below with an asterisk "*". Traffic generation calculations and copies of the cumulative project descriptions, locations, traffic generation, and assignments are also included in **Appendix L**. Information for each cumulative project is included below:

1) Big Rock Solar* and Laurel Solar* - a photovoltaic solar facility capable of producing approximately 200 megawatts of electricity generally located west of Drew Road and south of I-8. The construction phase is calculated to generate 566 daily trips with 221 AM peak hour trips and 225 PM peak hour trips.
2) *Calexico 1-A** - a photovoltaic solar facility capable of producing approximately 100 megawatts of electricity generally located 6 miles west of the City of Calexico. The construction phase is calculated to generate 283 daily trips with 110 AM peak hour trips and 112 PM peak hour trips.
3) *Calexico 1-B** - a photovoltaic solar facility capable of producing approximately 100 megawatts of electricity generally located 6 miles west of the City of Calexico. The construction phase is calculated to generate 283 daily trips with 110 AM peak hour trips and 112 PM peak hour trips.
4) *Calexico 2-A** - a photovoltaic solar facility capable of producing approximately 100 megawatts of electricity generally located 6 miles west of the City of Calexico. The construction phase is calculated to generate 283 daily trips with 110 AM peak hour trips and 112 PM peak hour trips.
5) *Campo Verde Battery Energy Storage System* – a battery storage system for the Campo Verde solar facility generally located west of Drew Road and south of I-8. The construction phase is calculated to generate 126 daily trips with 63 AM peak hour trips and 57 PM peak hour trips.
6) *Centinela Solar Phase 2** - a photovoltaic solar facility capable of producing approximately 100 megawatts of electricity generally located east of Drew Road and south of I-8. The construction phase is calculated to generate 283 daily trips with 110 AM peak hour trips and 112 PM peak hour trips.
7) *Coyne Ranch Specific Plan* – a residential project with up to 546 residential units located at 1642 Ross Road. The residential project is calculated to generate 5,198 ADT with 410 AM peak hour trips and 546 PM peak hour trips.

8) *County Center II Expansion* – a mixed use project of a commercial center, expansion of the Imperial County Office of Education, a Joint-Use Teacher Training and Conference Center, Judicial Center, County Park, Jail expansion, County Administrative Complex, Public Works Administration, and a County Administrative Complex located on the southwest corner of McCabe Road and Clark Road. The total project is calculated to generate 24,069 ADT with 2,581 AM peak hour trips and 2,242 PM peak hour trips.

9) *IV Substation and SDG&E Ocotillo Solar** – a project connecting the Imperial Irrigation District's "S" line from the Imperial Irrigation District substation to the Imperial Valley substation and a photovoltaic solar facility capable of producing approximately 14 megawatts of electricity generally located adjacent to the SDG&E Imperial Valley Substation. The combined projects are estimated at 240 ADT with 45 AM peak hour trips and 45 PM peak hour trips.

10) *IRIS Solar Farm Cluster (Ferrell, Rockwood, Iris, and Lyons)** – photovoltaic solar facilities capable of producing approximately 360 megawatts of electricity generally located north of SR-98 between Brockman Road and Weed Road. The traffic generation for this cumulative project is calculated at 1,020 ADT with 398 AM and 405 PM peak hour trips.

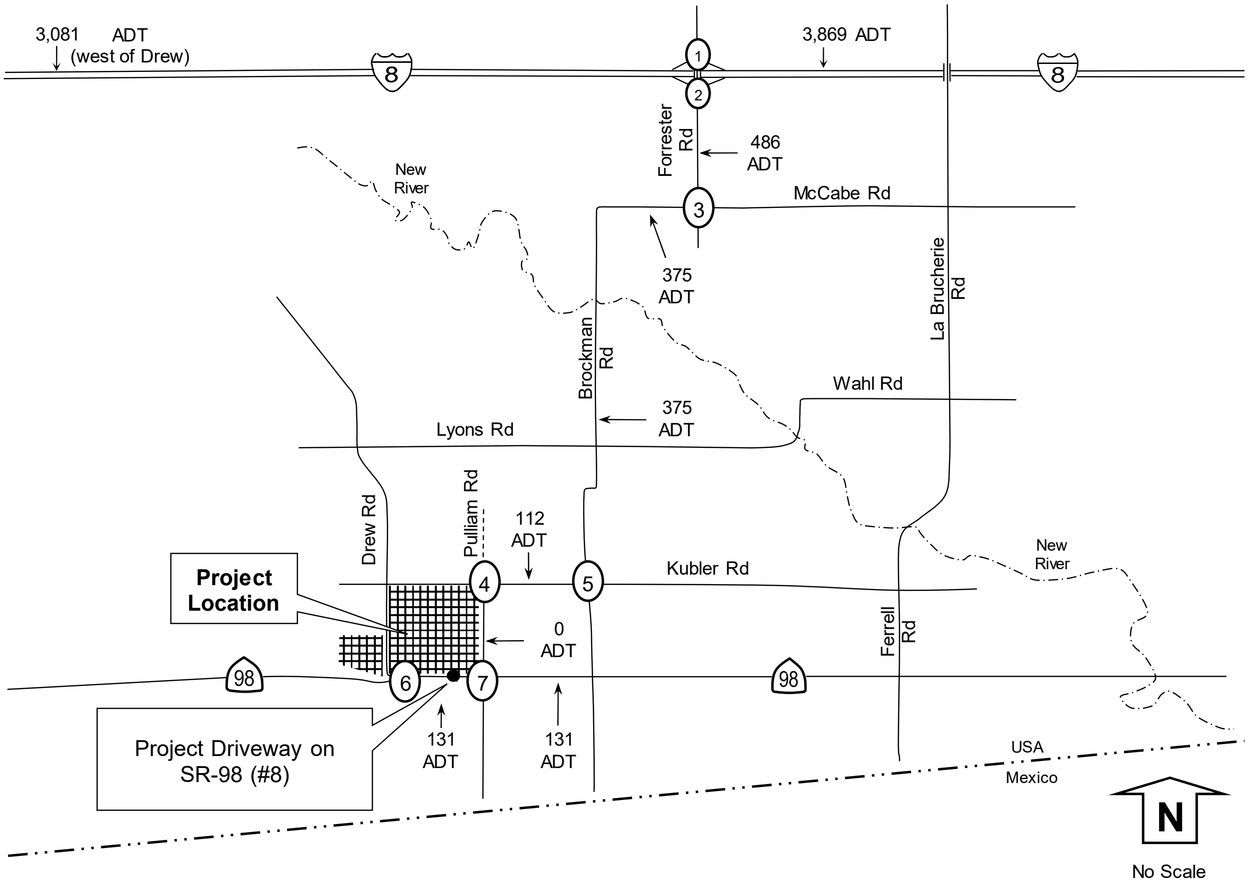
11) *Wistaria* - a photovoltaic solar facility capable of producing approximately 250 megawatts of electricity generally located 8 miles west of the city of Calexico. The construction phase is calculated to generate 664 daily trips with 209 AM peak hour trips and 209 PM peak hour trips.

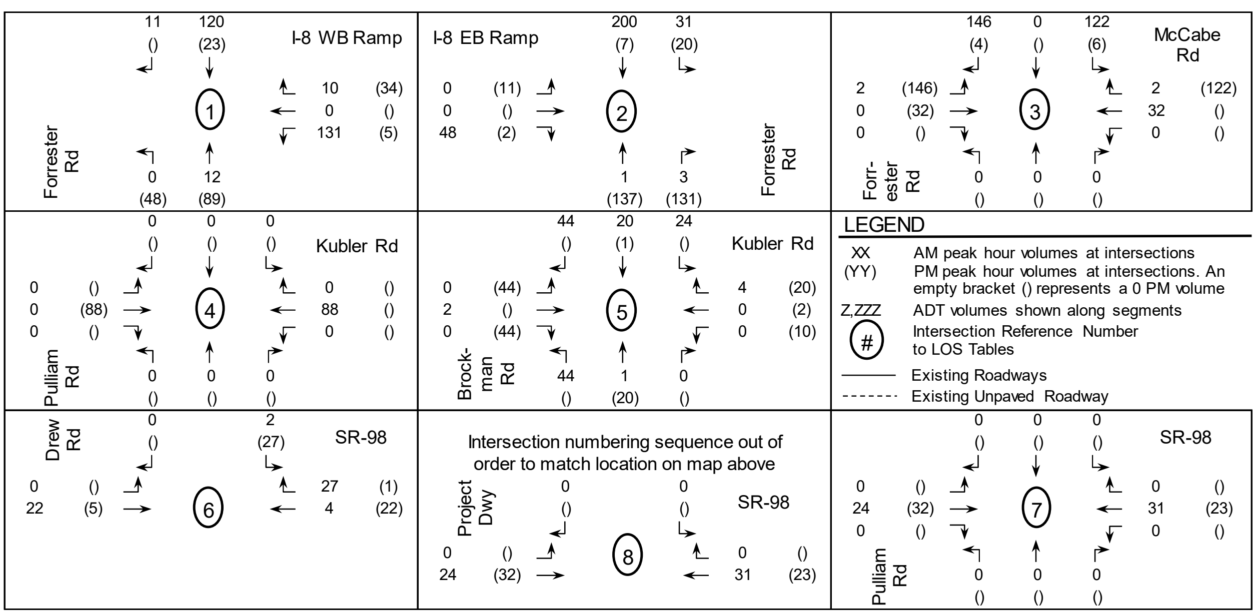
12) *Vega Solar** - a photovoltaic solar facility capable of producing approximately 100 megawatts of electricity generally located west of Drew Road and south of I-8. The construction phase is calculated to generate 283 daily trips with 110 AM peak hour trips and 112 PM peak hour trips.

13) *Cumulative on I-8* – some of the remaining cumulative projects within Imperial County may add traffic to I-8. Many of the cumulative projects do not have traffic assignments for I-8 (because they are too far away) and some cumulative projects are too small to require a traffic study; therefore, they do not have reported cumulative traffic volumes for I-8. To account for the possibility of cumulative traffic being added to I-8, five percent of the existing I-8 peak hour volume was used as cumulative background peak hour traffic on I-8.

It was assumed that the cumulative projects listed above will be generating construction traffic during the construction phase of the Drew Solar project. Presently, however, some of the cumulative projects are still in the environmental review process and, thus, may add construction traffic after the completion of the Drew Solar project. Alternatively, some of the cumulative projects may add traffic before the construction phase of Drew Solar. Furthermore, most if not all of the cumulative solar projects will have a peak construction period that may or may not coincide with the Drew Solar peak construction period. Finally, there is a chance that some of the cumulative projects will not proceed; however, this study is made with the conservative assumption that all of the peak cumulative construction volumes were used in the cumulative analysis. Realistically, however, there is high likelihood that all construction peaks will not coincide. The cumulative project (new development) volumes are shown in **Figure 8**.

Figure 8: Near-Term Cumulative Project (New Development) Volumes





6.0 Existing Year 2017 + Project Construction Conditions

This section documents the addition of construction traffic onto year 2017 conditions to document the scenario if the project was constructed immediately over 18 months. Year 2017 plus project construction traffic volumes are shown in **Figure 9**. Intersection, segment, and freeway LOS are shown in **Tables 10, 11 and 12**. Intersection LOS calculations are included in **Appendix M**.

TABLE 10: EXISTING YEAR 2017 WITHOUT AND WITH PROJECT CONSTRUCTION INTERSECTION LOS

Intersection &	Movement	Year 2017		Year 2017 + Project			
(Control)[1]		Delay[2]	LOS[3]	Delay[2]	LOS[3]	Delta[4]	Impact[5]
1) Forrester Rd at	Minor	9.7	A	10.2	B	0.5	None
I-8 WB Ramp (U)	Leg	9.6	A	9.8	A	0.2	None
2) Forrester Rd at	Minor	11.1	B	11.6	B	0.5	None
I-8 EB Ramp (U)	Leg	13.6	B	14.7	B	1.1	None
3) Forrester Rd at	Minor	9.5	A	9.9	A	0.4	None
McCabe Rd (U)	Leg	9.5	A	11.0	B	1.5	None
4) Pulliam Rd at	Minor	8.6	A	9.0	A	0.4	None
Kubler Rd (U)	Leg	8.6	A	9.2	A	0.6	None
5) Brockman Rd	Minor	8.9	A	9.1	A	0.2	None
at Kubler Rd (U)	Leg	9.0	A	9.1	A	0.1	None
6) Drew Rd at	Minor	8.7	A	8.9	A	0.2	None
SR-98 (U)	Leg	8.9	A	9.1	A	0.2	None
7) Pulliam Rd at	Minor	9.0	A	9.4	A	0.4	None
SR-98 (U)	Leg	8.6	A	8.8	A	0.2	None
8) SR-98 at Project	Minor	DNE	NA	1.2	A	NA	None
Driveway (U)	Leg	DNE	NA	9.2	A	NA	None

Notes: 1) Intersection Control - (S) Signalized, (U) Unsignalized. 2) Delay - HCM Average Control Delay in seconds.
3) LOS: Level of Service. Minor Leg: approach LOS of minor/lesser roadway. All: combined LOS for all approaches.
4) Delta is the increase in delay from project. 5) Type of impact: none, direct, or cumulative. DNE: Does not Exist.
NA: Not Applicable.

Figure 9: Existing Year 2017 + Project Construction Volumes

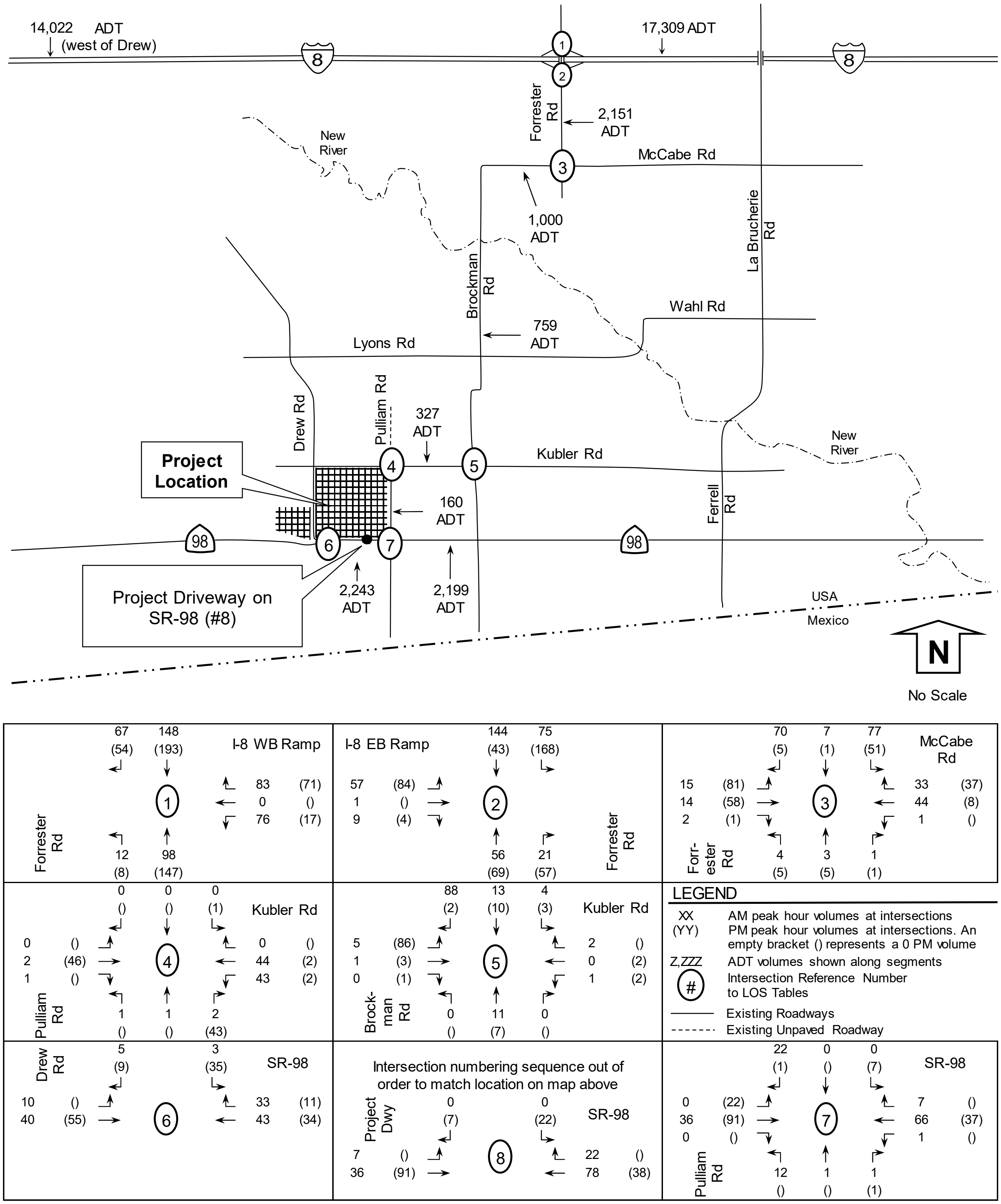


TABLE 11: EXISTING YEAR 2017 WITHOUT AND WITH PROJECT CONSTRUCTION ROADWAY AND STATE ROUTE LOS

Segment	Classification (as built)	Year 2017 Daily Volume	Year 2017 LOS C Capacity	Year 2017 V/C	Year 2017 LOS	Project Daily Volume	Year 2017 + Project Daily Volume	Year 2017 + Project LOS C Capacity	Year 2017 + Project V/C	Year 2017 + Project LOS	Change in V/C	Impact?
Brockman Road												
McCabe Rd to Kubler Rd	Major (2U)	497	7,100	0.07	A	262	759	7,100	0.11	A	0.04	None
Forrester Road												
I-8 to McCabe Rd	Prime (2U)	1,977	7,100	0.28	B	174	2,151	7,100	0.30	B	0.02	None
Kubler Road												
Brockman Rd to Ferrell Rd	Minor (2U)	65	7,100	0.01	A	262	327	7,100	0.05	A	0.04	None
McCabe Road												
Brockman Rd to Forrester Rd	Major (2U)	738	7,100	0.10	A	262	1,000	7,100	0.14	A	0.04	None
Pulliam Road												
Kubler Rd to SR-98	Minor (2U)	29	7,100	0.00	A	131	160	7,100	0.02	A	0.02	None
SR-98												
Drew Rd to Pulliam Rd	State Highway (2U)	2,090	7,100	0.29	B	153	2,243	7,100	0.32	B	0.02	None
Pulliam Rd to Brockman Rd	State Highway (2U)	2,090	7,100	0.29	B	109	2,199	7,100	0.31	B	0.02	None

Notes: Classification based on 1/29/08 Circulation and Scenic Highways Element. 2U = 2 lane undivided roadway. Daily volume is a 24 hour volume. LOS: Level of Service. LOS based on actual number of lanes currently constructed. V/C: Volume to Capacity ratio. Impact? = type of impact (none, cumulative, or direct).

TABLE 12: EXISTING YEAR 2017 WITHOUT AND WITH PROJECT CONSTRUCTION FREEWAY LOS

Freeway Segment	I-8 Dunaway Rd to Drew Rd				I-8 Forrester Rd to Imperial Ave			
Forecasted Year 2017								
ADT	14,000				17,200			
Peak Hour	A M		P M		A M		P M	
Direction	EB	WB	EB	WB	EB	WB	EB	WB
Number of Lanes	2	2	2	2	2	2	2	2
Capacity (1)	4,700	4,700	4,700	4,700	4,700	4,700	4,700	4,700
K Factor (2)	0.1346	0.1346	0.1631	0.1631	0.1346	0.1346	0.1631	0.1631
D Factor (3)	0.4770	0.5230	0.4958	0.5042	0.4770	0.5230	0.4958	0.5042
Truck Factor (4)	0.8712	0.8712	0.8712	0.8712	0.8376	0.8376	0.8376	0.8376
Peak Hour Volume	1,032	1,131	1,299	1,321	1,318	1,446	1,661	1,689
Volume to Capacity	0.220	0.241	0.276	0.281	0.281	0.308	0.353	0.359
LOS	A	A	A	A	A	B	B	B
Project Pk Hr Vol	7	0	0	7	1	36	36	1
Year 2017 + Project								
Peak Hour Volume	1,039	1,131	1,299	1,328	1,319	1,482	1,697	1,690
Volume to Capacity	0.221	0.241	0.276	0.283	0.281	0.315	0.361	0.360
LOS	A	A	A	A	A	B	B	B
Increase in V/C	0.001	0.000	0.000	0.001	0.000	0.008	0.008	0.000
Impact?	None	None	None	None	None	None	None	None

Notes: (1) Capacity of 2,350 pcphpl from CALTRANS' Guide for the Preparation of Traffic Impact Studies, December 2002. (2) Latest K factor from Caltrans (based on 2017 report), which is the percentage of AADT in both directions. (3) Latest D factor from Caltrans (based on 2017 report), which when multiplied by K and ADT will provide peak hour volume. (4) Latest truck factor from Caltrans (based on 2015 report). Impact? = Direct, Cumulative, or None.

Under existing year 2017 + project construction conditions, the study intersections, roadways, State Route and freeway were calculated to operate at LOS B or better with <u>no significant direct project impacts.</u>

7.0 Existing Year 2017 + Project Construction + Cumulative Conditions

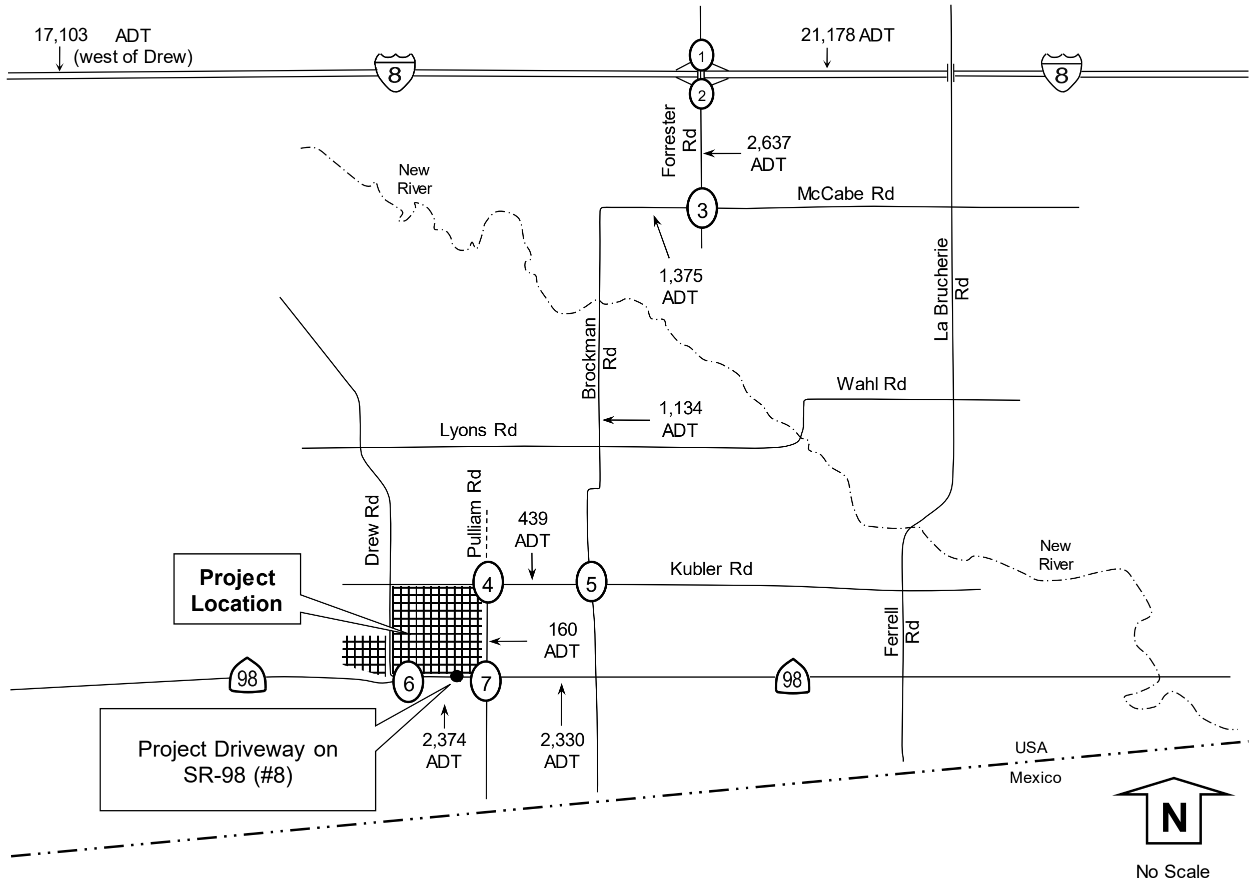
This section documents the addition of project construction traffic onto year 2017 with cumulative conditions. Year 2017 plus project construction + cumulative traffic volumes are shown in **Figure 10**. Intersection, segment, and freeway LOS are shown in **Tables 13, 14 and 15**. Intersection LOS calculations are included in **Appendix N**.

TABLE 13: EXISTING YEAR 2017 WITH PROJECT CONSTRUCTION WITH CUMULATIVE INTERSECTION LOS

Intersection &	Movement	Peak	Year 2017 + Cumulative		Year 2017 + Cumulative + Project			
(Control)[1]		Hour	Delay[2]	LOS[3]	Delay[2]	LOS[3]	Delta[4]	Impact[5]
1) Forrester Rd at	Minor	AM	12.8	B	14.2	B	1.4	None
I-8 WB Ramp (U)	Leg	PM	10.8	B	11.1	B	0.3	None
2) Forrester Rd at	Minor	AM	12.9	B	13.7	B	0.8	None
I-8 EB Ramp (U)	Leg	PM	21.1	C	22.9	C	1.8	None
3) Forrester Rd at	Minor	AM	12.1	B	13.7	B	1.6	None
McCabe Rd (U)	Leg	PM	14.9	B	18.9	C	4.0	None
4) Pulliam Rd at	Minor	AM	9.0	A	9.4	A	0.4	None
Kubler Rd (U)	Leg	PM	9.1	A	9.8	A	0.7	None
5) Brockman Rd	Minor	AM	10.5	B	10.9	B	0.4	None
at Kubler Rd (U)	Leg	PM	9.1	A	9.8	A	0.7	None
6) Drew Rd at	Minor	AM	8.9	A	9.1	A	0.2	None
SR-98 (U)	Leg	PM	9.3	A	9.5	A	0.2	None
7) Pulliam Rd at	Minor	AM	9.4	A	9.8	A	0.4	None
SR-98 (U)	Leg	PM	8.8	A	10.0	B	1.2	None
8) SR-98 at Project	Minor	AM	0.0	A	0.8	A	0.8	None
Driveway (U)	Leg	PM	0.0	A	9.5	A	9.5	None

Notes: 1) Intersection Control - (S) Signalized, (U) Unsignalized. 2) Delay - HCM Average Control Delay in seconds.
3) LOS: Level of Service. Minor Leg: approach LOS of minor/lesser roadway. All: combined LOS for all approaches.
4) Delta is the increase in delay from project. 5) Type of impact: none, direct, or cumulative.

Figure 10: Existing Year 2017 + Project Construction + Cumulative Volumes



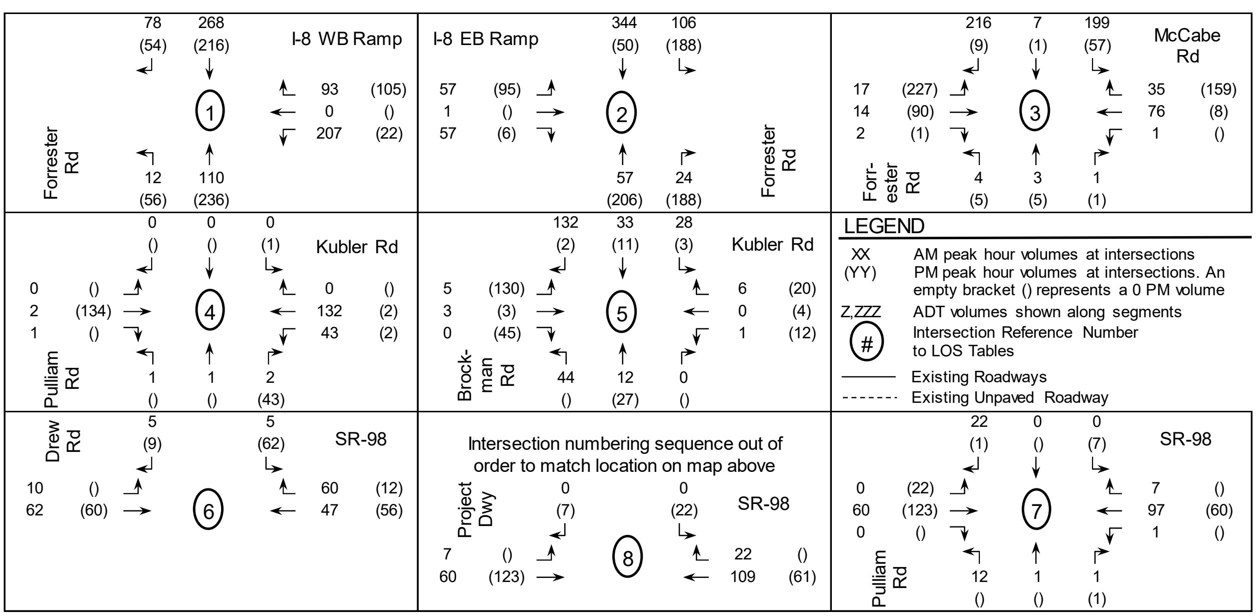


TABLE 14: EXISTING YEAR 2017 WITH PROJECT CONSTRUCTION WITH CUMULATIVE ROADWAY AND STATE ROUTE LOS

Segment	Classification (as built)	Year 2017 + Cumulative Daily Volume	Year 2017 + Cumulative LOS C Capacity	Year 2017 + Cumulative V/C	Year 2017 + Cumulative LOS	Project Daily Volumes	Year 2017 + Cumulative + Project Daily Volume	Year 2017 + Cumulative + Project LOS C Capacity	Year 2017 + Cumulative + Project V/C	Year 2017 + Cumulative + Project LOS	Impact?
Brockman Road											
McCabe Rd to Kubler Rd	Major (2U)	872	7,100	0.12	A	262	1,134	7,100	0.16	A	None
Forrester Road											
I-8 to McCabe Rd	Prime (2U)	2,463	7,100	0.35	B	174	2,637	7,100	0.37	B	None
Kubler Road											
Brockman Rd to Ferrell Rd	Minor (2U)	177	7,100	0.02	A	262	439	7,100	0.06	A	None
McCabe Road											
Brockman Rd to Forrester Rd	Major (2U)	1,113	7,100	0.16	A	262	1,375	7,100	0.19	A	None
Pulliam Road											
Kubler Rd to SR-98	Minor (2U)	29	7,100	0.00	A	131	160	7,100	0.02	A	None
SR-98											
Drew Rd to Pulliam Rd	State Highway (2U)	2,221	7,100	0.31	B	153	2,374	7,100	0.33	B	None
Pulliam Rd to Brockman Rd	State Highway (2U)	2,221	7,100	0.31	B	109	2,330	7,100	0.33	B	None

Notes: Classification based on 1/29/08 Circulation and Scenic Highways Element. 2U = 2 lane undivided roadway. Daily volume is a 24 hour volume. LOS: Level of Service. LOS based on actual number of lanes currently constructed. V/C: Volume to Capacity ratio. Impact? = type of impact (none, cumulative, or direct).

TABLE 15: EXISTING YEAR 2017 WITH PROJECT CONSTRUCTION WITH CUMULATIVE FREEWAY LOS

Freeway Segment	I-8 Dunaway Rd to Drew Rd				I-8 Forrester Rd to Imperial Ave			
Forecasted Year 2017								
ADT	14,000				17,200			
Peak Hour	A M		P M		A M		P M	
Direction	EB	WB	EB	WB	EB	WB	EB	WB
Number of Lanes	2	2	2	2	2	2	2	2
Capacity (1)	4700	4700	4700	4700	4700	4700	4700	4700
K Factor (2)	0.1346	0.1346	0.1631	0.1631	0.1346	0.1346	0.1631	0.1631
D Factor (3)	0.4770	0.5230	0.4958	0.5042	0.4770	0.5230	0.4958	0.5042
Truck Factor (4)	0.8712	0.8712	0.8712	0.8712	0.8376	0.8376	0.8376	0.8376
Peak Hour Volume	1032	1131	1299	1321	1318	1446	1661	1689
Volume to Capacity	0.220	0.241	0.276	0.281	0.281	0.308	0.353	0.359
LOS	A	A	A	A	A	B	B	B
Cumualtive + Project	248	385	435	282	237	582	643	280
Year 2017 + Cumulative + Project								
Peak Hour Volume	1280	1516	1734	1603	1555	2028	2304	1969
Volume to Capacity	0.272	0.323	0.369	0.341	0.331	0.431	0.490	0.419
LOS	A	B	B	B	B	B	C	B
Increase in V/C	0.053	0.082	0.093	0.060	0.050	0.124	0.137	0.060
Impact?	None	None	None	None	None	None	None	None

Notes: (1) Capacity of 2,350 pcphpl from CALTRANS' Guide for the Preparation of Traffic Impact Studies, December 2002. (2) Latest K factor from Caltrans (based on 2017 report), which is the percentage of AADT in both directions. (3) Latest D factor from Caltrans (based on 2017 report), which when multiplied by K and ADT will provide peak hour volume. (4) Latest truck factor from Caltrans (based on 2015 report). Impact? = Direct, Cumulative, or None.

Under existing year 2017 + project construction + cumulative conditions, the study intersections, roadways, State Route, and freeway were calculated to operate at LOS C or better with no cumulatively considerable impacts.

8.0 Near-Term Year 2019 Conditions

This section documents near-term year 2019 conditions when the project is anticipated to be at the peak of construction activities. The year 2019 background volumes are based on increasing the existing year 2017 volumes by an annual growth rate. The following documents and data were reviewed to determine a growth rate:

1) The California Economic Forecast *California County-Level Economic Forecast 2015-2040*, dated September 2015 documents an average annual growth factor of 1.8 percent from 2015 to 2020 for Imperial County.
2) The U.S. Census Bureau population data from year 2010 to year 2016 for Imperial County was used to calculated an average growth factor of 0.6 percent.

For the purpose of this traffic study, the more conservative average growth rate of **1.8 percent** was selected for the annual population growth rate. Excerpts from the California Economic Forecast and Census data are included in **Appendix O**. Year 2019 traffic data was factored up from existing data through the application of a 1.8% annual growth rate (3.6% total).

Year 2019 volumes for the construction peak period were calculated by increasing existing volumes year 2017 by 1.8% annually (3.6% total) as shown in **Figure 11**. Intersection, segment, and freeway LOS are shown in **Tables 16, 17 and 18**. Intersection LOS calculations are included in **Appendix P**.

TABLE 16: NEAR-TERM YEAR 2019 INTERSECTION LOS

Intersection & (Control)[1]	Movement	Peak Hour	Year 2019 Delay[2]	Year 2019 LOS[3]
1) Forrester Rd at I-8 WB Ramp (U)	Minor Leg	AM	9.7	A
		PM	9.7	A
2) Forrester Rd at I-8 EB Ramp (U)	Minor Leg	AM	11.1	B
		PM	14.3	B
3) Forrester Rd at McCabe Rd (U)	Minor Leg	AM	9.6	A
		PM	9.6	A
4) Pulliam Rd at Kubler Rd (U)	Minor Leg	AM	8.6	A
		PM	8.6	A
5) Brockman Rd at Kubler Rd (U)	Minor Leg	AM	8.9	A
		PM	8.9	A
6) Drew Rd at SR-98 (U)	Minor Leg	AM	8.7	A
		PM	8.9	A
7) Pulliam Rd at SR-98 (U)	Minor Leg	AM	9.1	A
		PM	8.6	A

Notes: 1) Intersection Control - (S) Signalized, (U) Unsignalized. 2) Delay - HCM Average Control Delay in seconds.
3) LOS: Level of Service. Minor Leg: approach LOS of minor/lesser roadway. All: combined LOS for all approaches.

Figure 11: Near-Term Year 2019 Volumes

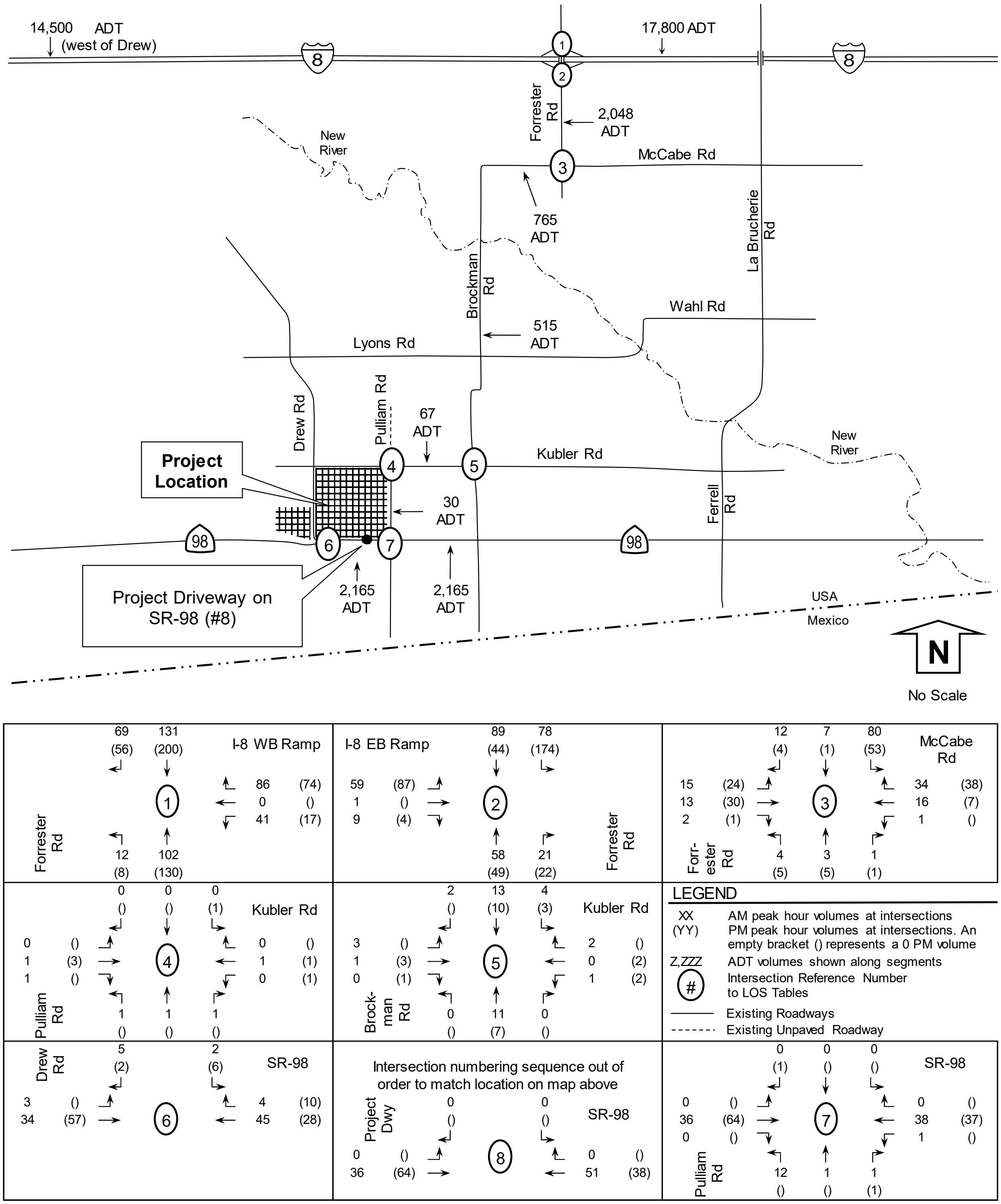


TABLE 17: NEAR-TERM YEAR 2019 ROADWAY AND STATE ROUTE LOS

Segment		Classification (as built)	Year 2019 Daily Volume	# of lanes	LOS C Capacity	V/C	LOS
Brockman Road							
	McCabe Rd to Kubler Rd	Major (2U)	515	2	7,100	0.07	A
Forrester Road							
	I-8 to McCabe Rd	Prime (2U)	2,048	2	7,100	0.29	B
Kubler Road							
	Brockman Rd to Ferrell Rd	Minor (2U)	67	2	7,100	0.01	A
McCabe Road							
	Brockman Rd to Forrester Rd	Major (2U)	765	2	7,100	0.11	A
Pulliam Road							
	Kubler Rd to SR-98	Minor (2U)	30	2	7,100	0.00	A
SR-98							
	Drew Rd to Pulliam Rd	State Highway (2U)	2,165	2	7,100	0.30	B
	Pulliam Rd to Brockman Rd	State Highway (2U)	2,165	2	7,100	0.30	B

Notes: Classification based on 1/29/08 Circulation and Scenic Highways Element. 2U = 2 lane undivided roadway. Daily volume is a 24 hour volume. LOS: Level of Service. LOS based on actual number of lanes currently constructed. V/C: Volume to Capacity ratio.

TABLE 18: NEAR-TERM YEAR 2019 FREEWAY LOS

Freeway Segment	I-8 Dunaway Rd to Drew Rd				I-8 Forrester Rd to Imperial Ave			
Forecasted Year 2019								
ADT	14,500				17,800			
Peak Hour	A M		P M		A M		P M	
Direction	EB	WB	EB	WB	EB	WB	EB	WB
Number of Lanes	2	2	2	2	2	2	2	2
Capacity (1)	4,700	4,700	4,700	4,700	4,700	4,700	4,700	4,700
K Factor (2)	0.1346	0.1346	0.1631	0.1631	0.1346	0.1346	0.1631	0.1631
D Factor (3)	0.4770	0.5230	0.4958	0.5042	0.4770	0.5230	0.4958	0.5042
Truck Factor (4)	0.8712	0.8712	0.8712	0.8712	0.8376	0.8376	0.8376	0.8376
Peak Hour Volume	1,069	1,172	1,346	1,369	1,364	1,496	1,718	1,748
Volume to Capacity	0.227	0.249	0.286	0.291	0.290	0.318	0.366	0.372
LOS	A	A	A	A	A	B	B	B

Notes: (1) Capacity of 2,350 pcphpl from CALTRANS' Guide for the Preparation of Traffic Impact Studies, December 2002. (2) Latest K factor from Caltrans (based on 2017 report), which is the percentage of AADT in both directions. (3) Latest D factor from Caltrans (based on 2017 report), which when multiplied by K and ADT will provide peak hour volume. (4) Latest truck factor from Caltrans (based on 2015 report).

Under near-term year 2019 conditions, the study intersections, roadways, State Route, and freeway were calculated to operate at LOS B or better.

9.0 Near-Term Year 2019 + Project Construction Conditions

This section documents the addition of construction traffic onto near-term year 2019 conditions for the anticipated construction peak. Year 2019 plus project construction traffic volumes are shown in **Figure 12**. Intersection, segment, and freeway LOS are shown in **Tables 19, 20 and 21**. Intersection LOS calculations are included in **Appendix Q**.

TABLE 19: NEAR-TERM YEAR 2019 WITHOUT AND WITH PROJECT CONSTRUCTION INTERSECTION LOS

Intersection &	Movement	Year 2019		Year 2019 + Project			
(Control)[1]		Delay[2]	LOS[3]	Delay[2]	LOS[3]	Delta[4]	Impact[5]
1) Forrester Rd at	Minor	9.7	A	10.2	B	0.5	None
I-8 WB Ramp (U)	Leg	9.7	A	9.9	A	0.2	None
2) Forrester Rd at	Minor	11.1	B	11.8	B	0.7	None
I-8 EB Ramp (U)	Leg	14.3	B	15.2	C	0.9	None
3) Forrester Rd at	Minor	9.6	A	9.9	A	0.3	None
McCabe Rd (U)	Leg	9.6	A	11.0	B	1.4	None
4) Pulliam Rd at	Minor	8.6	A	9.0	A	0.4	None
Kubler Rd (U)	Leg	8.6	A	9.2	A	0.6	None
5) Brockman Rd	Minor	8.9	A	9.1	A	0.2	None
at Kubler Rd (U)	Leg	8.9	A	9.1	A	0.2	None
6) Drew Rd at	Minor	8.7	A	8.9	A	0.2	None
SR-98 (U)	Leg	8.9	A	9.1	A	0.2	None
7) Pulliam Rd at	Minor	9.1	A	9.4	A	0.3	None
SR-98 (U)	Leg	8.6	A	8.8	A	0.2	None
8) SR-98 at Project	Minor	DNE	NA	1.2	A	NA	None
Driveway (U)	Leg	DNE	NA	9.2	A	NA	None

Notes: 1) Intersection Control - (S) Signalized, (U) Unsignalized. 2) Delay - HCM Average Control Delay in seconds. 3) LOS: Level of Service. Minor Leg: approach LOS of minor/lesser roadway. All: combined LOS for all approaches. 4) Delta is the increase in delay from project. 5) Type of impact: none, direct, or cumulative. DNE: Does not Exist. NA: Not Applicable.

Figure 12: Near-Term Year 2019 + Project Construction Volumes

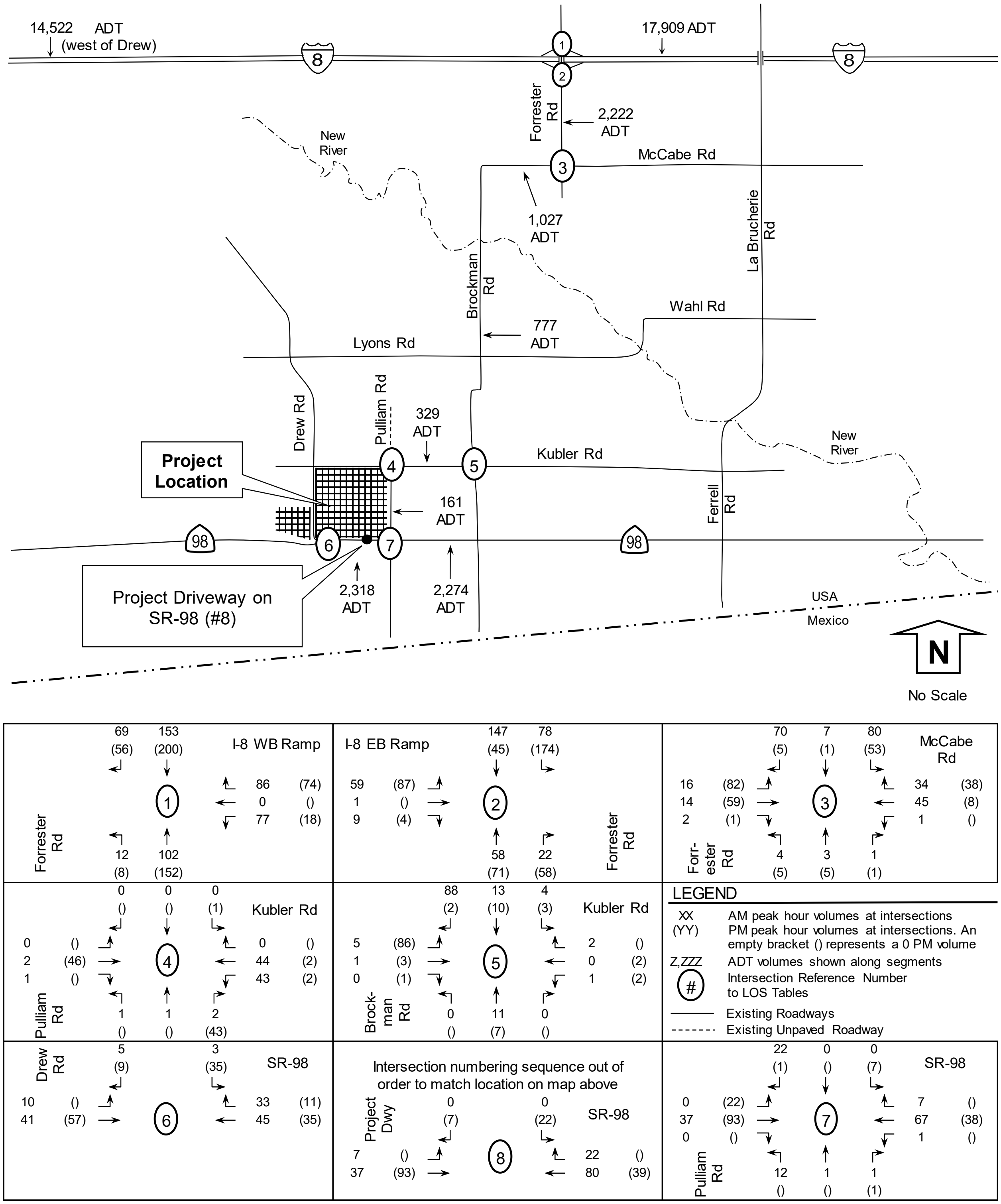


TABLE 20: NEAR-TERM YEAR 2019 WITHOUT AND WITH PROJECT CONSTRUCTION ROADWAY AND STATE ROUTE LOS

Segment	Classification (as built)	Year 2019 Daily Volume	Year 2019 LOS C Capacity	Year 2019 V/C	Year 2019 LOS	Project Daily Volume	Year 2019 + Project Daily Volume	Year 2019 + Project LOS C Capacity	Year 2019 + Project V/C	Year 2019 + Project LOS	Change in V/C	Impact?
Brockman Road												
McCabe Rd to Kubler Rd	Major (2U)	515	7,100	0.07	A	262	777	7,100	0.11	A	0.04	None
Forrester Road												
I-8 to McCabe Rd	Prime (2U)	2,048	7,100	0.29	B	174	2,222	7,100	0.31	B	0.02	None
Kubler Road												
Brockman Rd to Ferrell Rd	Minor (2U)	67	7,100	0.01	A	262	329	7,100	0.05	A	0.04	None
McCabe Road												
Brockman Rd to Forrester Rd	Major (2U)	765	7,100	0.11	A	262	1,027	7,100	0.14	A	0.04	None
Pulliam Road												
Kubler Rd to SR-98	Minor (2U)	30	7,100	0.00	A	131	161	7,100	0.02	A	0.02	None
SR-98												
Drew Rd to Pulliam Rd	State Highway (2U)	2,165	7,100	0.30	B	153	2,318	7,100	0.33	B	0.02	None
Pulliam Rd to Brockman Rd	State Highway (2U)	2,165	7,100	0.30	B	109	2,274	7,100	0.32	B	0.02	None

Notes: Classification based on 1/29/08 Circulation and Scenic Highways Element. 2U = 2 lane undivided roadway. Daily volume is a 24 hour volume. LOS: Level of Service. LOS based on actual number of lanes currently constructed. V/C: Volume to Capacity ratio. Impact? = type of impact (none, cumulative, or direct).

TABLE 21: NEAR-TERM YEAR 2019 WITHOUT AND WITH PROJECT CONSTRUCTION FREEWAY LOS

Freeway Segment	I-8 Dunaway Rd to Drew Rd				I-8 Forrester Rd to Imperial Ave			
Forecasted Year 2019								
ADT	14,500				17,800			
Peak Hour	A M		P M		A M		P M	
Direction	EB	WB	EB	WB	EB	WB	EB	WB
Number of Lanes	2	2	2	2	2	2	2	2
Capacity (1)	4,700	4,700	4,700	4,700	4,700	4,700	4,700	4,700
K Factor (2)	0.1346	0.1346	0.1631	0.1631	0.1346	0.1346	0.1631	0.1631
D Factor (3)	0.4770	0.5230	0.4958	0.5042	0.4770	0.5230	0.4958	0.5042
Truck Factor (4)	0.8712	0.8712	0.8712	0.8712	0.8376	0.8376	0.8376	0.8376
Peak Hour Volume	1,069	1,172	1,346	1,369	1,364	1,496	1,718	1,748
Volume to Capacity	0.227	0.249	0.286	0.291	0.290	0.318	0.366	0.372
LOS	A	A	A	A	A	B	B	B
Project Pk Hr Vol	7	0	0	7	1	36	36	1
Year 2019 + Project								
Peak Hour Volume	1,076	1,172	1,346	1,376	1,365	1,532	1,754	1,749
Volume to Capacity	0.229	0.249	0.286	0.293	0.291	0.326	0.373	0.372
LOS	A	A	A	A	A	B	B	B
Increase in V/C	0.001	0.000	0.000	0.001	0.000	0.008	0.008	0.000
Impact?	None	None	None	None	None	None	None	None

Notes: (1) Capacity of 2,350 pcphpl from CALTRANS' Guide for the Preparation of Traffic Impact Studies, December 2002. (2) Latest K factor from Caltrans (based on 2017 report), which is the percentage of AADT in both directions. (3) Latest D factor from Caltrans (based on 2017 report), which when multiplied by K and ADT will provide peak hour volume. (4) Latest truck factor from Caltrans (based on 2015 report). Impact? = Direct, Cumulative, or None.

Under near-term year 2019 + project construction conditions, the study intersections, roadways, State Route, and freeway were calculated to operate at LOS C or better with no significant direct project impacts.

10.0 Near-Term Year 2019 + Project Construction + Cumulative Conditions

This section documents the addition of cumulative traffic onto near-term year 2019 with project construction conditions. Year 2019 plus project construction + cumulative traffic volumes are shown in **Figure 13**. Intersection, segment, and freeway LOS are shown in **Tables 22, 23 and 24**. Intersection LOS calculations are included in **Appendix R**.

TABLE 22: NEAR-TERM YEAR 2019 WITH PROJECT CONSTRUCTION WITH CUMULATIVE INTERSECTION LOS

Intersection &	Movement	Peak	Year 2019 + Cumulative		Year 2019 + Cumulative + Project			
(Control)[1]		Hour	Delay[2]	LOS[3]	Delay[2]	LOS[3]	Delta[4]	Impact[5]
1) Forrester Rd at	Minor	AM	13.0	B	14.4	B	1.4	None
I-8 WB Ramp (U)	Leg	PM	10.9	B	11.2	B	0.3	None
2) Forrester Rd at	Minor	AM	13.1	B	13.9	B	0.8	None
I-8 EB Ramp (U)	Leg	PM	22.2	C	24.3	C	2.1	None
3) Forrester Rd at	Minor	AM	12.2	B	13.9	B	1.7	None
McCabe Rd (U)	Leg	PM	15.1	C	19.1	C	4.0	None
4) Pulliam Rd at	Minor	AM	9.0	A	9.4	A	0.4	None
Kubler Rd (U)	Leg	PM	9.1	A	9.8	A	0.7	None
5) Brockman Rd	Minor	AM	10.5	B	10.9	B	0.4	None
at Kubler Rd (U)	Leg	PM	9.1	A	9.8	A	0.7	None
6) Drew Rd at	Minor	AM	8.9	A	9.1	A	0.2	None
SR-98 (U)	Leg	PM	9.3	A	9.5	A	0.2	None
7) Pulliam Rd at	Minor	AM	9.4	A	9.8	A	0.4	None
SR-98 (U)	Leg	PM	8.8	A	10.1	B	1.3	None
8) SR-98 at Project	Minor	AM	0.0	A	0.8	A	0.8	None
Driveway (U)	Leg	PM	0.0	A	9.5	A	9.5	None

Notes: 1) Intersection Control - (S) Signalized, (U) Unsignalized. 2) Delay - HCM Average Control Delay in seconds.
3) LOS: Level of Service. Minor Leg: approach LOS of minor/lesser roadway. All: combined LOS for all approaches.
4) Delta is the increase in delay from project. 5) Type of impact: none, direct, or cumulative.

Figure 13: Near-Term Year 2019 + Project Construction + Cumulative Volumes

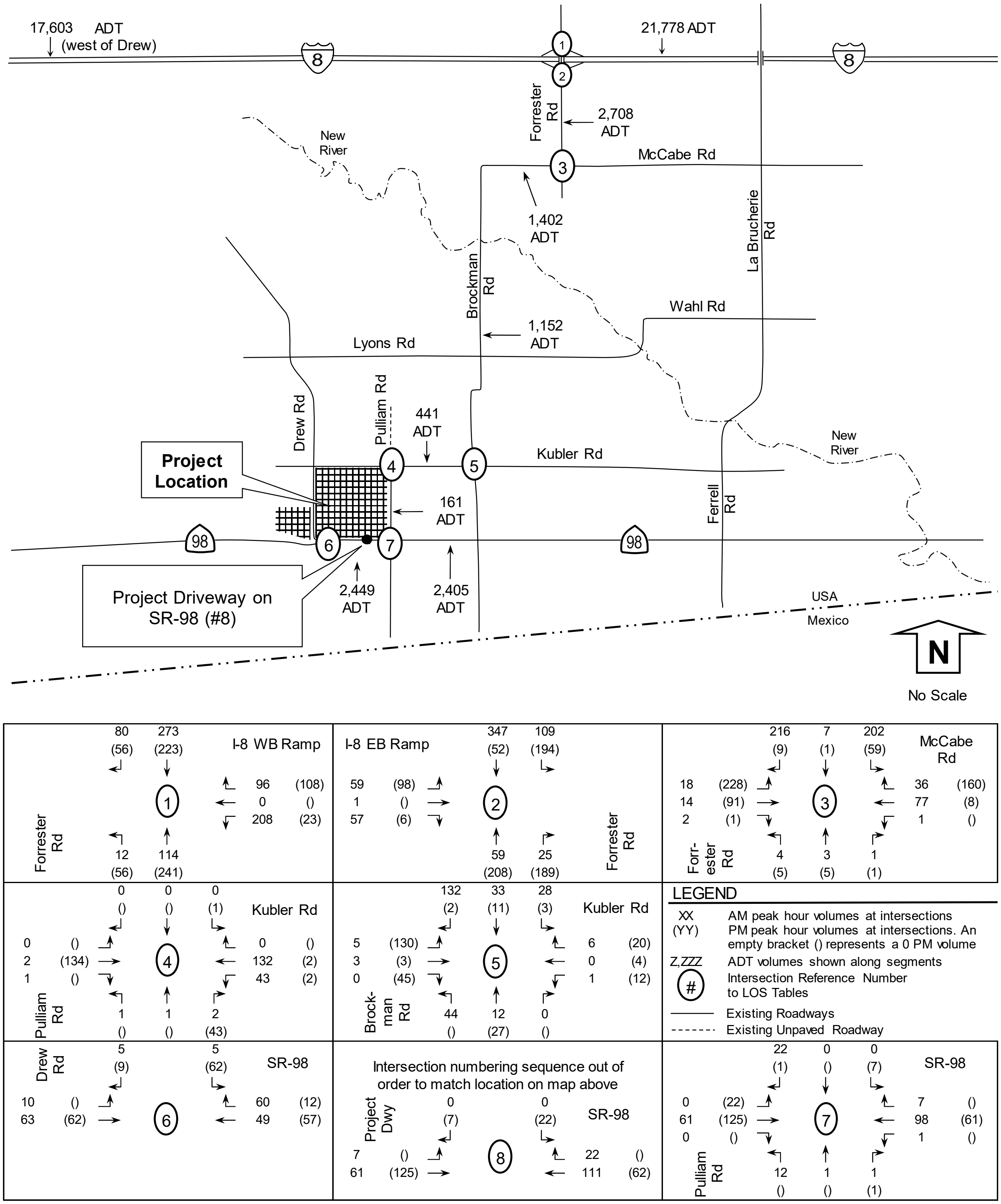


TABLE 23: NEAR-TERM YEAR 2019 WITH PROJECT CONSTRUCTION WITH CUMULATIVE ROADWAY AND STATE ROUTE LOS

Segment	Classification (as built)	Year 2019 + Cumulative				Project	Year 2019 + Cumulative + Project				
		Daily Volume	LOS C Capacity	V/C	LOS	Daily Volumes	Daily Volume	LOS C Capacity	V/C	LOS	Impact?
Brockman Road											
McCabe Rd to Kubler Rd	Major (2U)	890	7,100	0.13	A	262	1,152	7,100	0.16	A	None
Forrester Road											
I-8 to McCabe Rd	Prime (2U)	2,534	7,100	0.36	B	174	2,708	7,100	0.38	B	None
Kubler Road											
Brockman Rd to Ferrell Rd	Minor (2U)	179	7,100	0.03	A	262	441	7,100	0.06	A	None
McCabe Road											
Brockman Rd to Forrester Rd	Major (2U)	1,140	7,100	0.16	A	262	1,402	7,100	0.20	A	None
Pulliam Road											
Kubler Rd to SR-98	Minor (2U)	30	7,100	0.00	A	131	161	7,100	0.02	A	None
SR-98											
Drew Rd to Pulliam Rd	State Highway (2U)	2,296	7,100	0.32	B	153	2,449	7,100	0.34	B	None
Pulliam Rd to Brockman Rd	State Highway (2U)	2,296	7,100	0.32	B	109	2,405	7,100	0.34	B	None

Notes: Classification based on 1/29/08 Circulation and Scenic Highways Element. 2U = 2 lane undivided roadway. Daily volume is a 24 hour volume. LOS: Level of Service. LOS based on actual number of lanes currently constructed. V/C: Volume to Capacity ratio. Impact? = type of impact (none, cumulative, or direct).

TABLE 24: NEAR-TERM YEAR 2019 WITH PROJECT CONSTRUCTION WITH CUMULATIVE FREEWAY LOS

Freeway Segment	I-8 Dunaway Rd to Drew Rd				I-8 Forrester Rd to Imperial Ave			
Forecasted Year 2019								
ADT	14,500				17,800			
Peak Hour	A M		P M		A M		P M	
Direction	EB	WB	EB	WB	EB	WB	EB	WB
Number of Lanes	2	2	2	2	2	2	2	2
Capacity (1)	4700	4700	4700	4700	4700	4700	4700	4700
K Factor (2)	0.1346	0.1346	0.1631	0.1631	0.1346	0.1346	0.1631	0.1631
D Factor (3)	0.4770	0.5230	0.4958	0.5042	0.4770	0.5230	0.4958	0.5042
Truck Factor (4)	0.8712	0.8712	0.8712	0.8712	0.8376	0.8376	0.8376	0.8376
Peak Hour Volume	1069	1172	1346	1369	1364	1496	1718	1748
Volume to Capacity	0.227	0.249	0.286	0.291	0.290	0.318	0.366	0.372
LOS	A	A	A	A	A	B	B	B
Cumualtive + Project	248	385	435	282	237	582	643	280
Year 2019 + Cumulative + Project								
Peak Hour Volume	1317	1557	1781	1651	1601	2078	2361	2028
Volume to Capacity	0.280	0.331	0.379	0.351	0.341	0.442	0.502	0.431
LOS	A	B	B	B	B	B	C	B
Increase in V/C	0.053	0.082	0.093	0.060	0.050	0.124	0.137	0.060
Impact?	None	None	None	None	None	None	None	None

Notes: (1) Capacity of 2,350 pcphpl from CALTRANS' Guide for the Preparation of Traffic Impact Studies, December 2002. (2) Latest K factor from Caltrans (based on 2017 report), which is the percentage of AADT in both directions. (3) Latest D factor from Caltrans (based on 2017 report), which when multiplied by K and ADT will provide peak hour volume. (4) Latest truck factor from Caltrans (based on 2015 report). Impact? = Direct, Cumulative, or None.

Under near-term year 2019 + project construction + cumulative conditions, the study intersections, roadways, State Route, and freeway were calculated to operate at LOS C or better with <u>no cumulatively considerable impacts</u>.

11.0 Long-Term Year 2027 Conditions

This section documents long-term year 2027 conditions in case the entire project (in 18 months) is constructed at the end of the period when construction must commence per the CUP. The year 2027 background volumes are based on increasing the existing year 2017 volumes by an annual growth rate of 1.8% (19.5% total due to compounding growth) as described in the Near-Term Year 2019 Conditions' Section. Year 2027 traffic volumes are shown in **Figure 14**. Intersection, segment, and freeway LOS are shown in **Tables 25, 26 & 27**. Intersection LOS calculations are included in **Appendix S**.

TABLE 25: LONG-TERM YEAR 2027 INTERSECTION LOS

Intersection & (Control)[1]	Movement	Peak Hour	Year 2027 Delay[2]	Year 2027 LOS[3]
1) Forrester Rd at	Minor	AM	10.0	B
I-8 WB Ramp (U)	Leg	PM	10.0	B
2) Forrester Rd at	Minor	AM	11.8	B
I-8 EB Ramp (U)	Leg	PM	16.4	C
3) Forrester Rd at	Minor	AM	9.8	A
McCabe Rd (U)	Leg	PM	9.7	A
4) Pulliam Rd at	Minor	AM	8.6	A
Kubler Rd (U)	Leg	PM	8.6	A
5) Brockman Rd	Minor	AM	8.9	A
at Kubler Rd (U)	Leg	PM	9.0	A
6) Drew Rd at	Minor	AM	8.7	A
SR-98 (U)	Leg	PM	9.0	A
7) Pulliam Rd at	Minor	AM	9.1	A
SR-98 (U)	Leg	PM	8.7	A

Notes: 1) Intersection Control - (S) Signalized, (U) Unsignalized. 2) Delay - HCM Average Control Delay in seconds.
3) LOS: Level of Service. Minor Leg: approach LOS of minor/lesser roadway. All: combined LOS for all approaches.

Figure 14: Long-Term Year 2027 Volumes

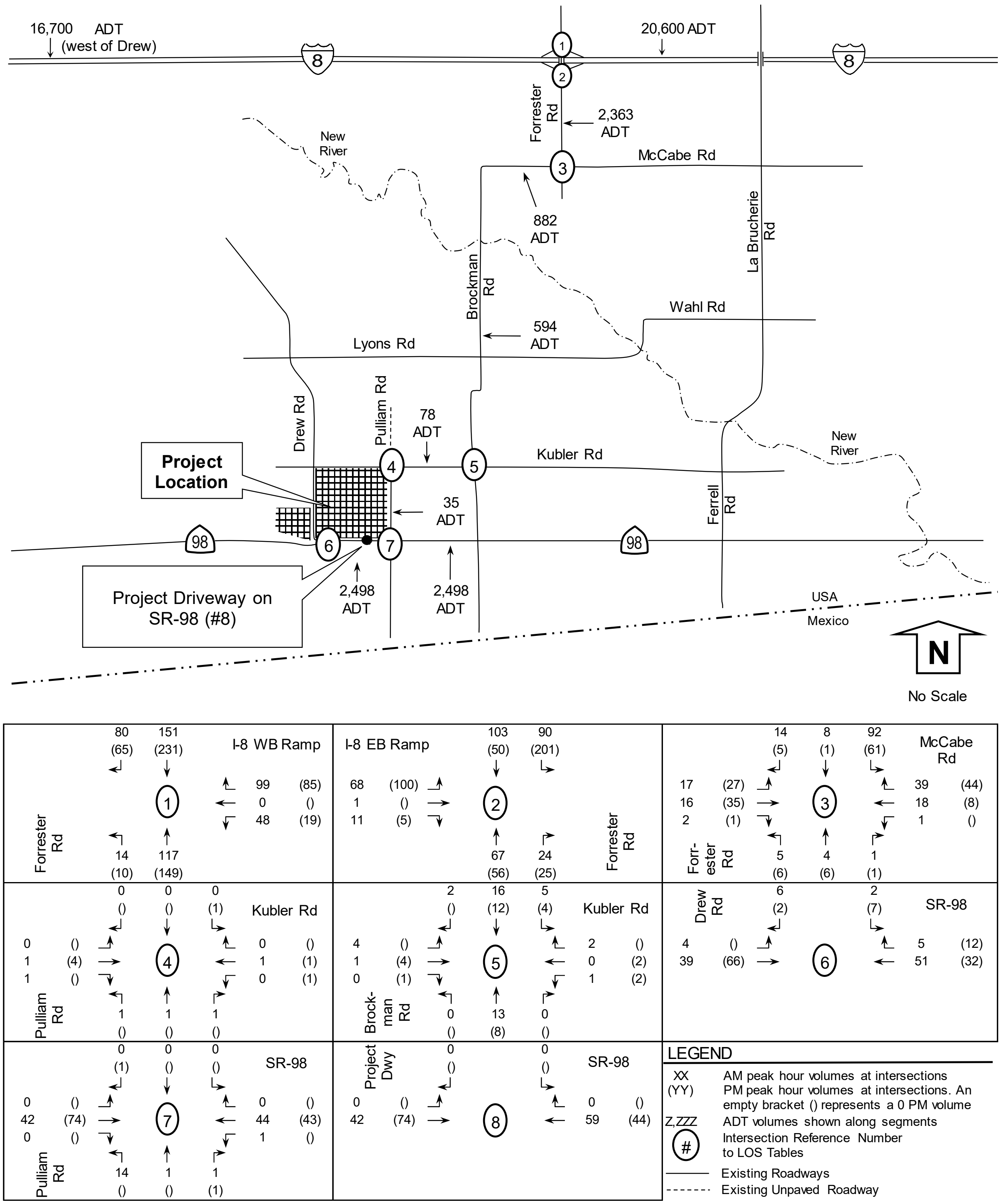


TABLE 26: LONG-TERM YEAR 2027 ROADWAY AND STATE ROUTE LOS

Segment		Classification (as built)	Year 2027 Daily Volume	# of lanes	LOS C Capacity	V/C	LOS
Brockman Road							
	McCabe Rd to Kubler Rd	Major (2U)	594	2	7,100	0.08	A
Forrester Road							
	I-8 to McCabe Rd	Prime (2U)	2,363	2	7,100	0.33	B
Kubler Road							
	Brockman Rd to Ferrell Rd	Minor (2U)	78	2	7,100	0.01	A
McCabe Road							
	Brockman Rd to Forrester Rd	Major (2U)	882	2	7,100	0.12	A
Pulliam Road							
	Kubler Rd to SR-98	Minor (2U)	35	2	7,100	0.00	A
SR-98							
	Drew Rd to Pulliam Rd	State Highway (2U)	2,498	2	7,100	0.35	B
	Pulliam Rd to Brockman Rd	State Highway (2U)	2,498	2	7,100	0.35	B

Notes: Classification based on 1/29/08 Circulation and Scenic Highways Element. 2U = 2 lane undivided roadway. Daily volume is a 24 hour volume. LOS: Level of Service. LOS based on actual number of lanes currently constructed. V/C: Volume to Capacity ratio.

TABLE 27: LONG-TERM YEAR 2027 FREEWAY LOS

Freeway Segment	I-8 Dunaway Rd to Drew Rd				I-8 Forrester Rd to Imperial Ave			
Forecasted Year 2027								
ADT	16,700				20,600			
Peak Hour	A M		P M		A M		P M	
Direction	EB	WB	EB	WB	EB	WB	EB	WB
Number of Lanes	2	2	2	2	2	2	2	2
Capacity (1)	4,700	4,700	4,700	4,700	4,700	4,700	4,700	4,700
K Factor (2)	0.1346	0.1346	0.1631	0.1631	0.1346	0.1346	0.1631	0.1631
D Factor (3)	0.4770	0.5230	0.4958	0.5042	0.4770	0.5230	0.4958	0.5042
Truck Factor (4)	0.8712	0.8712	0.8712	0.8712	0.8376	0.8376	0.8376	0.8376
Peak Hour Volume	1,231	1,349	1,550	1,576	1,579	1,731	1,989	2,022
Volume to Capacity	0.262	0.287	0.330	0.335	0.336	0.368	0.423	0.430
LOS	A	A	B	B	B	B	B	B

Notes: (1) Capacity of 2,350 pcphpl from CALTRANS' Guide for the Preparation of Traffic Impact Studies, December 2002. (2) Latest K factor from Caltrans (based on 2017 report), which is the percentage of AADT in both directions. (3) Latest D factor from Caltrans (based on 2017 report), which when multiplied by K and ADT will provide peak hour volume. (4) Latest truck factor from Caltrans (based on 2015 report).

Under long-term year 2027 conditions, the study intersections, roadways, State Route, and freeway were calculated to operate at LOS C or better.

12.0 Long-Term Year 2027 + Project Construction Conditions

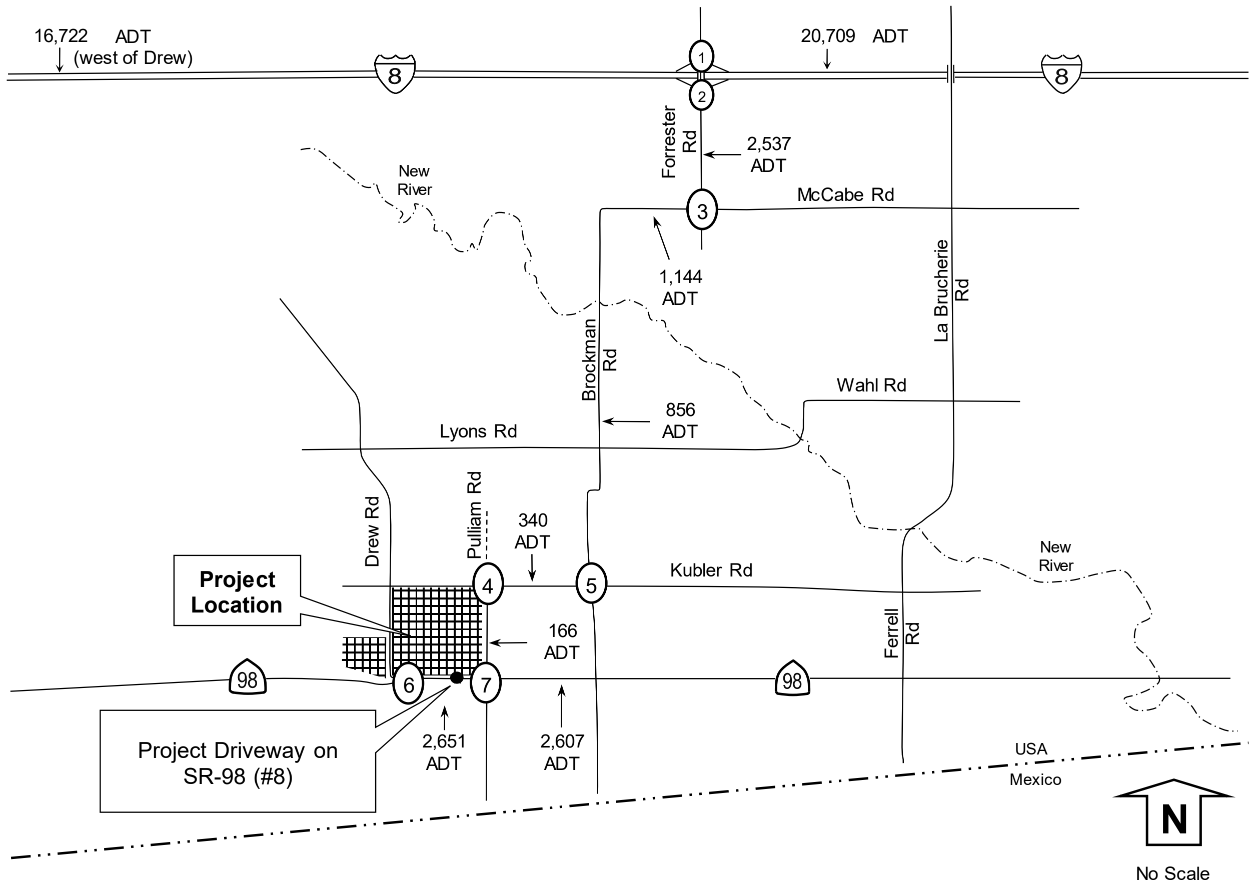
This section documents the addition of construction traffic onto long-term year 2027 conditions. Year 2027 plus project construction traffic volumes are shown in **Figure 15**. Intersection, segment, and freeway LOS are shown in **Tables 28, 29 and 30**. Intersection LOS calculations are included in **Appendix T**.

TABLE 28: LONG-TERM YEAR 2027 WITH PROJECT CONSTRUCTION INTERSECTION LOS

Intersection &	Movement	Year 2027		Year 2027 + Project			
(Control)[1]		Delay[2]	LOS[3]	Delay[2]	LOS[3]	Delta[4]	Impact[5]
1) Forrester Rd at	Minor	10.0	B	10.6	B	0.6	None
I-8 WB Ramp (U)	Leg	10.0	B	10.2	B	0.2	None
2) Forrester Rd at	Minor	11.8	B	12.6	B	0.8	None
I-8 EB Ramp (U)	Leg	16.4	C	17.5	C	1.1	None
3) Forrester Rd at	Minor	9.8	A	10.2	B	0.4	None
McCabe Rd (U)	Leg	9.7	A	11.3	B	1.6	None
4) Pulliam Rd at	Minor	8.6	A	9.0	A	0.4	None
Kubler Rd (U)	Leg	8.6	A	9.2	A	0.6	None
5) Brockman Rd	Minor	8.9	A	9.1	A	0.2	None
at Kubler Rd (U)	Leg	9.0	A	9.1	A	0.1	None
6) Drew Rd at	Minor	8.7	A	8.9	A	0.2	None
SR-98 (U)	Leg	9.0	A	9.2	A	0.2	None
7) Pulliam Rd at	Minor	9.1	A	9.5	A	0.4	None
SR-98 (U)	Leg	8.7	A	8.8	A	0.1	None
8) SR-98 at Project	Minor	DNE	NA	1.0	A	NA	None
Driveway (U)	Leg	DNE	NA	9.3	A	NA	None

Notes: 1) Intersection Control - (S) Signalized, (U) Unsignalized. 2) Delay - HCM Average Control Delay in seconds.
3) LOS: Level of Service. Minor Leg: approach LOS of minor/lesser roadway. All: combined LOS for all approaches.
4) Delta is the increase in delay from project. 5) Type of impact: none, direct, or cumulative. DNE: Does not Exist.
NA: Not Applicable.

Figure 15: Long-Term Year 2027 + Project Construction Volumes



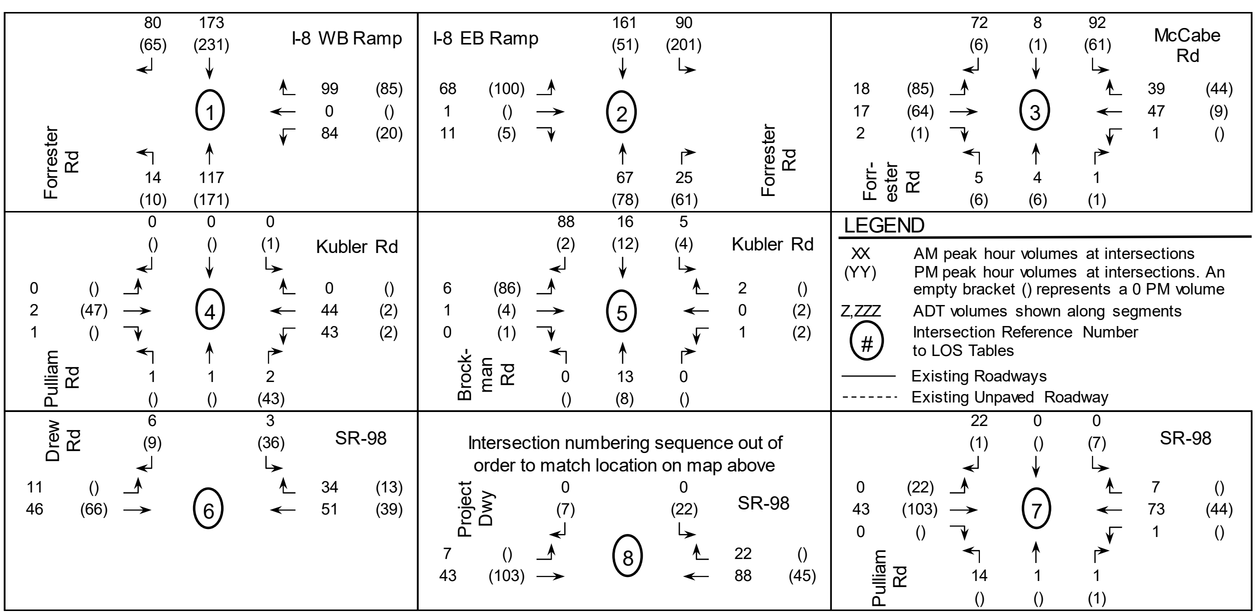


TABLE 29: LONG-TERM YEAR 2027 WITH PROJECT CONSTRUCTION ROADWAY AND STATE ROUTE LOS

Segment	Classification (as built)	Year 2027 Daily Volume	Year 2027 LOS C Capacity	Year 2027 V/C	Year 2027 LOS	Project Daily Volume	Year 2027 + Project Daily Volume	Year 2027 + Project LOS C Capacity	Year 2027 + Project V/C	Year 2027 + Project LOS	Change in V/C	Impact?
Brockman Road												
McCabe Rd to Kubler Rd	Major (2U)	594	7,100	0.08	A	262	856	7,100	0.12	A	0.04	None
Forrester Road												
I-8 to McCabe Rd	Prime (2U)	2,363	7,100	0.33	B	174	2,537	7,100	0.36	B	0.02	None
Kubler Road												
Brockman Rd to Ferrell Rd	Minor (2U)	78	7,100	0.01	A	262	340	7,100	0.05	A	0.04	None
McCabe Road												
Brockman Rd to Forrester Rd	Major (2U)	882	7,100	0.12	A	262	1,144	7,100	0.16	A	0.04	None
Pulliam Road												
Kubler Rd to SR-98	Minor (2U)	35	7,100	0.00	A	131	166	7,100	0.02	A	0.02	None
SR-98												
Drew Rd to Pulliam Rd	State Highway (2U)	2,498	7,100	0.35	B	153	2,651	7,100	0.37	B	0.02	None
Pulliam Rd to Brockman Rd	State Highway (2U)	2,498	7,100	0.35	B	109	2,607	7,100	0.37	B	0.02	None

Notes: Classification based on 1/29/08 Circulation and Scenic Highways Element. 2U = 2 lane undivided roadway. Daily volume is a 24 hour volume. LOS: Level of Service. LOS based on actual number of lanes currently constructed. V/C: Volume to Capacity ratio. Impact? = type of impact (none, cumulative, or direct).

TABLE 30: LONG-TERM YEAR 2027 WITH PROJECT CONSTRUCTION FREEWAY LOS

Freeway	I-8				I-8			
Segment	Dunaway Rd to Drew Rd				Forrester Rd to Imperial Ave			
Forecasted Year 2027								
ADT	16,700				20,600			
Peak Hour	A M		P M		A M		P M	
Direction	EB	WB	EB	WB	EB	WB	EB	WB
Number of Lanes	2	2	2	2	2	2	2	2
Capacity (1)	4,700	4,700	4,700	4,700	4,700	4,700	4,700	4,700
K Factor (2)	0.1346	0.1346	0.1631	0.1631	0.1346	0.1346	0.1631	0.1631
D Factor (3)	0.4770	0.5230	0.4958	0.5042	0.4770	0.5230	0.4958	0.5042
Truck Factor (4)	0.8712	0.8712	0.8712	0.8712	0.8376	0.8376	0.8376	0.8376
Peak Hour Volume	1,231	1,349	1,550	1,576	1,579	1,731	1,989	2,022
Volume to Capacity	0.262	0.287	0.330	0.335	0.336	0.368	0.423	0.430
LOS	A	A	B	B	B	B	B	B
Project Pk Hr Vol	7	0	0	7	1	36	36	1
Year 2027 + Project								
Peak Hour Volume	1,238	1,349	1,550	1,583	1,580	1,767	2,025	2,023
Volume to Capacity	0.263	0.287	0.330	0.337	0.336	0.376	0.431	0.431
LOS	A	A	B	B	B	B	B	B
Increase in V/C	0.001	0.000	0.000	0.001	0.000	0.008	0.008	0.000
Impact?	None	None	None	None	None	None	None	None

Notes: (1) Capacity of 2,350 pcphpl from CALTRANS' Guide for the Preparation of Traffic Impact Studies, December 2002. (2) Latest K factor from Caltrans (based on 2017 report), which is the percentage of AADT in both directions. (3) Latest D factor from Caltrans (based on 2017 report), which when multiplied by K and ADT will provide peak hour volume. (4) Latest truck factor from Caltrans (based on 2015 report). Impact? = Direct, Cumulative, or None.

Under long-term year 2027 + project construction conditions, the study intersections, roadways, State Route, and freeway were calculated to operate at LOS C or better with no significant direct project impacts.

13.0 Long-Term Year 2027 Cumulative Projects (Past, Present, & Reasonably Foreseeable New Development)

The long-term cumulative project list was based on the near-term cumulative project list; however, most of the projects on this list are solar or other renewable energy projects. For these solar/renewable energy projects, the traffic generation was updated to reflect the post construction operations phase, which has a significantly lower amount of traffic because the typical operations staff is about 10 people compared to about 200 to 250 construction workers required to construct a solar project. The timely conversion of construction to operations is supported by the fact that County Code section 90203.13 voids such project's conditional use permits unless the permittee commences the project within one year from the approval date of the conditional use permit or obtains an extension for up to two one-year periods. Therefore, if applications on file at the County in 2017 take two years to get approved, have a one year CUP life with two years of possible CUP extensions, and an 18 month construction period, then it is reasonable to assume all renewable energy projects on the cumulative list will be completed by year 2027 and would be generating operations traffic (not construction traffic) as noted below.

The long-term cumulative list below describes the cumulative projects in the immediate area around the project site (i.e. projects that are generally located south of I-8 and west of Clark Road). Most of the cumulative projects have completed technical studies including traffic generation information; however, several have not. For the projects that do not have detailed operations phase traffic generation information, an estimate was calculated based on operations traffic generation information for similar projects and are noted below with an asterisk "*". Operations traffic generation calculations are included in **Appendix U**. Information for each cumulative project is included below with text identifying if a cumulative project was observed to be under construction:

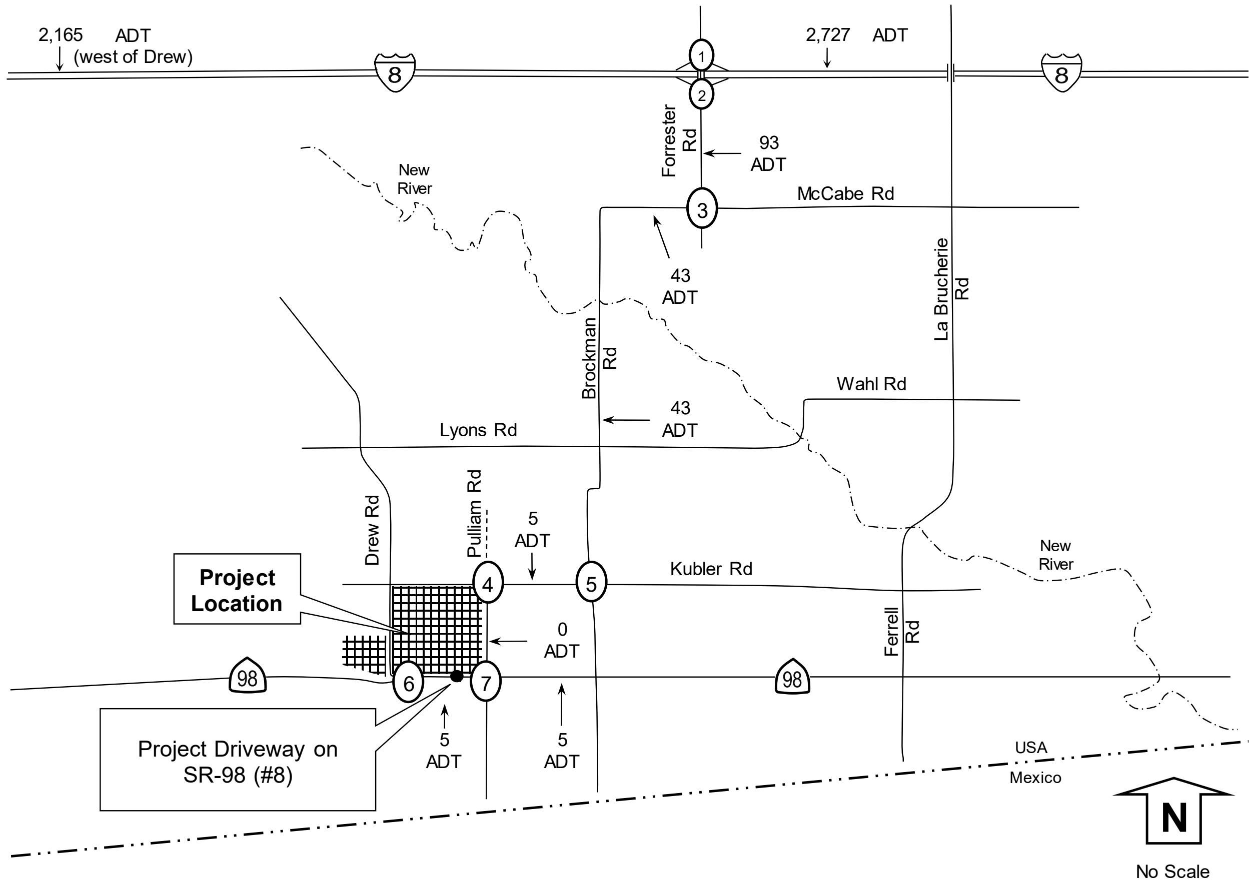
1) Big Rock Solar* and Laurel Solar* - a photovoltaic solar facility capable of producing approximately 200 megawatts of electricity generally located west of Drew Road and south of I-8. The operations phase is calculated to generate 16 daily trips with 5 AM peak hour trips and 5 PM peak hour trips.
2) *Calexico 1-A** - a photovoltaic solar facility capable of producing approximately 100 megawatts of electricity generally located 6 miles west of the City of Calexico. The operations phase is calculated to generate 8 daily trips with 3 AM peak hour trips and 3 PM peak hour trips.
3) *Calexico 1-B** - a photovoltaic solar facility capable of producing approximately 100 megawatts of electricity generally located 6 miles west of the City of Calexico. The operations phase is calculated to generate 8 daily trips with 3 AM peak hour trips and 3 PM peak hour trips.
4) *Calexico 2-A** - a photovoltaic solar facility capable of producing approximately 100 megawatts of electricity generally located 6 miles west of the City of Calexico. The operations phase is calculated to generate 8 daily trips with 3 AM peak hour trips and 3 PM peak hour trips.
5) *Campo Verde Battery Energy Storage System* – a battery storage system for the Campo Verde

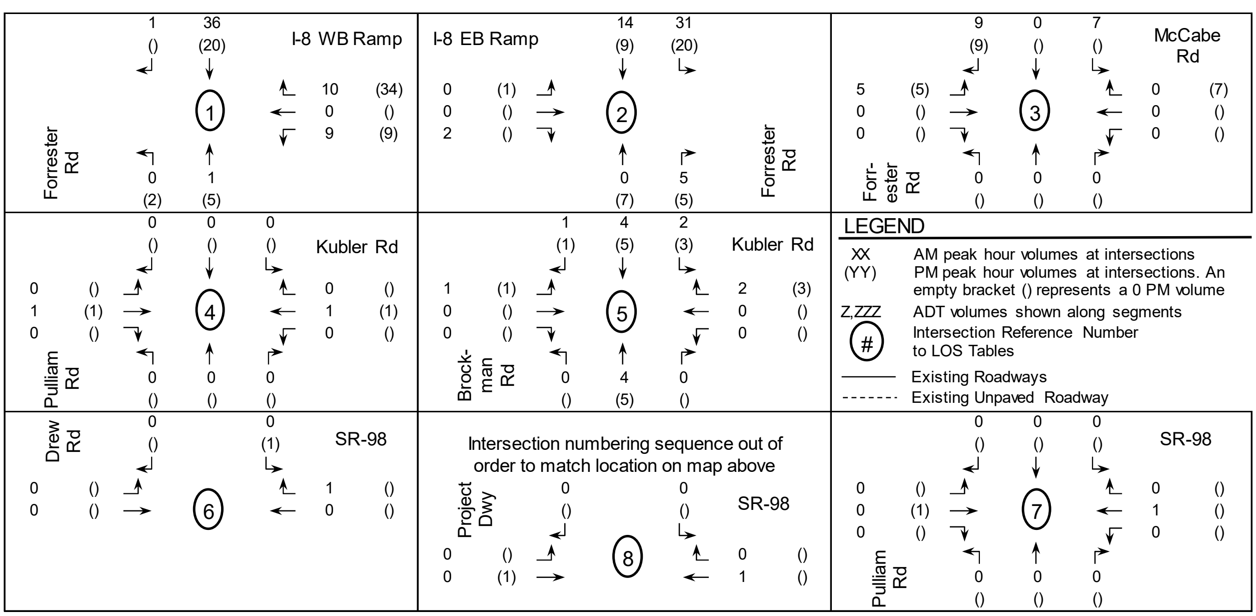
solar facility generally located west of Drew Road and south of I-8. The operations phase is calculated to generate 8 daily trips with 2 AM peak hour trips and 2 PM peak hour trips.

6) *Centinela Solar Phase 2** - a photovoltaic solar facility capable of producing approximately 100 megawatts of electricity generally located east of Drew Road and south of I-8. The operations phase is calculated to generate 8 daily trips with 3 AM peak hour trips and 3 PM peak hour trips.
7) *Coyne Ranch Specific Plan* – a residential project with up to 546 residential units located at 1642 Ross Road. The residential project is calculated to generate 5,198 ADT with 410 AM peak hour trips and 546 PM peak hour trips.
8) *County Center II Expansion* – a mixed use project of a commercial center, expansion of the Imperial County Office of Education, a Joint-Use Teacher Training and Conference Center, Judicial Center, County Park, Jail expansion, County Administrative Complex, Public Works Administration, and a County Administrative Complex located on the southwest corner of McCabe Road and Clark Road. The total project is calculated to generate 24,069 ADT with 2,581 AM peak hour trips and 2,242 PM peak hour trips.
9) *IV Substation and SDG&E Ocotillo Solar** – a project connecting the Imperial Irrigation District's "S" line from the Imperial Irrigation District substation to the Imperial Valley substation and a photovoltaic solar facility capable of producing approximately 14 megawatts of electricity generally located adjacent to the SDG&E Imperial Valley Substation. The operations phase is calculated to generate 8 daily trips with 3 AM peak hour trips and 3 PM peak hour trips.
10) *IRIS Solar Farm Cluster (Ferrell, Rockwood, Iris, and Lyons)** – photovoltaic solar facilities capable of producing approximately 360 megawatts of electricity generally located north of SR-98 between Brockman Road and Weed Road. The operations phase is calculated to generate 28 daily trips with 9 AM peak hour trips and 9 PM peak hour trips.
11) *Wistaria* - a photovoltaic solar facility capable of producing approximately 250 megawatts of electricity generally located 8 miles west of the city of Calexico. The operations phase is calculated to generate 19 daily trips with 6 AM peak hour trips and 6 PM peak hour trips.
12) *Vega Solar** - a photovoltaic solar facility capable of producing approximately 100 megawatts of electricity generally located west of Drew Road and south of I-8. The operations phase is calculated to generate 8 daily trips with 3 AM peak hour trips and 3 PM peak hour trips.
13) *Cumulative on I-8* – some of the remaining cumulative projects within Imperial County may add traffic to I-8. Many of the cumulative projects do not have traffic assignments for I-8 (because they are too far away) and some cumulative projects are too small to require a traffic study; therefore, they do not have reported cumulative traffic volumes for I-8. To account for the possibility of cumulative traffic being added to I-8, five percent of the existing I-8 peak hour volume was used as cumulative background peak hour traffic on I-8.

Traffic from the long-term cumulative list above was applied to the long-term year 2027 conditions. The long-term cumulative project (new development) volumes are shown in **Figure 16**.

Figure 16: Long-Term Cumulative Project (New Development) Volumes





14.0 Long-Term Year 2027 + Project Construction + Cumulative Conditions

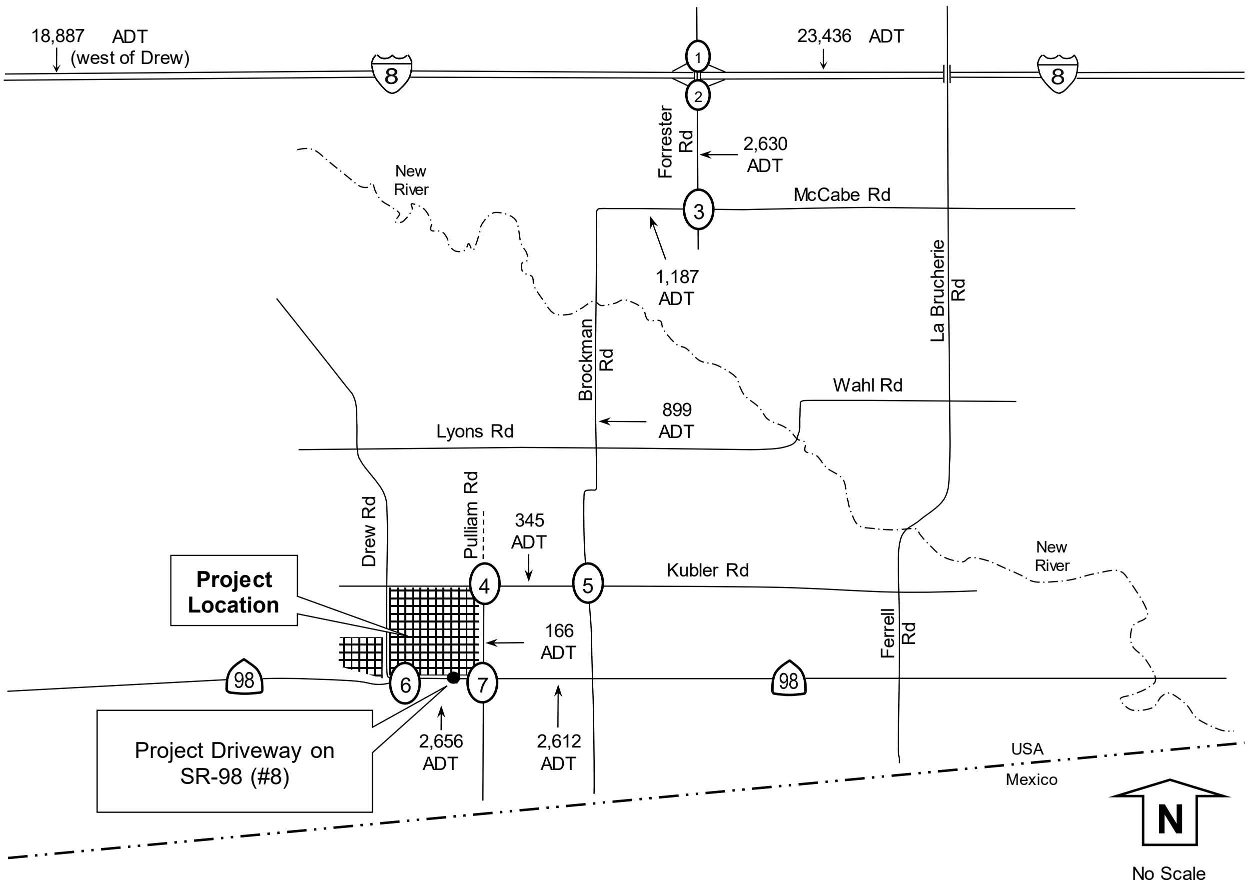
This section documents the addition of project construction traffic onto year 2027 with cumulative conditions. The long-term cumulative project traffic was used for this scenario. Year 2027 plus project construction + cumulative traffic volumes are shown in **Figure 17**. Intersection, segment, and freeway LOS are shown in **Tables 31, 32 and 33**. Intersection LOS calculations are included in **Appendix V**.

TABLE 31: LONG-TERM YEAR 2027 WITH PROJECT CONSTRUCTION WITH CUMULATIVE INTERSECTION LOS

Intersection & (Control)[1]	Movement	Peak Hour	Year 2027 + Cumulative Delay[2]	Year 2027 + Cumulative LOS[3]	Year 2027 + Cumulative + Project Delay[2]	Year 2027 + Cumulative + Project LOS[3]	Delta[4]	Impact[5]
1) Forrester Rd at	Minor	AM	10.3	B	10.9	B	0.6	None
I-8 WB Ramp (U)	Leg	PM	10.3	B	10.5	B	0.2	None
2) Forrester Rd at	Minor	AM	12.9	B	13.9	B	1.0	None
I-8 EB Ramp (U)	Leg	PM	18.2	C	19.6	C	1.4	None
3) Forrester Rd at	Minor	AM	9.9	A	10.4	B	0.5	None
McCabe Rd (U)	Leg	PM	9.8	A	11.3	B	1.5	None
4) Pulliam Rd at	Minor	AM	8.7	A	9.1	A	0.4	None
Kubler Rd (U)	Leg	PM	8.6	A	9.2	A	0.6	None
5) Brockman Rd	Minor	AM	9.0	A	9.3	A	0.3	None
at Kubler Rd (U)	Leg	PM	9.1	A	9.3	A	0.2	None
6) Drew Rd at	Minor	AM	8.7	A	8.9	A	0.2	None
SR-98 (U)	Leg	PM	9.0	A	9.2	A	0.2	None
7) Pulliam Rd at	Minor	AM	9.1	A	9.5	A	0.4	None
SR-98 (U)	Leg	PM	8.7	A	8.8	B	0.1	None
8) SR-98 at Project	Minor	AM	0.0	A	1.0	A	1.0	None
Driveway (U)	Leg	PM	0.0	A	9.3	A	9.3	None

Notes: 1) Intersection Control - (S) Signalized, (U) Unsignalized. 2) Delay - HCM Average Control Delay in seconds.
3) LOS: Level of Service. Minor Leg: approach LOS of minor/lesser roadway. All: combined LOS for all approaches.
4) Delta is the increase in delay from project. 5) Type of impact: none, direct, or cumulative.

Figure 17: Long-Term Year 2027 + Project Construction + Cumulative Volumes



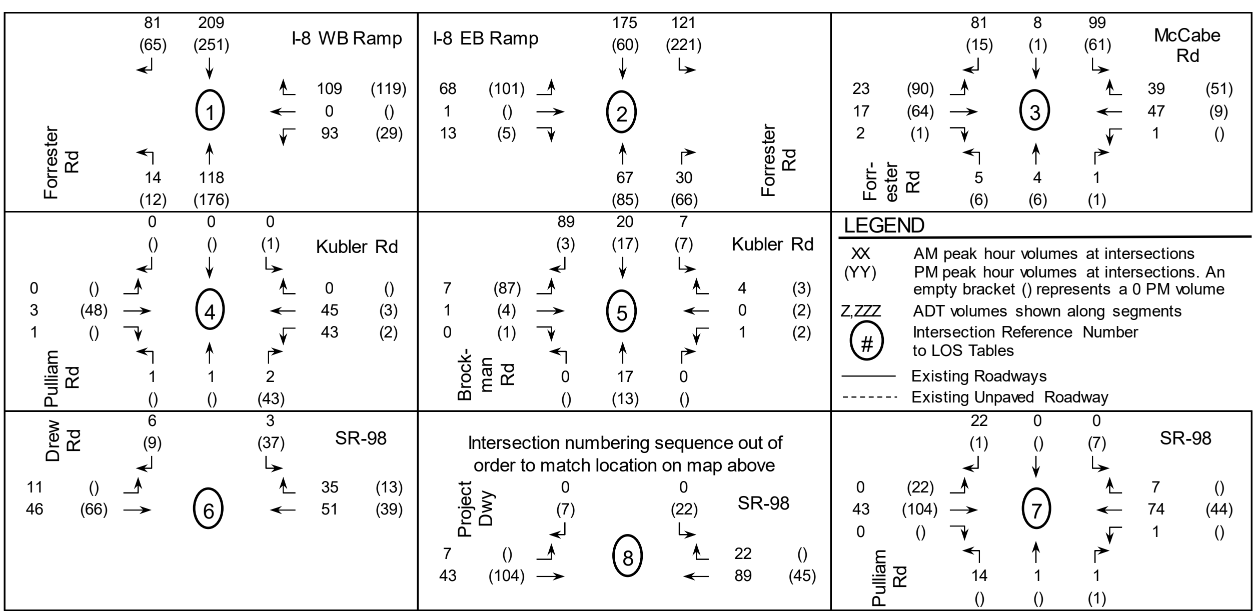


TABLE 32: LONG-TERM YEAR 2027 WITH PROJECT CONSTRUCTION WITH CUMULATIVE ROADWAY AND STATE ROUTE LOS

Segment	Classification (as built)	Year 2027 + Cumulative				Project	Year 2027 + Cumulative + Project				
		Daily Volume	LOS C Capacity	V/C	LOS	Daily Volumes	Daily Volume	LOS C Capacity	V/C	LOS	Impact?
Brockman Road											
McCabe Rd to Kubler Rd	Major (2U)	637	7,100	0.09	A	262	899	7,100	0.13	A	None
Forrester Road											
I-8 to McCabe Rd	Prime (2U)	2,456	7,100	0.35	B	174	2,630	7,100	0.37	B	None
Kubler Road											
Brockman Rd to Ferrell Rd	Minor (2U)	83	7,100	0.01	A	262	345	7,100	0.05	A	None
McCabe Road											
Brockman Rd to Forrester Rd	Major (2U)	925	7,100	0.13	A	262	1,187	7,100	0.17	A	None
Pulliam Road											
Kubler Rd to SR-98	Minor (2U)	35	7,100	0.00	A	131	166	7,100	0.02	A	None
SR-98											
Drew Rd to Pulliam Rd	State Highway (2U)	2,503	7,100	0.35	B	153	2,656	7,100	0.37	B	None
Pulliam Rd to Brockman Rd	State Highway (2U)	2,503	7,100	0.35	B	109	2,612	7,100	0.37	B	None

Notes: Classification based on 1/29/08 Circulation and Scenic Highways Element. 2U = 2 lane undivided roadway. Daily volume is a 24 hour volume. LOS: Level of Service. LOS based on actual number of lanes currently constructed. V/C: Volume to Capacity ratio. Impact? = type of impact (none, cumulative, or direct).

TABLE 33: LONG-TERM YEAR 2027 WITH PROJECT CONSTRUCTION WITH CUMULATIVE FREEWAY LOS

Freeway Segment	I-8 Dunaway Rd to Drew Rd				I-8 Forrester Rd to Imperial Ave			
Forecasted Year 2027								
ADT	16,700				20,600			
Peak Hour	A M		P M		A M		P M	
Direction	EB	WB	EB	WB	EB	WB	EB	WB
Number of Lanes	2	2	2	2	2	2	2	2
Capacity (1)	4700	4700	4700	4700	4700	4700	4700	4700
K Factor (2)	0.1346	0.1346	0.1631	0.1631	0.1346	0.1346	0.1631	0.1631
D Factor (3)	0.4770	0.5230	0.4958	0.5042	0.4770	0.5230	0.4958	0.5042
Truck Factor (4)	0.8712	0.8712	0.8712	0.8712	0.8376	0.8376	0.8376	0.8376
Peak Hour Volume	1231	1349	1550	1576	1579	1731	1989	2022
Volume to Capacity	0.262	0.287	0.330	0.335	0.336	0.368	0.423	0.430
LOS	A	A	B	B	B	B	B	B
Cumualtive + Project	248	385	435	282	237	582	643	280
Year 2027 + Cumulative + Project								
Peak Hour Volume	1479	1734	1985	1858	1816	2313	2632	2302
Volume to Capacity	0.315	0.369	0.422	0.395	0.386	0.492	0.560	0.490
LOS	B	B	B	B	B	C	C	B
Increase in V/C	0.053	0.082	0.093	0.060	0.050	0.124	0.137	0.060
Impact?	None	None	None	None	None	None	None	None

Notes: (1) Capacity of 2,350 pcphpl from CALTRANS' Guide for the Preparation of Traffic Impact Studies, December 2002. (2) Latest K factor from Caltrans (based on 2017 report), which is the percentage of AADT in both directions. (3) Latest D factor from Caltrans (based on 2017 report), which when multiplied by K and ADT will provide peak hour volume. (4) Latest truck factor from Caltrans (based on 2015 report). Impact? = Direct, Cumulative, or None.

Under long-term year 2027 + project construction + cumulative conditions, the study intersections, roadways, State Route, and freeway were calculated to operate at LOS C or better with no cumulatively considerable impacts.

15.0 Horizon Year 2060 Conditions

The year 2060 was selected as the horizon year because it is 40 years past the earliest estimate (year 2019 construction peak with completion about a year later or 2020) of when the project may be constructed and decommissioned. Under the development agreement, the CUP will be valid for 40 years with up to 10 years to commence construction. At the conclusion of the CUP term (estimated at year 2059), the Project entitlements require the Applicant to decommission the site and restore it to farmland uses in accordance with a future reclamation Plan. Implementation of the future reclamation plan is anticipated to generate traffic on the roads in the vicinity of the Project from trucks that will remove solar panels and other infrastructure from the site after the 40 year CUP life. The traffic would also include the workers who travel to and from the site to perform the work. Nevertheless, after careful consideration of various methodologies for evaluating such traffic impacts, it is not possible to accurately forecast the traffic impacts for the following reasons:

1) There have been no solar projects decommissioned in Imperial County yet to provide a reference point for potential traffic impacts,

2) The near-term construction work force is based on the concentration of populations per the 2010 Census. The source and location of a horizon year 2060 construction work force cannot be estimated in the same manner; therefore, it would require speculation to determine where the construction work force would originate and the amount of workers from the local area (i.e. Imperial Valley) vs. the regional area (i.e. Los Angeles, San Diego, or Arizona),

3) Other solar projects on the cumulative project list in the vicinity may or may not be performing their own decommissioning phase activities at the same time. Many of these other solar projects have a 10 year extension option and it is not possible to estimate how many would exercise the option. Accordingly, only a guess could be made to as to when the other cumulative projects would initiate their own decommissioning phases and thus would add traffic to the horizon year background conditions, and

4) The horizon year traffic model for Imperial County does not have horizon year volumes for the study area roadways around the project site nor does the traffic model have data for decommissioning scenarios.

5) The California Economic Forecast *California County-Level Economic Forecast 2015-2040*, dated September 2015 does not forecast beyond 2040.

Therefore, after a thorough investigation for reliable data and having used our best efforts to obtain and disclose all the information we reasonably can about traffic in the decommissioning phase, the only conclusion that can be drawn is that it is simply too speculative for evaluation.

16.0 Conclusions and Recommendations

The project is a solar photovoltaic energy-generating and energy storage facility of approximately 100 megawatts of electricity on approximately 855 gross acres and 762.8 net acres of lands that have been used for agriculture. The project is located approximately 6.5 miles southwest of the city of El Centro and approximately 7.5 miles west of Calexico, California.

The project consists of a construction phase, an operations phase and a decommissioning phase. The construction phase will have the highest amount of workers and greatest amount of traffic while the operations phase will have approximately 10 fulltime personnel. Therefore, the higher and more conservative construction trip generation was used to determine potential project impacts. The worker and construction truck traffic was calculated at 436 ADT with 147 AM peak hour trips (144 inbound and 3 outbound) and 147 PM peak hour trips (3 inbound and 144 outbound). The operations phase (after construction) is estimated to generate up to 20 ADT with approximately 2 AM and 2 PM peak hour trips.

The project may be constructed at one time taking approximately 18 months or it may be completed over a ten-year period. Under the development agreement, the CUP Permit will be valid for 40 years with up to 10 years to commence construction. If construction is to commence immediately after approvals, the project could have the highest concentration of workers in year 2019. If delayed due to market forces, the project could have the highest concentration of worker in year 2027. The project may also be phased (i.e. 20 MW constructed at a time or 1/5 of the overall project) that would result in a lower concentration of workers and less trip generation. However, to be conservative, the entire project (100 MW) was analyzed under year 2019 and year 2027 conditions, assuming a construction period of 18-months.

Information on cumulative projects was obtained from the County of Imperial and confirmed with the County of Imperial EIR team to be current as of November 2017. Cumulative projects that are located in the immediate area around the project site (i.e. projects that are generally located south of I-8 and west of Clark Road) were included in this analysis.

1) Under existing year 2017 conditions, the study intersections, roadways, State Route, and freeway were calculated to operate at LOS B or better.
2) Under existing year 2017 + project construction conditions, the study intersections, roadways, State Route, and freeway were calculated to operate at LOS B or better with <u>no significant direct project impacts.</u>
3) Under existing year 2017 + project construction + cumulative conditions, the study intersections, roadways, State Route, and freeway were calculated to operate at LOS C or better with <u>no cumulatively considerable impacts</u>.
4) Under near-term year 2019 conditions, the study intersections, roadways, State Route, and freeway were calculated to operate at LOS B or better.
5) Under near-term year 2019 + project construction conditions, the study intersections, roadways, State Route, and freeway were calculated to operate at LOS C or better with <u>no significant direct project impacts.</u>

6) Under near-term year 2019 + project construction + cumulative conditions, the study intersections, roadways, State Route, and freeway were calculated to operate at LOS C or better with no cumulatively considerable impacts.

7) Under long-term year 2027 conditions, the study intersections, roadways, State Route, and freeway were calculated to operate at LOS C or better.

8) Under long-term year 2027 + project construction conditions, the study intersections, roadways, State Route, and freeway were calculated to operate at LOS C or better with no significant direct project impacts.

9) Under long-term year 2027 + project construction + cumulative conditions, the study intersections, roadways, State Route, and freeway were calculated to operate at LOS C or better with no cumulatively considerable impacts.

The project may be phased with construction occurring in years 2019 or 2027. As noted above for the various scenarios, there are no calculated traffic impacts under existing 2017 conditions, near-term 2019 conditions, or long-term 2027 conditions. Since these are no significant impact from long-term conditions of the entire project in these scenarios where other cumulative projects are generating traffic, we conclude that if the project were to be constructed either one CUP or a group of CUPs at a time phased out over the 10 years permitted by the Project's Development Agreement, then such phased-CUP construction would also not have a significant direct project impact or cumulatively considerable impact on traffic.

The year 2060 was selected as the horizon year because it is 41 years past the earliest estimate (year 2019 construction peak with completion about a year later or 2020) of when the project may be constructed and decommissioned. Under the development agreement, the CUP will be valid for 40 years with up to 10 years to commence construction. At the conclusion of the CUP term (estimated at year 2059), the Project entitlements require the Applicant to decommission the site and restore it to farmland uses in accordance with a future reclamation Plan. Implementation of the future reclamation plan is anticipated to generate traffic on the roads in the vicinity of the Project from trucks that will remove solar panels and other infrastructure from the site immediately after the 40 year CUP life. The traffic would also include the workers who travel to and from the site to perform the work. Nevertheless, after careful consideration of various methodologies for evaluating such traffic impacts, it is not possible to accurately forecast the traffic impacts related to decommissioning the project at this time. The only conclusion that can be drawn is that it is simply too speculative for evaluation.

17.0 References

Caltrans. December 2002. *Guide for the Preparation of Traffic Impact Studies.*

County of Imperial Department of Public Works. Dated March 12, 2007, revised June 29, 2007 and approved by the Board of Supervisors of the County of Imperial on August 7, 2007. *Traffic Study and Report Policy.*

Institute of Transportation Engineers, 1999. *Traffic Engineering Handbook, Fifth Edition.*

Imperial County Planning & Development Services Department. October 1, 2006. *Imperial County Circulation Element.*

Imperial County Planning & Development Services Department. January 29, 2008. *Circulation and Scenic Highways Element.*

Trafficware. Synchro 10.0 computer software.

Transportation Research Board National Research Council Washington, D.C. 2000. *Highway Capacity Manual 2000*. CD ROM.

Appendix A

Excerpts from Imperial County's Traffic Study and Report Policy

BOS Approved 08-07-07
M.O. #37

COUNTY OF IMPERIAL

DEPARTMENT OF PUBLIC WORKS

TRAFFIC STUDY AND REPORT POLICY

Date: March, 12, 2007

Revised June 29, 2007

APPROVALS:

William S Brunet

WILLIAM S. BRUNET, P. E.
DIRECTOR OF PUBLIC WORKS
ROAD COMMISSIONER

JURG HEUBERGER
PLANNING DIRECTOR

necessary to develop a traffic report that determines whether the traffic study general criteria have been met.

In the case of significant development, it may be necessary to hold one or more scope of work meetings which would be attended by a ICPDS staff, the County Traffic Engineer or other County Advisory Staff, the individual who will be responsible for preparing the traffic study report and the Traffic and/or Civil Engineer responsible for the report and its recommendations. The individual preparing the traffic study should be familiar with the project site and the local conditions which may affect any final conclusions and recommendations.

Listed below are the basic criteria that will be used to make the determination for providing a complete traffic study as a part of the project review process. The criteria are not a complete or exhaustive list, but they are intended to define when such a report is to be prepared and to indicate the necessary components of the study report to be submitted.

1. **General Criteria**

   a. Any project that adds more than 8% of the total existing vehicle trips on the adjacent road system at full build-out of the project.

   b. Any project that generates more than 400 daily residential trip ends, 800 commercial or industrial trip ends or 200 peak hour trip ends, as determined by the average trip rates contained in the ITE Trip Generation Informational Report or the **Imperial County local exceptions in Section 2.**

   c. Any project that has the potential to degrade an existing road section, an existing signalized intersection, or an existing unsignalized intersection to below the existing level of service or to cause it to be lower than a level of service (LOS)

"C" during any peak hour, using the HCM Methods of analysis on any individual, existing traffic movement.

d. Any project, within Section C. 1. b. above, which generates more than 10% of its total traffic in the form of truck traffic.

e. Any project that intensifies the usage of the site above the level currently allowed by zoning codes and requires a GPA; and/or CUP, zone change, variance or other discretionary permit.

f. Any project that may cause an existing or proposed intersection to meet traffic signal warrants or cause a proposed intersection to be lower than LOS "C."

2. Report Contents

Traffic Reports submitted for review and approval must contain the following items as a minimum:

a. Total number of trips anticipated from the project based on the <u>average trip generation rates</u> as specified in this section for single family residential use or those contained in the ITE Trip Generation Informational Report for other residential, commercial and industrial uses for total build out of the project (minimum of 5 years), or by using fully documented (and previously approved by the County Engineer) data for a similar or like facility. Passer-by trips for commercial/retail projects will not be more than 35 percent of the total generated site traffic without Public Works/Engineering and Planning staff approval (see

Section B. above). Passer-by trips, over 35 percent and internal trips, over 5 percent, must be justified, if used. Reference to another report or another source of data will not be adequate justification.

For traffic studies carried out for presentation to the County of Imperial, single family residential trip generation of less than 10.0 trip ends per D.U. per weekday must be justified by documentation, including the age or maturity of the development producing the trip ends. Normally, new development, that is not fully an infill project, will have a trip generation rate of at least 10 trip ends per D.U. per weekday. Studies carried out by local agencies in other areas have shown the trip generation rate to be at least 15 trip ends per dwelling unit for a development at full occupancy (at project build out), at 10 years of age and at least 15 trip ends per D. U. at 20 years after build out. The local sample studies showed that a residential development trip generation rate may be as high as 20 trip ends per D.U. per weekday. The estimated build-out, 5-year or 20-year peak hour trip ends generation rate will be 1.55 for the a.m. peak hour, and the p.m. peak hour trip ends generation rate will be 1.68 trip ends per dwelling unit for the same single family residential use at 15.0 trip ends per dwelling unit per weekday. The County of Imperial requires the use of the local exceptions, unless the report preparer provides previously approved data to support using other rates. The I.T.E. Trip Generation Report will not be accepted for single family residential daily and peak hour trip ends per dwelling

unit, unless it is for urban infill development, within one half mile of major retail and commercial developmentt.

b. Existing traffic on the adjacent road system and projected traffic on the adjacent road system, projected for a minimum of five (5) years, to project build-out, or both, depending on the project and the area; larger projects or high traffic generation may require future year build-out, currently Year 2030. Future CMP TIA reports would require additional traffic projection information.

c. Traffic projections on the adjacent road system for both the project and "normal background growth" (demonstrated growth, as detailed in the general plan, or as agreed upon with County staff). Normally, traffic will be projected to Year 2030 or later for an updated future year condition.

d. Traffic projections shall include the additional impact of undeveloped land or new development within an area surrounding the proposed development site (project) as agreed to by the County Director of Public Works, the County Planning Director and advisory staff.

e. Projected impacts on intersections adjacent to or within the defined impact area of the project, using intersection capacity analysis - Highway Capacity Manual Operations Delay Method. Right turn-on-red volumes and changes in signal timing can be incorporated in a signalized intersection analysis, but any signal timing changes must be specifically identified in the study recommendations with additional cautions or impact conclusions identified if the timing changes are not

m. Traffic counts, calculations, other basic information, and supporting data shall be included in an Appendix to the report or provided as a separate Technical Appendix. All actual traffic count data will be provided to the County in a useful summary form, digital and paper format, as specified by the County.

3. **Analysis Methodology**

The build-up method of traffic analysis will be followed, showing:

a. Existing traffic;

b. Existing traffic and normal background growth (rate and time to be agreed to by County staff);

c. Existing traffic and normal background growth (see C. 3. b. above) and project build-out traffic;

d. Existing traffic and normal background growth (see C. 3. b. above) and new development traffic (see C. 3. b. above);

e. Existing traffic and 5 year normal background growth (see b. above) and new development (see b. above) and project build out, if longer than 5 years to build out of project.

If the study period to build-out is longer than 5 years, the future projection time period appropriate for a new development will be determined by the County staff. Significant projects may require a future projection time period of 20 years or General Plan build out. The future year is currently year 2030 as of the date of adopting this Policy. State Highway traffic projections will usually be carried to the year 2030 or to Caltrans current policy and procedures.

Appendix B

Excerpts from Caltrans' Guide for the Preparation of Traffic Impact Studies

GUIDE FOR THE PREPARATION

OF

TRAFFIC IMPACT STUDIES

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

December 2002

D. Travel Forecasting (Transportation Modeling)

The local or regional traffic model should reflect the most current land use and planned improvements (i.e., where programming or funding is secured). When a general plan build-out model is not available, the closest forecast model year to build-out should be used. If a traffic model is not available, historical growth rates and current trends can be used to project future traffic volumes. The TIS should clearly describe any changes made in the model to accommodate the analysis of a proposed project.

V. TRAFFIC IMPACT ANALYSIS METHODOLOGIES

Typically, the traffic analysis methodologies for the facility types indicated below are used by Caltrans and will be accepted without prior consultation. When a State highway has saturated flows, the use of a micro-simulation model is encouraged for the analysis (please note however, the micro-simulation model must be calibrated and validated for reliable results). Other analysis methods may be accepted, however, consultation between the lead agency, Caltrans and those preparing the TIS is recommended to agree on the data necessary for the analysis.

A. <u>Freeway Segments</u> – Highway Capacity Manual (HCM)*, operational analysis
B. <u>Weaving Areas</u> – Caltrans Highway Design Manual (HDM)
C. <u>Ramps and Ramp Junctions</u> – HCM*, operational analysis or Caltrans HDM, Caltrans Ramp Metering Guidelines (most recent edition)
D. <u>Multi-Lane Highways</u> – HCM*, operational analysis
E. <u>Two-lane Highways</u> – HCM*, operational analysis
F. <u>Signalized Intersections</u>[8] – HCM*, Highway Capacity Software**, operational analysis, TRAFFIX™**, Synchro**, see footnote 8
G. <u>Unsignalized Intersections</u> – HCM*, operational analysis, Caltrans Traffic Manual for signal warrants if a signal is being considered
H. <u>Transit</u> – HCM*, operational analysis
I. Pedestrians – HCM*
J. <u>Bicycles</u> – HCM*
K. <u>Caltrans Criteria/Warrants</u> – Caltrans Traffic Manual (stop signs, traffic signals, freeway lighting, conventional highway lighting, school crossings)
L. <u>Channelization</u> – Caltrans guidelines for Reconstruction of Intersections, August 1985, Ichiro Fukutome

*The most current edition of the Highway Capacity Manual, Transportation Research Board, National Research Council, should be used.

****NOTE**: Caltrans does not officially advocate the use of any special software. However, consistency with the HCM is advocated in most but not all cases. The Caltrans local development review units utilize the software mentioned above. If different software or analytical techniques are used for the TIS then consultation between the lead agency, Caltrans and those preparing the TIS is recommended. Results that are significantly different than those produced with the analytical techniques above should be challenged.

[8] The procedures in the Highway Capacity Manual "do not explicitly address operations of closely spaced signalized intersections. Under such conditions, several unique characteristics must be considered, including spill-back potential from the downstream intersection to the upstream intersection, effects of downstream queues on upstream saturation flow rate, and unusual platoon dispersion or compression between intersections. An example of such closely spaced operations is signalized ramp terminals at urban interchanges. Queue interactions between closely spaced intersections may seriously distort the procedures in" the HCM.

Appendix C

Excerpts from Imperial County's Circulation and Scenic Highways Element

CIRCULATION AND
SCENIC HIGHWAYS ELEMENT

Prepared by:
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

in collaboration with the

Imperial County Public Works Department
155 South 11th Street
El Centro, CA 92243

WILLIAM S. BRUNET, P.E.
Director of Public Works

JURG HEUBERGER, AICP
Planning & Development Services Director

Approved by:
Board of Supervisors
January 29, 2008

TABLE 5
IMPERIAL COUNTY STANDARD STREET CLASSIFICATION
AVERAGE DAILY VEHICLE TRIPS

Road		Level of Service (LOS)				
Class	**X-Section**	**A**	**B**	**C**	**D**	**E**
Expressway	154/210	30,000	42,000	60,000	70,000	80,000
Prime Arterial	106/136	22,200	37,000	44,600	50,000	57,000
Minor Arterial	82/102	14,800	24,700	29,600	33,400	37,000
Major Collector (Collector)	64/84	13,700	22,800	27,400	30,800	34,200
Minor Collector (Local Collector)	40/70	1,900	4,100	7,100	10,900	16,200
Local County (Residential)	40/60	*	*	<1,500	*	*
Local County (Residential Cul-de-Sac or Loop Street)	40/60	*	*	<200	*	*
Major Industrial Collector – (Industrial)	76/96	5,000	10,000	14,000	17,000	20,000
Industrial Local	44/64	2,500	5,000	7,000	8,500	10,000

* Levels of service are not applied to residential streets since their primary purpose is to serve abutting lots, not carry through traffic. Levels of service normally apply to roads carrying through traffic between major trip generators and attractors.

Table 5 was originally developed for the County of San Diego by the San Diego County Department of Public Works in 1985 and compares ADT to levels of service (LOS) for various roadway classifications. Proposed functional classifications were then inserted into this table and right-of-way widths adjusted to match County of Imperial standards.

Transition Areas

The Circulation and Scenic Highways Element is the graphical reference guide which shows the present and planned street system, along with the classification of those streets. It is important to note that where there is a change from one classification to another along a certain street, the transition will occur in mid-block areas to preclude non-continuing lanes and intersections. The design criteria (design, speed, curve radii, etc.) for the higher classification shall generally take precedence through the transition area.

The capacity for SR-98 in the project vicinity is based on a 2 lane Local Collector as shown in Table 3 of the County's *Circulation and Scenic Highways Element* included on the following page.

TABLE 3
IMPERIAL COUNTY PROJECTED STREET SEGMENT CONFIGURATIONS AND VOLUMES (continued)

Segment Location	2003 Classification	Year 2002 ADT Volume[a]	Year 2005 ADT Volume[a]	Year 2025 ADT Volume[c]	25 Year Total Growth Factor[d]	Year 2050 ADT Volume	Year 2050 Recommended Classification (# of Lanes)	2050 LOS[e]
State Route 86								
Imperial County Line/Desert Shores	State Hwy	N/A	12,900	21,138	1.28	27,500	Minor Arterial (4)	C
Desert Shores/Brawley Ave.	State Hwy	N/A	12,400	20,319	1.28	26,500	Collector (4)	C
Brawley Ave./S. Marina	State Hwy	N/A	13,400	21,957	1.28	28,500	Minor Arterial (4)	C
S. Marina/Air Park	State Hwy	N/A	12,100	19,827	1.64	33,000	Prime Arterial (6-divided)	B
Air Park/SR-78 West	State Hwy	N/A	10,800	17,697	1.64	29,500	Minor Arterial (4)	C
SR-78 West/Lack	State Hwy	N/A	10,800	17,890	1.64	29,500	Minor Arterial (4)	C
Lack/West Westmorland City Limits	State Hwy	N/A	10,200	19,650	1.64	32,500	Prime Arterial (6-divided)	B
E Westmorland C. Limits/W Brawley C. Limits	State Hwy	N/A	14,000	19,440	1.64	32,000	Prime Arterial (6-divided)	B
South Brawley City Limits/Legion	State Hwy	N/A	21,400	28,300	1.13	32,500	Prime Arterial (6-divided)	B
Legion/Keystone	State Hwy	N/A	19,100	27,940	1.13	32,000	Prime Arterial (6-divided)	B
Keystone/Imperial Ave.	State Hwy	N/A	14,700	27,980	1.13	32,000	Prime Arterial (6-divided)	B
I-8/McCabe	State Hwy	N/A	21,500	24,890	1.28	32,000	Prime Arterial (6-divided)	B
McCabe/Heber	State Hwy	N/A	7,100	26,100	1.28	33,500	Prime Arterial (6-divided)	B
Heber/Dogwood	State Hwy	N/A	7,500	26,100	1.28	33,500	Prime Arterial (6-divided)	B
Dogwood/SR-111	State Hwy	N/A	5,200	26,000	1.28	33,500	Prime Arterial (6-divided)	B
South Imperial City Limits/North El Centro City Limits	State Hwy	N/A	6,500	27,980	1.13	32,000	Prime Arterial (6-divided)	B
State Route 98								
Imperial Hwy/Drew	State Hwy	N/A	2,300	1,730	1.64	3,000	Local Collector (2)	B
Drew/Clark	State Hwy	N/A	3,800	5,350	1.64	9,000	Collector (4)	A
Clark/Dogwood	State Hwy	N/A	4,550	8,800	1.64	14,500	Collector (4)	B
Dogwood/West Calexico City Limits	State Hwy	N/A	9,800	24,180	1.64	31,500	Prime Arterial (6-divided)	B
East Calexico City Limits/Barbara Worth	State Hwy	N/A	24,400	26,000	1.64	33,500	Prime Arterial (6-divided)	B
Barbara Worth/Bonds Corner	State Hwy	N/A	16,300	26,000	1.64	33,500	Prime Arterial (6-divided)	B
Bonds Corner/E. Highline Canal	State Hwy	N/A	4,500	770	1.64	1,500	Local Collector (2)	A
E. Highline Canal/I-8	State Hwy	N/A	2,200	250	1.64	500	Local Collector (2)	A
State Route 111								
North Calexico City Limits	State Hwy	N/A	50,000	97,570	1.13	111,000	Freeway (8)	C
Heber/McCabe	State Hwy	N/A	33,500	98,650	1.13	112,000	Freeway (8)	C
McCabe/I-8	State Hwy	N/A	37,000	90,830	1.13	103,000	Freeway (8)	C
I-8/Evan Hewes Hwy	State Hwy	N/A	16,300	52,980	1.13	60,500	Expressway (6)	D
Evan Hewes/Aten	State Hwy	N/A	14,100	60,200	1.13	68,500	Expressway (6)	D
Aten/Worthington	State Hwy	N/A	11,300	58,160	1.13	66,000	Expressway (6)	D
Worthington/Keystone	State Hwy	N/A	10,600	58,710	1.13	67,000	Expressway (6)	D
Keystone/E. Junction 78	State Hwy	N/A	9,300	57,590	1.13	65,500	Expressway (6)	D
North Brawley City Limits/Rutherford	State Hwy	N/A	9,500	18,510	1.64	30,500	Prime Arterial (6-divided)	B
Rutherford/South Calipatria City Limits	State Hwy	N/A	6,600	18,560	1.64	30,500	Prime Arterial (6-divided)	B
North Calipatria City Limits/Sinclair	State Hwy	N/A	5,700	15,640	1.64	26,000	Minor Arterial (4)	C
Sinclair/Niland Ave	State Hwy	N/A	5,100	13,532	1.64	22,500	Collector (4)	B
Niland Ave/English	State Hwy	N/A	3,700	9,817	1.64	16,500	Collector (4)	B
English/Bombay Beach	State Hwy	N/A	2,300	6,103	1.64	10,500	Collector (4)	A
Bombay Beach/Imperial-Riverside County line	State Hwy	N/A	1,900	5,041	1.64	8,500	Collector (4)	A
State Route 115								
Junction I-8/East Holtville City Limits	State Hwy	N/A	1,850	4,140	1.64	7,000	Local Collector (2)	C
West Holtville City Limits/West Junction Evan Hewes Hwy	State Hwy	N/A	6,600	8,320	1.64	14,000	Collector (4)	B
West Junction Evan Hewes Hwy/SR-78	State Hwy	N/A	2,850	27,870	1.13	32,000	Prime Arterial (6-divided)	B
SR-78/Rutherford	State Hwy	N/A	990	13,450	1.64	22,500	Minor Arterial (4)	B
Rutherford/Wirt	State Hwy	N/A	1,650	9,720	1.64	16,000	Collector (4)	B
Wirt/East Calipatria City Limits	State Hwy	N/A	1,150	9,240	1.64	15,500	Collector (4)	B
State Route 186								
I-8/International Border	State Hwy	N/A					State Hwy	

Notes:
* See Table 1 regarding additional right-of-way for transit facility with roadway.
a. Volume from Imperial County Circulation and Scenic Highways Element Manual (Dec. 2003).
b. Volume from Caltrans, Imperial County, or Linscott Law & Greenspan, Engineers counts.
c. Volumes from Caltrans CalexGP+ Model and adjusted higher in some cases.
d. A 0.5%, 1.0%, or 2.0% annual growth rate was applied to the Year 2025 volumes to obtain Year 2050 volumes.
e. Capacity based on the Imperial County Classification Table (depending on the Year 2050 volume amount).

Appendix D

Excerpts from Caltrans' Guide for the Preparation of Traffic Impact Studies

GUIDE FOR THE PREPARATION

OF

TRAFFIC IMPACT STUDIES

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

December 2002

Transition between LOS "C" and LOS "D" Criteria

(Reference Highway Capacity Manual)

BASIC FREEWAY SEGMENTS @ 65 mi/hr

LOS	Maximum Density (pc/mi/ln)	Minimum Speed (mph)	Maximum v/c	Maximum Service Flow Rate (pc/hr/ln)
A	11	65.0	0.30	710
B	18	65.0	0.50	1170
C	26	64.6	0.71	1680
D	35	59.7	0.89	2090
E	45	52.2	1.00	2350

SIGNALIZED INTERSECTIONS and RAMP TERMINALS

LOS	Control Delay per Vehicle (sec/veh)
A	**≤ 10**
B	**> 10 - 20**
C	**> 20 - 35**
D	**> 35 - 55**
E	**> 55 - 80**
F	**> 80**

MULTI-LANE HIGHWAYS @ 55 mi/hr

LOS	Maximum Density (pc/mi/ln)	Minimum Speed (mph)	Maximum v/c	Maximum Service Flow Rate (pc/hr/ln)
A	11	55.0	0.29	600
B	18	55.0	0.47	990
C	26	54.9	0.68	1430
D	35	52.9	0.88	1850
E	41	51.2	1.00	2100

Dotted line represents the transition between LOS "C" and LOS "D"

Appendix E

Excerpts of Significance Criteria from Imperial County's Circulation Element

CIRCULATION AND
SCENIC HIGHWAYS ELEMENT

Prepared by:
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

in collaboration with the

Imperial County Public Works Department
155 South 11th Street
El Centro, CA 92243

WILLIAM S. BRUNET, P.E.
Director of Public Works

JURG HEUBERGER, AICP
Planning & Development Services Director

Approved by:
Board of Supervisors
January 29, 2008

The County Director of Public Works shall review these transition areas and provide guidance in achieving this policy.

c. New or enlarged Roads:

Local Roads

The County shall require all new developments to provide for local roads to serve the direct access needs of abutting property. These streets should be designed with a discontinuous pattern to discourage through traffic. They generally should not intersect with arterial street classifications. Typical design features include two travel lanes with parking on both sides of the street. Local roads include loop streets and cul-de-sacs.

Regional Roads (Roads beyond the actual development project)

The County shall require that all new developments participate in the improvement of regional roads that may be impacted by the proposed development. The extent to which a project impacts regional roads is generally determined by a traffic study. In some cases however the County may have predetermined improvement requirements for certain road segments or road intersections. The new developments will be required to either make certain regional improvements or in the alternative contribute a “fair share” towards the cost of such improvements.

d. Level of Service Standards

As the County continues to grow, transportation demand management and systems management will be necessary to preserve and increase available roadway “capacity”. Level of Service (LOS) standards are used to assess the performance of a street or highway system and the capacity of a roadway.

An important goal when planning the transportation system is to maintain acceptable levels of service along the federal and state highways and the local roadway network. To accomplish this, the California Department of Transportation (Caltrans), Imperial County and local agencies adopt minimum levels of service to determine future infrastructure needs.

Imperial County must provide and maintain a highway system with adequate capacity and acceptable levels of service to accommodate projected travel demands associated with the projected population growth within the Land Use Element. This can be accomplished by establishing minimum service levels for the designated street and conventional state highway system. Strategies that result in improvements to the transportation system, coupled with local job creation, will allow County residents to have access to a wide range of job opportunities within reasonable commute times.

The County's goal for an acceptable traffic service standard on an ADT basis and during AM and PM peak periods for all County-Maintained Roads shall be LOS C for all street segment links and intersections. These service values are defined by the 1985 or 2000 edition of the *Highway Capacity* Manual or any subsequent edition thereof. This policy shall acknowledge that the aforementioned level of service standards may not be obtainable on some existing facilities where abutting development precludes acquisition of additional right-of-way needed for changes in facility classification.

In order to achieve the level of service goals in the previous policy, the County shall develop and institute a long-range funding program in which new land development shall bear the major burden of the associated costs and improvement requirements.

e. Design Standards

The County shall adopt design standards for all streets in accordance with their functional classifications and recognized design guidelines. In developing these standards, the County shall consider the design standards of Caltrans and the American Association of State and Highway Transportation Officials (AASHTO). All streets within the County shall be designed in accordance with the adopted County of Imperial Design Standards. Typical cross sections and design criteria for the various street classifications are shown as an attachment to this document.

f. Private Streets

The County may permit construction of private streets within individual development projects (gated community). providing the following are addressed:

- They are designed geometrically and structurally to meet County standards.
- Only project occupants are served (gated community).
- Emergency vehicle access requirements are satisfied.
- The streets do not provide a direct through route between public streets.
- The Homeowners Associations and/or property owners provide an acceptable program for financing regular street maintenance.
- If the private street is permitted with a waiver of any of the above standards, any future requests to make the private street a public street shall require that all adjacent property owners provide and pay for all improvements and right of way required to bring the street to current public street or road standards. This includes road width, right of way widths and structural section. In no circumstance shall the County pay for any costs to upgrade a private street to public street standards if the above-mentioned requirements were waived at the request of the original developer or subdivider.

Appendix F

Traffic Impact Significance Criteria from Imperial area EIRs

4.6.2 Impact Significance Criteria

Significance Criteria

The significance criteria summarized in Table 4.6-2 by Linscott, Law and Greenspan Engineers is based upon the City of El Centro and the County of Imperial's goal for intersections and roadway segments to operate at LOS C or better. In general, a degradation in LOS from LOS C or better to LOS D or worse is considered a significant direct impact. A cumulative impact can occur if the intersection or segment LOS is already operating below City/County standards and the project increases the delay by more than 2 seconds or the v/c ratio by more than 0.02.

Table 4.6-2
Significance Criteria

Existing	Existing + Project	Existing + Project + Cumulative Projects	Impact Type
INTERSECTIONS			
Existing	**Existing + Project**	**Existing + Project + Cumulative Projects**	**Impact Type**
LOS [1] C or better	LOS C or better	LOS C or better	None
LOS C or better	LOS D or worse	-	Direct
LOS D	LOS E or F	-	Direct
LOS E	LOS F	-	Direct
Any LOS	Project does not degrade LOS and adds > 2.0 seconds of delay	LOS E or worse	Cumulative
Any LOS	Project does not degrade LOS and adds < 2.0 seconds of delay	Any LOS	None
SEGMENTS			
Existing	**Existing + Project**	**Existing + Project + Cumulative Projects**	**Impact Type**
LOS C or better	LOS C or better	LOS C or better	None
LOS C or better	LOS D or worse	-	Direct [2]
LOS D	LOS E or F	-	Direct
LOS E	LOS F	-	Direct
Any LOS	LOS E or worse and v/c [3] > 0.02	LOS E or worse	Cumulative
Any LOS	LOS E or worse and v/c [3] < 0.02	Any LOS	None

Source: Linscott, Law & Greenspan, Engineers (July 2004)
Notes:
1. LOS: Level of Service
2. Exception: post-project segment operation is D and intersections along segment are D or better, no significant impact.
3. V/C: Volume to Capacity Ratio

In addition the project would have a significant impact if:

- It would substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment).

TABLE 5.1
SIGNIFICANCE CRITERIA

Intersections			
Existing	**Existing + Project**	**Existing + Project + Cumulative Projects**	**Impact Type**
LOS C or better	LOS C or better	LOS C or better	None
LOS C or better	LOS C or better and project adds < 2.0 seconds of delay	LOS D or worse	None
LOS C or better	LOS C or better and project adds > 2.0 seconds of delay	LOS D or worse	Cumulative
LOS C or better	LOS D or worse	LOS D or worse	Direct
LOS D	LOS D and project adds < 2.0 seconds of delay	LOS D or worse	None
LOS D	LOS D and project adds > 2.0 seconds of delay	LOS D or worse	Cumulative
LOS D	LOS E or F	LOS E or F	Direct
LOS E	LOS E and project adds < 2.0 seconds of delay	LOS E or F	None
LOS E	LOS E and project adds > 2.0 seconds of delay	LOS E or F	Cumulative
LOS E	LOS F	LOS F	Direct
LOS F	Project add < 2.0 seconds of delay	LOS F	None
LOS F	Project adds 2.0 to 9.9 seconds of delay	LOS F	Cumulative
LOS F	Project adds 10.0 or more seconds of delay	LOS F	Direct
Segments			
Existing	**Existing + Project**	**Existing + Project + Cumulative Projects**	**Impact Type**
LOS C or better	LOS C or better	LOS C or better	None
LOS C or better	LOS or better and project increases V/C by < 0.02	LOS D or worse	None
LOS C or better	LOS C or better and project increase V/C by >0.02	LOS D or worse	Cumulative
LOS C or better	LOS D or worse	LOS D or worse	Direct[1]
LOS D	LOS D and project increases V/C by < 0.02	LOS D or worse	None
LOS D	LOS D and project increases V/C by > 0.02	LOS D or worse	Cumulative
LOS D	LOS E or F	LOS E or F	Direct
LOS E	LOS E and project increases V/C by < 0.02	LOS E or F	None
LOS E	LOS E and project increases V/C by > 0.02	LOS E or F	Cumulative
LOS E	LOS F	LOS F	Direct
LOS F	Project increases V/C by < 0.02	LOS F	None
LOS F	Project increases V/C by > 0.02 and < 0.09	LOS F	Cumulative
LOS F	Project increases V/C by > 0.09	LOS F	Direct

Notes: LOS = Level of Service; V/C = Volume to Capacity Ratio; [1] Exception: If Existing + Project segment operation is LOS D and intersections along segment are LOS D or better, then there is no significant impact.

In addition to the above listed projects, the Lerno/Verhaegen project was recently submitted and is currently starting the CEQA process. This project is listed for information purposes but cannot be analyzed in cumulative terms. The following is a brief description based on the limited information available for this project.

Lerno-Verhaegen Specific Plan is proposed to be a mixed-use development of 2,708 dwelling units. The project consists of 680 acres on the west side of the City of El Centro. The project includes a zone change, Tentative Map, an amendment of the City's General Plan and an annexation.

Individual traffic assignments were completed for each cumulative project. Figure 2-7 depicts the total cumulative project traffic volumes in the area. Figure 2-8 shows the existing + project + cumulative projects traffic volumes for the vicinity. Appendix D of this Mitigated Negative Declaration contains the individual cumulative project traffic assignments.

Significance Criteria

The significance criteria summarized in Table 2-7 by Linscott, Law and Greenspan, engineers is based upon the County of Imperial's goal for intersections and roadway segments to operate at LOS C or better. Intersections or segments operating at LOS D, E or F are unacceptable and therefore constitute a significant impact.

Table 2-7 – Significance Criteria

INTERSECTIONS			
Existing	**Existing + Project**	**Existing + Project + Cumulative Projects**	**Impact Type**
LOS [1] C or better	LOS C or better	LOS C or better	None
LOS C or better	LOS D or worse	-	Direct
LOS D	LOS E or F	-	Direct
LOS E	LOS F	-	Direct
Any LOS	Project does not degrade LOS and adds > 2.0 seconds of delay	LOS E or worse	Cumulative
Any LOS	Project does not degrade LOS and adds < 2.0 seconds of delay	Any LOS	None
SEGMENTS			
Existing	**Existing + Project**	**Existing + Project + Cumulative Projects**	**Impact Type**
LOS C or better	LOS C or better	LOS C or better	None
LOS C or better	LOS D or worse	-	Direct [2]
LOS D	LOS E or F	-	Direct
LOS E	LOS F	-	Direct
Any LOS	LOS E or worse and v/c [3] > 0.02	LOS E or worse	Cumulative
Any LOS	LOS E or worse and v/c [3] < 0.02	Any LOS	None

Source: LL&G, July 2004.

Notes:

1. LOS: Level of Service
2. Exception: post-project segment operation is D and intersections along segment are D or better, no significant impact.
3. V/C: Volume to Capacity Ratio

TABLE 5-1
SIGNIFICANCE CRITERIA

Existing	Existing + Project	Existing + Project + Cumulative Projects	Impact Type
INTERSECTIONS			
LOS [a] C or better	LOS C or better	LOS C or better	None
LOS C or better	LOS D or worse	—	Direct
LOS D	LOS D and adds 2.0 seconds or more of delay	LOS D or worse	Cumulative
LOS D	LOS E or F	—	Direct
LOS E	LOS F	—	Direct
LOS F	LOS F and delay increases by ≥ 10.0 seconds	LOS F	Direct
Any LOS	Project does not degrade LOS and adds 2.0 to 9.9 seconds of delay	LOS E or worse	Cumulative
Any LOS	Project does not degrade LOS and adds < 2.0 seconds of delay	Any LOS	None
SEGMENTS			
Existing	**Existing + Project**	**Existing + Project + Cumulative Projects**	**Impact Type**
LOS C or better	LOS C or better	LOS C or better	None
LOS C or better	LOS C or better and v/c [b] > 0.02	LOS D or worse	Cumulative
LOS C or better	LOS D or worse	—	Direct
LOS D	LOS D and v/c > 0.02	LOS D or worse	Cumulative
LOS D	LOS E or F	—	Direct
LOS E	LOS F	—	Direct
LOS F	LOS F and v/c increases by > 0.09	LOS F	Direct
Any LOS	LOS E or worse and v/c 0.02 to 0.09	LOS E or worse	Cumulative
Any LOS	LOS E or worse and v/c < 0.02	Any LOS	None

Source: Linscott, Law & Greenspan, Engineers

Footnotes:

a. Level of Service

b. Volume to Capacity Ratio

Appendix G

Excerpts of Existing Roadway Systems and Classifications from Imperial County Circulation Element

CIRCULATION AND
SCENIC HIGHWAYS ELEMENT

Prepared by:
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

in collaboration with the

Imperial County Public Works Department
155 South 11th Street
El Centro, CA 92243

WILLIAM S. BRUNET, P.E.
Director of Public Works

JURG HEUBERGER, AICP
Planning & Development Services Director

Approved by:
Board of Supervisors
January 29, 2008

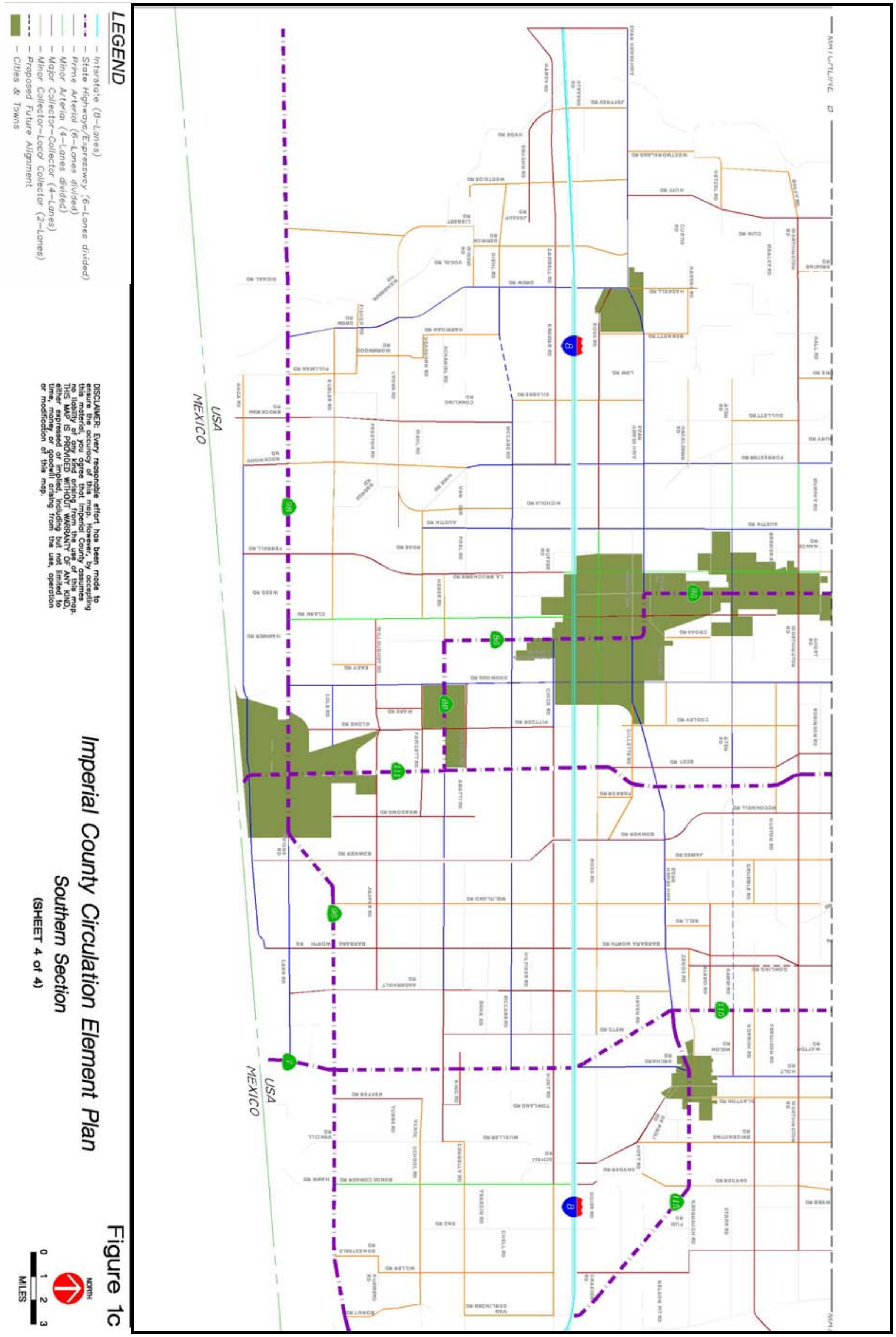

LEGEND
– Interstate (8–Lanes)
– State Highways/Expressway (6–Lanes divided)
– Prime Arterial (6–Lanes divided)
– Minor Arterial (4–Lanes divided)
– Major Collector–Collector (4–Lanes)
– Minor Collector–Local Collector (2–Lanes)
– Proposed Future Alignment
– Cities & Towns
DISCLAIMER: Every reasonable effort has been made to ensure the accuracy of this map. However, by accepting this material, you agree that Imperial County assumes no liability of any kind arising from the use of this map. THIS MAP IS PROVIDED WITHOUT WARRANTY OF ANY KIND, either expressed or implied, including but not limited to time, money or goodwill arising from the use, operation or modification of this map.
USA
MEXICO
Imperial County Circulation Element Plan
Southern Section
(SHEET 4 of 4)
Figure 1c
NORTH
0 1 2 3
MILES

TABLE 3
IMPERIAL COUNTY PROJECTED STREET SEGMENT CONFIGURATIONS AND VOLUMES

Segment Location	2003 Classification	Year 2002 ADT Volume[a]	Year 2005 ADT Volume[a]	Year 2025 ADT Volume[c]	25 Year Total Growth Factor[d]	Year 2050 ADT Volume	Year 2050 Recommended Classification (# of Lanes)	2050 LOS[e]
Alamo Road								
Meloland/SR-115	Major Collector						Major Collector (4)	
Albright Road								
SR-111/SR-115	Minor Collector						Minor Collector (2)	
SR-115/Butters	Major Collector						Major Collector (4)	
Anderholt Road								
Evan Hewes (S-80)/Hunt	Minor Collector						Minor Collector (2)	
Hunt/Carr	Major Collector						Major Collector (4)	
Andre Road								
Forrester/End	Minor Collector						Minor Collector (2)	
Anza Road								
Pulliam/Rockwood	Local						Minor Collector (2)	
Rockwood/Calexico	Prime Arterial						Prime Arterial (6-divided)	
Calexico/Barbara Worth	Prime Arterial						Prime Arterial (6-divided)	
Aten Road								
End/Forrester	Minor Collector						Minor Collector (2)	
Forrester/Austin	Minor Arterial						Minor Arterial (6-divided)	
East Imperial City Limits/Dogwood	Prime Arterial	7,300	8,450	39,000	1.13	44,500	Prime Arterial (6-divided)	C
Dogwood/SR-111	Prime Arterial						Prime Arterial (6-divided)	
Proposed/SR-111/River	None						Prime Arterial (6-divided)	
Austin Road								
McCabe/Wahl	Local						Prime Arterial (6-divided)	
Proposed Wahl/SR-98	None						Prime Arterial (6-divided)	
Evan Hewes Hwy/McCabe	Major Collector						Prime Arterial (6-divided)	
Aten/Evan Hewes Hwy	Minor Arterial						Prime Arterial (6-divided)	
Keystone/Aten	Major Collector						Prime Arterial (6-divided)	
SR-86/Keystone	Minor Collector						Prime Arterial (6-divided)	
Bannister Road								
SR-86/Brandt	Major Collector						Major Collector (4)	
Barbara Worth Road								
Zenos/Evan Hewes (S-80)	Minor Collector						Major Collector (4)	
Evan Hewes Hwy/Anza	Major Collector						Major Collector (4)	
Baughman Road								
Garvey/Lack	Minor Collector						Minor Collector (2)	
Lack/SR-86	Major Collector						Major Collector (4)	
Bell Road								
Alamo/Evan Hewes Hwy	Minor Collector						Minor Collector (2)	
Bennett Road								
Havens/Ross	Minor Collector						Minor Collector (2)	
Best Road								
Rutherford/Brawley	Minor Arterial						Minor Arterial (4)	
Blair Road								
Pound/Sinclair	Minor Collector						Minor Collector (2)	
Peterson/Lindsey	Major Collector						Major Collector (4)	
Lindsey/SR-115	Major Collector						Major Collector (4)	
SR-115/Yocum	Local						Major Collector (4)	
Blais Road								
Wieman/Forrester	Minor Collector						Minor Collector	
Boarts Road (S26)								
Westmorland/Kalin	Major Collector						Major Collector (4)	
Boley Road								
Westmorland/Huff	Minor Collector						Minor Collector (2)	
Bonds Corner Road								
Holtville/I-8	Major Collector						Major Collector (4)	
I-8/SR-98	Minor Arterial						Minor Arterial (4)	
Bonesteele Road								
Kumberg/SR-98	Minor Collector						Minor Collector (2)	
Bornt Road								
Verde School/SR-98	Minor Collector						Minor Collector (2)	
Bowker Road								
Evan Hewes Hwy/I-8	Major Collector						Major Collector (4)	
I-8/SR-98	Minor Arterial						Expressway (6)	
SR-98/Anza	None						Minor Arterial (4)	

TABLE 3
IMPERIAL COUNTY PROJECTED STREET SEGMENT CONFIGURATIONS AND VOLUMES (continued)

Segment Location	2003 Classification	Year 2002 ADT Volume[a]	Year 2005 ADT Volume[a]	Year 2025 ADT Volume[c]	25 Year Total Growth Factor[d]	Year 2050 ADT Volume	Year 2050 Recommended Classification (# of Lanes)	2050 LOS[e]
Bowles Road								
Riley/Lyerly	Minor Collector						Minor Collector (2)	
Boyd Road								
Wiest/SR-78	Local						Minor Collector (2)	
SR-115/Highline	Local						Minor Collector (2)	
Highline/End	Minor Collector						Minor Collector (2)	
Brandt Road								
Sinclair/Lindsey	Local						Minor Collector (2)	
Lindsey/Eddins	Minor Collector						Minor Collector (2)	
Eddins/Webster	Minor Collector						Minor Collector (2)	
Bridenstein Road								
Proposed SR-78/Hartshorn							Minor Collector (2)	
Hartshorn/Bonds Corner	Minor Collector						Minor Collector (2)	
Brockman Road (S30)								
McCabe/SR-98	Major Collector						Major Collector (4)	
Butters Road (S32)								
Gonder/SR-78	Prime Arterial						Prime Arterial (6)	A
Bowles/Albright	Local						Major Collector (4)	
Albright/SR-78	Major Collector						Major Collector (4)	
Cady Road								
Pellett/SR-86	Major Collector						Major Collector (4)	
Cambell Road								
Jessup/Derrick	Major Collector						Major Collector (4)	
Derrick/Drew	Major Collector						Major Collector (4)	
Carey Road								
SR-86/Dogwood	Minor Collector						Minor Collector (2)	
Carr Road								
Barbara Worth/SR-7	Major Collector						Minor Arterial (4)	
Carter Road								
Kalin/Forrester	Minor Collector						Major Collector (4)	
Casey Road								
Dickerman/SR-78	Minor Collector						Minor Collector (2)	
SR-78/Worthington	Minor Collector						Major Collector (4)	
Proposed Worthington/Norrish	None						Major Collector (4)	
Chick Road								
El Centro/Pitzer	Prime Arterial						Prime Arterial (6)	
Pitzer/Barbara Worth	Major Collector						Major Collector (4)	
Clark Road								
El Centro/SR-98	Minor Arterial						Minor Arterial (4)	
North El Centro City Limits/Worthington	Major Collector	2,100	2,430	12,550	1.64	21,000	Major Collector (4)	B
Worthington/Larsen	Minor Collector	800	930	6,220	1.64	10,500	Major Collector (4)	A
Cole Road								
Dogwood/Calexico	Prime Arterial						Prime Arterial (6-divided)	
East Calexico City Limits/SR-98	Minor Arterial	9,700	11,230	18,340	1.64	30,500	Prime Arterial (6-divided)	B
Connelly Road								
Vencill/Van Der Linden	Minor Collector						Minor Collector (2)	
Cooley Road								
Worthington/Gillett	Minor Collector						Minor Collector (2)	
Corn Road								
Bowles/Eddins	Minor Collector						Minor Collector (2)	
Correll Road								
Dogwood/SR 111	Minor Arterial						Minor Arterial (4)	
Cross Road								
Imperial (City)/Villa	Minor Collector						Minor Collector (2)	
Davis Road								
Gillespie/Schrimpf	Major Collector						Major Collector (4)	
Proposed Schrimpf/Sinclair	Major Collector						Major Collector (4)	
Dearborn Road								
Harrigan/Wormwood	Minor Collector						Minor Collector (2)	
Derrick Road								
Evan Hewes Hwy/Wixom	Minor Collector						Minor Collector (2)	
Dickerman Road								
SR-115/Butters	Minor Collector						Minor Collector (2)	

TABLE 3

IMPERIAL COUNTY PROJECTED STREET SEGMENT CONFIGURATIONS AND VOLUMES (continued)

Segment Location	2003 Classification	Year 2002 ADT Volume[a]	Year 2005 ADT Volume[a]	Year 2025 ADT Volume[c]	25 Year Total Growth Factor[d]	Year 2050 ADT Volume	Year 2050 Recommended Classification (# of Lanes)	2050 LOS[e]
Diehl Road								
Westside/Drew	Minor Collector						Minor Collector (2)	
Drew/Harrigan	Major Collector						Prime Arterial (6)	
Proposed Harrigan/Silsbee	Major Collector						Prime Arterial (6)	
Dietrich Road								
Rutherford/Shank	Minor Collector						Major Collector (4)	
Proposed Shank/SR-78	None						Major Collector (4)	
Doetsch Road								
Elder/SR-86	Minor Collector						Minor Collector (2)	
Dogwood Road (S31)*								
Proposed Lindsey/Hovley	None						Prime Arterial (6-divided)	
Brawley/SR-98	Prime Arterial						Prime Arterial (6-divided)	
Dowden Road								
Proposed Forrester/Gentry	None						Local Collector (2)	
Gentry/Kershaw	None						Prime Arterial (6)	
Kershaw/Butters	Minor Collector						Prime Arterial (6)	
Drew Road (S29)								
Evan Hewes/SR-98	Prime Arterial						Prime Arterial (6-divided)	
Dunaway Road								
I-8/Evan Hewes Hwy	Major Collector	900	1,040	2,756	1.64	4,500	Major Collector (4)	A
Eady Road								
Willoughby/Cole	Minor Collector						Minor Collector (2)	
Eddins Road (S30)								
Gentry/SR-111(Calipatria City Limits)	Major Collector						Major Collector (4)	
Edgar Road								
Pierle/Forrester	Minor Collector						Minor Collector (2)	
Elder Road								
Doetsch/Cady	Minor Collector						Minor Collector (2)	
English Road								
Sinclair/Wilkins	Minor Collector						Minor Collector (2)	
Erskine Road								
Wheeler/Payne	Minor Collector						Minor Collector	
Evan Hewes Hwy (S80)								
Imperial Hwy/El Centro	Prime Arterial						Prime Arterial (6-divided)	
El Centro/SR-115	Prime Arterial						Prime Arterial (6-divided)	
SR-115/End	Prime Arterial						Prime Arterial (6-divided)	
Fawcett Road								
Dogwood/Meadows	Minor Collector						Major Collector (4)	
Ferrell Road								
Kubler/SR-98	Major Collector						Major Collector (4)	
SR-98/Anza	Minor Collector						Minor Collector (2)	
Fifield Road								
SR-78/Streiby	Minor Collector						Minor Collector (2)	
Fisher Road								
Drew/Pulliam	Minor Collector						Minor Collector (2)	
Flett Road								
Wilkinson/Wirt	Minor Collector						Minor Collector (2)	
Forrester Road (S30)								
Proposed Sinclair/Walker	None						Prime Arterial (6-divided)	
Walker/Westmorland	Major Collector						Prime Arterial (6-divided)	
Westmorland/McCabe	Prime Arterial						Prime Arterial (6-divided)	
McCabe/Hime	Minor Collector						Prime Arterial (6-divided)	
Proposed Hime/River	Minor Collector						Prime Arterial (6-divided)	
North Westmorland City Limits/Gentry	Major Collector	1,200	1,390	9,000	1.64	15,000	Prime Arterial (6-divided)	A
Foulds Road								
Pellett/Lack	Minor Collector						Minor Collector (2)	
Fredericks Road								
Loveland/SR-111	Minor Collector						Minor Collector (2)	
Frontage Road								
Ross/Brawley (City)	Major Collector						Major Collector (4)	
Garst Road								
Sinclair/McDonald	Minor Collector						Minor Collector (2)	
Garvey Road								
Baughman/Andre	Minor Collector						Minor Collector (2)	

TABLE 3
IMPERIAL COUNTY PROJECTED STREET SEGMENT CONFIGURATIONS AND VOLUMES (continued)

Segment Location	2003 Classification	Year 2002 ADT Volume[a]	Year 2005 ADT Volume[a]	Year 2025 ADT Volume[c]	25 Year Total Growth Factor[d]	Year 2050 ADT Volume	Year 2050 Recommended Classification (# of Lanes)	2050 LOS[e]
Gentry Road								
Sinclair/Walker	Major Collector						Major Collector (4)	
Gillespie Road								
Davis/Wilkins	Minor Collector						Minor Collector (2)	
Gillett Road								
Cooley/Bowker	Minor Collector						Minor Collector (2)	
Gonder Road								
Proposed New River/SR-115	None						Major Collector (4)	
SR-115/Butters	Local						Minor Collector (2)	
Butters/Green	Minor Collector						Minor Collector (2)	
Green/Highline	Major Collector						Major Collector (4)	
Gowling Road								
Norrish/Zenos	Minor Collector						Major Collector (4)	
Green Road								
SR-78/Gonder	Major Collector						Major Collector (4)	
Griffin Road								
Wiest/SR-115	Minor Collector						Minor Collector (2)	
Grumbles Road								
James/Meloland	Minor Collector						Minor Collector (2)	
Gullett Road								
Worthington/Aten	Minor Collector						Minor Collector (2)	
Gutherie Road								
Wienert/Worthington	Minor Collector						Minor Collector (2)	
Proposed Worthington/Hackleman	Minor Collector						Minor Collector (2)	
Hackleman Road								
Low/Forrester	Minor Collector						Minor Collector (2)	
Hardy Road								
Dunaway/Jeffrey	Major Collector						Major Collector (4)	
Jeffrey/Hyde	Major Collector						Major Collector (4)	
Hyde/Jessup	Major Collector						Major Collector (4)	
Harrigan Road								
Diehl/Dearborn	Minor Collector						Minor Collector (2)	
Harris Road								
Austin/SR-86	Local						Major Collector (4)	
SR-86/McConnel	Major Collector						Major Collector (4)	
McConnell/Highline	Minor Collector						Major Collector (4)	
Hart Road								
Wiest/SR-115	Minor Collector						Minor Collector (2)	
Hartshorn Road								
Bridenstein/Proposed Bridenstein	Minor Collector						Minor Collector	
Haskell Road								
Evan Hewes Hwy/End	Minor Collector						Minor Collector (2)	
Hastain Road								
Taecker/SR-78	Minor Collector						Minor Collector (2)	
Young/Dickerman	Minor Collector						Minor Collector (2)	
Havens Road								
Haskell/Bennett	Minor Collector						Minor Collector (2)	
Hetzel Road								
Westmorland/Huff	Minor Collector						Minor Collector (2)	
Heber Road								
La Brucherie/SR-86	Local						Minor Collector (2)	
SR-111/Anderholt	Minor Arterial	N/A	2,040	16,700	1.64	27,500	Prime Arterial (6-divided)	B
Anderholt/Keffer	Major Collector						Major Collector (4)	
Keffer/Vencill	Minor Collector						Major Collector (4)	
Highline Road (S33)								
Proposed SR-78/Gonder	None						Major Collector (4)	
Gonder/Kavanuagh	Major Collector						Major Collector (4)	
Proposed Kavanaugh/I-8	None						Major Collector (4)	
Holt Road. (S32)								
Gonder/Holtville city limits	Prime Arterial						Prime Arterial (6-divided)	
Hoskins Road								
SR-86/Steiner	Minor Collector						Minor Collector	
Hovley Road								
Rutherford/Brawley	Major Collector						Major Collector (4)	

TABLE 3
IMPERIAL COUNTY PROJECTED STREET SEGMENT CONFIGURATIONS AND VOLUMES (continued)

Segment Location	2003 Classification	Year 2002 ADT Volume[a]	Year 2005 ADT Volume[a]	Year 2025 ADT Volume[c]	25 Year Total Growth Factor[d]	Year 2050 ADT Volume	Year 2050 Recommended Classification (# of Lanes)	2050 LOS[e]
Huff Road								
Imler/Evan Hewes Hwy	Major Collector						Major Collector (4)	
Hunt Road								
Barbara Worth/Bonds Corner	Major Collector						Major Collector (4)	
Bonds Corner/Van Der Linden	Minor Collector						Minor Collector (2)	
Huston Road								
Dogwood/McConnell	Minor Collector						Minor Collector (2)	
Imler Road								
Huff/Forrester	Major Collector						Major Collector (4)	
International Road								
Noffsinger/Pound	Minor Collector						Minor Collector (2)	
Irvine Road								
Shank/End	Minor Collector						Minor Collector (2)	
James Road								
Ralph/Evan Hewes Hwy	Minor Collector						Minor Collector (2)	
Jasper Road								
Calexico/Anderholt	Major Collector						Expressway (6)	
Proposed Anderholt/ SR-7	None						Expressway (6)	
Jeffery Road								
Evan Hewes Hwy/Hardy	Minor Collector						Minor Collector (2)	
Kaiser Road								
Wirt/Albright	Minor Collector						Minor Collector (2)	
Kalin (S26)								
Sinclair/SR-78/86	Major Collector						Major Collector (4)	
SR-78/86/Webster	Minor Collector						Minor Collector (4)	
Kamm Road								
River/SR-115	Local						Prime Arterial (6)	
SR-115/Holt	Minor Collector						Major Collector (4)	
Keffer Road								
SR-98/King	Major Collector						Major Collector (4)	
Kershaw Road								
Yocum/Rutherford	Minor Collector						Minor Collector (2)	
Keystone Road (S27)								
Forrester/SR-111	Prime Arterial						Expressway (6)	
SR-111/Highline	Major Collector						Expressway (6)	
King Road								
Orchard/Keffer	Major Collector						Major Collector (4)	
Kloke Road								
Willoughby/Calexico	Major Collector						Major Collector (4)	
Kramar Road								
Drew/Forrester	Major Collector						Major Collector (4)	
Kubler Road								
Drew/Clark	Minor Collector						Minor Collector (2)	
Kumberg Road								
Bonesteele/Miller	Minor Collector						Minor Collector (2)	
La Brucherie Road								
El Centro city limits/Kubler	Major Collector						Major Collector (4)	
Larsen/Murphy	Minor Collector						Minor Collector (2)	
Murphy/Imperial city limits	Minor Collector						Minor Collector (2)	
Lack Road								
Lindsey/Blais	Minor Collector						Minor Collector (2)	
Larsen Road								
Forrester/SR-86	Major Collector						Major Collector (4)	
SR-86/Clark	Minor Collector						Minor Collector (2)	
Lavigne Road								
SR-98/Bowker	Prime Arterial						Prime Arterial (6)	
Proposed Bowker/Barbara Worth	Prime Arterial						Prime Arterial (6)	
Liebert Road								
Wixom/Rd 8018	Minor Collector						Minor Collector (2)	
Proposed Road 8018/SR-98	Minor Collector						Minor Collector (2)	
Lindsey Road								
Lack/Wiest	Minor Collector						Minor Collector (2)	
Loveland Road								
Fredericks/Monte	Minor Collector						Minor Collector (2)	
Low Road								
Hackleman/Evan Hewes Hwy	Minor Collector						Minor Collector (2)	

TABLE 3
IMPERIAL COUNTY PROJECTED STREET SEGMENT CONFIGURATIONS AND VOLUMES (continued)

Segment Location	2003 Classification	Year 2002 ADT Volume[a]	Year 2005 ADT Volume[a]	Year 2025 ADT Volume[c]	25 Year Total Growth Factor[d]	Year 2050 ADT Volume	Year 2050 Recommended Classification (# of Lanes)	2050 LOS[e]
Lyerly Road								
Bowles/Eddins	Minor Collector						Minor Collector (2)	
Lyons Road								
Drew/Nichols	Minor Collector						Major Collector (4)	
Proposed Nichols/La Brucherie	None						Major Collector (4)	
Main ST (Niland)								
SR-111/Blair	Major Collector						Major Collector (4)	
Martin Road								
Baughman/7th	Minor Collector						Minor Collector (2)	
7th/Bannister	Local						Minor Collector (2)	
Mead Road								
Dogwood/McConnell	Minor Collector						Minor Collector (2)	
Meadows Road								
Heber/Calexico (City)	Major Collector						Major Collector (4)	
Meloland Road								
Worthington/Correll	Minor Collector						Minor Collector (2)	
Proposed Correll/SR-98	Minor Collector						Minor Collector (2)	
McCabe Road								
Silsbee/La Brucherie	Major Collector						Prime Arterial (6-divided)	
La Brucherie/SR-111	Minor Arterial	N/A	200	17,270	1.64	28,500	Prime Arterial (6-divided)	B
SR-111/SR-7	Major Collector						Prime Arterial (6-divided)	
McConnell Road								
SR-78/Evan Hewes Hwy	Major Collector						Major Collector (4)	
McDonald Road								
Garst/SR-111	Minor Collector						Minor Collector (2)	
SR-111 TO Rd 8041	Minor Collector						Minor Collector (2)	
McKim Road								
Harris/Ralph	Minor Collector						Minor Collector (2)	
Miller Road (S33)								
I-8/Kumberg	Minor Collector						Minor Collector (2)	
I-8/SR-115	Major Collector	200	230	5,250	1.64	9,000	Major Collector (4)	A
SR-115/Kavanaugh	Major Collector	100	120	5,300	1.64	9,000	Major Collector (4)	A
Monte Road								
Pellett/Loveland	Minor Collector						Minor Collector (2)	
Neckel Road								
Austin/Clark	Minor Collector						Minor Collector (2)	
Nichols Road								
McCabe/Lyons	Minor Collector						Minor Collector (2)	
Noffsinger Road								
SR-111/McDonald	Minor Collector						Minor Collector (2)	
Norrish Road								
Gowling/Holt	Minor Collector						Minor Collector (2)	
Holt/Highline	Local						Major Collector (4)	
Highline/End	Major Collector						Major Collector (4)	
Orchard Road (S32)/ SR 7								
King/McCabe	Major Collector	700	810	50,740	1.13	57,500	Expressway (6)	C
McCabe/I-8	Major Collector	900	1,040	49,000	1.13	56,000	Expressway (6)	C
Holtville/I-8	Minor Arterial						Prime Arterial (6-divided)	
I-8/Connelly	Major Collector						Major Collector (4)	
Orr Road								
Baughman/SR-86	Minor Collector						Minor Collector (2)	
Park Road								
Proposed Dowden/Williams	None						Major Collector (4)	
Williams/Rutherford	Minor Collector						Major Collector (4)	
Proposed Rutherford/Dietrich	None						Major Collector (4)	
Parker Road								
Ross/Gilllett	Minor Collector						Minor Collector (2)	
Payne Road								
Huff/Erskine	Minor Collector						Minor Collector (2)	
Pellett Road								
Foulds/Monte	Minor Collector						Minor Collector (2)	
Proposed Monte/Imler	Minor Collector						Minor Collector (2)	
Pickett Road								
Hastain/Butters	Minor Collector						Minor Collector (2)	

TABLE 3
IMPERIAL COUNTY PROJECTED STREET SEGMENT CONFIGURATIONS AND VOLUMES (continued)

Segment Location	2003 Classification	Year 2002 ADT Volume[a]	Year 2005 ADT Volume[a]	Year 2025 ADT Volume[c]	25 Year Total Growth Factor[d]	Year 2050 ADT Volume	Year 2050 Recommended Classification (# of Lanes)	2050 LOS[e]
Pierle Road								
Edgar/Wheeler	Minor Collector						Minor Collector(2)	
Pitzer Road								
Proposed Jasper/Willoughby	None						Major Collector (4)	
Chick/SR-86	Major Collector						Major Collector (4)	
SR-86/Jasper	Minor Collector						Major Collector (4)	
Pound Road								
Davis/International	Major Collector						Major Collector (4)	
International/Noffsinger	Minor Collector						Minor Collector (2)	
Pulliam Road								
Fisher/ SR-98	Minor Collector						Minor Collector (2)	
Ralph Road								
Imperial (City)/Dogwood	Major Collector						Major Collector (4)	
Dogwood/Mckim	Minor Collector						Minor Collector (2)	
Riley Road								
Bowles/Eddins	Minor Collector						Minor Collector	
Rockwood Road								
Proposed River/Lyons	Minor Collector						Prime Arterial (6)	
Lyons SR-98	Minor Collector						Prime Arterial (6)	
SR-98/Anza	Major Collector						Major Collector	
Ross Road								
Drew/Bennett	Major Collector	1,500	1,740	2,310	1.64	4,000	Major Collector (4)	A
Drew/Austin	Major Collector						Major Collector (4)	
El Centro/SR-111	Minor Arterial						Minor Arterial (4)	
SR-111/Mets	Local	N/A	560	2,120	1.64	3,500	Minor Collector (2)	B
Ruegger Road								
Kalin/SR-111	Minor Collector						Minor Collector (2)	
Rutherford Road (S26)								
Proposed Banister/Kalin							Major Collector (4)	
Kalin/Butters	Major Collector						Major Collector (4)	
Butters/Irvine	Minor Collector						Minor Collector (2)	
Schartz Road								
Proposed SR-86/Dogwood	None						Major Collector (4)	
Dogwood/McConnell	Minor Collector						Major Collector (4)	
Proposed McConnell/River	None						Major Collector (4)	
Seybert Road								
Taecker/SR-78	Minor Collector						Minor Collector	
Shank Road								
Best/SR-115	Minor Arterial						Minor Arterial (4)	
SR-115/Irvine	Minor Collector						Minor Collector (2)	
Silsbee Road								
Evan Hewes Hwy/McCabe	Minor Collector						Minor Collector (2)	
Sinclair Road								
Gentry/SR-111	Major Collector						Prime Arterial (6-divided)	
SR-111/Weist	Minor Collector						Minor Collector (2)	
Slayton Road								
Worthington/Holtville (City)	Minor Collector						Minor Collector (2)	
Snyder Road								
Worthington/Bonds Corner Road	Minor Collector						Minor Collector (2)	
Stahl Road								
McConnell/End	Minor Collector						Minor Collector (2)	
Streiby Road								
Fifield/Wiest	Minor Collector						Minor Collector (2)	
Taecker Road								
Seybert/Hastain	Minor Collector						Minor Collector (2)	
Titsworth Road								
Butters/End	Minor Collector						Minor Collector (2)	
Townsend Road								
SR-115/Holt	Minor Collector						Minor Collector (2)	
Vail Road								
Lack/Kalin	Minor Collector						Minor Collector (2)	
Van Der Linden								
Hunt/Connelly	Minor Collector						Minor Collector (2)	
Vencill Road								
Connelly/Heber	Minor Collector						Minor Collector (2)	

TABLE 3
IMPERIAL COUNTY PROJECTED STREET SEGMENT CONFIGURATIONS AND VOLUMES (continued)

Segment Location	2003 Classification	Year 2002 ADT Volume[a]	Year 2005 ADT Volume[a]	Year 2025 ADT Volume[c]	25 Year Total Growth Factor[d]	Year 2050 ADT Volume	Year 2050 Recommended Classification (# of Lanes)	2050 LOS[e]
Verde School Road								
Keffer/Bornt	Minor Collector						Minor Collector (2)	
Villa Road								
Dogwood/Cooley	Minor Collector						Minor Collector (2)	
Wahl Road								
Nichols/Clark	Minor Collector						Minor Collector (2)	
Walker Road								
Gentry/End	Major Collector						Major Collector (4)	
Gentry/Brandt	Minor Collector						Minor Collector (2)	
Ware Road								
Fawcett/Willoughby	Major Collector						Major Collector (4)	
Weaver Road								
Kalin/SR-86	Minor Collector						Minor Collector (2)	
Webster Road								
Kalin/Brandt	Minor Collector						Minor Collector (2)	
Westmorland Road								
Boley/Evan Hewes Hwy	Minor Collector						Minor Collector (2)	
Westside Road								
Evan Hewes Hwy/End	Minor Collector						Minor Collector (2)	
Wheeler Road								
Erskine/Pierle	Minor Collector						Minor Collector (2)	
Wieman Road								
Steiner/Cady	Minor Collector						Minor Collector (2)	
Wienert Road								
Guthrie/Forrester	Minor Collector						Minor Collector (2)	
Wiest Road								
SR-78/Griffin	Minor Collector						Minor Collector (2)	
Griffin/Boyd	Local						Minor Collector (2)	
McDonald/SR-115	Minor Collector						Minor Collector (2)	
Wilkins Road								
English/Cuff	Minor Collector						Minor Collector (2)	
Wilkinson Road								
Brandt/SR-111	Minor Collector						Minor Collector (2)	
Wiest/Flett	Minor Collector						Minor Collector (2)	
Willoughby Road								
Proposed La Brucherie/Clark	none						Major Collector (4)	
Clark/Dogwood	Minor Collector						Major Collector (4)	
Dogwood/Kloke	Major Collector						Major Collector (4)	
Wirt Road								
Wiest/Kaiser	Minor Collector						Minor Collector (2)	
Wixom Road								
Liebert/Drew	Minor Collector						Minor Collector (2)	
Wormwood Road								
Dearborn/Fisher	Minor Collector						Minor Collector (2)	
Worthington Road (S28)								
Huff/Highline	Major Collector						Major Collector (4)	
Yocum Road								
Proposed Dogwood/Lyerly	none						Major Collector (2)	
Lyerly/Kershaw	Minor Collector						Major Collector (4)	
Kershaw/Blair	Local						Major Collector (4)	
Young Road								
SR-111/Blair	Minor Collector						Minor Collector (2)	
Zenos Road								
Barbara Worth/Holtville (City)	Minor Collector						Minor Collector (2)	
State Route 78								
S.D.-Imperial County Line/Junction SR-86	State Hwy	N/A	920	8,104	1.64	13,500	Collector (4)	A
SR-111/SR-115N	State Hwy	N/A	3,950	10,592	1.64	17,500	Collector (4)	B
SR-115N/SR-115S	State Hwy	N/A	3,100	13,447	1.64	22,500	Collector (4)	B
115S/Glamis	State Hwy	N/A	1,950	7,340	1.64	12,500	Collector (4)	A
Glamis/Olgilby	State Hwy	N/A	1,850	4,909	1.64	8,500	Collector (4)	A
Olgilby/Palo Verde, Fourth	State Hwy	N/A	2,000	5,307	1.64	9,000	Collector (4)	A
Palo Verde, Fourth/Imperial County Line	State Hwy	N/A	2,000	5,307	1.64	9,000	Collector (4)	A

TABLE 3
IMPERIAL COUNTY PROJECTED STREET SEGMENT CONFIGURATIONS AND VOLUMES (continued)

Segment Location	2003 Classification	Year 2002 ADT Volume[a]	Year 2005 ADT Volume[a]	Year 2025 ADT Volume[c]	25 Year Total Growth Factor[d]	Year 2050 ADT Volume	Year 2050 Recommended Classification (# of Lanes)	2050 LOS[e]
State Route 86								
Imperial County Line/Desert Shores	State Hwy	N/A	12,900	21,138	1.28	27,500	Minor Arterial (4)	C
Desert Shores/Brawley Ave.	State Hwy	N/A	12,400	20,319	1.28	26,500	Collector (4)	C
Brawley Ave./S. Marina	State Hwy	N/A	13,400	21,957	1.28	28,500	Minor Arterial (4)	C
S. Marina/Air Park	State Hwy	N/A	12,100	19,827	1.64	33,000	Prime Arterial (6-divided)	B
Air Park/SR-78 West	State Hwy	N/A	10,800	17,697	1.64	29,500	Minor Arterial (4)	C
SR-78 West/Lack	State Hwy	N/A	10,800	17,890	1.64	29,500	Minor Arterial (4)	C
Lack/West Westmorland City Limits	State Hwy	N/A	10,200	19,650	1.64	32,500	Prime Arterial (6-divided)	B
E Westmorland C. Limits/W Brawley C. Limits	State Hwy	N/A	14,000	19,440	1.64	32,000	Prime Arterial (6-divided)	B
South Brawley City Limits/Legion	State Hwy	N/A	21,400	28,300	1.13	32,500	Prime Arterial (6-divided)	B
Legion/Keystone	State Hwy	N/A	19,100	27,940	1.13	32,000	Prime Arterial (6-divided)	B
Keystone/Imperial Ave.	State Hwy	N/A	14,700	27,980	1.13	32,000	Prime Arterial (6-divided)	B
I-8/McCabe	State Hwy	N/A	21,500	24,890	1.28	32,000	Prime Arterial (6-divided)	B
McCabe/Heber	State Hwy	N/A	7,100	26,100	1.28	33,500	Prime Arterial (6-divided)	B
Heber/Dogwood	State Hwy	N/A	7,500	26,100	1.28	33,500	Prime Arterial (6-divided)	B
Dogwood/SR-111	State Hwy	N/A	5,200	26,000	1.28	33,500	Prime Arterial (6-divided)	B
South Imperial City Limits/North El Centro City Limits	State Hwy	N/A	6,500	27,980	1.13	32,000	Prime Arterial (6-divided)	B
State Route 98								
Imperial Hwy/Drew	State Hwy	N/A	2,300	1,730	1.64	3,000	Local Collector (2)	B
Drew/Clark	State Hwy	N/A	3,800	5,350	1.64	9,000	Collector (4)	A
Clark/Dogwood	State Hwy	N/A	4,550	8,800	1.64	14,500	Collector (4)	B
Dogwood/West Calexico City Limits	State Hwy	N/A	9,800	24,180	1.64	31,500	Prime Arterial (6-divided)	B
East Calexico City Limits/Barbara Worth	State Hwy	N/A	24,400	26,000	1.64	33,500	Prime Arterial (6-divided)	B
Barbara Worth/Bonds Corner	State Hwy	N/A	16,300	26,000	1.64	33,500	Prime Arterial (6-divided)	B
Bonds Corner/E. Highline Canal	State Hwy	N/A	4,500	770	1.64	1,500	Local Collector (2)	A
E. Highline Canal/I-8	State Hwy	N/A	2,200	250	1.64	500	Local Collector (2)	A
State Route 111								
North Calexico City Limits	State Hwy	N/A	50,000	97,570	1.13	111,000	Freeway (8)	C
Heber/McCabe	State Hwy	N/A	33,500	98,650	1.13	112,000	Freeway (8)	C
McCabe/I-8	State Hwy	N/A	37,000	90,830	1.13	103,000	Freeway (8)	C
I-8/Evan Hewes Hwy	State Hwy	N/A	16,300	52,980	1.13	60,500	Expressway (6)	D
Evan Hewes/Aten	State Hwy	N/A	14,100	60,200	1.13	68,500	Expressway (6)	D
Aten/Worthington	State Hwy	N/A	11,300	58,160	1.13	66,000	Expressway (6)	D
Worthington/Keystone	State Hwy	N/A	10,600	58,710	1.13	67,000	Expressway (6)	D
Keystone/E. Junction 78	State Hwy	N/A	9,300	57,590	1.13	65,500	Expressway (6)	D
North Brawley City Limits/Rutherford	State Hwy	N/A	9,500	18,510	1.64	30,500	Prime Arterial (6-divided)	B
Rutherford/South Calipatria City Limits	State Hwy	N/A	6,600	18,560	1.64	30,500	Prime Arterial (6-divided)	B
North Calipatria City Limits/Sinclair	State Hwy	N/A	5,700	15,640	1.64	26,000	Minor Arterial (4)	C
Sinclair/Niland Ave	State Hwy	N/A	5,100	13,532	1.64	22,500	Collector (4)	B
Niland Ave/English	State Hwy	N/A	3,700	9,817	1.64	16,500	Collector (4)	B
English/Bombay Beach	State Hwy	N/A	2,300	6,103	1.64	10,500	Collector (4)	A
Bombay Beach/Imperial-Riverside County line	State Hwy	N/A	1,900	5,041	1.64	8,500	Collector (4)	A
State Route 115								
Junction I-8/East Holtville City Limits	State Hwy	N/A	1,850	4,140	1.64	7,000	Local Collector (2)	C
West Holtville City Limits/West Junction Evan Hewes Hwy	State Hwy	N/A	6,600	8,320	1.64	14,000	Collector (4)	B
West Junction Evan Hewes Hwy/SR-78	State Hwy	N/A	2,850	27,870	1.13	32,000	Prime Arterial (6-divided)	B
SR-78/Rutherford	State Hwy	N/A	990	13,450	1.64	22,500	Minor Arterial (4)	B
Rutherford/Wirt	State Hwy	N/A	1,650	9,720	1.64	16,000	Collector (4)	B
Wirt/East Calipatria City Limits	State Hwy	N/A	1,150	9,240	1.64	15,500	Collector (4)	B
State Route 186								
I-8/International Border	State Hwy	N/A					State Hwy	

Notes:
* See Table 1 regarding additional right-of-way for transit facility with roadway.
a. Volume from Imperial County Circulation and Scenic Highways Element Manual (Dec. 2003).
b. Volume from Caltrans, Imperial County, or Linscott Law & Greenspan, Engineers counts.
c. Volumes from Caltrans CalexGP+ Model and adjusted higher in some cases.
d. A 0.5%, 1.0%, or 2.0% annual growth rate was applied to the Year 2025 volumes to obtain Year 2050 volumes.
e. Capacity based on the Imperial County Classification Table (depending on the Year 2050 volume amount).

Appendix H

Count Data

PO Box 1178
Corona, CA 92878
951-268-6268

Location:	County of Imperial	Date: 11/14/2017
N/S:	Forrester Road	Day: TUESDAY
E/W:	I-8 WB Ramps	Project # 143-17778

TURNING MOVEMENT COUNT

	Forrester Road Northbound			Forrester Road Southbound			I-8 WB Ramps Eastbound			I-8 WB Ramps Westbound			
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
6:00 AM	0	3	0	0	16	20	0	0	0	5	2	27	73
6:15 AM	0	12	0	0	10	17	0	0	0	5	0	35	79
6:30 AM	1	15	0	0	24	21	0	0	0	4	0	41	106
6:45 AM	1	17	0	0	17	13	0	0	0	8	0	39	95
7:00 AM	2	22	0	0	28	10	0	0	0	5	0	31	98
7:15 AM	1	25	0	0	24	18	0	0	0	4	0	18	90
7:30 AM	5	22	0	0	33	20	0	0	0	13	0	16	109
7:45 AM	4	29	0	0	41	19	0	0	0	18	0	18	129
TOTAL VOLUMES:	14	145	0	0	193	138	0	0	0	62	2	225	779

AM Peak Hr Begins at: 700 AM

	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
PEAK VOLUMES:	12	98	0	0	126	67	0	0	0	40	0	83	426

PEAK HR FACTOR:	0.833	0.804	0.000	0.854	0.826

	Forrester Road Northbound			Forrester Road Southbound			I-8 WB Ramps Eastbound			I-8 WB Ramps Westbound			
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
4:00 PM	1	30	0	0	38	11	0	0	0	5	0	19	104
4:15 PM	2	32	0	0	33	20	0	0	0	5	0	19	111
4:30 PM	2	22	0	0	71	14	0	0	0	1	0	15	125
4:45 PM	4	30	0	0	45	9	0	0	0	5	0	19	112
5:00 PM	0	41	0	0	44	11	0	0	0	5	0	18	119
5:15 PM	4	26	0	0	25	6	0	0	0	4	0	19	84
5:30 PM	0	24	0	0	27	15	0	0	0	5	0	13	84
5:45 PM	0	19	0	0	23	4	0	0	0	6	0	11	63
TOTAL VOLUMES:	13	224	0	0	306	90	0	0	0	36	0	133	802

PM Peak Hr Begins at: 415 PM

	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
PEAK VOLUMES:	8	125	0	0	193	54	0	0	0	16	0	71	467

PEAK HR FACTOR:	0.811	0.726	0.000	0.906	0.934

PO Box 1178
Corona, CA 92878
951-268-6268

Location: County of Imperial
N/S: Forrester Road
E/W: I-8 EB Ramps

Date: 11/14/2017
Day: TUESDAY
Project # 143-17778

TURNING MOVEMENT COUNT

	Forrester Road Northbound			Forrester Road Southbound			I-8 EB Ramps Eastbound			I-8 EB Ramps Westbound			
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
6:00 AM	0	2	5	8	14	0	1	0	5	0	0	0	35
6:15 AM	0	4	2	2	10	0	8	0	2	0	0	0	28
6:30 AM	0	9	2	12	15	0	8	0	2	0	0	0	48
6:45 AM	0	4	0	12	17	0	13	0	0	0	0	0	46
7:00 AM	0	17	2	21	10	0	9	0	2	0	0	0	61
7:15 AM	0	10	1	16	10	0	15	1	2	0	0	0	55
7:30 AM	0	10	8	20	25	0	17	0	4	0	0	0	84
7:45 AM	0	19	9	18	41	0	16	0	1	0	0	0	104
TOTAL VOLUMES:	0	75	29	109	142	0	87	1	18	0	0	0	461

AM Peak Hr Begins at: 700 AM

	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
PEAK VOLUMES:	0	56	20	75	86	0	57	1	9	0	0	0	304

PEAK HR FACTOR:	0.679	0.682	0.798	0.000	0.731

	Forrester Road Northbound			Forrester Road Southbound			I-8 EB Ramps Eastbound			I-8 EB Ramps Westbound			
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
4:00 PM	0	12	6	23	19	0	18	0	3	0	0	0	81
4:15 PM	0	5	5	23	14	0	25	0	2	0	0	0	74
4:30 PM	0	12	8	62	10	0	10	0	1	0	0	0	103
4:45 PM	0	14	4	41	7	0	20	0	1	0	0	0	87
5:00 PM	0	16	4	42	11	0	29	0	0	0	0	0	102
5:15 PM	0	5	4	17	8	0	23	0	1	0	0	0	58
5:30 PM	0	8	2	20	9	0	16	0	0	0	0	0	55
5:45 PM	0	4	7	21	10	0	16	0	1	0	0	0	59
TOTAL VOLUMES:	0	76	40	249	88	0	157	0	9	0	0	0	619

PM Peak Hr Begins at: 415 PM

	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
PEAK VOLUMES:	0	47	21	168	42	0	84	0	4	0	0	0	366

PEAK HR FACTOR:	0.850	0.729	0.759	0.000	0.888

PO Box 1178
Corona, CA 92878
951-268-6268

Location: County of Imperial
N/S: Forrester Road
E/W: McCabe Road

Date: 11/14/2017
Day: TUESDAY
Project # 143-17778

TURNING MOVEMENT COUNT

	Forrester Road Northbound			Forrester Road Southbound			McCabe Road Eastbound			McCabe Road Westbound			
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
6:00 AM	0	0	0	7	1	2	1	1	1	1	5	4	23
6:15 AM	0	1	0	5	3	3	0	2	1	0	5	3	23
6:30 AM	2	0	0	9	1	4	2	1	4	0	4	4	31
6:45 AM	0	1	0	3	4	4	3	1	1	1	9	3	30
7:00 AM	0	0	0	7	1	2	8	3	1	0	7	6	35
7:15 AM	1	1	0	10	1	2	3	4	0	1	4	6	33
7:30 AM	2	0	0	16	5	4	1	4	0	0	1	8	41
7:45 AM	1	2	1	44	0	4	2	2	1	0	3	13	73
TOTAL VOLUMES:	6	5	1	101	16	25	20	18	9	3	38	47	289

AM Peak Hr Begins at: 700 AM

	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
PEAK VOLUMES:	4	3	1	77	7	12	14	13	2	1	15	33	182

PEAK HR FACTOR:	0.500	0.500	0.604	0.766	0.623

	Forrester Road Northbound			Forrester Road Southbound			McCabe Road Eastbound			McCabe Road Westbound			
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
4:00 PM	0	1	1	10	1	3	5	12	1	0	2	6	42
4:15 PM	5	4	0	29	0	1	3	8	0	0	3	17	70
4:30 PM	0	0	0	6	0	0	8	4	0	0	1	7	26
4:45 PM	0	0	0	6	0	0	7	5	0	0	1	7	26
5:00 PM	0	0	0	9	0	2	5	1	0	1	0	7	25
5:15 PM	0	0	0	3	0	2	5	2	0	0	3	4	19
5:30 PM	0	1	0	5	1	1	1	1	0	0	1	1	12
5:45 PM	0	0	0	3	1	6	0	2	0	0	0	2	14
TOTAL VOLUMES:	5	6	1	71	3	15	34	35	1	1	11	51	234

PM Peak Hr Begins at: 400 PM

	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
PEAK VOLUMES:	5	5	1	51	1	4	23	29	1	0	7	37	164

PEAK HR FACTOR:	0.306	0.467	0.736	0.550	0.586

Counts unlimited
PO Box 1178
Corona, CA 92878
951-268-6268

Location: County of Imperial
N/S: Pulliam Road
E/W: Kubler Road

Date: 11/14/2017
Day: TUESDAY
Project # 143-17778

TURNING MOVEMENT COUNT

	Pulliam Road Northbound			Pulliam Road Southbound			Kubler Road Eastbound			Kubler Road Westbound			
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
6:00 AM	0	1	1	0	0	0	0	0	0	0	0	0	2
6:15 AM	0	0	0	0	0	0	0	0	1	0	1	0	2
6:30 AM	1	0	0	0	0	0	0	0	0	0	0	0	1
6:45 AM	0	0	0	0	0	0	0	1	0	0	0	0	1
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	1	0	0	0	0	0	0	1	0	2
7:30 AM	0	0	1	0	0	0	0	1	0	0	0	0	2
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL VOLUMES:	1	1	2	1	0	0	0	2	1	0	2	0	10

AM Peak Hr Begins at: 600 AM

	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
PEAK VOLUMES:	1	1	1	0	0	0	0	1	1	0	1	0	6

PEAK HR FACTOR:	0.375	0.000	0.500	0.250	0.750

	Pulliam Road Northbound			Pulliam Road Southbound			Kubler Road Eastbound			Kubler Road Westbound			
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
4:00 PM	0	0	0	0	0	0	0	0	0	1	1	0	2
4:15 PM	0	0	0	0	0	0	0	3	0	0	0	0	3
4:30 PM	0	0	0	1	0	0	0	0	0	0	0	0	1
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	1	0	0	0	0	1
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL VOLUMES:	0	0	0	1	0	0	0	4	0	1	1	0	7

PM Peak Hr Begins at: 400 PM

	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
PEAK VOLUMES:	0	0	0	1	0	0	0	3	0	1	1	0	6

PEAK HR FACTOR:	0.000	0.250	0.250	0.250	0.500

PO Box 1178
Corona, CA 92878
951-268-6268

Location: County of Imperial
N/S: Brockman Road
E/W: Kubler Road

Date: 11/14/2017
Day: TUESDAY
Project # 143-17778

TURNING MOVEMENT COUNT

	Brockman Road Northbound			Brockman Road Southbound			Kubler Road Eastbound			Kubler Road Westbound			
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
6:00 AM	0	1	0	0	2	0	1	0	0	0	0	0	4
6:15 AM	0	1	0	1	1	0	0	0	0	0	0	0	3
6:30 AM	0	3	0	1	3	1	0	0	0	0	0	1	9
6:45 AM	0	2	0	2	5	0	0	1	0	0	0	1	11
7:00 AM	0	5	0	0	3	1	1	0	0	0	0	0	10
7:15 AM	0	1	0	1	2	0	2	0	0	1	0	0	7
7:30 AM	0	0	0	0	1	0	0	1	0	0	1	0	3
7:45 AM	0	1	0	0	3	0	0	0	1	0	1	0	6
TOTAL VOLUMES:	0	14	0	5	20	2	4	2	1	1	2	2	53

AM Peak Hr Begins at: 630 AM

	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
PEAK VOLUMES:	0	11	0	4	13	2	3	1	0	1	0	2	37

PEAK HR FACTOR:	0.550	0.679	0.500	0.750	0.841

	Brockman Road Northbound			Brockman Road Southbound			Kubler Road Eastbound			Kubler Road Westbound			
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
4:00 PM	0	1	0	2	3	0	0	0	0	0	0	0	6
4:15 PM	0	2	0	0	2	0	0	0	0	1	2	0	7
4:30 PM	0	4	0	1	5	0	0	2	0	1	0	0	13
4:45 PM	0	0	0	0	0	0	0	1	1	0	0	0	2
5:00 PM	0	1	0	0	1	1	0	0	0	0	0	1	4
5:15 PM	0	1	0	0	0	0	0	0	0	0	0	1	2
5:30 PM	0	3	0	1	0	0	0	0	0	1	0	0	5
5:45 PM	1	1	0	0	2	0	0	0	2	0	0	0	6
TOTAL VOLUMES:	1	13	0	4	13	1	0	3	3	3	2	2	45

PM Peak Hr Begins at: 400 PM

	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
PEAK VOLUMES:	0	7	0	3	10	0	0	3	1	2	2	0	28

PEAK HR FACTOR:	0.438	0.542	0.500	0.333	0.538

PO Box 1178
Corona, CA 92878
951-268-6268

Location: County of Imperial
N/S: Drew Road
E/W: SR-98

Date: 11/14/2017
Day: TUESDAY
Project # 143-17778

TURNING MOVEMENT COUNT

	Drew Road Northbound			Drew Road Southbound			SR-98 Eastbound			SR-98 Westbound			
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
6:00 AM	0	0	0	2	0	0	0	2	0	0	18	0	22
6:15 AM	0	0	0	1	0	0	0	4	0	0	7	0	12
6:30 AM	0	0	0	0	0	1	0	6	0	0	11	0	18
6:45 AM	0	0	0	0	0	1	0	10	0	0	11	0	22
7:00 AM	0	0	0	0	0	3	2	11	0	0	13	0	29
7:15 AM	0	0	0	1	0	1	1	7	0	0	8	3	21
7:30 AM	0	0	0	1	0	0	0	5	0	0	11	1	18
7:45 AM	0	0	0	2	0	0	0	7	0	0	9	1	19
TOTAL VOLUMES:	0	0	0	7	0	6	3	52	0	0	88	5	161

AM Peak Hr Begins at: 645 AM

	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
PEAK VOLUMES:	0	0	0	2	0	5	3	33	0	0	43	4	90

PEAK HR FACTOR:	0.000	0.583	0.692	0.904	0.776

	Drew Road Northbound			Drew Road Southbound			SR-98 Eastbound			SR-98 Westbound			
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
4:00 PM	0	0	0	3	0	0	0	8	0	0	7	0	18
4:15 PM	0	0	0	0	0	0	0	14	0	0	6	0	20
4:30 PM	0	0	0	2	0	2	0	20	0	0	15	4	43
4:45 PM	0	0	0	2	0	0	0	10	0	0	3	3	18
5:00 PM	0	0	0	2	0	0	0	12	0	0	5	0	19
5:15 PM	0	0	0	0	0	0	0	13	0	0	4	3	20
5:30 PM	0	0	0	1	0	0	0	11	0	0	9	1	22
5:45 PM	0	0	0	0	0	0	1	7	0	0	5	1	14
TOTAL VOLUMES:	0	0	0	10	0	2	1	95	0	0	54	12	174

PM Peak Hr Begins at: 430 PM

	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
PEAK VOLUMES:	0	0	0	6	0	2	0	55	0	0	27	10	100

PEAK HR FACTOR:	0.000	0.500	0.688	0.487	0.581

PO Box 1178
Corona, CA 92878
951-268-6268

Location: County of Imperial
N/S: Drew Road
E/W: SR-98

Date: 11/14/2017
Day: TUESDAY
Project # 143-17778

TURNING MOVEMENT COUNT

	Drew Road Northbound			Drew Road Southbound			SR-98 Eastbound			SR-98 Westbound			
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
6:00 AM	0	1	0	0	0	0	0	5	0	0	20	0	26
6:15 AM	0	0	0	0	1	0	0	5	0	0	5	0	11
6:30 AM	0	1	0	0	0	0	0	5	0	1	12	0	19
6:45 AM	5	0	1	0	0	0	0	7	0	0	8	0	21
7:00 AM	5	0	0	0	0	0	0	14	0	1	7	0	27
7:15 AM	1	0	0	0	0	0	0	8	0	0	10	0	19
7:30 AM	1	1	0	0	0	0	0	6	0	0	12	0	20
7:45 AM	1	0	0	0	0	0	0	6	1	1	6	0	15
TOTAL VOLUMES:	13	3	1	0	1	0	0	56	1	3	80	0	158

AM Peak Hr Begins at: 645 AM

	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
PEAK VOLUMES:	12	1	1	0	0	0	0	35	0	1	37	0	87

PEAK HR FACTOR:	0.583	0.000	0.625	0.792	0.806

	Drew Road Northbound			Drew Road Southbound			SR-98 Eastbound			SR-98 Westbound			
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
4:00 PM	0	0	0	0	0	0	0	8	0	0	7	0	15
4:15 PM	0	0	1	0	0	1	0	17	0	0	7	0	26
4:30 PM	0	0	0	0	0	0	0	22	0	0	20	0	42
4:45 PM	0	0	0	0	0	0	0	11	0	0	4	0	15
5:00 PM	0	0	0	0	0	0	0	12	0	0	5	0	17
5:15 PM	0	0	1	0	0	0	0	15	0	0	7	0	23
5:30 PM	0	0	0	0	0	0	0	12	0	0	9	0	21
5:45 PM	0	0	0	0	0	0	0	6	0	0	7	0	13
TOTAL VOLUMES:	0	0	2	0	0	1	0	103	0	0	66	0	172

PM Peak Hr Begins at: 415 PM

	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
PEAK VOLUMES:	0	0	1	0	0	1	0	62	0	0	36	0	100

PEAK HR FACTOR:	0.250	0.250	0.705	0.450	0.595

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878

County of Imperial
Brockman Road
B/ McCabe Road - Kubler Road

File Name 003
Site Code: 143-17778
24 Hour Directional Volume Count

Date:	Northbound				Southbound					
11/14/2017	15 Minute Totals		Hourly Totals		15 Minute Totals		Hourly Totals		Combined Totals	
Time	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon
12:00	0	10			0	2				
12:15	0	3			0	6				
12:30	0	1			0	1				
12:45	0	5	0	19	0	5	0	14	0	33
1:00	0	3			0	3				
1:15	0	3			1	3				
1:30	0	5			0	3				
1:45	0	3	0	14	0	3	1	12	1	26
2:00	0	11			0	5				
2:15	1	2			0	2				
2:30	0	2			0	5				
2:45	0	0	1	15	0	9	0	21	1	36
3:00	0	5			0	7				
3:15	0	7			0	2				
3:30	0	3			1	4				
3:45	1	2	1	17	0	3	1	16	2	33
4:00	0	1			1	9				
4:15	0	2			0	2				
4:30	2	4			0	3				
4:45	0	5	2	12	5	0	6	14	8	26
5:00	1	6			1	2				
5:15	2	4			4	2				
5:30	3	4			0	1				
5:45	1	2	7	16	5	4	10	9	17	25
6:00	3	0			6	1				
6:15	2	1			3	0				
6:30	4	1			4	0				
6:45	4	0	13	2	4	0	17	1	30	3
7:00	10	2			1	1				
7:15	4	1			5	2				
7:30	2	1			6	2				
7:45	9	0	25	4	11	0	23	5	48	9
8:00	0	1			4	1				
8:15	5	2			3	0				
8:30	6	0			15	0				
8:45	6	0	17	3	5	0	27	1	44	4
9:00	6	1			5	0				
9:15	7	0			2	1				
9:30	2	0			4	1				
9:45	8	0	23	1	6	1	17	3	40	4
10:00	5	2			4	0				
10:15	11	1			5	2				
10:30	5	2			4	2				
10:45	6	3	27	8	3	0	16	4	43	12
11:00	19	2			7	2				
11:15	1	0			6	0				
11:30	5	0			4	0				
11:45	2	0	27	2	3	1	20	3	47	5
Totals	143	113			138	103				
Combined Totals		256				241				
ADT										497
AM Peak Hour	1015	AM			745	AM				
Volume	41				33					
P.H.F.	0.539				0.550					
PM Peak Hour		115	PM			230	PM			
Volume		22				23	**TWO PEAK HOURS**			
P.H.F.		0.500				0.639				
Percentage	55.9%	44.1%			57.3%	42.7%				

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878

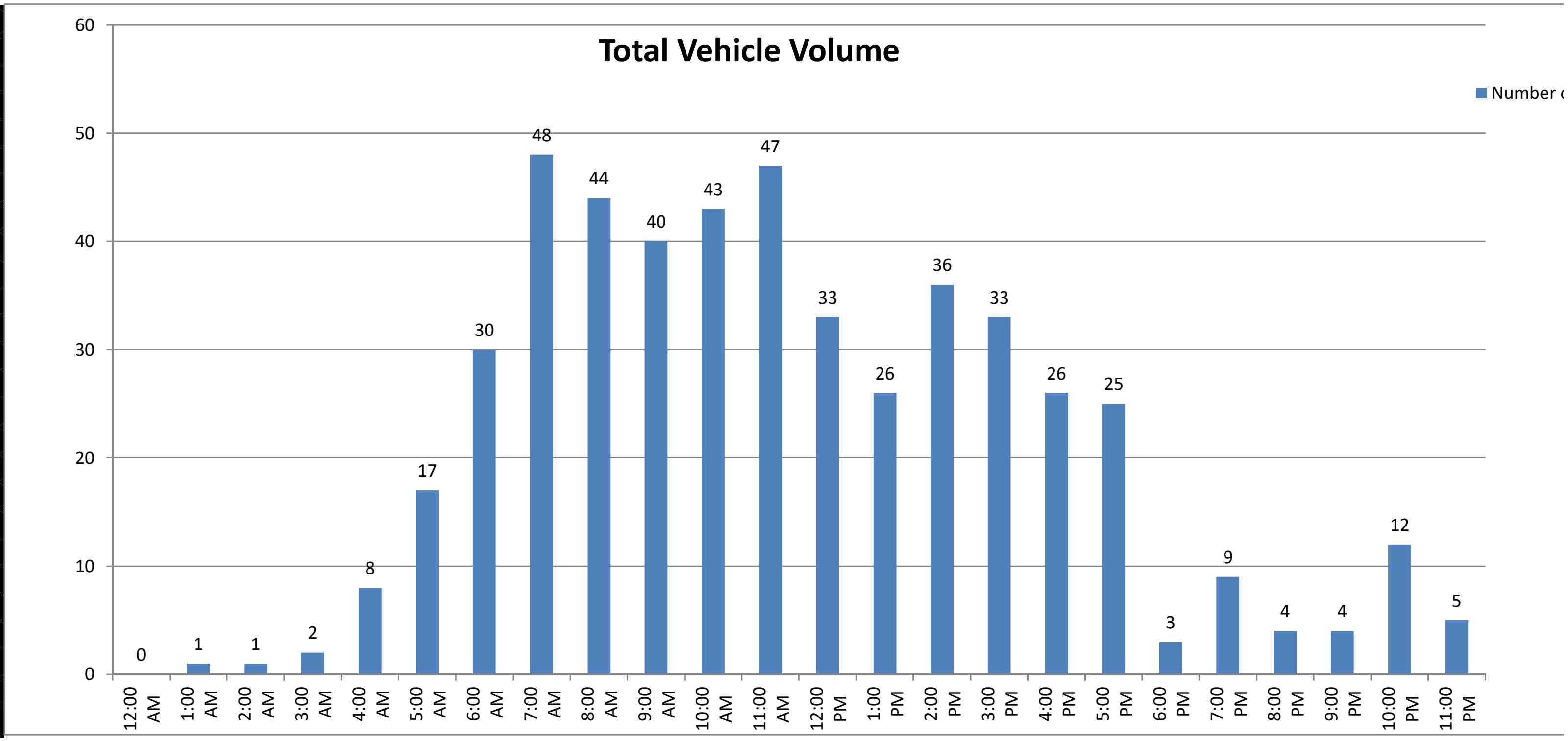
24 Hour Volume Plot

Brockman Road

B/ McCabe Road - Kubler Road

11/14/2017

Start Time	#########
12:00 AM	0
1:00 AM	1
2:00 AM	1
3:00 AM	2
4:00 AM	8
5:00 AM	17
6:00 AM	30
7:00 AM	48
8:00 AM	44
9:00 AM	40
10:00 AM	43
11:00 AM	47
12:00 PM	33
1:00 PM	26
2:00 PM	36
3:00 PM	33
4:00 PM	26
5:00 PM	25
6:00 PM	3
7:00 PM	9
8:00 PM	4
9:00 PM	4
10:00 PM	12
11:00 PM	5
Total	497



Volumes represent the combined totals for both directions

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878

County of Imperial
Forrester Road
B/ Interstate 8 - McCabe Road

File Name 001
Site Code: 143-17778
24 Hour Directional Volume Count

Date:	Northbound				Southbound					
11/14/2017	15 Minute Totals		Hourly Totals		15 Minute Totals		Hourly Totals		Combined Totals	
Time	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon
12:00	1	12			5	8				
12:15	1	16			1	12				
12:30	1	6			1	10				
12:45	3	12	6	46	6	12	13	42	19	88
1:00	3	18			6	16				
1:15	0	24			3	7				
1:30	3	9			4	14				
1:45	0	14	6	65	0	16	13	53	19	118
2:00	0	32			3	21				
2:15	1	12			3	23				
2:30	0	21			13	18				
2:45	2	33	3	98	1	19	20	81	23	179
3:00	3	10			1	16				
3:15	2	23			0	8				
3:30	5	11			1	16				
3:45	2	21	12	65	0	10	2	50	14	115
4:00	0	21			8	23				
4:15	2	18			6	15				
4:30	4	28			6	10				
4:45	10	21	16	88	8	6	28	54	44	142
5:00	6	24			8	11				
5:15	9	11			15	9				
5:30	10	15			21	9				
5:45	6	10	31	60	19	13	63	42	94	102
6:00	12	7			21	4				
6:15	11	13			10	8				
6:30	26	12			21	8				
6:45	8	8	57	40	16	3	68	23	125	63
7:00	27	1			12	3				
7:15	25	4			10	4				
7:30	24	7			29	3				
7:45	37	2	113	14	46	4	97	14	210	28
8:00	28	2			19	3				
8:15	18	2			21	3				
8:30	23	2			7	3				
8:45	14	2	83	8	20	7	67	16	150	24
9:00	17	1			15	2				
9:15	22	5			15	2				
9:30	17	2			18	2				
9:45	24	3	80	11	12	2	60	8	140	19
10:00	20	3			15	0				
10:15	11	0			13	2				
10:30	11	4			14	2				
10:45	13	2	55	9	17	0	59	4	114	13
11:00	33	4			8	1				
11:15	17	1			8	2				
11:30	21	1			10	0				
11:45	13	1	84	7	11	3	37	6	121	13
Totals	546	511			527	393				
Combined Totals		1057				920				
ADT										1977
AM Peak Hour	715	AM			730	AM				
Volume	114				115					
P.H.F.	0.770				0.625					
PM Peak Hour		200	PM			200	PM			
Volume		98				81				
P.H.F.		0.742				0.880				
Percentage	51.7%	48.3%			57.3%	42.7%				

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878

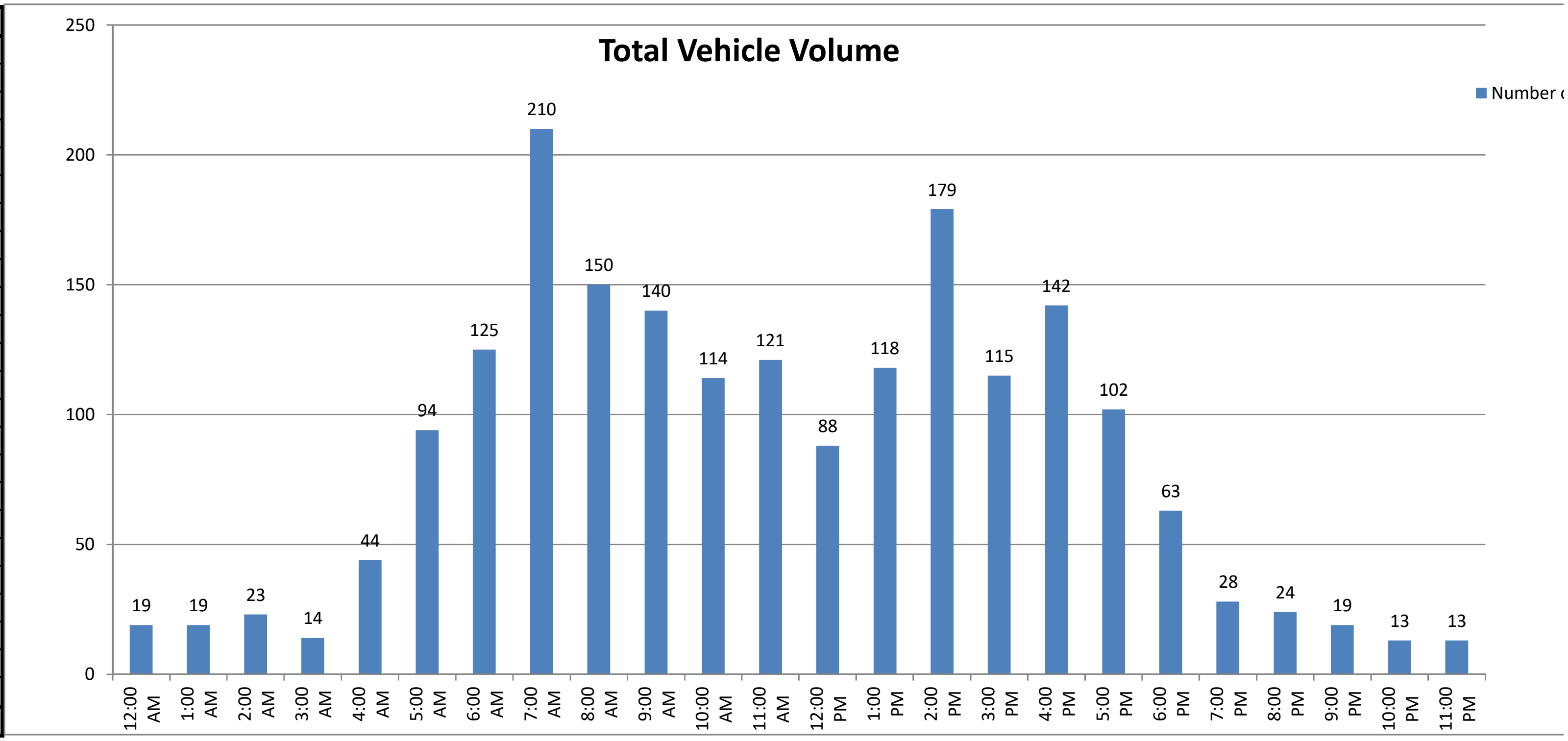
24 Hour Volume Plot

Forrester Road

B/ Interstate 8 - McCabe Road

11/14/2017

Start Time	#########
12:00 AM	19
1:00 AM	19
2:00 AM	23
3:00 AM	14
4:00 AM	44
5:00 AM	94
6:00 AM	125
7:00 AM	210
8:00 AM	150
9:00 AM	140
10:00 AM	114
11:00 AM	121
12:00 PM	88
1:00 PM	118
2:00 PM	179
3:00 PM	115
4:00 PM	142
5:00 PM	102
6:00 PM	63
7:00 PM	28
8:00 PM	24
9:00 PM	19
10:00 PM	13
11:00 PM	13
Total	1977



Volumes represent the combined totals for both directions

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878

County of Imperial
Kubler Road
B/ Pulliam Road - Brockman Road

File Name 004
Site Code: 143-17778
24 Hour Directional Volume Count

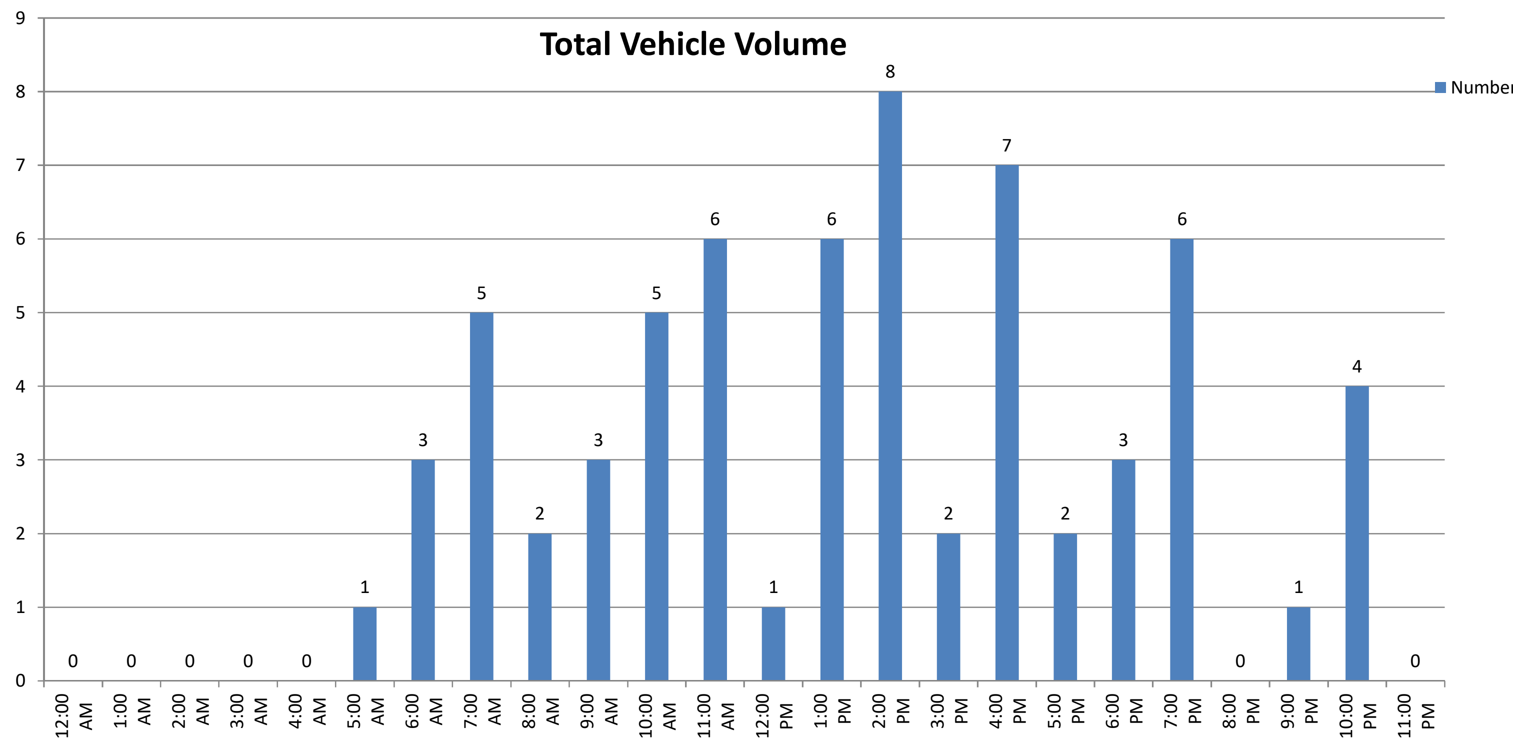
Date:	Eastbound				Westbound					
11/14/2017	15 Minute Totals		Hourly Totals		15 Minute Totals		Hourly Totals		Combined Totals	
Time	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon
12:00	0	0			0	0				
12:15	0	0			0	0				
12:30	0	0			0	1				
12:45	0	0	0	0	0	0	0	1	0	1
1:00	0	0			0	0				
1:15	0	3			0	0				
1:30	0	0			0	2				
1:45	0	0	0	3	0	1	0	3	0	6
2:00	0	1			0	1				
2:15	0	2			0	0				
2:30	0	2			0	2				
2:45	0	0	0	5	0	0	0	3	0	8
3:00	0	1			0	0				
3:15	0	1			0	0				
3:30	0	0			0	0				
3:45	0	0	0	2	0	0	0	0	0	2
4:00	0	0			0	0				
4:15	0	0			0	3				
4:30	0	2			0	0				
4:45	0	2	0	4	0	0	0	3	0	7
5:00	0	0			0	1				
5:15	0	0			1	0				
5:30	0	0			0	0				
5:45	0	1	0	1	0	0	1	1	1	2
6:00	1	1			0	1				
6:15	0	0			1	1				
6:30	0	0			0	0				
6:45	1	0	2	1	0	0	1	2	3	3
7:00	0	0			0	1				
7:15	1	1			1	3				
7:30	2	1			0	0				
7:45	0	0	3	2	1	0	2	4	5	6
8:00	0	0			0	0				
8:15	0	0			0	0				
8:30	0	0			0	0				
8:45	0	0	0	0	2	0	2	0	2	0
9:00	0	0			1	0				
9:15	0	1			1	0				
9:30	0	0			1	0				
9:45	0	0	0	1	0	0	3	0	3	1
10:00	3	0			0	0				
10:15	2	0			0	0				
10:30	0	0			0	0				
10:45	0	1	5	1	0	3	0	3	5	4
11:00	0	0			1	0				
11:15	0	0			0	0				
11:30	3	0			1	0				
11:45	0	0	3	0	1	0	3	0	6	0
Totals	13	20			12	20				
Combined Totals		33				32				
ADT										65
AM Peak Hour	1000	AM			845	AM				
Volume	5	**TWO PEAK HOURS**			5					
P.H.F.	0.417				0.625					
PM Peak Hour		215	PM			700	PM			
Volume		5	**TWO PEAK HOURS**			4	**TWO PEAK HOURS**			
P.H.F.		0.625				0.333				
Percentage	39.4%	60.6%			37.5%	62.5%				

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878

24 Hour Volume Plot

Kubler Road
B/ Pulliam Road - Brockman Road
11/14/2017

Start Time	#########
12:00 AM	0
1:00 AM	0
2:00 AM	0
3:00 AM	0
4:00 AM	0
5:00 AM	1
6:00 AM	3
7:00 AM	5
8:00 AM	2
9:00 AM	3
10:00 AM	5
11:00 AM	6
12:00 PM	1
1:00 PM	6
2:00 PM	8
3:00 PM	2
4:00 PM	7
5:00 PM	2
6:00 PM	3
7:00 PM	6
8:00 PM	0
9:00 PM	1
10:00 PM	4
11:00 PM	0
Total	65



Volumes represent the combined totals for both directions

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878

County of Imperial
McCabe Road
B/ Brockman Road - Forrester Road

File Name 002
Site Code: 143-17778
24 Hour Directional Volume Count

Date:	Eastbound				Westbound					
11/14/2017	15 Minute Totals		Hourly Totals		15 Minute Totals		Hourly Totals		Combined Totals	
Time	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon
12:00	0	5			0	4				
12:15	0	3			1	7				
12:30	0	2			0	6				
12:45	0	11	0	21	0	6	1	23	1	44
1:00	0	4			0	2				
1:15	0	5			1	4				
1:30	0	8			1	4				
1:45	0	9	0	26	0	5	2	15	2	41
2:00	0	7			0	5				
2:15	0	6			0	5				
2:30	0	4			0	9				
2:45	0	3	0	20	0	13	0	32	0	52
3:00	0	8			0	7				
3:15	1	7			0	6				
3:30	0	6			1	11				
3:45	0	7	1	28	1	13	2	37	3	65
4:00	0	17			1	9				
4:15	0	3			1	3				
4:30	1	3			0	8				
4:45	0	12	1	35	8	1	10	21	11	56
5:00	1	6			3	2				
5:15	1	6			9	5				
5:30	1	2			5	5				
5:45	1	5	4	19	10	5	27	17	31	36
6:00	1	1			8	0				
6:15	4	1			7	0				
6:30	10	1			13	0				
6:45	6	2	21	5	12	1	40	1	61	6
7:00	21	0			6	1				
7:15	6	2			7	3				
7:30	5	1			7	0				
7:45	6	0	38	3	9	0	29	4	67	7
8:00	5	1			8	2				
8:15	1	1			3	1				
8:30	9	0			4	1				
8:45	10	1	25	3	8	2	23	6	48	9
9:00	4	2			9	1				
9:15	8	0			6	0				
9:30	4	0			6	1				
9:45	15	0	31	2	6	2	27	4	58	6
10:00	6	2			11	0				
10:15	13	1			8	2				
10:30	2	1			10	2				
10:45	5	3	26	7	5	1	34	5	60	12
11:00	23	2			5	1				
11:15	3	0			6	0				
11:30	10	0			4	0				
11:45	3	1	39	3	3	1	18	2	57	5
Totals	186	172			213	167				
Combined Totals		358				380				
ADT										738
AM Peak Hour	1015	AM			600	AM				
Volume	43	**TWO PEAK HOURS**			40					
P.H.F.	0.467				0.769					
PM Peak Hour		315	PM			315	PM			
Volume		37				39				
P.H.F.		0.544				0.750				
Percentage	52.0%	48.0%			56.1%	43.9%				

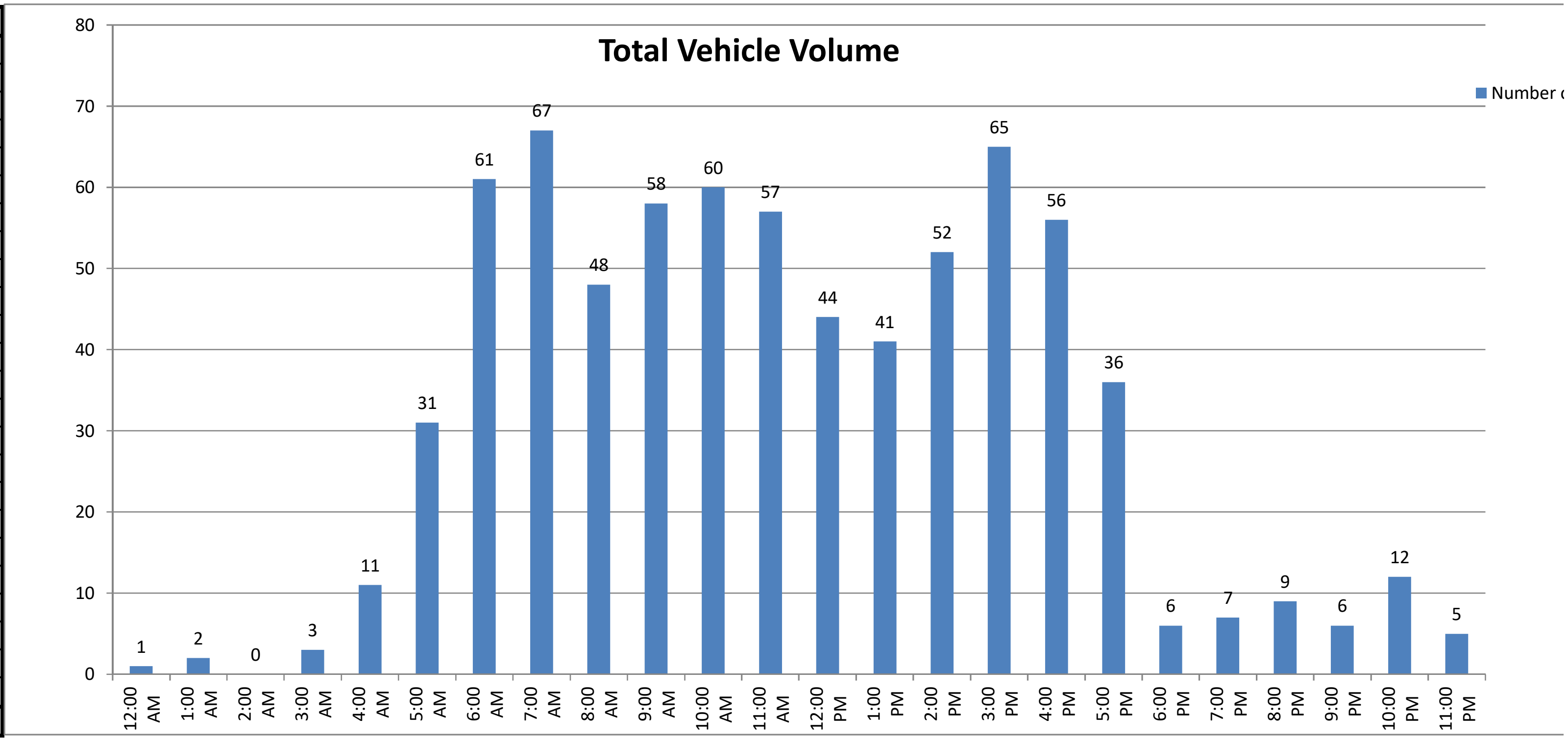
Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878

24 Hour Volume Plot

McCabe Road
B/ Brockman Road - Forrester Road

11/14/2017

Start Time	#########
12:00 AM	1
1:00 AM	2
2:00 AM	0
3:00 AM	3
4:00 AM	11
5:00 AM	31
6:00 AM	61
7:00 AM	67
8:00 AM	48
9:00 AM	58
10:00 AM	60
11:00 AM	57
12:00 PM	44
1:00 PM	41
2:00 PM	52
3:00 PM	65
4:00 PM	56
5:00 PM	36
6:00 PM	6
7:00 PM	7
8:00 PM	9
9:00 PM	6
10:00 PM	12
11:00 PM	5
Total	738



Volumes represent the combined totals for both directions

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878

County of Imperial
Pulliam Road
B/ Kubler Road - State Route 98

File Name 005
Site Code: 143-17778
24 Hour Directional Volume Count

Date: 11/14/2017	Northbound				Southbound				Combined Totals	
	15 Minute Totals		Hourly Totals		15 Minute Totals		Hourly Totals			
Time	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon
12:00	0	0			0	0				
12:15	0	0			0	1				
12:30	0	0			0	0				
12:45	0	0	0	0	0	0	0	1	0	1
1:00	0	0			0	0				
1:15	0	0			0	0				
1:30	0	0			0	0				
1:45	0	0	0	0	0	1	0	1	0	1
2:00	0	1			0	1				
2:15	0	0			0	0				
2:30	0	1			0	0				
2:45	0	0	0	2	0	0	0	1	0	3
3:00	0	0			0	0				
3:15	0	0			0	0				
3:30	0	0			0	0				
3:45	0	0	0	0	0	0	0	0	0	0
4:00	0	0			0	0				
4:15	0	0			0	2				
4:30	0	0			0	0				
4:45	0	0	0	0	0	0	0	2	0	2
5:00	0	0			0	0				
5:15	0	0			0	0				
5:30	1	0			0	0				
5:45	1	0	2	0	0	0	0	0	2	0
6:00	1	0			0	0				
6:15	0	0			1	0				
6:30	1	0			0	0				
6:45	0	0	2	0	0	0	1	0	3	0
7:00	0	0			0	0				
7:15	0	0			0	1				
7:30	1	1			0	1				
7:45	0	0	1	1	0	0	0	2	1	3
8:00	0	0			1	0				
8:15	0	0			0	0				
8:30	0	0			0	0				
8:45	0	0	0	0	0	0	1	0	1	0
9:00	0	0			0	0				
9:15	0	0			0	0				
9:30	0	0			1	0				
9:45	0	0	0	0	0	0	1	0	1	0
10:00	1	0			0	0				
10:15	1	0			0	0				
10:30	0	0			0	0				
10:45	1	3	3	3	0	1	0	1	3	4
11:00	1	0			0	0				
11:15	1	0			0	0				
11:30	1	0			1	0				
11:45	0	0	3	0	0	0	1	0	4	0
Totals	11	6			4	8				
Combined Totals		17				12				
ADT										29
AM Peak Hour	1045	AM			0	AM				
Volume	4				0	TWO PEAK HOURS				
P.H.F.	1.000				0.000					
PM Peak Hour		1130	PM			1130	PM			
Volume		23	TWO PEAK HOURS			20	TWO PEAK HOURS			
P.H.F.		0.000				0.000				
Percentage	64.7%	35.3%			33.3%	66.7%				

Counts Unlimited, Inc.
PO Box 1178
Corona, CA 92878

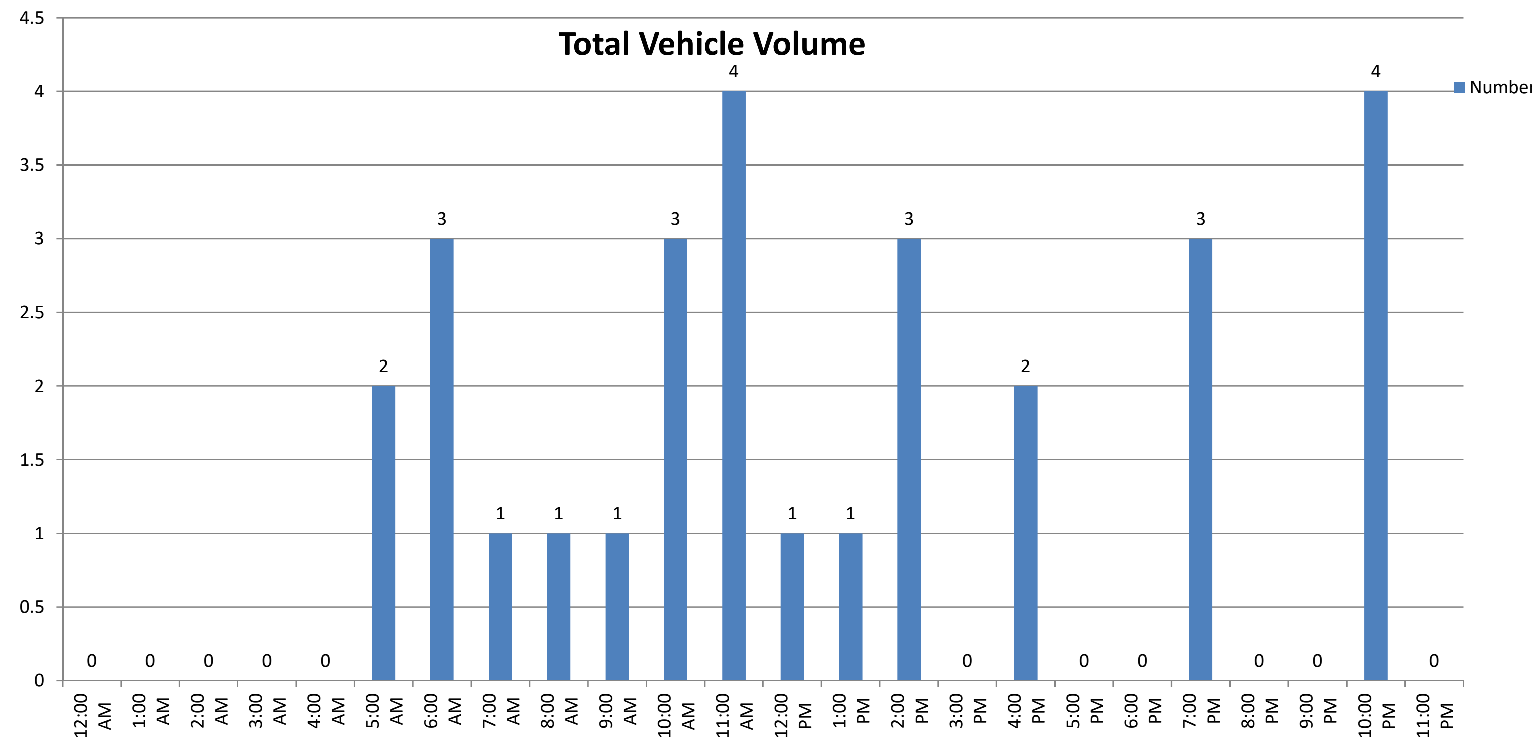
24 Hour Volume Plot

Pulliam Road

B/ Kubler Road - State Route 98

11/14/2017

Start Time	#########
12:00 AM	0
1:00 AM	0
2:00 AM	0
3:00 AM	0
4:00 AM	0
5:00 AM	2
6:00 AM	3
7:00 AM	1
8:00 AM	1
9:00 AM	1
10:00 AM	3
11:00 AM	4
12:00 PM	1
1:00 PM	1
2:00 PM	3
3:00 PM	0
4:00 PM	2
5:00 PM	0
6:00 PM	0
7:00 PM	3
8:00 PM	0
9:00 PM	0
10:00 PM	4
11:00 PM	0
Total	29



Volumes represent the combined totals for both directions

CALTRANS 2016 VOLUMES

Dist	Route	County		Postmile	Description	Back Peak Hour	Back Peak Month	Back AADT	Ahead Peak Hour	Ahead Peak Month	Ahead AADT
11	008	IMP	R	29.933	DREW ROAD	1950	18000	13800	2300	17100	15600
11	008	IMP	R	33.991	FORRESTER ROAD	2300	17100	15600	2150	20400	16900
11	098	IMP		22.197	DREW ROAD	250	2150	2050	220	2150	2050

PEAK HOUR VOLUME DATA

Peak hour volume data consists of hourly volume relationships and data location. The hourly volumes are expressed as a percentage of the Annual Average Daily Traffic (AADT). The percentages are shown for both the AM and the PM peak periods.

The principle data described here are the K factor, the D factor and their product (KD). The K factor is the percentage of AADT during the peak hour for both directions of travel. The D factor is the percentage of the peak hour travel in the peak direction. KD multiplied with the AADT gives the one way peak period directional flow rate or the design hourly volume (DHV). The design hourly volume is used for either Operational Analysis or Design Analysis. Refer to the 2000 Highway Capacity Manual for more details.

Following is a glossary of terms used in this listing of peak hour volume data:

Dir	Indicates direction of travel for peak volume
AADT	Annual Average Daily Traffic in vehicles per day (vpd).
AM Peak	Represents the morning peak period for traffic analysis
CS	Control Station Number, Caltrans identification number for monitoring site.
CO	County abbreviation used by Caltrans
D	D factor. The percentage of traffic in the peak direction during the peak hour. Values in this book are derived by dividing the measured PHV by the sum of both directions of travel during the peak hour.
DAY	Day of week for the peak volume.
DDHV	The directional design hour volume, in vehicles per hour (vph) DDHV=AADTxKxD. See equation (8-1) on page 8-11 of the 2000 Highway Capacity Manual.
DI	Caltrans has twelve transportation districts statewide. This abbreviation identifies the district in which the count station is located.
HR	The ending time for the peak hour volume listed. The volume observed fro 1 to 2 would be recorded as 2.

K — The percentage of the AADT in both directions during the peak hour. Values in this table are derived by dividing the measured 2-way PHV by the AADT.

KD — The product of K and D. The percentage of AADT in the peak direction during the peak hour. Values in this table are derived by dividing the measured 1-way PHV by the AADT.

LEG — For traffic counting purposes, a highway intersection or interchange is assigned two legs according to increasing postmiles (route direction) and with a postmile reference at the center of the intersection or interchange. The volume of traffic on each leg is denoted by an A, B or O. A = ahead leg, B = back leg, and O – traffic volume being same for both back and ahead legs.

MNTH — The month that the peak volume occurred.

PHV — Peak Hour Volume in the peak direction. A one way volume in vehicles per hour (vph) as used here. The PHV is analogous to the DDHV as used for design purposes.

PM — The Post Mile is the mileage measured from the county line, or from the beginning of a route. Each postmile along a route in a county is a unique location on the state highway system.

PM Peak — Represents the afternoon peak period for traffic analysis.

PRE — The postmile may have a prefix like R, T, L, M, etc. When a length of highway is changed due to construction or realigment, new postmile values are assigned. To distinguish the new values from the old, an alpha code is prefixed to the new postmile.

RTE — The state highway route number

YR — The year when the count was made. Traffic counting is on a 3-year cycle.

CALTRANS TRAFFIC VOLUMES
LATEST TRAFFIC YEAR SELECTED
PEAK HOUR VOLUME DATA

DI	RTE	CO	PRE	PM	CS	LEG	YR	Dir	AM PEAK 1 WAY PHV	AM PEAK % K	AM PEAK % D	AM PEAK % KD	HR	DAY	MNTH	Dir	PM PEAK 1 WAY PHV	PM PEAK % K	PM PEAK % D	PM PEAK % KD	HR	DAY	MNTH
11	008	SD	L	1.213	958	A	16	E	4363	7.25	58.8	4.26	7	TUE	FEB	W	4339	6.64	63.82	4.24	17	THU	OCT
11	008	SD	R	.023	859	A	16	W	8092	6.77	61.03	4.13	7	TUE	AUG	E	8284	7.54	56.06	4.23	15	WED	MAR
11	008	SD		.946	804	A	16	W	8252	6.95	59.76	4.15	7	WED	MAY	E	8230	7.67	53.99	4.14	14	FRI	APR
11	008	SD		5.638	953	B	16	W	10949	6.84	64.98	4.45	7	TUE	NOV	E	10607	7.4	58.25	4.31	15	TUE	MAY
11	008	SD		8.336	807	B	16	W	10589	6.18	76.53	4.73	6	THU	MAY	E	10492	8.02	58.4	4.68	15	FRI	JUN
11	008	SD		8.336	808	A	16	W	9812	6.77	76.42	5.17	6	WED	MAY	E	9724	8.19	62.59	5.12	16	MON	NOV
11	008	SD		11.76	810	B	16	W	7752	5.8	71.82	4.17	6	WED	FEB	E	8655	8.04	57.85	4.65	15	TUE	APR
11	008	SD		12.65	834	A	16	W	9464	6.21	65.92	4.09	6	WED	JUN	E	10045	7.92	54.84	4.34	15	WED	JUN
11	008	SD		14.59	806	B	16	W	7377	6.95	60.71	4.22	7	TUE	AUG	E	7351	7.96	52.84	4.2	15	MON	SEP
11	008	SD	R	18.73	824	B	16	W	4084	6.51	66.1	4.3	7	MON	SEP	E	4219	7.65	58.04	4.44	16	WED	SEP
11	008	SD	R	20.04	888	B	16	E	3685	7.52	57.82	4.35	12	SUN	JAN	E	3938	8.18	56.85	4.65	16	THU	DEC
11	008	SD	R	23.64	979	O	16	E	2431	7.68	54.36	4.17	11	SAT	MAR	E	2969	8.68	58.72	5.1	16	FRI	APR
11	008	SD	R	37.83	811	A	16	E	1260	10.95	53.28	5.83	11	SAT	MAR	W	1494	10.77	64.2	6.91	14	SAT	JUL
11	008	SD	R	51.98	621	B	16	W	1100	12.42	52.26	6.49	11	SAT	JUL	W	1310	14.9	51.88	7.73	15	MON	MAY
11	008	SD	R	65.90	981	A	16	W	1032	10.77	65.07	7.01	11	SUN	JUL	W	1285	13.57	64.28	8.72	15	SUN	DEC
11	008	IMP	R	10.29	993	B	16	W	1024	11.33	61.99	7.02	10	SAT	JUL	E	1241	13.67	62.27	8.51	13	TUE	JUL
11	008	IMP	R	10.29	994	A	16	E	957	13.55	54.34	7.36	12	SUN	JUL	W	1182	14.93	60.9	9.09	16	FRI	JUL
11	008	IMP	R	23.48	624	A	16	W	980	13.46	52.3	7.04	12	SUN	DEC	E	1145	16.31	50.42	8.22	15	MON	MAY
11	008	IMP	R	40.94	638	B	16	W	1470	8.77	51.72	4.54	12	SUN	DEC	E	1702	9.14	57.48	5.25	14	FRI	OCT
11	008	IMP	R	53.50	964	A	16	W	975	12.87	54.23	6.98	12	SAT	NOV	W	1183	15.07	56.17	8.46	13	SUN	DEC
11	008	IMP	R	96.54	688	X	16	W	1003	12.67	51.02	6.46	12	SAT	NOV	E	1025	12.67	52.14	6.6	16	SUN	NOV
11	008	IMP	R	96.99	988	B	16	E	1217	11.34	54.38	6.17	12	WED	DEC	E	1289	11.43	57.14	6.53	15	MON	FEB
05	009	SCR		.046	48	A	14	N	1591	10.53	58.19	6.13	12	MON	DEC	N	1651	10.7	59.41	6.36	15	THU	DEC
05	009	SCR		.63	681	A	14	S	306	9.59	61.57	5.91	12	SAT	JUN	S	361	11.58	60.17	6.97	14	SAT	MAR
05	009	SCR		13.04	169	B	14	S	641	8.84	59.19	5.23	12	SAT	MAR	N	623	9.39	54.17	5.09	17	FRI	MAR
05	009	SCR		27.09	49	B	14	N	277	10.9	97.88	10.67	7	WED	MAR	S	340	15.64	83.74	13.1	16	FRI	JUN
04	009	SCL		0	50	A	16	N	288	13.85	64.29	8.91	12	SAT	JUN	S	337	13.27	78.56	10.42	17	SUN	JUN
04	009	SCL		7.09	170	A	16	N	533	11.65	67.21	7.83	11	SAT	DEC	N	685	15.41	65.3	10.06	14	SUN	SEP
04	009	SCL		11.45	171	B	16	N	1633	7.88	64.32	5.06	8	WED	DEC	S	1748	8.34	64.98	5.42	17	TUE	DEC
07	010	LA		18.41	456	B	15	W	1558	13.19	96.35	12.7	7	MON	DEC	E	1308	12.93	82.47	10.67	17	WED	JUL
07	010	LA		19.71	783	O	15	W	1585	12.46	95.02	11.84	8	TUE	JUL	E	1303	12.29	79.16	9.73	17	WED	JUL
07	010	LA		24.31	785	A	15	W	3325	11.87	92.52	10.98	7	WED	OCT	E	2694	10.73	82.94	8.9	16	WED	SEP
07	010	LA	R	6.745	525	O	14	W	7995	5.29	62.07	3.28	6	TUE	NOV	E	8158	6.31	53.01	3.35	14	THU	JAN

2015

Annual Average Daily Truck Traffic
on the
California State Highway System

Compiled by
Traffic Data Branch

State of California
California State Transportation Agency
Department of Transportation

Prepared in cooperation with the
U.S. Department of Transportation
Federal Highway Administration

RTE	DIST	CNTY	POST MILE	LEG	DESCRIPTION	VEHICLE AADT TOTAL	TRUCK AADT TOTAL	TRUCK % TOT VEH	TRUCK AADT By Axle 2	3	4	5+	TOTAL % TRUCK AADT By Axle 2	3	4	5+	EAL 2-WAY (1000)	YEAR VER/ EST
8	11	SD	10.57	B	FLETCHER PARKWAY	191,000	7,067	3.70	4,226	898	247	1,696	59.80	12.70	3.50	24.00	852	84V
8	11	SD	10.57	A	FLETCHER PARKWAY	181,000	7,964	4.40	4,500	1,226	406	1,832	56.50	15.40	5.10	23.00	962	78V
8	11	SD	15.8	B	EL CAJON, JCT. RTE. 67 NORTH	144,000	6,768	4.70	3,648	887	311	1,922	53.90	13.10	4.60	28.40	918	78V
8	11	SD	15.8	A	EL CAJON, JCT. RTE. 67 NORTH	113,000	3,277	2.90	1,815	370	115	977	55.40	11.30	3.50	29.80	452	78V
8	11	SD	R18.727	B	GREENFIELD DRIVE	93,000	10,461	11.25	7,895	721	546	1,299	75.47	6.89	5.22	12.42	871	15V
8	11	SD	R18.727	A	GREENFIELD DRIVE	81,000	5,589	6.90	2,945	436	134	2,074	52.70	7.80	2.40	37.10	878	86V
8	11	SD	R37.831	B	JCT. RTE. 79 NORTH, JAPATUL VALLEY RD	24,600	2,952	12.00	1,160	174	89	1,529	39.30	5.90	3.00	51.80	597	86E
8	11	SD	R37.831	A	JCT. RTE. 79 NORTH, JAPATUL VALLEY RD	20,600	2,803	13.60	911	219	81	1,592	32.50	7.80	2.90	56.80	613	00E
8	11	SD	R51.98	B	CAMERON RD	16,300	1,906	11.69	752	91	39	1,024	39.45	4.77	2.05	53.73	394	15V
8	11	SD	R65.904	B	JCT. RTE. 94 SOUTH	15,300	2,125	13.89	760	98	49	1,218	35.78	4.59	2.29	57.34	463	05V
8	11	SD	R65.904	A	JCT. RTE. 94 SOUTH	14,400	2,040	14.16	730	94	47	1,169	35.78	4.59	2.29	57.34	444	05V
8	11	IMP	R10.01	B	JCT. RTE. 98	14,100	1,960	13.90	702	90	45	1,123	35.80	4.60	2.30	57.30	427	05E
8	11	IMP	R10.01	A	JCT. RTE. 98	12,700	1,765	13.90	632	81	41	1,011	35.80	4.60	2.30	57.30	384	05E
8	11	IMP	R23.48	A	DUNAWAY RD	13,800	1,777	12.88	587	86	37	1,067	33.03	4.84	2.08	60.05	402	15V
8	11	IMP	R29.933	B	DREW RD	13,800	2,241	16.24	664	104	41	1,432	29.63	4.63	1.85	63.89	533	05E
8	11	IMP	R37.972	B	JCT. RTE. 86	31,500	3,370	10.70	1,085	185	74	2,026	32.20	5.50	2.20	60.10	765	05E

Appendix I

Existing Intersection LOS Calculations

Intersection	
Int Delay, s/veh	3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	40	0	83	12	98	0	0	126	67
Future Vol, veh/h	0	0	0	40	0	83	12	98	0	0	126	67
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	Yield	-	-	None	-	-	None
Storage Length	-	-	-	-	-	50	-	-	-	-	-	-
Veh in Median Storage, #	-	-	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	43	0	90	13	107	0	0	137	73

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	307	343	107	210	0	-	-	-	0
Stage 1	133	133	-	-	-	-	-	-	-
Stage 2	174	210	-	-	-	-	-	-	-
Critical Hdwy	6.42	6.52	6.22	4.12	-	-	-	-	-
Critical Hdwy Stg 1	5.42	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.42	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	2.218	-	-	-	-	-
Pot Cap-1 Maneuver	685	579	947	1361	-	0	0	-	-
Stage 1	893	786	-	-	-	0	0	-	-
Stage 2	856	728	-	-	-	0	0	-	-
Platoon blocked, %					-			-	-
Mov Cap-1 Maneuver	678	0	947	1361	-	-	-	-	-
Mov Cap-2 Maneuver	678	0	-	-	-	-	-	-	-
Stage 1	884	0	-	-	-	-	-	-	-
Stage 2	856	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.7	0.8	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	WBLn1	WBLn2	SBT	SBR
Capacity (veh/h)	1361	-	678	947	-	-
HCM Lane V/C Ratio	0.01	-	0.064	0.095	-	-
HCM Control Delay (s)	7.7	0	10.7	9.2	-	-
HCM Lane LOS	A	A	B	A	-	-
HCM 95th %tile Q(veh)	0	-	0.2	0.3	-	-

Intersection	
Int Delay, s/veh	4.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	57	1	9	0	0	0	0	56	20	75	86	0
Future Vol, veh/h	57	1	9	0	0	0	0	56	20	75	86	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	None
Storage Length	-	-	50	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	62	1	10	0	0	0	0	61	22	82	93	0

Major/Minor	Minor2						Major1			Major2		
Conflicting Flow All	329	340	93				-	0	0	83	0	0
Stage 1	257	257	-				-	-	-	-	-	-
Stage 2	72	83	-				-	-	-	-	-	-
Critical Hdwy	6.42	6.52	6.22				-	-	-	4.12	-	-
Critical Hdwy Stg 1	5.42	5.52	-				-	-	-	-	-	-
Critical Hdwy Stg 2	5.42	5.52	-				-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318				-	-	-	2.218	-	-
Pot Cap-1 Maneuver	665	582	964				0	-	-	1514	-	0
Stage 1	786	695	-				0	-	-	-	-	0
Stage 2	951	826	-				0	-	-	-	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	627	0	964				-	-	-	1514	-	-
Mov Cap-2 Maneuver	627	0	-				-	-	-	-	-	-
Stage 1	741	0	-				-	-	-	-	-	-
Stage 2	951	0	-				-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11.1	0	3.5
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	EBLn2	SBL	SBT
Capacity (veh/h)	-	-	627	964	1514	-
HCM Lane V/C Ratio	-	-	0.101	0.01	0.054	-
HCM Control Delay (s)	-	-	11.4	8.8	7.5	0
HCM Lane LOS	-	-	B	A	A	A
HCM 95th %tile Q(veh)	-	-	0.3	0	0.2	-

Intersection	
Int Delay, s/veh	6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	14	13	2	1	15	33	4	3	1	77	7	12
Future Vol, veh/h	14	13	2	1	15	33	4	3	1	77	7	12
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	15	14	2	1	16	36	4	3	1	84	8	13

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	52	0	0	16	0	0	92	99	15	83	82	34
Stage 1	-	-	-	-	-	-	45	45	-	36	36	-
Stage 2	-	-	-	-	-	-	47	54	-	47	46	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1554	-	-	1602	-	-	892	791	1065	904	808	1039
Stage 1	-	-	-	-	-	-	969	857	-	980	865	-
Stage 2	-	-	-	-	-	-	967	850	-	967	857	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1554	-	-	1602	-	-	867	782	1065	892	799	1039
Mov Cap-2 Maneuver	-	-	-	-	-	-	867	782	-	892	799	-
Stage 1	-	-	-	-	-	-	959	848	-	970	864	-
Stage 2	-	-	-	-	-	-	946	849	-	953	848	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	3.5	0.1	9.3	9.5
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	852	1554	-	-	1602	-	-	900
HCM Lane V/C Ratio	0.01	0.01	-	-	0.001	-	-	0.116
HCM Control Delay (s)	9.3	7.3	0	-	7.2	0	-	9.5
HCM Lane LOS	A	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0.4

Intersection	
Int Delay, s/veh	4.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	1	1	0	1	0	1	1	1	0	0	0
Future Vol, veh/h	0	1	1	0	1	0	1	1	1	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	1	1	0	1	0	1	1	1	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1	0	0	2	0	0	3	3	2	4	3	1
Stage 1	-	-	-	-	-	-	2	2	-	1	1	-
Stage 2	-	-	-	-	-	-	1	1	-	3	2	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1622	-	-	1620	-	-	1019	893	1082	1017	893	1084
Stage 1	-	-	-	-	-	-	1021	894	-	1022	895	-
Stage 2	-	-	-	-	-	-	1022	895	-	1020	894	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1622	-	-	1620	-	-	1019	893	1082	1015	893	1084
Mov Cap-2 Maneuver	-	-	-	-	-	-	1019	893	-	1015	893	-
Stage 1	-	-	-	-	-	-	1021	894	-	1022	895	-
Stage 2	-	-	-	-	-	-	1022	895	-	1018	894	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0	8.6	0
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	992	1622	-	-	1620	-	-	-
HCM Lane V/C Ratio	0.003	-	-	-	-	-	-	-
HCM Control Delay (s)	8.6	0	-	-	0	-	-	0
HCM Lane LOS	A	A	-	-	A	-	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	-

Intersection	
Int Delay, s/veh	2.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	3	1	0	1	0	2	0	11	0	4	13	2
Future Vol, veh/h	3	1	0	1	0	2	0	11	0	4	13	2
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	3	1	0	1	0	2	0	12	0	4	14	2

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	36	35	15	36	36	12	16	0	0	12	0	0
Stage 1	23	23	-	12	12	-	-	-	-	-	-	-
Stage 2	13	12	-	24	24	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	970	857	1065	970	856	1069	1602	-	-	1607	-	-
Stage 1	995	876	-	1009	886	-	-	-	-	-	-	-
Stage 2	1007	886	-	994	875	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	966	854	1065	967	853	1069	1602	-	-	1607	-	-
Mov Cap-2 Maneuver	966	854	-	967	853	-	-	-	-	-	-	-
Stage 1	995	873	-	1009	886	-	-	-	-	-	-	-
Stage 2	1005	886	-	990	872	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	8.9	8.5	0	1.5
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1602	-	-	935	1033	1607	-	-
HCM Lane V/C Ratio	-	-	-	0.005	0.003	0.003	-	-
HCM Control Delay (s)	0	-	-	8.9	8.5	7.2	0	-
HCM Lane LOS	A	-	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0	0	-	-

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	3	33	43	4	2	5
Future Vol, veh/h	3	33	43	4	2	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	3	36	47	4	2	5

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	51	0	-	0	91	49
Stage 1	-	-	-	-	49	-
Stage 2	-	-	-	-	42	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1555	-	-	-	909	1020
Stage 1	-	-	-	-	973	-
Stage 2	-	-	-	-	980	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1555	-	-	-	907	1020
Mov Cap-2 Maneuver	-	-	-	-	907	-
Stage 1	-	-	-	-	971	-
Stage 2	-	-	-	-	980	-

Approach	EB	WB	SB
HCM Control Delay, s	0.6	0	8.7
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1555	-	-	-	985
HCM Lane V/C Ratio	0.002	-	-	-	0.008
HCM Control Delay (s)	7.3	0	-	-	8.7
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

Intersection	
Int Delay, s/veh	1.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	35	0	1	37	0	12	1	1	0	0	0
Future Vol, veh/h	0	35	0	1	37	0	12	1	1	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	38	0	1	40	0	13	1	1	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	40	0	0	38	0	0	80	80	38	81	80	40
Stage 1	-	-	-	-	-	-	38	38	-	42	42	-
Stage 2	-	-	-	-	-	-	42	42	-	39	38	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1570	-	-	1572	-	-	908	810	1034	907	810	1031
Stage 1	-	-	-	-	-	-	977	863	-	972	860	-
Stage 2	-	-	-	-	-	-	972	860	-	976	863	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1570	-	-	1572	-	-	907	809	1034	904	809	1031
Mov Cap-2 Maneuver	-	-	-	-	-	-	907	809	-	904	809	-
Stage 1	-	-	-	-	-	-	977	863	-	972	859	-
Stage 2	-	-	-	-	-	-	971	859	-	974	863	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.2	9	0
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	907	1570	-	-	1572	-	-	-
HCM Lane V/C Ratio	0.017	-	-	-	0.001	-	-	-
HCM Control Delay (s)	9	0	-	-	7.3	0	-	0
HCM Lane LOS	A	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	-

Intersection	
Int Delay, s/veh	1.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	16	0	71	8	125	0	0	193	54
Future Vol, veh/h	0	0	0	16	0	71	8	125	0	0	193	54
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	Yield	-	-	None	-	-	None
Storage Length	-	-	-	-	-	50	-	-	-	-	-	-
Veh in Median Storage, #	-	-	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	17	0	77	9	136	0	0	210	59

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	394	423	136	269	0	-	-	-	0
Stage 1	154	154	-	-	-	-	-	-	-
Stage 2	240	269	-	-	-	-	-	-	-
Critical Hdwy	6.42	6.52	6.22	4.12	-	-	-	-	-
Critical Hdwy Stg 1	5.42	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.42	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	2.218	-	-	-	-	-
Pot Cap-1 Maneuver	611	522	913	1295	-	0	0	-	-
Stage 1	874	770	-	-	-	0	0	-	-
Stage 2	800	687	-	-	-	0	0	-	-
Platoon blocked, %					-			-	-
Mov Cap-1 Maneuver	606	0	913	1295	-	-	-	-	-
Mov Cap-2 Maneuver	606	0	-	-	-	-	-	-	-
Stage 1	867	0	-	-	-	-	-	-	-
Stage 2	800	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.6	0.5	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	WBLn1	WBLn2	SBT	SBR
Capacity (veh/h)	1295	-	606	913	-	-
HCM Lane V/C Ratio	0.007	-	0.029	0.085	-	-
HCM Control Delay (s)	7.8	0	11.1	9.3	-	-
HCM Lane LOS	A	A	B	A	-	-
HCM 95th %tile Q(veh)	0	-	0.1	0.3	-	-

Intersection	
Int Delay, s/veh	6.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	84	0	4	0	0	0	0	47	21	168	42	0
Future Vol, veh/h	84	0	4	0	0	0	0	47	21	168	42	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	None
Storage Length	-	-	50	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	91	0	4	0	0	0	0	51	23	183	46	0

Major/Minor	Minor2						Major1			Major2		
Conflicting Flow All	475	486	46				-	0	0	74	0	0
Stage 1	412	412	-				-	-	-	-	-	-
Stage 2	63	74	-				-	-	-	-	-	-
Critical Hdwy	6.42	6.52	6.22				-	-	-	4.12	-	-
Critical Hdwy Stg 1	5.42	5.52	-				-	-	-	-	-	-
Critical Hdwy Stg 2	5.42	5.52	-				-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318				-	-	-	2.218	-	-
Pot Cap-1 Maneuver	548	481	1023				0	-	-	1526	-	0
Stage 1	669	594	-				0	-	-	-	-	0
Stage 2	960	833	-				0	-	-	-	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	481	0	1023				-	-	-	1526	-	-
Mov Cap-2 Maneuver	481	0	-				-	-	-	-	-	-
Stage 1	587	0	-				-	-	-	-	-	-
Stage 2	960	0	-				-	-	-	-	-	-

Approach	EB						NB			SB		
HCM Control Delay, s	13.9						0			6.1		
HCM LOS	B											

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	EBLn2	SBL	SBT
Capacity (veh/h)	-	-	481	1023	1526	-
HCM Lane V/C Ratio	-	-	0.19	0.004	0.12	-
HCM Control Delay (s)	-	-	14.2	8.5	7.7	0
HCM Lane LOS	-	-	B	A	A	A
HCM 95th %tile Q(veh)	-	-	0.7	0	0.4	-

Intersection	
Int Delay, s/veh	4.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	23	29	1	0	7	37	5	5	1	51	1	4
Future Vol, veh/h	23	29	1	0	7	37	5	5	1	51	1	4
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	25	32	1	0	8	40	5	5	1	55	1	4

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	48	0	0	33	0	0	114	131	33	114	111	28
Stage 1	-	-	-	-	-	-	83	83	-	28	28	-
Stage 2	-	-	-	-	-	-	31	48	-	86	83	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1559	-	-	1579	-	-	863	760	1041	863	779	1047
Stage 1	-	-	-	-	-	-	925	826	-	989	872	-
Stage 2	-	-	-	-	-	-	986	855	-	922	826	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1559	-	-	1579	-	-	848	748	1041	847	767	1047
Mov Cap-2 Maneuver	-	-	-	-	-	-	848	748	-	847	767	-
Stage 1	-	-	-	-	-	-	910	813	-	973	872	-
Stage 2	-	-	-	-	-	-	981	855	-	900	813	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	3.2	0	9.5	9.5
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	812	1559	-	-	1579	-	-	857
HCM Lane V/C Ratio	0.015	0.016	-	-	-	-	-	0.071
HCM Control Delay (s)	9.5	7.3	0	-	0	-	-	9.5
HCM Lane LOS	A	A	A	-	A	-	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0.2

Intersection	
Int Delay, s/veh	2.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	3	0	1	1	0	0	0	0	1	0	0
Future Vol, veh/h	0	3	0	1	1	0	0	0	0	1	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	3	0	1	1	0	0	0	0	1	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1	0	0	3	0	0	6	6	3	6	6	1
Stage 1	-	-	-	-	-	-	3	3	-	3	3	-
Stage 2	-	-	-	-	-	-	3	3	-	3	3	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1622	-	-	1619	-	-	1014	889	1081	1014	889	1084
Stage 1	-	-	-	-	-	-	1020	893	-	1020	893	-
Stage 2	-	-	-	-	-	-	1020	893	-	1020	893	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1622	-	-	1619	-	-	1013	888	1081	1013	888	1084
Mov Cap-2 Maneuver	-	-	-	-	-	-	1013	888	-	1013	888	-
Stage 1	-	-	-	-	-	-	1020	893	-	1020	892	-
Stage 2	-	-	-	-	-	-	1019	892	-	1020	893	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	3.6	0	8.6
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	1622	-	-	1619	-	-	1013
HCM Lane V/C Ratio	-	-	-	-	0.001	-	-	0.001
HCM Control Delay (s)	0	0	-	-	7.2	0	-	8.6
HCM Lane LOS	A	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	-	0	-	-	0	-	-	0

Intersection	
Int Delay, s/veh	3.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	3	1	2	2	0	0	7	0	3	10	0
Future Vol, veh/h	0	3	1	2	2	0	0	7	0	3	10	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	3	1	2	2	0	0	8	0	3	11	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	26	25	11	27	25	8	11	0	0	8	0	0
Stage 1	17	17	-	8	8	-	-	-	-	-	-	-
Stage 2	9	8	-	19	17	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	984	868	1070	983	868	1074	1608	-	-	1612	-	-
Stage 1	1002	881	-	1013	889	-	-	-	-	-	-	-
Stage 2	1012	889	-	1000	881	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	981	866	1070	978	866	1074	1608	-	-	1612	-	-
Mov Cap-2 Maneuver	981	866	-	978	866	-	-	-	-	-	-	-
Stage 1	1002	879	-	1013	889	-	-	-	-	-	-	-
Stage 2	1010	889	-	993	879	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9	8.9	0	1.7
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1608	-	-	909	919	1612	-	-
HCM Lane V/C Ratio	-	-	-	0.005	0.005	0.002	-	-
HCM Control Delay (s)	0	-	-	9	8.9	7.2	0	-
HCM Lane LOS	A	-	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0	0	-	-

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	55	27	10	6	2
Future Vol, veh/h	0	55	27	10	6	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	60	29	11	7	2

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	40	0	-	0	95	35
Stage 1	-	-	-	-	35	-
Stage 2	-	-	-	-	60	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1570	-	-	-	905	1038
Stage 1	-	-	-	-	987	-
Stage 2	-	-	-	-	963	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1570	-	-	-	905	1038
Mov Cap-2 Maneuver	-	-	-	-	905	-
Stage 1	-	-	-	-	987	-
Stage 2	-	-	-	-	963	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	8.9
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1570	-	-	-	935
HCM Lane V/C Ratio	-	-	-	-	0.009
HCM Control Delay (s)	0	-	-	-	8.9
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

Intersection	
Int Delay, s/veh	0.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	62	0	0	36	0	0	0	1	0	0	1
Future Vol, veh/h	0	62	0	0	36	0	0	0	1	0	0	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	67	0	0	39	0	0	0	1	0	0	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	39	0	0	67	0	0	107	106	67	107	106	39
Stage 1	-	-	-	-	-	-	67	67	-	39	39	-
Stage 2	-	-	-	-	-	-	40	39	-	68	67	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1571	-	-	1535	-	-	872	784	997	872	784	1033
Stage 1	-	-	-	-	-	-	943	839	-	976	862	-
Stage 2	-	-	-	-	-	-	975	862	-	942	839	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1571	-	-	1535	-	-	871	784	997	871	784	1033
Mov Cap-2 Maneuver	-	-	-	-	-	-	871	784	-	871	784	-
Stage 1	-	-	-	-	-	-	943	839	-	976	862	-
Stage 2	-	-	-	-	-	-	974	862	-	941	839	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0	8.6	8.5
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	997	1571	-	-	1535	-	-	1033
HCM Lane V/C Ratio	0.001	-	-	-	-	-	-	0.001
HCM Control Delay (s)	8.6	0	-	-	0	-	-	8.5
HCM Lane LOS	A	A	-	-	A	-	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0

Appendix J

Project Description Details

CHAPTER 2.0

PROJECT DESCRIPTION

2.1 PROJECT DESCRIPTION

The term Project refers to construction, operation, and decommissioning of the solar field and energy storage site parcels, Gen-Ties, improvements at the existing Drew Switchyard and other on-site and off-site ancillary features as described in the Project Description under either the Phased CUP Scenario or Full Build-out Scenario with up to approximately 855 gross and 762.8 net farmable acres of disturbance. The term CUPs refers to an individual CUP (i.e. CUP 17-0031), multiple CUPs (i.e. CUP 17-0031, CUP 17-0032 and CUP 17-0033) or all CUPs (CUP 17-0031 thru CUP 17-0035 and CUP 18-0001) as appropriate. The term Solar Energy Center refers to the area developed within each CUP with PV panels, collector lines, inverters and pad mounted transformers, substation(s) and switchyard(s), energy storage, O&M building, etc. The term Solar Field Site Parcels refers to the six parcels (052-170-039-000, 052-170-067-000, 052-170-031-000, 052-170-032-000, 052-170-056-000, and 052-170-037-000) which are currently flat crop farm fields where the PV panels and associated solar and energy storage equipment are proposed for development as CUP 17-0031 thru CUP 17-0035 and CUP 18-0001.

2.1.1 INTRODUCTION

This chapter of the Environmental Impact Report (EIR) describes the Drew Solar Project ("Project" or "Proposed Project") proposed by Drew Solar, LLC. The Project is a proposal to build an approximately 100-mega-watt (MW) alternating current (AC) solar generation facility using photovoltaic (PV) technology. The entire Project is located on land owned by the Imperial Irrigation District (IID). The Project's generation interconnection *(*gen-tie*)* transmission lines ("Gen-ties") are proposed from the south end of the Project site running south across Drew Road and State Route 98 connecting into the existing Drew Switchyard located on APN 052-190-039. The term Project Site refers individually or collectively to the six parcels (052-170-039-000, 052-170-067-000, 052-170-031-000, 052-170-032-000, 052-170-056-000, and 052-170-037-000) on which the Project is proposed. The term Project Area refers to the area encompassed by all six CUPs as well as the Gen-Ties and other off-site ancillary facilities.

The Proposed Project consists of a photovoltaic (PV) solar facility capable of producing approximately 100 MWac on approximately 855 gross and 762.8 net farmable acres. The ultimate energy output is dependent on several variables, including off-take arrangements and the evolving efficiency of PV panels, so it is possible that the Project could generate more or less than 100 MW. The Project may be constructed at one time over approximately 18 months, or it may be built out over an approximately 10-year period. A conceptual phasing configuration is shown in Figure 2.0-3. A Site Plan is provided in Figure 2.0-4. The Project Proponent is requesting that a Conditional Use Permit (CUP) be issued for each of the five phases of the Project as well as an additional sixth CUP for Phase 5 for energy storage in the southwesterly portion of the Project Area. Project phasing allows utilities greater flexibility in obtaining renewable energy to meet ratepayer needs by allowing utilities to procure smaller energy quantities phased over time.

The Project Proponent has filed an application for a General Plan Amendment (GPA) for amendment of the Renewable Energy & Transmission Element to create an Island Overlay, an amendment of the requirements for said Island Overlay, a Zone Change to add the RE Overlay to the Project Site, a Variance and six CUPs. Each of the six CUPs may include an Operations and Maintenance (O&M) building or buildings. The Project may also include additional auxiliary facilities such as raw water/fire water storage, treated water storage, evaporation ponds, storm water retention basins, water filtration buildings and equipment, and equipment control buildings, septic system(s) and parking. The Project will also include electric and vehicular crossings of State facilities, IID facilities and County facilities. The Project crossings will not interfere with the purpose of these Agencies' facilities (e.g., where a drain flows, the Project crossing will still allow the drain to flow). Each phase of the Project may have its own energy storage component as well as energy storage being housed within the inverters.

2.1.2 PROJECT BACKGROUND

For the last two decades, California has emerged as a leader in promoting policies designed to grow the State's portfolio of renewable energy generation and use. Most recently, California passed two bills further increasing the State's commitment to reductions in greenhouse gas emissions through reductions in fossil fuels and increases in renewable energy: Senate Bill (SB) 350 requiring retail sellers and publicly owned utilities to procure half of their electricity from renewable sources by 2030. This requirement is known as the Renewable Portfolio Standard or "RPS." In 2016, the Legislature passed SB 32, which codifies a 2030 greenhouse gas emissions reduction target of 40 percent below 1990 levels. According to Greentech Media, reaching such high amounts of variable renewable generation all but requires a wider build-out of storage capacity to give the grid more control over when that wind and solar power is consumed. The California legislature has passed several bills recently to help expand and expedite the amount of energy storage that is connected to California's electric grid. Newly signed AB 2861 authorizes the CPUC to create an independent dispute-resolution panel, staffed by electrical systems experts. Their job is to evaluate a disputed interconnection fee, gathering input from both sides and ruling on the case within 60 days. AB 2868 is aimed at increasing the overall size of the storage market by directing utilities to deploy up to 500 megawatts of additional storage capacity, of which no more than a quarter can be behind-the-meter. AB 33 declares the legislature's wish that the CPUC pay extra attention to long-duration storage for the grid. "The commission, in coordination with the Energy Commission, shall, as part of a new or existing proceeding, evaluate and analyze the potential for all types of long-duration bulk energy storage resources to help integrate renewable generation into the electrical grid," the law says. The CPUC's ruling comes after years of work jump-started by a 2010 state law, Assembly Bill 2514, which originally called for the statewide energy storage mandate of 1.3 GW to enable a "market transformation" for these new technologies. On June 10, 2013, CPUC Commissioner Peterman's Assigned Commissioner's Ruling stated "Energy storage has the potential to transform how the California electric system is conceived, designed, and operated. In so doing, energy storage has the potential to offer services needed as California seeks to maximize the value of its generation and transmission investments: optimizing the grid to avoid or defer investments in new fossil-power plants, integrating renewable power, and minimizing greenhouse emissions."

The Applicant is proposing to construct, operate and decommission a solar generation and energy storage facility on approximately 855 gross and 762.8 net farmable acres (inclusive of solar field, energy storage, project substation(s), roads, retention basins, etc.) located in southern Imperial County, California. A fundamental challenge posed by solar energy is that peak supply does not consistently coincide with peak demand times (e.g., 5:00 – 9:00 PM). Energy storage is a rapidly developing technology that can help balance supply and demand by capturing and storing renewable energy generated during daylight hours for peak evening demand. Energy storage, where available, reduces reliance on fossil fuels and furthers California's RPS policies by providing for better integration of locally-sourced solar and wind generation and RPS requirements.

On December 28, 2017, January 8, 2018, July 5, 2018 and [insert date that Derek submits the TPM], the Applicant submitted the following applications to ICPDS Department.

- Amendment (GPA 17-0006) to Imperial County's General Plan for amendment of the Renewable Energy & Transmission Element to create an Island Overlay for the Project Site, and amendment of the requirements for said Island Overlay; Zone Change (ZC 17-0007) to add the RE Overlay Zone to the Project Site;
- Variance (V 17-0003) for power pole structures that are over 120 feet in height on all proposed project parcels, including the existing Drew Switchyard. With approval of the Variance, the proposed structures could be up to 180 feet in height;
- Parcel Map ([insert PM #} to fix the existing inconsistency with the legal and physical boundary of the SW ¼ Section of the Project Site (APNs: 052-170-039 & 052-170-067), including APN 052-170-030 to the north of the Project Site as part of the Parcel Map;Five CUPs (CUP 17-0031; CUP 17-0032; CUP 17-0033; CUP 17-0034 and CUP 17-0035) to develop solar energy generating systems including potential energy storage on lands zoned A-2, A-2-R, and A-3 per Title 9, Division 5: Zoning Areas Established, Chapter 8, Sections 90508.02 and 90509.02; and
- One CUP (CUP 18-0001) to develop energy storage as a component of solar on lands zoned A-2 and A-3 per Title 9, Division 5: Zoning Areas Established, Chapter 8, Sections 90508.02 and 90509.02 (A-2 & A-3). Said energy storage would be removed at the time of removal of associated solar facility.

In addition to the foregoing, the applicant will request Similarity In Use designation from the Planning and Development Services Department in compliance with Section 90203.10 of the County's Land Use Ordinance for the energy storage facilities proposed to be developed under CUP 18-0001.

The Project will use PV technology to convert sunlight directly into direct current (DC) electricity. The process starts with photovoltaic cells that make up photovoltaic modules (environmentally sealed collections of photovoltaic cells). PV modules are generally non-reflective. Groups of photovoltaic modules are wired together to form a PV array. The DC produced by the array is collected at inverters (power conversion devices) where the DC is converted to AC. The voltage of the electricity is increased by a transformer at each power conversion station to a medium voltage level (typically 34.5 kilovolts (kV)). Medium voltage electric lines (underground and/or overhead) are used to collect the electricity from each medium voltage transformer and transmit it to the facility substation(s), where the voltage is further increased by a high voltage transformer to match the electric grid for export to the point of interconnection at the Drew Road Switchyard. Disconnect switches, fuses, circuit breakers, and other miscellaneous equipment will be installed throughout the system for electrical protection and operations and maintenance purposes.

This EIR is being prepared to analyze the potential environmental impacts of the Project and fulfill the requirements of the California Environmental Quality Act (CEQA).

A primary project objective is to develop a project that will produce public benefits for Imperial County, the Southern California Region, and the State of California. The following is a list of key public benefits that are fundamental to the project's objectives:

- To enable better energy balancing and greater grid reliability through the development of Energy Storage Facilities.
- To reduce the likelihood of energy blackouts through the development of Energy Storage Facilities.
- To help meet the mandate of 1.3GW of energy storage established by Assembly Bill 2514.

- To help maximize the investment of Californians in transmission infrastructure through the development of Energy Storage Facilities.
- To levelize the cost of energy through the development of Energy Storage Facilities.
- To reinforce Imperial County's position as a leader in the Renewable Energy Marketplace through the development of Energy Storage Facilities.
- To create significant lease revenue for Imperial Irrigation District ("IID") as the property owner, a public agency, which will benefit the citizens of Imperial County.
- To enable IID to solar fallow and reduce water use on developed CUPs, which help assist IID in meeting its water conservation goals and requirements, and Salton Sea conservation obligations under various agreements, while also avoiding taking higher value farmland out of production as a means of water conservation.
- To utilize Imperial County's abundance of available solar energy (sunlight) to generate approximately 100 megawatts of solar power consistent with the Imperial County General Plan renewable energy objectives.
- To locate the Project in Imperial County in close proximity to the existing California Independent System Operator ("CAISO") electric transmission system at a location which has available capacity to deliver electricity to major load centers in California.
- To meet the terms and requirements of any Power Purchase Agreement (PPA) and Large Generator Interconnection Agreement ("LGIA") that the Applicant has or may enter into and that require it to be interconnected directly to the CAISO grid at the existing Drew Switchyard.
- To deploy a technology that is safe, readily available, efficient, and environmentally responsible.
- To generate power, and store energy in Energy Storage Facilities, in an efficient manner and at a cost that is competitive in the renewable market on sites controlled by the applicant.
- To provide a new source of renewable energy to assist the State of California in achieving and exceeding the RPS.
- To maximize local construction jobs for a variety of trades through the development of a solar generation facility and an energy storage facility, therefore helping maximize the reduction of unemployment in the construction sector.
- To locate the Project in an area that ranks among the highest in solar resource potential in the nation, as measured by the CEC.
- To minimize potential impacts to aesthetics, health and safety and other potential environmental impacts:

  o Locate the Project on disturbed land.

  o Consistent with County conditions on similar solar generation projects, group or collocate the Project's proposed electrical interconnection facilities with existing or proposed electrical interconnection facilities, to the extent that such grouping/colocation can be accommodated.

  o Utilize existing infrastructure (switchyards, transmission lines, roads, and water sources) where feasible to locate the project proximate to existing electric interconnection and transmission systems in Imperial County with capacity to deliver electricity to major load centers in California.

- To indirectly reduce the need to emit greenhouse gases caused by the generation of similar quantities of electricity from either existing or future non-renewable sources through the use of renewable energy sources during on-peak power periods.
- To create a sustainable form of electricity that requires little fuel to be consumed.
- Where existing agricultural operations are active, to promote continued agricultural operations until that CUP is developed for use.
- To encourage economic investment in renewable energy activities.
- To diversify Imperial County's economic base by developing environmentally responsible non-agricultural activities.
- To provide tax revenue through sales, use and property taxes generated by renewable energy development within Imperial County.
- To help maximize the expansion of the renewable energy sector in Imperial County's economy by developing solar generation facilities and Energy Storage Facilities.

2.1.3 SITE LOCATION

The proposed Project site is located on six parcels (052-170-039-000, 052-170-067-000, 052-170-031-000, 052-170-032-000, 052-170-056-000, and 052-170-037-000) approximately 6.5 miles southwest of the City of El Centro, California and 7.5 miles directly west of Calexico, California. The geographic center of the Project roughly corresponds with 32° 41' 13" North and 115° 40' 8" West, at an elevation of 19 feet below sea level. The Project site is generally located south of Kubler Road, east of the Westside Main Canal, north of State Route 98, and west of Pulliam Road.

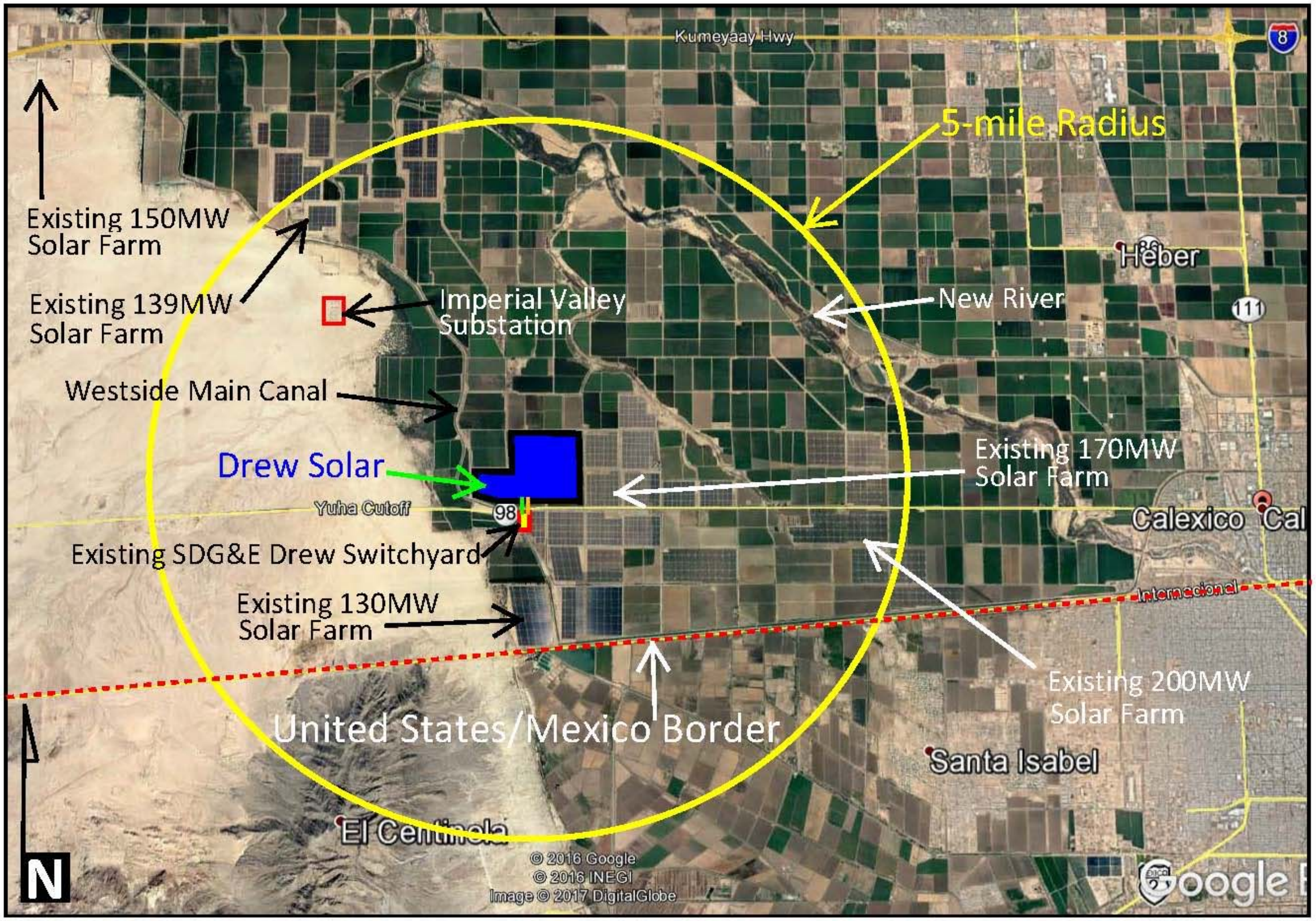
Figure 2.0-1 depicts the regional location of the Project. **Figure 2.0-2** shows the Project site and surrounding area. **Figure 2.0-3** is a conceptual phasing configuration of the Project. **Figure 2.0-4** is a site plan showing the layout of the Project and its various components.

2.1.4 OWNERSHIP

The property is owned by the IID. Drew Solar, LLC will lease the property for the construction, operation and decommissioning of the facility.

Source: Google Earth 2018.

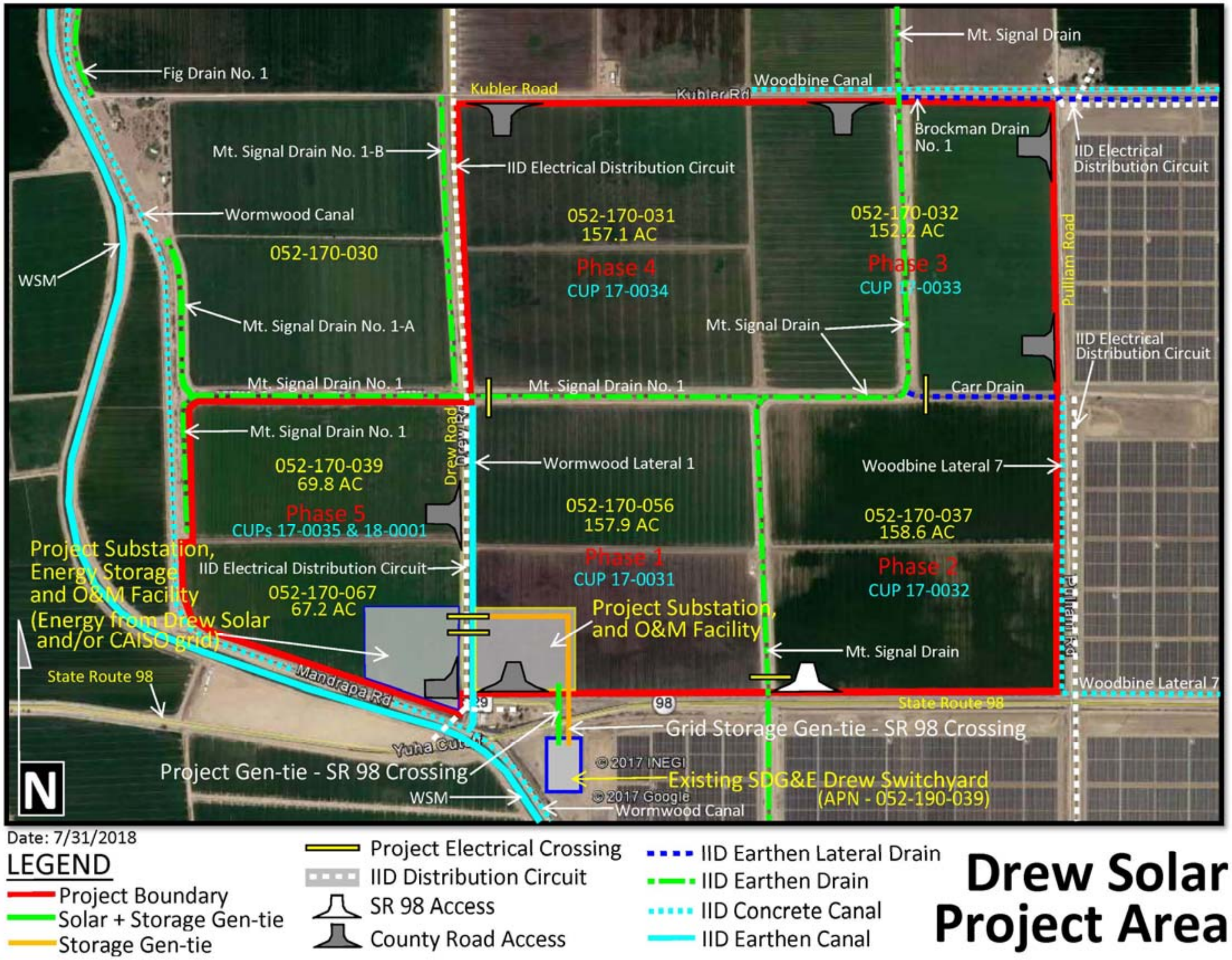
FIGURE 2.0-1
REGIONAL LOCATION MAP



Date: 6/4/2018

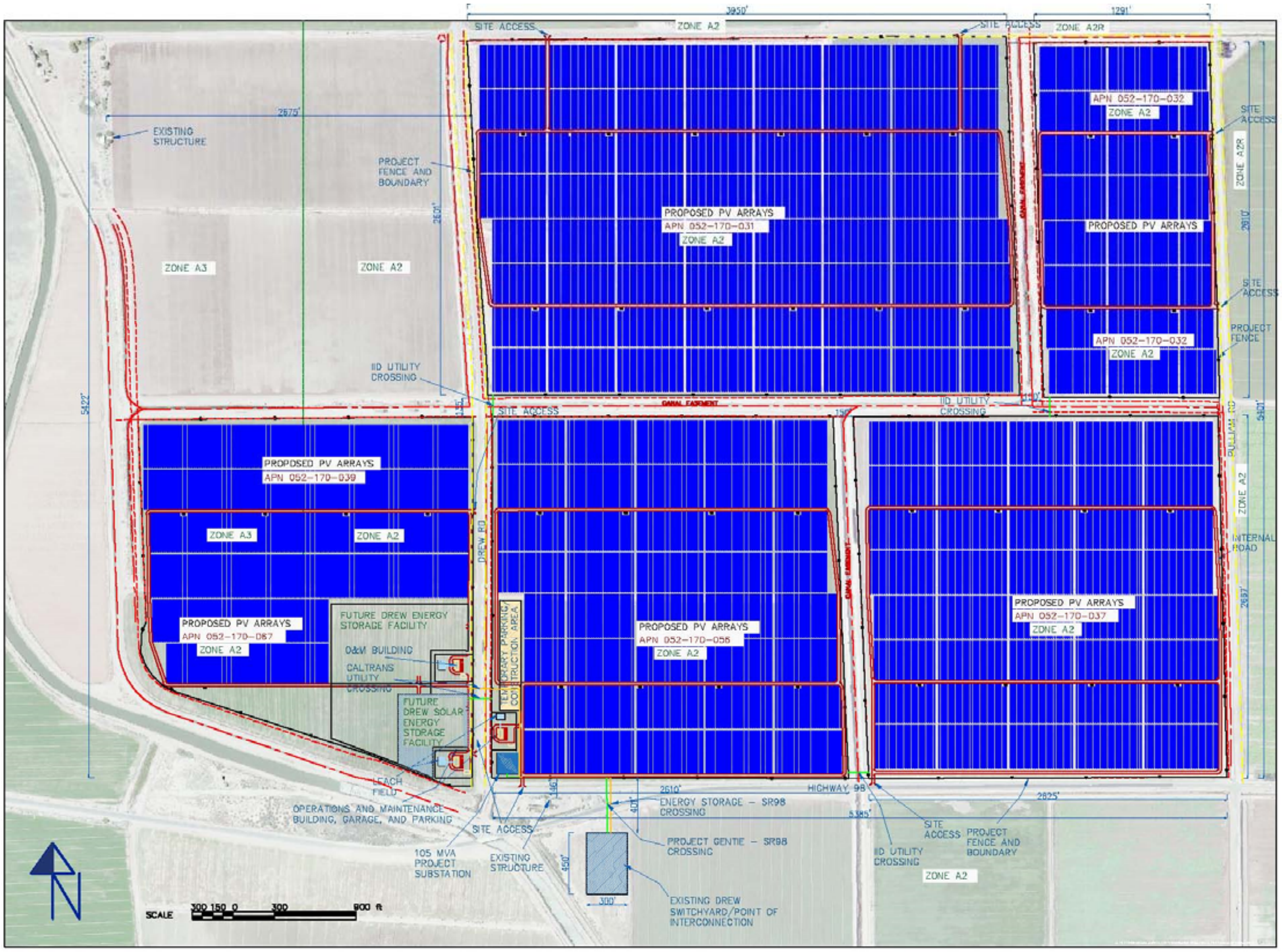
Source: Drew Solar 2018.

FIGURE 2.0-2
PROJECT VICINITY MAP



Source: Drew Solar 2018.

FIGURE 2.0-3
PROJECT PHASING MAP



Source: Drew Solar 2018.

FIGURE 2.0-4
SITE PLAN

2.1.5 PROJECT CHARACTERISTICS

A. EXISTING ON-SITE USES AND SURROUNDING USES

Figure 2.0-3 shows the boundary of the Project site and the six parcels which total approximately 855 gross and 762.8 net farmable acres of lands that have been used for agriculture. **Table 2.0-1** provides the Assessor's Parcel Numbers (APNs), approximate acreage, zoning and current use of each parcel that comprise the Project site.

The Project site is located in the southwestern portion of Imperial County. There are several other approved/built solar projects in the immediate vicinity surrounding the Project site. The other projects include Centinela Solar, the Mount Signal and Calexico Solar projects, Campo Verde Solar, Wistaria Ranch Solar and Imperial Solar Energy Center South. The Project is surrounded on 2 sides by the existing Centinela Solar project and is adjacent to the existing Drew Switchyard, which a majority of the projects in the area interconnect to. The rest of the area is predominantly agricultural with very few residences and agricultural buildings mixed in.

B. GENERAL PLAN AND ZONING DESIGNATIONS

The Imperial County General Plan Land Use Element designates the Project site as "Agriculture" (refer to Figure 4.2-1 in Section 4.2, Land Use). As shown in **Table 2.0-1**, lands on which the Drew Solar Project is proposed are currently zoned A-2 (General Agricultural Zone), A-2-R (General Agricultural Zone/Rural Zone), and A-3 (Heavy Agricultural) (refer to Figure 4.2-2 in Section 4.2, Land Use). Solar energy electrical generators, electrical power generating plants, substation(s), and facilities for the transmission of electrical energy are allowed as conditional uses in Agricultural zones (Land Use Ordinance, Title 9, Division 5, Sections 90508.02 and 90509.02).

TABLE 2.0-1
PROJECT SITE PARCELS

APN	Net Acres	Gross Acres	Zoning	Current Use
052-170-039	69.8	80.93	A-2 & A-3	Farmed for flat crops
052-170-067	67.2	72.04	A-2	Farmed for flat crops
052-170-031	157.1	168.61	A-2 & A-2-R	Farmed for flat crops
052-170-032	152.2	178.07	A-2-R	Farmed for flat crops
052-170-056	157.9	168.31	A-2	Farmed for flat crops
052-170-037	158.6	176.24	A-2 & A-2-R	Farmed for flat crops

Sources: Drew Solar 2017; Imperial County Planning & Development Services, 2017; IID Real Estate Department, 2017
Notes: A-2 = Agricultural; General A-2-R = General Agricultural Rural Zone; A-3 = Agricultural, Heavy

The Project is processing a Parcel Map to fix the existing inconsistency with the legal and physical boundary of the SW ¼ Section of the Project Site (APNs: 052-170-039 & 052-170-067), including APN 052-170-030 to the north of the Project Site as part of the Parcel Map. In doing so the net farmable acreage of the Project Site will remain the same (762.8 net acres), and the gross acreage will increase from 844.2 gross acres to approximately 855 gross acres once the Parcel Map is recorded.

Development of a solar facility would preclude the use of approximately 762.8 net farmable acres for agricultural production for life of the Project. The development agreement would enable the CUPs to be valid for a total of 40 years with commencement of construction starting any time within 10 years of CUP approval. At the end of the useful life of the Project, the solar facility would be decommissioned and reclaimed to its original condition.

C. PROJECT COMPONENTS

Each of the components of the proposed Project is described in detail below. The components would be installed as part of construction, in use during operation, and removed and decommissioned as part of reclamation.

The net electrical output of the proposed Project is anticipated to be approximately 100 MWac. The actual net electrical output of the Project will depend upon the technology selected and final design and layout. The design and construction of the buildings, solar arrays (panels, etc.), energy storage facilities, and auxiliary facilities will be consistent with County building standards.

Solar Energy Generation Component - This component includes the construction, operation, and decommissioning of the five proposed solar energy generation parcels (Phases 1-5), inclusive of the shared Phase 5 Operation and Maintenance Complex, substation(s), and supporting transmission and Gen-Tie facilities. This component could be built out under either the Full Build-out Scenario or Phased Build-out Scenario.

Energy Storage Component – This includes the construction, operation, and decommissioning of the proposed energy storage facilities in conjunction with the storage of grid and solar energy generated by the Project. This component could be built out under either the Full Build-out Scenario or Phased Build-out Scenario.

Drew Switchyard and Gen-Tie Component - This component includes the construction, operation and decommissioning of required improvements at the existing Drew Switchyard facility and supporting transmission and Gen-Tie facilities in order to accommodate the Project’s proposed utilization of the facility. This component is considered to be built out at one time under both the Full Build-out and Phased Build-out Scenario. Therefore, phased-buildout is not analyzed separately for this component.

Solar Technology

The Project may include only one PV technology or a combination of various PV technologies, including but not limited to crystalline silicon-based systems, thin-film systems, and perovskites.

When sunlight strikes a PV module, the energy absorbed is transferred to electrons in the atoms of the semiconductor causing them to escape from their normal positions and become part of the current in an electrical circuit. The PV modules convert the sunlight directly into low-voltage DC electricity that is subsequently transformed to AC electricity through an inverter. The system only operates when the sun is shining during daylight hours. The system operates at peak output when the sunlight is most intense, though it also produces power in low light conditions.

Fixed-Tilt and Tracker Structures

The Project may include only one PV technology or a combination of various PV technologies, including but not limited to crystalline silicon-based systems, bifacial modules, thin-film systems and perovskites. Depending on the selected manufacturer for the PV modules, the modules will be mounted on fixed-tilt or single-axis tracking structures. The modules will be grouped in nominal 1 to 4MW-AC arrays. Fixed tilt arrays will be oriented in east-west rows and will face in a generally southern orientation with a tilt angle between 10 and 35 degrees to maximize the amount of incidental solar radiation absorbed over the year. Single-axis trackers typically rotate ±60 degrees (0 degrees is horizontal) along a nominally north-south axis to track the sun’s movement throughout the day. Structural support elements will be constructed of corrosion-resistant steel, aluminum, or equivalent members that are attached to circular piers or I-beam posts that will be driven into the prepared base grade of the Project site. The solar array field is arranged in groups called "blocks."

Figure 2.0-5 depicts a typical array layout. **Figure 2.0-6** is a graphic showing tracker details. The entire array block is connected to an inverter and transformer station to convert the current from DC to AC and step up the voltage to a higher voltage which is more efficient for transmitting power to the project substation(s).

Inverters and Pad-mounted Transformers

At the center of each array is a power conversion station where inverters take the DC power output from the PV modules and convert it to AC power. **Figure 2.0-7** provides an elevation of a typical inverter station. The adjacent pad-mounted transformer steps the voltage up to a medium voltage level. The medium

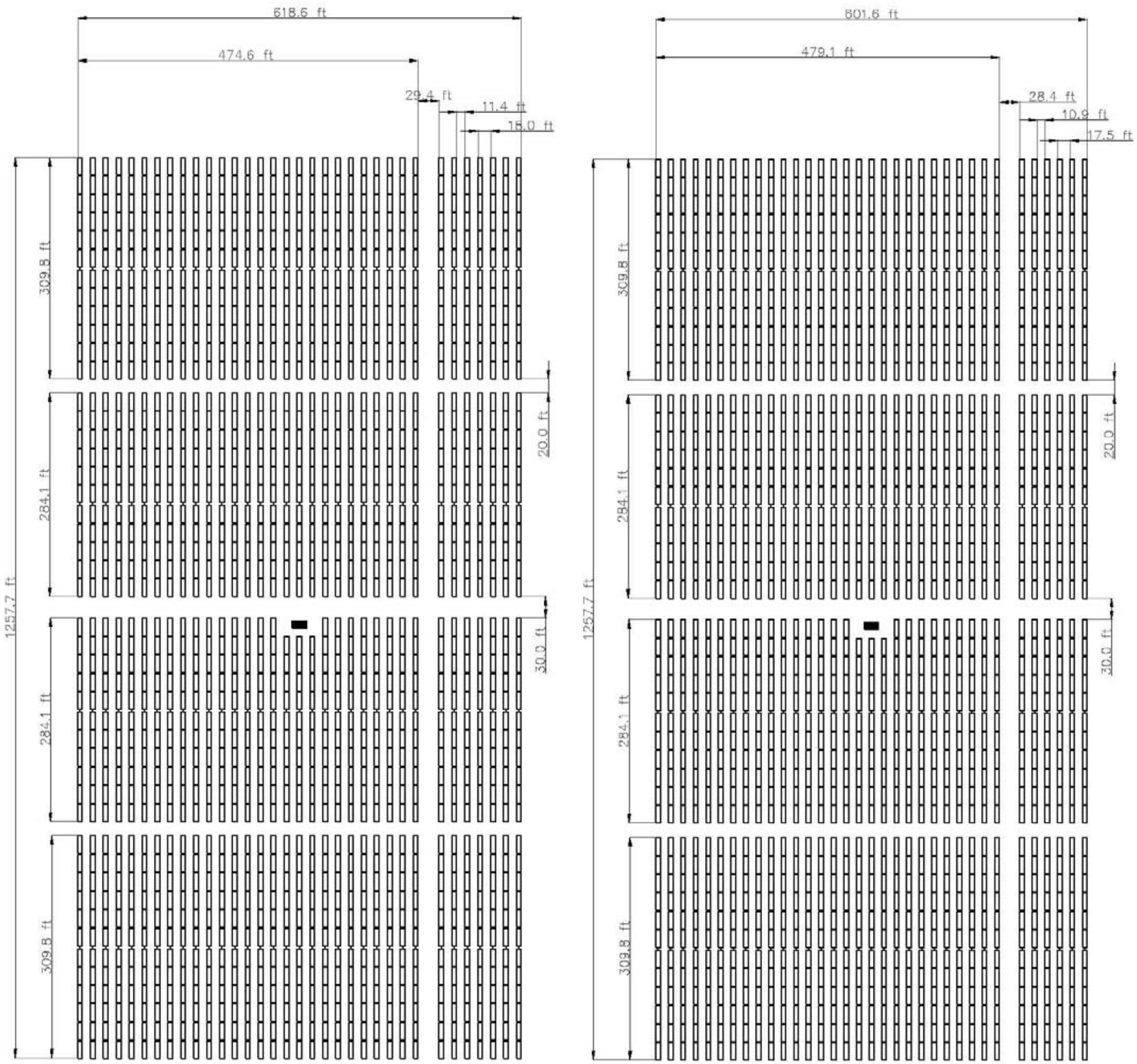
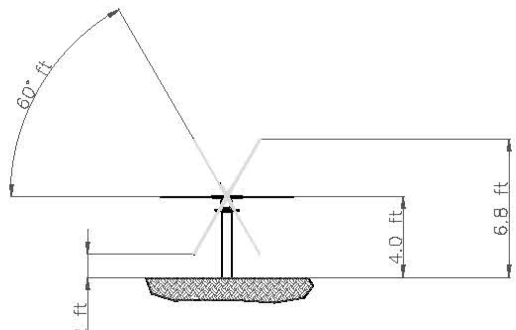


FIGURE 2.0-5

Source: Revolution Labs 2017. **LS**



TRACKER DETAIL A
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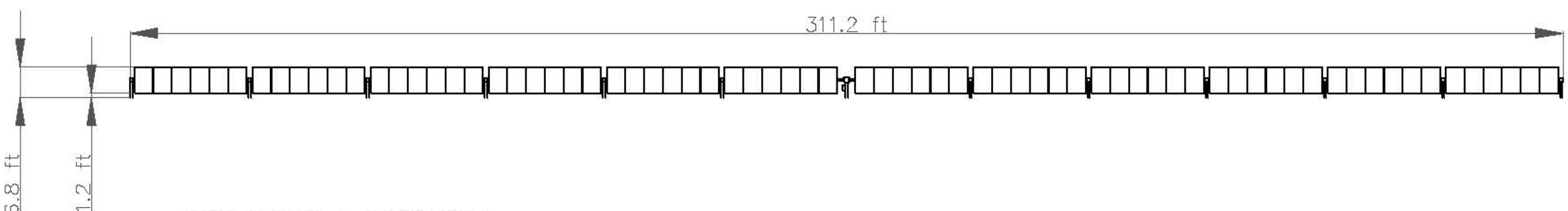
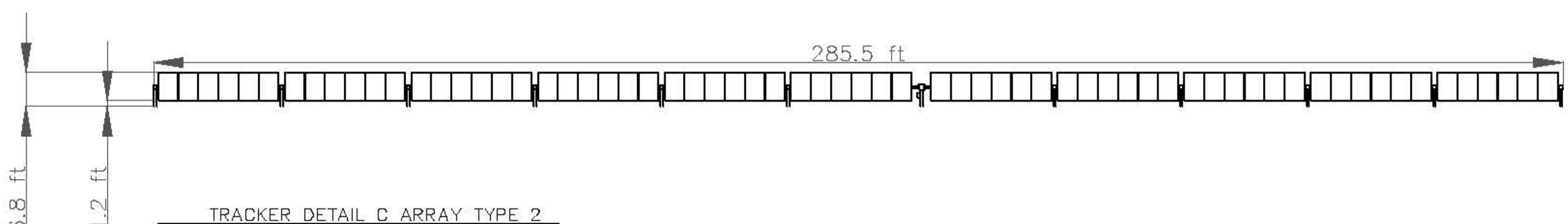
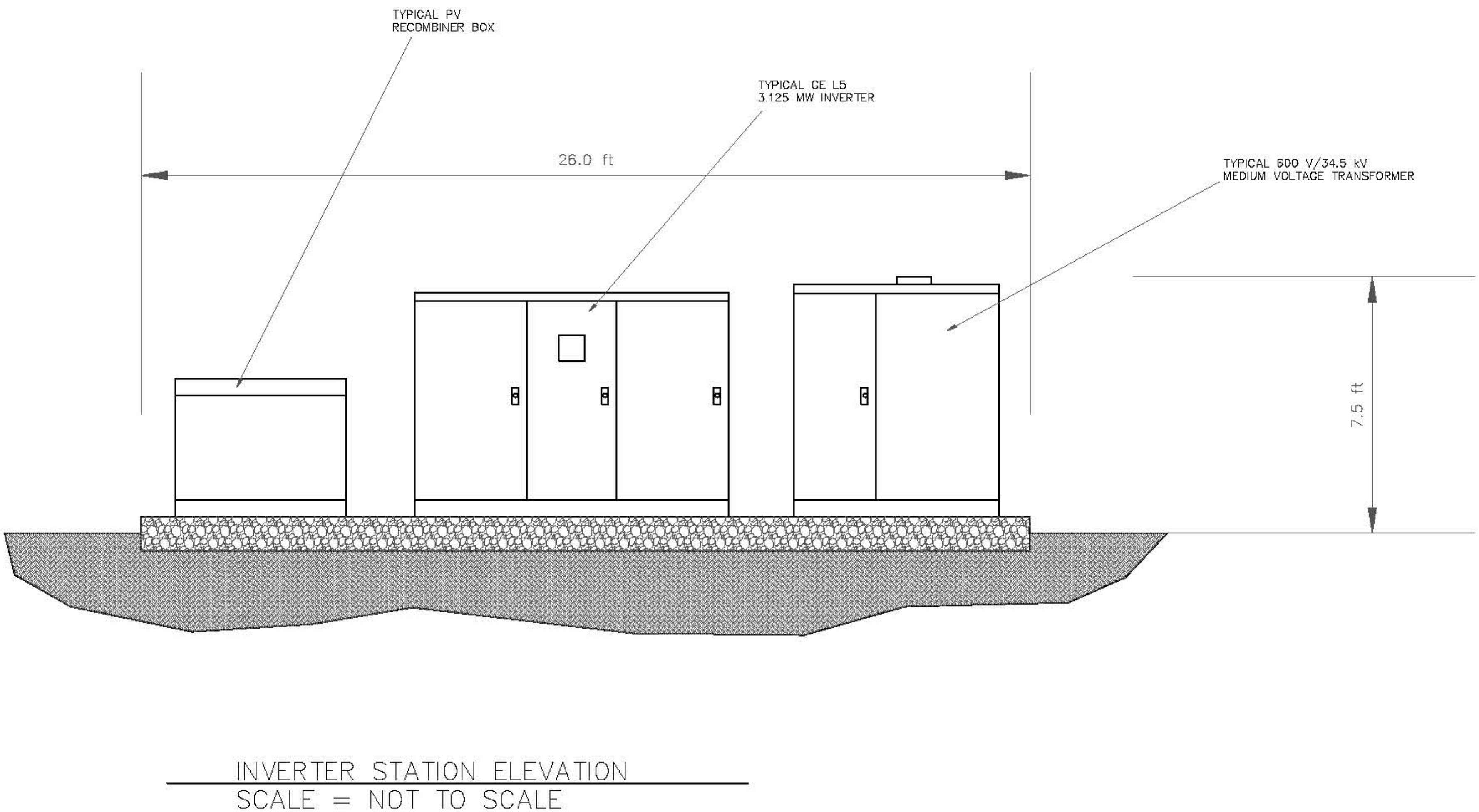


TRACKER DETAIL B ARRAY TYPE 1
SCALE = NOT TO SCALE



TRACKER DETAIL C ARRAY TYPE 2
SCALE = NOT TO SCALE



Source: Revolution Labs 2017.

FIGURE 2.0-7
INVERTER STATION ELEVATION

voltage outputs from each of the pad-mounted transformers are collected together in combining switchgear located at discrete locations on the Project site. The medium voltage output from the combining switchgear will be connected to the Project substation(s) where it will then be stepped up to 230-kV for export to the grid. The Project's Gen-ties will interconnect to the existing Drew Switchyard.

Substation and Switchyard

An on-site substation will step-up the voltage from the collection level voltage to 230-kV. Breakers, buswork, protective relaying, Supervisory Control and Data Acquisition (SCADA), and associated substation equipment will be constructed on the Project site. The communication system may include above or below ground fiber optic cable or microwave tower. The Project will be interconnected to the regional transmission system from the onsite substation(s)/switchyard(s) via the Gen-ties facilities described in this project description. **Figure 2.0-8** depicts a typical substation configuration.

Transmission Interconnection Facilities

The Project plans to connect to San Diego Gas & Electric's (SDG&E) Imperial Valley Substation by way of the existing Drew Switchyard.

Whether or not the Project is built in phases or at one time, the use of collector lines to collect electricity from the array fields to the Project substation(s) would remain similar. Skid mounted enclosed switchgear would be used within panel fields/phases to collect and transmit the electricity from the panel array fields to the Project substation(s).

In order to minimize impacts to the environment, the Project will utilize the existing Drew Switchyard as its point of interconnection. As illustrated in **Figures 2.0 -2, 2.0-3, 2.0-4 and 2.0-9**, the Project's Gen-ties are proposed to extend south from the south end of the Project site across Drew Road and State Route 98 into the existing Drew Switchyard located on APN 052-190-039-000. A new pole may be constructed on the existing Centinela Solar project on APN 052-190-041-000 and its line cutover into the new bay constructed by Drew Solar in the existing Drew Switchyard in order to minimize power line crossings. This will require vehicles and equipment to work at each tower location as well as to utilize pull sites along the Gen-ties. The structures for the 230-kV Gen-ties line are expected to be similar to those shown in **Figure 2.0-10**. If the Project is able to collocate with other facilities in the area, the Project may construct a new pole to the east of the existing pole that is on the northerly side of the existing Drew Switchyard in order to reduce Gen-tie crossings.

Operations and Maintenance (O&M) Building Complex

The Operations and Maintenance (O&M) Building Complexes may contain administrative offices, parts storage, a maintenance shop, plant security systems, a site control center (**Figure 2.0-11**), and plant monitoring equipment. A specific design for the building(s) has not yet been selected as the technology utilized in utility scale solar energy production continues to improve dramatically at a rapid pace. The final layout will be based on the technology selected. The building(s) may have exterior lighting on motion sensors and will have fire and security alarms. The building(s) will be located on a graded area(s) with adjacent worker parking. The parking lot will be surfaced with concrete or asphalt per County standards and have a handicapped parking space. Additionally, the access road/driveway to the parking lot would be surfaced with either concrete asphalt per County standards. The Project will collect wastewater from sanitary facilities such as sinks and toilets in the O&M building(s). This waste stream will be sent to an on-site sanitary waste septic system and leach field to be installed in compliance with standards established by Imperial County Environmental Health Services. Alternatively, the Project may be designed to direct these waste streams to an underground tank for storage until it is pumped out, on a periodic or as-needed basis, and transported for disposal at a licensed waste treatment facility. During periodic major maintenance events, portable restroom facilities may be provided to accommodate additional maintenance workers. An on-site water treatment facility may be constructed. Each phase may have its own O&M Building Complex, and Phase 5 may have two O&M Building Complexes.

Energy Storage

The Project will likely incorporate an energy storage component and each phase may have its own energy storage component. The field of energy storage is rapidly advancing; thus, a single technology or provider has not been selected for the energy storage portion of the Project. The storage components of the Project will utilize storage technologies that operate based upon the principles of potential including but not limited to compressed air or pumped storage, lithium (ion, oxygen, polymer, phosphate, sulphur), Nickel Metal Hydride, Nickel Cadmium, Lead Acid, antiperovskites or other batteries, including but not limited to solid state batteries that may be approved for commercial use within the United States of America, and flywheels. The storage components may be centralized and located adjacent to the substation or switchgear, or alternatively, the energy storage components may be distributed throughout the plant adjacent to individual power conversion centers. The storage components would be housed in a warehouse type building (**Figure 2.0-12**) or alternatively in smaller modular structures such as cargo shipping containers (**Figure 2.0-13**). The Project may store energy generated onsite as well as energy from the CAISO grid.

The Renewable Energy and Transmission Element identifies public benefits associated with renewable energy. As demonstrated in Table 2.0-2, the Project with energy storage incorporated contributes to and enhances each of the eight public benefits associated with renewable energy generation:

TABLE 2.0-2
ENERGY STORAGE AND THE PUBLIC BENEFITS ASSOCIATED WITH RENEWABLE ENERGY AND TRANSMISSION

Public Benefits of Renewable Energy and Transmission	How Energy Storage Achieves the Benefit
Fiscal benefit of sales tax revenues from the purchase of equipment, goods and services.	Equipment purchases related to the design, construction, and operations of energy storage facilities will generate additional sales tax revenues.
Lease benefits to IID, a public agency.	The Project will be built on land owned by the local public utility, IID.
Social and fiscal benefits from increased economic activity and local employment opportunities that do not threaten the economic viability of other industries	The construction and operational phases of the Project will generate increased economic activity by bringing new jobs to the local community.
Improvements in technology to reduce costs of electrical generation	Energy storage enables better energy balancing and great grid reliability by solving the discrepancy between solar energy's peak demand and peak supply times, benefitting both the region and the state in achieving critically needed energy balancing. Energy balancing, in turn, levelizes the cost of energy. By storing excess energy generated during daylight hours, energy storage would increase the supply of energy available during peak demand, thereby offsetting some of the

	higher costs of energy consumption generally associated with peak nighttime demand.
Reduction in potential greenhouse gases by displacing fossil-fuel-generated electricity with renewable energy power which does not add to the greenhouse effect	Energy storage will help the region and the State achieve greenhouse gas reduction targets by allowing the CAISO to procure electricity from renewable resources held in storage rather than from fossil-fuel sources.
Contribution towards meeting the State of California's RPS	Aid California in meeting its RPS requirements by contributing to the supply of renewable electricity for CAISO's procurement.
Minimization of impacts to local communities, agriculture and sensitive environmental resources	Energy storage leverages existing renewable energy resources and reduces the need for fossil fuel-derived sources of electricity, thus reducing potential air quality and GHG emissions. The Project is sited on previously disturbed agricultural land to minimize impacts to sensitive environmental species. The Project Site will be restored to farmable conditions at the end of the life of the Project.

Additional benefits of energy storage include the following:

Energy storage will likely reduce blackouts and contribute to grid reliability. Customer demand on the grid is highest typically during the summer months, when energy regulators are most concerned about the possibility of brownouts and blackouts. Energy storage will increase the region's energy storage capacity by establishing energy reserves that can be used during this high demand period. Energy storage is a cost-effective and environmentally friendly technology to address ramp, regulation, capacity, ancillary services, system reliability and power quality because smoothing the power supply and providing a spinning reserve are functions usually performed by costly burning of fossil fuels. Further, energy storage can respond rapidly to increased demand / decreased supply (e.g., when clouds block the sun), whereas a conventional steam or gas-fired generator takes much longer and can result in supply deficits during the ramp-up period or when excess energy is kept on the grid and facilities are kept on standby to avoid excessive ramping times. This can make a significant difference when trying to correct frequency issues or meet reliability standards established by the North American Electric Reliability Corporation.

The large amount of intermittent renewable energy located at the Imperial Valley Substation has the potential to create challenges for CAISO and IID due to fluctuating weather conditions. For example, clear skies will generate significant solar resources (more than 1,000 MW) to the Imperial Valley Substation, but, cloud cover could significantly and suddenly reduce that generation to 100 MW. These variations have the potential to disrupt grid reliability. The Project's energy storage component would be capable of storing enough energy to discharge and maintain the 1,000MW output even during extended cloud cover.

The Applicant is proposing to install the energy storage facilities on with the Project Site given its close proximity to the existing Drew Switchyard. This location is ideal to help accommodate the high levels of intermittent solar energy flowing through the existing Drew Switchyard and thus minimizing the risks of grid instability and outages.

Energy storage promotes stable electricity prices. Energy storage will enhance the Project's solar generation facility by providing for storage of energy generated during peak supply for use during peak demand periods, thus reducing the need to call up more expensive gas peaker plants to meet peak demand. Energy storage coupled with solar will allow the Project to supply stable electricity prices over the long term by eliminating potential fuel price volatility associated with use of fossil fuels, thus promoting stable electricity prices.

Energy Storage maximizes regional investments in transmission infrastructure. Energy storage will help manage transmission congestion, which in turn will help increase overall load carrying capacity. Further, by reducing the demand on transmission and distribution infrastructure during peak generation hours, energy storage will help extend the life of existing transmission infrastructure and defer repair and replacement costs that are often passed on to the public through increased rates.

Site Access / Traffic and Circulation

There are County maintained roads providing access throughout the Project Site. Access to the Project Site will be from Kubler Road, Drew Road, Pulliam Road, and State Route 98. Access to components of the solar field will be controlled through security gates at several entrances. Multiple gate restricted access points will be used during construction, operation and decommissioning.

Roadway and IID Crossings

The Project will include electric and vehicular crossings of State facilities, IID facilities and County facilities. Due to the nature of the Project and the rapidly changing technology, the exact locations of the crossings are not known at this time. However, it should be assumed for California Environmental Quality Act (CEQA) analysis purposes that wherever an Imperial Irrigation District (IID) facility (drain, irrigation canal, electric line, etc.) or County or State facility (road, etc.) intersect the Project, an electric or vehicular access crossing will occur. The Project crossings will not interfere with the purpose or continued use of these Agencies' facilities. For instance, where a drain flows, the Project crossing or access point will still allow the drain to flow.

Source: Drew Solar 2018.

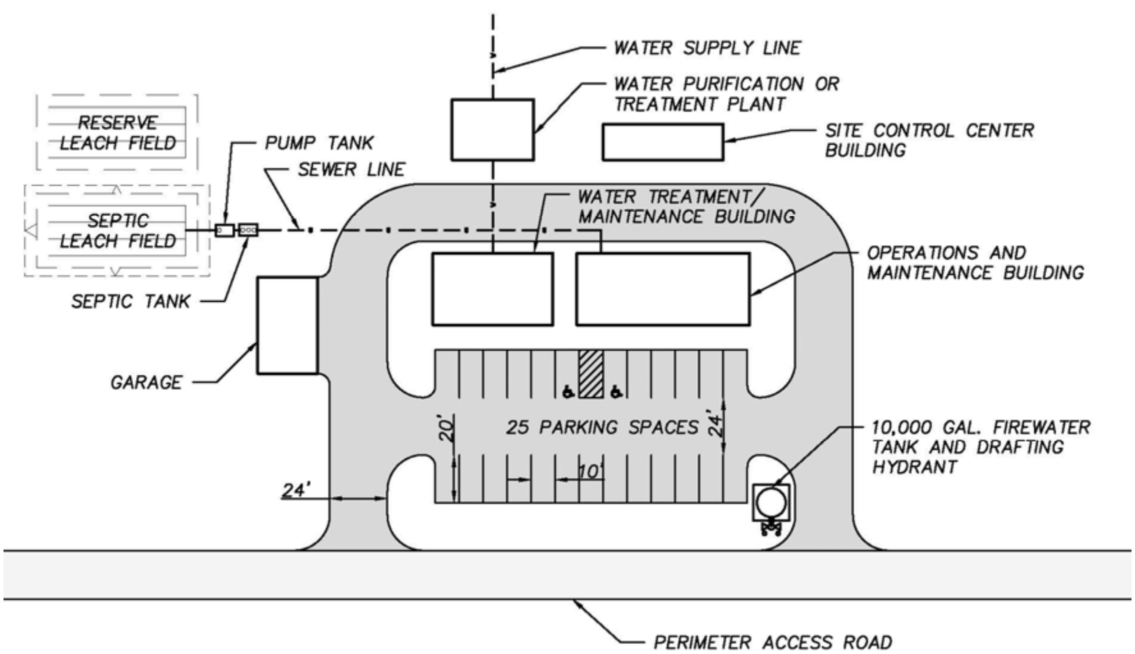
FIGURE 2.0-8
TYPICAL PROJECT SUBSTATION

Source: Drew Solar 2018.

FIGURE 2.0-9 GEN-TIE TO EXISTING DREW SWITCHYARD

Source: Drew Solar 2018.

FIGURE 2.0-10
TYPICAL MONOPOLE STRUCTURE



Source: Fuscoe 2017.

FIGURE 2.0-11
OPERATIONS AND MAINTENANCE AREA

Source: Drew Solar 2018.

FIGURE 2.0-12
BATTERY ENERGY STORAGE SYSTEM BUILDING

Electric Service

Permanent electric service may be obtained from IID for the O&M building(s) and auxiliary loads. Temporary electric service will be obtained for primary construction logistical areas. Generator power may be utilized for temporary portable construction trailer(s), construction and/or for decommissioning.

Fire Control

The PV modules and ancillary equipment are constructed of fire-resistant material. Additionally, routine weed abatement and landscape maintenance will occur. As such, the Project represents a negligible increase in fire potential.

However, a Fire Management Plan will be prepared in accordance with Fire Department requirements for access and will not impact the ability to provide emergency access to the Project site. Access to nearby properties will not be hindered or restricted by the Project.

D. PROJECT CONSTRUCTION

Construction Workers

The Project would generate construction jobs. The number of workers on the Project site is expected to vary over the construction period. However, the number of construction workers onsite is expected to average up to 250 workers daily.

Source: Drew Solar 2018.

FIGURE 2.0-13
BATTERY ENERGY STORAGE SYSTEM CONTAINERS

Typical construction work hours are expected to be from 7:00 am to 7:00 pm Monday through Friday, and 9:00 am to 5:00 pm on Saturdays. The schedule may change based on a need to comply with various biological mitigation measures, overall construction timing, or worker safety such as avoidance of excessive midday heat. Any deviation from construction work hours allowed in the General Plan Noise Element would require Planning Director approval.

Construction Duration

The construction equipment, materials, and labor involved in building the Project remain similar whether the project is constructed in phases over time or built out over an 18-month period. The 18-month buildout of the entire Project at once results in greater intensity of labor and equipment during the construction period.

Phasing

This EIR contemplates a Phased CUP Scenario and a Full Build-out Scenario. The Phased CUP Scenario refers to the development scenario where the Project is constructed in phases by individual CUP (i.e. CUP 17-0031) or a group of CUPs (i.e. CUP 17-0031, CUP 17-0035 and CUP 18-0001) as appropriate to accommodate market demand. This scenario also refers to the Gen-Ties, electrical collector lines and other on-site and off-site ancillary facilities proposed for development as part of the Project. Each CUP of the project may have its own off-taker and operate independently from the other CUPs. The phases shown on the phasing plan (**Figure 2.0-3**) are conceptual and will not be constructed in any particular order. The phases may be aggregated during construction and operations/maintenance so that multiple phases could be built at one time. All phases are anticipated to utilize proposed Gen-ties that run from the south end of the Project site across Drew Road and State Route 98 into the existing Drew Switchyard located on APN 052-190-039. The phases are anticipated to use main Project switchyard; however, each phase may independently construct its own up to 230-kv step up transformer and switchyard. **Table 2.0-3** provides a list of the conceptual phases along with the APNs and approximate acreage.

The Full Build-out Scenario refers to all six CUPs (including five CUPs for solar energy generating and storage systems and one CUP for energy storage as a component of solar), Gen-Ties, improvements to the existing Drew Switchyard and other on-site and off-site ancillary facilities proposed for development as part of the Project.

If the Project is constructed at once, construction would take place over approximately 18 months. If the phases are constructed over time (up to 10 years from issuance of the CUPs), each phase could take approximately 12 months and construction of some phases may overlap with one another.

TABLE 2.0-3 PHASING - NET & GROSS ACRES

APN	Net Acreage	Gross Acreage
Phase 1		
052-170-056-000	157.9 Acres	168.31
Phase 2		
052-170-037-000	158.6 Acres	176.24
Phase 3		
052-170-031-000	152.2 Acres	168.61
Phase 4		
052-170-032-000	157.1 Acres	178.07
Phase 5		
052-170-039-000	69.8 Acres	80.93

052-170-067-000	67.2 Acres	72.04

Note: The Project is processing a Parcel Map to fix the existing inconsistency with the legal and physical boundary of the SW ¼ Section of the Project Site (APNs: 052-170-039 & 052-170-067), including APN 052-170-030 to the north of the Project Site as part of the Parcel Map. In doing so the net farmable acreage of the Project Site will remain the same (762.8 net acres), and the gross acreage will increase from 844.2 gross acres to approximately 855 gross acres once the Parcel Map is recorded.

Source: Drew Solar 2018.

Temporary Construction Facilities

During construction, temporary facilities will be developed on-site to facilitate the construction process. These facilities may include construction trailers, temporary septic systems or holding tanks, connections to adjacent IID raw water canals, parking areas, material receiving / storage areas, water storage ponds, construction power service, recycling / waste handling areas, and others. These facilities will be located at the construction areas designated on the final site plan(s).

Laydown Areas

At full build-out, most of the Project site will be disturbed by construction of the Project. Temporary construction lay down, construction trailers, and parking areas will be provided within the Project Site. Due to the size of the Project site, the solar field lay down areas may be relocated periodically within the solar field acreage as the project is built out in phases.

Disturbance

TABLE 2.0-4
CONSERVATIVELY CALCULATED PROJECT DISTURBED ACRES

Property/Project Component	Disturbed Acres (gross)
Project Site	855
Project Gen-Ties	0.8
Access Roads	N/A
Total Project Disturbance	855.8

Grading and Drainage

Site preparation will be planned and designed to minimize the amount of earth movement required for the Project to the extent feasible. The hydrology design will be given first priority in order to protect the Project's facilities and adjacent facilities including any IID/County facilities from large storm events. It is the intent of the Project to support the panels on driven piles. Additional compaction of the soil in order to support the building and traffic loads as well as the PV module supports may be required and is dependent on final project engineering design.

The existing on-site drainage patterns will be maintained to the greatest extent feasible. It may be necessary to remove, relocate and/or fill in portions of the existing drainage ditches or delivery canals to accommodate the final panel layout for the Project. The final engineering design for these facilities will be reviewed by IID and the County to be sure that the purpose for the facilities (if still needed) will still be met.

Dust Control

Dust generated during construction would be controlled by watering and, as necessary, the use of other dust suppression methods and materials accepted by ICAPCD or CARB. During grading, actively disturbed on-site areas and unpaved roads would be watered at least three times a day as necessary to reduce fugitive dust emissions. In addition, speeds would be limited to 15-mile per hour (mph) speed during construction.

Water Use

During construction of the Project, water will be required for a variety of construction activities, including dust suppression, earth compaction, the creation of engineered fill, and concrete preparation. Construction-phase water demand will be greatest during site grading which will consist of disc and roll compaction over the site. An estimated total of 1,200 acre-feet of water will be used for the Project dust control and other construction activities during Project construction. An estimated 1,200 acre-feet of water will be used for decommissioning.

Construction Traffic

Daily trip generation during the construction of the Project would be from delivery of equipment and supplies and the commuting of the construction workforce. Deliveries of equipment and supplies to the Project site would also vary over the construction period but have the potential to range from 5 to 40 daily trips, averaging approximately 10 daily trips. Parking for Project-related vehicles will be provided onsite during construction. **Table 2.0-5** summarizes project construction trip generation.

TABLE 2.0-5
DREW SOLAR PROJECT- CONSTRUCTION TRIP GENERATION

Proposed Construction Related Traffic	ADT	6-7 AM		7-8 AM		4-5 PM		5-6 PM	
		IN	OUT	IN	OUT	IN	OUT	IN	OUT
Construction Workers on 4-10 Shift (75% of 250)[1]	282	141	0	0	0	0	0	0	141
Construction Workers on 5-8 Shift (25% of 250)[2]	94	0	0	47	0	0	47	0	0
Equipment and Construction Trucks (with PCE)[3]	60	3	3	3	3	3	3	3	3
Total Traffic During Peak Construction Period	436	144	3	50	3	3	50	3	144
Daily and Higher Peak Hour Used For Analysis	**436**	**144**	**3**					**3**	**144**

Notes: 1) Applicant estimates the 4 days at 10 hrs/day (4-10s) shift to include about 188 workers (75% of the total 250 peak work force) with about 25% carpooling (47) and riding with the 75% (141), thus the inbound is 141 trips and the ADT is 282. 2) Applicant estimates the 5 days at 8 hrs/day (5-8) shift to include about 62 workers (25% of the total 250 peak work force) with about 25% carpooling (15) and riding with the 75% (47), thus the inbound is 47 and the ADT is 94. 3) Approx. 10 daily trucks with a Passenger Car Equivalent (PCE) factor of 3 applied to each truck equals 60 ADT (10 trucks x 2 x 3 PCE = 60 ADT) that are anticipated to have a frequency of about 1 in and 1 out per hour for a peak period volume of 6 (with PCE).

Based on the expected trips generated, traffic on the local roads would increase during construction but impacts to current traffic patterns are anticipated to be minimal. With a phased Project, the total number of trips generated during construction would be about the same, but the number of daily trips would be reduced and the number of days to complete construction would be extended resulting in a decrease in intensity.

Storm Water

The Proposed Project would retain to the greatest extent feasible the existing drainage characteristics of the Project site. Existing low-lying areas which receive runoff will continue to do so in the proposed conditions. Shallow on-site retention basins will be utilized. Where on-site soils have the potential to infiltrate runoff, runoff will be infiltrated. Where infiltration is not feasible, runoff may be detained and slowly released to the IID Drain system such that the peak flowrate of runoff from the 100-year storm event in the proposed condition is equal to or less than it is in the existing condition.

Staging Areas

If the Project is constructed in phases, it is anticipated to be constructed in a counterclockwise manner starting with the parcel that is across the street from the existing Drew Switchyard. It is anticipated that any staging would take place within the parcel that is under construction.

Waste

Small amounts of trash would be generated during construction from packaging materials delivered to the Project site. Construction related waste would be transported to a local landfill authorized to accept this waste for disposal or an appropriate recycling center authorized to accept recyclable materials.

Hazardous Materials

Very little hazardous waste (waste oil and lubricants, spill clean-ups, etc.) is expected to be generated from the Project during construction and decommissioning. Fuel that may be used on site during construction and decommissioning would be stored in secondary containment. The Project will also be required to comply with State laws and County Ordinance restrictions which regulate and control hazardous materials.

Energy Storage systems comprised of compressed air or pumped storage, lithium (ion, oxygen, polymer, phosphate, sulphur), Nickel Metal Hydride, Nickel Cadmium, Lead Acid, antiperovskites or other batteries include materials that run the risk of overheating and catching fire if equipment is not operated properly. The project would operate in accordance with all applicable regulatory requirements, including but not limited to the following, which would mitigate the risk of fires and other hazardous events:

Energy Storage Buildings

- Fire suppression system
- Climate control
- Mechanical ventilation
- Non-corrosive flooring e.g., fiberglass grated flooring

Energy Storage Maintenance

- Operate energy storage systems per manufacture’s specifications.
- Monitor energy storage levels and temperatures while operating.
- Ensure temperature controls are set to specified temperatures.
- Observe run time with a full-charged battery.
- Ensure batteries self-discharge.
- Check batteries before placing in storage for irregularities in charge status.

Handling Precautions

- Avoid exposing lithium batteries to excessive vibration.
- Do not keep batteries in high or low temperatures.
- Always handle batteries with caution.
- Place batteries in storage after the building reaches compliant temperature levels.
- Do not use damaged batteries.
- In case of contact with fluid do not rub eyes. Immediately flush eyes.
- Wash hands after handling batteries.
- In the event of contact on clothing, change clothing immediately.

Sanitation

Portable toilets would be located on site during construction and sanitary waste would be removed by a local contractor.

Off-Site Construction Activities

The portion of the Gen-ties crossing the Caltrans right of way over State Route 98 (SR-98) into the existing Drew Switchyard parcel would be approximately 400 feet in length and would be either overhead or underground. A new bay will be constructed inside the existing Drew Switchyard as part of the Project Gen-ties. If the Gen-ties are overhead, there would be one monopole on either side of the SR-98 crossing similar to the monopole that currently exists on the north side of the existing Drew Switchyard. Collector lines will cross Drew Road and IID drains and canals. Drive approaches will be constructed on Drew, Kubler, and Pulliam Roads as well as SR-98.

E. Operations and Maintenance

Once construction is completed, the Drew Solar Project begin its operational phase.

Employees

Approximately two to six full-time workers will be employed to operate the generating facility. These personnel will perform maintenance and security functions.

Traffic

No impact to current traffic patterns would result during operation of the Project. Operation of the Project site would be expected to generate approximately 4 to 10 trips per day from maintenance and security personnel.

Security

To ensure the safety of the public and the facility, the property will be fenced, security lighting may be installed, and signs will be posted. Access to the Project site will be controlled, and gates will be installed at the roads entering the property. The fence will be monitored periodically to detect any intrusion into the property. The Project proposes an up to 7-foot chain link fence with 3-strand barb wire placed at the top, extending to a total of up to 8 feet. Landscaping and entry monumentation will be maintained at the entrance to the O&M building(s).

Lighting System

The lighting system will provide operation and maintenance personnel with illumination in both normal and emergency conditions. Lighting will be designed to provide the minimum illumination needed to achieve safety and security objectives and will be shielded and oriented to focus illumination on the desired areas, minimizing light spillover.

Water Use


Typical system configuration with two 10,000-gallon tanks and plant in building

The Project plans to secure water rights from the IID under the IID's Interim Water Supply Policy for Non- Agricultural Projects. In the event this isn't feasible, the Project will truck water to the Project site for operational purposes, or procure water from IID's applicable water policy/program at that time.

The water used during operations will be used for domestic use and fire protection. Water is typically procured from IID via a long-term Water Supply Agreement with a service pipe connection to an adjacent IID raw water canal. The Project may also use water to wash the solar modules should it be determined to be beneficial to the Project. The Project anticipates a requirement of approximately 60 acre-feet per year during plant operation. Water for fire protection will be stored in a 10,000-gallon tank onsite (similar to that shown in the image above). Project operational water use will be significantly less than the estimated total of 1,200 acre-feet of water to be used during construction, and also significantly less than the estimated total of 1,200 acre-feet of water to be used for decommissioning.

Noise

The primary noise sources during operation of the Project are anticipated to be from inverter tracking motors and blowers (that are used to remove condensation from solar panels), which would be distributed throughout the facility.

Additional noise may be generated by equipment within the substation; typically this includes switches, protection and control equipment, transformers, and the incoming transmission lines. The noise generated by transmission lines and switches has previously been analyzed to be 25 dBA at 50 feet. Transformers within the substation would generate noise levels similar to those at the inverters. Substation switches do not generate an audible noise, and circuit breakers (70 dBA at 65 feet) would not be a common noise source, as they would only operate for short periods of time during an emergency event in order to protect the switches and transformers within the substation.

Communications Systems

The Project will utilize telephone and internet services that will be provided via overhead or underground lines, microwave tower or via cellular service obtained from a local provider.

Waste

Some waste material would be generated during normal operations, and would be hauled off-site. Sanitary waste generated during operations would go to project septic systems and/or periodically be pumped and hauled off-site and disposed of by a licensed contractor.

The Applicant will provide appropriate training and supervision of on-site personnel throughout construction of all CUPs and regularly during operation of the project regarding management of materials and wastes, and responding to hazardous releases or spills or other Project site emergencies. This training will include the procedures to follow during any Project site emergency, and appropriate reporting of spills, releases, or other emergencies to Imperial County, and local emergency service providers. Either directly or through its contractors, the Applicant will hire several personnel to oversee all aspects of a hazardous materials management plan and follow Best Management Practices (BMPs).

Panel Washing & Project Water Use

Solar panels may be washed on a periodic basis if it determined to be beneficial to the Project. Solar panels would be washed up to four times per year. Approximately 14 acre-feet of water per year of the 60 acre feet of water per year required for Project operations and maintenance will be used for panel washing. Fire protection is estimated to be 1 acre foot of water per year, sanitary water is estimated to be 5 acre feet of water per year, dust suppression is estimated to be 35 acre feet of water per year, and potable water is estimated to be 5 acre feet of water per year.

Weed and Vegetation Management

Invasive / weedy species would be controlled and any non-invasive vegetation that re-establishes within the Project site would be controlled within the solar field. Vegetation growing within the boundaries of the Project Site would be periodically removed manually and/or treated with herbicides. The Applicant would be required to prepare a Pest Management Plan for submission to the Imperial County Agricultural Commission.

Miscellaneous

Other maintenance activities that would be conducted include periodic testing of equipment, inspection and repair of project components, and maintenance of on-site roads and drainage systems (i.e. retention basin[s]).

Electricity Consumption

The Proposed Project may consume an estimated 4.4 MW-hours (Station Service, Trackers, and backfeed) of electrical energy daily from the IID power system. This energy would be used to operate the solar panel trackers, the on-site security system and the solar facility monitoring and control system when the solar panels are not generating power.

Air Quality

Normal operations of the Project would not result in any direct air emissions from the electricity production process as the PV solar panels convert sunlight directly into DC electricity. No fossil fuels are consumed in the process and no pollutants are emitted during normal operations. Daily air pollutant emission sources are anticipated to be limited to vehicular traffic and small engines associated with operations and maintenance activities.

Hazardous Material Handling and Storage

The Project would not use or store large quantities of hazardous chemicals within the Project site during normal operations. Any hazardous materials brought to the Project site would be required to comply with all applicable local, state and federal regulations.

F. DECOMMISSIONING AND RECLAMATION PLANS

The Project is processing a Development Agreement with Imperial County to enable and control a phased build-out of the Project that is capable of meeting changing market demands by authorizing initiation of the CUP or CUPs anytime within a 10 year period. Thereafter, the CUPs are valid for the remaining period of 40 years from the date of the CUP approval. The requested Development Agreement would provide flexibility to allow the start of construction to commence for up to 10 years after the CUPs are approved. The proposed Project is expected to operate for 30 to 40 years. At the end of its useful life, the Applicant proposes to decommission the Project and reclaim the area associated with surface disturbance. Roads that benefit agricultural activities would be left in place.

The planned operational life of the facility is approximately 30 years. However, if the facility continues to be economically viable, it could be operated for a longer period. The Project will create a decommissioning plan that will be implemented at the end of the Project's life, and will adhere to Imperial County's decommissioning requirements, including, but not limited to:

- Description of the proposed decommissioning measures for the facility and for all appurtenances constructed as part of the facility.
- Description of the activities necessary to restore the Project site to its previous condition.
- Presentation of the costs associated with the proposed decommissioning measures. Discussion of conformance with applicable regulations and with local and regional plans.

In the phased buildout, the phases will be decommissioned independently of one another.

I. DESIGN FEATURES AND BEST MANAGEMENT PRACTICES

Table 2.0-6 identifies draft Applicant-proposed measures that would be incorporated into the proposed Project to reduce impacts to resources.

TABLE 2.0-6
APPLICANT PROPOSED MEASURES INCLUDED AS PART OF THE DREW SOLAR PROJECT

AESTHETICS
Visibility
The Project will provide landscaping at Project entrances and the operations and maintenance buildings.
AIR QUALITY
Comply with APCD Rule 800 during construction, including but not limited to the following: Stabilize all disturbed areas with water, tarps, dust suppressants, or soil binders. Most construction equipment will be equipped with EPA Tier 2 or better engine designation. Bulk Materials shall be completely covered unless six inches of freeboard space from the top of the container is maintained with no spillage and loss of Bulk Material. In addition, the cargo compartment of all Haul Trucks is to be cleaned and/or washed at delivery site after removal of Bulk Material. Clean all Track-Out or Carry-Out at the end of each workday or immediately when mud or dirt extends a cumulative distance of 50 linear feet or more onto a paved road within an Urban area. Vehicle speed for all construction vehicles shall not exceed 15 mph on any unpaved surface at the construction site.
BIOLOGICAL RESOURCES
The project will complete preconstruction clearance surveys for burrowing owl within 30 days prior to construction. If active burrows are present within the project footprint, the following design features will be implemented. The owls will be passively relocated. This includes covering or excavating all burrows and installing one-way doors into occupied burrows. This will allow any animals inside to leave the burrow, but will exclude any animals from re-entering the burrow. The

TABLE 2.0-6
APPLICANT PROPOSED MEASURES INCLUDED AS PART OF THE DREW SOLAR PROJECT

burrows should then be excavated and filled to prevent reuse. The proposed project shall also comply with the following mitigation measures:

MM-BIO-1 General Avoidance and Minimization Measures

Debris/Non-native Vegetation/Pollution

- Fully covered trash receptacles that are animal-proof will be installed and used onsite to contain all food, food scraps, food wrappers, beverage containers, and other miscellaneous trash.
- No litter or debris will be discharged into state-jurisdictional waters.
- Work areas shall be kept clean of debris, such as trash, and construction materials.

Vehicle and Equipment Restrictions and Maintenance

- Night-time construction should be minimized to the extent possible. However, if night-time activity (e.g., equipment maintenance) is necessary, then the speed limit shall be 10 mph.
- Vehicle operation within jurisdictional resources when surface water is present will be prohibited except as necessary to perform work in IID facilities pursuant to ACOE, RWQCB, and/or CDFW permits and/or authorizations. Any equipment or vehicles driven and/or operated within or adjacent to a state-jurisdictional channel will be checked and maintained by the operator daily to prevent leaks of oil or other petroleum products that could be deleterious to aquatic life if introduced to the watercourse.
- Vehicles and equipment access will be limited to the identified impact areas and speed limit of 15 mph will be enforced. The work areas and sensitive areas will be flagged prior to construction in order to ensure construction activities remain within the approved work limits. During operations and maintenance, vehicles and equipment will be restricted from entering sensitive habitat, and limited to maintenance access roads, where feasible, and the minimal area necessary to perform the work.
- Staging and storage areas for spoils, equipment, materials, fuels, lubricants, and solvents will be located outside the state-jurisdictional channels and within the designated impact area. Stationary equipment, such as motors, pumps, generators, compressors, and welders, located adjacent to state-jurisdictional waters shall be positioned over drip-pans or other containment. Prior to refueling and lubrication, vehicles and other equipment shall be moved away from the jurisdictional waters.

TABLE 2.0-6
APPLICANT PROPOSED MEASURES INCLUDED AS PART OF THE DREW SOLAR PROJECT

	Other Restrictions on Activities and Personnel
	• No pets, such as cats or dogs, permitted on the Project site during construction or operations and maintenance. • Any contractor, employee, or agency personnel who kills, injures, or traps a wildlife species shall immediately report the incident to the Project biologist during construction and the operations manager during operations and maintenance. • All pipes, culverts, or similar structures with a diameter of 4 inches or more that are stored at a construction site for one or more overnight periods shall be covered to prevent entry to nesting birds and other wildlife.
MM-BIO-2	**Environmental Awareness Training, Biological Monitoring, and Compliance**
	Worker Environmental Awareness Program and Ongoing Training
	Prior to the initiation of any on-site grading, all construction/contractor personnel working on site must complete training through a Worker Environmental Awareness Program (WEAP). New construction workers engaged in construction activities (e.g., grading, utility installation, etc.) shall complete WEAP training within the first week of deployment on the Project site. Additionally, operational staff shall complete WEAP training prior to deployment on the Project site.
	Biological Monitoring and Compliance Documentation
	The Project biologist shall perform the biological monitoring and compliance documentation for the Project during construction, including the following:
	• Prior to the initiation of any on-site grading, the Project biologist will document that required pre-construction surveys and/or relocation efforts have been implemented. • The Project biologist will periodically monitor activities during initial grading. • The Project biologist will note any evidence of trash and, if present, communicate the presence and requirement to remove the trash to the construction manager. • The Project Biologist shall have the following minimum qualifications: (1) Have a bachelor's degree in biological sciences, zoology, botany, ecology or a closely related field; (2) Have at least 2 years of experience in biological compliance for construction projects; and (3) Have at least 1 year of field experience with

TABLE 2.0-6
APPLICANT PROPOSED MEASURES INCLUDED AS PART OF THE DREW SOLAR PROJECT

	biological resources found in the geographic region of the Project.
MM-BIO-3	**Burrowing Owl Surveys and Avoidance/Relocation**. No more than 14 days prior to ground-disturbing activities (vegetation clearance, grading), a qualified wildlife biologist (i.e., a wildlife biologist with previous burrowing owl survey experience) shall conduct pre-construction take avoidance surveys on and within 200 meters (656 feet) of the construction zone (where safe and legally accessible) to identify occupied breeding or wintering burrowing owl burrows. The two-pass take avoidance burrowing owl surveys shall be conducted in accordance with the Staff Report on Burrowing Owl Mitigation (2012 Staff Report; CDFG 2012) and shall consist of walking parallel transects 7 to 20 meters apart, adjusting for vegetation height and density as needed, and noting any suitably sized burrows with fresh burrowing owl sign or presence of burrowing owls. As each burrow is investigated, biologists shall also look for signs of American badger and desert kit fox. Copies of the burrowing owl survey results will be submitted to the CDFW. If burrowing owls are detected on site, no ground-disturbing activities will be permitted within 200 meters (656 feet) of an occupied burrow during the breeding season (February 1 to August 31), unless otherwise authorized by CDFW. During the nonbreeding season (September 1 to January 31), ground-disturbing work can proceed near active burrows as long as the work occurs no closer than 50 meters (165 feet) from the burrow. Depending on the level of disturbance, a smaller buffer may be established in consultation with CDFW. If avoidance of active burrows is infeasible during the nonbreeding season, then, before breeding behavior is exhibited and after the burrow is confirmed empty by site surveillance and/or scoping, a qualified biologist shall implement a passive relocation program in accordance with Appendix E (i.e., Example Components for Burrowing Owl Artificial Burrow and Exclusion Plans) of the 2012 Staff Report. Passive relocation consists of excluding burrowing owls from occupied burrows by closing or collapsing the burrows and providing suitable artificial burrows nearby for the excluded burrowing owls. Where required buffering will not be feasible, passive relocation is an option in consultation with CDFW, but it is preferred to install appropriate artificial burrows (in accordance with the negotiated Plan) and then let the owls decide whether they would like to abandon the existing burrow. Only burrows that are in danger by construction should be collapsed if at all possible. A Burrowing Owl Relocation Plan will be prepared and approved by CDFW prior to commencement of burrowing owl exclusion activities if this method of mitigation is required. The plan will detail the procedures of the passive relocation effort, the location of constructed replacement burrows, design of replacement burrows, and post relocation monitoring requirements.
MM-BIO-4	**Nesting Bird Pre-construction Surveys and Avoidance Plan.** The Project biologist shall conduct pre-construction surveys no earlier than 7 days prior

TABLE 2.0-6
APPLICANT PROPOSED MEASURES INCLUDED AS PART OF THE DREW SOLAR PROJECT

	to any on-site grading and construction activities that occurs during the nesting season defined as February 1 – September 15 or as determined by the Project biologist. Pre-construction surveys shall be conducted within the designated construction area and a 500-foot buffer (where safe and legally accessible). Burrowing owl measures are addressed in MM-BIO-3. The purpose of the pre-construction surveys will be to determine whether occupied nests are present in the construction zone or within 500 feet of the construction zone boundary on lands that are legally accessible. If occupied nests are found, then limits of construction to avoid occupied nests shall be established by the Project biologist in the field with flagging, fencing, or other appropriate barriers (e.g., 250 feet around active passerine nests to 500 feet around active raptor nests), and construction personnel shall be instructed on the sensitivity of nest areas. The Project biologist may adjust the 250-foot or 500-foot setback at his or her discretion depending on the species and the location of the nest (e.g., if the nest is well protected in an area buffered by dense vegetation the setback may be reduced). Once a Project biologist has determined that the birds have fledged and are no longer reliant upon the nest or parental care for survival, construction may proceed.
MM-BIO-5	All transmission towers and lines are designed to conform to Avian Power Line Interaction Committee (APLIC) standards. APLIC standards identify the necessary physical separation between energized and/or grounded structures, conductors, hardware, or equipment to avoid the potential for that to be bridged by birds, thus avoiding the potential for electrocution. The Proposed Project shall implement recommendations by the APLIC (2006, 2012) to protect raptors and other birds.
CULTURAL RESOURCES	
Archaeological monitoring shall occur during drilling activities for the Gen-ties, and if only disturbed sediments or other sediments and formations are identified that do not have the potential to contain archaeological resources, then monitoring may be reduced or terminated. In the event that archaeological resources (sites, features, or artifacts) are exposed during construction activities for the Project, all construction work occurring within 100 feet of the find shall immediately stop until a qualified archaeologist meeting the Secretary of the Interior's Professional Qualification Standards can evaluate the significance of the find and determine whether or not additional study is warranted. If the discovery is clearly not significant (e.g., and isolate) the archaeologist may simply record the find and allow work to continue. If the discovery proves potentially significant under CEQA, additional work such as preparation of an	

TABLE 2.0-6
APPLICANT PROPOSED MEASURES INCLUDED AS PART OF THE DREW SOLAR PROJECT

archaeological treatment plan, testing, or data recovery may be warranted.

In accordance with Section 7050.5 of the California Health and Safety Code, if human remains are found, the County Coroner shall be immediately notified of the discovery. No further excavation or disturbance of the site or any nearby area reasonably suspected to overlie adjacent remains shall occur until the County Coroner has determined, within 2 working days of notification of the discovery, the appropriate treatment and disposition of the human remains. If the County Coroner determines that the remains are, or are believed to be, Native American, he or she shall notify the NAHC in Sacramento within 24 hours. In accordance with California Public Resources Code Section 5097.98, the NAHC must immediately notify those persons it believes to be the MLD from the deceased Native American. The MLD shall complete inspection within 48 hours of being granted access to the site. The designated Native American representative would then determine, in consultation with the property owner, the disposition of the human remains.

HAZARDS AND HAZARDOUS MATERIALS

Prior to commencement of construction of a CUP, all trash and debris will be removed from the CUP parcels of the Project and properly disposed.

HYDROLOGY AND WATER QUALITY

Flood Hazard

The Project will make best efforts to avoid constructing facilities within a flood hazard zone; however, in the event some facilities are required to be constructed in flood hazard zone, the Project will design its facilities to meet Imperial County Building Standards. The project will be designed to comply with Imperial County and IID storm water retention standards.

Construction Activities

Prior to the issuance of the first grading permit, the developer shall prepare and submit a Storm Water Pollution Prevention Plan (SWPPP), and receive coverage under the General Construction National Pollutant Discharge Elimination System Permit from the California State Water Resources Control Board. The SWPPP shall include source control and treatment control BMPs. Possible source control BMPs include, but are not limited to:

- trash storage;
- integrated pest management;
- efficient irrigation and landscape design; and,
- property owner educational materials regarding source control management.

Treatment control BMPs will be comprised of detention basins to remove trash and pollutants such as sediment, nutrients, metals, bacteria, oil and grease, and organics.

GEOLOGY AND SOILS

Prior to approval of final engineering and grading plans for the Project, the County shall verify that all recommendations contained in the Geotechnical Investigation Report have been incorporated into all final engineering and grading plans. This report identifies specific measures for mitigating geotechnical conditions on the Project site, and addresses site preparation, foundations and settlements, slabs-on-grade, concrete mixes and corrosivity, seismic design, and pavement design. The County's Public Works Department shall review grading plans prior to finalization, to verify plan compliance with the recommendations of the Geotechnical Investigation Report. All development on the Project site shall be in accordance with Title 24, California Code of Regulations.

TABLE 2.0-6
APPLICANT PROPOSED MEASURES INCLUDED AS PART OF THE DREW SOLAR PROJECT

TRANSPORTATION AND CIRCULATION
Construction traffic will minimize use of unpaved roads to the extent feasible. Roads will be photographed prior to construction and Project related impacts to County roads will be repaired. Before construction a Traffic Control Plan will be prepared for the Imperial County Department of Public Works, and a Traffic Management Plan will be prepared for Caltrans for State Route 98 encroachments.
PUBLIC HEALTH AND SAFETY
Fire Prevention
A Fire Prevention and Response Plan (FPRP) will be developed and implemented during construction, operation, and maintenance of the Project.
Security
The Project will contract with a security company to protect the facility. A perimeter fence with 3 strands of barbed wire will be placed along the Project perimeter to keep people out of the facility.
NOISE
The use of noise-generating and vibration-generating construction equipment will not begin before 7:00 a.m. during weekdays or 9:00 a.m. on Saturday per the County General Plan Noise Element.

2.2 ALTERNATIVES

2.2.1 ALTERNATIVE 1 - REDUCED PRIME FARMLAND ALTERNATIVE

This alternative would exclude the portion of the proposed Project west of Drew Road (CUPs 17-0035 & 18-0001), and would reduce potential impacts to Prime Farmland.

2.2.2 ALTERNATIVE 2 - NO PROJECT ALTERNATIVE

CEQA Guidelines Section 15126.6(e)(1) requires that a No Project Alternative be analyzed in order to allow the decision-makers to compare the impacts of approving a proposed Project with the impacts of not approving the proposed Project. Under the No Project Alternative, the proposed Drew Solar Project would not be developed. No GPA, Zone Change, Variance or CUP applications would be approved. The Project site could remain in its existing condition as agricultural land owned by the IID.

These are discussed in detail in Chapter 6.0, Alternatives.

2.3 INTENDED USES OF THE EIR/AUTHORIZING ACTIONS

The EIR is intended to provide documentation pursuant to CEQA to cover all local, regional, and state permits and approvals which may be needed or are desirable in order to implement the proposed project. Discretionary actions and approvals by the Imperial County Planning Commission and/or Board of Supervisors for the proposed Project or its alternatives may include, but are not limited to:

2.3.1 DISCRETIONARY ACTIONS AND APPROVALS

A. COUNTY OF IMPERIAL

In conformance with Sections 15050 and 15367 of the CEQA Guidelines, the County of Imperial has been designated the "lead agency," defined as, "the public agency which has the principal responsibility for carrying out or approving a project." Discretionary actions and approvals by the Imperial County Planning Commission and/or Board of Supervisors for the proposed Project or its alternatives may include, but are not limited to:

Development Agreement

The Project is processing a Development Agreement with Imperial County to enable and control a phased build-out of the Project that is capable of meeting changing market demands by authorizing initiation of the CUP or CUPs anytime within a 10 year period. Thereafter, the CUPs are valid for the remaining period of 40 years from the date of the CUP approval. The requested Development Agreement would provide flexibility to allow the start of construction to commence for up to 10 years after the CUPs are approved.

Certification of the Final EIR

After the required public review for the Draft EIR, Imperial County will respond to written comments, edit the document, and produce a Final EIR to be considered for certification by the Board of Supervisors prior to making a decision on the Project.

Findings

Following certification of the EIR, the Board of Supervisors must approve Findings pursuant to CEQA Guidelines Section 15091.

Mitigation Monitoring and Reporting Program

A Mitigation Monitoring and Reporting Program (MMRP) will be adopted as required by CEQA Guidelines Section 15097 to ensure that mitigation measures identified in the EIR are implemented as appropriate.

General Plan Amendment

The proposed Project will require approval of a General Plan Amendment (GPA) (17-0006) for amendment of the Renewable Energy & Transmission Element to create an Island Overlay for the Project Site, and amendment of the requirements for said Island Overlay. The Project shares a common boundary to an existing transmission source (i.e. the existing Drew Switchyard) and is adjacent to the existing Centinela Solar Farm.

Zone Change

Zone Change (ZC 17-0007) to add the RE Overlay Zone to the Project Site.

Variance

Variance (V 17-0003) for the entire proposed Project Area, including the existing Drew Switchyard, for power pole structures that are over 120 feet in height. With approval of the Variance, the proposed structures could be up to 180 feet in height.

Conditional Use Permits

The proposed Project will require a total of six CUPs (CUP 17-0031, CUP 17-0032, CUP 17-0033, CUP 17-0034, CUP 17-0035 and CUP 18-0001). Five CUPs will be required to develop solar energy generating systems including potential energy storage on lands zoned A-2, A-2-R, and A-3 per Title 9, Division 5: Zoning Areas Established, Chapter 8, Section 90508.02 and 90509.02; and one CUP (CUP 18-0001) to develop energy storage as a component of solar on lands currently zoned A-2 and A-3, per Title 9, Division 5: Zoning Areas Established, Chapter 8, Sections 90508.02 and 90509.02 (A-2 and A-3).

Development Agreement

The Project is processing a Development Agreement with Imperial County to enable and control a phased build-out of the Project that is capable of meeting changing market demands by authorizing initiation of the CUP or CUPs anytime within a 10 year period. Thereafter, the CUPs are valid for the remaining period of 40 years from the date of the CUP approval. The requested Development Agreement would provide flexibility to allow the start of construction to commence for up to 10 years after the CUPs are approved.

Parcel Map

The Project is processing a Parcel Map to fix the existing inconsistency with the legal and physical boundary of the SW ¼ Section of the Project Site (APNs: 052-170-039 & 052-170-067), including APN 052-170-030 to the north of the Project Site as part of the Parcel Map. In doing so the net farmable acreage of the Project Site will remain the same (762.8 net acres), and the gross acreage will increase from 844.2 gross acres to approximately 855 gross acres once the Parcel Map is recorded.

Lot Tie Agreements

Lot Tie Agreement(s) to hold some or all of the parcels that are part of the Project together as a single parcel in order to reduce/eliminate the setbacks for interior property lines of parcels that are part of the Project and adjacent to one another.

B. Discretionary Actions and Approvals by Other Agencies

Responsible Agencies are those agencies that have discretionary approval over one or more actions involved with development of the proposed Project. Trustee Agencies are state agencies that have discretionary approval or jurisdiction by law over natural resources affected by a project. These agencies may include, but are not limited to the following:

- California Public Utility Commission (Authority to Enter into Power Purchase Agreement)
- California Department of Fish and Wildlife (Streambed Alteration Agreement)
- United States Fish and Wildlife Service (Section 7 Consultation)
- California Regional Water Quality Control Board (401 Water Quality Certification)
- United States Army Corps of Engineers (404 permit)
- Imperial County Air Pollution Control District
    - Authority to Construct Permit for emergency backup generators

2.3.2 SUBSEQUENT/CONCURRENT ENTITLEMENTS TO IMPLEMENT THE PROPOSED PROJECT

A variety of ministerial actions and permits may be required by Imperial County to implement the components of the Proposed Project, including, but not limited to:

- Grading Plan for the solar field and energy storage site parcels: ICPDSD
- Construction Traffic Control Plan: ICDPW
- Building Permits: ICPDSD
- Dust Control Plan (Imperial County Air Pollution Control District)
- Rule 310 Exemption: ICAPCD
- Site Plan and Architectural Review: ICPDSD
- Construction Traffic Control Plan: ICDPW
- Encroachment Permits from for access to the project parcels from County roads, and for any proposed Country road crossings: ICDPW
- Occupancy Permits: ICPDSD
- On-site Water Treatment Permit: ICPDSD / ICEHS
- Private Sewage Disposal Permit to construct and operate a septic system and leach field for the O&M building(s), if proposed for the Proposed Project: ICEHS
- Ag Reclamation Plan/Decommissioning Plan: ICPDSD/ICDPW
- Minor-modifications to CUP to implement changes responsive to market conditions or changes imposed by other agencies with jurisdiction over the Proposed Project: ICPDSD
- Vacation of easements: ICDPW
- Abandonment of rights-of-way: ICDPW
- Pest Management Plan: Imperial County Agricultural Commissioner's Office
- Review of Plans/Access and Fire Water Requirements: Imperial County Fire Department

2.3.3 ACTIONS AND APPROVALS BY OTHER AGENCIES

Responsible Agencies are those agencies that have approval over one or more actions involved with development of the Proposed Project. Trustee Agencies are state agencies that have approval or jurisdiction by law over natural resources affected by a project. These agencies may include, but are not limited to the following:

IMPERIAL IRRIGATION DISTRICT (IID)

Various approvals may be required from IID in conjunction with implementation of the proposed Project.

For the purposes of CEQA, wherever an IID facility (drain, irrigation canal, electric line, etc.) intersects the Project, an encroachment will occur as the Proposed Project would cross IID facilities with access points and electrical project electrical crossings. The Proposed Project may also drain into IID drain facilities. Due to the preliminary nature of the Project and the rapidly changing technology, the exact locations of proposed access and drainage encroachments, and project electrical crossings, are not known at this time; however approximate access points and crossing locations have been provided in **Figure 2.0-3**.

The Project encroachments/crossings will not interfere with the purpose of IID's facilities. The following IID approvals, although not discretionary approvals, include, but are not limited to:

- Encroachment Permits/Agreements
- Electrical Crossings
- Water Supply Agreements
- Backfeed Service Agreement
- Electric Service Agreement

California Department of Transportation

Project gen-tie lines will cross SR-98, and project access points are proposed along SR-98. Although not a discretionary approval, these crossings will require encroachment permits from the California Department of Transportation (Caltrans), as well as approval of a water pollution control program and transportation management plan by Caltrans.

California State Water Resources Control Board

General Construction Storm Water Permit Notice of lntent/Storm Water Pollution Prevention Plan

Appendix K

Imperial County Solar Farm Map

Imperial County Solar Farm Projects
South End Projects

Sources: IC Assessors, IC Planning Dept., Aerial: NAIP 2014. created by Derek Newland

UPDATED: August 28, 2017

Cities		**Project Status**	
IV Substation		Operational	
Roads		Approved - Under Construction	
US Highways		Approved - Not Built	
Interstate		Pending Entitlement	

N

Appendix L

Cumulative Project (New Development) Information

Solar Farm Average Traffic Generation Rates

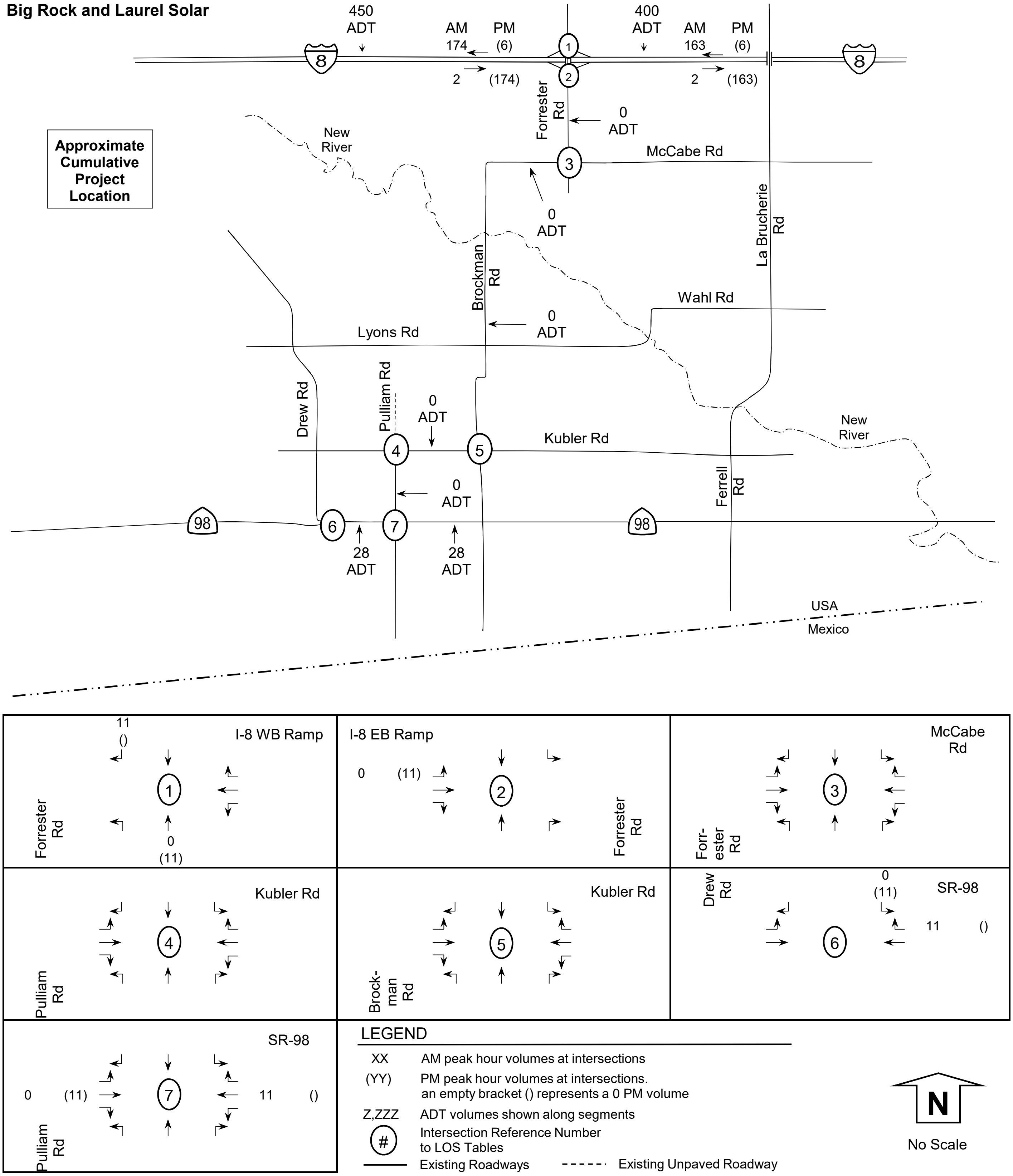
Several cumualtive projects did not have techincal studies and therefore did not have reported cumulative project traffic generation. Therefore, an average traffic generation rate from other existing solar farm projects was calculated based on the number of megawatts (MW). The following tables listes the traffic generation assocaited with each cumulative project and the associated MW.

				AM				PM			
Project	**Mega Watts**	**ADT**	**ADT / MW**	**IN**	**IN/MW**	**OUT**	**OUT/MW**	**IN**	**IN/MW**	**OUT**	**OUT/MW**
Mount Signal Solar Farm I	200	522	2.61	162	0.81	0	0.00	0	0.00	162	0.81
Imperial Solar South	200	680	3.40	265	1.33	6	0.03	15	0.08	265	1.33
Imperial Solar West	250	750	3.00	300	1.20	6	0.02	15	0.06	300	1.20
Imperial Valley Solar	750	1736	2.31	772	1.03	0	0.00	0	0.00	772	1.03
Average Rates			**2.83**		**1.09**		**0.01**		**0.03**		**1.09**

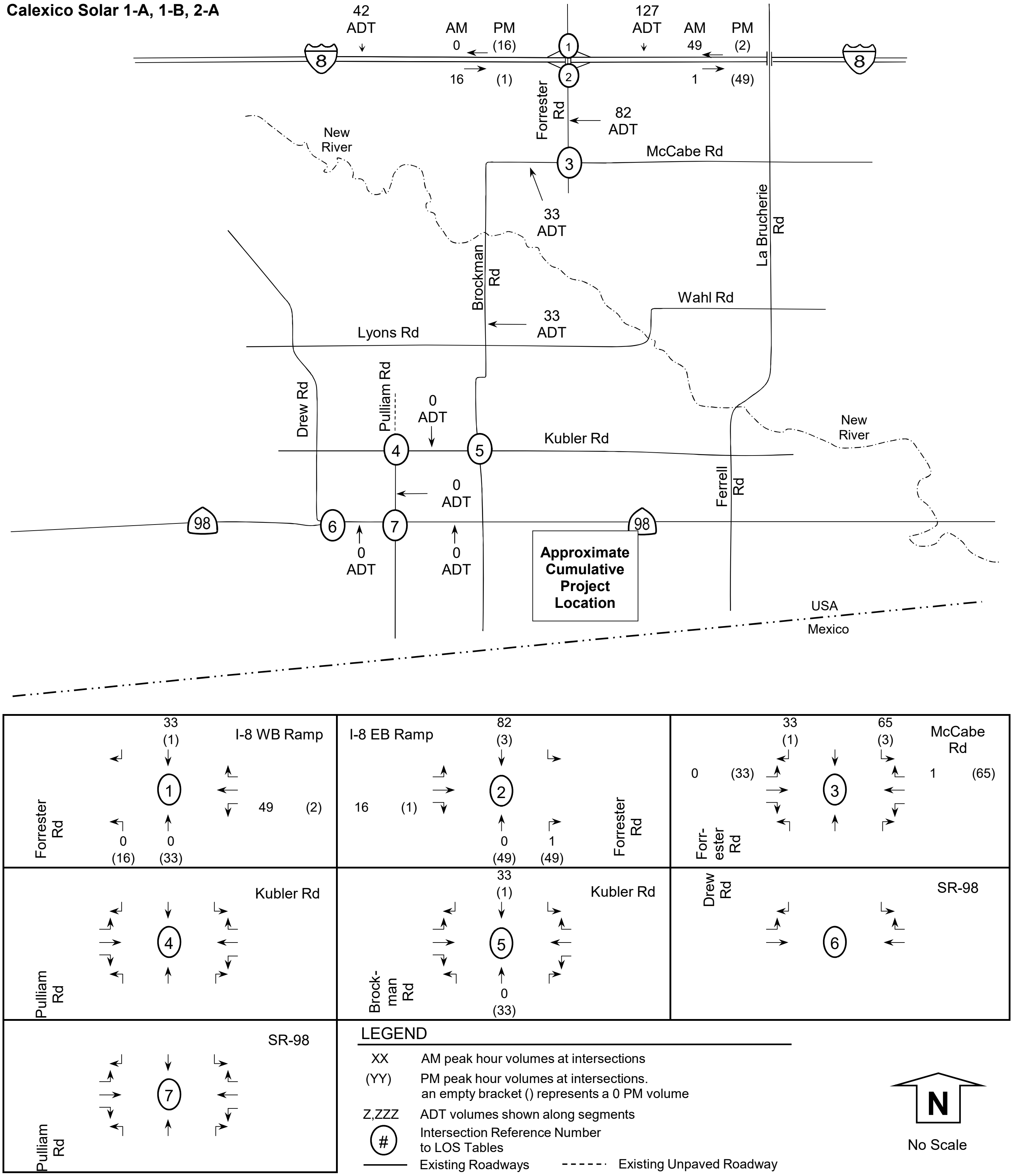
The above rates were used to calcualted the traffic associated with the following cumualtive projects.

Proposed Cumulative Projects	MW	ADT	IN	OUT	IN	OUT
Big Rock and Laurel Solar	200	566	218	3	7	218
Calexico I-A	100	283	109	1	3	109
Calexico I-B	100	283	109	1	3	109
Calexico 2-A	100	283	109	1	3	109
Centinela Phase 2	100	283	109	1	3	109
Iris Solar Cluster	360	1019	393	5	12	393
Vega Solar	100	283	109	1	3	109

Big Rock and Laurel Solar



Calexico Solar 1-A, 1-B, 2-A



4.0 Project Description

The proposed Battery Energy Storage System will incorporate traditional lithium-ion batteries. The Project is proposed to be constructed in two phases, with Phase 1 designed to store up to 5 megawatt-hours of energy and Phase 2 up to 100 megawatt-hours of energy. Construction for Phase 1 is proposed to start in late 2016 and construction for Phase 2 is expected to begin in 2018.

4.1 Project Phase 1 Construction Trip Generation

Phase 1 construction (planned for late 2016) will occur over a period of approximately 66 days to install the foundations and connect the components to the existing controls system and project substation. Approximately 12 workers will be on site for 6 to 8 weeks generally from sunrise to 2:30 PM. In addition to the construction workers, three technicians will work an additional 3 to 6 weeks to commission and debug the system integration. Work hours for three technicians will be approximately from 8 PM to 5 AM to avoid interference with the facility when solar power is being generated. Phase 1 deliveries will occur throughout the construction period; however, peak deliveries are anticipated to occur in Week 3 with approximately 4 truck deliveries in the morning and 1 truck delivery in the afternoon. A water truck is anticipated to deliver water with an average of less than one truck per day; however, to be conservative one daily water truck is included in the trip generation. For trip generation purposes, truck trips are converted to a Passenger Car Equivalent (PCE) by multiplying each truck by a factor of 3 due to size and speed constraints. For Phase 1 the peak construction traffic is calculated at 66 ADT with 39 morning peak hour trips (27 inbound and 12 outbound) and 21 afternoon peak hour trips (3 inbound and 18 outbound) as shown in **Table 6**.

TABLE 6: PHASE 1 PROJECT TRIP GENERATION (PASSENGER CAR EQUIVALENT)

Phase 1 Construction Related Traffic	Daily Vehicles	ADT with PCE[2]	Morning Peak IN	Morning Peak OUT	Afternoon Peak IN	Afternoon Peak OUT
Daytime Construction Workers (12 with no PCE)[1]	12	24	12	0	0	12
Nighttime Technicians 8 pm to 5 am (3 with no PCE)[1]	3	6	0	0	0	0
Equipment Deliveries and Construction Trucks (with PCE of 3)[2]	5	30	12	12	3	3
Water Truck (with PCE of 3)[2]	1	6	3	0	0	3
Phase 1 Total Traffic During Peak Construction Period	21	**66**	**27**	**12**	**3**	**18**

ADT: Average Daily Trips. PCE: Passenger Car Equivalent factor of 3 applied to delivery and water trucks to provide an equivalent number of passenger cars. 1) Number of construction workers and construction trucks provided by applicant. 2) Passenger Car Equivalent (PCE) factor of 3 applied to each truck.

4.2 Project Phase 2 Construction Trip Generation

Phase 2 construction (expected in 2018) will occur over a period of approximately 160 days and will include site preparation; civil and foundation work (conduit, equipment pads, concrete foundations); building works (form and pour slab) framing, sheathing, roofing, mechanical, lighting and electrical, fire suppression); data support installation; batteries (install battery racks, install batteries in racks); electrical works (pull and test cable, set and test equipment, point of interconnection work); certificate of occupancy; and commissioning. Approximately 30 workers will be on site generally from sunrise to 2:30 PM. In addition to the construction workers, three technicians will work an additional 3 to 6 weeks to commission and debug the system integration. Work hours for three technicians will be approximately from 8 PM to 5 AM to avoid interference with the facility when solar power is being generated. Phase 2 deliveries will occur throughout the construction period; however, peak deliveries are anticipated to occur in Month 3 with approximately 5 truck deliveries in the morning and 4 truck deliveries in the afternoon. A water truck is anticipated to deliver water with an average of less than one truck per day; therefore, to be conservative one daily water truck is included in the trip generation. For trip generation purposes, truck trips are converted to a Passenger Car Equivalent (PCE) by multiplying each truck by a factor of 3 due to size and speed constraints. For Phase 2 the peak construction traffic is calculated at 126 ADT with 63 morning peak hour trips (48 inbound and 15 outbound) and 57 afternoon peak hour trips (12 inbound and 45 outbound) as shown in **Table 7**.

TABLE 7: PHASE 2 PROJECT TRIP GENERATION (PASSENGER CAR EQUIVALENT)

Phase 2 Construction Related Traffic	Daily Vehicles	ADT with PCE[2]	Morning Peak		Afternoon Peak	
			IN	OUT	IN	OUT
Daytime Construction Workers (12 with no PCE)[1]	30	60	30	0	0	30
Nighttime Technicians 8 pm to 5 am (3 with no PCE)[1]	3	6	0	0	0	0
Equipment Deliveries and Construction Trucks (with PCE of 3)[2]	9	54	15	15	12	12
Water Truck (with PCE of 3)[2]	1	6	3	0	0	3
Phase 2 Total Traffic During Peak Construction Period	43	**126**	**48**	**15**	**12**	**45**

ADT: Average Daily Trips. PCE: Passenger Car Equivalent factor of 3 applied to delivery and water trucks to provide an equivalent number of passenger cars. 1) Number of construction workers and construction trucks provided by applicant. 2) Passenger Car Equivalent (PCE) factor of 3 applied to each truck.

The construction is anticipated to occur Monday through Friday; however, if extra work days are required, they would occur on Saturdays.

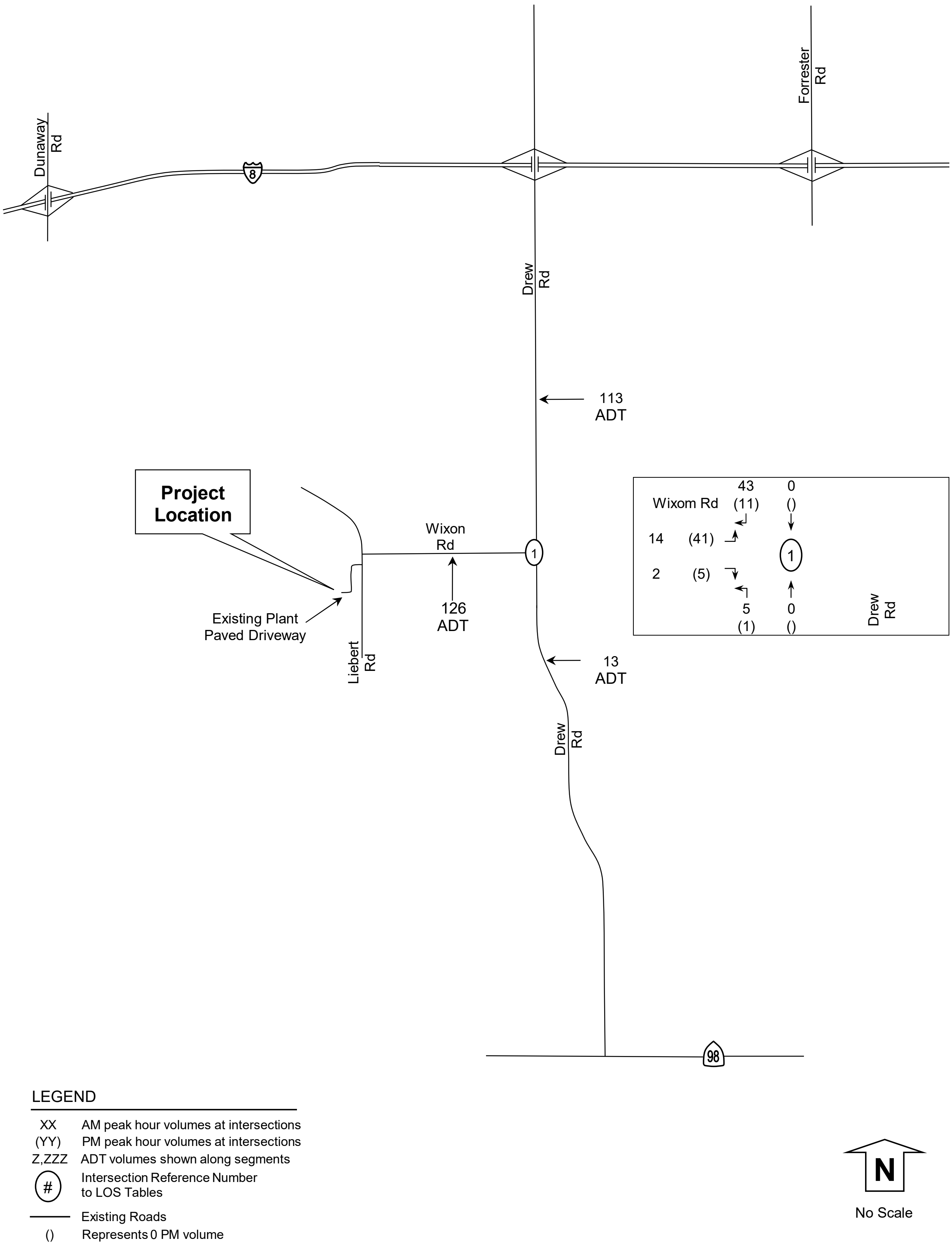
4.3 Project Operations and Maintenance Trip Generation

The post construction operations and maintenance of the Battery Energy Storage Facility will be monitored by existing six operators currently on-site as part of the existing Campo Verde Solar Facility operations. No additional full time staff is anticipated as part of the Battery Energy Storage Facility; however, technicians will be brought in if necessary, thus there is no anticipated new trip generation for the maintenance and project operations. Therefore, this traffic analysis is based on the higher and temporary construction traffic.

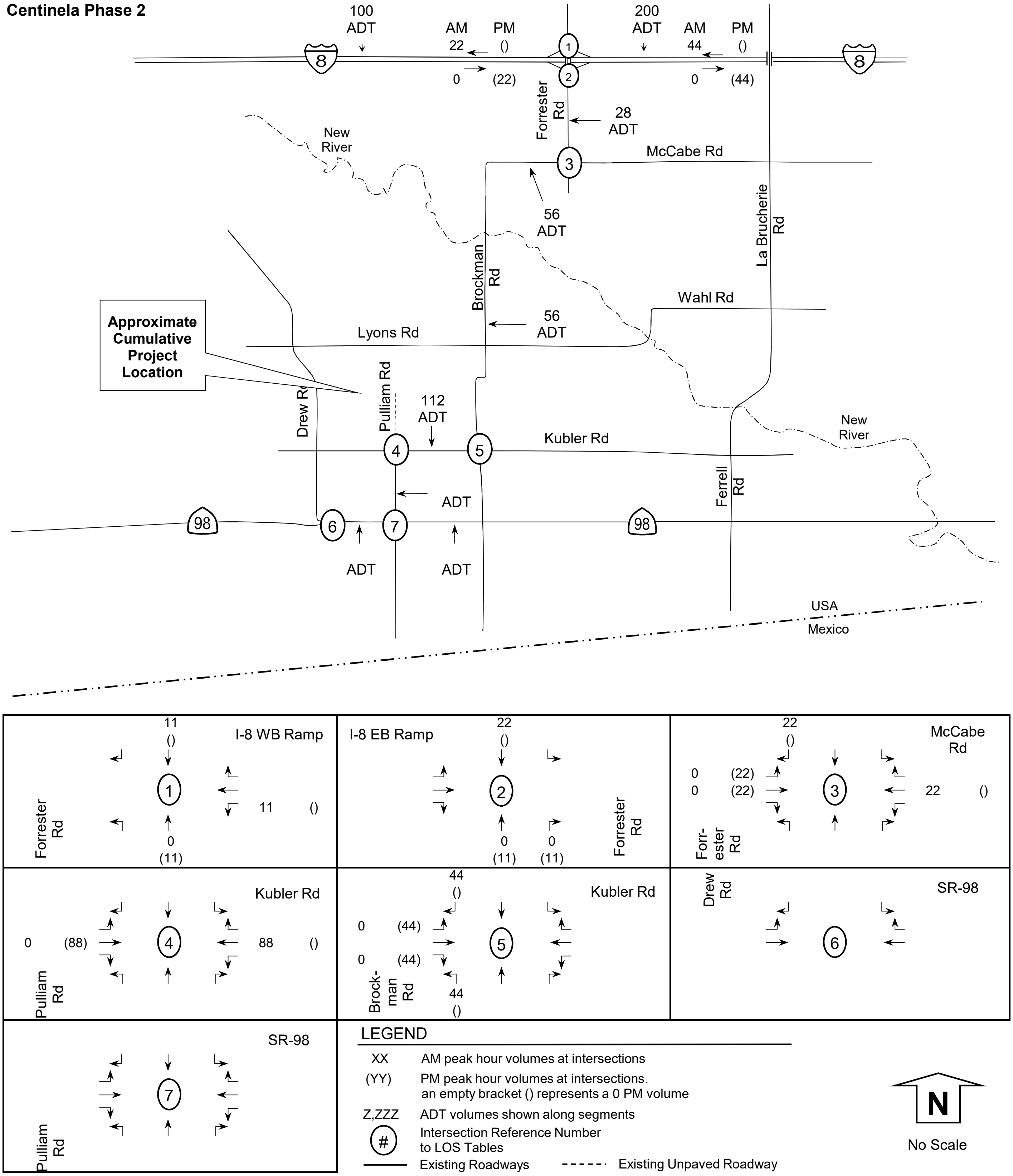
4.4 Construction Trip Distribution and Assignment

The trip distribution is based on the proximity to I-8 and SR-98, anticipated delivery of equipment, and construction workforce origination as shown in shown in **Figure 7.** The assignment of phase 1 construction traffic is shown in **Figure 8** while phase 2 construction traffic is shown in **Figure 9.**

Figure 9: Project Trip Assignment (Phase 2)



Centinela Phase 2



TO:	Commissioner Charles Baker Commissioner Dennis Logue Commissioner Sandy Carver Commissioner Charles Lucas Commissioner Mike Goodsell
FROM:	Jim Minnick, Secretary Airport Land Use Commission
SUBJECT:	Public Hearing to consider the proposed Coyne Ranch Specific Plan, General Plan Amendment, Zone Change, Tract Map for consistency with the 1996 Airport Land Use Compatibility Plan **(ALUCP 13-17)**
DATE OF REPORT:	September 26, 2017

AGENDA ITEM NO:	1
HEARING DATE:	October 18, 2017
HEARING TIME:	6:00 p.m.
HEARING LOCATION:	County Administrative Center Board of Supervisors Chambers 940 Main Street El Centro, CA 92243

SECRETARY'S RECOMMENDATION

It is Staff's recommendation that the attached proposed project(s) for the proposed Coyne Ranch Specific Plan, General Plan Amendment, Zone Change & Tract Map (within the ALUCP's "C" Zone") could be deemed consistent with the 1996 Airport Land Use Compatibility Plan.

SECRETARY'S REPORT

Project Location:

The project is located on a 129 acre parcel within the Seeley Urban Area plan on the Northwest corner of Ross Road and Bennett Road; APN 051-450-009-000; legally described as that portion of the Par 1 PM 2285 of TR 189 Township 16 Range 12-13 129.45 acres.

The specific location of the proposed project location is found within the attached Imperial County Airport Compatibility Map, Zone C, of the 1996 Airport Land Use Compatibility Plan.

Project Description:

The Planning & Development Services Department received the attached proposed Coyne Ranch Specific Plan 16-0001, General Plan Amendment, Zone Change 16-0002 and Tract Map 989 on September 2017.The proposed Specific Plan project is a multi-year build out residential development. The project will be built out in four (4) phases, and will include up to 546 residential units.

The proposed Specific Plan, General Plan Amendment, Zone Change & Major Subdivision have been submitted for the Airport Land Use Commission's review and determination of consistency with the 1996 Airport Land Use Compatibility Plan (ALUCP).

The proposed site is located within the attached "C Zone" of the Imperial County Airport's Compatibility Map, ALUCP Figure 3G.

The ALUCP's Compatibility Criteria for the C Zone, "Common Traffic Pattern zone, indicates a maximum density of six (6) dwelling units/per acre. The project is proposing a possible total of 546 residential units on the 129.45 acre parcel. This calculates to 4.21 units per acre. The development of 435 single family homes on 77 acres equals 5.65 units per acre, however, a portion of the proposed Specific Plan allows up to 111 multi-family units on 7.55 acres. This calculation of (14.70 per acre) which puts a small portion of the total project area over the 6 unit per acre limit per the Class C Airport Land Use restrictions.

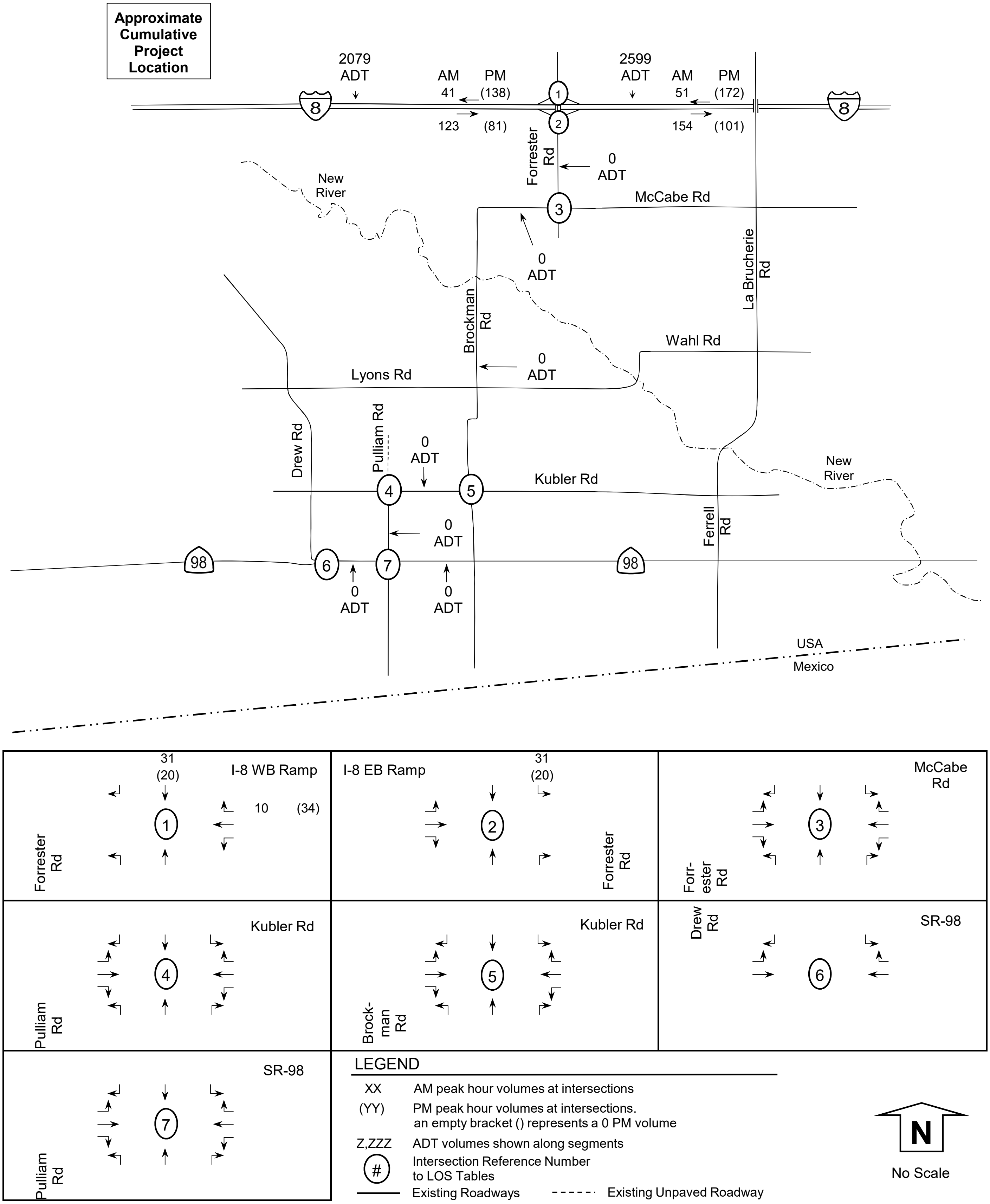
Other uses (people/ac) [2] for a maximum of 200 per acre and a required open Land[3] of 15% of project site. (129 acres x 15%) = 19.35 acres of required open space appears to meet ALUC limits.

General Plan/ALUCP Analysis:

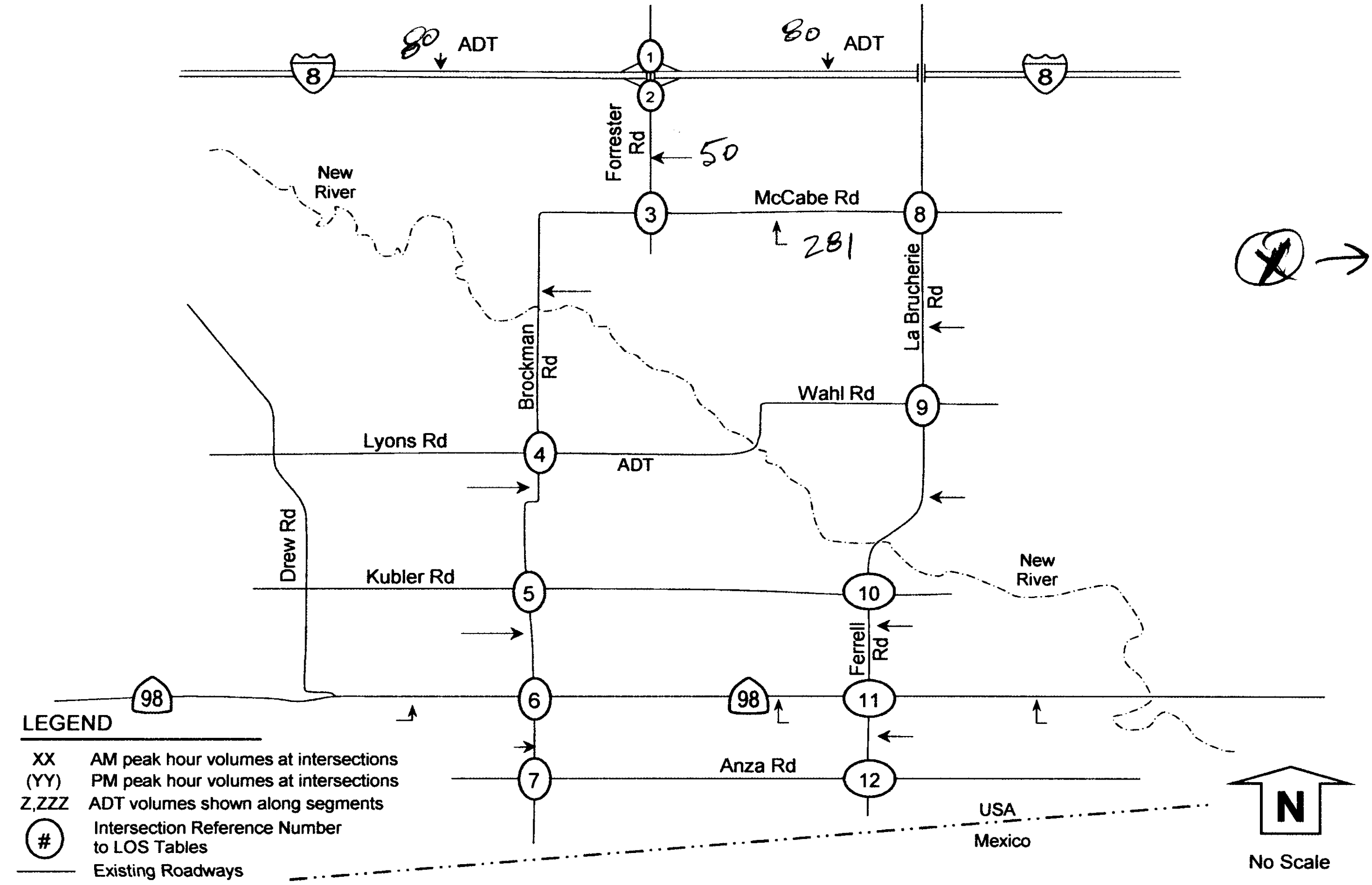
The Airport Land Use Compatibility Plan (AlUCP), Chapter 2, Section 1.3. 2 (a) & (b), provides "Statutory Requirements" by the Commission, which include:

> "As required by State law, (a) the adoption or approval of any amendment to a general or specific plan affecting the Commission's geographic area of concern as indicated in " (Section 1.3.2 (a), pg. 2-3), &
>
> "Other Project Review- State law empowers the Commission to review additional types of land use "actions, regulations, and permits." as shown on page 2-3

Coyne Ranch Specific Plan



CUMULATIVE PROJECT: COUNTY CENTER II PHASE 1A & 1B



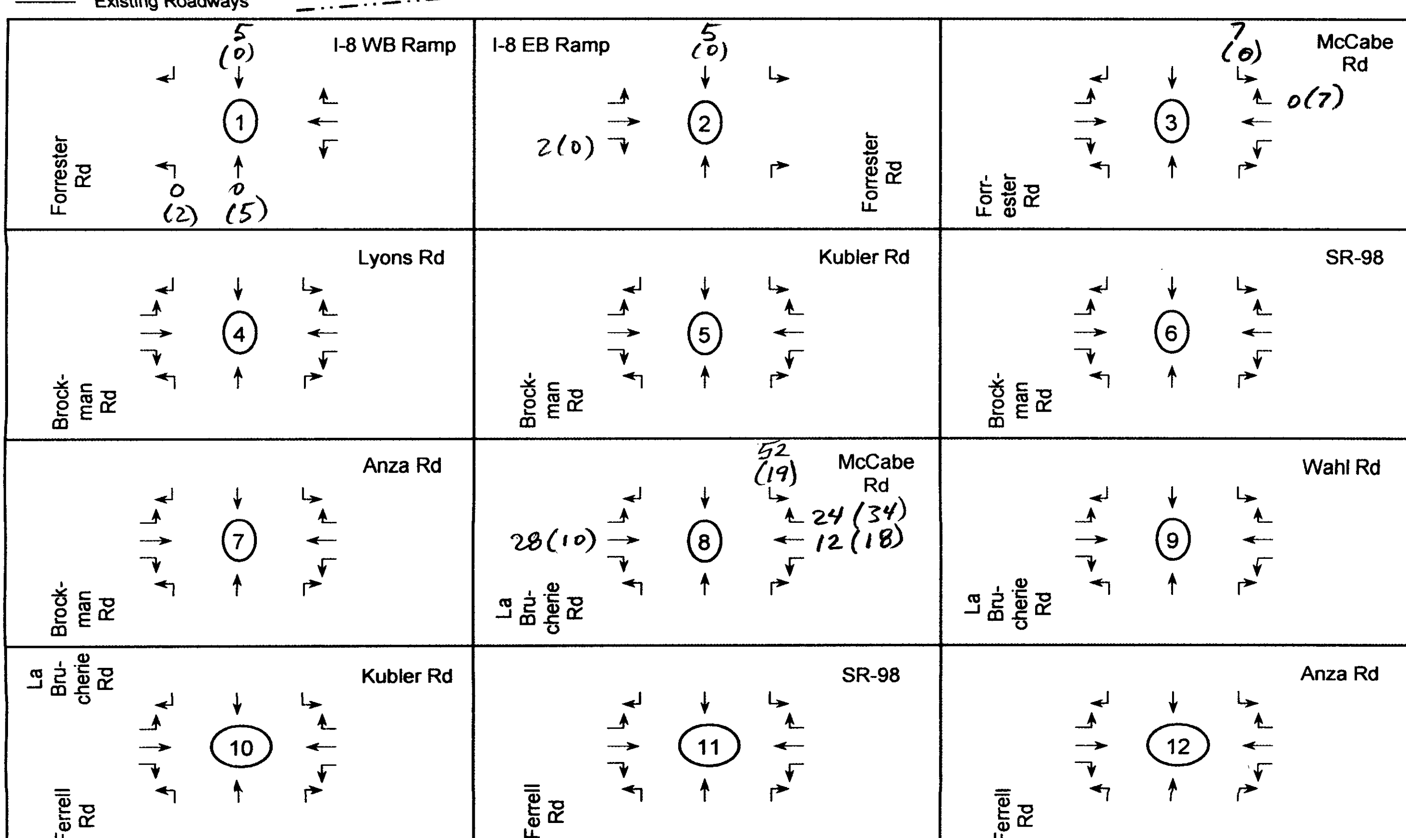


Figure 8: Project Assignment (Phase 1A)

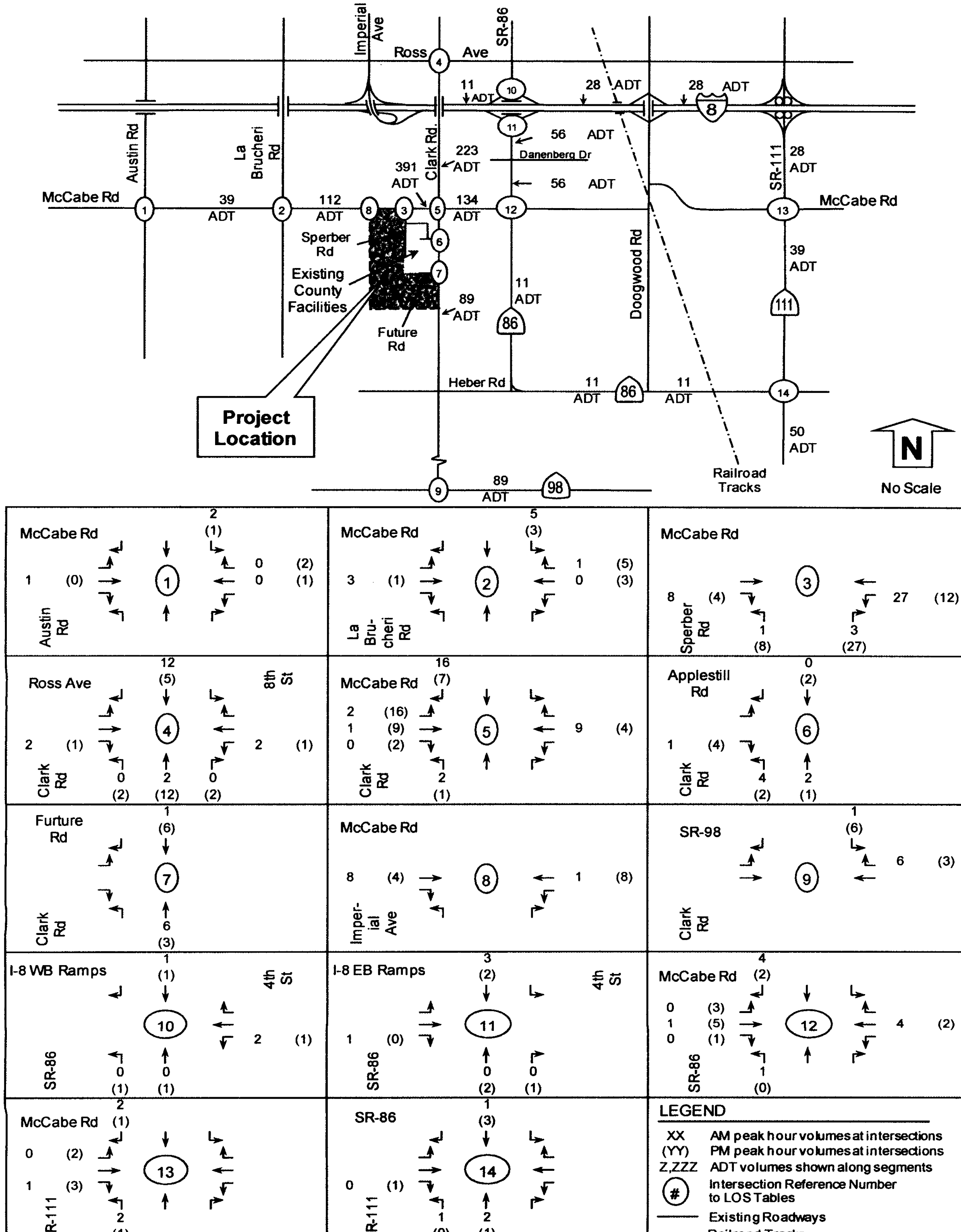
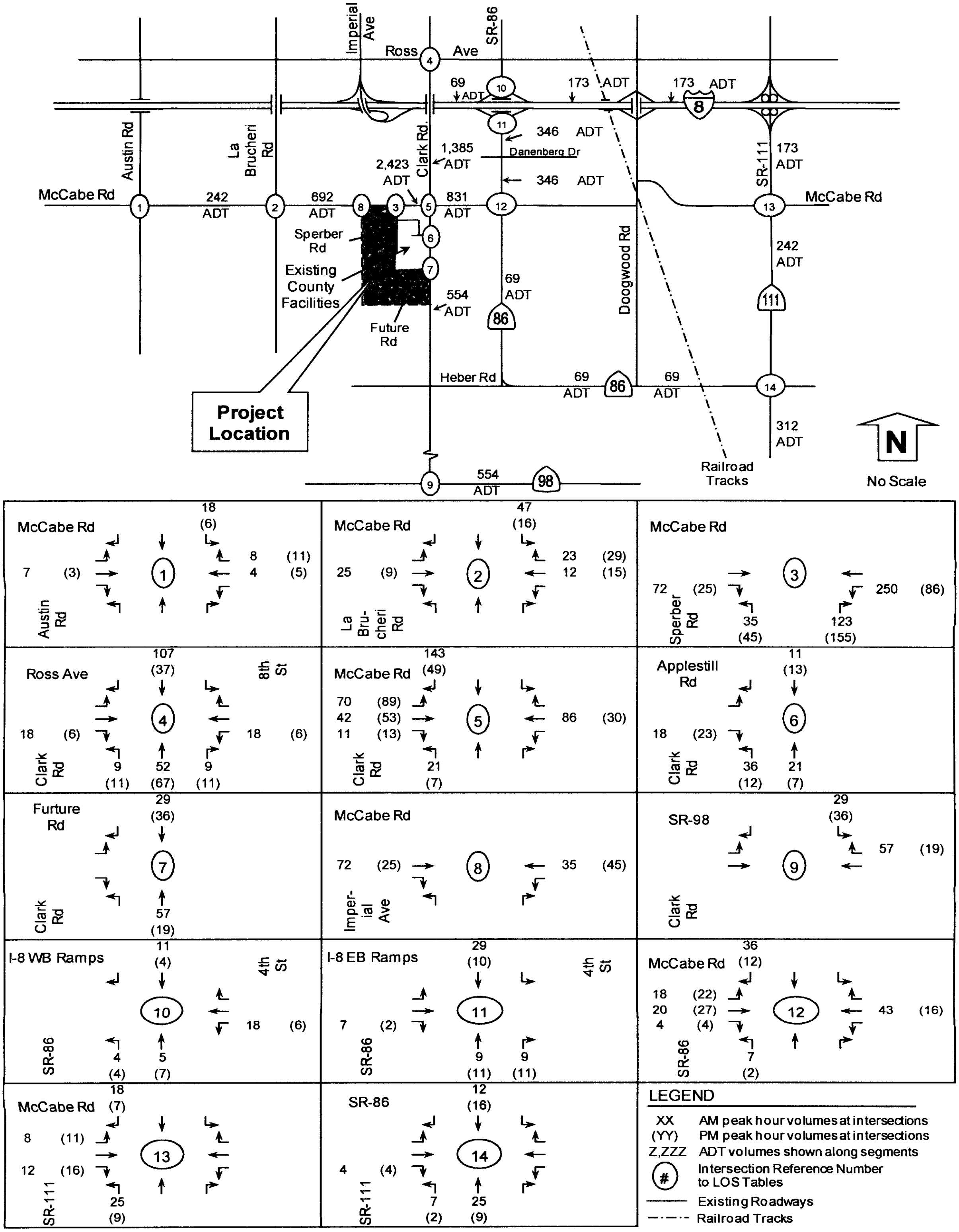
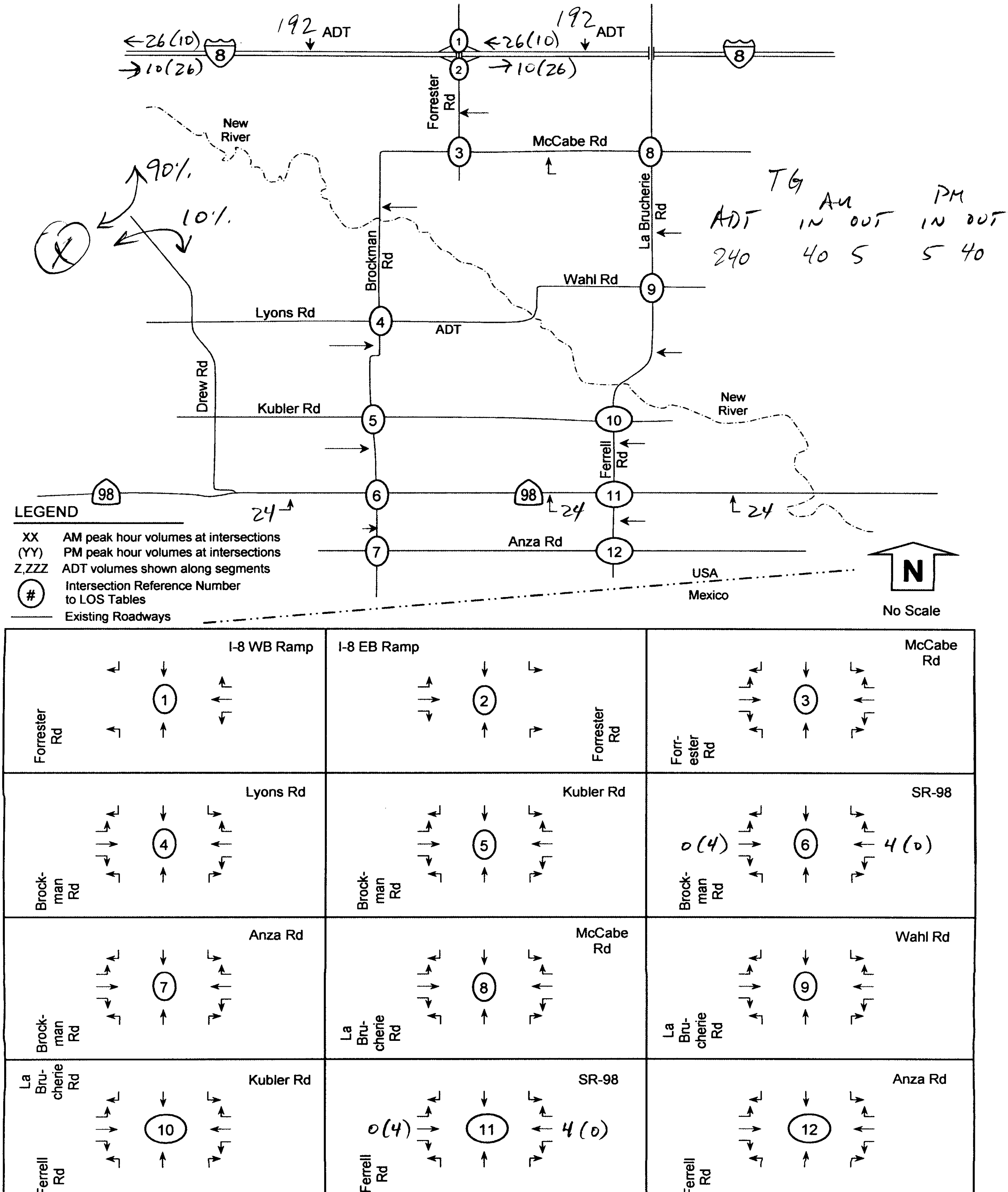


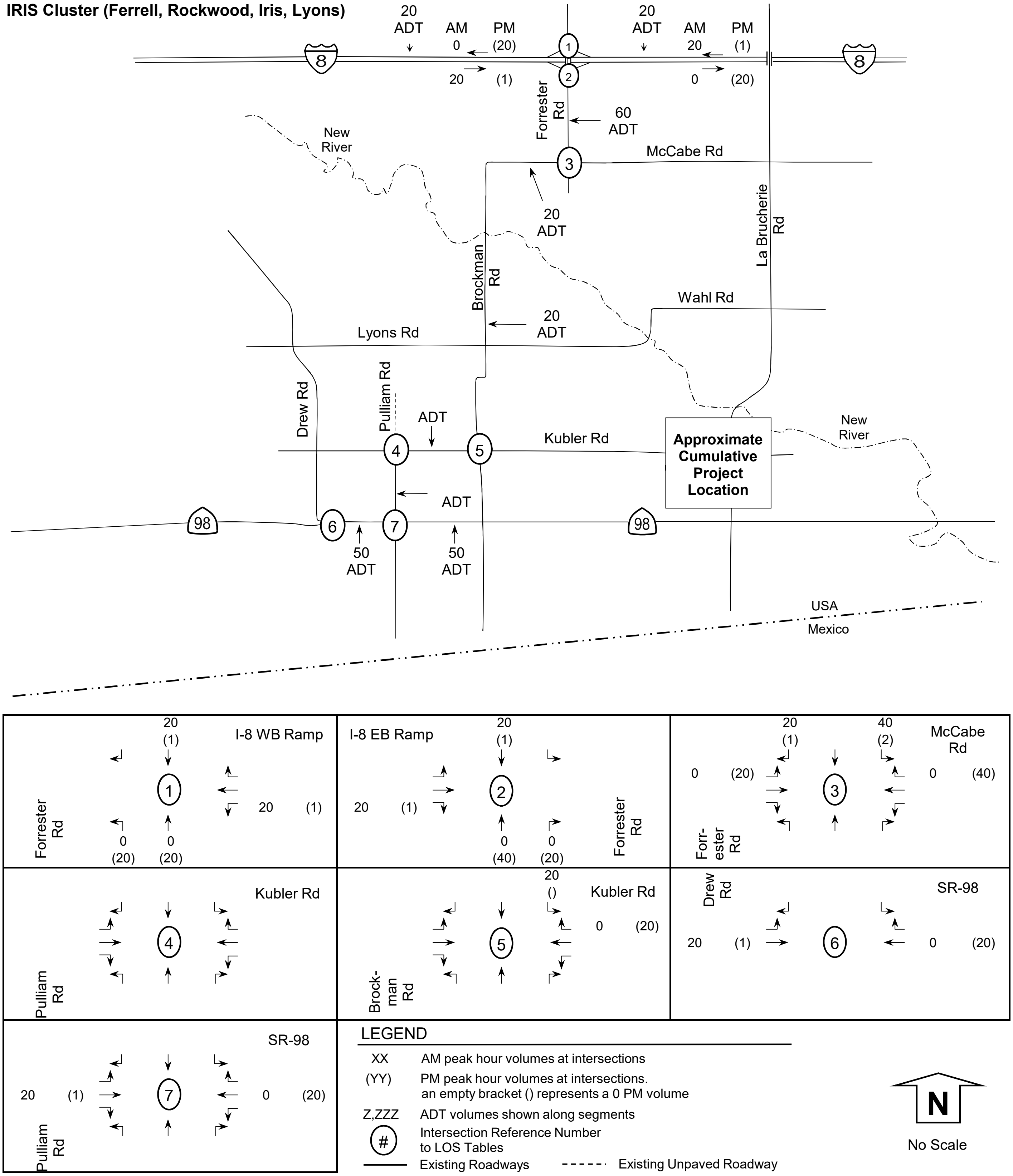
Figure 10: Project Assignment (Phase 1B)



CUMULATIVE PROJECTS: IV SUBSTATION & OCOTILLO SOLAR



IRIS Cluster (Ferrell, Rockwood, Iris, Lyons)



4.0 Project Description

The project is a solar photovoltaic energy-generating facility capable of producing approximately 250 megawatts of electricity on approximately 2,793 acres. The project is located approximately 8 miles west of the City of Calexico in the Mt. Signal area of Imperial Valley. The project is located on privately owned, agricultural land.

4.1 Project Trip Generation and Phases/Phasing

The project trip generation consists of a construction phase and operations phase. The construction phase will have the highest intensity followed by an operations phase with significantly fewer trips. This section describes the construction and operations trip generation. Project description details are included in **Appendix J**.

The project may be phased over time; therefore, four possible phases were analyzed. This included the entire project being constructed early in 2013 (existing conditions scenario), the entire project being constructed on a typical schedule that accounts for time needed to obtain permits and financing for the project in 2016 (near-term scenario), the entire project being construct in 2019 (2024 minus 5 years for a mid-point scenario of the CUP), and the entire project being delayed due to market forces until 2024 (long-term scenario).

4.1.1 Project Construction Trip Generation

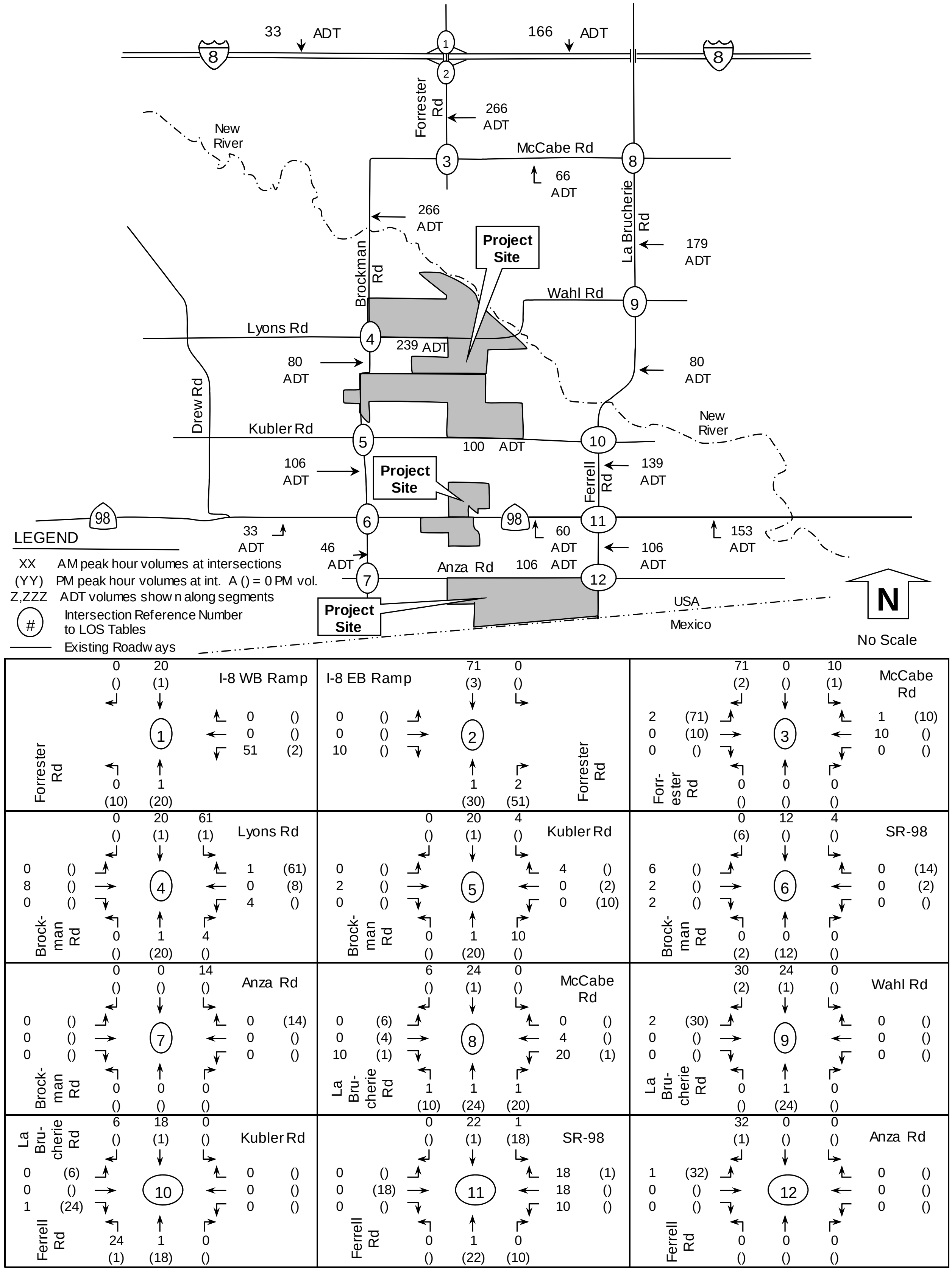
Construction of the project includes site preparation, foundation construction, delivery of equipment and supplies, erection of major equipment and structures, installation of control systems, and start-up/testing. These construction activities are expected to require approximately 18 months. According to the Applicant, the construction workforce is expected to start in 2015 and reach the highest concentration in spring of 2016 (for the near-term scenario) with an average of 250 workers and a possible peak of up to 350 daily workers. Based on the applicant's experience in the current construction of IV Solar South, about 75% of the workers follow a 4 day at 10 hours per day (4-10) schedule, about 25% follow a 5 day at 8 hours per day (5-8) schedule, and roughly 25% of the workers carpool. The workers also have different start and end times between the 4-10 and 5-8 schedule. The 4-10 workers typically arrive at 6am and depart at 5pm while the 8-5 workers typically arrive at 7am and depart at 4pm. This analysis is based on the higher concentration (75%) of 4-10 workers that arrive a 6am and depart at 5pm. The worker and construction truck traffic is calculated at 664 ADT with 209 AM peak hour trips (203 inbound and 6 outbound) and 209 PM peak hour trips (6 inbound and 203 outbound) as shown in **Table 8**.

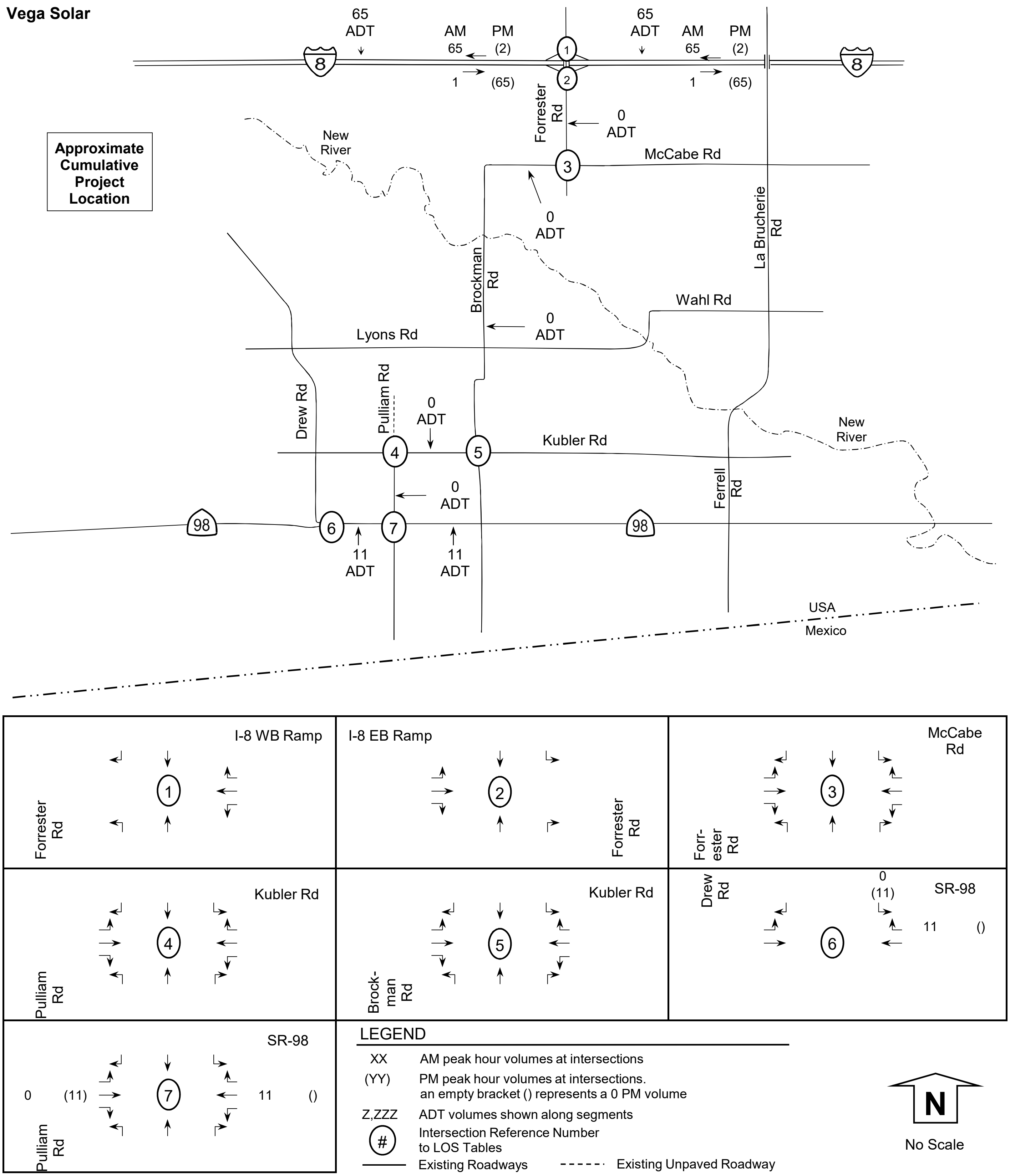
TABLE 8: PROJECT CONSTRUCTION TRIP GENERATION

Proposed Construction Related Traffic	ADT	6:00 AM		7:00 AM		4:00 PM		5:00 PM	
		IN	OUT	IN	OUT	IN	OUT	IN	OUT
Construction Workers on 4-10 Shift (75% of 350)[1]	394	197	0	0	0	0	0	0	197
Construction Workers on 5-8 Shift (25% of 350)[2]	132	0	0	66	0	0	66	0	0
Equipment and Construction Trucks (with PCE)[3]	138	6	6	6	6	6	6	6	6
Total Traffic During Peak Construction Period	664	203	6	72	6	6	72	6	203
Daily and Higher Peak Hour Used For Analysis	**664**	**203**	**6**					**6**	**203**

Notes: 1) Applicant estimates the 4 days at 10 hrs/day (4-10) shift to include about 75% of the total 350 peak w ork force w ith about 25% carpooling. 2) Applicant estimates the 5 days at 8 hrs/day (5-8) shift to include about 25% of the total 350 peak w ork forces w ith about 25% carpooling. 3) About 23 daily trucks w ith a Passenger Car Equivalent (PCE) factor of 3 applied to each truch equals 138 ADT (23 trucks x 2 x 3 PCE = 138 ADT) that are anticipated to have a frequency of about 2 per hour for a peak period volume of 6 (w ith PCE).

Figure 7: Project Construction Traffic





Vega Solar
Approximate Cumulative Project Location
65 ADT
AM 65 1
PM (2) (65)
65 ADT
AM 65 1
PM (2) (65)
8
Forrester Rd
0 ADT
New River
McCabe Rd
0 ADT
La Brucherie Rd
Brockman Rd
Wahl Rd
0 ADT
Lyons Rd
Drew Rd
Pulliam Rd
0 ADT
Kubler Rd
New River
0 ADT
Ferrell Rd
98
11 ADT
11 ADT
USA
Mexico
I-8 WB Ramp
Forrester Rd
I-8 EB Ramp
Forrester Rd
McCabe Rd
Forr-ester Rd
Kubler Rd
Pulliam Rd
Kubler Rd
Brock-man Rd
Drew Rd
0
(11)
SR-98
11
()
SR-98
0
(11)
11
()
Pulliam Rd
LEGEND
XX AM peak hour volumes at intersections
(YY) PM peak hour volumes at intersections. an empty bracket () represents a 0 PM volume
Z,ZZZ ADT volumes shown along segments
Intersection Reference Number to LOS Tables
Existing Roadways
Existing Unpaved Roadway
N
No Scale

I-8 Forecasted Background Cumulative

Freeway Segment	I-8 Drew Rd to Forrester Rd				I-8 Forrester Rd to Imperial Ave			
Forecasted Year 2017								
ADT	14,000				17,200			
Peak Hour	A M		P M		A M		P M	
Direction	EB	WB	EB	WB	EB	WB	EB	WB
Number of Lanes	2	2	2	2	2	2	2	2
Capacity (1)	4,700	4,700	4,700	4,700	4,700	4,700	4,700	4,700
K Factor (2)	0.1346	0.1346	0.1631	0.1631	0.1346	0.1346	0.1631	0.1631
D Factor (3)	0.4770	0.5230	0.4958	0.5042	0.4770	0.5230	0.4958	0.5042
Truck Factor (4)	0.8712	0.8712	0.8712	0.8712	0.8376	0.8376	0.8376	0.8376
Peak Hour Volume	1,032	1,131	1,299	1,321	1,318	1,446	1,661	1,689
5% of background	**52**	**57**	**65**	**66**	**66**	**72**	**83**	**84**

Notes: (1) Capacity of 2,350 pcphpl from CALTRANS' Guide for the Preparation of Traffic Impact Studies, December 2002. (2) Latest K factor from Caltrans (based on 2017 report), which is the percentage of AADT in both directions. (3) Latest D factor from Caltrans (based on 2017 report), which when multiplied by K and ADT will provide peak hour volume. (4) Latest truck factor from Caltrans (based on 2015 report).

Appendix M

Year 2017 + Project Construction Intersection LOS Calculations

Intersection	
Int Delay, s/veh	3.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	76	0	83	12	98	0	0	148	67
Future Vol, veh/h	0	0	0	76	0	83	12	98	0	0	148	67
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	Yield	-	-	None	-	-	None
Storage Length	-	-	-	-	-	50	-	-	-	-	-	-
Veh in Median Storage, #	-	-	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	83	0	90	13	107	0	0	161	73

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	331	367	107	234	0	-	-	-	0
Stage 1	133	133	-	-	-	-	-	-	-
Stage 2	198	234	-	-	-	-	-	-	-
Critical Hdwy	6.42	6.52	6.22	4.12	-	-	-	-	-
Critical Hdwy Stg 1	5.42	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.42	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	2.218	-	-	-	-	-
Pot Cap-1 Maneuver	664	562	947	1333	-	0	0	-	-
Stage 1	893	786	-	-	-	0	0	-	-
Stage 2	835	711	-	-	-	0	0	-	-
Platoon blocked, %					-			-	-
Mov Cap-1 Maneuver	657	0	947	1333	-	-	-	-	-
Mov Cap-2 Maneuver	657	0	-	-	-	-	-	-	-
Stage 1	884	0	-	-	-	-	-	-	-
Stage 2	835	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.2	0.8	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	WBLn1	WBLn2	SBT	SBR
Capacity (veh/h)	1333	-	657	947	-	-
HCM Lane V/C Ratio	0.01	-	0.126	0.095	-	-
HCM Control Delay (s)	7.7	0	11.3	9.2	-	-
HCM Lane LOS	A	A	B	A	-	-
HCM 95th %tile Q(veh)	0	-	0.4	0.3	-	-

Intersection	
Int Delay, s/veh	3.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	57	1	9	0	0	0	0	56	21	75	144	0
Future Vol, veh/h	57	1	9	0	0	0	0	56	21	75	144	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	None
Storage Length	-	-	50	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	62	1	10	0	0	0	0	61	23	82	157	0

Major/Minor	Minor2						Major1			Major2		
Conflicting Flow All	394	405	157				-	0	0	84	0	0
Stage 1	321	321	-				-	-	-	-	-	-
Stage 2	73	84	-				-	-	-	-	-	-
Critical Hdwy	6.42	6.52	6.22				-	-	-	4.12	-	-
Critical Hdwy Stg 1	5.42	5.52	-				-	-	-	-	-	-
Critical Hdwy Stg 2	5.42	5.52	-				-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318				-	-	-	2.218	-	-
Pot Cap-1 Maneuver	611	535	889				0	-	-	1513	-	0
Stage 1	735	652	-				0	-	-	-	-	0
Stage 2	950	825	-				0	-	-	-	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	575	0	889				-	-	-	1513	-	-
Mov Cap-2 Maneuver	575	0	-				-	-	-	-	-	-
Stage 1	692	0	-				-	-	-	-	-	-
Stage 2	950	0	-				-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11.6	0	2.6
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	EBLn2	SBL	SBT
Capacity (veh/h)	-	-	575	889	1513	-
HCM Lane V/C Ratio	-	-	0.11	0.011	0.054	-
HCM Control Delay (s)	-	-	12	9.1	7.5	0
HCM Lane LOS	-	-	B	A	A	A
HCM 95th %tile Q(veh)	-	-	0.4	0	0.2	-

Intersection	
Int Delay, s/veh	6.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	15	14	2	1	44	33	4	3	1	77	7	70
Future Vol, veh/h	15	14	2	1	44	33	4	3	1	77	7	70
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	16	15	2	1	48	36	4	3	1	84	8	76

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	84	0	0	17	0	0	158	134	16	118	117	66
Stage 1	-	-	-	-	-	-	48	48	-	68	68	-
Stage 2	-	-	-	-	-	-	110	86	-	50	49	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1513	-	-	1600	-	-	808	757	1063	858	773	998
Stage 1	-	-	-	-	-	-	965	855	-	942	838	-
Stage 2	-	-	-	-	-	-	895	824	-	963	854	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1513	-	-	1600	-	-	734	748	1063	847	764	998
Mov Cap-2 Maneuver	-	-	-	-	-	-	734	748	-	847	764	-
Stage 1	-	-	-	-	-	-	954	846	-	932	837	-
Stage 2	-	-	-	-	-	-	818	823	-	948	845	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	3.6	0.1	9.7	9.9
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	769	1513	-	-	1600	-	-	905
HCM Lane V/C Ratio	0.011	0.011	-	-	0.001	-	-	0.185
HCM Control Delay (s)	9.7	7.4	0	-	7.3	0	-	9.9
HCM Lane LOS	A	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0.7

Intersection	
Int Delay, s/veh	3.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	2	1	43	44	0	1	1	2	0	0	0
Future Vol, veh/h	0	2	1	43	44	0	1	1	2	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	2	1	47	48	0	1	1	2	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	48	0	0	3	0	0	145	145	3	146	145	48
Stage 1	-	-	-	-	-	-	3	3	-	142	142	-
Stage 2	-	-	-	-	-	-	142	142	-	4	3	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1559	-	-	1619	-	-	824	746	1081	823	746	1021
Stage 1	-	-	-	-	-	-	1020	893	-	861	779	-
Stage 2	-	-	-	-	-	-	861	779	-	1018	893	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1559	-	-	1619	-	-	805	724	1081	802	724	1021
Mov Cap-2 Maneuver	-	-	-	-	-	-	805	724	-	802	724	-
Stage 1	-	-	-	-	-	-	1020	893	-	861	756	-
Stage 2	-	-	-	-	-	-	835	756	-	1015	893	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	3.6	9	0
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	894	1559	-	-	1619	-	-	-
HCM Lane V/C Ratio	0.005	-	-	-	0.029	-	-	-
HCM Control Delay (s)	9	0	-	-	7.3	0	-	0
HCM Lane LOS	A	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0.1	-	-	-

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	1	0	1	0	2	0	11	0	4	13	88
Future Vol, veh/h	5	1	0	1	0	2	0	11	0	4	13	88
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	1	0	1	0	2	0	12	0	4	14	96

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	83	82	62	83	130	12	110	0	0	12	0	0
Stage 1	70	70	-	12	12	-	-	-	-	-	-	-
Stage 2	13	12	-	71	118	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	904	808	1003	904	761	1069	1480	-	-	1607	-	-
Stage 1	940	837	-	1009	886	-	-	-	-	-	-	-
Stage 2	1007	886	-	939	798	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	900	806	1003	901	759	1069	1480	-	-	1607	-	-
Mov Cap-2 Maneuver	900	806	-	901	759	-	-	-	-	-	-	-
Stage 1	940	834	-	1009	886	-	-	-	-	-	-	-
Stage 2	1005	886	-	935	796	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9.1	8.6	0	0.3
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1480	-	-	883	1006	1607	-	-
HCM Lane V/C Ratio	-	-	-	0.007	0.003	0.003	-	-
HCM Control Delay (s)	0	-	-	9.1	8.6	7.2	0	-
HCM Lane LOS	A	-	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0	0	-	-

Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	10	40	43	33	3	5
Future Vol, veh/h	10	40	43	33	3	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	43	47	36	3	5

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	83	0	-	0	130	65
Stage 1	-	-	-	-	65	-
Stage 2	-	-	-	-	65	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1514	-	-	-	864	999
Stage 1	-	-	-	-	958	-
Stage 2	-	-	-	-	958	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1514	-	-	-	858	999
Mov Cap-2 Maneuver	-	-	-	-	858	-
Stage 1	-	-	-	-	951	-
Stage 2	-	-	-	-	958	-

Approach	EB	WB	SB
HCM Control Delay, s	1.5	0	8.9
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1514	-	-	-	941
HCM Lane V/C Ratio	0.007	-	-	-	0.009
HCM Control Delay (s)	7.4	0	-	-	8.9
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

Intersection	
Int Delay, s/veh	2.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	36	0	1	66	7	12	1	1	0	0	22
Future Vol, veh/h	0	36	0	1	66	7	12	1	1	0	0	22
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	39	0	1	72	8	13	1	1	0	0	24

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	80	0	0	39	0	0	129	121	39	118	117	76
Stage 1	-	-	-	-	-	-	39	39	-	78	78	-
Stage 2	-	-	-	-	-	-	90	82	-	40	39	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1518	-	-	1571	-	-	844	769	1033	858	773	985
Stage 1	-	-	-	-	-	-	976	862	-	931	830	-
Stage 2	-	-	-	-	-	-	917	827	-	975	862	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1518	-	-	1571	-	-	823	768	1033	855	772	985
Mov Cap-2 Maneuver	-	-	-	-	-	-	823	768	-	855	772	-
Stage 1	-	-	-	-	-	-	976	862	-	931	829	-
Stage 2	-	-	-	-	-	-	894	826	-	973	862	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.1	9.4	8.7
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	831	1518	-	-	1571	-	-	985
HCM Lane V/C Ratio	0.018	-	-	-	0.001	-	-	0.024
HCM Control Delay (s)	9.4	0	-	-	7.3	0	-	8.7
HCM Lane LOS	A	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.1

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	7	36	78	22	0	0
Future Vol, veh/h	7	36	78	22	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	8	39	85	24	0	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	109	0	-	0	152	97
Stage 1	-	-	-	-	97	-
Stage 2	-	-	-	-	55	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1481	-	-	-	840	959
Stage 1	-	-	-	-	927	-
Stage 2	-	-	-	-	968	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1481	-	-	-	835	959
Mov Cap-2 Maneuver	-	-	-	-	835	-
Stage 1	-	-	-	-	921	-
Stage 2	-	-	-	-	968	-

Approach	EB	WB	SB
HCM Control Delay, s	1.2	0	0
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1481	-	-	-	-
HCM Lane V/C Ratio	0.005	-	-	-	-
HCM Control Delay (s)	7.4	0	-	-	0
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	-

Intersection	
Int Delay, s/veh	1.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	17	0	71	8	147	0	0	193	54
Future Vol, veh/h	0	0	0	17	0	71	8	147	0	0	193	54
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	Yield	-	-	None	-	-	None
Storage Length	-	-	-	-	-	50	-	-	-	-	-	-
Veh in Median Storage, #	-	-	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	18	0	77	9	160	0	0	210	59

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	418	447	160	269	0	-	-	-	0
Stage 1	178	178	-	-	-	-	-	-	-
Stage 2	240	269	-	-	-	-	-	-	-
Critical Hdwy	6.42	6.52	6.22	4.12	-	-	-	-	-
Critical Hdwy Stg 1	5.42	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.42	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	2.218	-	-	-	-	-
Pot Cap-1 Maneuver	591	506	885	1295	-	0	0	-	-
Stage 1	853	752	-	-	-	0	0	-	-
Stage 2	800	687	-	-	-	0	0	-	-
Platoon blocked, %					-			-	-
Mov Cap-1 Maneuver	586	0	885	1295	-	-	-	-	-
Mov Cap-2 Maneuver	586	0	-	-	-	-	-	-	-
Stage 1	846	0	-	-	-	-	-	-	-
Stage 2	800	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.8	0.4	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	WBLn1	WBLn2	SBT	SBR
Capacity (veh/h)	1295	-	586	885	-	-
HCM Lane V/C Ratio	0.007	-	0.032	0.087	-	-
HCM Control Delay (s)	7.8	0	11.3	9.5	-	-
HCM Lane LOS	A	A	B	A	-	-
HCM 95th %tile Q(veh)	0	-	0.1	0.3	-	-

Intersection	
Int Delay, s/veh	6.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	84	0	4	0	0	0	0	69	57	168	43	0
Future Vol, veh/h	84	0	4	0	0	0	0	69	57	168	43	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	None
Storage Length	-	-	50	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	91	0	4	0	0	0	0	75	62	183	47	0

Major/Minor	Minor2						Major1			Major2		
Conflicting Flow All	519	550	47				-	0	0	137	0	0
Stage 1	413	413	-				-	-	-	-	-	-
Stage 2	106	137	-				-	-	-	-	-	-
Critical Hdwy	6.42	6.52	6.22				-	-	-	4.12	-	-
Critical Hdwy Stg 1	5.42	5.52	-				-	-	-	-	-	-
Critical Hdwy Stg 2	5.42	5.52	-				-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318				-	-	-	2.218	-	-
Pot Cap-1 Maneuver	517	443	1022				0	-	-	1447	-	0
Stage 1	668	594	-				0	-	-	-	-	0
Stage 2	918	783	-				0	-	-	-	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	450	0	1022				-	-	-	1447	-	-
Mov Cap-2 Maneuver	450	0	-				-	-	-	-	-	-
Stage 1	581	0	-				-	-	-	-	-	-
Stage 2	918	0	-				-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	14.7	0	6.2
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	EBLn2	SBL	SBT
Capacity (veh/h)	-	-	450	1022	1447	-
HCM Lane V/C Ratio	-	-	0.203	0.004	0.126	-
HCM Control Delay (s)	-	-	15	8.5	7.8	0
HCM Lane LOS	-	-	C	A	A	A
HCM 95th %tile Q(veh)	-	-	0.8	0	0.4	-

Intersection	
Int Delay, s/veh	5.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	81	58	1	0	8	37	5	5	1	51	1	5
Future Vol, veh/h	81	58	1	0	8	37	5	5	1	51	1	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	88	63	1	0	9	40	5	5	1	55	1	5

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	49	0	0	64	0	0	272	289	64	272	269	29
Stage 1	-	-	-	-	-	-	240	240	-	29	29	-
Stage 2	-	-	-	-	-	-	32	49	-	243	240	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1558	-	-	1538	-	-	680	621	1000	680	637	1046
Stage 1	-	-	-	-	-	-	763	707	-	988	871	-
Stage 2	-	-	-	-	-	-	984	854	-	761	707	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1558	-	-	1538	-	-	645	584	1000	644	599	1046
Mov Cap-2 Maneuver	-	-	-	-	-	-	645	584	-	644	599	-
Stage 1	-	-	-	-	-	-	718	665	-	930	871	-
Stage 2	-	-	-	-	-	-	978	854	-	709	665	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	4.3	0	10.8	11
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	635	1558	-	-	1538	-	-	666
HCM Lane V/C Ratio	0.019	0.057	-	-	-	-	-	0.093
HCM Control Delay (s)	10.8	7.4	0	-	0	-	-	11
HCM Lane LOS	B	A	A	-	A	-	-	B
HCM 95th %tile Q(veh)	0.1	0.2	-	-	0	-	-	0.3

Intersection												
Int Delay, s/veh	4.2											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Vol, veh/h	0	46	0	2	2	0	0	0	43	1	0	0
Future Vol, veh/h	0	46	0	2	2	0	0	0	43	1	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	50	0	2	2	0	0	0	47	1	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	2	0	0	50	0	0	56	56	50	80	56	2
Stage 1	-	-	-	-	-	-	50	50	-	6	6	-
Stage 2	-	-	-	-	-	-	6	6	-	74	50	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1620	-	-	1557	-	-	941	835	1018	908	835	1082
Stage 1	-	-	-	-	-	-	963	853	-	1016	891	-
Stage 2	-	-	-	-	-	-	1016	891	-	935	853	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1620	-	-	1557	-	-	940	834	1018	865	834	1082
Mov Cap-2 Maneuver	-	-	-	-	-	-	940	834	-	865	834	-
Stage 1	-	-	-	-	-	-	963	853	-	1016	890	-
Stage 2	-	-	-	-	-	-	1015	890	-	892	853	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	3.7	8.7	9.2
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	1018	1620	-	-	1557	-	-	865
HCM Lane V/C Ratio	0.046	-	-	-	0.001	-	-	0.001
HCM Control Delay (s)	8.7	0	-	-	7.3	0	-	9.2
HCM Lane LOS	A	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0

Intersection	
Int Delay, s/veh	7.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	86	3	1	2	2	0	0	7	0	3	10	2
Future Vol, veh/h	86	3	1	2	2	0	0	7	0	3	10	2
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	93	3	1	2	2	0	0	8	0	3	11	2

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	27	26	12	28	27	8	13	0	0	8	0	0
Stage 1	18	18	-	8	8	-	-	-	-	-	-	-
Stage 2	9	8	-	20	19	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	983	867	1069	981	866	1074	1606	-	-	1612	-	-
Stage 1	1001	880	-	1013	889	-	-	-	-	-	-	-
Stage 2	1012	889	-	999	880	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	980	865	1069	976	864	1074	1606	-	-	1612	-	-
Mov Cap-2 Maneuver	980	865	-	976	864	-	-	-	-	-	-	-
Stage 1	1001	878	-	1013	889	-	-	-	-	-	-	-
Stage 2	1010	889	-	992	878	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9.1	8.9	0	1.4
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1606	-	-	977	917	1612	-	-
HCM Lane V/C Ratio	-	-	-	0.1	0.005	0.002	-	-
HCM Control Delay (s)	0	-	-	9.1	8.9	7.2	0	-
HCM Lane LOS	A	-	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.3	0	0	-	-

Intersection	
Int Delay, s/veh	2.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	55	34	11	35	9
Future Vol, veh/h	0	55	34	11	35	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	60	37	12	38	10

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	49	0	-	0	103	43
Stage 1	-	-	-	-	43	-
Stage 2	-	-	-	-	60	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1558	-	-	-	895	1027
Stage 1	-	-	-	-	979	-
Stage 2	-	-	-	-	963	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1558	-	-	-	895	1027
Mov Cap-2 Maneuver	-	-	-	-	895	-
Stage 1	-	-	-	-	979	-
Stage 2	-	-	-	-	963	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	9.1
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1558	-	-	-	919
HCM Lane V/C Ratio	-	-	-	-	0.052
HCM Control Delay (s)	0	-	-	-	9.1
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection	
Int Delay, s/veh	1.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	22	91	0	0	37	0	0	0	1	7	0	1
Future Vol, veh/h	22	91	0	0	37	0	0	0	1	7	0	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	24	99	0	0	40	0	0	0	1	8	0	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	40	0	0	99	0	0	188	187	99	188	187	40
Stage 1	-	-	-	-	-	-	147	147	-	40	40	-
Stage 2	-	-	-	-	-	-	41	40	-	148	147	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1570	-	-	1494	-	-	772	708	957	772	708	1031
Stage 1	-	-	-	-	-	-	856	775	-	975	862	-
Stage 2	-	-	-	-	-	-	974	862	-	855	775	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1570	-	-	1494	-	-	762	697	957	762	697	1031
Mov Cap-2 Maneuver	-	-	-	-	-	-	762	697	-	762	697	-
Stage 1	-	-	-	-	-	-	842	763	-	959	862	-
Stage 2	-	-	-	-	-	-	973	862	-	840	763	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.4	0	8.8	9.6
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	957	1570	-	-	1494	-	-	788
HCM Lane V/C Ratio	0.001	0.015	-	-	-	-	-	0.011
HCM Control Delay (s)	8.8	7.3	0	-	0	-	-	9.6
HCM Lane LOS	A	A	A	-	A	-	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0

Intersection	
Int Delay, s/veh	1.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	91	38	0	22	7
Future Vol, veh/h	0	91	38	0	22	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	99	41	0	24	8

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	41	0	-	0	140	41
Stage 1	-	-	-	-	41	-
Stage 2	-	-	-	-	99	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1568	-	-	-	853	1030
Stage 1	-	-	-	-	981	-
Stage 2	-	-	-	-	925	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1568	-	-	-	853	1030
Mov Cap-2 Maneuver	-	-	-	-	853	-
Stage 1	-	-	-	-	981	-
Stage 2	-	-	-	-	925	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	9.2
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1568	-	-	-	890
HCM Lane V/C Ratio	-	-	-	-	0.035
HCM Control Delay (s)	0	-	-	-	9.2
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Appendix N

Year 2017 + Project Construction + Cumulative Intersection LOS Calculations

Intersection	
Int Delay, s/veh	4.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	171	0	93	12	110	0	0	246	78
Future Vol, veh/h	0	0	0	171	0	93	12	110	0	0	246	78
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	Yield	-	-	None	-	-	None
Storage Length	-	-	-	-	-	50	-	-	-	-	-	-
Veh in Median Storage, #	-	-	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	186	0	101	13	120	0	0	267	85

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	456	498	120	352	0	-	-	-	0
Stage 1	146	146	-	-	-	-	-	-	-
Stage 2	310	352	-	-	-	-	-	-	-
Critical Hdwy	6.42	6.52	6.22	4.12	-	-	-	-	-
Critical Hdwy Stg 1	5.42	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.42	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	2.218	-	-	-	-	-
Pot Cap-1 Maneuver	562	474	931	1207	-	0	0	-	-
Stage 1	881	776	-	-	-	0	0	-	-
Stage 2	744	632	-	-	-	0	0	-	-
Platoon blocked, %					-			-	-
Mov Cap-1 Maneuver	555	0	931	1207	-	-	-	-	-
Mov Cap-2 Maneuver	555	0	-	-	-	-	-	-	-
Stage 1	870	0	-	-	-	-	-	-	-
Stage 2	744	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.8	0.8	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	WBLn1	WBLn2	SBT	SBR
Capacity (veh/h)	1207	-	555	931	-	-
HCM Lane V/C Ratio	0.011	-	0.335	0.109	-	-
HCM Control Delay (s)	8	0	14.7	9.3	-	-
HCM Lane LOS	A	A	B	A	-	-
HCM 95th %tile Q(veh)	0	-	1.5	0.4	-	-

Intersection	
Int Delay, s/veh	3.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	57	1	57	0	0	0	0	57	23	106	286	0
Future Vol, veh/h	57	1	57	0	0	0	0	57	23	106	286	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	None
Storage Length	-	-	50	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	62	1	62	0	0	0	0	62	25	115	311	0

Major/Minor	Minor2						Major1			Major2		
Conflicting Flow All	616	628	311				-	0	0	87	0	0
Stage 1	541	541	-				-	-	-	-	-	-
Stage 2	75	87	-				-	-	-	-	-	-
Critical Hdwy	6.42	6.52	6.22				-	-	-	4.12	-	-
Critical Hdwy Stg 1	5.42	5.52	-				-	-	-	-	-	-
Critical Hdwy Stg 2	5.42	5.52	-				-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318				-	-	-	2.218	-	-
Pot Cap-1 Maneuver	454	400	729				0	-	-	1509	-	0
Stage 1	583	521	-				0	-	-	-	-	0
Stage 2	948	823	-				0	-	-	-	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	412	0	729				-	-	-	1509	-	-
Mov Cap-2 Maneuver	412	0	-				-	-	-	-	-	-
Stage 1	529	0	-				-	-	-	-	-	-
Stage 2	948	0	-				-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.9	0	2.1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	EBLn2	SBL	SBT
Capacity (veh/h)	-	-	412	729	1509	-
HCM Lane V/C Ratio	-	-	0.153	0.085	0.076	-
HCM Control Delay (s)	-	-	15.3	10.4	7.6	0
HCM Lane LOS	-	-	C	B	A	A
HCM 95th %tile Q(veh)	-	-	0.5	0.3	0.2	-

Intersection	
Int Delay, s/veh	9.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	16	13	2	1	47	35	4	3	1	199	7	158
Future Vol, veh/h	16	13	2	1	47	35	4	3	1	199	7	158
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	17	14	2	1	51	38	4	3	1	216	8	172

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	89	0	0	16	0	0	211	140	15	123	122	70
Stage 1	-	-	-	-	-	-	49	49	-	72	72	-
Stage 2	-	-	-	-	-	-	162	91	-	51	50	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1506	-	-	1602	-	-	746	751	1065	852	768	993
Stage 1	-	-	-	-	-	-	964	854	-	938	835	-
Stage 2	-	-	-	-	-	-	840	820	-	962	853	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1506	-	-	1602	-	-	606	742	1065	841	759	993
Mov Cap-2 Maneuver	-	-	-	-	-	-	606	742	-	841	759	-
Stage 1	-	-	-	-	-	-	953	845	-	928	834	-
Stage 2	-	-	-	-	-	-	688	819	-	947	844	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	3.8	0.1	10.3	12.1
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	691	1506	-	-	1602	-	-	899
HCM Lane V/C Ratio	0.013	0.012	-	-	0.001	-	-	0.44
HCM Control Delay (s)	10.3	7.4	0	-	7.2	0	-	12.1
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	2.3

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	1	1	0	89	0	1	1	1	0	0	0
Future Vol, veh/h	0	1	1	0	89	0	1	1	1	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	1	1	0	97	0	1	1	1	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	97	0	0	2	0	0	99	99	2	100	99	97
Stage 1	-	-	-	-	-	-	2	2	-	97	97	-
Stage 2	-	-	-	-	-	-	97	97	-	3	2	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1496	-	-	1620	-	-	883	791	1082	881	791	959
Stage 1	-	-	-	-	-	-	1021	894	-	910	815	-
Stage 2	-	-	-	-	-	-	910	815	-	1020	894	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1496	-	-	1620	-	-	883	791	1082	879	791	959
Mov Cap-2 Maneuver	-	-	-	-	-	-	883	791	-	879	791	-
Stage 1	-	-	-	-	-	-	1021	894	-	910	815	-
Stage 2	-	-	-	-	-	-	910	815	-	1018	894	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0	9	0
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	903	1496	-	-	1620	-	-	-
HCM Lane V/C Ratio	0.004	-	-	-	-	-	-	-
HCM Control Delay (s)	9	0	-	-	0	-	-	0
HCM Lane LOS	A	A	-	-	A	-	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	-

Intersection	
Int Delay, s/veh	3.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	3	3	0	1	0	6	44	12	0	28	33	46
Future Vol, veh/h	3	3	0	1	0	6	44	12	0	28	33	46
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	3	3	0	1	0	7	48	13	0	30	36	50

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	234	230	61	232	255	13	86	0	0	13	0	0
Stage 1	121	121	-	109	109	-	-	-	-	-	-	-
Stage 2	113	109	-	123	146	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	721	670	1004	723	649	1067	1510	-	-	1606	-	-
Stage 1	883	796	-	896	805	-	-	-	-	-	-	-
Stage 2	892	805	-	881	776	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	689	636	1004	692	616	1067	1510	-	-	1606	-	-
Mov Cap-2 Maneuver	689	636	-	692	616	-	-	-	-	-	-	-
Stage 1	855	780	-	867	779	-	-	-	-	-	-	-
Stage 2	858	779	-	860	760	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	10.5	8.7	5.9	1.9
HCM LOS	B	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1510	-	-	661	990	1606	-	-
HCM Lane V/C Ratio	0.032	-	-	0.01	0.008	0.019	-	-
HCM Control Delay (s)	7.5	0	-	10.5	8.7	7.3	0	-
HCM Lane LOS	A	A	-	B	A	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0	0	0.1	-	-

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	3	55	47	31	4	5
Future Vol, veh/h	3	55	47	31	4	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	3	60	51	34	4	5

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	85	0	-	0	134	68
Stage 1	-	-	-	-	68	-
Stage 2	-	-	-	-	66	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1512	-	-	-	860	995
Stage 1	-	-	-	-	955	-
Stage 2	-	-	-	-	957	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1512	-	-	-	858	995
Mov Cap-2 Maneuver	-	-	-	-	858	-
Stage 1	-	-	-	-	953	-
Stage 2	-	-	-	-	957	-

Approach	EB	WB	SB
HCM Control Delay, s	0.4	0	8.9
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1512	-	-	-	929
HCM Lane V/C Ratio	0.002	-	-	-	0.011
HCM Control Delay (s)	7.4	0	-	-	8.9
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

Intersection	
Int Delay, s/veh	1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	59	0	1	68	0	12	1	1	0	0	0
Future Vol, veh/h	0	59	0	1	68	0	12	1	1	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	64	0	1	74	0	13	1	1	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	74	0	0	64	0	0	140	140	64	141	140	74
Stage 1	-	-	-	-	-	-	64	64	-	76	76	-
Stage 2	-	-	-	-	-	-	76	76	-	65	64	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1526	-	-	1538	-	-	830	751	1000	829	751	988
Stage 1	-	-	-	-	-	-	947	842	-	933	832	-
Stage 2	-	-	-	-	-	-	933	832	-	946	842	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1526	-	-	1538	-	-	829	750	1000	827	750	988
Mov Cap-2 Maneuver	-	-	-	-	-	-	829	750	-	827	750	-
Stage 1	-	-	-	-	-	-	947	842	-	933	831	-
Stage 2	-	-	-	-	-	-	932	831	-	944	842	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.1	9.4	0
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	833	1526	-	-	1538	-	-	-
HCM Lane V/C Ratio	0.018	-	-	-	0.001	-	-	-
HCM Control Delay (s)	9.4	0	-	-	7.3	0	-	0
HCM Lane LOS	A	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	-

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	59	80	0	0	0
Future Vol, veh/h	0	59	80	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	64	87	0	0	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	87	0	-	0	151	87
Stage 1	-	-	-	-	87	-
Stage 2	-	-	-	-	64	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1509	-	-	-	841	971
Stage 1	-	-	-	-	936	-
Stage 2	-	-	-	-	959	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1509	-	-	-	841	971
Mov Cap-2 Maneuver	-	-	-	-	841	-
Stage 1	-	-	-	-	936	-
Stage 2	-	-	-	-	959	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	0
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1509	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	-	-	0
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	-

Intersection	
Int Delay, s/veh	2.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	21	0	105	56	214	0	0	216	54
Future Vol, veh/h	0	0	0	21	0	105	56	214	0	0	216	54
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	Yield	-	-	None	-	-	None
Storage Length	-	-	-	-	-	50	-	-	-	-	-	-
Veh in Median Storage, #	-	-	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	23	0	114	61	233	0	0	235	59

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	620	649	233	294	0	-	-	-	0
Stage 1	355	355	-	-	-	-	-	-	-
Stage 2	265	294	-	-	-	-	-	-	-
Critical Hdwy	6.42	6.52	6.22	4.12	-	-	-	-	-
Critical Hdwy Stg 1	5.42	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.42	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	2.218	-	-	-	-	-
Pot Cap-1 Maneuver	452	389	806	1268	-	0	0	-	-
Stage 1	710	630	-	-	-	0	0	-	-
Stage 2	779	670	-	-	-	0	0	-	-
Platoon blocked, %					-			-	-
Mov Cap-1 Maneuver	427	0	806	1268	-	-	-	-	-
Mov Cap-2 Maneuver	427	0	-	-	-	-	-	-	-
Stage 1	671	0	-	-	-	-	-	-	-
Stage 2	779	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.8	1.7	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	WBLn1	WBLn2	SBT	SBR
Capacity (veh/h)	1268	-	427	806	-	-
HCM Lane V/C Ratio	0.048	-	0.053	0.142	-	-
HCM Control Delay (s)	8	0	13.9	10.2	-	-
HCM Lane LOS	A	A	B	B	-	-
HCM 95th %tile Q(veh)	0.2	-	0.2	0.5	-	-

Intersection	
Int Delay, s/veh	5.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	95	0	6	0	0	0	0	184	152	188	49	0
Future Vol, veh/h	95	0	6	0	0	0	0	184	152	188	49	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	None
Storage Length	-	-	50	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	103	0	7	0	0	0	0	200	165	204	53	0

Major/Minor	Minor2						Major1			Major2		
Conflicting Flow All	744	826	53				-	0	0	365	0	0
Stage 1	461	461	-				-	-	-	-	-	-
Stage 2	283	365	-				-	-	-	-	-	-
Critical Hdwy	6.42	6.52	6.22				-	-	-	4.12	-	-
Critical Hdwy Stg 1	5.42	5.52	-				-	-	-	-	-	-
Critical Hdwy Stg 2	5.42	5.52	-				-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318				-	-	-	2.218	-	-
Pot Cap-1 Maneuver	382	307	1014				0	-	-	1194	-	0
Stage 1	635	565	-				0	-	-	-	-	0
Stage 2	765	623	-				0	-	-	-	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	315	0	1014				-	-	-	1194	-	-
Mov Cap-2 Maneuver	315	0	-				-	-	-	-	-	-
Stage 1	523	0	-				-	-	-	-	-	-
Stage 2	765	0	-				-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	21.1	0	6.9
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	EBLn2	SBL	SBT
Capacity (veh/h)	-	-	315	1014	1194	-
HCM Lane V/C Ratio	-	-	0.328	0.006	0.171	-
HCM Control Delay (s)	-	-	21.9	8.6	8.6	0
HCM Lane LOS	-	-	C	A	A	A
HCM 95th %tile Q(veh)	-	-	1.4	0	0.6	-

Intersection	
Int Delay, s/veh	5.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	169	61	1	0	7	159	5	5	1	57	1	8
Future Vol, veh/h	169	61	1	0	7	159	5	5	1	57	1	8
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	184	66	1	0	8	173	5	5	1	62	1	9

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	181	0	0	67	0	0	535	616	67	533	530	95
Stage 1	-	-	-	-	-	-	435	435	-	95	95	-
Stage 2	-	-	-	-	-	-	100	181	-	438	435	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1394	-	-	1535	-	-	456	406	997	458	455	962
Stage 1	-	-	-	-	-	-	600	580	-	912	816	-
Stage 2	-	-	-	-	-	-	906	750	-	597	580	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1394	-	-	1535	-	-	404	350	997	405	393	962
Mov Cap-2 Maneuver	-	-	-	-	-	-	404	350	-	405	393	-
Stage 1	-	-	-	-	-	-	518	501	-	787	816	-
Stage 2	-	-	-	-	-	-	897	750	-	509	501	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	5.8	0	14.3	14.9
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	398	1394	-	-	1535	-	-	435
HCM Lane V/C Ratio	0.03	0.132	-	-	-	-	-	0.165
HCM Control Delay (s)	14.3	8	0	-	0	-	-	14.9
HCM Lane LOS	B	A	A	-	A	-	-	B
HCM 95th %tile Q(veh)	0.1	0.5	-	-	0	-	-	0.6

Intersection	
Int Delay, s/veh	0.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	91	0	1	1	0	0	0	0	1	0	0
Future Vol, veh/h	0	91	0	1	1	0	0	0	0	1	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	99	0	1	1	0	0	0	0	1	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1	0	0	99	0	0	102	102	99	102	102	1
Stage 1	-	-	-	-	-	-	99	99	-	3	3	-
Stage 2	-	-	-	-	-	-	3	3	-	99	99	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1622	-	-	1494	-	-	879	788	957	879	788	1084
Stage 1	-	-	-	-	-	-	907	813	-	1020	893	-
Stage 2	-	-	-	-	-	-	1020	893	-	907	813	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1622	-	-	1494	-	-	878	787	957	878	787	1084
Mov Cap-2 Maneuver	-	-	-	-	-	-	878	787	-	878	787	-
Stage 1	-	-	-	-	-	-	907	813	-	1020	892	-
Stage 2	-	-	-	-	-	-	1019	892	-	907	813	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	3.7	0	9.1
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	1622	-	-	1494	-	-	878
HCM Lane V/C Ratio	-	-	-	-	0.001	-	-	0.001
HCM Control Delay (s)	0	0	-	-	7.4	0	-	9.1
HCM Lane LOS	A	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	-	0	-	-	0	-	-	0

Intersection	
Int Delay, s/veh	7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	44	3	45	12	4	20	0	27	0	3	11	0
Future Vol, veh/h	44	3	45	12	4	20	0	27	0	3	11	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	48	3	49	13	4	22	0	29	0	3	12	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	60	47	12	73	47	29	12	0	0	29	0	0
Stage 1	18	18	-	29	29	-	-	-	-	-	-	-
Stage 2	42	29	-	44	18	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	936	845	1069	918	845	1046	1607	-	-	1584	-	-
Stage 1	1001	880	-	988	871	-	-	-	-	-	-	-
Stage 2	972	871	-	970	880	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	912	843	1069	872	843	1046	1607	-	-	1584	-	-
Mov Cap-2 Maneuver	912	843	-	872	843	-	-	-	-	-	-	-
Stage 1	1001	878	-	988	871	-	-	-	-	-	-	-
Stage 2	947	871	-	920	878	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9.1	8.9	0	1.6
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1607	-	-	980	957	1584	-	-
HCM Lane V/C Ratio	-	-	-	0.102	0.041	0.002	-	-
HCM Control Delay (s)	0	-	-	9.1	8.9	7.3	0	-
HCM Lane LOS	A	-	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.3	0.1	0	-	-

Intersection	
Int Delay, s/veh	2.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	60	49	11	33	2
Future Vol, veh/h	0	60	49	11	33	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	65	53	12	36	2

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	65	0	-	0	124	59
Stage 1	-	-	-	-	59	-
Stage 2	-	-	-	-	65	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1537	-	-	-	871	1007
Stage 1	-	-	-	-	964	-
Stage 2	-	-	-	-	958	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1537	-	-	-	871	1007
Mov Cap-2 Maneuver	-	-	-	-	871	-
Stage 1	-	-	-	-	964	-
Stage 2	-	-	-	-	958	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	9.3
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1537	-	-	-	878
HCM Lane V/C Ratio	-	-	-	-	0.043
HCM Control Delay (s)	0	-	-	-	9.3
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	94	0	0	59	0	0	0	1	0	0	1
Future Vol, veh/h	0	94	0	0	59	0	0	0	1	0	0	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	102	0	0	64	0	0	0	1	0	0	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	64	0	0	102	0	0	167	166	102	167	166	64
Stage 1	-	-	-	-	-	-	102	102	-	64	64	-
Stage 2	-	-	-	-	-	-	65	64	-	103	102	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1538	-	-	1490	-	-	797	727	953	797	727	1000
Stage 1	-	-	-	-	-	-	904	811	-	947	842	-
Stage 2	-	-	-	-	-	-	946	842	-	903	811	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1538	-	-	1490	-	-	796	727	953	796	727	1000
Mov Cap-2 Maneuver	-	-	-	-	-	-	796	727	-	796	727	-
Stage 1	-	-	-	-	-	-	904	811	-	947	842	-
Stage 2	-	-	-	-	-	-	945	842	-	902	811	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0	8.8	8.6
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	953	1538	-	-	1490	-	-	1000
HCM Lane V/C Ratio	0.001	-	-	-	-	-	-	0.001
HCM Control Delay (s)	8.8	0	-	-	0	-	-	8.6
HCM Lane LOS	A	A	-	-	A	-	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0

Intersection						
Int Delay, s/veh	0					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	94	60	0	0	0
Future Vol, veh/h	0	94	60	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	102	65	0	0	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	65	0	-	0	167	65
Stage 1	-	-	-	-	65	-
Stage 2	-	-	-	-	102	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1537	-	-	-	823	999
Stage 1	-	-	-	-	958	-
Stage 2	-	-	-	-	922	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1537	-	-	-	823	999
Mov Cap-2 Maneuver	-	-	-	-	823	-
Stage 1	-	-	-	-	958	-
Stage 2	-	-	-	-	922	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	0
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1537	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	-	-	0
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	-

Intersection	
Int Delay, s/veh	5.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	207	0	93	12	110	0	0	268	78
Future Vol, veh/h	0	0	0	207	0	93	12	110	0	0	268	78
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	Yield	-	-	None	-	-	None
Storage Length	-	-	-	-	-	50	-	-	-	-	-	-
Veh in Median Storage, #	-	-	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	225	0	101	13	120	0	0	291	85

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	480	522	120	376	0	-	-	-	0
Stage 1	146	146	-	-	-	-	-	-	-
Stage 2	334	376	-	-	-	-	-	-	-
Critical Hdwy	6.42	6.52	6.22	4.12	-	-	-	-	-
Critical Hdwy Stg 1	5.42	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.42	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	2.218	-	-	-	-	-
Pot Cap-1 Maneuver	545	459	931	1182	-	0	0	-	-
Stage 1	881	776	-	-	-	0	0	-	-
Stage 2	725	616	-	-	-	0	0	-	-
Platoon blocked, %					-			-	-
Mov Cap-1 Maneuver	538	0	931	1182	-	-	-	-	-
Mov Cap-2 Maneuver	538	0	-	-	-	-	-	-	-
Stage 1	870	0	-	-	-	-	-	-	-
Stage 2	725	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	14.2	0.8	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	WBLn1	WBLn2	SBT	SBR
Capacity (veh/h)	1182	-	538	931	-	-
HCM Lane V/C Ratio	0.011	-	0.418	0.109	-	-
HCM Control Delay (s)	8.1	0	16.4	9.3	-	-
HCM Lane LOS	A	A	C	A	-	-
HCM 95th %tile Q(veh)	0	-	2	0.4	-	-

Intersection	
Int Delay, s/veh	3.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	57	1	57	0	0	0	0	57	24	106	344	0
Future Vol, veh/h	57	1	57	0	0	0	0	57	24	106	344	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	None
Storage Length	-	-	50	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	62	1	62	0	0	0	0	62	26	115	374	0

Major/Minor	Minor2			Major1			Major2		
Conflicting Flow All	679	692	374	-	0	0	88	0	0
Stage 1	604	604	-	-	-	-	-	-	-
Stage 2	75	88	-	-	-	-	-	-	-
Critical Hdwy	6.42	6.52	6.22	-	-	-	4.12	-	-
Critical Hdwy Stg 1	5.42	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.42	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	-	-	-	2.218	-	-
Pot Cap-1 Maneuver	417	367	672	0	-	-	1508	-	0
Stage 1	546	488	-	0	-	-	-	-	0
Stage 2	948	822	-	0	-	-	-	-	0
Platoon blocked, %					-	-		-	
Mov Cap-1 Maneuver	377	0	672	-	-	-	1508	-	-
Mov Cap-2 Maneuver	377	0	-	-	-	-	-	-	-
Stage 1	494	0	-	-	-	-	-	-	-
Stage 2	948	0	-	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	13.7	0	1.8
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	EBLn2	SBL	SBT
Capacity (veh/h)	-	-	377	672	1508	-
HCM Lane V/C Ratio	-	-	0.167	0.092	0.076	-
HCM Control Delay (s)	-	-	16.5	10.9	7.6	0
HCM Lane LOS	-	-	C	B	A	A
HCM 95th %tile Q(veh)	-	-	0.6	0.3	0.2	-

Intersection	
Int Delay, s/veh	10.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	17	14	2	1	76	35	4	3	1	199	7	216
Future Vol, veh/h	17	14	2	1	76	35	4	3	1	199	7	216
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	18	15	2	1	83	38	4	3	1	216	8	235

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	121	0	0	17	0	0	278	175	16	158	157	102
Stage 1	-	-	-	-	-	-	52	52	-	104	104	-
Stage 2	-	-	-	-	-	-	226	123	-	54	53	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1467	-	-	1600	-	-	674	718	1063	808	735	953
Stage 1	-	-	-	-	-	-	961	852	-	902	809	-
Stage 2	-	-	-	-	-	-	777	794	-	958	851	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1467	-	-	1600	-	-	499	709	1063	797	725	953
Mov Cap-2 Maneuver	-	-	-	-	-	-	499	709	-	797	725	-
Stage 1	-	-	-	-	-	-	949	842	-	891	808	-
Stage 2	-	-	-	-	-	-	579	793	-	942	841	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	3.9	0.1	11	13.7
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	607	1467	-	-	1600	-	-	868
HCM Lane V/C Ratio	0.014	0.013	-	-	0.001	-	-	0.528
HCM Control Delay (s)	11	7.5	0	-	7.3	0	-	13.7
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	3.2

Intersection	
Int Delay, s/veh	1.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	2	1	43	132	0	1	1	2	0	0	0
Future Vol, veh/h	0	2	1	43	132	0	1	1	2	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	2	1	47	143	0	1	1	2	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	143	0	0	3	0	0	240	240	3	241	240	143
Stage 1	-	-	-	-	-	-	3	3	-	237	237	-
Stage 2	-	-	-	-	-	-	237	237	-	4	3	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1440	-	-	1619	-	-	714	661	1081	713	661	905
Stage 1	-	-	-	-	-	-	1020	893	-	766	709	-
Stage 2	-	-	-	-	-	-	766	709	-	1018	893	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1440	-	-	1619	-	-	697	640	1081	693	640	905
Mov Cap-2 Maneuver	-	-	-	-	-	-	697	640	-	693	640	-
Stage 1	-	-	-	-	-	-	1020	893	-	766	686	-
Stage 2	-	-	-	-	-	-	741	686	-	1015	893	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	1.8	9.4	0
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	825	1440	-	-	1619	-	-	-
HCM Lane V/C Ratio	0.005	-	-	-	0.029	-	-	-
HCM Control Delay (s)	9.4	0	-	-	7.3	0	-	0
HCM Lane LOS	A	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0.1	-	-	-

Intersection	
Int Delay, s/veh	2.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	3	0	1	0	6	44	12	0	28	33	132
Future Vol, veh/h	5	3	0	1	0	6	44	12	0	28	33	132
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	3	0	1	0	7	48	13	0	30	36	143

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	281	277	108	278	348	13	179	0	0	13	0	0
Stage 1	168	168	-	109	109	-	-	-	-	-	-	-
Stage 2	113	109	-	169	239	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	671	631	946	674	576	1067	1397	-	-	1606	-	-
Stage 1	834	759	-	896	805	-	-	-	-	-	-	-
Stage 2	892	805	-	833	708	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	639	596	946	643	544	1067	1397	-	-	1606	-	-
Mov Cap-2 Maneuver	639	596	-	643	544	-	-	-	-	-	-	-
Stage 1	805	743	-	865	777	-	-	-	-	-	-	-
Stage 2	856	777	-	812	693	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	10.9	8.7	6	1.1
HCM LOS	B	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1397	-	-	622	975	1606	-	-
HCM Lane V/C Ratio	0.034	-	-	0.014	0.008	0.019	-	-
HCM Control Delay (s)	7.7	0	-	10.9	8.7	7.3	0	-
HCM Lane LOS	A	A	-	B	A	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0	0	0.1	-	-

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	10	62	47	60	5	5
Future Vol, veh/h	10	62	47	60	5	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	67	51	65	5	5

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	116	0	-	0	173	84
Stage 1	-	-	-	-	84	-
Stage 2	-	-	-	-	89	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1473	-	-	-	817	975
Stage 1	-	-	-	-	939	-
Stage 2	-	-	-	-	934	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1473	-	-	-	810	975
Mov Cap-2 Maneuver	-	-	-	-	810	-
Stage 1	-	-	-	-	931	-
Stage 2	-	-	-	-	934	-

Approach	EB	WB	SB
HCM Control Delay, s	1	0	9.1
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1473	-	-	-	885
HCM Lane V/C Ratio	0.007	-	-	-	0.012
HCM Control Delay (s)	7.5	0	-	-	9.1
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

Intersection	
Int Delay, s/veh	1.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	60	0	1	97	7	12	1	1	0	0	22
Future Vol, veh/h	0	60	0	1	97	7	12	1	1	0	0	22
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	65	0	1	105	8	13	1	1	0	0	24

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	113	0	0	65	0	0	188	180	65	177	176	109
Stage 1	-	-	-	-	-	-	65	65	-	111	111	-
Stage 2	-	-	-	-	-	-	123	115	-	66	65	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1476	-	-	1537	-	-	772	714	999	785	717	945
Stage 1	-	-	-	-	-	-	946	841	-	894	804	-
Stage 2	-	-	-	-	-	-	881	800	-	945	841	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1476	-	-	1537	-	-	752	713	999	783	716	945
Mov Cap-2 Maneuver	-	-	-	-	-	-	752	713	-	783	716	-
Stage 1	-	-	-	-	-	-	946	841	-	894	803	-
Stage 2	-	-	-	-	-	-	858	799	-	943	841	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.1	9.8	8.9
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	762	1476	-	-	1537	-	-	945
HCM Lane V/C Ratio	0.02	-	-	-	0.001	-	-	0.025
HCM Control Delay (s)	9.8	0	-	-	7.3	0	-	8.9
HCM Lane LOS	A	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.1

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	7	60	109	22	0	0
Future Vol, veh/h	7	60	109	22	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	8	65	118	24	0	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	142	0	-	0	211	130
Stage 1	-	-	-	-	130	-
Stage 2	-	-	-	-	81	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1441	-	-	-	777	920
Stage 1	-	-	-	-	896	-
Stage 2	-	-	-	-	942	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1441	-	-	-	772	920
Mov Cap-2 Maneuver	-	-	-	-	772	-
Stage 1	-	-	-	-	891	-
Stage 2	-	-	-	-	942	-

Approach	EB	WB	SB
HCM Control Delay, s	0.8	0	0
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1441	-	-	-	-
HCM Lane V/C Ratio	0.005	-	-	-	-
HCM Control Delay (s)	7.5	0	-	-	0
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	-

Intersection	
Int Delay, s/veh	2.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	22	0	105	56	236	0	0	216	54
Future Vol, veh/h	0	0	0	22	0	105	56	236	0	0	216	54
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	Yield	-	-	None	-	-	None
Storage Length	-	-	-	-	-	50	-	-	-	-	-	-
Veh in Median Storage, #	-	-	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	24	0	114	61	257	0	0	235	59

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	644	673	257	294	0	-	-	-	0
Stage 1	379	379	-	-	-	-	-	-	-
Stage 2	265	294	-	-	-	-	-	-	-
Critical Hdwy	6.42	6.52	6.22	4.12	-	-	-	-	-
Critical Hdwy Stg 1	5.42	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.42	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	2.218	-	-	-	-	-
Pot Cap-1 Maneuver	437	377	782	1268	-	0	0	-	-
Stage 1	692	615	-	-	-	0	0	-	-
Stage 2	779	670	-	-	-	0	0	-	-
Platoon blocked, %					-			-	-
Mov Cap-1 Maneuver	413	0	782	1268	-	-	-	-	-
Mov Cap-2 Maneuver	413	0	-	-	-	-	-	-	-
Stage 1	653	0	-	-	-	-	-	-	-
Stage 2	779	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.1	1.5	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	WBLn1	WBLn2	SBT	SBR
Capacity (veh/h)	1268	-	413	782	-	-
HCM Lane V/C Ratio	0.048	-	0.058	0.146	-	-
HCM Control Delay (s)	8	0	14.3	10.4	-	-
HCM Lane LOS	A	A	B	B	-	-
HCM 95th %tile Q(veh)	0.2	-	0.2	0.5	-	-

Intersection	
Int Delay, s/veh	5.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	95	0	6	0	0	0	0	206	188	188	50	0
Future Vol, veh/h	95	0	6	0	0	0	0	206	188	188	50	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	None
Storage Length	-	-	50	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	103	0	7	0	0	0	0	224	204	204	54	0

Major/Minor	Minor2			Major1			Major2		
Conflicting Flow All	788	890	54	-	0	0	428	0	0
Stage 1	462	462	-	-	-	-	-	-	-
Stage 2	326	428	-	-	-	-	-	-	-
Critical Hdwy	6.42	6.52	6.22	-	-	-	4.12	-	-
Critical Hdwy Stg 1	5.42	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.42	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	-	-	-	2.218	-	-
Pot Cap-1 Maneuver	360	282	1013	0	-	-	1131	-	0
Stage 1	634	565	-	0	-	-	-	-	0
Stage 2	731	585	-	0	-	-	-	-	0
Platoon blocked, %					-	-		-	
Mov Cap-1 Maneuver	293	0	1013	-	-	-	1131	-	-
Mov Cap-2 Maneuver	293	0	-	-	-	-	-	-	-
Stage 1	516	0	-	-	-	-	-	-	-
Stage 2	731	0	-	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	22.9	0	7
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	EBLn2	SBL	SBT
Capacity (veh/h)	-	-	293	1013	1131	-
HCM Lane V/C Ratio	-	-	0.352	0.006	0.181	-
HCM Control Delay (s)	-	-	23.8	8.6	8.9	0
HCM Lane LOS	-	-	C	A	A	A
HCM 95th %tile Q(veh)	-	-	1.5	0	0.7	-

Intersection	
Int Delay, s/veh	5.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Vol, veh/h	227	90	1	0	8	159	5	5	1	57	1	9
Future Vol, veh/h	227	90	1	0	8	159	5	5	1	57	1	9
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	247	98	1	0	9	173	5	5	1	62	1	10

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	182	0	0	99	0	0	694	775	99	692	689	96
Stage 1	-	-	-	-	-	-	593	593	-	96	96	-
Stage 2	-	-	-	-	-	-	101	182	-	596	593	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1393	-	-	1494	-	-	357	329	957	358	369	960
Stage 1	-	-	-	-	-	-	492	493	-	911	815	-
Stage 2	-	-	-	-	-	-	905	749	-	490	493	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1393	-	-	1494	-	-	301	267	957	301	300	960
Mov Cap-2 Maneuver	-	-	-	-	-	-	301	267	-	301	300	-
Stage 1	-	-	-	-	-	-	400	400	-	740	815	-
Stage 2	-	-	-	-	-	-	895	749	-	392	400	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	5.8	0	17.4	18.9
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	302	1393	-	-	1494	-	-	332
HCM Lane V/C Ratio	0.04	0.177	-	-	-	-	-	0.219
HCM Control Delay (s)	17.4	8.1	0	-	0	-	-	18.9
HCM Lane LOS	C	A	A	-	A	-	-	C
HCM 95th %tile Q(veh)	0.1	0.6	-	-	0	-	-	0.8

Intersection	
Int Delay, s/veh	2.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	134	0	2	2	0	0	0	43	1	0	0
Future Vol, veh/h	0	134	0	2	2	0	0	0	43	1	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	146	0	2	2	0	0	0	47	1	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	2	0	0	146	0	0	152	152	146	176	152	2
Stage 1	-	-	-	-	-	-	146	146	-	6	6	-
Stage 2	-	-	-	-	-	-	6	6	-	170	146	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1620	-	-	1436	-	-	815	740	901	786	740	1082
Stage 1	-	-	-	-	-	-	857	776	-	1016	891	-
Stage 2	-	-	-	-	-	-	1016	891	-	832	776	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1620	-	-	1436	-	-	814	739	901	744	739	1082
Mov Cap-2 Maneuver	-	-	-	-	-	-	814	739	-	744	739	-
Stage 1	-	-	-	-	-	-	857	776	-	1016	890	-
Stage 2	-	-	-	-	-	-	1015	890	-	789	776	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	3.8	9.2	9.8
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	901	1620	-	-	1436	-	-	744
HCM Lane V/C Ratio	0.052	-	-	-	0.002	-	-	0.001
HCM Control Delay (s)	9.2	0	-	-	7.5	0	-	9.8
HCM Lane LOS	A	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	0.2	0	-	-	0	-	-	0

Intersection	
Int Delay, s/veh	8.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	130	3	45	12	4	20	0	27	0	3	11	2
Future Vol, veh/h	130	3	45	12	4	20	0	27	0	3	11	2
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	141	3	49	13	4	22	0	29	0	3	12	2

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	61	48	13	74	49	29	14	0	0	29	0	0
Stage 1	19	19	-	29	29	-	-	-	-	-	-	-
Stage 2	42	29	-	45	20	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	934	844	1067	916	843	1046	1604	-	-	1584	-	-
Stage 1	1000	880	-	988	871	-	-	-	-	-	-	-
Stage 2	972	871	-	969	879	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	910	842	1067	870	841	1046	1604	-	-	1584	-	-
Mov Cap-2 Maneuver	910	842	-	870	841	-	-	-	-	-	-	-
Stage 1	1000	878	-	988	871	-	-	-	-	-	-	-
Stage 2	947	871	-	919	877	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9.8	8.9	0	1.4
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1604	-	-	944	956	1584	-	-
HCM Lane V/C Ratio	-	-	-	0.205	0.041	0.002	-	-
HCM Control Delay (s)	0	-	-	9.8	8.9	7.3	0	-
HCM Lane LOS	A	-	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.8	0.1	0	-	-

Intersection	
Int Delay, s/veh	3.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	60	56	12	62	9
Future Vol, veh/h	0	60	56	12	62	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	65	61	13	67	10

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	74	0	-	0	133	68
Stage 1	-	-	-	-	68	-
Stage 2	-	-	-	-	65	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1526	-	-	-	861	995
Stage 1	-	-	-	-	955	-
Stage 2	-	-	-	-	958	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1526	-	-	-	861	995
Mov Cap-2 Maneuver	-	-	-	-	861	-
Stage 1	-	-	-	-	955	-
Stage 2	-	-	-	-	958	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	9.5
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1526	-	-	-	876
HCM Lane V/C Ratio	-	-	-	-	0.088
HCM Control Delay (s)	0	-	-	-	9.5
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.3

Intersection	
Int Delay, s/veh	1.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	22	123	0	0	60	0	0	0	1	7	0	1
Future Vol, veh/h	22	123	0	0	60	0	0	0	1	7	0	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	24	134	0	0	65	0	0	0	1	8	0	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	65	0	0	134	0	0	248	247	134	248	247	65
Stage 1	-	-	-	-	-	-	182	182	-	65	65	-
Stage 2	-	-	-	-	-	-	66	65	-	183	182	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1537	-	-	1451	-	-	706	655	915	706	655	999
Stage 1	-	-	-	-	-	-	820	749	-	946	841	-
Stage 2	-	-	-	-	-	-	945	841	-	819	749	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1537	-	-	1451	-	-	696	644	915	696	644	999
Mov Cap-2 Maneuver	-	-	-	-	-	-	696	644	-	696	644	-
Stage 1	-	-	-	-	-	-	806	736	-	930	841	-
Stage 2	-	-	-	-	-	-	944	841	-	804	736	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.1	0	8.9	10
HCM LOS			A	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	915	1537	-	-	1451	-	-	723
HCM Lane V/C Ratio	0.001	0.016	-	-	-	-	-	0.012
HCM Control Delay (s)	8.9	7.4	0	-	0	-	-	10
HCM Lane LOS	A	A	A	-	A	-	-	B
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0

Intersection						
Int Delay, s/veh	1.3					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	123	61	0	22	7
Future Vol, veh/h	0	123	61	0	22	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	134	66	0	24	8

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	66	0	-	0	200	66
Stage 1	-	-	-	-	66	-
Stage 2	-	-	-	-	134	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1536	-	-	-	789	998
Stage 1	-	-	-	-	957	-
Stage 2	-	-	-	-	892	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1536	-	-	-	789	998
Mov Cap-2 Maneuver	-	-	-	-	789	-
Stage 1	-	-	-	-	957	-
Stage 2	-	-	-	-	892	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	9.5
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1536	-	-	-	831
HCM Lane V/C Ratio	-	-	-	-	0.038
HCM Control Delay (s)	0	-	-	-	9.5
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Appendix O

Growth Factor Support Data

California County-Level Economic Forecast 2015 - 2040

September 2015

This publication was prepared for:

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Imperial County Economic Forecast

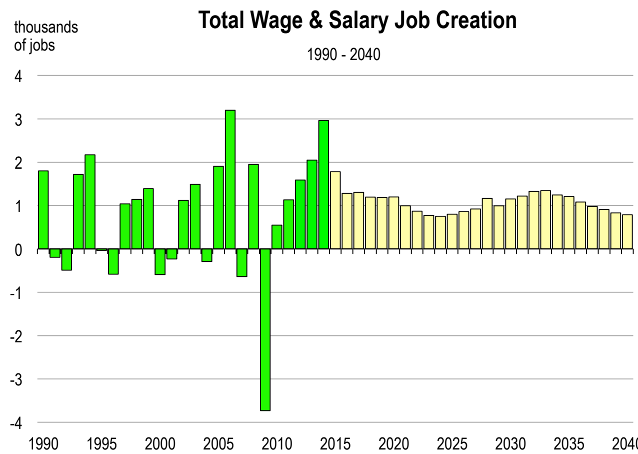
Imperial County is located at the extreme southeastern edge of California, adjacent to San Diego County. It is the home of the Salton Sea, the largest lake in the state. Imperial County has a population of 181,100 people and a total of 64,500 wage and salary jobs. The income per capita is $32,219 and the average salary per worker is $45,715, both of which represent the lowest levels among all Southern California counties.

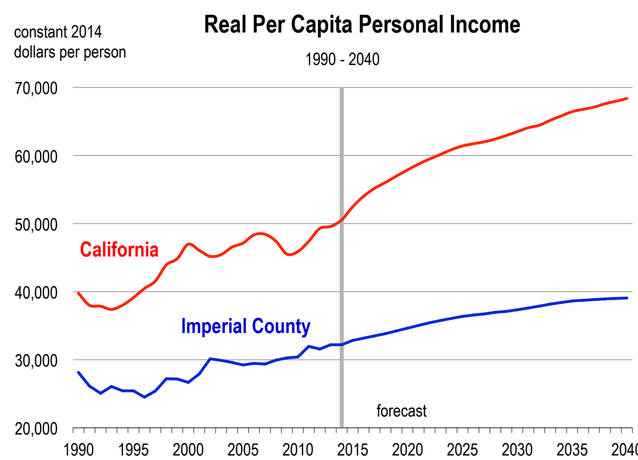
Imperial County's economy is heavily agricultural. With approximately 10,700 farm workers, the county is responsible for more than $2 billion of agricultural output per year. Its most prevalent commodities are cattle, alfalfa, broccoli, and lettuce. The public sector also plays a large role in the region's economy, and with 17,900 workers, it is the county's largest employment sector. A substantial number of the government jobs in Imperial County are related to the two state correctional facilities, which employ a combined total of 2,300 staff and house 6,700 inmates.

Across Southern California, employment increased by 2.6 percent in 2014. Imperial County gained 3,000 wage and salary jobs, representing a growth rate of 4.8 percent. Farm employment increased by 6.6 percent, while non-farm employment grew by 4.5 percent. Although the unemployment rate remains very high, it improved substantially, falling from 24.9 percent in 2013 to 23.6 percent in 2014.

In 2014, the largest employment gains were observed in wholesale and retail trade (+1,200 jobs), education and healthcare (+1,100 jobs), agriculture (+660 jobs), and construction (+340 jobs). The largest losses were observed in manufacturing (-800 jobs).

Between 2009 and 2014, the Imperial County population grew at an average rate of 0.9 percent per year. This growth was entirely due to the natural increase (new births), as overall net migration was negative.



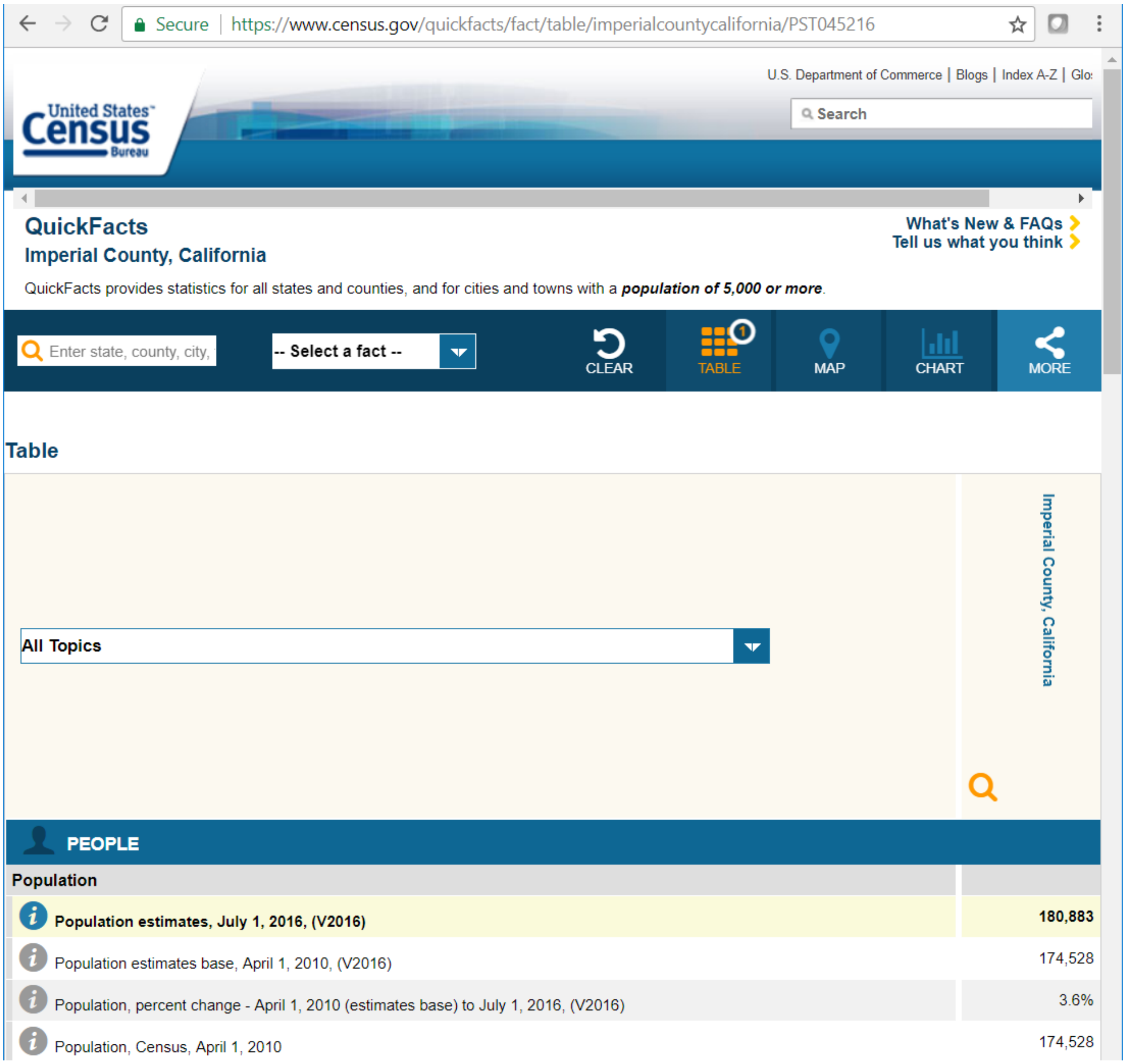


Forecast Highlights

- Total employment is expected to increase by 2.8 percent in 2015. From 2015 to 2020, the growth rate will average 1.8 percent per year. Over the same period, agricultural employment will be relatively flat.
- Average salaries are currently well below the California state average, and will remain so over the forecast horizon. Adjusted for inflation, average salaries in Imperial County will rise by an average of 0.9 percent per year from 2015 to 2020.
- The sectors that will create the most jobs between 2015 and 2020 are education and healthcare, government, and wholesale and retail trade. Together, these industries will account for 85 percent of net job creation in the county.
- The population will continue to grow faster than the state average. Annual growth in the 2015 to 2020 period will average 1.5 percent.
- Net migration is expected to turn positive in 2016. Over the 2015-2020 period, an average of 530 net migrants will enter the county each year.
- Real income per capita, adjusted for inflation, is projected to increase by 1.9 percent in 2015. Between 2015 and 2020, growth will average 1.1 percent per year.
- Total taxable sales, adjusted for inflation, are expected to increase by an average of 1.7 percent per year between 2015 and 2020.
- Industrial production is expected to increase by 4.9 percent in 2015. From 2015 to 2020, the growth rate of industrial production is expected to average 4.0 percent per year.
- Farm production is forecasted to increase by 0.3 percent per year between 2015 and 2020. The principal farm products in the county are cattle and leaf lettuce.

County	2010 Census Population	2016 Census Estimate Population
Imperial County	174,528	180,883
	10 Year Overall Percent Growth:	3.6%
	Average Percent Growth/Year:	**0.6%**

Source: Population data from U.S. Census Bureau (http://www.census.gov).



Appendix P

Year 2019 Intersection LOS Calculations

Intersection	
Int Delay, s/veh	3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	41	0	86	12	102	0	0	131	69
Future Vol, veh/h	0	0	0	41	0	86	12	102	0	0	131	69
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	Yield	-	-	None	-	-	None
Storage Length	-	-	-	-	-	50	-	-	-	-	-	-
Veh in Median Storage, #	-	-	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	45	0	93	13	111	0	0	142	75

Major/Minor				Minor1			Major1			Major2		
Conflicting Flow All				317	354	111	217	0	-	-	-	0
Stage 1				137	137	-	-	-	-	-	-	-
Stage 2				180	217	-	-	-	-	-	-	-
Critical Hdwy				6.42	6.52	6.22	4.12	-	-	-	-	-
Critical Hdwy Stg 1				5.42	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2				5.42	5.52	-	-	-	-	-	-	-
Follow-up Hdwy				3.518	4.018	3.318	2.218	-	-	-	-	-
Pot Cap-1 Maneuver				676	571	942	1353	-	0	0	-	-
Stage 1				890	783	-	-	-	0	0	-	-
Stage 2				851	723	-	-	-	0	0	-	-
Platoon blocked, %								-			-	-
Mov Cap-1 Maneuver				669	0	942	1353	-	-	-	-	-
Mov Cap-2 Maneuver				669	0	-	-	-	-	-	-	-
Stage 1				881	0	-	-	-	-	-	-	-
Stage 2				851	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.7	0.8	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	WBLn1	WBLn2	SBT	SBR
Capacity (veh/h)	1353	-	669	942	-	-
HCM Lane V/C Ratio	0.01	-	0.067	0.099	-	-
HCM Control Delay (s)	7.7	0	10.8	9.2	-	-
HCM Lane LOS	A	A	B	A	-	-
HCM 95th %tile Q(veh)	0	-	0.2	0.3	-	-

Intersection	
Int Delay, s/veh	4.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	59	1	9	0	0	0	0	58	21	78	89	0
Future Vol, veh/h	59	1	9	0	0	0	0	58	21	78	89	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	None
Storage Length	-	-	50	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	64	1	10	0	0	0	0	63	23	85	97	0

Major/Minor	Minor2						Major1			Major2		
Conflicting Flow All	342	353	97				-	0	0	86	0	0
Stage 1	267	267	-				-	-	-	-	-	-
Stage 2	75	86	-				-	-	-	-	-	-
Critical Hdwy	6.42	6.52	6.22				-	-	-	4.12	-	-
Critical Hdwy Stg 1	5.42	5.52	-				-	-	-	-	-	-
Critical Hdwy Stg 2	5.42	5.52	-				-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318				-	-	-	2.218	-	-
Pot Cap-1 Maneuver	654	572	959				0	-	-	1510	-	0
Stage 1	778	688	-				0	-	-	-	-	0
Stage 2	948	824	-				0	-	-	-	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	615	0	959				-	-	-	1510	-	-
Mov Cap-2 Maneuver	615	0	-				-	-	-	-	-	-
Stage 1	732	0	-				-	-	-	-	-	-
Stage 2	948	0	-				-	-	-	-	-	-

Approach	EB						NB			SB		
HCM Control Delay, s	11.1						0			3.5		
HCM LOS	B											

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	EBLn2	SBL	SBT
Capacity (veh/h)	-	-	615	959	1510	-
HCM Lane V/C Ratio	-	-	0.106	0.01	0.056	-
HCM Control Delay (s)	-	-	11.5	8.8	7.5	0
HCM Lane LOS	-	-	B	A	A	A
HCM 95th %tile Q(veh)	-	-	0.4	0	0.2	-

Intersection	
Int Delay, s/veh	6.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	15	13	2	1	16	34	4	3	1	80	7	12
Future Vol, veh/h	15	13	2	1	16	34	4	3	1	80	7	12
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	16	14	2	1	17	37	4	3	1	87	8	13

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	54	0	0	16	0	0	95	103	15	87	86	36
Stage 1	-	-	-	-	-	-	47	47	-	38	38	-
Stage 2	-	-	-	-	-	-	48	56	-	49	48	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1551	-	-	1602	-	-	888	787	1065	899	804	1037
Stage 1	-	-	-	-	-	-	967	856	-	977	863	-
Stage 2	-	-	-	-	-	-	965	848	-	964	855	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1551	-	-	1602	-	-	863	778	1065	887	795	1037
Mov Cap-2 Maneuver	-	-	-	-	-	-	863	778	-	887	795	-
Stage 1	-	-	-	-	-	-	957	847	-	967	862	-
Stage 2	-	-	-	-	-	-	944	847	-	950	846	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	3.7	0.1	9.3	9.6
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	848	1551	-	-	1602	-	-	895
HCM Lane V/C Ratio	0.01	0.011	-	-	0.001	-	-	0.12
HCM Control Delay (s)	9.3	7.3	0	-	7.2	0	-	9.6
HCM Lane LOS	A	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0.4

Intersection	
Int Delay, s/veh	4.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	1	1	0	1	0	1	1	1	0	0	0
Future Vol, veh/h	0	1	1	0	1	0	1	1	1	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	1	1	0	1	0	1	1	1	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1	0	0	2	0	0	3	3	2	4	3	1
Stage 1	-	-	-	-	-	-	2	2	-	1	1	-
Stage 2	-	-	-	-	-	-	1	1	-	3	2	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1622	-	-	1620	-	-	1019	893	1082	1017	893	1084
Stage 1	-	-	-	-	-	-	1021	894	-	1022	895	-
Stage 2	-	-	-	-	-	-	1022	895	-	1020	894	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1622	-	-	1620	-	-	1019	893	1082	1015	893	1084
Mov Cap-2 Maneuver	-	-	-	-	-	-	1019	893	-	1015	893	-
Stage 1	-	-	-	-	-	-	1021	894	-	1022	895	-
Stage 2	-	-	-	-	-	-	1022	895	-	1018	894	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0	8.6	0
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	992	1622	-	-	1620	-	-	-
HCM Lane V/C Ratio	0.003	-	-	-	-	-	-	-
HCM Control Delay (s)	8.6	0	-	-	0	-	-	0
HCM Lane LOS	A	A	-	-	A	-	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	-

Intersection	
Int Delay, s/veh	2.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Vol, veh/h	3	1	0	1	0	2	0	11	0	4	13	2
Future Vol, veh/h	3	1	0	1	0	2	0	11	0	4	13	2
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	3	1	0	1	0	2	0	12	0	4	14	2

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	36	35	15	36	36	12	16	0	0	12	0	0
Stage 1	23	23	-	12	12	-	-	-	-	-	-	-
Stage 2	13	12	-	24	24	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	970	857	1065	970	856	1069	1602	-	-	1607	-	-
Stage 1	995	876	-	1009	886	-	-	-	-	-	-	-
Stage 2	1007	886	-	994	875	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	966	854	1065	967	853	1069	1602	-	-	1607	-	-
Mov Cap-2 Maneuver	966	854	-	967	853	-	-	-	-	-	-	-
Stage 1	995	873	-	1009	886	-	-	-	-	-	-	-
Stage 2	1005	886	-	990	872	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	8.9	8.5	0	1.5
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1602	-	-	935	1033	1607	-	-
HCM Lane V/C Ratio	-	-	-	0.005	0.003	0.003	-	-
HCM Control Delay (s)	0	-	-	8.9	8.5	7.2	0	-
HCM Lane LOS	A	-	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0	0	-	-

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	3	34	45	4	2	5
Future Vol, veh/h	3	34	45	4	2	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	3	37	49	4	2	5

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	53	0	-	0	94	51
Stage 1	-	-	-	-	51	-
Stage 2	-	-	-	-	43	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1553	-	-	-	906	1017
Stage 1	-	-	-	-	971	-
Stage 2	-	-	-	-	979	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1553	-	-	-	904	1017
Mov Cap-2 Maneuver	-	-	-	-	904	-
Stage 1	-	-	-	-	969	-
Stage 2	-	-	-	-	979	-

Approach	EB	WB	SB
HCM Control Delay, s	0.6	0	8.7
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1553	-	-	-	982
HCM Lane V/C Ratio	0.002	-	-	-	0.008
HCM Control Delay (s)	7.3	0	-	-	8.7
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

Intersection	
Int Delay, s/veh	1.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	36	0	1	38	0	12	1	1	0	0	0
Future Vol, veh/h	0	36	0	1	38	0	12	1	1	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	39	0	1	41	0	13	1	1	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	41	0	0	39	0	0	82	82	39	83	82	41
Stage 1	-	-	-	-	-	-	39	39	-	43	43	-
Stage 2	-	-	-	-	-	-	43	43	-	40	39	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1568	-	-	1571	-	-	905	808	1033	904	808	1030
Stage 1	-	-	-	-	-	-	976	862	-	971	859	-
Stage 2	-	-	-	-	-	-	971	859	-	975	862	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1568	-	-	1571	-	-	904	807	1033	901	807	1030
Mov Cap-2 Maneuver	-	-	-	-	-	-	904	807	-	901	807	-
Stage 1	-	-	-	-	-	-	976	862	-	971	858	-
Stage 2	-	-	-	-	-	-	970	858	-	973	862	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.2	9.1	0
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	904	1568	-	-	1571	-	-	-
HCM Lane V/C Ratio	0.017	-	-	-	0.001	-	-	-
HCM Control Delay (s)	9.1	0	-	-	7.3	0	-	0
HCM Lane LOS	A	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	-

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	36	51	0	0	0
Future Vol, veh/h	0	36	51	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	39	55	0	0	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	55	0	-	0	94	55
Stage 1	-	-	-	-	55	-
Stage 2	-	-	-	-	39	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1550	-	-	-	906	1012
Stage 1	-	-	-	-	968	-
Stage 2	-	-	-	-	983	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1550	-	-	-	906	1012
Mov Cap-2 Maneuver	-	-	-	-	906	-
Stage 1	-	-	-	-	968	-
Stage 2	-	-	-	-	983	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	0
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1550	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	-	-	0
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	-

Intersection	
Int Delay, s/veh	2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	17	0	74	8	130	0	0	200	56
Future Vol, veh/h	0	0	0	17	0	74	8	130	0	0	200	56
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	Yield	-	-	None	-	-	None
Storage Length	-	-	-	-	-	50	-	-	-	-	-	-
Veh in Median Storage, #	-	-	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	18	0	80	9	141	0	0	217	61

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	407	437	141	278	0	-	-	-	0
Stage 1	159	159	-	-	-	-	-	-	-
Stage 2	248	278	-	-	-	-	-	-	-
Critical Hdwy	6.42	6.52	6.22	4.12	-	-	-	-	-
Critical Hdwy Stg 1	5.42	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.42	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	2.218	-	-	-	-	-
Pot Cap-1 Maneuver	600	513	907	1285	-	0	0	-	-
Stage 1	870	766	-	-	-	0	0	-	-
Stage 2	793	680	-	-	-	0	0	-	-
Platoon blocked, %					-			-	-
Mov Cap-1 Maneuver	595	0	907	1285	-	-	-	-	-
Mov Cap-2 Maneuver	595	0	-	-	-	-	-	-	-
Stage 1	863	0	-	-	-	-	-	-	-
Stage 2	793	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.7	0.5	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	WBLn1	WBLn2	SBT	SBR
Capacity (veh/h)	1285	-	595	907	-	-
HCM Lane V/C Ratio	0.007	-	0.031	0.089	-	-
HCM Control Delay (s)	7.8	0	11.2	9.4	-	-
HCM Lane LOS	A	A	B	A	-	-
HCM 95th %tile Q(veh)	0	-	0.1	0.3	-	-

Intersection	
Int Delay, s/veh	6.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	87	0	4	0	0	0	0	49	22	174	44	0
Future Vol, veh/h	87	0	4	0	0	0	0	49	22	174	44	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	None
Storage Length	-	-	50	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	95	0	4	0	0	0	0	53	24	189	48	0

Major/Minor	Minor2						Major1			Major2		
Conflicting Flow All	491	503	48				-	0	0	77	0	0
Stage 1	426	426	-				-	-	-	-	-	-
Stage 2	65	77	-				-	-	-	-	-	-
Critical Hdwy	6.42	6.52	6.22				-	-	-	4.12	-	-
Critical Hdwy Stg 1	5.42	5.52	-				-	-	-	-	-	-
Critical Hdwy Stg 2	5.42	5.52	-				-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318				-	-	-	2.218	-	-
Pot Cap-1 Maneuver	537	471	1021				0	-	-	1522	-	0
Stage 1	659	586	-				0	-	-	-	-	0
Stage 2	958	831	-				0	-	-	-	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	468	0	1021				-	-	-	1522	-	-
Mov Cap-2 Maneuver	468	0	-				-	-	-	-	-	-
Stage 1	575	0	-				-	-	-	-	-	-
Stage 2	958	0	-				-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	14.3	0	6.1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	EBLn2	SBL	SBT
Capacity (veh/h)	-	-	468	1021	1522	-
HCM Lane V/C Ratio	-	-	0.202	0.004	0.124	-
HCM Control Delay (s)	-	-	14.6	8.5	7.7	0
HCM Lane LOS	-	-	B	A	A	A
HCM 95th %tile Q(veh)	-	-	0.7	0	0.4	-

Intersection	
Int Delay, s/veh	5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	24	30	1	0	7	38	5	5	1	53	1	4
Future Vol, veh/h	24	30	1	0	7	38	5	5	1	53	1	4
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	26	33	1	0	8	41	5	5	1	58	1	4

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	49	0	0	34	0	0	117	135	34	118	115	29
Stage 1	-	-	-	-	-	-	86	86	-	29	29	-
Stage 2	-	-	-	-	-	-	31	49	-	89	86	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1558	-	-	1578	-	-	859	756	1039	858	775	1046
Stage 1	-	-	-	-	-	-	922	824	-	988	871	-
Stage 2	-	-	-	-	-	-	986	854	-	918	824	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1558	-	-	1578	-	-	844	743	1039	842	762	1046
Mov Cap-2 Maneuver	-	-	-	-	-	-	844	743	-	842	762	-
Stage 1	-	-	-	-	-	-	906	810	-	971	871	-
Stage 2	-	-	-	-	-	-	981	854	-	895	810	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	3.2	0	9.5	9.6
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	808	1558	-	-	1578	-	-	852
HCM Lane V/C Ratio	0.015	0.017	-	-	-	-	-	0.074
HCM Control Delay (s)	9.5	7.4	0	-	0	-	-	9.6
HCM Lane LOS	A	A	A	-	A	-	-	A
HCM 95th %tile Q(veh)	0	0.1	-	-	0	-	-	0.2

Intersection	
Int Delay, s/veh	2.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	3	0	1	1	0	0	0	0	1	0	0
Future Vol, veh/h	0	3	0	1	1	0	0	0	0	1	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	3	0	1	1	0	0	0	0	1	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1	0	0	3	0	0	6	6	3	6	6	1
Stage 1	-	-	-	-	-	-	3	3	-	3	3	-
Stage 2	-	-	-	-	-	-	3	3	-	3	3	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1622	-	-	1619	-	-	1014	889	1081	1014	889	1084
Stage 1	-	-	-	-	-	-	1020	893	-	1020	893	-
Stage 2	-	-	-	-	-	-	1020	893	-	1020	893	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1622	-	-	1619	-	-	1013	888	1081	1013	888	1084
Mov Cap-2 Maneuver	-	-	-	-	-	-	1013	888	-	1013	888	-
Stage 1	-	-	-	-	-	-	1020	893	-	1020	892	-
Stage 2	-	-	-	-	-	-	1019	892	-	1020	893	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	3.6	0	8.6
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	1622	-	-	1619	-	-	1013
HCM Lane V/C Ratio	-	-	-	-	0.001	-	-	0.001
HCM Control Delay (s)	0	0	-	-	7.2	0	-	8.6
HCM Lane LOS	A	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	-	0	-	-	0	-	-	0

Intersection	
Int Delay, s/veh	3.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Vol, veh/h	0	3	1	2	2	0	0	7	0	3	10	0
Future Vol, veh/h	0	3	1	2	2	0	0	7	0	3	10	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	3	1	2	2	0	0	8	0	3	11	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	26	25	11	27	25	8	11	0	0	8	0	0
Stage 1	17	17	-	8	8	-	-	-	-	-	-	-
Stage 2	9	8	-	19	17	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	984	868	1070	983	868	1074	1608	-	-	1612	-	-
Stage 1	1002	881	-	1013	889	-	-	-	-	-	-	-
Stage 2	1012	889	-	1000	881	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	981	866	1070	978	866	1074	1608	-	-	1612	-	-
Mov Cap-2 Maneuver	981	866	-	978	866	-	-	-	-	-	-	-
Stage 1	1002	879	-	1013	889	-	-	-	-	-	-	-
Stage 2	1010	889	-	993	879	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9	8.9	0	1.7
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1608	-	-	909	919	1612	-	-
HCM Lane V/C Ratio	-	-	-	0.005	0.005	0.002	-	-
HCM Control Delay (s)	0	-	-	9	8.9	7.2	0	-
HCM Lane LOS	A	-	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0	0	-	-

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	57	28	10	6	2
Future Vol, veh/h	0	57	28	10	6	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	62	30	11	7	2

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	41	0	-	0	98	36
Stage 1	-	-	-	-	36	-
Stage 2	-	-	-	-	62	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1568	-	-	-	901	1037
Stage 1	-	-	-	-	986	-
Stage 2	-	-	-	-	961	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1568	-	-	-	901	1037
Mov Cap-2 Maneuver	-	-	-	-	901	-
Stage 1	-	-	-	-	986	-
Stage 2	-	-	-	-	961	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	8.9
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1568	-	-	-	932
HCM Lane V/C Ratio	-	-	-	-	0.009
HCM Control Delay (s)	0	-	-	-	8.9
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

Intersection	
Int Delay, s/veh	0.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	64	0	0	37	0	0	0	1	0	0	1
Future Vol, veh/h	0	64	0	0	37	0	0	0	1	0	0	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	70	0	0	40	0	0	0	1	0	0	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	40	0	0	70	0	0	111	110	70	111	110	40
Stage 1	-	-	-	-	-	-	70	70	-	40	40	-
Stage 2	-	-	-	-	-	-	41	40	-	71	70	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1570	-	-	1531	-	-	867	780	993	867	780	1031
Stage 1	-	-	-	-	-	-	940	837	-	975	862	-
Stage 2	-	-	-	-	-	-	974	862	-	939	837	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1570	-	-	1531	-	-	866	780	993	866	780	1031
Mov Cap-2 Maneuver	-	-	-	-	-	-	866	780	-	866	780	-
Stage 1	-	-	-	-	-	-	940	837	-	975	862	-
Stage 2	-	-	-	-	-	-	973	862	-	938	837	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0	8.6	8.5
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	993	1570	-	-	1531	-	-	1031
HCM Lane V/C Ratio	0.001	-	-	-	-	-	-	0.001
HCM Control Delay (s)	8.6	0	-	-	0	-	-	8.5
HCM Lane LOS	A	A	-	-	A	-	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	64	38	0	0	0
Future Vol, veh/h	0	64	38	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	70	41	0	0	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	41	0	-	0	111	41
Stage 1	-	-	-	-	41	-
Stage 2	-	-	-	-	70	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1568	-	-	-	886	1030
Stage 1	-	-	-	-	981	-
Stage 2	-	-	-	-	953	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1568	-	-	-	886	1030
Mov Cap-2 Maneuver	-	-	-	-	886	-
Stage 1	-	-	-	-	981	-
Stage 2	-	-	-	-	953	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	0
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1568	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	-	-	0
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	-

Appendix Q

Year 2019 + Project Construction Intersection LOS Calculations

Intersection	
Int Delay, s/veh	3.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	77	0	86	12	102	0	0	153	69
Future Vol, veh/h	0	0	0	77	0	86	12	102	0	0	153	69
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	Yield	-	-	None	-	-	None
Storage Length	-	-	-	-	-	50	-	-	-	-	-	-
Veh in Median Storage, #	-	-	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	84	0	93	13	111	0	0	166	75

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	341	378	111	241	0	-	-	-	0
Stage 1	137	137	-	-	-	-	-	-	-
Stage 2	204	241	-	-	-	-	-	-	-
Critical Hdwy	6.42	6.52	6.22	4.12	-	-	-	-	-
Critical Hdwy Stg 1	5.42	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.42	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	2.218	-	-	-	-	-
Pot Cap-1 Maneuver	655	554	942	1326	-	0	0	-	-
Stage 1	890	783	-	-	-	0	0	-	-
Stage 2	830	706	-	-	-	0	0	-	-
Platoon blocked, %					-			-	-
Mov Cap-1 Maneuver	648	0	942	1326	-	-	-	-	-
Mov Cap-2 Maneuver	648	0	-	-	-	-	-	-	-
Stage 1	881	0	-	-	-	-	-	-	-
Stage 2	830	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.2	0.8	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	WBLn1	WBLn2	SBT	SBR
Capacity (veh/h)	1326	-	648	942	-	-
HCM Lane V/C Ratio	0.01	-	0.129	0.099	-	-
HCM Control Delay (s)	7.7	0	11.4	9.2	-	-
HCM Lane LOS	A	A	B	A	-	-
HCM 95th %tile Q(veh)	0	-	0.4	0.3	-	-

Intersection	
Int Delay, s/veh	3.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	59	1	9	0	0	0	0	58	22	78	147	0
Future Vol, veh/h	59	1	9	0	0	0	0	58	22	78	147	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	None
Storage Length	-	-	50	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	64	1	10	0	0	0	0	63	24	85	160	0

Major/Minor	Minor2			Major1			Major2		
Conflicting Flow All	405	417	160	-	0	0	87	0	0
Stage 1	330	330	-	-	-	-	-	-	-
Stage 2	75	87	-	-	-	-	-	-	-
Critical Hdwy	6.42	6.52	6.22	-	-	-	4.12	-	-
Critical Hdwy Stg 1	5.42	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.42	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	-	-	-	2.218	-	-
Pot Cap-1 Maneuver	602	527	885	0	-	-	1509	-	0
Stage 1	728	646	-	0	-	-	-	-	0
Stage 2	948	823	-	0	-	-	-	-	0
Platoon blocked, %					-	-		-	
Mov Cap-1 Maneuver	565	0	885	-	-	-	1509	-	-
Mov Cap-2 Maneuver	565	0	-	-	-	-	-	-	-
Stage 1	683	0	-	-	-	-	-	-	-
Stage 2	948	0	-	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11.8	0	2.6
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	EBLn2	SBL	SBT
Capacity (veh/h)	-	-	565	885	1509	-
HCM Lane V/C Ratio	-	-	0.115	0.011	0.056	-
HCM Control Delay (s)	-	-	12.2	9.1	7.5	0
HCM Lane LOS	-	-	B	A	A	A
HCM 95th %tile Q(veh)	-	-	0.4	0	0.2	-

Intersection	
Int Delay, s/veh	6.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	16	14	2	1	45	34	4	3	1	80	7	70
Future Vol, veh/h	16	14	2	1	45	34	4	3	1	80	7	70
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	17	15	2	1	49	37	4	3	1	87	8	76

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	86	0	0	17	0	0	162	138	16	122	121	68
Stage 1	-	-	-	-	-	-	50	50	-	70	70	-
Stage 2	-	-	-	-	-	-	112	88	-	52	51	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1510	-	-	1600	-	-	803	753	1063	853	769	995
Stage 1	-	-	-	-	-	-	963	853	-	940	837	-
Stage 2	-	-	-	-	-	-	893	822	-	961	852	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1510	-	-	1600	-	-	729	744	1063	842	760	995
Mov Cap-2 Maneuver	-	-	-	-	-	-	729	744	-	842	760	-
Stage 1	-	-	-	-	-	-	952	844	-	930	836	-
Stage 2	-	-	-	-	-	-	816	821	-	946	843	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	3.7	0.1	9.8	9.9
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	765	1510	-	-	1600	-	-	899
HCM Lane V/C Ratio	0.011	0.012	-	-	0.001	-	-	0.19
HCM Control Delay (s)	9.8	7.4	0	-	7.3	0	-	9.9
HCM Lane LOS	A	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0.7

Intersection	
Int Delay, s/veh	3.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	2	1	43	44	0	1	1	2	0	0	0
Future Vol, veh/h	0	2	1	43	44	0	1	1	2	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	2	1	47	48	0	1	1	2	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	48	0	0	3	0	0	145	145	3	146	145	48
Stage 1	-	-	-	-	-	-	3	3	-	142	142	-
Stage 2	-	-	-	-	-	-	142	142	-	4	3	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1559	-	-	1619	-	-	824	746	1081	823	746	1021
Stage 1	-	-	-	-	-	-	1020	893	-	861	779	-
Stage 2	-	-	-	-	-	-	861	779	-	1018	893	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1559	-	-	1619	-	-	805	724	1081	802	724	1021
Mov Cap-2 Maneuver	-	-	-	-	-	-	805	724	-	802	724	-
Stage 1	-	-	-	-	-	-	1020	893	-	861	756	-
Stage 2	-	-	-	-	-	-	835	756	-	1015	893	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	3.6	9	0
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	894	1559	-	-	1619	-	-	-
HCM Lane V/C Ratio	0.005	-	-	-	0.029	-	-	-
HCM Control Delay (s)	9	0	-	-	7.3	0	-	0
HCM Lane LOS	A	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0.1	-	-	-

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	1	0	1	0	2	0	11	0	4	13	88
Future Vol, veh/h	5	1	0	1	0	2	0	11	0	4	13	88
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	1	0	1	0	2	0	12	0	4	14	96

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	83	82	62	83	130	12	110	0	0	12	0	0
Stage 1	70	70	-	12	12	-	-	-	-	-	-	-
Stage 2	13	12	-	71	118	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	904	808	1003	904	761	1069	1480	-	-	1607	-	-
Stage 1	940	837	-	1009	886	-	-	-	-	-	-	-
Stage 2	1007	886	-	939	798	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	900	806	1003	901	759	1069	1480	-	-	1607	-	-
Mov Cap-2 Maneuver	900	806	-	901	759	-	-	-	-	-	-	-
Stage 1	940	834	-	1009	886	-	-	-	-	-	-	-
Stage 2	1005	886	-	935	796	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9.1	8.6	0	0.3
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1480	-	-	883	1006	1607	-	-
HCM Lane V/C Ratio	-	-	-	0.007	0.003	0.003	-	-
HCM Control Delay (s)	0	-	-	9.1	8.6	7.2	0	-
HCM Lane LOS	A	-	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0	0	-	-

Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	10	41	45	33	3	5
Future Vol, veh/h	10	41	45	33	3	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	45	49	36	3	5

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	85	0	-	0	134	67
Stage 1	-	-	-	-	67	-
Stage 2	-	-	-	-	67	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1512	-	-	-	860	997
Stage 1	-	-	-	-	956	-
Stage 2	-	-	-	-	956	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1512	-	-	-	854	997
Mov Cap-2 Maneuver	-	-	-	-	854	-
Stage 1	-	-	-	-	949	-
Stage 2	-	-	-	-	956	-

Approach	EB	WB	SB
HCM Control Delay, s	1.5	0	8.9
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1512	-	-	-	938
HCM Lane V/C Ratio	0.007	-	-	-	0.009
HCM Control Delay (s)	7.4	0	-	-	8.9
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

Intersection	
Int Delay, s/veh	2.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Vol, veh/h	0	37	0	1	67	7	12	1	1	0	0	22
Future Vol, veh/h	0	37	0	1	67	7	12	1	1	0	0	22
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	40	0	1	73	8	13	1	1	0	0	24

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	81	0	0	40	0	0	131	123	40	120	119	77
Stage 1	-	-	-	-	-	-	40	40	-	79	79	-
Stage 2	-	-	-	-	-	-	91	83	-	41	40	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1517	-	-	1570	-	-	841	767	1031	855	771	984
Stage 1	-	-	-	-	-	-	975	862	-	930	829	-
Stage 2	-	-	-	-	-	-	916	826	-	974	862	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1517	-	-	1570	-	-	820	766	1031	852	770	984
Mov Cap-2 Maneuver	-	-	-	-	-	-	820	766	-	852	770	-
Stage 1	-	-	-	-	-	-	975	862	-	930	828	-
Stage 2	-	-	-	-	-	-	893	825	-	972	862	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.1	9.4	8.8
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	828	1517	-	-	1570	-	-	984
HCM Lane V/C Ratio	0.018	-	-	-	0.001	-	-	0.024
HCM Control Delay (s)	9.4	0	-	-	7.3	0	-	8.8
HCM Lane LOS	A	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.1

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	7	37	80	22	0	0
Future Vol, veh/h	7	37	80	22	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	8	40	87	24	0	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	111	0	-	0	155	99
Stage 1	-	-	-	-	99	-
Stage 2	-	-	-	-	56	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1479	-	-	-	836	957
Stage 1	-	-	-	-	925	-
Stage 2	-	-	-	-	967	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1479	-	-	-	831	957
Mov Cap-2 Maneuver	-	-	-	-	831	-
Stage 1	-	-	-	-	919	-
Stage 2	-	-	-	-	967	-

Approach	EB	WB	SB
HCM Control Delay, s	1.2	0	0
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1479	-	-	-	-
HCM Lane V/C Ratio	0.005	-	-	-	-
HCM Control Delay (s)	7.4	0	-	-	0
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	-

Intersection	
Int Delay, s/veh	1.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	18	0	74	8	152	0	0	200	56
Future Vol, veh/h	0	0	0	18	0	74	8	152	0	0	200	56
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	Yield	-	-	None	-	-	None
Storage Length	-	-	-	-	-	50	-	-	-	-	-	-
Veh in Median Storage, #	-	-	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	20	0	80	9	165	0	0	217	61

Major/Minor				Minor1			Major1			Major2		
Conflicting Flow All				431	461	165	278	0	-	-	-	0
Stage 1				183	183	-	-	-	-	-	-	-
Stage 2				248	278	-	-	-	-	-	-	-
Critical Hdwy				6.42	6.52	6.22	4.12	-	-	-	-	-
Critical Hdwy Stg 1				5.42	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2				5.42	5.52	-	-	-	-	-	-	-
Follow-up Hdwy				3.518	4.018	3.318	2.218	-	-	-	-	-
Pot Cap-1 Maneuver				581	497	879	1285	-	0	0	-	-
Stage 1				848	748	-	-	-	0	0	-	-
Stage 2				793	680	-	-	-	0	0	-	-
Platoon blocked, %								-			-	-
Mov Cap-1 Maneuver				576	0	879	1285	-	-	-	-	-
Mov Cap-2 Maneuver				576	0	-	-	-	-	-	-	-
Stage 1				841	0	-	-	-	-	-	-	-
Stage 2				793	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.9	0.4	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	WBLn1	WBLn2	SBT	SBR
Capacity (veh/h)	1285	-	576	879	-	-
HCM Lane V/C Ratio	0.007	-	0.034	0.092	-	-
HCM Control Delay (s)	7.8	0	11.5	9.5	-	-
HCM Lane LOS	A	A	B	A	-	-
HCM 95th %tile Q(veh)	0	-	0.1	0.3	-	-

Intersection	
Int Delay, s/veh	6.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	87	0	4	0	0	0	0	71	58	174	45	0
Future Vol, veh/h	87	0	4	0	0	0	0	71	58	174	45	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	None
Storage Length	-	-	50	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	95	0	4	0	0	0	0	77	63	189	49	0

Major/Minor	Minor2						Major1			Major2		
Conflicting Flow All	536	567	49				-	0	0	140	0	0
Stage 1	427	427	-				-	-	-	-	-	-
Stage 2	109	140	-				-	-	-	-	-	-
Critical Hdwy	6.42	6.52	6.22				-	-	-	4.12	-	-
Critical Hdwy Stg 1	5.42	5.52	-				-	-	-	-	-	-
Critical Hdwy Stg 2	5.42	5.52	-				-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318				-	-	-	2.218	-	-
Pot Cap-1 Maneuver	505	433	1020				0	-	-	1443	-	0
Stage 1	658	585	-				0	-	-	-	-	0
Stage 2	916	781	-				0	-	-	-	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	437	0	1020				-	-	-	1443	-	-
Mov Cap-2 Maneuver	437	0	-				-	-	-	-	-	-
Stage 1	569	0	-				-	-	-	-	-	-
Stage 2	916	0	-				-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	15.2	0	6.3
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	EBLn2	SBL	SBT
Capacity (veh/h)	-	-	437	1020	1443	-
HCM Lane V/C Ratio	-	-	0.216	0.004	0.131	-
HCM Control Delay (s)	-	-	15.5	8.5	7.9	0
HCM Lane LOS	-	-	C	A	A	A
HCM 95th %tile Q(veh)	-	-	0.8	0	0.5	-

Intersection	
Int Delay, s/veh	5.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	82	59	1	0	8	38	5	5	1	53	1	5
Future Vol, veh/h	82	59	1	0	8	38	5	5	1	53	1	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	89	64	1	0	9	41	5	5	1	58	1	5

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	50	0	0	65	0	0	276	293	65	276	273	30
Stage 1	-	-	-	-	-	-	243	243	-	30	30	-
Stage 2	-	-	-	-	-	-	33	50	-	246	243	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1557	-	-	1537	-	-	676	618	999	676	634	1044
Stage 1	-	-	-	-	-	-	761	705	-	987	870	-
Stage 2	-	-	-	-	-	-	983	853	-	758	705	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1557	-	-	1537	-	-	642	582	999	640	597	1044
Mov Cap-2 Maneuver	-	-	-	-	-	-	642	582	-	640	597	-
Stage 1	-	-	-	-	-	-	716	663	-	929	870	-
Stage 2	-	-	-	-	-	-	977	853	-	707	663	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	4.3	0	10.8	11
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	633	1557	-	-	1537	-	-	661
HCM Lane V/C Ratio	0.019	0.057	-	-	-	-	-	0.097
HCM Control Delay (s)	10.8	7.5	0	-	0	-	-	11
HCM Lane LOS	B	A	A	-	A	-	-	B
HCM 95th %tile Q(veh)	0.1	0.2	-	-	0	-	-	0.3

Intersection	
Int Delay, s/veh	4.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Vol, veh/h	0	46	0	2	2	0	0	0	43	1	0	0
Future Vol, veh/h	0	46	0	2	2	0	0	0	43	1	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	50	0	2	2	0	0	0	47	1	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	2	0	0	50	0	0	56	56	50	80	56	2
Stage 1	-	-	-	-	-	-	50	50	-	6	6	-
Stage 2	-	-	-	-	-	-	6	6	-	74	50	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1620	-	-	1557	-	-	941	835	1018	908	835	1082
Stage 1	-	-	-	-	-	-	963	853	-	1016	891	-
Stage 2	-	-	-	-	-	-	1016	891	-	935	853	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1620	-	-	1557	-	-	940	834	1018	865	834	1082
Mov Cap-2 Maneuver	-	-	-	-	-	-	940	834	-	865	834	-
Stage 1	-	-	-	-	-	-	963	853	-	1016	890	-
Stage 2	-	-	-	-	-	-	1015	890	-	892	853	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	3.7	8.7	9.2
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	1018	1620	-	-	1557	-	-	865
HCM Lane V/C Ratio	0.046	-	-	-	0.001	-	-	0.001
HCM Control Delay (s)	8.7	0	-	-	7.3	0	-	9.2
HCM Lane LOS	A	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0

Intersection	
Int Delay, s/veh	7.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Traffic Vol, veh/h	86	3	1	2	2	0	0	7	0	3	10	2
Future Vol, veh/h	86	3	1	2	2	0	0	7	0	3	10	2
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	93	3	1	2	2	0	0	8	0	3	11	2

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	27	26	12	28	27	8	13	0	0	8	0	0
Stage 1	18	18	-	8	8	-	-	-	-	-	-	-
Stage 2	9	8	-	20	19	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	983	867	1069	981	866	1074	1606	-	-	1612	-	-
Stage 1	1001	880	-	1013	889	-	-	-	-	-	-	-
Stage 2	1012	889	-	999	880	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	980	865	1069	976	864	1074	1606	-	-	1612	-	-
Mov Cap-2 Maneuver	980	865	-	976	864	-	-	-	-	-	-	-
Stage 1	1001	878	-	1013	889	-	-	-	-	-	-	-
Stage 2	1010	889	-	992	878	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9.1	8.9	0	1.4
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1606	-	-	977	917	1612	-	-
HCM Lane V/C Ratio	-	-	-	0.1	0.005	0.002	-	-
HCM Control Delay (s)	0	-	-	9.1	8.9	7.2	0	-
HCM Lane LOS	A	-	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.3	0	0	-	-

Intersection						
Int Delay, s/veh	2.7					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	57	35	11	35	9
Future Vol, veh/h	0	57	35	11	35	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	62	38	12	38	10

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	50	0	-	0	106	44
Stage 1	-	-	-	-	44	-
Stage 2	-	-	-	-	62	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1557	-	-	-	892	1026
Stage 1	-	-	-	-	978	-
Stage 2	-	-	-	-	961	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1557	-	-	-	892	1026
Mov Cap-2 Maneuver	-	-	-	-	892	-
Stage 1	-	-	-	-	978	-
Stage 2	-	-	-	-	961	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	9.1
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1557	-	-	-	916
HCM Lane V/C Ratio	-	-	-	-	0.052
HCM Control Delay (s)	0	-	-	-	9.1
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection	
Int Delay, s/veh	1.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	22	93	0	0	38	0	0	0	1	7	0	1
Future Vol, veh/h	22	93	0	0	38	0	0	0	1	7	0	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	24	101	0	0	41	0	0	0	1	8	0	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	41	0	0	101	0	0	191	190	101	191	190	41
Stage 1	-	-	-	-	-	-	149	149	-	41	41	-
Stage 2	-	-	-	-	-	-	42	41	-	150	149	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1568	-	-	1491	-	-	769	705	954	769	705	1030
Stage 1	-	-	-	-	-	-	854	774	-	974	861	-
Stage 2	-	-	-	-	-	-	972	861	-	853	774	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1568	-	-	1491	-	-	759	694	954	759	694	1030
Mov Cap-2 Maneuver	-	-	-	-	-	-	759	694	-	759	694	-
Stage 1	-	-	-	-	-	-	840	762	-	958	861	-
Stage 2	-	-	-	-	-	-	971	861	-	838	762	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.4	0	8.8	9.6
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	954	1568	-	-	1491	-	-	785
HCM Lane V/C Ratio	0.001	0.015	-	-	-	-	-	0.011
HCM Control Delay (s)	8.8	7.3	0	-	0	-	-	9.6
HCM Lane LOS	A	A	A	-	A	-	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0

Intersection	
Int Delay, s/veh	1.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	93	39	0	22	7
Future Vol, veh/h	0	93	39	0	22	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	101	42	0	24	8

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	42	0	-	0	143	42
Stage 1	-	-	-	-	42	-
Stage 2	-	-	-	-	101	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1567	-	-	-	850	1029
Stage 1	-	-	-	-	980	-
Stage 2	-	-	-	-	923	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1567	-	-	-	850	1029
Mov Cap-2 Maneuver	-	-	-	-	850	-
Stage 1	-	-	-	-	980	-
Stage 2	-	-	-	-	923	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	9.2
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1567	-	-	-	887
HCM Lane V/C Ratio	-	-	-	-	0.036
HCM Control Delay (s)	0	-	-	-	9.2
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Appendix R

Year 2019 + Project Construction + Cumulative Intersection LOS Calculations

Intersection												
Int Delay, s/veh	4.9											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	172	0	96	12	114	0	0	251	80
Future Vol, veh/h	0	0	0	172	0	96	12	114	0	0	251	80
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	Yield	-	-	None	-	-	None
Storage Length	-	-	-	-	-	50	-	-	-	-	-	-
Veh in Median Storage, #	-	-	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	187	0	104	13	124	0	0	273	87

Major/Minor				Minor1			Major1			Major2		
Conflicting Flow All				467	510	124	360	0	-	-	-	0
Stage 1				150	150	-	-	-	-	-	-	-
Stage 2				317	360	-	-	-	-	-	-	-
Critical Hdwy				6.42	6.52	6.22	4.12	-	-	-	-	-
Critical Hdwy Stg 1				5.42	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2				5.42	5.52	-	-	-	-	-	-	-
Follow-up Hdwy				3.518	4.018	3.318	2.218	-	-	-	-	-
Pot Cap-1 Maneuver				554	467	927	1199	-	0	0	-	-
Stage 1				878	773	-	-	-	0	0	-	-
Stage 2				738	626	-	-	-	0	0	-	-
Platoon blocked, %								-			-	-
Mov Cap-1 Maneuver				547	0	927	1199	-	-	-	-	-
Mov Cap-2 Maneuver				547	0	-	-	-	-	-	-	-
Stage 1				867	0	-	-	-	-	-	-	-
Stage 2				738	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13	0.8	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	WBLn1	WBLn2	SBT	SBR
Capacity (veh/h)	1199	-	547	927	-	-
HCM Lane V/C Ratio	0.011	-	0.342	0.113	-	-
HCM Control Delay (s)	8	0	15	9.4	-	-
HCM Lane LOS	A	A	C	A	-	-
HCM 95th %tile Q(veh)	0	-	1.5	0.4	-	-

Intersection	
Int Delay, s/veh	4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	59	1	57	0	0	0	0	59	24	109	289	0
Future Vol, veh/h	59	1	57	0	0	0	0	59	24	109	289	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	None
Storage Length	-	-	50	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	64	1	62	0	0	0	0	64	26	118	314	0

Major/Minor	Minor2			Major1			Major2		
Conflicting Flow All	627	640	314	-	0	0	90	0	0
Stage 1	550	550	-	-	-	-	-	-	-
Stage 2	77	90	-	-	-	-	-	-	-
Critical Hdwy	6.42	6.52	6.22	-	-	-	4.12	-	-
Critical Hdwy Stg 1	5.42	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.42	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	-	-	-	2.218	-	-
Pot Cap-1 Maneuver	447	393	726	0	-	-	1505	-	0
Stage 1	578	516	-	0	-	-	-	-	0
Stage 2	946	820	-	0	-	-	-	-	0
Platoon blocked, %					-	-		-	
Mov Cap-1 Maneuver	405	0	726	-	-	-	1505	-	-
Mov Cap-2 Maneuver	405	0	-	-	-	-	-	-	-
Stage 1	523	0	-	-	-	-	-	-	-
Stage 2	946	0	-	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	13.1	0	2.1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	EBLn2	SBL	SBT
Capacity (veh/h)	-	-	405	726	1505	-
HCM Lane V/C Ratio	-	-	0.161	0.085	0.079	-
HCM Control Delay (s)	-	-	15.6	10.4	7.6	0
HCM Lane LOS	-	-	C	B	A	A
HCM 95th %tile Q(veh)	-	-	0.6	0.3	0.3	-

Intersection	
Int Delay, s/veh	9.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	17	13	2	1	48	36	4	3	1	202	7	158
Future Vol, veh/h	17	13	2	1	48	36	4	3	1	202	7	158
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	18	14	2	1	52	39	4	3	1	220	8	172

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	91	0	0	16	0	0	215	144	15	127	126	72
Stage 1	-	-	-	-	-	-	51	51	-	74	74	-
Stage 2	-	-	-	-	-	-	164	93	-	53	52	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1504	-	-	1602	-	-	742	747	1065	846	764	990
Stage 1	-	-	-	-	-	-	962	852	-	935	833	-
Stage 2	-	-	-	-	-	-	838	818	-	960	852	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1504	-	-	1602	-	-	603	737	1065	834	754	990
Mov Cap-2 Maneuver	-	-	-	-	-	-	603	737	-	834	754	-
Stage 1	-	-	-	-	-	-	950	842	-	924	832	-
Stage 2	-	-	-	-	-	-	686	817	-	944	842	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	3.9	0.1	10.3	12.2
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	687	1504	-	-	1602	-	-	893
HCM Lane V/C Ratio	0.013	0.012	-	-	0.001	-	-	0.447
HCM Control Delay (s)	10.3	7.4	0	-	7.2	0	-	12.2
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	2.3

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	1	1	0	89	0	1	1	1	0	0	0
Future Vol, veh/h	0	1	1	0	89	0	1	1	1	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	1	1	0	97	0	1	1	1	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	97	0	0	2	0	0	99	99	2	100	99	97
Stage 1	-	-	-	-	-	-	2	2	-	97	97	-
Stage 2	-	-	-	-	-	-	97	97	-	3	2	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1496	-	-	1620	-	-	883	791	1082	881	791	959
Stage 1	-	-	-	-	-	-	1021	894	-	910	815	-
Stage 2	-	-	-	-	-	-	910	815	-	1020	894	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1496	-	-	1620	-	-	883	791	1082	879	791	959
Mov Cap-2 Maneuver	-	-	-	-	-	-	883	791	-	879	791	-
Stage 1	-	-	-	-	-	-	1021	894	-	910	815	-
Stage 2	-	-	-	-	-	-	910	815	-	1018	894	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0	9	0
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	903	1496	-	-	1620	-	-	-
HCM Lane V/C Ratio	0.004	-	-	-	-	-	-	-
HCM Control Delay (s)	9	0	-	-	0	-	-	0
HCM Lane LOS	A	A	-	-	A	-	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	-

Intersection	
Int Delay, s/veh	3.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	3	3	0	1	0	6	44	12	0	28	33	46
Future Vol, veh/h	3	3	0	1	0	6	44	12	0	28	33	46
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	3	3	0	1	0	7	48	13	0	30	36	50

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	234	230	61	232	255	13	86	0	0	13	0	0
Stage 1	121	121	-	109	109	-	-	-	-	-	-	-
Stage 2	113	109	-	123	146	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	721	670	1004	723	649	1067	1510	-	-	1606	-	-
Stage 1	883	796	-	896	805	-	-	-	-	-	-	-
Stage 2	892	805	-	881	776	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	689	636	1004	692	616	1067	1510	-	-	1606	-	-
Mov Cap-2 Maneuver	689	636	-	692	616	-	-	-	-	-	-	-
Stage 1	855	780	-	867	779	-	-	-	-	-	-	-
Stage 2	858	779	-	860	760	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	10.5	8.7	5.9	1.9
HCM LOS	B	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1510	-	-	661	990	1606	-	-
HCM Lane V/C Ratio	0.032	-	-	0.01	0.008	0.019	-	-
HCM Control Delay (s)	7.5	0	-	10.5	8.7	7.3	0	-
HCM Lane LOS	A	A	-	B	A	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0	0	0.1	-	-

Intersection						
Int Delay, s/veh	0.7					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	3	56	49	31	4	5
Future Vol, veh/h	3	56	49	31	4	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	3	61	53	34	4	5

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	87	0	-	0	137	70
Stage 1	-	-	-	-	70	-
Stage 2	-	-	-	-	67	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1509	-	-	-	856	993
Stage 1	-	-	-	-	953	-
Stage 2	-	-	-	-	956	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1509	-	-	-	854	993
Mov Cap-2 Maneuver	-	-	-	-	854	-
Stage 1	-	-	-	-	951	-
Stage 2	-	-	-	-	956	-

Approach	EB	WB	SB
HCM Control Delay, s	0.4	0	8.9
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1509	-	-	-	926
HCM Lane V/C Ratio	0.002	-	-	-	0.011
HCM Control Delay (s)	7.4	0	-	-	8.9
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

Intersection	
Int Delay, s/veh	1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	60	0	1	69	0	12	1	1	0	0	0
Future Vol, veh/h	0	60	0	1	69	0	12	1	1	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	65	0	1	75	0	13	1	1	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	75	0	0	65	0	0	142	142	65	143	142	75
Stage 1	-	-	-	-	-	-	65	65	-	77	77	-
Stage 2	-	-	-	-	-	-	77	77	-	66	65	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1524	-	-	1537	-	-	828	749	999	826	749	986
Stage 1	-	-	-	-	-	-	946	841	-	932	831	-
Stage 2	-	-	-	-	-	-	932	831	-	945	841	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1524	-	-	1537	-	-	827	748	999	824	748	986
Mov Cap-2 Maneuver	-	-	-	-	-	-	827	748	-	824	748	-
Stage 1	-	-	-	-	-	-	946	841	-	932	830	-
Stage 2	-	-	-	-	-	-	931	830	-	943	841	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.1	9.4	0
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	831	1524	-	-	1537	-	-	-
HCM Lane V/C Ratio	0.018	-	-	-	0.001	-	-	-
HCM Control Delay (s)	9.4	0	-	-	7.3	0	-	0
HCM Lane LOS	A	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	-

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	60	82	0	0	0
Future Vol, veh/h	0	60	82	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	65	89	0	0	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	89	0	-	0	154	89
Stage 1	-	-	-	-	89	-
Stage 2	-	-	-	-	65	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1506	-	-	-	838	969
Stage 1	-	-	-	-	934	-
Stage 2	-	-	-	-	958	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1506	-	-	-	838	969
Mov Cap-2 Maneuver	-	-	-	-	838	-
Stage 1	-	-	-	-	934	-
Stage 2	-	-	-	-	958	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	0
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1506	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	-	-	0
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	-

Intersection	
Int Delay, s/veh	2.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	22	0	108	56	219	0	0	223	56
Future Vol, veh/h	0	0	0	22	0	108	56	219	0	0	223	56
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	Yield	-	-	None	-	-	None
Storage Length	-	-	-	-	-	50	-	-	-	-	-	-
Veh in Median Storage, #	-	-	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	24	0	117	61	238	0	0	242	61

Major/Minor				Minor1			Major1			Major2		
Conflicting Flow All				633	663	238	303	0	-	-	-	0
Stage 1				360	360	-	-	-	-	-	-	-
Stage 2				273	303	-	-	-	-	-	-	-
Critical Hdwy				6.42	6.52	6.22	4.12	-	-	-	-	-
Critical Hdwy Stg 1				5.42	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2				5.42	5.52	-	-	-	-	-	-	-
Follow-up Hdwy				3.518	4.018	3.318	2.218	-	-	-	-	-
Pot Cap-1 Maneuver				444	382	801	1258	-	0	0	-	-
Stage 1				706	626	-	-	-	0	0	-	-
Stage 2				773	664	-	-	-	0	0	-	-
Platoon blocked, %								-			-	-
Mov Cap-1 Maneuver				419	0	801	1258	-	-	-	-	-
Mov Cap-2 Maneuver				419	0	-	-	-	-	-	-	-
Stage 1				666	0	-	-	-	-	-	-	-
Stage 2				773	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.9	1.6	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	WBLn1	WBLn2	SBT	SBR
Capacity (veh/h)	1258	-	419	801	-	-
HCM Lane V/C Ratio	0.048	-	0.057	0.147	-	-
HCM Control Delay (s)	8	0	14.1	10.3	-	-
HCM Lane LOS	A	A	B	B	-	-
HCM 95th %tile Q(veh)	0.2	-	0.2	0.5	-	-

Intersection	
Int Delay, s/veh	5.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	98	0	6	0	0	0	0	186	153	194	51	0
Future Vol, veh/h	98	0	6	0	0	0	0	186	153	194	51	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	None
Storage Length	-	-	50	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	107	0	7	0	0	0	0	202	166	211	55	0

Major/Minor	Minor2						Major1			Major2		
Conflicting Flow All	762	845	55				-	0	0	368	0	0
Stage 1	477	477	-				-	-	-	-	-	-
Stage 2	285	368	-				-	-	-	-	-	-
Critical Hdwy	6.42	6.52	6.22				-	-	-	4.12	-	-
Critical Hdwy Stg 1	5.42	5.52	-				-	-	-	-	-	-
Critical Hdwy Stg 2	5.42	5.52	-				-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318				-	-	-	2.218	-	-
Pot Cap-1 Maneuver	373	300	1012				0	-	-	1191	-	0
Stage 1	624	556	-				0	-	-	-	-	0
Stage 2	763	621	-				0	-	-	-	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	305	0	1012				-	-	-	1191	-	-
Mov Cap-2 Maneuver	305	0	-				-	-	-	-	-	-
Stage 1	510	0	-				-	-	-	-	-	-
Stage 2	763	0	-				-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	22.2	0	6.9
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	EBLn2	SBL	SBT
Capacity (veh/h)	-	-	305	1012	1191	-
HCM Lane V/C Ratio	-	-	0.349	0.006	0.177	-
HCM Control Delay (s)	-	-	23	8.6	8.7	0
HCM Lane LOS	-	-	C	A	A	A
HCM 95th %tile Q(veh)	-	-	1.5	0	0.6	-

Intersection	
Int Delay, s/veh	5.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	170	62	1	0	7	160	5	5	1	59	1	8
Future Vol, veh/h	170	62	1	0	7	160	5	5	1	59	1	8
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	185	67	1	0	8	174	5	5	1	64	1	9

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	182	0	0	68	0	0	538	620	68	536	533	95
Stage 1	-	-	-	-	-	-	438	438	-	95	95	-
Stage 2	-	-	-	-	-	-	100	182	-	441	438	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1393	-	-	1533	-	-	454	404	995	455	453	962
Stage 1	-	-	-	-	-	-	597	579	-	912	816	-
Stage 2	-	-	-	-	-	-	906	749	-	595	579	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1393	-	-	1533	-	-	401	348	995	402	390	962
Mov Cap-2 Maneuver	-	-	-	-	-	-	401	348	-	402	390	-
Stage 1	-	-	-	-	-	-	515	499	-	786	816	-
Stage 2	-	-	-	-	-	-	897	749	-	507	499	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	5.8	0	14.4	15.1
HCM LOS			B	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	395	1393	-	-	1533	-	-	431
HCM Lane V/C Ratio	0.03	0.133	-	-	-	-	-	0.171
HCM Control Delay (s)	14.4	8	0	-	0	-	-	15.1
HCM Lane LOS	B	A	A	-	A	-	-	C
HCM 95th %tile Q(veh)	0.1	0.5	-	-	0	-	-	0.6

Intersection	
Int Delay, s/veh	0.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	91	0	1	1	0	0	0	0	1	0	0
Future Vol, veh/h	0	91	0	1	1	0	0	0	0	1	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	99	0	1	1	0	0	0	0	1	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1	0	0	99	0	0	102	102	99	102	102	1
Stage 1	-	-	-	-	-	-	99	99	-	3	3	-
Stage 2	-	-	-	-	-	-	3	3	-	99	99	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1622	-	-	1494	-	-	879	788	957	879	788	1084
Stage 1	-	-	-	-	-	-	907	813	-	1020	893	-
Stage 2	-	-	-	-	-	-	1020	893	-	907	813	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1622	-	-	1494	-	-	878	787	957	878	787	1084
Mov Cap-2 Maneuver	-	-	-	-	-	-	878	787	-	878	787	-
Stage 1	-	-	-	-	-	-	907	813	-	1020	892	-
Stage 2	-	-	-	-	-	-	1019	892	-	907	813	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	3.7	0	9.1
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	1622	-	-	1494	-	-	878
HCM Lane V/C Ratio	-	-	-	-	0.001	-	-	0.001
HCM Control Delay (s)	0	0	-	-	7.4	0	-	9.1
HCM Lane LOS	A	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	-	0	-	-	0	-	-	0

Intersection	
Int Delay, s/veh	7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	44	3	45	12	4	20	0	27	0	3	11	0
Future Vol, veh/h	44	3	45	12	4	20	0	27	0	3	11	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	48	3	49	13	4	22	0	29	0	3	12	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	60	47	12	73	47	29	12	0	0	29	0	0
Stage 1	18	18	-	29	29	-	-	-	-	-	-	-
Stage 2	42	29	-	44	18	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	936	845	1069	918	845	1046	1607	-	-	1584	-	-
Stage 1	1001	880	-	988	871	-	-	-	-	-	-	-
Stage 2	972	871	-	970	880	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	912	843	1069	872	843	1046	1607	-	-	1584	-	-
Mov Cap-2 Maneuver	912	843	-	872	843	-	-	-	-	-	-	-
Stage 1	1001	878	-	988	871	-	-	-	-	-	-	-
Stage 2	947	871	-	920	878	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9.1	8.9	0	1.6
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1607	-	-	980	957	1584	-	-
HCM Lane V/C Ratio	-	-	-	0.102	0.041	0.002	-	-
HCM Control Delay (s)	0	-	-	9.1	8.9	7.3	0	-
HCM Lane LOS	A	-	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.3	0.1	0	-	-

Intersection						
Int Delay, s/veh	2.1					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	62	50	11	33	2
Future Vol, veh/h	0	62	50	11	33	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	67	54	12	36	2

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	66	0	-	0	127	60
Stage 1	-	-	-	-	60	-
Stage 2	-	-	-	-	67	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1536	-	-	-	868	1005
Stage 1	-	-	-	-	963	-
Stage 2	-	-	-	-	956	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1536	-	-	-	868	1005
Mov Cap-2 Maneuver	-	-	-	-	868	-
Stage 1	-	-	-	-	963	-
Stage 2	-	-	-	-	956	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	9.3
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1536	-	-	-	875
HCM Lane V/C Ratio	-	-	-	-	0.043
HCM Control Delay (s)	0	-	-	-	9.3
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	96	0	0	60	0	0	0	1	0	0	1
Future Vol, veh/h	0	96	0	0	60	0	0	0	1	0	0	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	104	0	0	65	0	0	0	1	0	0	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	65	0	0	104	0	0	170	169	104	170	169	65
Stage 1	-	-	-	-	-	-	104	104	-	65	65	-
Stage 2	-	-	-	-	-	-	66	65	-	105	104	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1537	-	-	1488	-	-	794	724	951	794	724	999
Stage 1	-	-	-	-	-	-	902	809	-	946	841	-
Stage 2	-	-	-	-	-	-	945	841	-	901	809	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1537	-	-	1488	-	-	793	724	951	793	724	999
Mov Cap-2 Maneuver	-	-	-	-	-	-	793	724	-	793	724	-
Stage 1	-	-	-	-	-	-	902	809	-	946	841	-
Stage 2	-	-	-	-	-	-	944	841	-	900	809	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0	8.8	8.6
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	951	1537	-	-	1488	-	-	999
HCM Lane V/C Ratio	0.001	-	-	-	-	-	-	0.001
HCM Control Delay (s)	8.8	0	-	-	0	-	-	8.6
HCM Lane LOS	A	A	-	-	A	-	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0

Intersection						
Int Delay, s/veh	0					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	96	61	0	0	0
Future Vol, veh/h	0	96	61	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	104	66	0	0	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	66	0	-	0	170	66
Stage 1	-	-	-	-	66	-
Stage 2	-	-	-	-	104	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1536	-	-	-	820	998
Stage 1	-	-	-	-	957	-
Stage 2	-	-	-	-	920	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1536	-	-	-	820	998
Mov Cap-2 Maneuver	-	-	-	-	820	-
Stage 1	-	-	-	-	957	-
Stage 2	-	-	-	-	920	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	0
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1536	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	-	-	0
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	-

Intersection	
Int Delay, s/veh	5.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	208	0	96	12	114	0	0	273	80
Future Vol, veh/h	0	0	0	208	0	96	12	114	0	0	273	80
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	Yield	-	-	None	-	-	None
Storage Length	-	-	-	-	-	50	-	-	-	-	-	-
Veh in Median Storage, #	-	-	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	226	0	104	13	124	0	0	297	87

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	491	534	124	384	0	-	-	-	0
Stage 1	150	150	-	-	-	-	-	-	-
Stage 2	341	384	-	-	-	-	-	-	-
Critical Hdwy	6.42	6.52	6.22	4.12	-	-	-	-	-
Critical Hdwy Stg 1	5.42	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.42	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	2.218	-	-	-	-	-
Pot Cap-1 Maneuver	537	452	927	1174	-	0	0	-	-
Stage 1	878	773	-	-	-	0	0	-	-
Stage 2	720	611	-	-	-	0	0	-	-
Platoon blocked, %					-			-	-
Mov Cap-1 Maneuver	531	0	927	1174	-	-	-	-	-
Mov Cap-2 Maneuver	531	0	-	-	-	-	-	-	-
Stage 1	867	0	-	-	-	-	-	-	-
Stage 2	720	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	14.4	0.8	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	WBLn1	WBLn2	SBT	SBR
Capacity (veh/h)	1174	-	531	927	-	-
HCM Lane V/C Ratio	0.011	-	0.426	0.113	-	-
HCM Control Delay (s)	8.1	0	16.7	9.4	-	-
HCM Lane LOS	A	A	C	A	-	-
HCM 95th %tile Q(veh)	0	-	2.1	0.4	-	-

Intersection	
Int Delay, s/veh	3.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	59	1	57	0	0	0	0	59	25	109	347	0
Future Vol, veh/h	59	1	57	0	0	0	0	59	25	109	347	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	None
Storage Length	-	-	50	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	64	1	62	0	0	0	0	64	27	118	377	0

Major/Minor	Minor2						Major1			Major2		
Conflicting Flow All	691	704	377				-	0	0	91	0	0
Stage 1	613	613	-				-	-	-	-	-	-
Stage 2	78	91	-				-	-	-	-	-	-
Critical Hdwy	6.42	6.52	6.22				-	-	-	4.12	-	-
Critical Hdwy Stg 1	5.42	5.52	-				-	-	-	-	-	-
Critical Hdwy Stg 2	5.42	5.52	-				-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318				-	-	-	2.218	-	-
Pot Cap-1 Maneuver	410	361	670				0	-	-	1504	-	0
Stage 1	541	483	-				0	-	-	-	-	0
Stage 2	945	820	-				0	-	-	-	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	369	0	670				-	-	-	1504	-	-
Mov Cap-2 Maneuver	369	0	-				-	-	-	-	-	-
Stage 1	487	0	-				-	-	-	-	-	-
Stage 2	945	0	-				-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	13.9	0	1.8
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	EBLn2	SBL	SBT
Capacity (veh/h)	-	-	369	670	1504	-
HCM Lane V/C Ratio	-	-	0.177	0.092	0.079	-
HCM Control Delay (s)	-	-	16.8	10.9	7.6	0
HCM Lane LOS	-	-	C	B	A	A
HCM 95th %tile Q(veh)	-	-	0.6	0.3	0.3	-

Intersection	
Int Delay, s/veh	10.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	18	14	2	1	77	36	4	3	1	202	7	216
Future Vol, veh/h	18	14	2	1	77	36	4	3	1	202	7	216
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	20	15	2	1	84	39	4	3	1	220	8	235

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	123	0	0	17	0	0	283	181	16	164	163	104
Stage 1	-	-	-	-	-	-	56	56	-	106	106	-
Stage 2	-	-	-	-	-	-	227	125	-	58	57	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1464	-	-	1600	-	-	669	713	1063	801	729	951
Stage 1	-	-	-	-	-	-	956	848	-	900	807	-
Stage 2	-	-	-	-	-	-	776	792	-	954	847	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1464	-	-	1600	-	-	494	702	1063	788	718	951
Mov Cap-2 Maneuver	-	-	-	-	-	-	494	702	-	788	718	-
Stage 1	-	-	-	-	-	-	943	836	-	887	806	-
Stage 2	-	-	-	-	-	-	578	791	-	936	835	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	4	0.1	11.1	13.9
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	601	1464	-	-	1600	-	-	862
HCM Lane V/C Ratio	0.014	0.013	-	-	0.001	-	-	0.536
HCM Control Delay (s)	11.1	7.5	0	-	7.3	0	-	13.9
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	3.3

Intersection	
Int Delay, s/veh	1.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	2	1	43	132	0	1	1	2	0	0	0
Future Vol, veh/h	0	2	1	43	132	0	1	1	2	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	2	1	47	143	0	1	1	2	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	143	0	0	3	0	0	240	240	3	241	240	143
Stage 1	-	-	-	-	-	-	3	3	-	237	237	-
Stage 2	-	-	-	-	-	-	237	237	-	4	3	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1440	-	-	1619	-	-	714	661	1081	713	661	905
Stage 1	-	-	-	-	-	-	1020	893	-	766	709	-
Stage 2	-	-	-	-	-	-	766	709	-	1018	893	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1440	-	-	1619	-	-	697	640	1081	693	640	905
Mov Cap-2 Maneuver	-	-	-	-	-	-	697	640	-	693	640	-
Stage 1	-	-	-	-	-	-	1020	893	-	766	686	-
Stage 2	-	-	-	-	-	-	741	686	-	1015	893	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	1.8	9.4	0
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	825	1440	-	-	1619	-	-	-
HCM Lane V/C Ratio	0.005	-	-	-	0.029	-	-	-
HCM Control Delay (s)	9.4	0	-	-	7.3	0	-	0
HCM Lane LOS	A	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0.1	-	-	-

Intersection	
Int Delay, s/veh	2.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	3	0	1	0	6	44	12	0	28	33	132
Future Vol, veh/h	5	3	0	1	0	6	44	12	0	28	33	132
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	3	0	1	0	7	48	13	0	30	36	143

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	281	277	108	278	348	13	179	0	0	13	0	0
Stage 1	168	168	-	109	109	-	-	-	-	-	-	-
Stage 2	113	109	-	169	239	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	671	631	946	674	576	1067	1397	-	-	1606	-	-
Stage 1	834	759	-	896	805	-	-	-	-	-	-	-
Stage 2	892	805	-	833	708	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	639	596	946	643	544	1067	1397	-	-	1606	-	-
Mov Cap-2 Maneuver	639	596	-	643	544	-	-	-	-	-	-	-
Stage 1	805	743	-	865	777	-	-	-	-	-	-	-
Stage 2	856	777	-	812	693	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	10.9	8.7	6	1.1
HCM LOS	B	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1397	-	-	622	975	1606	-	-
HCM Lane V/C Ratio	0.034	-	-	0.014	0.008	0.019	-	-
HCM Control Delay (s)	7.7	0	-	10.9	8.7	7.3	0	-
HCM Lane LOS	A	A	-	B	A	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0	0	0.1	-	-

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	10	63	49	60	5	5
Future Vol, veh/h	10	63	49	60	5	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	68	53	65	5	5

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	118	0	-	0	176	86
Stage 1	-	-	-	-	86	-
Stage 2	-	-	-	-	90	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1470	-	-	-	814	973
Stage 1	-	-	-	-	937	-
Stage 2	-	-	-	-	934	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1470	-	-	-	807	973
Mov Cap-2 Maneuver	-	-	-	-	807	-
Stage 1	-	-	-	-	930	-
Stage 2	-	-	-	-	934	-

Approach	EB	WB	SB
HCM Control Delay, s	1	0	9.1
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1470	-	-	-	882
HCM Lane V/C Ratio	0.007	-	-	-	0.012
HCM Control Delay (s)	7.5	0	-	-	9.1
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

Intersection	
Int Delay, s/veh	1.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	61	0	1	98	7	12	1	1	0	0	22
Future Vol, veh/h	0	61	0	1	98	7	12	1	1	0	0	22
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	66	0	1	107	8	13	1	1	0	0	24

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	115	0	0	66	0	0	191	183	66	180	179	111
Stage 1	-	-	-	-	-	-	66	66	-	113	113	-
Stage 2	-	-	-	-	-	-	125	117	-	67	66	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1474	-	-	1536	-	-	769	711	998	782	715	942
Stage 1	-	-	-	-	-	-	945	840	-	892	802	-
Stage 2	-	-	-	-	-	-	879	799	-	943	840	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1474	-	-	1536	-	-	749	710	998	780	714	942
Mov Cap-2 Maneuver	-	-	-	-	-	-	749	710	-	780	714	-
Stage 1	-	-	-	-	-	-	945	840	-	892	801	-
Stage 2	-	-	-	-	-	-	856	798	-	941	840	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.1	9.8	8.9
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	760	1474	-	-	1536	-	-	942
HCM Lane V/C Ratio	0.02	-	-	-	0.001	-	-	0.025
HCM Control Delay (s)	9.8	0	-	-	7.3	0	-	8.9
HCM Lane LOS	A	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.1

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	7	61	111	22	0	0
Future Vol, veh/h	7	61	111	22	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	8	66	121	24	0	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	145	0	-	0	215	133
Stage 1	-	-	-	-	133	-
Stage 2	-	-	-	-	82	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1437	-	-	-	773	916
Stage 1	-	-	-	-	893	-
Stage 2	-	-	-	-	941	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1437	-	-	-	768	916
Mov Cap-2 Maneuver	-	-	-	-	768	-
Stage 1	-	-	-	-	888	-
Stage 2	-	-	-	-	941	-

Approach	EB	WB	SB
HCM Control Delay, s	0.8	0	0
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1437	-	-	-	-
HCM Lane V/C Ratio	0.005	-	-	-	-
HCM Control Delay (s)	7.5	0	-	-	0
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	-

Intersection	
Int Delay, s/veh	2.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	23	0	108	56	241	0	0	223	56
Future Vol, veh/h	0	0	0	23	0	108	56	241	0	0	223	56
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	Yield	-	-	None	-	-	None
Storage Length	-	-	-	-	-	50	-	-	-	-	-	-
Veh in Median Storage, #	-	-	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	25	0	117	61	262	0	0	242	61

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	657	687	262	303	0	-	-	-	0
Stage 1	384	384	-	-	-	-	-	-	-
Stage 2	273	303	-	-	-	-	-	-	-
Critical Hdwy	6.42	6.52	6.22	4.12	-	-	-	-	-
Critical Hdwy Stg 1	5.42	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.42	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	2.218	-	-	-	-	-
Pot Cap-1 Maneuver	430	370	777	1258	-	0	0	-	-
Stage 1	688	611	-	-	-	0	0	-	-
Stage 2	773	664	-	-	-	0	0	-	-
Platoon blocked, %					-			-	-
Mov Cap-1 Maneuver	405	0	777	1258	-	-	-	-	-
Mov Cap-2 Maneuver	405	0	-	-	-	-	-	-	-
Stage 1	649	0	-	-	-	-	-	-	-
Stage 2	773	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.2	1.5	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	WBLn1	WBLn2	SBT	SBR
Capacity (veh/h)	1258	-	405	777	-	-
HCM Lane V/C Ratio	0.048	-	0.062	0.151	-	-
HCM Control Delay (s)	8	0	14.5	10.5	-	-
HCM Lane LOS	A	A	B	B	-	-
HCM 95th %tile Q(veh)	0.2	-	0.2	0.5	-	-

Intersection	
Int Delay, s/veh	5.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	98	0	6	0	0	0	0	208	189	194	52	0
Future Vol, veh/h	98	0	6	0	0	0	0	208	189	194	52	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	None
Storage Length	-	-	50	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	107	0	7	0	0	0	0	226	205	211	57	0

Major/Minor	Minor2						Major1			Major2		
Conflicting Flow All	808	910	57				-	0	0	431	0	0
Stage 1	479	479	-				-	-	-	-	-	-
Stage 2	329	431	-				-	-	-	-	-	-
Critical Hdwy	6.42	6.52	6.22				-	-	-	4.12	-	-
Critical Hdwy Stg 1	5.42	5.52	-				-	-	-	-	-	-
Critical Hdwy Stg 2	5.42	5.52	-				-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318				-	-	-	2.218	-	-
Pot Cap-1 Maneuver	350	275	1009				0	-	-	1129	-	0
Stage 1	623	555	-				0	-	-	-	-	0
Stage 2	729	583	-				0	-	-	-	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	282	0	1009				-	-	-	1129	-	-
Mov Cap-2 Maneuver	282	0	-				-	-	-	-	-	-
Stage 1	503	0	-				-	-	-	-	-	-
Stage 2	729	0	-				-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	24.3	0	7
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	EBLn2	SBL	SBT
Capacity (veh/h)	-	-	282	1009	1129	-
HCM Lane V/C Ratio	-	-	0.378	0.006	0.187	-
HCM Control Delay (s)	-	-	25.3	8.6	8.9	0
HCM Lane LOS	-	-	D	A	A	A
HCM 95th %tile Q(veh)	-	-	1.7	0	0.7	-

Intersection	
Int Delay, s/veh	5.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	228	91	1	0	8	160	5	5	1	59	1	9
Future Vol, veh/h	228	91	1	0	8	160	5	5	1	59	1	9
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	248	99	1	0	9	174	5	5	1	64	1	10

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	183	0	0	100	0	0	698	779	100	695	692	96
Stage 1	-	-	-	-	-	-	596	596	-	96	96	-
Stage 2	-	-	-	-	-	-	102	183	-	599	596	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1392	-	-	1493	-	-	355	327	956	357	367	960
Stage 1	-	-	-	-	-	-	490	492	-	911	815	-
Stage 2	-	-	-	-	-	-	904	748	-	488	492	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1392	-	-	1493	-	-	300	265	956	300	298	960
Mov Cap-2 Maneuver	-	-	-	-	-	-	300	265	-	300	298	-
Stage 1	-	-	-	-	-	-	397	399	-	739	815	-
Stage 2	-	-	-	-	-	-	894	748	-	390	399	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	5.8	0	17.5	19.1
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	301	1392	-	-	1493	-	-	330
HCM Lane V/C Ratio	0.04	0.178	-	-	-	-	-	0.227
HCM Control Delay (s)	17.5	8.1	0	-	0	-	-	19.1
HCM Lane LOS	C	A	A	-	A	-	-	C
HCM 95th %tile Q(veh)	0.1	0.6	-	-	0	-	-	0.9

Intersection	
Int Delay, s/veh	2.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	134	0	2	2	0	0	0	43	1	0	0
Future Vol, veh/h	0	134	0	2	2	0	0	0	43	1	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	146	0	2	2	0	0	0	47	1	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	2	0	0	146	0	0	152	152	146	176	152	2
Stage 1	-	-	-	-	-	-	146	146	-	6	6	-
Stage 2	-	-	-	-	-	-	6	6	-	170	146	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1620	-	-	1436	-	-	815	740	901	786	740	1082
Stage 1	-	-	-	-	-	-	857	776	-	1016	891	-
Stage 2	-	-	-	-	-	-	1016	891	-	832	776	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1620	-	-	1436	-	-	814	739	901	744	739	1082
Mov Cap-2 Maneuver	-	-	-	-	-	-	814	739	-	744	739	-
Stage 1	-	-	-	-	-	-	857	776	-	1016	890	-
Stage 2	-	-	-	-	-	-	1015	890	-	789	776	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	3.8	9.2	9.8
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	901	1620	-	-	1436	-	-	744
HCM Lane V/C Ratio	0.052	-	-	-	0.002	-	-	0.001
HCM Control Delay (s)	9.2	0	-	-	7.5	0	-	9.8
HCM Lane LOS	A	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	0.2	0	-	-	0	-	-	0

Intersection	
Int Delay, s/veh	8.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	130	3	45	12	4	20	0	27	0	3	11	2
Future Vol, veh/h	130	3	45	12	4	20	0	27	0	3	11	2
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	141	3	49	13	4	22	0	29	0	3	12	2

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	61	48	13	74	49	29	14	0	0	29	0	0
Stage 1	19	19	-	29	29	-	-	-	-	-	-	-
Stage 2	42	29	-	45	20	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	934	844	1067	916	843	1046	1604	-	-	1584	-	-
Stage 1	1000	880	-	988	871	-	-	-	-	-	-	-
Stage 2	972	871	-	969	879	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	910	842	1067	870	841	1046	1604	-	-	1584	-	-
Mov Cap-2 Maneuver	910	842	-	870	841	-	-	-	-	-	-	-
Stage 1	1000	878	-	988	871	-	-	-	-	-	-	-
Stage 2	947	871	-	919	877	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9.8	8.9	0	1.4
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1604	-	-	944	956	1584	-	-
HCM Lane V/C Ratio	-	-	-	0.205	0.041	0.002	-	-
HCM Control Delay (s)	0	-	-	9.8	8.9	7.3	0	-
HCM Lane LOS	A	-	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.8	0.1	0	-	-

Intersection	
Int Delay, s/veh	3.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	62	57	12	62	9
Future Vol, veh/h	0	62	57	12	62	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	67	62	13	67	10

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	75	0	-	0	136	69
Stage 1	-	-	-	-	69	-
Stage 2	-	-	-	-	67	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1524	-	-	-	857	994
Stage 1	-	-	-	-	954	-
Stage 2	-	-	-	-	956	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1524	-	-	-	857	994
Mov Cap-2 Maneuver	-	-	-	-	857	-
Stage 1	-	-	-	-	954	-
Stage 2	-	-	-	-	956	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	9.5
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1524	-	-	-	872
HCM Lane V/C Ratio	-	-	-	-	0.089
HCM Control Delay (s)	0	-	-	-	9.5
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.3

Intersection	
Int Delay, s/veh	1.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	22	125	0	0	61	0	0	0	1	7	0	1
Future Vol, veh/h	22	125	0	0	61	0	0	0	1	7	0	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	24	136	0	0	66	0	0	0	1	8	0	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	66	0	0	136	0	0	251	250	136	251	250	66
Stage 1	-	-	-	-	-	-	184	184	-	66	66	-
Stage 2	-	-	-	-	-	-	67	66	-	185	184	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1536	-	-	1448	-	-	702	653	913	702	653	998
Stage 1	-	-	-	-	-	-	818	747	-	945	840	-
Stage 2	-	-	-	-	-	-	943	840	-	817	747	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1536	-	-	1448	-	-	692	642	913	692	642	998
Mov Cap-2 Maneuver	-	-	-	-	-	-	692	642	-	692	642	-
Stage 1	-	-	-	-	-	-	804	734	-	929	840	-
Stage 2	-	-	-	-	-	-	942	840	-	802	734	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.1	0	8.9	10.1
HCM LOS			A	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	913	1536	-	-	1448	-	-	720
HCM Lane V/C Ratio	0.001	0.016	-	-	-	-	-	0.012
HCM Control Delay (s)	8.9	7.4	0	-	0	-	-	10.1
HCM Lane LOS	A	A	A	-	A	-	-	B
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0

Intersection	
Int Delay, s/veh	1.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	125	62	0	22	7
Future Vol, veh/h	0	125	62	0	22	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	136	67	0	24	8

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	67	0	-	0	203	67
Stage 1	-	-	-	-	67	-
Stage 2	-	-	-	-	136	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1535	-	-	-	786	997
Stage 1	-	-	-	-	956	-
Stage 2	-	-	-	-	890	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1535	-	-	-	786	997
Mov Cap-2 Maneuver	-	-	-	-	786	-
Stage 1	-	-	-	-	956	-
Stage 2	-	-	-	-	890	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	9.5
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1535	-	-	-	828
HCM Lane V/C Ratio	-	-	-	-	0.038
HCM Control Delay (s)	0	-	-	-	9.5
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Appendix S

Year 2027 Intersection LOS Calculations

Intersection	
Int Delay, s/veh	3.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	48	0	99	14	117	0	0	151	80
Future Vol, veh/h	0	0	0	48	0	99	14	117	0	0	151	80
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	Yield	-	-	None	-	-	None
Storage Length	-	-	-	-	-	50	-	-	-	-	-	-
Veh in Median Storage, #	-	-	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	52	0	108	15	127	0	0	164	87

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	365	408	127	251	0	-	-	-	0
Stage 1	157	157	-	-	-	-	-	-	-
Stage 2	208	251	-	-	-	-	-	-	-
Critical Hdwy	6.42	6.52	6.22	4.12	-	-	-	-	-
Critical Hdwy Stg 1	5.42	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.42	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	2.218	-	-	-	-	-
Pot Cap-1 Maneuver	635	533	923	1314	-	0	0	-	-
Stage 1	871	768	-	-	-	0	0	-	-
Stage 2	827	699	-	-	-	0	0	-	-
Platoon blocked, %					-			-	-
Mov Cap-1 Maneuver	627	0	923	1314	-	-	-	-	-
Mov Cap-2 Maneuver	627	0	-	-	-	-	-	-	-
Stage 1	861	0	-	-	-	-	-	-	-
Stage 2	827	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10	0.8	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	WBLn1	WBLn2	SBT	SBR
Capacity (veh/h)	1314	-	627	923	-	-
HCM Lane V/C Ratio	0.012	-	0.083	0.117	-	-
HCM Control Delay (s)	7.8	0	11.3	9.4	-	-
HCM Lane LOS	A	A	B	A	-	-
HCM 95th %tile Q(veh)	0	-	0.3	0.4	-	-

Intersection	
Int Delay, s/veh	4.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	68	1	11	0	0	0	0	67	24	90	103	0
Future Vol, veh/h	68	1	11	0	0	0	0	67	24	90	103	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	None
Storage Length	-	-	50	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	74	1	12	0	0	0	0	73	26	98	112	0

Major/Minor	Minor2						Major1			Major2		
Conflicting Flow All	394	407	112				-	0	0	99	0	0
Stage 1	308	308	-				-	-	-	-	-	-
Stage 2	86	99	-				-	-	-	-	-	-
Critical Hdwy	6.42	6.52	6.22				-	-	-	4.12	-	-
Critical Hdwy Stg 1	5.42	5.52	-				-	-	-	-	-	-
Critical Hdwy Stg 2	5.42	5.52	-				-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318				-	-	-	2.218	-	-
Pot Cap-1 Maneuver	611	533	941				0	-	-	1494	-	0
Stage 1	745	660	-				0	-	-	-	-	0
Stage 2	937	813	-				0	-	-	-	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	568	0	941				-	-	-	1494	-	-
Mov Cap-2 Maneuver	568	0	-				-	-	-	-	-	-
Stage 1	693	0	-				-	-	-	-	-	-
Stage 2	937	0	-				-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11.8	0	3.5
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	EBLn2	SBL	SBT
Capacity (veh/h)	-	-	568	941	1494	-
HCM Lane V/C Ratio	-	-	0.132	0.013	0.065	-
HCM Control Delay (s)	-	-	12.3	8.9	7.6	0
HCM Lane LOS	-	-	B	A	A	A
HCM 95th %tile Q(veh)	-	-	0.5	0	0.2	-

Intersection	
Int Delay, s/veh	6.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	17	16	2	1	18	39	5	4	1	92	8	14
Future Vol, veh/h	17	16	2	1	18	39	5	4	1	92	8	14
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	18	17	2	1	20	42	5	4	1	100	9	15

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	62	0	0	19	0	0	109	118	18	100	98	41
Stage 1	-	-	-	-	-	-	54	54	-	43	43	-
Stage 2	-	-	-	-	-	-	55	64	-	57	55	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1541	-	-	1597	-	-	870	772	1061	881	792	1030
Stage 1	-	-	-	-	-	-	958	850	-	971	859	-
Stage 2	-	-	-	-	-	-	957	842	-	955	849	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1541	-	-	1597	-	-	841	762	1061	868	782	1030
Mov Cap-2 Maneuver	-	-	-	-	-	-	841	762	-	868	782	-
Stage 1	-	-	-	-	-	-	947	840	-	959	858	-
Stage 2	-	-	-	-	-	-	932	841	-	938	839	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	3.6	0.1	9.4	9.8
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	824	1541	-	-	1597	-	-	878
HCM Lane V/C Ratio	0.013	0.012	-	-	0.001	-	-	0.141
HCM Control Delay (s)	9.4	7.4	0	-	7.3	0	-	9.8
HCM Lane LOS	A	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0.5

Intersection	
Int Delay, s/veh	4.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	1	1	0	1	0	1	1	1	0	0	0
Future Vol, veh/h	0	1	1	0	1	0	1	1	1	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	1	1	0	1	0	1	1	1	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1	0	0	2	0	0	3	3	2	4	3	1
Stage 1	-	-	-	-	-	-	2	2	-	1	1	-
Stage 2	-	-	-	-	-	-	1	1	-	3	2	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1622	-	-	1620	-	-	1019	893	1082	1017	893	1084
Stage 1	-	-	-	-	-	-	1021	894	-	1022	895	-
Stage 2	-	-	-	-	-	-	1022	895	-	1020	894	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1622	-	-	1620	-	-	1019	893	1082	1015	893	1084
Mov Cap-2 Maneuver	-	-	-	-	-	-	1019	893	-	1015	893	-
Stage 1	-	-	-	-	-	-	1021	894	-	1022	895	-
Stage 2	-	-	-	-	-	-	1022	895	-	1018	894	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0	8.6	0
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	992	1622	-	-	1620	-	-	-
HCM Lane V/C Ratio	0.003	-	-	-	-	-	-	-
HCM Control Delay (s)	8.6	0	-	-	0	-	-	0
HCM Lane LOS	A	A	-	-	A	-	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	-

Intersection	
Int Delay, s/veh	2.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	4	1	0	1	0	2	0	13	0	5	16	2
Future Vol, veh/h	4	1	0	1	0	2	0	13	0	5	16	2
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	1	0	1	0	2	0	14	0	5	17	2

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	43	42	18	43	43	14	19	0	0	14	0	0
Stage 1	28	28	-	14	14	-	-	-	-	-	-	-
Stage 2	15	14	-	29	29	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	960	850	1061	960	849	1066	1597	-	-	1604	-	-
Stage 1	989	872	-	1006	884	-	-	-	-	-	-	-
Stage 2	1005	884	-	988	871	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	956	847	1061	957	846	1066	1597	-	-	1604	-	-
Mov Cap-2 Maneuver	956	847	-	957	846	-	-	-	-	-	-	-
Stage 1	989	869	-	1006	884	-	-	-	-	-	-	-
Stage 2	1003	884	-	984	868	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	8.9	8.5	0	1.6
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1597	-	-	932	1027	1604	-	-
HCM Lane V/C Ratio	-	-	-	0.006	0.003	0.003	-	-
HCM Control Delay (s)	0	-	-	8.9	8.5	7.3	0	-
HCM Lane LOS	A	-	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0	0	-	-

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	4	39	51	5	2	6
Future Vol, veh/h	4	39	51	5	2	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	4	42	55	5	2	7

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	60	0	-	0	108	58
Stage 1	-	-	-	-	58	-
Stage 2	-	-	-	-	50	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1544	-	-	-	889	1008
Stage 1	-	-	-	-	965	-
Stage 2	-	-	-	-	972	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1544	-	-	-	886	1008
Mov Cap-2 Maneuver	-	-	-	-	886	-
Stage 1	-	-	-	-	962	-
Stage 2	-	-	-	-	972	-

Approach	EB	WB	SB
HCM Control Delay, s	0.7	0	8.7
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1544	-	-	-	974
HCM Lane V/C Ratio	0.003	-	-	-	0.009
HCM Control Delay (s)	7.3	0	-	-	8.7
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

Intersection	
Int Delay, s/veh	1.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	42	0	1	44	0	14	1	1	0	0	0
Future Vol, veh/h	0	42	0	1	44	0	14	1	1	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	46	0	1	48	0	15	1	1	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	48	0	0	46	0	0	96	96	46	97	96	48
Stage 1	-	-	-	-	-	-	46	46	-	50	50	-
Stage 2	-	-	-	-	-	-	50	50	-	47	46	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1559	-	-	1562	-	-	887	794	1023	885	794	1021
Stage 1	-	-	-	-	-	-	968	857	-	963	853	-
Stage 2	-	-	-	-	-	-	963	853	-	967	857	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1559	-	-	1562	-	-	886	793	1023	882	793	1021
Mov Cap-2 Maneuver	-	-	-	-	-	-	886	793	-	882	793	-
Stage 1	-	-	-	-	-	-	968	857	-	963	852	-
Stage 2	-	-	-	-	-	-	962	852	-	965	857	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.2	9.1	0
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	887	1559	-	-	1562	-	-	-
HCM Lane V/C Ratio	0.02	-	-	-	0.001	-	-	-
HCM Control Delay (s)	9.1	0	-	-	7.3	0	-	0
HCM Lane LOS	A	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	-

Intersection						
Int Delay, s/veh	0					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	42	59	0	0	0
Future Vol, veh/h	0	42	59	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	46	64	0	0	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	64	0	-	0	110	64
Stage 1	-	-	-	-	64	-
Stage 2	-	-	-	-	46	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1538	-	-	-	887	1000
Stage 1	-	-	-	-	959	-
Stage 2	-	-	-	-	976	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1538	-	-	-	887	1000
Mov Cap-2 Maneuver	-	-	-	-	887	-
Stage 1	-	-	-	-	959	-
Stage 2	-	-	-	-	976	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	0
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1538	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	-	-	0
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	-

Intersection	
Int Delay, s/veh	2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	19	0	85	10	149	0	0	231	65
Future Vol, veh/h	0	0	0	19	0	85	10	149	0	0	231	65
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	Yield	-	-	None	-	-	None
Storage Length	-	-	-	-	-	50	-	-	-	-	-	-
Veh in Median Storage, #	-	-	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	21	0	92	11	162	0	0	251	71

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	471	506	162	322	0	-	-	-	0
Stage 1	184	184	-	-	-	-	-	-	-
Stage 2	287	322	-	-	-	-	-	-	-
Critical Hdwy	6.42	6.52	6.22	4.12	-	-	-	-	-
Critical Hdwy Stg 1	5.42	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.42	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	2.218	-	-	-	-	-
Pot Cap-1 Maneuver	551	469	883	1238	-	0	0	-	-
Stage 1	848	747	-	-	-	0	0	-	-
Stage 2	762	651	-	-	-	0	0	-	-
Platoon blocked, %					-			-	-
Mov Cap-1 Maneuver	545	0	883	1238	-	-	-	-	-
Mov Cap-2 Maneuver	545	0	-	-	-	-	-	-	-
Stage 1	840	0	-	-	-	-	-	-	-
Stage 2	762	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10	0.5	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	WBLn1	WBLn2	SBT	SBR
Capacity (veh/h)	1238	-	545	883	-	-
HCM Lane V/C Ratio	0.009	-	0.038	0.105	-	-
HCM Control Delay (s)	7.9	0	11.9	9.6	-	-
HCM Lane LOS	A	A	B	A	-	-
HCM 95th %tile Q(veh)	0	-	0.1	0.3	-	-

Intersection	
Int Delay, s/veh	7.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	100	0	5	0	0	0	0	56	25	201	50	0
Future Vol, veh/h	100	0	5	0	0	0	0	56	25	201	50	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	None
Storage Length	-	-	50	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	109	0	5	0	0	0	0	61	27	218	54	0

Major/Minor	Minor2						Major1			Major2		
Conflicting Flow All	565	578	54				-	0	0	88	0	0
Stage 1	490	490	-				-	-	-	-	-	-
Stage 2	75	88	-				-	-	-	-	-	-
Critical Hdwy	6.42	6.52	6.22				-	-	-	4.12	-	-
Critical Hdwy Stg 1	5.42	5.52	-				-	-	-	-	-	-
Critical Hdwy Stg 2	5.42	5.52	-				-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318				-	-	-	2.218	-	-
Pot Cap-1 Maneuver	486	427	1013				0	-	-	1508	-	0
Stage 1	616	549	-				0	-	-	-	-	0
Stage 2	948	822	-				0	-	-	-	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	414	0	1013				-	-	-	1508	-	-
Mov Cap-2 Maneuver	414	0	-				-	-	-	-	-	-
Stage 1	524	0	-				-	-	-	-	-	-
Stage 2	948	0	-				-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	16.4	0	6.2
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	EBLn2	SBL	SBT
Capacity (veh/h)	-	-	414	1013	1508	-
HCM Lane V/C Ratio	-	-	0.263	0.005	0.145	-
HCM Control Delay (s)	-	-	16.8	8.6	7.8	0
HCM Lane LOS	-	-	C	A	A	A
HCM 95th %tile Q(veh)	-	-	1	0	0.5	-

Intersection	
Int Delay, s/veh	5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	27	35	1	0	8	44	6	6	1	61	1	5
Future Vol, veh/h	27	35	1	0	8	44	6	6	1	61	1	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	29	38	1	0	9	48	7	7	1	66	1	5

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	57	0	0	39	0	0	133	154	39	134	130	33
Stage 1	-	-	-	-	-	-	97	97	-	33	33	-
Stage 2	-	-	-	-	-	-	36	57	-	101	97	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1547	-	-	1571	-	-	839	738	1033	838	761	1041
Stage 1	-	-	-	-	-	-	910	815	-	983	868	-
Stage 2	-	-	-	-	-	-	980	847	-	905	815	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1547	-	-	1571	-	-	821	724	1033	820	747	1041
Mov Cap-2 Maneuver	-	-	-	-	-	-	821	724	-	820	747	-
Stage 1	-	-	-	-	-	-	893	800	-	964	868	-
Stage 2	-	-	-	-	-	-	974	847	-	880	800	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	3.2	0	9.7	9.7
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	785	1547	-	-	1571	-	-	832
HCM Lane V/C Ratio	0.018	0.019	-	-	-	-	-	0.088
HCM Control Delay (s)	9.7	7.4	0	-	0	-	-	9.7
HCM Lane LOS	A	A	A	-	A	-	-	A
HCM 95th %tile Q(veh)	0.1	0.1	-	-	0	-	-	0.3

Intersection	
Int Delay, s/veh	2.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	4	0	1	1	0	0	0	0	1	0	0
Future Vol, veh/h	0	4	0	1	1	0	0	0	0	1	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	4	0	1	1	0	0	0	0	1	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1	0	0	4	0	0	7	7	4	7	7	1
Stage 1	-	-	-	-	-	-	4	4	-	3	3	-
Stage 2	-	-	-	-	-	-	3	3	-	4	4	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1622	-	-	1618	-	-	1013	888	1080	1013	888	1084
Stage 1	-	-	-	-	-	-	1018	892	-	1020	893	-
Stage 2	-	-	-	-	-	-	1020	893	-	1018	892	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1622	-	-	1618	-	-	1012	887	1080	1012	887	1084
Mov Cap-2 Maneuver	-	-	-	-	-	-	1012	887	-	1012	887	-
Stage 1	-	-	-	-	-	-	1018	892	-	1020	892	-
Stage 2	-	-	-	-	-	-	1019	892	-	1018	892	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	3.6	0	8.6
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	1622	-	-	1618	-	-	1012
HCM Lane V/C Ratio	-	-	-	-	0.001	-	-	0.001
HCM Control Delay (s)	0	0	-	-	7.2	0	-	8.6
HCM Lane LOS	A	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	-	0	-	-	0	-	-	0

Intersection	
Int Delay, s/veh	3.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	4	1	2	2	0	0	8	0	4	12	0
Future Vol, veh/h	0	4	1	2	2	0	0	8	0	4	12	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	4	1	2	2	0	0	9	0	4	13	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	31	30	13	33	30	9	13	0	0	9	0	0
Stage 1	21	21	-	9	9	-	-	-	-	-	-	-
Stage 2	10	9	-	24	21	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	977	863	1067	974	863	1073	1606	-	-	1611	-	-
Stage 1	998	878	-	1012	888	-	-	-	-	-	-	-
Stage 2	1011	888	-	994	878	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	973	860	1067	967	860	1073	1606	-	-	1611	-	-
Mov Cap-2 Maneuver	973	860	-	967	860	-	-	-	-	-	-	-
Stage 1	998	875	-	1012	888	-	-	-	-	-	-	-
Stage 2	1009	888	-	985	875	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9	9	0	1.8
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1606	-	-	895	910	1611	-	-
HCM Lane V/C Ratio	-	-	-	0.006	0.005	0.003	-	-
HCM Control Delay (s)	0	-	-	9	9	7.2	0	-
HCM Lane LOS	A	-	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0	0	-	-

Intersection						
Int Delay, s/veh	0.7					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	66	32	12	7	2
Future Vol, veh/h	0	66	32	12	7	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	72	35	13	8	2

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	48	0	-	0	114	42
Stage 1	-	-	-	-	42	-
Stage 2	-	-	-	-	72	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1559	-	-	-	882	1029
Stage 1	-	-	-	-	980	-
Stage 2	-	-	-	-	951	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1559	-	-	-	882	1029
Mov Cap-2 Maneuver	-	-	-	-	882	-
Stage 1	-	-	-	-	980	-
Stage 2	-	-	-	-	951	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	9
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1559	-	-	-	911
HCM Lane V/C Ratio	-	-	-	-	0.011
HCM Control Delay (s)	0	-	-	-	9
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	74	0	0	43	0	0	0	1	0	0	1
Future Vol, veh/h	0	74	0	0	43	0	0	0	1	0	0	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	80	0	0	47	0	0	0	1	0	0	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	47	0	0	80	0	0	128	127	80	128	127	47
Stage 1	-	-	-	-	-	-	80	80	-	47	47	-
Stage 2	-	-	-	-	-	-	48	47	-	81	80	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1560	-	-	1518	-	-	845	764	980	845	764	1022
Stage 1	-	-	-	-	-	-	929	828	-	967	856	-
Stage 2	-	-	-	-	-	-	965	856	-	927	828	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1560	-	-	1518	-	-	844	764	980	844	764	1022
Mov Cap-2 Maneuver	-	-	-	-	-	-	844	764	-	844	764	-
Stage 1	-	-	-	-	-	-	929	828	-	967	856	-
Stage 2	-	-	-	-	-	-	964	856	-	926	828	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0	8.7	8.5
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	980	1560	-	-	1518	-	-	1022
HCM Lane V/C Ratio	0.001	-	-	-	-	-	-	0.001
HCM Control Delay (s)	8.7	0	-	-	0	-	-	8.5
HCM Lane LOS	A	A	-	-	A	-	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	74	44	0	0	0
Future Vol, veh/h	0	74	44	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	80	48	0	0	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	48	0	-	0	128	48
Stage 1	-	-	-	-	48	-
Stage 2	-	-	-	-	80	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1559	-	-	-	866	1021
Stage 1	-	-	-	-	974	-
Stage 2	-	-	-	-	943	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1559	-	-	-	866	1021
Mov Cap-2 Maneuver	-	-	-	-	866	-
Stage 1	-	-	-	-	974	-
Stage 2	-	-	-	-	943	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	0
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1559	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	-	-	0
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	-

Appendix T

Year 2027 + Project Construction Intersection LOS Calculations

Intersection	
Int Delay, s/veh	3.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	84	0	99	14	117	0	0	173	80
Future Vol, veh/h	0	0	0	84	0	99	14	117	0	0	173	80
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	Yield	-	-	None	-	-	None
Storage Length	-	-	-	-	-	50	-	-	-	-	-	-
Veh in Median Storage, #	-	-	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	91	0	108	15	127	0	0	188	87

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	389	432	127	275	0	-	-	-	0
Stage 1	157	157	-	-	-	-	-	-	-
Stage 2	232	275	-	-	-	-	-	-	-
Critical Hdwy	6.42	6.52	6.22	4.12	-	-	-	-	-
Critical Hdwy Stg 1	5.42	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.42	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	2.218	-	-	-	-	-
Pot Cap-1 Maneuver	615	516	923	1288	-	0	0	-	-
Stage 1	871	768	-	-	-	0	0	-	-
Stage 2	807	683	-	-	-	0	0	-	-
Platoon blocked, %					-			-	-
Mov Cap-1 Maneuver	607	0	923	1288	-	-	-	-	-
Mov Cap-2 Maneuver	607	0	-	-	-	-	-	-	-
Stage 1	860	0	-	-	-	-	-	-	-
Stage 2	807	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.6	0.8	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	WBLn1	WBLn2	SBT	SBR
Capacity (veh/h)	1288	-	607	923	-	-
HCM Lane V/C Ratio	0.012	-	0.15	0.117	-	-
HCM Control Delay (s)	7.8	0	12	9.4	-	-
HCM Lane LOS	A	A	B	A	-	-
HCM 95th %tile Q(veh)	0	-	0.5	0.4	-	-

Intersection	
Int Delay, s/veh	4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	68	1	11	0	0	0	0	67	25	90	161	0
Future Vol, veh/h	68	1	11	0	0	0	0	67	25	90	161	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	None
Storage Length	-	-	50	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	74	1	12	0	0	0	0	73	27	98	175	0

Major/Minor	Minor2			Major1			Major2		
Conflicting Flow All	458	471	175	-	0	0	100	0	0
Stage 1	371	371	-	-	-	-	-	-	-
Stage 2	87	100	-	-	-	-	-	-	-
Critical Hdwy	6.42	6.52	6.22	-	-	-	4.12	-	-
Critical Hdwy Stg 1	5.42	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.42	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	-	-	-	2.218	-	-
Pot Cap-1 Maneuver	561	491	868	0	-	-	1493	-	0
Stage 1	698	620	-	0	-	-	-	-	0
Stage 2	936	812	-	0	-	-	-	-	0
Platoon blocked, %					-	-		-	
Mov Cap-1 Maneuver	520	0	868	-	-	-	1493	-	-
Mov Cap-2 Maneuver	520	0	-	-	-	-	-	-	-
Stage 1	647	0	-	-	-	-	-	-	-
Stage 2	936	0	-	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.6	0	2.7
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	EBLn2	SBL	SBT
Capacity (veh/h)	-	-	520	868	1493	-
HCM Lane V/C Ratio	-	-	0.144	0.014	0.066	-
HCM Control Delay (s)	-	-	13.1	9.2	7.6	0
HCM Lane LOS	-	-	B	A	A	A
HCM 95th %tile Q(veh)	-	-	0.5	0	0.2	-

Intersection	
Int Delay, s/veh	6.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	18	17	2	1	47	39	5	4	1	92	8	72
Future Vol, veh/h	18	17	2	1	47	39	5	4	1	92	8	72
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	20	18	2	1	51	42	5	4	1	100	9	78

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	93	0	0	20	0	0	177	154	19	136	134	72
Stage 1	-	-	-	-	-	-	59	59	-	74	74	-
Stage 2	-	-	-	-	-	-	118	95	-	62	60	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1501	-	-	1596	-	-	785	738	1059	835	757	990
Stage 1	-	-	-	-	-	-	953	846	-	935	833	-
Stage 2	-	-	-	-	-	-	887	816	-	949	845	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1501	-	-	1596	-	-	709	728	1059	822	746	990
Mov Cap-2 Maneuver	-	-	-	-	-	-	709	728	-	822	746	-
Stage 1	-	-	-	-	-	-	941	835	-	923	832	-
Stage 2	-	-	-	-	-	-	808	815	-	931	834	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	3.6	0.1	9.9	10.2
HCM LOS			A	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	741	1501	-	-	1596	-	-	880
HCM Lane V/C Ratio	0.015	0.013	-	-	0.001	-	-	0.212
HCM Control Delay (s)	9.9	7.4	0	-	7.3	0	-	10.2
HCM Lane LOS	A	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0.8

Intersection	
Int Delay, s/veh	3.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	2	1	43	44	0	1	1	2	0	0	0
Future Vol, veh/h	0	2	1	43	44	0	1	1	2	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	2	1	47	48	0	1	1	2	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	48	0	0	3	0	0	145	145	3	146	145	48
Stage 1	-	-	-	-	-	-	3	3	-	142	142	-
Stage 2	-	-	-	-	-	-	142	142	-	4	3	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1559	-	-	1619	-	-	824	746	1081	823	746	1021
Stage 1	-	-	-	-	-	-	1020	893	-	861	779	-
Stage 2	-	-	-	-	-	-	861	779	-	1018	893	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1559	-	-	1619	-	-	805	724	1081	802	724	1021
Mov Cap-2 Maneuver	-	-	-	-	-	-	805	724	-	802	724	-
Stage 1	-	-	-	-	-	-	1020	893	-	861	756	-
Stage 2	-	-	-	-	-	-	835	756	-	1015	893	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	3.6	9	0
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	894	1559	-	-	1619	-	-	-
HCM Lane V/C Ratio	0.005	-	-	-	0.029	-	-	-
HCM Control Delay (s)	9	0	-	-	7.3	0	-	0
HCM Lane LOS	A	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0.1	-	-	-

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	6	1	0	1	0	2	0	13	0	5	16	88
Future Vol, veh/h	6	1	0	1	0	2	0	13	0	5	16	88
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	7	1	0	1	0	2	0	14	0	5	17	96

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	90	89	65	90	137	14	113	0	0	14	0	0
Stage 1	75	75	-	14	14	-	-	-	-	-	-	-
Stage 2	15	14	-	76	123	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	895	801	999	895	754	1066	1476	-	-	1604	-	-
Stage 1	934	833	-	1006	884	-	-	-	-	-	-	-
Stage 2	1005	884	-	933	794	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	891	799	999	892	752	1066	1476	-	-	1604	-	-
Mov Cap-2 Maneuver	891	799	-	892	752	-	-	-	-	-	-	-
Stage 1	934	831	-	1006	884	-	-	-	-	-	-	-
Stage 2	1003	884	-	929	792	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9.1	8.6	0	0.3
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1476	-	-	877	1001	1604	-	-
HCM Lane V/C Ratio	-	-	-	0.009	0.003	0.003	-	-
HCM Control Delay (s)	0	-	-	9.1	8.6	7.3	0	-
HCM Lane LOS	A	-	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0	0	-	-

Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	11	46	51	34	3	6
Future Vol, veh/h	11	46	51	34	3	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	12	50	55	37	3	7

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	92	0	-	0	148	74
Stage 1	-	-	-	-	74	-
Stage 2	-	-	-	-	74	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1503	-	-	-	844	988
Stage 1	-	-	-	-	949	-
Stage 2	-	-	-	-	949	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1503	-	-	-	837	988
Mov Cap-2 Maneuver	-	-	-	-	837	-
Stage 1	-	-	-	-	941	-
Stage 2	-	-	-	-	949	-

Approach	EB	WB	SB
HCM Control Delay, s	1.4	0	8.9
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1503	-	-	-	932
HCM Lane V/C Ratio	0.008	-	-	-	0.01
HCM Control Delay (s)	7.4	0	-	-	8.9
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

Intersection	
Int Delay, s/veh	2.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	43	0	1	73	7	14	1	1	0	0	22
Future Vol, veh/h	0	43	0	1	73	7	14	1	1	0	0	22
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	47	0	1	79	8	15	1	1	0	0	24

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	87	0	0	47	0	0	144	136	47	133	132	83
Stage 1	-	-	-	-	-	-	47	47	-	85	85	-
Stage 2	-	-	-	-	-	-	97	89	-	48	47	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1509	-	-	1560	-	-	825	755	1022	839	759	976
Stage 1	-	-	-	-	-	-	967	856	-	923	824	-
Stage 2	-	-	-	-	-	-	910	821	-	965	856	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1509	-	-	1560	-	-	804	754	1022	836	758	976
Mov Cap-2 Maneuver	-	-	-	-	-	-	804	754	-	836	758	-
Stage 1	-	-	-	-	-	-	967	856	-	923	823	-
Stage 2	-	-	-	-	-	-	887	820	-	963	856	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.1	9.5	8.8
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	811	1509	-	-	1560	-	-	976
HCM Lane V/C Ratio	0.021	-	-	-	0.001	-	-	0.025
HCM Control Delay (s)	9.5	0	-	-	7.3	0	-	8.8
HCM Lane LOS	A	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.1

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	7	43	88	22	0	0
Future Vol, veh/h	7	43	88	22	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	8	47	96	24	0	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	120	0	-	0	171	108
Stage 1	-	-	-	-	108	-
Stage 2	-	-	-	-	63	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1468	-	-	-	819	946
Stage 1	-	-	-	-	916	-
Stage 2	-	-	-	-	960	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1468	-	-	-	814	946
Mov Cap-2 Maneuver	-	-	-	-	814	-
Stage 1	-	-	-	-	911	-
Stage 2	-	-	-	-	960	-

Approach	EB	WB	SB
HCM Control Delay, s	1	0	0
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1468	-	-	-	-
HCM Lane V/C Ratio	0.005	-	-	-	-
HCM Control Delay (s)	7.5	0	-	-	0
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	-

Intersection	
Int Delay, s/veh	2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	20	0	85	10	171	0	0	231	65
Future Vol, veh/h	0	0	0	20	0	85	10	171	0	0	231	65
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	Yield	-	-	None	-	-	None
Storage Length	-	-	-	-	-	50	-	-	-	-	-	-
Veh in Median Storage, #	-	-	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	22	0	92	11	186	0	0	251	71

Major/Minor				Minor1			Major1			Major2		
Conflicting Flow All				495	530	186	322	0	-	-	-	0
Stage 1				208	208	-	-	-	-	-	-	-
Stage 2				287	322	-	-	-	-	-	-	-
Critical Hdwy				6.42	6.52	6.22	4.12	-	-	-	-	-
Critical Hdwy Stg 1				5.42	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2				5.42	5.52	-	-	-	-	-	-	-
Follow-up Hdwy				3.518	4.018	3.318	2.218	-	-	-	-	-
Pot Cap-1 Maneuver				534	455	856	1238	-	0	0	-	-
Stage 1				827	730	-	-	-	0	0	-	-
Stage 2				762	651	-	-	-	0	0	-	-
Platoon blocked, %								-			-	-
Mov Cap-1 Maneuver				529	0	856	1238	-	-	-	-	-
Mov Cap-2 Maneuver				529	0	-	-	-	-	-	-	-
Stage 1				819	0	-	-	-	-	-	-	-
Stage 2				762	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.2	0.4	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	WBLn1	WBLn2	SBT	SBR
Capacity (veh/h)	1238	-	529	856	-	-
HCM Lane V/C Ratio	0.009	-	0.041	0.108	-	-
HCM Control Delay (s)	7.9	0	12.1	9.7	-	-
HCM Lane LOS	A	A	B	A	-	-
HCM 95th %tile Q(veh)	0	-	0.1	0.4	-	-

Intersection	
Int Delay, s/veh	7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	100	0	5	0	0	0	0	78	61	201	51	0
Future Vol, veh/h	100	0	5	0	0	0	0	78	61	201	51	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	None
Storage Length	-	-	50	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	109	0	5	0	0	0	0	85	66	218	55	0

Major/Minor	Minor2						Major1			Major2		
Conflicting Flow All	609	642	55				-	0	0	151	0	0
Stage 1	491	491	-				-	-	-	-	-	-
Stage 2	118	151	-				-	-	-	-	-	-
Critical Hdwy	6.42	6.52	6.22				-	-	-	4.12	-	-
Critical Hdwy Stg 1	5.42	5.52	-				-	-	-	-	-	-
Critical Hdwy Stg 2	5.42	5.52	-				-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318				-	-	-	2.218	-	-
Pot Cap-1 Maneuver	458	392	1012				0	-	-	1430	-	0
Stage 1	615	548	-				0	-	-	-	-	0
Stage 2	907	772	-				0	-	-	-	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	386	0	1012				-	-	-	1430	-	-
Mov Cap-2 Maneuver	386	0	-				-	-	-	-	-	-
Stage 1	518	0	-				-	-	-	-	-	-
Stage 2	907	0	-				-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	17.5	0	6.4
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	EBLn2	SBL	SBT
Capacity (veh/h)	-	-	386	1012	1430	-
HCM Lane V/C Ratio	-	-	0.282	0.005	0.153	-
HCM Control Delay (s)	-	-	17.9	8.6	8	0
HCM Lane LOS	-	-	C	A	A	A
HCM 95th %tile Q(veh)	-	-	1.1	0	0.5	-

Intersection												
Int Delay, s/veh	5.4											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Vol, veh/h	85	64	1	0	9	44	6	6	1	61	1	6
Future Vol, veh/h	85	64	1	0	9	44	6	6	1	61	1	6
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	92	70	1	0	10	48	7	7	1	66	1	7

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	58	0	0	71	0	0	293	313	71	293	289	34
Stage 1	-	-	-	-	-	-	255	255	-	34	34	-
Stage 2	-	-	-	-	-	-	38	58	-	259	255	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1546	-	-	1529	-	-	659	602	991	659	621	1039
Stage 1	-	-	-	-	-	-	749	696	-	982	867	-
Stage 2	-	-	-	-	-	-	977	847	-	746	696	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1546	-	-	1529	-	-	623	565	991	621	582	1039
Mov Cap-2 Maneuver	-	-	-	-	-	-	623	565	-	621	582	-
Stage 1	-	-	-	-	-	-	703	653	-	921	867	-
Stage 2	-	-	-	-	-	-	970	847	-	692	653	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	4.2	0	11	11.3
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	611	1546	-	-	1529	-	-	643
HCM Lane V/C Ratio	0.023	0.06	-	-	-	-	-	0.115
HCM Control Delay (s)	11	7.5	0	-	0	-	-	11.3
HCM Lane LOS	B	A	A	-	A	-	-	B
HCM 95th %tile Q(veh)	0.1	0.2	-	-	0	-	-	0.4

Intersection	
Int Delay, s/veh	4.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	47	0	2	2	0	0	0	43	1	0	0
Future Vol, veh/h	0	47	0	2	2	0	0	0	43	1	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	51	0	2	2	0	0	0	47	1	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	2	0	0	51	0	0	57	57	51	81	57	2
Stage 1	-	-	-	-	-	-	51	51	-	6	6	-
Stage 2	-	-	-	-	-	-	6	6	-	75	51	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1620	-	-	1555	-	-	940	834	1017	907	834	1082
Stage 1	-	-	-	-	-	-	962	852	-	1016	891	-
Stage 2	-	-	-	-	-	-	1016	891	-	934	852	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1620	-	-	1555	-	-	939	833	1017	864	833	1082
Mov Cap-2 Maneuver	-	-	-	-	-	-	939	833	-	864	833	-
Stage 1	-	-	-	-	-	-	962	852	-	1016	890	-
Stage 2	-	-	-	-	-	-	1015	890	-	891	852	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	3.7	8.7	9.2
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	1017	1620	-	-	1555	-	-	864
HCM Lane V/C Ratio	0.046	-	-	-	0.001	-	-	0.001
HCM Control Delay (s)	8.7	0	-	-	7.3	0	-	9.2
HCM Lane LOS	A	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0

Intersection	
Int Delay, s/veh	7.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	86	4	1	2	2	0	0	8	0	4	12	2
Future Vol, veh/h	86	4	1	2	2	0	0	8	0	4	12	2
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	93	4	1	2	2	0	0	9	0	4	13	2

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	32	31	14	34	32	9	15	0	0	9	0	0
Stage 1	22	22	-	9	9	-	-	-	-	-	-	-
Stage 2	10	9	-	25	23	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	976	862	1066	973	861	1073	1603	-	-	1611	-	-
Stage 1	996	877	-	1012	888	-	-	-	-	-	-	-
Stage 2	1011	888	-	993	876	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	972	859	1066	966	858	1073	1603	-	-	1611	-	-
Mov Cap-2 Maneuver	972	859	-	966	858	-	-	-	-	-	-	-
Stage 1	996	874	-	1012	888	-	-	-	-	-	-	-
Stage 2	1009	888	-	984	873	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9.1	9	0	1.6
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1603	-	-	967	909	1611	-	-
HCM Lane V/C Ratio	-	-	-	0.102	0.005	0.003	-	-
HCM Control Delay (s)	0	-	-	9.1	9	7.2	0	-
HCM Lane LOS	A	-	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.3	0	0	-	-

Intersection	
Int Delay, s/veh	2.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	66	39	13	36	9
Future Vol, veh/h	0	66	39	13	36	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	72	42	14	39	10

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	56	0	-	0	121	49
Stage 1	-	-	-	-	49	-
Stage 2	-	-	-	-	72	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1549	-	-	-	874	1020
Stage 1	-	-	-	-	973	-
Stage 2	-	-	-	-	951	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1549	-	-	-	874	1020
Mov Cap-2 Maneuver	-	-	-	-	874	-
Stage 1	-	-	-	-	973	-
Stage 2	-	-	-	-	951	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	9.2
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1549	-	-	-	900
HCM Lane V/C Ratio	-	-	-	-	0.054
HCM Control Delay (s)	0	-	-	-	9.2
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	22	103	0	0	44	0	0	0	1	7	0	1
Future Vol, veh/h	22	103	0	0	44	0	0	0	1	7	0	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	24	112	0	0	48	0	0	0	1	8	0	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	48	0	0	112	0	0	209	208	112	209	208	48
Stage 1	-	-	-	-	-	-	160	160	-	48	48	-
Stage 2	-	-	-	-	-	-	49	48	-	161	160	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1559	-	-	1478	-	-	748	689	941	748	689	1021
Stage 1	-	-	-	-	-	-	842	766	-	965	855	-
Stage 2	-	-	-	-	-	-	964	855	-	841	766	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1559	-	-	1478	-	-	738	678	941	738	678	1021
Mov Cap-2 Maneuver	-	-	-	-	-	-	738	678	-	738	678	-
Stage 1	-	-	-	-	-	-	829	754	-	950	855	-
Stage 2	-	-	-	-	-	-	963	855	-	827	754	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.3	0	8.8	9.8
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	941	1559	-	-	1478	-	-	764
HCM Lane V/C Ratio	0.001	0.015	-	-	-	-	-	0.011
HCM Control Delay (s)	8.8	7.3	0	-	0	-	-	9.8
HCM Lane LOS	A	A	A	-	A	-	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0

Intersection	
Int Delay, s/veh	1.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	103	45	0	22	7
Future Vol, veh/h	0	103	45	0	22	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	112	49	0	24	8

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	49	0	-	0	161	49
Stage 1	-	-	-	-	49	-
Stage 2	-	-	-	-	112	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1558	-	-	-	830	1020
Stage 1	-	-	-	-	973	-
Stage 2	-	-	-	-	913	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1558	-	-	-	830	1020
Mov Cap-2 Maneuver	-	-	-	-	830	-
Stage 1	-	-	-	-	973	-
Stage 2	-	-	-	-	913	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	9.3
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1558	-	-	-	869
HCM Lane V/C Ratio	-	-	-	-	0.036
HCM Control Delay (s)	0	-	-	-	9.3
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Appendix U

Solar Farm Average Operations Traffic Generation Rates

Solar Farm Average Operations Phase Traffic Generation Rates

After construction completion, the solar projects will change to an operations phase with fewer employees and thus the project will generation less traffic. Some of the other solar projects did not have traffic identifed for the operations phase; therefore, an average traffic generation operations rate was calculated based on the number of megawatts (MW). The following tables listes the traffic generation assocaited with each cumulative project and the associated MW.

	Operations			Operations AM				Operations PM			
Project	**Mega Watts**	**ADT**	**ADT / MW**	**IN**	**IN/MW**	**OUT**	**OUT/MW**	**IN**	**IN/MW**	**OUT**	**OUT/MW**
Centinela	275	21	0.08	4	0.01	3	0.01	3	0.01	4	0.01
Imperial Solar South	200	15	0.08	2	0.01	2	0.01	2	0.01	2	0.01
Imperial Solar West	250	15	0.06	2	0.01	2	0.01	2	0.01	2	0.01
Mt Signal	200	20	0.10	7	0.04	1	0.01	7	0.04	1	0.01
Average Operation Rates/MW			**0.08**		**0.02**		**0.01**		**0.02**		**0.01**

The above operation rates were used to calcualted the traffic associated with the following cumualtive projects during their operations phase.

Proposed Cumulative Projects	MW	ADT	IN	OUT	IN	OUT
Big Rock and Laurel Solar	200	16	3	2	3	2
Calexico I-A	100	8	2	1	2	1
Calexico I-B	100	8	2	1	2	1
Calexico 2-A	100	8	2	1	2	1
Centinela Phase 2	100	8	2	1	2	1
Iris Solar Cluster	360	28	6	3	6	3
Vega Solar	100	8	2	1	2	1
Wistaria	250	19	4	2	4	2

Appendix V

Year 2027 + Project Construction + Cumulative Intersection LOS Calculations

Intersection	
Int Delay, s/veh	3.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	57	0	109	14	118	0	0	187	81
Future Vol, veh/h	0	0	0	57	0	109	14	118	0	0	187	81
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	Yield	-	-	None	-	-	None
Storage Length	-	-	-	-	-	50	-	-	-	-	-	-
Veh in Median Storage, #	-	-	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	62	0	118	15	128	0	0	203	88

Major/Minor				Minor1			Major1			Major2		
Conflicting Flow All				405	449	128	291	0	-	-	-	0
Stage 1				158	158	-	-	-	-	-	-	-
Stage 2				247	291	-	-	-	-	-	-	-
Critical Hdwy				6.42	6.52	6.22	4.12	-	-	-	-	-
Critical Hdwy Stg 1				5.42	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2				5.42	5.52	-	-	-	-	-	-	-
Follow-up Hdwy				3.518	4.018	3.318	2.218	-	-	-	-	-
Pot Cap-1 Maneuver				602	505	922	1271	-	0	0	-	-
Stage 1				871	767	-	-	-	0	0	-	-
Stage 2				794	672	-	-	-	0	0	-	-
Platoon blocked, %								-			-	-
Mov Cap-1 Maneuver				594	0	922	1271	-	-	-	-	-
Mov Cap-2 Maneuver				594	0	-	-	-	-	-	-	-
Stage 1				860	0	-	-	-	-	-	-	-
Stage 2				794	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.3	0.8	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	WBLn1	WBLn2	SBT	SBR
Capacity (veh/h)	1271	-	594	922	-	-
HCM Lane V/C Ratio	0.012	-	0.104	0.129	-	-
HCM Control Delay (s)	7.9	0	11.8	9.5	-	-
HCM Lane LOS	A	A	B	A	-	-
HCM 95th %tile Q(veh)	0	-	0.3	0.4	-	-

Intersection	
Int Delay, s/veh	4.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	68	1	13	0	0	0	0	67	29	121	117	0
Future Vol, veh/h	68	1	13	0	0	0	0	67	29	121	117	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	None
Storage Length	-	-	50	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	74	1	14	0	0	0	0	73	32	132	127	0

Major/Minor	Minor2						Major1			Major2		
Conflicting Flow All	480	496	127				-	0	0	105	0	0
Stage 1	391	391	-				-	-	-	-	-	-
Stage 2	89	105	-				-	-	-	-	-	-
Critical Hdwy	6.42	6.52	6.22				-	-	-	4.12	-	-
Critical Hdwy Stg 1	5.42	5.52	-				-	-	-	-	-	-
Critical Hdwy Stg 2	5.42	5.52	-				-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318				-	-	-	2.218	-	-
Pot Cap-1 Maneuver	545	475	923				0	-	-	1486	-	0
Stage 1	683	607	-				0	-	-	-	-	0
Stage 2	934	808	-				0	-	-	-	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	493	0	923				-	-	-	1486	-	-
Mov Cap-2 Maneuver	493	0	-				-	-	-	-	-	-
Stage 1	617	0	-				-	-	-	-	-	-
Stage 2	934	0	-				-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.9	0	3.9
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	EBLn2	SBL	SBT
Capacity (veh/h)	-	-	493	923	1486	-
HCM Lane V/C Ratio	-	-	0.152	0.015	0.089	-
HCM Control Delay (s)	-	-	13.6	9	7.7	0
HCM Lane LOS	-	-	B	A	A	A
HCM 95th %tile Q(veh)	-	-	0.5	0	0.3	-

Intersection	
Int Delay, s/veh	6.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	22	16	2	1	18	39	5	4	1	99	8	23
Future Vol, veh/h	22	16	2	1	18	39	5	4	1	99	8	23
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	24	17	2	1	20	42	5	4	1	108	9	25

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	62	0	0	19	0	0	126	130	18	112	110	41
Stage 1	-	-	-	-	-	-	66	66	-	43	43	-
Stage 2	-	-	-	-	-	-	60	64	-	69	67	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1541	-	-	1597	-	-	848	761	1061	866	780	1030
Stage 1	-	-	-	-	-	-	945	840	-	971	859	-
Stage 2	-	-	-	-	-	-	951	842	-	941	839	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1541	-	-	1597	-	-	810	748	1061	850	767	1030
Mov Cap-2 Maneuver	-	-	-	-	-	-	810	748	-	850	767	-
Stage 1	-	-	-	-	-	-	930	827	-	955	858	-
Stage 2	-	-	-	-	-	-	918	841	-	920	826	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	4.1	0.1	9.6	9.9
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	802	1541	-	-	1597	-	-	871
HCM Lane V/C Ratio	0.014	0.016	-	-	0.001	-	-	0.162
HCM Control Delay (s)	9.6	7.4	0	-	7.3	0	-	9.9
HCM Lane LOS	A	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0.6

Intersection	
Int Delay, s/veh	3.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	2	1	0	2	0	1	1	1	0	0	0
Future Vol, veh/h	0	2	1	0	2	0	1	1	1	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	2	1	0	2	0	1	1	1	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	2	0	0	3	0	0	5	5	3	6	5	2
Stage 1	-	-	-	-	-	-	3	3	-	2	2	-
Stage 2	-	-	-	-	-	-	2	2	-	4	3	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1620	-	-	1619	-	-	1016	890	1081	1014	890	1082
Stage 1	-	-	-	-	-	-	1020	893	-	1021	894	-
Stage 2	-	-	-	-	-	-	1021	894	-	1018	893	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1620	-	-	1619	-	-	1016	890	1081	1012	890	1082
Mov Cap-2 Maneuver	-	-	-	-	-	-	1016	890	-	1012	890	-
Stage 1	-	-	-	-	-	-	1020	893	-	1021	894	-
Stage 2	-	-	-	-	-	-	1021	894	-	1016	893	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0	8.7	0
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	989	1620	-	-	1619	-	-	-
HCM Lane V/C Ratio	0.003	-	-	-	-	-	-	-
HCM Control Delay (s)	8.7	0	-	-	0	-	-	0
HCM Lane LOS	A	A	-	-	A	-	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	-

Intersection	
Int Delay, s/veh	2.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	1	0	1	0	4	0	17	0	7	20	3
Future Vol, veh/h	5	1	0	1	0	4	0	17	0	7	20	3
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	1	0	1	0	4	0	18	0	8	22	3

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	60	58	24	58	59	18	25	0	0	18	0	0
Stage 1	40	40	-	18	18	-	-	-	-	-	-	-
Stage 2	20	18	-	40	41	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	936	833	1052	939	832	1061	1589	-	-	1599	-	-
Stage 1	975	862	-	1001	880	-	-	-	-	-	-	-
Stage 2	999	880	-	975	861	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	929	829	1052	934	828	1061	1589	-	-	1599	-	-
Mov Cap-2 Maneuver	929	829	-	934	828	-	-	-	-	-	-	-
Stage 1	975	858	-	1001	880	-	-	-	-	-	-	-
Stage 2	995	880	-	969	857	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9	8.5	0	1.7
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1589	-	-	911	1033	1599	-	-
HCM Lane V/C Ratio	-	-	-	0.007	0.005	0.005	-	-
HCM Control Delay (s)	0	-	-	9	8.5	7.3	0	-
HCM Lane LOS	A	-	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0	0	-	-

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	4	39	51	6	2	6
Future Vol, veh/h	4	39	51	6	2	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	4	42	55	7	2	7

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	62	0	-	0	109	59
Stage 1	-	-	-	-	59	-
Stage 2	-	-	-	-	50	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1541	-	-	-	888	1007
Stage 1	-	-	-	-	964	-
Stage 2	-	-	-	-	972	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1541	-	-	-	885	1007
Mov Cap-2 Maneuver	-	-	-	-	885	-
Stage 1	-	-	-	-	961	-
Stage 2	-	-	-	-	972	-

Approach	EB	WB	SB
HCM Control Delay, s	0.7	0	8.7
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1541	-	-	-	973
HCM Lane V/C Ratio	0.003	-	-	-	0.009
HCM Control Delay (s)	7.3	0	-	-	8.7
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

Intersection												
Int Delay, s/veh	1.5											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Vol, veh/h	0	42	0	1	45	0	14	1	1	0	0	0
Future Vol, veh/h	0	42	0	1	45	0	14	1	1	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	46	0	1	49	0	15	1	1	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	49	0	0	46	0	0	97	97	46	98	97	49
Stage 1	-	-	-	-	-	-	46	46	-	51	51	-
Stage 2	-	-	-	-	-	-	51	51	-	47	46	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1558	-	-	1562	-	-	885	793	1023	884	793	1020
Stage 1	-	-	-	-	-	-	968	857	-	962	852	-
Stage 2	-	-	-	-	-	-	962	852	-	967	857	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1558	-	-	1562	-	-	884	792	1023	881	792	1020
Mov Cap-2 Maneuver	-	-	-	-	-	-	884	792	-	881	792	-
Stage 1	-	-	-	-	-	-	968	857	-	962	851	-
Stage 2	-	-	-	-	-	-	961	851	-	965	857	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.2	9.1	0
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	885	1558	-	-	1562	-	-	-
HCM Lane V/C Ratio	0.02	-	-	-	0.001	-	-	-
HCM Control Delay (s)	9.1	0	-	-	7.3	0	-	0
HCM Lane LOS	A	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	-

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	42	60	0	0	0
Future Vol, veh/h	0	42	60	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	46	65	0	0	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	65	0	-	0	111	65
Stage 1	-	-	-	-	65	-
Stage 2	-	-	-	-	46	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1537	-	-	-	886	999
Stage 1	-	-	-	-	958	-
Stage 2	-	-	-	-	976	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1537	-	-	-	886	999
Mov Cap-2 Maneuver	-	-	-	-	886	-
Stage 1	-	-	-	-	958	-
Stage 2	-	-	-	-	976	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	0
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1537	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	-	-	0
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	-

Intersection	
Int Delay, s/veh	2.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	28	0	119	12	154	0	0	251	65
Future Vol, veh/h	0	0	0	28	0	119	12	154	0	0	251	65
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	Yield	-	-	None	-	-	None
Storage Length	-	-	-	-	-	50	-	-	-	-	-	-
Veh in Median Storage, #	-	-	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	30	0	129	13	167	0	0	273	71

Major/Minor				Minor1			Major1			Major2		
Conflicting Flow All				502	537	167	344	0	-	-	-	0
Stage 1				193	193	-	-	-	-	-	-	-
Stage 2				309	344	-	-	-	-	-	-	-
Critical Hdwy				6.42	6.52	6.22	4.12	-	-	-	-	-
Critical Hdwy Stg 1				5.42	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2				5.42	5.52	-	-	-	-	-	-	-
Follow-up Hdwy				3.518	4.018	3.318	2.218	-	-	-	-	-
Pot Cap-1 Maneuver				529	450	877	1215	-	0	0	-	-
Stage 1				840	741	-	-	-	0	0	-	-
Stage 2				745	637	-	-	-	0	0	-	-
Platoon blocked, %								-			-	-
Mov Cap-1 Maneuver				523	0	877	1215	-	-	-	-	-
Mov Cap-2 Maneuver				523	0	-	-	-	-	-	-	-
Stage 1				830	0	-	-	-	-	-	-	-
Stage 2				745	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.3	0.6	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	WBLn1	WBLn2	SBT	SBR
Capacity (veh/h)	1215	-	523	877	-	-
HCM Lane V/C Ratio	0.011	-	0.058	0.147	-	-
HCM Control Delay (s)	8	0	12.3	9.8	-	-
HCM Lane LOS	A	A	B	A	-	-
HCM 95th %tile Q(veh)	0	-	0.2	0.5	-	-

Intersection	
Int Delay, s/veh	7.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	101	0	5	0	0	0	0	63	30	221	59	0
Future Vol, veh/h	101	0	5	0	0	0	0	63	30	221	59	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	None
Storage Length	-	-	50	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	110	0	5	0	0	0	0	68	33	240	64	0

Major/Minor	Minor2						Major1			Major2		
Conflicting Flow All	629	645	64				-	0	0	101	0	0
Stage 1	544	544	-				-	-	-	-	-	-
Stage 2	85	101	-				-	-	-	-	-	-
Critical Hdwy	6.42	6.52	6.22				-	-	-	4.12	-	-
Critical Hdwy Stg 1	5.42	5.52	-				-	-	-	-	-	-
Critical Hdwy Stg 2	5.42	5.52	-				-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318				-	-	-	2.218	-	-
Pot Cap-1 Maneuver	446	391	1000				0	-	-	1491	-	0
Stage 1	582	519	-				0	-	-	-	-	0
Stage 2	938	811	-				0	-	-	-	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	372	0	1000				-	-	-	1491	-	-
Mov Cap-2 Maneuver	372	0	-				-	-	-	-	-	-
Stage 1	485	0	-				-	-	-	-	-	-
Stage 2	938	0	-				-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	18.2	0	6.2
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	EBLn2	SBL	SBT
Capacity (veh/h)	-	-	372	1000	1491	-
HCM Lane V/C Ratio	-	-	0.295	0.005	0.161	-
HCM Control Delay (s)	-	-	18.7	8.6	7.9	0
HCM Lane LOS	-	-	C	A	A	A
HCM 95th %tile Q(veh)	-	-	1.2	0	0.6	-

Intersection	
Int Delay, s/veh	5.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	32	35	1	0	8	51	6	6	1	61	1	14
Future Vol, veh/h	32	35	1	0	8	51	6	6	1	61	1	14
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	35	38	1	0	9	55	7	7	1	66	1	15

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	64	0	0	39	0	0	154	173	39	150	146	37
Stage 1	-	-	-	-	-	-	109	109	-	37	37	-
Stage 2	-	-	-	-	-	-	45	64	-	113	109	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1538	-	-	1571	-	-	813	720	1033	818	745	1035
Stage 1	-	-	-	-	-	-	896	805	-	978	864	-
Stage 2	-	-	-	-	-	-	969	842	-	892	805	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1538	-	-	1571	-	-	786	703	1033	797	728	1035
Mov Cap-2 Maneuver	-	-	-	-	-	-	786	703	-	797	728	-
Stage 1	-	-	-	-	-	-	875	786	-	956	864	-
Stage 2	-	-	-	-	-	-	954	842	-	863	786	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	3.5	0	9.8	9.8
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	759	1538	-	-	1571	-	-	831
HCM Lane V/C Ratio	0.019	0.023	-	-	-	-	-	0.099
HCM Control Delay (s)	9.8	7.4	0	-	0	-	-	9.8
HCM Lane LOS	A	A	A	-	A	-	-	A
HCM 95th %tile Q(veh)	0.1	0.1	-	-	0	-	-	0.3

Intersection	
Int Delay, s/veh	1.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	5	0	1	2	0	0	0	0	1	0	0
Future Vol, veh/h	0	5	0	1	2	0	0	0	0	1	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	5	0	1	2	0	0	0	0	1	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	2	0	0	5	0	0	9	9	5	9	9	2
Stage 1	-	-	-	-	-	-	5	5	-	4	4	-
Stage 2	-	-	-	-	-	-	4	4	-	5	5	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1620	-	-	1616	-	-	1010	886	1078	1010	886	1082
Stage 1	-	-	-	-	-	-	1017	892	-	1018	892	-
Stage 2	-	-	-	-	-	-	1018	892	-	1017	892	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1620	-	-	1616	-	-	1009	885	1078	1009	885	1082
Mov Cap-2 Maneuver	-	-	-	-	-	-	1009	885	-	1009	885	-
Stage 1	-	-	-	-	-	-	1017	892	-	1018	891	-
Stage 2	-	-	-	-	-	-	1017	891	-	1017	892	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	2.4	0	8.6
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	1620	-	-	1616	-	-	1009
HCM Lane V/C Ratio	-	-	-	-	0.001	-	-	0.001
HCM Control Delay (s)	0	0	-	-	7.2	0	-	8.6
HCM Lane LOS	A	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	-	0	-	-	0	-	-	0

Intersection	
Int Delay, s/veh	3.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	4	1	2	2	3	0	13	0	7	17	1
Future Vol, veh/h	1	4	1	2	2	3	0	13	0	7	17	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	1	4	1	2	2	3	0	14	0	8	18	1

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	52	49	19	51	49	14	19	0	0	14	0	0
Stage 1	35	35	-	14	14	-	-	-	-	-	-	-
Stage 2	17	14	-	37	35	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	947	843	1059	948	843	1066	1597	-	-	1604	-	-
Stage 1	981	866	-	1006	884	-	-	-	-	-	-	-
Stage 2	1002	884	-	978	866	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	938	839	1059	939	839	1066	1597	-	-	1604	-	-
Mov Cap-2 Maneuver	938	839	-	939	839	-	-	-	-	-	-	-
Stage 1	981	862	-	1006	884	-	-	-	-	-	-	-
Stage 2	996	884	-	967	862	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9.1	8.8	0	2
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1597	-	-	885	955	1604	-	-
HCM Lane V/C Ratio	-	-	-	0.007	0.008	0.005	-	-
HCM Control Delay (s)	0	-	-	9.1	8.8	7.3	0	-
HCM Lane LOS	A	-	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0	0	-	-

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	66	32	12	8	2
Future Vol, veh/h	0	66	32	12	8	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	72	35	13	9	2

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	48	0	-	0	114	42
Stage 1	-	-	-	-	42	-
Stage 2	-	-	-	-	72	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1559	-	-	-	882	1029
Stage 1	-	-	-	-	980	-
Stage 2	-	-	-	-	951	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1559	-	-	-	882	1029
Mov Cap-2 Maneuver	-	-	-	-	882	-
Stage 1	-	-	-	-	980	-
Stage 2	-	-	-	-	951	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	9
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1559	-	-	-	908
HCM Lane V/C Ratio	-	-	-	-	0.012
HCM Control Delay (s)	0	-	-	-	9
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	75	0	0	43	0	0	0	1	0	0	1
Future Vol, veh/h	0	75	0	0	43	0	0	0	1	0	0	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	82	0	0	47	0	0	0	1	0	0	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	47	0	0	82	0	0	130	129	82	130	129	47
Stage 1	-	-	-	-	-	-	82	82	-	47	47	-
Stage 2	-	-	-	-	-	-	48	47	-	83	82	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1560	-	-	1515	-	-	843	762	978	843	762	1022
Stage 1	-	-	-	-	-	-	926	827	-	967	856	-
Stage 2	-	-	-	-	-	-	965	856	-	925	827	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1560	-	-	1515	-	-	842	762	978	842	762	1022
Mov Cap-2 Maneuver	-	-	-	-	-	-	842	762	-	842	762	-
Stage 1	-	-	-	-	-	-	926	827	-	967	856	-
Stage 2	-	-	-	-	-	-	964	856	-	924	827	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0	8.7	8.5
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	978	1560	-	-	1515	-	-	1022
HCM Lane V/C Ratio	0.001	-	-	-	-	-	-	0.001
HCM Control Delay (s)	8.7	0	-	-	0	-	-	8.5
HCM Lane LOS	A	A	-	-	A	-	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	75	44	0	0	0
Future Vol, veh/h	0	75	44	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	82	48	0	0	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	48	0	-	0	130	48
Stage 1	-	-	-	-	48	-
Stage 2	-	-	-	-	82	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1559	-	-	-	864	1021
Stage 1	-	-	-	-	974	-
Stage 2	-	-	-	-	941	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1559	-	-	-	864	1021
Mov Cap-2 Maneuver	-	-	-	-	864	-
Stage 1	-	-	-	-	974	-
Stage 2	-	-	-	-	941	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	0
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1559	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	-	-	0
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	-

Intersection	
Int Delay, s/veh	3.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	93	0	109	14	118	0	0	209	81
Future Vol, veh/h	0	0	0	93	0	109	14	118	0	0	209	81
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	Yield	-	-	None	-	-	None
Storage Length	-	-	-	-	-	50	-	-	-	-	-	-
Veh in Median Storage, #	-	-	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	101	0	118	15	128	0	0	227	88

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	429	473	128	315	0	-	-	-	0
Stage 1	158	158	-	-	-	-	-	-	-
Stage 2	271	315	-	-	-	-	-	-	-
Critical Hdwy	6.42	6.52	6.22	4.12	-	-	-	-	-
Critical Hdwy Stg 1	5.42	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.42	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	2.218	-	-	-	-	-
Pot Cap-1 Maneuver	583	490	922	1245	-	0	0	-	-
Stage 1	871	767	-	-	-	0	0	-	-
Stage 2	775	656	-	-	-	0	0	-	-
Platoon blocked, %					-			-	-
Mov Cap-1 Maneuver	575	0	922	1245	-	-	-	-	-
Mov Cap-2 Maneuver	575	0	-	-	-	-	-	-	-
Stage 1	860	0	-	-	-	-	-	-	-
Stage 2	775	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.9	0.8	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	WBLn1	WBLn2	SBT	SBR
Capacity (veh/h)	1245	-	575	922	-	-
HCM Lane V/C Ratio	0.012	-	0.176	0.129	-	-
HCM Control Delay (s)	7.9	0	12.6	9.5	-	-
HCM Lane LOS	A	A	B	A	-	-
HCM 95th %tile Q(veh)	0	-	0.6	0.4	-	-

Intersection	
Int Delay, s/veh	4.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	68	1	13	0	0	0	0	67	30	121	175	0
Future Vol, veh/h	68	1	13	0	0	0	0	67	30	121	175	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	None
Storage Length	-	-	50	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	74	1	14	0	0	0	0	73	33	132	190	0

Major/Minor	Minor2						Major1			Major2		
Conflicting Flow All	544	560	190				-	0	0	106	0	0
Stage 1	454	454	-				-	-	-	-	-	-
Stage 2	90	106	-				-	-	-	-	-	-
Critical Hdwy	6.42	6.52	6.22				-	-	-	4.12	-	-
Critical Hdwy Stg 1	5.42	5.52	-				-	-	-	-	-	-
Critical Hdwy Stg 2	5.42	5.52	-				-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318				-	-	-	2.218	-	-
Pot Cap-1 Maneuver	500	437	852				0	-	-	1485	-	0
Stage 1	640	569	-				0	-	-	-	-	0
Stage 2	934	807	-				0	-	-	-	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	451	0	852				-	-	-	1485	-	-
Mov Cap-2 Maneuver	451	0	-				-	-	-	-	-	-
Stage 1	577	0	-				-	-	-	-	-	-
Stage 2	934	0	-				-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	13.8	0	3.1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	EBLn2	SBL	SBT
Capacity (veh/h)	-	-	451	852	1485	-
HCM Lane V/C Ratio	-	-	0.166	0.017	0.089	-
HCM Control Delay (s)	-	-	14.6	9.3	7.7	0
HCM Lane LOS	-	-	B	A	A	A
HCM 95th %tile Q(veh)	-	-	0.6	0.1	0.3	-

Intersection	
Int Delay, s/veh	6.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	23	17	2	1	47	39	5	4	1	99	8	81
Future Vol, veh/h	23	17	2	1	47	39	5	4	1	99	8	81
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	25	18	2	1	51	42	5	4	1	108	9	88

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	93	0	0	20	0	0	192	164	19	146	144	72
Stage 1	-	-	-	-	-	-	69	69	-	74	74	-
Stage 2	-	-	-	-	-	-	123	95	-	72	70	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1501	-	-	1596	-	-	768	729	1059	823	747	990
Stage 1	-	-	-	-	-	-	941	837	-	935	833	-
Stage 2	-	-	-	-	-	-	881	816	-	938	837	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1501	-	-	1596	-	-	684	716	1059	807	734	990
Mov Cap-2 Maneuver	-	-	-	-	-	-	684	716	-	807	734	-
Stage 1	-	-	-	-	-	-	925	823	-	919	832	-
Stage 2	-	-	-	-	-	-	793	815	-	916	823	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	4.1	0.1	10.1	10.4
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	723	1501	-	-	1596	-	-	873
HCM Lane V/C Ratio	0.015	0.017	-	-	0.001	-	-	0.234
HCM Control Delay (s)	10.1	7.4	0	-	7.3	0	-	10.4
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0	0.1	-	-	0	-	-	0.9

Intersection												
Int Delay, s/veh	3.7											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Vol, veh/h	0	3	1	43	45	0	1	1	2	0	0	0
Future Vol, veh/h	0	3	1	43	45	0	1	1	2	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	3	1	47	49	0	1	1	2	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	49	0	0	4	0	0	147	147	4	148	147	49
Stage 1	-	-	-	-	-	-	4	4	-	143	143	-
Stage 2	-	-	-	-	-	-	143	143	-	5	4	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1558	-	-	1618	-	-	821	744	1080	820	744	1020
Stage 1	-	-	-	-	-	-	1018	892	-	860	779	-
Stage 2	-	-	-	-	-	-	860	779	-	1017	892	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1558	-	-	1618	-	-	802	722	1080	799	722	1020
Mov Cap-2 Maneuver	-	-	-	-	-	-	802	722	-	799	722	-
Stage 1	-	-	-	-	-	-	1018	892	-	860	756	-
Stage 2	-	-	-	-	-	-	834	756	-	1014	892	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	3.6	9.1	0
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	892	1558	-	-	1618	-	-	-
HCM Lane V/C Ratio	0.005	-	-	-	0.029	-	-	-
HCM Control Delay (s)	9.1	0	-	-	7.3	0	-	0
HCM Lane LOS	A	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0.1	-	-	-

Intersection												
Int Delay, s/veh	1.1											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	7	1	0	1	0	4	0	17	0	7	20	89
Future Vol, veh/h	7	1	0	1	0	4	0	17	0	7	20	89
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	8	1	0	1	0	4	0	18	0	8	22	97

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	107	105	71	105	153	18	119	0	0	18	0	0
Stage 1	87	87	-	18	18	-	-	-	-	-	-	-
Stage 2	20	18	-	87	135	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	872	785	991	875	739	1061	1469	-	-	1599	-	-
Stage 1	921	823	-	1001	880	-	-	-	-	-	-	-
Stage 2	999	880	-	921	785	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	865	781	991	871	735	1061	1469	-	-	1599	-	-
Mov Cap-2 Maneuver	865	781	-	871	735	-	-	-	-	-	-	-
Stage 1	921	819	-	1001	880	-	-	-	-	-	-	-
Stage 2	995	880	-	915	781	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9.3	8.6	0	0.4
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1469	-	-	854	1017	1599	-	-
HCM Lane V/C Ratio	-	-	-	0.01	0.005	0.005	-	-
HCM Control Delay (s)	0	-	-	9.3	8.6	7.3	0	-
HCM Lane LOS	A	-	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0	0	-	-

Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	11	46	51	35	3	6
Future Vol, veh/h	11	46	51	35	3	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	12	50	55	38	3	7

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	93	0	-	0	148	74
Stage 1	-	-	-	-	74	-
Stage 2	-	-	-	-	74	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1501	-	-	-	844	988
Stage 1	-	-	-	-	949	-
Stage 2	-	-	-	-	949	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1501	-	-	-	837	988
Mov Cap-2 Maneuver	-	-	-	-	837	-
Stage 1	-	-	-	-	941	-
Stage 2	-	-	-	-	949	-

Approach	EB	WB	SB
HCM Control Delay, s	1.4	0	8.9
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1501	-	-	-	932
HCM Lane V/C Ratio	0.008	-	-	-	0.01
HCM Control Delay (s)	7.4	0	-	-	8.9
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

Intersection	
Int Delay, s/veh	2.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	43	0	1	74	7	14	1	1	0	0	22
Future Vol, veh/h	0	43	0	1	74	7	14	1	1	0	0	22
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	47	0	1	80	8	15	1	1	0	0	24

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	88	0	0	47	0	0	145	137	47	134	133	84
Stage 1	-	-	-	-	-	-	47	47	-	86	86	-
Stage 2	-	-	-	-	-	-	98	90	-	48	47	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1508	-	-	1560	-	-	824	754	1022	838	758	975
Stage 1	-	-	-	-	-	-	967	856	-	922	824	-
Stage 2	-	-	-	-	-	-	908	820	-	965	856	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1508	-	-	1560	-	-	803	753	1022	835	757	975
Mov Cap-2 Maneuver	-	-	-	-	-	-	803	753	-	835	757	-
Stage 1	-	-	-	-	-	-	967	856	-	922	823	-
Stage 2	-	-	-	-	-	-	885	819	-	963	856	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.1	9.5	8.8
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	810	1508	-	-	1560	-	-	975
HCM Lane V/C Ratio	0.021	-	-	-	0.001	-	-	0.025
HCM Control Delay (s)	9.5	0	-	-	7.3	0	-	8.8
HCM Lane LOS	A	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.1

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	7	43	89	22	0	0
Future Vol, veh/h	7	43	89	22	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	8	47	97	24	0	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	121	0	-	0	172	109
Stage 1	-	-	-	-	109	-
Stage 2	-	-	-	-	63	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1467	-	-	-	818	945
Stage 1	-	-	-	-	916	-
Stage 2	-	-	-	-	960	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1467	-	-	-	813	945
Mov Cap-2 Maneuver	-	-	-	-	813	-
Stage 1	-	-	-	-	911	-
Stage 2	-	-	-	-	960	-

Approach	EB	WB	SB
HCM Control Delay, s	1	0	0
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1467	-	-	-	-
HCM Lane V/C Ratio	0.005	-	-	-	-
HCM Control Delay (s)	7.5	0	-	-	0
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	-

Intersection	
Int Delay, s/veh	2.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	29	0	119	12	176	0	0	251	65
Future Vol, veh/h	0	0	0	29	0	119	12	176	0	0	251	65
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	Yield	-	-	None	-	-	None
Storage Length	-	-	-	-	-	50	-	-	-	-	-	-
Veh in Median Storage, #	-	-	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	32	0	129	13	191	0	0	273	71

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	526	561	191	344	0	-	-	-	0
Stage 1	217	217	-	-	-	-	-	-	-
Stage 2	309	344	-	-	-	-	-	-	-
Critical Hdwy	6.42	6.52	6.22	4.12	-	-	-	-	-
Critical Hdwy Stg 1	5.42	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.42	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	2.218	-	-	-	-	-
Pot Cap-1 Maneuver	512	436	851	1215	-	0	0	-	-
Stage 1	819	723	-	-	-	0	0	-	-
Stage 2	745	637	-	-	-	0	0	-	-
Platoon blocked, %					-			-	-
Mov Cap-1 Maneuver	506	0	851	1215	-	-	-	-	-
Mov Cap-2 Maneuver	506	0	-	-	-	-	-	-	-
Stage 1	809	0	-	-	-	-	-	-	-
Stage 2	745	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.5	0.5	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	WBLn1	WBLn2	SBT	SBR
Capacity (veh/h)	1215	-	506	851	-	-
HCM Lane V/C Ratio	0.011	-	0.062	0.152	-	-
HCM Control Delay (s)	8	0	12.6	10	-	-
HCM Lane LOS	A	A	B	B	-	-
HCM 95th %tile Q(veh)	0	-	0.2	0.5	-	-

Intersection	
Int Delay, s/veh	7.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	101	0	5	0	0	0	0	85	66	221	60	0
Future Vol, veh/h	101	0	5	0	0	0	0	85	66	221	60	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	Yield	-	-	None	-	-	None	-	-	None
Storage Length	-	-	50	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	110	0	5	0	0	0	0	92	72	240	65	0

Major/Minor	Minor2						Major1			Major2		
Conflicting Flow All	673	709	65				-	0	0	164	0	0
Stage 1	545	545	-				-	-	-	-	-	-
Stage 2	128	164	-				-	-	-	-	-	-
Critical Hdwy	6.42	6.52	6.22				-	-	-	4.12	-	-
Critical Hdwy Stg 1	5.42	5.52	-				-	-	-	-	-	-
Critical Hdwy Stg 2	5.42	5.52	-				-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318				-	-	-	2.218	-	-
Pot Cap-1 Maneuver	421	359	999				0	-	-	1414	-	0
Stage 1	581	519	-				0	-	-	-	-	0
Stage 2	898	762	-				0	-	-	-	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	347	0	999				-	-	-	1414	-	-
Mov Cap-2 Maneuver	347	0	-				-	-	-	-	-	-
Stage 1	479	0	-				-	-	-	-	-	-
Stage 2	898	0	-				-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	19.6	0	6.3
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	EBLn2	SBL	SBT
Capacity (veh/h)	-	-	347	999	1414	-
HCM Lane V/C Ratio	-	-	0.316	0.005	0.17	-
HCM Control Delay (s)	-	-	20.1	8.6	8.1	0
HCM Lane LOS	-	-	C	A	A	A
HCM 95th %tile Q(veh)	-	-	1.3	0	0.6	-

Intersection	
Int Delay, s/veh	5.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	90	64	1	0	9	51	6	6	1	61	1	15
Future Vol, veh/h	90	64	1	0	9	51	6	6	1	61	1	15
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	98	70	1	0	10	55	7	7	1	66	1	16

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	65	0	0	71	0	0	313	332	71	309	305	38
Stage 1	-	-	-	-	-	-	267	267	-	38	38	-
Stage 2	-	-	-	-	-	-	46	65	-	271	267	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1537	-	-	1529	-	-	640	588	991	643	608	1034
Stage 1	-	-	-	-	-	-	738	688	-	977	863	-
Stage 2	-	-	-	-	-	-	968	841	-	735	688	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1537	-	-	1529	-	-	597	549	991	604	568	1034
Mov Cap-2 Maneuver	-	-	-	-	-	-	597	549	-	604	568	-
Stage 1	-	-	-	-	-	-	689	643	-	913	863	-
Stage 2	-	-	-	-	-	-	952	841	-	679	643	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	4.4	0	11.2	11.3
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	591	1537	-	-	1529	-	-	657
HCM Lane V/C Ratio	0.024	0.064	-	-	-	-	-	0.127
HCM Control Delay (s)	11.2	7.5	0	-	0	-	-	11.3
HCM Lane LOS	B	A	A	-	A	-	-	B
HCM 95th %tile Q(veh)	0.1	0.2	-	-	0	-	-	0.4

Intersection	
Int Delay, s/veh	4.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	48	0	2	3	0	0	0	43	1	0	0
Future Vol, veh/h	0	48	0	2	3	0	0	0	43	1	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	52	0	2	3	0	0	0	47	1	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	3	0	0	52	0	0	59	59	52	83	59	3
Stage 1	-	-	-	-	-	-	52	52	-	7	7	-
Stage 2	-	-	-	-	-	-	7	7	-	76	52	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1619	-	-	1554	-	-	937	832	1016	904	832	1081
Stage 1	-	-	-	-	-	-	961	852	-	1015	890	-
Stage 2	-	-	-	-	-	-	1015	890	-	933	852	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1619	-	-	1554	-	-	936	831	1016	862	831	1081
Mov Cap-2 Maneuver	-	-	-	-	-	-	936	831	-	862	831	-
Stage 1	-	-	-	-	-	-	961	852	-	1015	889	-
Stage 2	-	-	-	-	-	-	1014	889	-	890	852	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	2.9	8.7	9.2
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	1016	1619	-	-	1554	-	-	862
HCM Lane V/C Ratio	0.046	-	-	-	0.001	-	-	0.001
HCM Control Delay (s)	8.7	0	-	-	7.3	0	-	9.2
HCM Lane LOS	A	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0

Intersection												
Int Delay, s/veh	7											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Vol, veh/h	87	4	1	2	2	3	0	13	0	7	17	3
Future Vol, veh/h	87	4	1	2	2	3	0	13	0	7	17	3
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	95	4	1	2	2	3	0	14	0	8	18	3

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	53	50	20	52	51	14	21	0	0	14	0	0
Stage 1	36	36	-	14	14	-	-	-	-	-	-	-
Stage 2	17	14	-	38	37	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	946	841	1058	947	840	1066	1595	-	-	1604	-	-
Stage 1	980	865	-	1006	884	-	-	-	-	-	-	-
Stage 2	1002	884	-	977	864	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	937	837	1058	938	836	1066	1595	-	-	1604	-	-
Mov Cap-2 Maneuver	937	837	-	938	836	-	-	-	-	-	-	-
Stage 1	980	861	-	1006	884	-	-	-	-	-	-	-
Stage 2	996	884	-	966	860	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9.3	8.8	0	1.9
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1595	-	-	933	954	1604	-	-
HCM Lane V/C Ratio	-	-	-	0.107	0.008	0.005	-	-
HCM Control Delay (s)	0	-	-	9.3	8.8	7.3	0	-
HCM Lane LOS	A	-	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.4	0	0	-	-

Intersection	
Int Delay, s/veh	2.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	66	39	13	37	9
Future Vol, veh/h	0	66	39	13	37	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	72	42	14	40	10

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	56	0	-	0	121	49
Stage 1	-	-	-	-	49	-
Stage 2	-	-	-	-	72	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1549	-	-	-	874	1020
Stage 1	-	-	-	-	973	-
Stage 2	-	-	-	-	951	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1549	-	-	-	874	1020
Mov Cap-2 Maneuver	-	-	-	-	874	-
Stage 1	-	-	-	-	973	-
Stage 2	-	-	-	-	951	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	9.2
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1549	-	-	-	899
HCM Lane V/C Ratio	-	-	-	-	0.056
HCM Control Delay (s)	0	-	-	-	9.2
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Vol, veh/h	22	104	0	0	44	0	0	0	1	7	0	1
Future Vol, veh/h	22	104	0	0	44	0	0	0	1	7	0	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	24	113	0	0	48	0	0	0	1	8	0	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	48	0	0	113	0	0	210	209	113	210	209	48
Stage 1	-	-	-	-	-	-	161	161	-	48	48	-
Stage 2	-	-	-	-	-	-	49	48	-	162	161	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1559	-	-	1476	-	-	747	688	940	747	688	1021
Stage 1	-	-	-	-	-	-	841	765	-	965	855	-
Stage 2	-	-	-	-	-	-	964	855	-	840	765	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1559	-	-	1476	-	-	737	677	940	737	677	1021
Mov Cap-2 Maneuver	-	-	-	-	-	-	737	677	-	737	677	-
Stage 1	-	-	-	-	-	-	828	753	-	950	855	-
Stage 2	-	-	-	-	-	-	963	855	-	826	753	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.3	0	8.8	9.8
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	940	1559	-	-	1476	-	-	764
HCM Lane V/C Ratio	0.001	0.015	-	-	-	-	-	0.011
HCM Control Delay (s)	8.8	7.3	0	-	0	-	-	9.8
HCM Lane LOS	A	A	A	-	A	-	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0

Intersection						
Int Delay, s/veh	1.5					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	104	45	0	22	7
Future Vol, veh/h	0	104	45	0	22	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	113	49	0	24	8

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	49	0	-	0	162	49
Stage 1	-	-	-	-	49	-
Stage 2	-	-	-	-	113	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1558	-	-	-	829	1020
Stage 1	-	-	-	-	973	-
Stage 2	-	-	-	-	912	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1558	-	-	-	829	1020
Mov Cap-2 Maneuver	-	-	-	-	829	-
Stage 1	-	-	-	-	973	-
Stage 2	-	-	-	-	912	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	9.3
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1558	-	-	-	868
HCM Lane V/C Ratio	-	-	-	-	0.036
HCM Control Delay (s)	0	-	-	-	9.3
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

APPENDIX D

AIR QUALITY AND GREENHOUSE GAS ANALYSIS

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Air Quality and Greenhouse Gas Analysis for the Drew Solar Project, Imperial County, California

Prepared for
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July 24, 2018

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FIGURES

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TABLES

ATTACHMENT

Acronyms

°F	degrees Fahrenheit
AB	Assembly Bill
APCD	Air Pollution Control District
APN	Assessor's Parcel Number
AQMD	Air Quality Monitoring District
CAA	Clean Air Act
CAAQS	California Ambient Air Quality Standards
CAISO	California Independent Service Operator
CalEEMod	California Emissions Estimator Model
CalGreen	California Green Building Standards Code
CARB	California Air Resources Board
CBC	California Building Code
CCAA	California Clean Air Act
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CH_4	methane
CO	carbon monoxide
CO_2	carbon dioxide
CO_2E	carbon dioxide equivalent
County	County of Imperial
DPM	diesel-exhaust particulate matter
Drew Switchyard	San Diego Gas & Electric's Drew Switchyard
EO	Executive Order
GHG	greenhouse gas
GWP	Global Warming Potential
IID	Imperial Irrigation District
ITE	Institute of Transportation Engineers
LOS	Level of Service
MMT	million metric ton
mph	miles per hour
MPO	Metropolitan Planning Organization
MT	metric ton
MW	megawatt
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NHTSA	National Highway Traffic Safety Administration
NO_2	nitrogen dioxide
NO_x	oxides of nitrogen
O&M	operations and maintenance
Pb	lead
PM_{10}	particulate matter less than 10 microns in diameter
$PM_{2.5}$	Particulate matter less than 2.5 microns in diameter
project	Drew Solar Project
PV	photovoltaic
ROC	reactive organic compounds

ROG	reactive organic gases
RPS	Renewable Portfolio Standard
RTP	Regional Transportation Plan
SB	Senate Bill
SCAG	Southern California Association of Governments
SCAQMD	South Coast Air Quality Management District
SCS	Sustainable Communities Strategy
SIP	State Implementation Plan
SO_2	sulfur dioxide
SOx	oxides of sulfur
SR-98	State Route 98
TAC	toxic air contaminant
U.S. EPA	U.S. Environmental Protection Agency
USC	United States Code
VOC	volatile organic compounds

Executive Summary

This report provides the results of the air quality and greenhouse gas (GHG) emissions analysis performed for the proposed Drew Solar Project (project) in Imperial County, California. The project would involve construction of an approximately 100-megawatt (MW) alternating current solar generation facility, which may include energy storage facilities on an 844.2-gross-acre (855-gross acre after the project's Parcel Map is recorded) and 762.8-net-farmable-acre site. The project site is bounded by Kubler Road to the north, Westside Main and Wormwood Canals to the west, State Route 98 (SR-98) to the south, and Pulliam Road to the east.

This analysis evaluates the significance of the proposed project in accordance with the California Environmental Quality Act and guidance from the Imperial County Air Pollution Control District (Imperial County APCD). The project was evaluated to determine if it would (1) conflict with applicable air quality plans, (2) violate ambient air quality standards, (3) result in cumulative impacts to air quality, (4) impact sensitive receptors, (5) expose a substantial number of people to objectionable odors, (6) significantly contribute to cumulative statewide GHG emissions, and (7) conflict with regulations, plans, and policies aimed at reducing GHG emissions. Project emissions were calculated using the California Emissions Estimator Model Version 2016.3.2.

A significant air quality impact would occur if the project conflicted with the Imperial County APCD's ozone and particulate matter air quality plans. Based on the project vehicle trip generation and associated air pollutant emission calculations, the project air pollutant emissions would be accounted for in regional growth projections and the air quality plan emission forecasts. As such, impacts would be considered less than significant.

A significant air quality impact would occur if construction or operation of the project contributed to an air quality violation. Construction- and operation-related emissions would be less than all applicable significance thresholds. Impacts associated with attainment of air quality standards would be less than significant.

A significant air quality impact would occur if the project resulted in a cumulatively considerable net increase of any criteria pollutant for which the project region is in non-attainment. The project site is in a non-attainment area for ozone, particulate matter with an aerodynamic diameter of 10 microns or less (PM_{10}), and particulate matter with an aerodynamic diameter of 2.5 microns or less ($PM_{2.5}$) emissions. Project ozone precursor, PM_{10}, and $PM_{2.5}$ emissions would be less than applicable significance thresholds. Thus, the project would not result in a cumulatively considerable net increase of ozone precursors or particulate matter emissions. Impacts would be less than significant.

A significant air quality impact would occur if the project exposed sensitive receptors to substantial pollutant concentration including air toxics. Sensitive receptors in the vicinity of the project site include a single-family residence immediately west of the intersection of Drew Road and SR-98 and another single-family residence northwest of the intersection of

Kubler Road and Pulliam Road. The project would result in the generation of diesel-exhaust particulate matter (DPM) during construction and mobile-source carbon monoxide (CO) during operation. Due to the limited intensity of construction, DPM generated by project construction activities is not expected to create conditions where the incremental cancer risk exceeds the Imperial County APCD's ten in one million significance threshold; thus impacts from DPM exposure would be less than significant. Due to the limited traffic generated by the project, the project would not substantially contribute to elevated CO concentrations; impacts from mobile-source CO emissions would be less than significant. The components of solar generation facilities, including the proposed storage and transmission components, are not known to result in substantial air toxic emissions. Localized air quality impacts from project operations would be less than significant.

Project construction would result in temporary odors associated with diesel exhaust. Odors generated from construction would be temporary and intermittent, and would largely dissipate at short distances from the source. Solar generation facilities, including the proposed storage and transmission components, are not known to emit odors during operation. Thus, the project would not create objectionable odors affecting a substantial number of people. Impacts would be less than significant.

No GHG emission significance threshold has been adopted by the Imperial County APCD. Project GHG emissions were evaluated against the South Coast Air Quality Management District (South Coast AQMD) screening level of 3,000 equivalent metric tons of carbon dioxide (MT CO_2E). The project's combined gross construction, operational, and decommissioning emissions would be 366 MT CO_2E in 2020; accounting for the GHG emissions offset by the renewable energy generation of the solar generation facility, the project would result in a 73,829 MT CO_2E reduction in 2020. The project's gross annual GHG emissions and the GHG emissions offset by the renewable energy generation of the solar generation facility would gradually decline as a result of federal, state, and local implementation measures. As emissions do not exceed the South Coast AQMD's screening threshold, the project would not result in a cumulatively considerable impact to GHG emissions and would not conflict with the state GHG reduction targets. Impacts would be less than significant.

1.0 Introduction

1.1 Purpose of the Report

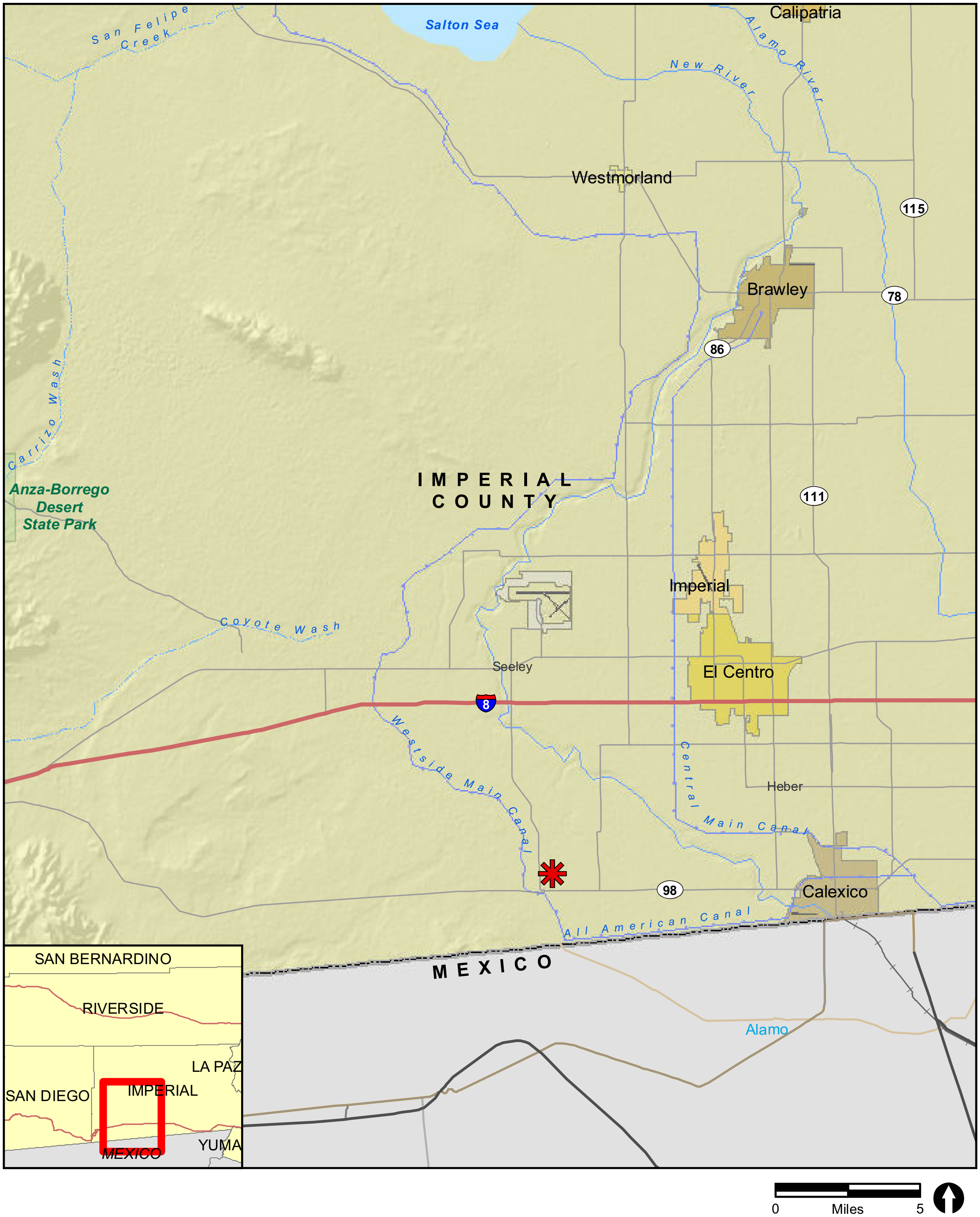
This report evaluates the significance of air quality and greenhouse gas (GHG) emissions associated with the proposed Drew Solar Project (project). This report characterizes existing conditions at the project site and in the region, identifies applicable rules and regulations, and assesses impacts to air quality and climate change from construction and operation of the project.

1.2 Project Description

The project is a proposed solar photovoltaic generation facility which may include energy storage located in Imperial County, California. The project site is located in the unincorporated Mount Signal area, approximately 6.5 miles southwest of the city of El Centro and approximately 1.85 miles north of the U.S.-Mexico border. Figure 1 shows the regional location of the project site.

The project site is approximately 844.2 gross-acres (855 gross acres after the project's Parcel Map is recorded) and 762.8 net farmable-acres and comprises six parcels: Assessor's Parcel Numbers (APNs) 052-170-031, 052-170-032, 052-170-037, 052-170-039, 052-170-056, and 052-170-067. The project site is bounded by Kubler Road to the north, Westside Main and Wormwood Canals to the west, State Route 98 (SR-98) to the south, and Pulliam Road to the east. Agricultural uses are located on the project site and properties to the north, west, and southwest. Solar generation facilities are located on properties to the east and south of the project site. A single-family residence is located immediately west of the intersection of Drew Road and SR-98 (approximately 100 feet from project site), and another single-family residence is located northeast of the intersection of Kubler Road and Pulliam Road (approximately 400 feet from project site). Figure 2 shows an aerial photograph of the project site and vicinity.

The purpose of the project is to generate approximately 100 MW of renewable electricity, and the storage of power from both the generation portion of the project and power from the California Independent Service Operator (CAISO) for the State of California. Five solar power generation and potential energy storage conditional use permits (CUPs) are proposed, and a sixth CUP for energy storage as a component of solar. The project may include an operations and maintenance (O&M) building or buildings, substation(s), photovoltaic modules mounted on horizontal single-axis trackers, energy storage facilities, inverters, internal roadways, and may also include auxiliary improvements for storm water retention, fire water storage, water filtration and treatment, equipment control buildings, septic systems, and parking. The project would connect to San Diego Gas & Electric's Drew Switchyard (Drew Switchyard), which is located immediately south of the project, across SR-98, for power transmission to the CAISO grid. Figure 3 shows the anticipated site plan.



Project Location

FIGURE 1
Regional Location

RECON

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Image Source: USDA FSA NAIP (flown May 2016)

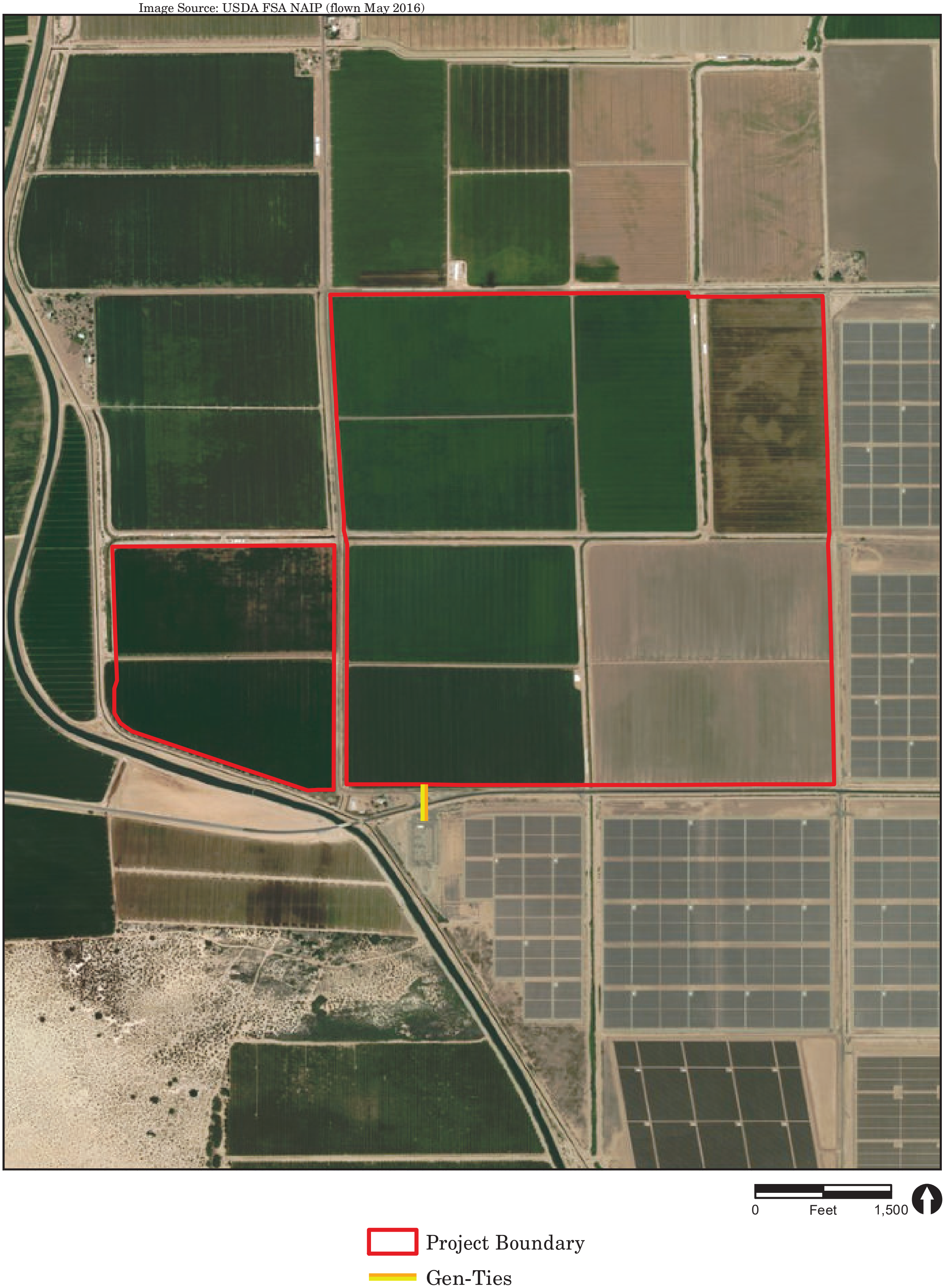

FIGURE 2

Project Location on Aerial Photograph

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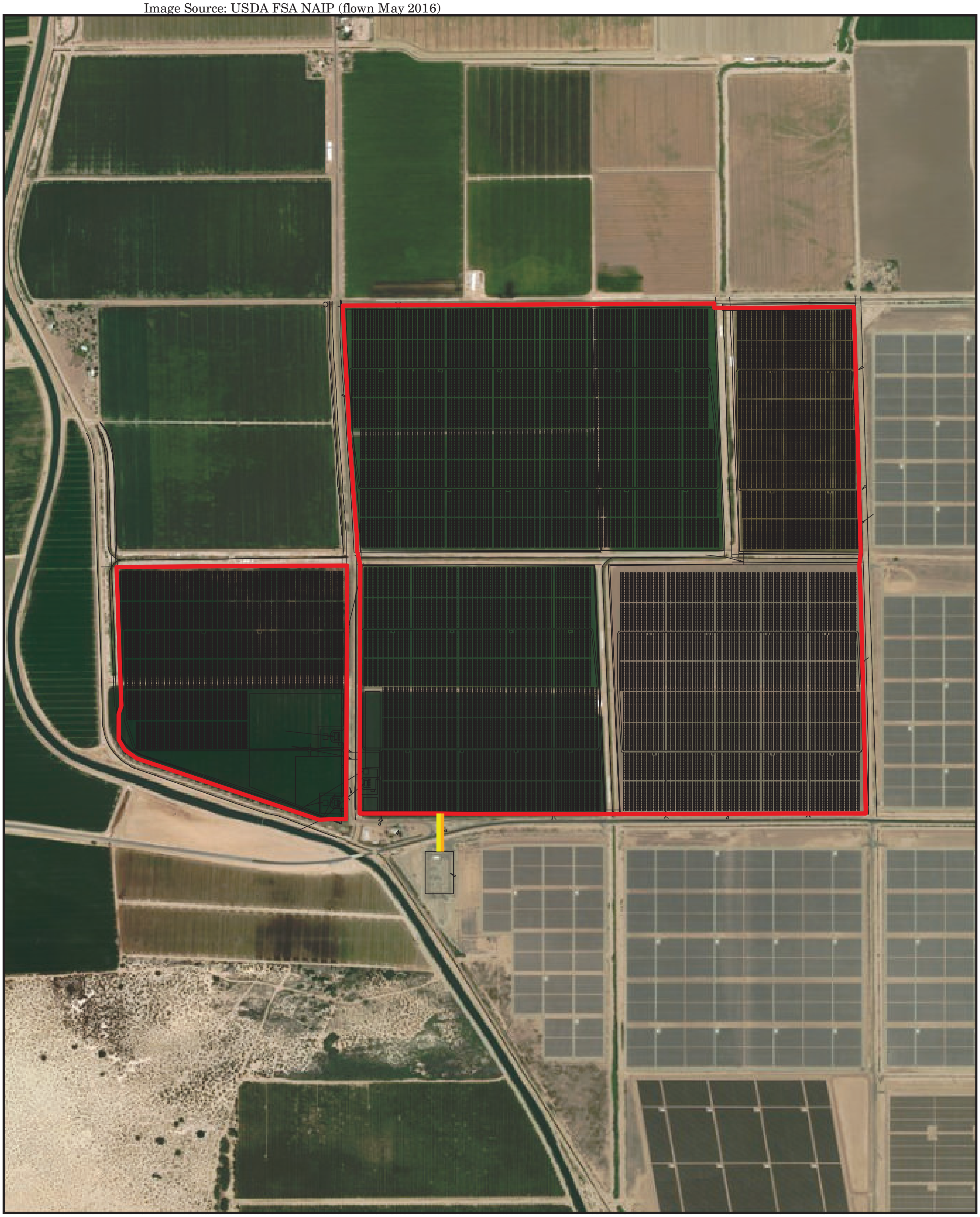
Image Source: USDA FSA NAIP (flown May 2016)



Project Boundary

Gen-Ties

Site Plan Lines

0 Feet 1,500

FIGURE 3

Site Plan

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The project may also incorporate an energy storage component. The field of energy storage is rapidly advancing; thus a single technology or provider has not been selected for the energy storage component of the project. The storage component may be centralized and located adjacent to the substation, or alternatively, the energy storage component may be distributed throughout the plant adjacent to individual power conversion centers. The storage component would be housed in a warehouse type building or alternatively in smaller modular structures such as cargo shipping containers.

The project site is owned by Imperial Irrigation District (IID) and would be leased by the Applicant for at least the duration of the Development Agreement. Project development would be phased, with renewable energy generation and energy storage facilities developed at a flexible rate based on market conditions and changing utility procurement plans. Development phases would occur under up to six separate CUPs. Under the development agreement, the CUPs will be valid for 40 years with up to 10 years to commence construction. At the conclusion of the term of the CUPs, the project entitlements require the Applicant to decommission the site and restore it to farmland uses in accordance with a future reclamation Plan.

Project approvals would include the Development Agreement, Zone Change to add Renewable Energy (RE) Overlay, General Plan Amendment of the Renewable Energy and Transmission Element, 6 CUPs, 1 Parcel Map, 2 Lot-Tie Agreements, one Variance for power pole height requirements, and certification of the Environmental Impact Report.

1.2.1 Project Construction and Phasing

The construction schedule would be phased based on market conditions and changing utility procurement plans; the specific phasing is not known at this time. If the project construction were to occur in a single phase, construction would take place over approximately 18 months.

No structures are present on the project site and the project site has previously been graded to accommodate agricultural uses. The construction would involve site preparation activities such as clearing, grading, perimeter fencing, development of staging areas and site access roads; and would involve facility installation activities such as installation of support masts (impact pile driving), trenching utility connections, installation of racks and panels on support masts, installation of energy storage facilities including buildings and/or shipping containers, construction of electrical distribution facilities, construction of the O&M building(s), and construction of substation(s) and gen-tie(s). Daily trip generation during the construction would include up to 436 worker commute trips per day and 10 average daily hauling trips (up to 40 heavy-duty truck trips per day).

1.2.2 Project Operation

Operation of the project would require routine maintenance and security; the operations phase will have approximately 10 full-time personnel. Operation of the project would generate up to 20 trips per day.

1.2.3 Project Decommissioning

Consistent with the County of Imperial (County) decommissioning requirements, the project site would be restored to its existing condition upon project conclusion. Although there have been no solar facilities decommissioned in Imperial County, the activities and equipment involved in decommissioning are anticipated to be similar to those involved in construction, thus decommissioning would result in similar air and GHG emissions as construction.

1.3 Fundamentals of Air Quality

Air quality impacts can result from the emission of pollutants associated with construction and operation of a project. Construction impacts are short term and may result from fugitive dust, equipment exhaust, and indirect effects associated with construction workers and deliveries. Operational impacts are long term and may result from equipment and processes used in the project (e.g., water heaters, engines, boilers, and paints or solvents), motor vehicle emissions associated with the project, regional impacts resulting from growth-inducing development, and local hot-spot effects stemming from sensitive receivers being placed close to highly congested roadways. Health effects can include the following:

- Increased respiratory infections
- Increased discomfort
- Missed days from work and school
- Increased mortality

The analysis of air quality impacts is based on National and California Ambient Air Quality Standards (NAAQS and CAAQS). NAAQS and CAAQS represent the maximum levels of background pollution considered safe, with an adequate margin of safety, to protect the public health and welfare. Six pollutants of key concern known as “criteria pollutants” include ozone, carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter (PM_{10} and $PM_{2.5}$), and lead (Pb).

1.3.1 Ozone

Ozone is the primary component of smog. Ozone is not directly emitted into the air but is formed through complex chemical reactions between precursor emissions of nitrogen oxides (NO_X) and reactive organic gases (ROG) (a.k.a. volatile organic chemicals [VOC] or reactive organic compounds) in the presence of sunlight. The adverse health effects associated with exposure to ozone pertain primarily to the respiratory system. Scientific evidence indicates that ambient levels of ozone affect not only sensitive receptors, such as asthma sufferers and children, but healthy adults as well. Exposure to ozone has been found to significantly alter lung functions by increasing respiratory rates and pulmonary resistance, decreasing tidal volumes (the amount of air inhaled and exhaled), and impairing respiratory mechanics. Symptomatic responses include such as throat dryness, chest tightness, headache, and nausea. About half of smog-forming emissions come from automobiles.

1.3.2 Carbon Monoxide

Carbon monoxide is a colorless, odorless gas that is formed when carbon in fuel is not burned completely. It is a component of motor vehicle exhaust, which contributes about 56 percent of all CO emissions nationwide. CO enters the bloodstream through the lungs by combining with hemoglobin, which normally supplies oxygen to the cells. However, CO combines with hemoglobin much more readily than oxygen does, resulting in a drastic reduction in the amount of oxygen available to the cells. Adverse health effects associated with exposure to CO concentrations include such symptoms as dizziness, headaches, and fatigue (United States Environmental Protection Agency [U.S. EPA] 2017a).

Small-scale, localized concentrations of CO above the NAAQS and CAAQS may occur at intersections with stagnation points such as those that occur on major highways and heavily traveled and congested roadways. Localized high concentrations of CO are referred to as "CO hotspots" and are a concern at congested intersections, where automobile engines burn fuel less efficiently and their exhaust contains more CO.

1.3.3 Nitrogen Dioxide

Nitrogen dioxide is a brownish, highly reactive gas that is present in all urban environments. The major human-made sources of NO_2 are combustion devices, such as boilers, gas turbines, and mobile and stationary reciprocating internal combustion engines. Inhalation is the most common route of exposure to NO_2. Because NO_2 has relatively low solubility in water, the principal site of toxicity is in the lower respiratory tract. The severity of the adverse health effects depends primarily on the concentration inhaled rather than the duration of exposure. An individual may experience a variety of acute symptoms, including coughing, difficulty with breathing, vomiting, headache, and eye irritation during or shortly after exposure. After a period of approximately 4 to 12 hours, an exposed individual may experience chemical pneumonitis or pulmonary edema with breathing abnormalities, cough, cyanosis, chest pain, and rapid heartbeat.

1.3.4 Sulfur Dioxide

Sulfur dioxide is a combustion product, with the primary source being power plants and heavy industries that use coal or oil as fuel. SO_2 is also a product of diesel engine combustion. The health effects of SO_2 include lung disease and breathing problems for people with asthma. SO_2 in the atmosphere contributes to the formation of acid rain.

1.3.5 Particulate Matter

Health studies have shown a significant association between exposure to particulate matter and premature death in people with heart or lung diseases. Other important effects include aggravation of respiratory and cardiovascular disease, lung disease, decreased lung function, asthma attacks, and certain cardiovascular problems such as heart attacks and irregular heartbeat (U.S. EPA 2017b).

Inhalable Coarse Particles (PM_{10})

PM_{10} is particulate matter with an aerodynamic diameter of 10 microns or less. Ten microns is about one-seventh of the diameter of a human hair. Particulate matter is a complex mixture of very tiny solid or liquid particles composed of chemicals, soot, and dust. Under typical conditions (i.e., no wildfires) particles classified under the PM_{10} category are mainly emitted directly from activities that disturb the soil including travel on roads and construction, mining, or agricultural operations. Other sources include windblown dust, salts, brake dust, and tire wear.

Inhalable Fine Particles ($PM_{2.5}$)

Airborne, inhalable particles with aerodynamic diameter of 2.5 microns or less have been recognized as an air quality concern requiring regular monitoring. Federal regulations required that $PM_{2.5}$ monitoring begin January 1, 1999. Similar to PM_{10}, $PM_{2.5}$ is also inhaled into the lungs and causes serious health problems.

1.3.6 Lead

Lead is a metal found naturally in the environment as well as in manufactured products. At high levels of exposure, lead can have detrimental effects on the central nervous system. The major sources of lead emissions have historically been mobile and industrial sources. As a result of the phase-out of leaded gasoline, metal processing is currently the primary source of lead emissions.

1.4 Fundamentals of Climate Change

1.4.1 Understanding Global Climate Change

Global climate change is a change in the average weather of the earth, which can be measured by wind patterns, storms, precipitation, and temperature. The earth's climate is in a state of constant flux with periodic warming and cooling cycles. Extreme periods of cooling are termed "ice ages," which may then be followed by extended periods of warmth. For most of the earth's geologic history, these periods of warming and cooling have been the result of many complicated interacting natural factors that include: volcanic eruptions that spew gases and particles (dust) into the atmosphere; the amount of water, vegetation, and ice covering the earth's surface; subtle changes in the earth's orbit; and the amount of energy released by the sun (sun cycles). However, since the beginning of the Industrial Revolution around 1750, the average temperature of the earth has been increasing at a rate that is faster than can be explained by natural climate cycles alone.

With the Industrial Revolution came an increase in the combustion of carbon-based fuels such as wood, coal, oil, natural gas, and biomass. Industrial processes have also created emissions of substances not found in nature. This in turn has led to a marked increase in the emissions of gases shown to influence the world's climate. These gases, termed "greenhouse" gases, influence the amount of heat trapped in the earth's atmosphere.

Because recently observed increased concentrations of GHGs in the atmosphere are related to increased emissions resulting from human activity, the current cycle of "global warming" is generally believed to be largely due to human activity. Of late, the issue of global warming or global climate change has arguably become the most important and widely debated environmental issue in the United States and the world. Because it is the collective of human actions taking place throughout the world that contributes to climate change, it is quintessentially a global or cumulative issue.

1.4.2 Greenhouse Gases of Primary Concern

There are numerous GHGs, both naturally occurring and manmade. Each GHG has variable atmospheric lifetime and global warming potential (GWP). The atmospheric lifetime of the gas is the average time a molecule stays stable in the atmosphere. Most GHGs have long atmospheric lifetimes, staying in the atmosphere hundreds or thousands of years. GWP is a measure of the potential for a gas to trap heat and warm the atmosphere. Although GWP is related to its atmospheric lifetime, many other factors including chemical reactivity of the gas also influence GWP. GWP is reported as a unitless factor representing the potential for the gas to affect global climate relative to the potential of carbon dioxide (CO_2). Because CO_2 is the reference gas for establishing GWP, by definition its GWP is 1. Although methane (CH_4) has a shorter atmospheric lifetime than CO_2, it has a 100-year GWP of 25; this means that CH_4 has 25 times more effect on global warming than CO_2 on a molecule-by-molecule basis.

The GWP is officially defined as "[T]he cumulative radiative forcing—both direct and indirect effects—integrated over a period of time from the emission of a unit mass of gas relative to some reference gas" (U.S. EPA 2010). GHG emissions estimates are typically represented in terms of metric tons (MT) of CO_2 equivalent (CO_2E). CO_2E emissions are the product of the amount of each gas by its GWP. The effects of several GHGs may be discussed in terms of MT CO_2E and can be summed to represent the total potential of these gases to warm the global climate. Table 1 summarizes some of the most common GHGs.

All of the gases in Table 1 are produced by both biogenic (natural) and anthropogenic (human) sources. These are the GHGs of primary concern in this analysis. CO_2 would be emitted by the project due to the combustion of fossil fuels in vehicles (including construction), from electricity generation and natural gas consumption, water use, and from solid waste disposal. Smaller amounts of CH_4 and nitrous oxide (N_2O) would be emitted from these activities.

Table 1
Global Warming Potentials and Atmospheric Lifetimes

Gas	Atmospheric Lifetime (years)	100-year GWP	20-year GWP
Carbon dioxide (CO_2)	50–200	1	1
Methane (CH_4)*	12.4	28	84
Nitrous oxide (N_2O)	121	265	264
HFC-23	222	12,400	10,800
HFC-32	5.2	677	2,430

Table 1
Global Warming Potentials and Atmospheric Lifetimes

Gas	Atmospheric Lifetime (years)	100-year GWP	20-year GWP
HFC-125	28.2	3,170	6,090
HFC-134a	13.4	1,300	3,710
HFC-143a	47.1	4,800	6,940
HFC-152a	1.5	138	506
HFC-227ea	38.9	3,350	5,360
HFC-236fa	242	8,060	6,940
HFC-43-10mee	16.1	1,650	4,310
CF_4	50,000	6,630	4,880
C_2F_6	10,000	11,100	8,210
C_3F_8	2,600	8,900	6,640
C_4F_{10}	2,600	9,200	6,870
c-C_4F_8	3,200	9,540	7,110
C_5F_{12}	4,100	8,550	6,350
C_6F_{14}	3,100	7,910	5,890
SF_6	3,200	23,500	17,500
SOURCE: Intergovernmental Panel on Climate Change (IPCC) 2014.			

2.0 Existing Conditions

2.1 Site Conditions

The project site is relatively flat and is currently an agricultural use. Sources of air pollutant emissions associated with the existing agricultural use include mobile sources and area source emissions such as N_2O emissions resulting from fertilizer use and exhaust from farming equipment. Sources of GHG emissions include water use emissions, mobile emissions, solid waste emissions, and exhaust from farming equipment.

2.2 Land Use Environment

The General Plan land use designation for the project site and all surrounding parcels is Agriculture.

Agricultural uses are located on the project site and properties to the north, west, and southwest; associated buildings include a single-family residence located immediately west of the intersection of Drew Road and SR-98 (approximately 100 feet from project site), and another single-family residence located northwest of the intersection of Kubler Road and Pulliam Road (approximately 400 feet from project site). Additionally, three single-family residences are located to the southwest of the intersection of Kubler Road and Mandrapa Road (0.5 mile from project site).

Solar generation facilities are located on properties to the east and south of the project site; associated buildings include an O&M building at the Drew Switchyard (approximately 400 feet from project site), and an O&M building at the Centinela Solar Farm (0.7 mile east of the project site).

2.3 Regional Setting and Climate

Climate conditions at the project site, like the rest of Imperial County, are governed by the large-scale sinking and warming of air in the semi-permanent tropical high-pressure center of the Pacific Ocean. The high-pressure ridge blocks out most storms except in winter when it is weakest and farthest south. The coastal mountains prevent the intrusion of any cool, damp air found in California coastal environs. Because of the barrier and weakened storms, Imperial County experiences clear skies, extremely hot summers, mild winters, and little rainfall (Imperial County APCD 2017a).

Winters are mild and dry with daily average temperatures ranging between 65 and 75 degrees Fahrenheit (ºF). Summers are extremely hot with daily average temperatures ranging between 104 and 115ºF. The flat terrain and the strong temperature differentials created by intense solar heating result in moderate winds and deep thermal convection. The combination of subsiding air, protective mountains, and distance from the ocean all combine to severely limit precipitation (Imperial County APCD 2017a).

The large daily oscillation of temperature produces a corresponding large variation in the relative humidity. Nocturnal humidity rises to 50 to 60 percent, but drops to about 10 percent during the day. Prevailing winds are from the west-northwest through southwest; a secondary flow maximum from the southeast is also evident. The prevailing winds from the west and northwest occur seasonally from fall through spring and are known to be from the Los Angeles area. Occasionally, Imperial County experiences periods of extremely high wind speeds. Wind speeds can exceed 31 miles per hour and this occurs most frequently during the months of April and May. However, speeds of less than 6.8 miles per hour account for more than one-half of the observed wind measurements (Imperial County APCD 2017a).

2.4 Existing Air Quality

Air quality at a particular location is a function of the kinds, amounts, and dispersal rates of pollutants being emitted into the air locally and regionally. The major factors affecting pollutant dispersion are wind speed and direction, the vertical dispersion of pollutants (which is affected by temperature inversions), and topography.

Imperial County experiences surface inversions almost every day of the year. Due to strong surface heating, these inversions are usually broken and allow pollutants to be more easily dispersed. In some circumstances, the presence of the Pacific high-pressure cell can cause the air to warm to a temperature higher than the air below. This highly stable atmospheric condition, termed a subsidence inversion can act as a nearly impenetrable lid to the vertical mixing of pollutants. The strength of these inversions makes them difficult to disrupt. Consequently, they can persist for one or more days, causing air stagnation and the build-up of pollutants. Highest and worst-case ozone levels are often associated with the presence of subsidence inversions (Imperial County APCD 2017a).

Air quality is commonly expressed as the number of days in which air pollution levels exceed state standards set by California Air Resources Board (CARB) or federal standards set by the U.S. EPA. The Imperial County Air Pollution Control District (Imperial County APCD) maintains five air quality monitoring stations located throughout the region. Air pollutant concentrations and meteorological information are continuously recorded at these stations. Measurements are then used by scientists to help forecast daily air pollution levels, and to gauge compliance with state and federal air quality standards.

The nearest active monitoring station is the El Centro Monitoring Station located approximately 8 miles northeast of the project site. The El Centro Monitoring Station measures ozone, NO_2, PM_{10}, and $PM_{2.5}$. Table 2 provides a summary of measurements collected at the El Centro Monitoring Station for the years 2014 through 2016.

Table 2
Summary of Air Quality Measurements - El Centro Monitoring Station

Pollutant/Standard	2014	2015	2016
Ozone			
Days State 1-hour Standard Exceeded (0.09 ppm)	2	2	4
Days State 8-hour Standard Exceeded (0.07 ppm)	13	12	11
Days Federal 8-hour Standard Exceeded (0.07 ppm)	12	11	11
Max. 1-hr (ppm)	0.101	0.099	0.108
Max 8-hr (ppm)	0.081	0.080	0.082
Nitrogen Dioxide			
Days State 1-hour Standard Exceeded (0.18 ppm)	0	0	0
Days Federal 1-hour Standard Exceeded (0.100 ppm)	0	0	0
Max 1-hr (ppm)	0.059	0.059	0.051
Annual Average (ppm)	0.007	0.007	0.005
*PM_{10}**			
Measured Days State 24-hour Standard Exceeded (50 μg/m^3)	15	7	NA
Calculated Days State 24-hour Standard Exceeded (50 μg/m^3)	90.0	44.1	NA
Measured Days Federal 24-hour Standard Exceeded (150 μg/m^3)	0	1	9
Calculated Days Federal 24-hour Standard Exceeded (150 μg/m^3)	0	6.1	9.0
Max. Daily (μg/m^3)	120.4	172.1	207.5
State Annual Average (μg/m^3)	40.8	35.6	NA
Federal Annual Average (μg/m^3)	40.8	35.6	44.3
*$PM_{2.5}$**			
Days Federal 24-hour Standard Exceeded (35 μg/m^3)	0	0	0
Max. Daily (μg/m^3)	27.5	31.2	31.3
State Annual Average (μg/m^3)	6.6	6.3	9.5
Federal Annual Average (μg/m^3)	6.5	6.2	9.4

SOURCE: California Air Resources Board (CARB) 2017a.
ppm = parts per million; μg/m^3 = micrograms per cubic meter
* Calculated days value. Calculated days are the estimated number of days that a measurement would have been greater than the level of the standard had measurements been collected every day. The number of days above the standard is not necessarily the number of violations of the standard for the year.

2.5 Existing Greenhouse Gas Emissions

The CARB performs statewide GHG inventories. The inventory is divided into nine broad sectors of economic activity: agriculture, commercial, electricity generation, forestry, high GWP emitters, industrial, recycling and waste, residential, and transportation. Emissions are quantified in million metric tons (MMT) of CO_2E. Table 3 shows the estimated statewide GHG emissions for the years 1990, 2005, and 2015.

Table 3
California Greenhouse Gas Emissions by Sector in 1990, 2008, and 2015

Emissions Sector	1990 Emissions in MMT CO_2E (% total)[1,2]	2005 Emissions in MMT CO_2E (% total)[2,3,4]	2015 Emissions in MMT CO_2E (% total)[2,3,4]
Agriculture	23.4 (5%)	34.52 (7%)	34.65 (8%)
Commercial	14.4 (3%)	14.27 (3%)	14.75 (3%)
Electricity Generation	110.6 (26%)	107.85 (22%)	83.67 (19%)
High Global Warming Potential	--	9.42 (2%)	19.05 (4%)
Industrial	103.0 (24%)	95.45 (20%)	91.71 (21%)
Recycling and Waste	--	7.78 (2%)	8.73 (2%)
Residential	29.7 (7%)	27.98 (6%)	23.17 (5%)
Transportation	150.7 (35%)	184.48 (38%)	164.63 (37%)
Forestry (Net CO_2 flux)	*-6.5*	--	--
Not Specified	1.3	--	--
TOTAL	**426.6**	**481.75**	**440.36**

SOURCE: CARB 2007 and 2017a.
MMT CO_2E = million metric tons of CO_2 equivalent
[1] 1990 data was retrieved from the CARB 2007 source.
[2] Quantities and percentages may not total properly due to rounding.
[3] 2005 and 2015 data was retrieved from the CARB 2017a source.
[4] Reported emissions for key sectors. The inventory totals for 2005 and 2015 did not include Forestry or Not Specified sources.

As shown in Table 3, statewide GHG source emissions totaled about 427 MMT CO_2E in 1990, 480 MMT CO_2E in 2005, and 440 MMT CO_2E in 2015. Many factors affect year-to-year changes in GHG emissions, including economic activity, demographic influences, environmental conditions such as drought, and the impact of regulatory efforts to control GHG emissions. However, transportation-related emissions consistently contribute the most GHG emissions, followed by electricity generation and industrial emissions.

3.0 Regulatory Framework

3.1 Air Quality Regulations

3.1.1 Federal Air Quality Regulations

3.1.1.1 National Ambient Air Quality Standards

The NAAQS represent the maximum levels of background pollution considered safe, with an adequate margin of safety, to protect the public health and welfare. The Clean Air Act (CAA) was enacted in 1970 and amended in 1977 and 1990 (42 United States Code [USC] 7401) for the purposes of protecting and enhancing the quality of the nation's air resources to benefit public health, welfare, and productivity. In 1971, in order to achieve the purposes of Section 109 of the CAA (42 USC 7409), the U.S. EPA developed primary and secondary NAAQS.

Six criteria pollutants of primary concern have been designated: ozone, CO, SO_2, NO_2, lead, and respirable particulate matter (PM_{10} and $PM_{2.5}$). The primary NAAQS ". . . in the judgment of the Administrator, based on such criteria and allowing an adequate margin of safety, are requisite to protect the public health . . . " and the secondary standards ". . . protect the public welfare from any known or anticipated adverse effects associated with the presence of such air pollutant in the ambient air" (42 USC 7409(b)(2)). The NAAQS are presented in Table 4 (CARB 2016).

An area within a state is designated as either attainment or non-attainment for a particular pollutant. States are required to adopt enforceable plans, known as a State Implementation Plan (SIP), to achieve and maintain air quality meeting the NAAQS. State plans also must control emissions that drift across state lines and harm air quality in downwind states. Once a non-attainment area has achieved the NAAQS for a particular pollutant, it is redesignated as an attainment area for that pollutant. To be redesignated, the area must meet air quality standards for three consecutive years. After re-designation to attainment, the area is known as a maintenance area and must develop a 10-year plan for continuing to meet and maintain air quality standards, as well as satisfy other requirements of the CAA.

National Ambient Air Quality Standards Attainment Status

The project site is located in Imperial County, which is a moderate non-attainment area for the 1997 and 2008 federal ozone standards (U.S. EPA 2017c). The Imperial Valley portion of the County is a serious non-attainment area for the 1987 federal PM_{10} standard (U.S. EPA 2017c). The portion of Imperial County that includes El Centro and other cities in the Imperial Valley (nonattainment area is defined by townships) is a moderate non-attainment area for the 2012 federal $PM_{2.5}$ standards (U.S. EPA 2017c). On May 13, 2017, the U.S. EPA issued a clean data determination declaring that Imperial County had achieved attainment of the 2006 federal $PM_{2.5}$ standard (U.S. EPA 2017d).

Table 4
State and National Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards[1]		National Standards[2]		
		Concentration[3]	Method[4]	Primary[3,5]	Secondary[3,6]	Method[7]
Ozone[8]	1 Hour	0.09 ppm (180 μg/m³)	Ultraviolet Photometry	–	Same as Primary Standard	Ultraviolet Photometry
	8 Hour	0.07 ppm (137 μg/m³)		0.070 ppm (137 μg/m³)		
Respirable Particulate Matter (PM_{10})[9]	24 Hour	50 μg/m³	Gravimetric or Beta Attenuation	150 μg/m³	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	20 μg/m³		–		
Fine Particulate Matter ($PM_{2.5}$)[9]	24 Hour	No Separate State Standard		35 μg/m³	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	12 μg/m³	Gravimetric or Beta Attenuation	12 μg/m³	15 μg/m³	
Carbon Monoxide (CO)	1 Hour	20 ppm (23 mg/m³)	Non-dispersive Infrared Photometry	35 ppm (40 mg/m³)	–	Non-dispersive Infrared Photometry
	8 Hour	9.0 ppm (10 mg/m³)		9 ppm (10 mg/m³)	–	
	8 Hour (Lake Tahoe)	6 ppm (7 mg/m³)		–	–	
Nitrogen Dioxide (NO_2)[10]	1 Hour	0.18 ppm (339 μg/m³)	Gas Phase Chemi-luminescence	100 ppb (188 μg/m³)	–	Gas Phase Chemi-luminescence
	Annual Arithmetic Mean	0.030 ppm (57 μg/m³)		0.053 ppm (100 μg/m³)	Same as Primary Standard	
Sulfur Dioxide (SO_2)[11]	1 Hour	0.25 ppm (655 μg/m³)	Ultraviolet Fluorescence	75 ppb (196 μg/m³)	–	Ultraviolet Fluorescence; Spectro-photometry (Pararosaniline Method)
	3 Hour	–		–	0.5 ppm (1,300 μg/m³)	
	24 Hour	0.04 ppm (105 μg/m³)		0.14 ppm (for certain areas)[10]	–	
	Annual Arithmetic Mean	–		0.030 ppm (for certain areas)[10]	–	
Lead[12,13]	30 Day Average	1.5 μg/m³	Atomic Absorption	–	–	High Volume Sampler and Atomic Absorption
	Calendar Quarter	–		1.5 μg/m³ (for certain areas)[12]	Same as Primary Standard	
	Rolling 3-Month Average	–		0.15 μg/m³		
Visibility Reducing Particles[14]	8 Hour	See footnote 13	Beta Attenuation and Transmittance through Filter Tape	No National Standards		
Sulfates	24 Hour	25 μg/m³	Ion Chroma-tography			
Hydrogen Sulfide	1 Hour	0.03 ppm (42 μg/m³)	Ultraviolet Fluorescence			
Vinyl Chloride[12]	24 Hour	0.01 ppm (26 μg/m³)	Gas Chroma-tography			

See footnotes on next page.

Table 4
State and National Ambient Air Quality Standards

ppm = parts per million; ppb = parts per billion; µg/m³ = micrograms per cubic meter; – = not applicable.

1 California standards for ozone, carbon monoxide (except 8-hour Lake Tahoe), sulfur dioxide (1 and 24 hour), nitrogen dioxide, particulate matter (PM_{10}, $PM_{2.5}$, and visibility reducing particles), are values that are not to be exceeded. All others are not to be equaled or exceeded. California ambient air quality standards are listed in the Table of Standards in Section 70200 of Title 17 of the California Code of Regulations.

2 National standards (other than ozone, particulate matter, and those based on annual arithmetic mean) are not to be exceeded more than once a year. The ozone standard is attained when the fourth highest 8-hour concentration measured at each site in a year, averaged over three years, is equal to or less than the standard. For PM_{10}, the 24-hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 µg/m³ is equal to or less than one. For $PM_{2.5}$, the 24-hour standard is attained when 98 percent of the daily concentrations, averaged over three years, are equal to or less than the standard. Contact the U.S. EPA for further clarification and current national policies.

3 Concentration expressed first in units in which it was promulgated. Equivalent units given in parentheses are based upon a reference temperature of 25°C and a reference pressure of 760 torr. Most measurements of air quality are to be corrected to a reference temperature of 25°C and a reference pressure of 760 torr; ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.

4 Any equivalent measurement method which can be shown to the satisfaction of the Air Resources Board to give equivalent results at or near the level of the air quality standard may be used.

5 National Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health.

6 National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

7 Reference method as described by the U.S. EPA. An "equivalent method" of measurement may be used but must have a "consistent relationship to the reference method" and must be approved by the U.S. EPA.

8 On October 1, 2015, the national 8-hour ozone primary and secondary standards were lowered from 0.075 to 0.070 ppm.

9 On December 14, 2012, the national annual $PM_{2.5}$ primary standard was lowered from 15 µg/m³ to 12.0 µg/m³. The existing national 24-hour $PM_{2.5}$ standards (primary and secondary) were retained at 35 µg/m³, as was the annual secondary standards of 15 µg/m³. The existing 24-hour PM_{10} standards (primary and secondary) of 150 µg/m³ also were retained. The form of the annual primary and secondary standards is the annual mean, averaged over 3 years.

10 To attain the 1-hour national standard, the 3-year average of the annual 98th percentile of the 1-hour daily maximum concentrations at each site must not exceed 100 ppb. Note that the national standards are in units of parts per billion (ppb). California standards are in units of parts per million (ppm). To directly compare the national standards to the California standards the units can be converted from ppb to ppm. In this case, the national standard of 100 ppb is identical to 0.100 ppm.

11 On June 2, 2010, a new 1-hour SO_2 standard was established and the existing 24-hour and annual primary standards were revoked. To attain the 1-hour national standard, the 3-year average of the annual 99th percentile of the 1-hour daily maximum concentrations at each site must not exceed 75 ppb. The 1971 SO_2 national standards (24-hour and annual) remain in effect until one year after an area is designated for the 2010 standard, except that in areas designated nonattainment for the 1971 standards, the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standards are approved.
Note that the 1-hour national standard is in units of parts per billion (ppb). California standards are in units of parts per million (ppm). To directly compare the 1-hour national standard to the California standard the units can be converted to ppm. In this case, the national standard of 75 ppb is identical to 0.075 ppm.

12 The ARB has identified lead and vinyl chloride as 'toxic air contaminants' with no threshold level of exposure for adverse health effects determined. These actions allow for the implementation of control measures at levels below the ambient concentrations specified for these pollutants.

13 The national standard for lead was revised on October 15, 2008 to a rolling 3-month average. The 1978 lead standard (1.5 µg/m³ as a quarterly average) remains in effect until one year after an area is designated for the 2008 standard, except that in areas designated nonattainment for the 1978 standard, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.

14 In 1989, the ARB converted both the general statewide 10-mile visibility standard and the Lake Tahoe 30-mile visibility standard to instrumental equivalents, which are "extinction of 0.23 per kilometer" and "extinction of 0.07 per kilometer" for the statewide and Lake Tahoe Air Basin standards, respectively.

SOURCE: CARB 2016.

3.1.2 State Air Quality Regulations

3.1.2.1 California Ambient Air Quality Standards (CAAQS)

The California Clean Air Act was enacted in 1988 (California Health & Safety Code Section 39000 et seq.). Under the California Clean Air Act, CARB has developed the CAAQS and generally has set more stringent limits on the criteria pollutants than the NAAQS (see Table 4). In addition to the federal criteria pollutants, the CAAQS also specify standards for visibility-reducing particles, sulfates, hydrogen sulfide, and vinyl chloride (see Table 4).

The state of California is divided geographically into 15 air basins for managing the air resources of the state on a regional basis. Areas within each air basin are considered to share the same air masses and, therefore, are expected to have similar ambient air quality. Similar to the CAA, the state classifies these specific geographic areas as either “attainment” or “nonattainment” areas for each pollutant based on the comparison of measured data with the CAAQS.

California Ambient Air Quality Standards Attainment Status

The project site is located in the Salton Sea Air Basin, which encompasses Imperial County and parts of Riverside County (Coachella Valley). The Salton Sea Air Basin is a non-attainment area for the CAAQS for ozone and PM_{10} (CARB 2017b).

3.1.2.2 Toxic Air Contaminants

The public’s exposure to toxic air contaminants (TACs) is a significant public health issue in California. Diesel-exhaust particulate matter (DPM) emissions have been established as TACs. In 1983, the California Legislature enacted a program to identify the health effects of TACs and to reduce exposure to these contaminants to protect the public health (Assembly Bill [AB] 1807: California Health and Safety Code Sections 39650–39674). The California Legislature established a two-step process to address the potential health effects from TACs. The first step is the risk assessment (or identification) phase. The second step is the risk management (or control) phase of the process.

The California Air Toxics Program establishes the process for the identification and control of TACs and includes provisions to make the public aware of significant toxic exposures and for reducing risk. Additionally, the Air Toxics "Hot Spots" Information and Assessment Act (AB 2588, 1987, Connelly Bill) was enacted in 1987 and requires stationary sources to report the types and quantities of certain substances routinely released into the air. The goals of the Air Toxics "Hot Spots" Act are to collect emission data, to identify facilities having localized impacts, to ascertain health risks, to notify nearby residents of significant risks, and to reduce those significant risks to acceptable levels.

The Children’s Environmental Health Protection Act, California Senate Bill (SB) 25 (Chapter 731, Escutia, Statutes of 1999), focuses on children’s exposure to air pollutants. SB 25 requires CARB to review its air quality standards from a children’s health perspective, evaluate the statewide air monitoring network, and develop any additional air toxic control measures needed to protect children's health. Locally, toxic air pollutants are regulated through the Imperial County APCD's Regulation X. Of particular concern statewide are DPM emissions. DPM was established as a TAC in 1998, and is estimated to represent a majority of the cancer risk from TACs statewide (based on the statewide average). Diesel exhaust is a complex mixture of gases, vapors, and fine particles. This complexity makes the evaluation of health effects of diesel exhaust a complex scientific issue. Some of the chemicals in diesel exhaust, such as benzene and formaldehyde, have been previously identified as TACs by CARB and are listed as carcinogens either under the state's Proposition 65 or under the federal Hazardous Air Pollutants program.

Following the identification of DPM as a TAC in 1998, CARB has worked on developing strategies and regulations aimed at reducing the risk from DPM. The overall strategy for achieving these reductions is found in CARB's *Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles* (CARB 2000). A stated goal of the plan is to reduce the statewide cancer risk arising from exposure to DPM by 85 percent by 2020.

In April 2005, CARB published the *Air Quality and Land Use Handbook: A Community Health Perspective* (CARB 2005). The CARB Air Quality Handbook makes recommendations directed at protecting sensitive land uses from air pollutant emissions while balancing a myriad of other land use issues (e.g., housing, transportation needs, economics, etc.). It notes that the CARB Air Quality Handbook is not regulatory or binding on local agencies and recognizes that application takes a qualitative approach. As reflected in the CARB Air Quality Handbook, there is currently no adopted standard for the significance of health effects from mobile sources. Therefore, CARB has provided guidelines for the siting of land uses near heavily traveled roadways. Of pertinence to this analysis, CARB guidelines indicate that siting new sensitive land uses within 1,000 feet of distribution centers with heavy truck traffic should be avoided when possible.

As an ongoing process, CARB will continue to establish new programs and regulations for the control of diesel particulate and other air-toxics emissions as appropriate. The continued development and implementation of these programs and policies will continue to reduce the public's exposure to DPM.

3.1.2.3 State Implementation Plan

The California SIP is a collection of documents that set forth the state's strategies for achieving the NAAQS. The California SIP is a compilation of new and previously submitted plans, programs (such as air quality management plans, monitoring, modeling, permitting, etc.), district rules, state regulations, and federal controls. CARB is the lead agency for all purposes related to the California SIP under federal law. Local air districts and other agencies, such as the Department of Pesticide Regulation and the Bureau of Automotive Repair, prepare SIP elements and submit them to CARB for review and approval. CARB then forwards revisions to the U.S. EPA for approval and publication in the *Federal*

Register. All of the items included in the California SIP are listed in the Code of Federal Regulations (CFR) at 40 CFR 52.220.

The Imperial County APCD is responsible for preparing and implementing the portion of the California SIP applicable to the portion of the SSAB that is in Imperial County. These portions include:

- *Imperial County 2009 State Implementation Plan for Particulate matter Less than 10 Microns in Aerodynamic Diameter*
- *Imperial County 2013 State Implementation Plan for the 2006 24-Hour $PM_{2.5}$ Moderate Non-attainment Area*
- *Imperial County 2017 State Implementation Plan for the 2008 8-Hour Ozone Standard*

3.1.2.4 California In-Use Off-Road Diesel-Fueled Fleets Regulation

The California In-Use Off-Road Diesel-Fueled Fleets Regulations were approved by CARB in July 2007, and subsequent major amendments were incorporated in December 2011. The regulations are intended to reduce diesel-exhaust and NO_X emissions from in-use off-road heavy-duty diesel vehicles in California. The regulation requires that any operator of diesel-powered off-road vehicles with 25-horsepower or greater engines meet specific fleet average targets. CARB maintains schedules for small, medium, and large equipment fleets that require equipment retrofits or replacements over time to gradually bring the existing equipment up to standard. As of January 2018, all newly purchased equipment for medium and large equipment fleets will be required to meet Tier 3 or higher engine standards.

3.1.3 Local Air Quality Regulations

3.1.3.1 CEQA Air Quality Handbook

The Imperial County APCD adopted its *CEQA Air Quality Handbook: Guidelines for the Implementation of the California Environmental Quality Act of 1970* in 2007 and amended the handbook in December 2017 (Imperial County APCD 2017b). The Imperial County APCD CEQA Air Quality Handbook provides guidance on how to determine the significance of impacts, including air pollutant emissions, related to the development of residential, commercial, and industrial projects. Where impacts are determined to be significant, the Imperial County APCD CEQA Air Quality Handbook provides guidance to mitigate adverse impacts to air quality from development projects.

3.1.3.2 Stationary Source Permitting

Pursuant to Imperial County APCD Rule 207 (New & Modified Stationary Source Review) and associated rules such as Rule 201 (Permits Required) and Rule 208 (Permit to

Operate), the construction, installation, modification, replacement, and operation of any equipment which may emit air contaminants requires Imperial County APCD permits. The Imperial County APCD requires that all such equipment be assessed for the potential to result in health risk impacts, and permits to operate equipment must be renewed each year equipment is in use or upon the modification of equipment.

3.1.3.3 Fugitive Dust Control

The Imperial County APCD Regulation VIII regulates emissions of fugitive dust. Fugitive dust is:

> Particulate Matter entrained in the ambient air which is caused from man-made and natural activities such as, but not limited to, movement of soil, vehicles, equipment, blasting, and wind. This excludes Particulate Matter emitted directly in the exhaust of motor vehicles or other fuel combustion devices, from portable brazing, soldering, or welding equipment, pile drivers, and stack emissions from stationary sources (Imperial County APCD, Rule 800 (c)(18)).

Regulation VIII includes the following specific rules:

- Rule 800–Fugitive Dust Requirements for Control of $PM_{2.5}$
- Rule 801–Construction and Earthmoving Activities
- Rule 802–Bulk Materials
- Rule 803–Carry Out and Track Out
- Rule 804–Open Areas
- Rule 805–Paved and Unpaved Roads
- Rule 806–Conservation Management Practices

3.2 Climate Change Regulations

In response to rising concern associated with increasing GHG emissions and global climate change impacts, several plans and regulations have been adopted at the international, national, and state levels with the aim of reducing GHG emissions. The following is a discussion of the federal, state, and local plans and regulations most applicable to the project.

3.2.1 Federal

3.2.1.1 U.S. Environmental Protection Agency

The U.S. EPA has many federal level programs and projects to reduce GHG emissions. The U.S. EPA provides technical expertise and encourages voluntary reductions from the private sector. One of the voluntary programs applicable to the project is the Energy Star program.

Energy Star is a joint program of U.S. EPA and the U.S. Department of Energy, which promotes energy-efficient products and practices. Tools and initiatives include the Energy Star Portfolio Manager, which helps track and assess energy and water consumption across an entire portfolio of buildings, and the Energy Star Most Efficient 2013, which provides information on exceptional products that represent the leading edge in energy-efficient products in 2013 (U.S. EPA 2013).

3.2.1.2 Corporate Average Fuel Economy Standards

The federal Corporate Average Fuel Economy standards established by National Highway Traffic Safety Administration determine the fuel efficiency of certain vehicle classes in the United States. Current Corporate Average Fuel Economy standards require vehicle manufacturers of passenger cars and light-duty trucks to achieve an average fuel economy of 35.5 miles per gallon by 2016 and an average fuel economy of 54.5 miles per gallon by 2025. With improved gas mileage, fewer gallons of transportation fuel would be combusted to travel the same distance, thereby reducing nationwide GHG emissions associated with vehicle travel.

3.2.2 State

3.2.2.1 Statewide GHG Emission Targets

Executive Order S-3-05—Statewide GHG Emission Targets

This executive order (EO) establishes the following GHG emissions reduction goals for the state of California:

- by 2010, reduce GHG emissions to 2000 levels;
- by 2020, reduce GHG emissions to 1990 levels; and
- by 2050, reduce GHG emissions to 80 percent below 1990 levels.

This EO also directs the Secretary of the California EPA to oversee the efforts made to reach these targets, and to prepare biannual reports on the progress made toward meeting the targets and on the impacts to California related to global warming, including impacts to water supply, public health, agriculture, the coastline, and forestry. With regard to impacts, the report shall also prepare and report on mitigation and adaptation plans to combat the impacts. The first Climate Action Team Assessment Report was produced in March 2006, and has been updated every two years since then.

Executive Order B-30-15—2030 Statewide GHG Emission Goal

This EO, issued on April 29, 2015, establishes an interim GHG emission reduction goal for the state of California to reduce GHG emissions 40 percent below 1990 levels by 2030. This EO also directs all state agencies with jurisdiction over GHG-emitting sources to implement measures designed to achieve the new interim 2030 goal, as well as the pre-existing, long-term 2050 goal identified in EO S-3-05. Additionally, this EO directs CARB to update its

Climate Change Scoping Plan to address the 2030 goal. CARB released the update to the Climate Change Scoping Plan in November 2017 (See Section 3.2.2.4).

3.2.2.2 Assembly Bill 32—California Global Warming Solutions Act of 2006

In response to EO S-3-05, the California Legislature passed AB 32, the California Global Warming Solutions Act of 2006, and thereby enacted Sections 38500–38599 of the California Health and Safety Code. The heart of AB 32 is its requirement that CARB establish an emissions cap and adopt rules and regulations that would reduce GHG emissions to 1990 levels by 2020. AB 32 also required CARB to adopt a plan by January 1, 2009, indicating how emission reductions would be achieved from significant GHG sources via regulations, market mechanisms, and other actions.

3.2.2.3 Senate Bill 32—California Global Warming Solutions Act of 2006

Approved in September 2016, SB 32 updates the California Global Warming Solutions Act of 2006. Under SB 32, the state would reduce its GHG emissions to 40 percent below 1990 levels by 2030. In implementing the 40 percent reduction goal, CARB is required to prioritize emissions reductions to consider the social costs of the emissions of GHGs; where "social costs" is defined as "an estimate of the economic damages, including, but not limited to, changes in net agricultural productivity; impacts to public health; climate adaptation impacts, such as property damages from increased flood risk; and changes in energy system costs, per metric ton of greenhouse gas emission per year."

Implementation of SB 32 was contingent upon adoption of AB 197, State Air Resources Board: greenhouse gases: regulations, prior to January 1, 2017. AB 197 includes certain administrative changes to CARB and directs CARB to update the State Scoping Plan. AB 197 was adopted in September 2016.

3.2.2.4 Climate Change Scoping Plan

As directed by the California Global Warming Solutions Act of 2006, in 2008, CARB adopted the Climate Change Scoping Plan: A Framework for Change (Original Scoping Plan). CARB has periodically revised GHG emissions forecasts and prepared supplemental revisions to the Original Scoping Plan. In 2014, CARB adopted the comprehensive First Update to the Climate Change Scoping Plan: Building on the Framework (First Update to the Scoping Plan) (CARB 2014a). The First Update to the Scoping Plan ". . . highlights California's success to date in reducing its GHG emissions and lays the foundation for establishing a broad framework for continued emission reductions beyond 2020, on the path to 80 percent below 1990 levels by 2050" (CARB 2014a). The First Update to the Scoping Plan found that California is on track to meet the 2020 emissions reduction mandate established by AB 32 and notes that California could reduce emissions further by 2030 to levels squarely in line with those needed to stay on track to reduce emissions to 80 percent below 1990 levels by 2050 if the state realizes the expected benefits of existing policy goals (CARB 2014a).

In conjunction with the First Update to the Scoping Plan, CARB identified "six key focus areas comprising major components of the state's economy to evaluate and describe the larger transformative actions that will be needed to meet the state's more expansive emission reduction needs by 2050" (CARB 2014a). Those six areas are: (1) energy; (2) transportation (vehicles/equipment, sustainable communities, housing, fuels, and infrastructure); (3) agriculture; (4) water; (5) waste management; and (6) natural and working lands. The First Update identifies key recommended actions for each sector that will facilitate achievement of the 2050 reduction goal.

Based on CARB's research efforts, it has a "strong sense of the mix of technologies needed to reduce emissions through 2050" (CARB 2014a). Those technologies include energy demand reduction through efficiency and activity changes; large-scale electrification of on-road vehicles, buildings and industrial machinery; decarbonizing electricity and fuel supplies; and the rapid market penetration of efficient and clean energy technologies.

In November 2017, CARB released the 2017 Climate Change Scoping Plan Update, the Proposed Strategy for Achieving California's 2030 Greenhouse Gas Target (2017 Scoping Plan; CARB 2017c). The 2017 Scoping Plan identifies state strategies for achieving the state's 2030 interim GHG emissions reduction target codified by SB 32. Measures under the 2017 Scoping Plan Scenario build on existing programs such as the Low Carbon Fuel Standard, Advanced Clean Cars Program, Renewable Portfolio Standard (RPS), Sustainable Communities Strategy (SCS), and the Short-Lived Climate Pollutant Reduction Strategy, and the Cap-and-Trade Program. Additionally the 2017 Scoping Plan proposes new policies to address GHG emissions from natural and working lands. As discussed in Section 3.2.2.5 below, CARB continues to adjust the cap of the Cap-and-Trade Program to achieve emission levels consistent with 2020 statewide GHG emissions reduction targets established by AB 32.

3.2.2.5 Cap-and-Trade Program

The California Cap-and-Trade Program began in January 2013 and is authorized to continue until the end of 2030. The program is a market-based regulation that is designed to reduce GHG emissions associated major sources by setting a firm cap on overall GHG emissions from covered entities and gradually reducing that cap over time. The program defines major sources as facilities that generate more than 25,000 MT CO_2E per year, which includes many electricity generators, refineries, cement production facilities, oil and gas production facilities, glass manufacturing facilities, and food processing plants. Each entity covered by the program is allocated specific GHG emission allowances and is able to buy or sell additional offset credits to other major sources-covered entities. Thus, the program employs market mechanisms to cost-effectively reduce overall GHG emissions. Throughout the program's duration, CARB continues to adjust the overall GHG emissions cap to achieve emission levels consistent with 2020 statewide GHG emission reduction targets established by AB 32 and the 2030 statewide GHG emission reduction targets established by SB 32.

3.2.2.6 Regional Emissions Targets—SB 375

SB 375, the 2008 Sustainable Communities and Climate Protection Act, was signed into law in September 2008 and requires CARB to set regional targets for reducing passenger vehicle GHG emissions in accordance with the Original Scoping Plan. The purpose of SB 375 is to align regional transportation planning efforts, regional GHG emissions reduction targets and fair-share housing allocations under state housing law. SB 375 requires Metropolitan Planning Organizations (MPOs) to adopt an SCS or Alternative Planning Strategy to address GHG reduction targets from cars and light-duty trucks in the context of that MPO's Regional Transportation Plan (RTP).

The Southern California Association of Governments (SCAG) adopted the *2016–2040 Regional Transportation Plan/Sustainable Communities Strategy, A Plan for Mobility, Accessibility, Sustainability and a High Quality of Life* (2016 RTP/SCS) in April 2016. The main goal of the 2016 RTP/SCS is a long-range visioning plan that balances future mobility and housing needs with economic, environmental and public health goals. CARB's targets for the SCAG region call for an 8 percent reduction in GHG emissions per capita from automobiles and light-duty trucks compared to 2005 levels by 2020, and a 13 percent reduction by 2035. The overarching strategy of the 2016 RTP/SCS is create more compact communities in existing urban areas, providing neighborhoods with efficient and plentiful public transit, abundant and safe opportunities to walk, bike and pursue other forms of active transportation, and preserving more of the region's remaining natural lands.

Pursuant to Government Code Section 65080(b)(2)(K), a Sustainable Communities Strategy does not: (i) regulate the use of land; (ii) supersede the land use authority of cities and counties; or (iii) require that a City's or County's land use policies and regulations, including those in a general plan, be consistent with it. Nonetheless, SB 375 makes regional and local planning agencies responsible for developing those strategies as part of the federally required metropolitan transportation planning process and the state-mandated housing element process.

3.2.2.7 California Building Standards Code (Title 24)

The California Code of Regulation, Title 24, is referred to as the California Building Code (CBC). It consists of a compilation of several distinct standards and codes related to building construction including, plumbing, electrical, interior acoustics, energy efficiency, handicap accessibility and so on. Of particular relevance to GHG emissions reductions are the CBC's energy efficiency and green building standards as outlined below.

Part 6 – Energy Code

Title 24, Part 6, of the California Code of Regulations is the Energy Efficiency Standards or California Energy Code. This code, originally enacted in 1978, establishes energy-efficiency standards for residential and non-residential buildings in order to reduce California's energy consumption. The Energy Code is updated periodically to incorporate and consider new energy-efficiency technologies and methodologies as they become available. New construction and major renovations must demonstrate their compliance with the current Energy Code through submission and approval of a Title 24 Compliance Report to the local building permit review authority and the California Energy Commission (CEC). By reducing California's energy consumption, emissions of statewide GHGs may also be reduced. The previous Energy Code, known as the 2013 Energy Code, became effective July 1, 2014.

The current version of the Energy Code, known as the 2016 Energy Code, became effective January 1, 2017. The 2016 Energy Code provides mandatory energy-efficiency measures as well as voluntary tiers for increased energy efficiency. The CEC's preliminary estimates indicate that the 2016 Energy Code would achieve a 28 percent reduction in home energy use and a 5 percent reduction in non-residential energy use when compared to the previous 2013 Energy Code (CEC 2015). The CEC has further indicated that the 2020 Energy Code will require new residential developments to achieve zero-net energy use.

Part 11 – California Green Building Standards Code

The California Green Building Standards Code, referred to as CalGreen, was added to Title 24 as Part 11 first in 2009 as a voluntary code, which then became mandatory effective January 1, 2011 (as part of the 2010 CBC). The 2016 CalGreen institutes mandatory minimum environmental performance standards for all ground-up new construction of non-residential and residential structures. It also includes voluntary tiers (I and II) with stricter environmental performance standards for these same categories of residential and non-residential buildings. Local jurisdictions must enforce the minimum mandatory Green Building Standards and may adopt additional amendments for stricter requirements.

The mandatory standards require:

- Outdoor water use requirements as outlined in Model Water Efficient Landscape Ordinance emergency standards
- 20 percent mandatory reduction in indoor water use relative to specified baseline levels;
- 65 percent construction/demolition waste diverted from landfills;
- Infrastructure requirements for electric vehicle charging stations;
- Mandatory inspections of energy systems to ensure optimal working efficiency; and
- Requirements for low-pollutant emitting exterior and interior finish materials such as paints, carpets, vinyl flooring, and particleboards.

Similar to the reporting procedure for demonstrating Energy Code compliance in new buildings and major renovations, compliance with the CalGreen water reduction requirements must be demonstrated through completion of water use reporting forms for new low-rise residential and non-residential buildings. The water use compliance form must demonstrate a 20 percent reduction in indoor water use by either showing a 20 percent reduction in the overall baseline water use as identified in CalGreen or a reduced per-plumbing-fixture water use rate.

3.2.2.8 Other State Measures

Other related regulations adopted by California are summarized below.

- Advanced Clean Cars Program (i.e., Pavley I and Low Emission Vehicle III) – A set of vehicle standards that require light-duty cars and trucks to have reduced GHG emissions.

- Low Carbon Fuel Standard – A statewide goal requiring a 10 percent reduction in the carbon intensity of transportation fuels by 2020.

- RPS – Requires electrical providers achieve an energy mix of 33 percent renewable energy by 2020 and 50 percent renewable energy by 2030.

- AB 341, Solid Waste Diversion – The Commercial Recycling Requirements mandate that businesses (including public entities) that generate 4 cubic yards or more of commercial solid waste per week and multi-family residential with five units or more arrange for recycling services. Businesses can take one or any combination of measures in order to reuse, recycle, compost, or otherwise divert solid waste from disposal. Additionally, AB 341 mandates that 75 percent of all solid waste generated in the state be reduced, recycled, or composted by 2020 regardless of the source.

3.2.3 Local

3.2.3.1 Imperial County General Plan

The Imperial County General Plan Renewable Energy and Transmission Element was adopted in October 2015. As stated in the element, the benefits of renewable energy development include reduction in potential GHG by displacing fossil-fuel-generated electricity with renewable energy, which does not add to the greenhouse effect; contribution towards meeting the state's RPS mandate; and minimization of impacts to local communities, agriculture and sensitive resources (Imperial County 2015).

4.0 Significance Criteria

The California Natural Resources Agency maintains *State CEQA Guidelines* to assist lead agencies in developing significance thresholds for assessing potentially significant environmental impacts. According to California Environmental Quality Act (CEQA) Guidelines Appendix G Environmental Checklist, implementation of the proposed project would have significant environmental impacts on air quality if it would:

1) Obstruct or conflict with the implementation of the applicable air quality plan.

2) Violate any air quality standard or contribute substantially to an existing or projected air quality violation.

3) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including the release of emissions which exceed quantitative thresholds for ozone precursors).

4) Expose sensitive receptors to substantial pollutant concentration including air toxics such as diesel particulates.

5) Create objectionable odors affecting a substantial number of people.

Additionally, according to CEQA Guidelines Appendix G, implementation of the proposed project would have significant environmental impacts on GHG emissions if it would:

6) Generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment.

7) Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emission of GHGs.

As stated in the CEQA Guidelines, these questions are “intended to encourage thoughtful assessment of impacts and do not necessarily represent thresholds of significance” (Title 14, Division 6, Chapter 3 Guidelines for Implementation of the CEQA, Appendix G, Environmental Checklist Form). The CEQA Guidelines encourage lead agencies to adopt regionally specific thresholds of significance. When adopting these thresholds, the amended Guidelines allow lead agencies to consider thresholds of significance adopted or recommended by other public agencies, or recommended by experts, provided that the thresholds are supported by substantial evidence.

4.1 Air Quality Significance Thresholds

The Imperial County APCD CEQA Air Quality Handbook establishes the following four separate evaluation categories (Imperial County APCD 2017b):

1) Comparison of calculated project emissions to Imperial County APCD emission thresholds.

2) Consistency with the most recent Clean Air Plan for Imperial County.

3) Comparison of predicted ambient pollutant concentrations resulting from the project to state and federal health standards, when applicable.

4) The evaluation of special conditions which apply to certain projects.

Any development with a potential to emit criteria pollutants below significance levels defined by the Imperial County APCD is called a "Tier I project," and is considered by the Imperial County APCD to have less than significant potential adverse impacts on local air quality. For Tier I projects, the project proponent should implement a set of feasible "standard" mitigation measures (enumerated by the Imperial County APCD) to reduce the air quality impact to an insignificant level. A "Tier II project" is one whose emissions exceed any of the thresholds. Its impact is significant and the project proponent should select and implement all feasible "discretionary" mitigation measures (also enumerated by the Imperial County APCD) in addition to the standard measures.

4.1.1 Operational Impacts

Table 5 provides general guidelines for determining the significance of impacts based on the total emissions that are expected from project operation established by the Imperial County APCD.

Table 5
Significance Thresholds for Operations

Pollutant	Tier I	Tier II
NO_X and ROG	Less than 137 lbs/day	137 lbs/day and Greater
PM_{10} and SO_X	Less than 150 lbs/day	150 lbs/day and Greater
CO and $PM_{2.5}$	Less than 550 lbs/day	550 lbs/day and Greater

ROG = reactive organic gas; NO_X = oxides of nitrogen; CO = carbon monoxide; PM_{10} = particulate matter with an aerodynamic diameter 10 microns or less; lbs/day = pounds per day
SOURCE: Imperial County APCD 2017b.

As stated above, Tier 1 projects are required to implement all feasible standard measures specified by the Imperial County APCD. Tier II projects are required to implement all feasible standard measures as well as all feasible discretionary measures specified by the Imperial County APCD.

4.1.2 Construction Impacts

The Imperial County APCD has also established thresholds of significance for project construction. Table 6 provides general guidelines for determining significance of impacts based on the total emissions that are expected from project construction.

Table 6
Significance Thresholds for Construction

Pollutant	Thresholds (pounds/day)
PM_{10}	150
ROG	75
NO_X	100
CO	550

ROG = reactive organic gas; NO_X = oxides of nitrogen;
CO = carbon monoxide; PM_{10} = particulate matter with an aerodynamic diameter 10 microns or less.
SOURCE: Imperial County APCD 2017b.

Regardless of project size, all feasible standard measures specified by the Imperial County APCD for construction equipment and fugitive PM_{10} control for construction activities should be implemented at construction sites. Control measures for fugitive PM_{10} construction emissions in Imperial County are found in Imperial County APCD Regulation VIII and in the Imperial County APCD CEQA Air Quality Handbook and are discussed below.

4.1.3 Public Nuisance Law (Odors)

State of California Health and Safety Code Sections 41700 and 41705 and Imperial County APCD Rule 407 prohibit emissions from any source whatsoever in quantities of air contaminants or other material, that cause injury, detriment, nuisance, or annoyance to the public health or damage to property.

The Imperial County APCD CEQA Air Quality Handbook provides screening level distances for potential odor sources. If a project is proposed within one mile of a wastewater treatment plant, sanitary landfill, composting station, feedlot, asphalt plant, painting and coating operation, or rendering plant, a potential odor problem may result (Imperial County APCD 2017b).

4.2 Greenhouse Gas Significance Thresholds

As stated previously, the CEQA Guidelines allow Lead Agencies to establish significance thresholds for their respective jurisdictions. These significance thresholds may be adopted after considering thresholds of significance adopted or recommended by other public agencies or experts.

No GHG emission significance threshold has been adopted by the Imperial County APCD for land development projects. Thus, in the absence of a threshold of significance for GHG emissions that has been adopted in a public process following environmental review, this analysis considers guidance promulgated by other agencies.

The County is a member of SCAG, which is composed of several different counties including Imperial, Los Angeles, Orange, Riverside, San Bernardino, and Ventura counties. Air districts responsible for managing air quality of within the SCAG boundaries include the Antelope Valley Air Quality Management District (AQMD), the Mojave Desert APCD, South Coast AQMD, and the Ventura County APCD. This analysis conservatively uses South Coast AQMD screening level thresholds.

South Coast AQMD

The South Coast AQMD published its *Interim CEQA GHG Significance Thresholds for Stationary Sources, Rules, and Plans* in 2008 (South Coast AQMD 2008). The interim thresholds are a tiered approach; projects may be determined to be less than significant under each tier or require further analysis under subsequent tiers. The five tiers are:

- Tier 1 – The project is exempt from CEQA.
- Tier 2 – The project is consistent with an applicable regional GHG emissions reduction plan.
- Tier 3 – Project GHG emissions represent an incremental increase below, or mitigated to less than Significance Screening Levels, where screening levels are developed based on a 90 percent emissions capture rate
    - 3,000 MT CO_2E is the Residential/Commercial Screening Level
    - 10,000 MT CO_2E is the Permitted Industrial Screening Level
- Tier 4 – The project achieves performance standards, where performance standards may include
    - Option #1: Uniform Percent Emission Reduction Target Objective (e.g., 30 percent) from BAU by incorporating Project Design Features and/or Implementing Emissions Reduction Measures.
    - Option #2: Early Implementation of Applicable AB32 Scoping Plan Measures.
    - Option #3: Achieve sector-based standard (e.g. pounds per person, pounds per square foot, etc.)
- Tier 5 – Offsets along or in combination with the above target Significance Screening Level. Offsets must be provided for a 30-year project life, unless the project life is limited by permit, lease, or other legally binding condition

Consistent with the South Coast AQMD guidance, the recommended/preferred tiered approach for most land use development projects in South Coast AQMD jurisdiction is assessment against the applicable screening levels. As the project is not exempt from CEQA and is not part of an approved local plan, project emissions would initially be assessed against a 3,000 MT CO_2E screening level. This 3,000 MT CO_2E screening level is intended to exempt projects that are too small to have significant impacts from further analysis.

5.0 Air Quality and GHG Assessment

Implementation of the proposed project would result in air pollutant and GHG emissions associated with the construction and operation of the project. Both air pollutant and GHG emissions were calculated using California Emissions Estimator Model (CalEEMod) Version 2016.3.2 (CAPCOA 2017). The CalEEMod program is a tool used to estimate emissions resulting from land development projects in the State of California. CalEEMod was developed with the participation of several state air districts including the South Coast AQMD.

CalEEMod estimates parameters such as the type and amount of construction equipment required, trip generation, and utility consumption based on the size and type of each specific land use using data collected from surveys performed in South Coast AQMD. Where available, parameters were modified to reflect project-specific data.

Air pollutant and GHG emissions associated with build-out of the project site were estimated for the operations year in 2020. Additionally, GHG emissions were modeled in year 2030 to parallel the year of the state GHG reduction target established by SB 32.

5.1 Construction-related Emissions

Construction-related activities are temporary, short-term sources of air pollutant and GHG emissions. Sources of construction-related emissions include:

- Fugitive dust from grading activities;
- Exhaust emissions from construction equipment;
- Application of chemical coatings (paints, stains, sealants, etc.); and
- Exhaust and fugitive dust emission from on-road vehicles (trips by workers, delivery trucks, and material-hauling trucks).

The air quality impact analysis for the project assumes the entire project to be constructed in a single phase, which would be anticipated to last approximately 18 months. This assumption is a conservative worst case scenario; if construction activities were spaced out over a longer period, then estimated maximum daily emissions would be less.

Project development would be anticipated to be phased, with construction occurring at a flexible rate based on market conditions and changing utility procurement plans. The phase-in of In-Use Off-Road Diesel Engine Standards and the State Advanced Clean Cars Program would result in increasingly clean construction equipment and on-road vehicles over time. However, this analysis assumes that construction would begin in 2019 and would occur in a single phase; thus, this analysis does not take credit for reductions that would be increased through the phase-in of cleaner construction equipment and on-road vehicles.

Construction emissions are calculated for construction activity based on the construction equipment profile and other factors determined as needed to complete all phases of construction. Based on Guidance from the South Coast Air Quality Management District (SCAQMD), total construction GHG emissions resulting from a project should be amortized over a period of 30 years and added to operational GHG emissions to account for their contribution to GHG emissions over the lifetime of a project (SCAQMD 2009).

5.1.1 Fugitive dust from Grading

Fugitive dust would be associated with construction activities that involve ground disturbance. Calculation of fugitive dust emissions are based on the area of disturbed ground and the fugitive dust measures implemented.

The Imperial County APCD requires that, regardless of the size of a project, all feasible standard measures for fugitive PM_{10} must be implemented at construction sites. Standard measures from the Imperial County APCD handbook are listed below.

Standard Measures for Fugitive PM_{10} Control:

a) All disturbed areas, including Bulk Material storage which is not being actively utilized, shall be effectively stabilized and visible emissions shall be limited to no greater than 20% opacity for dust emissions by using water, chemical stabilizers, dust suppressants, tarps or other suitable material such as vegetative ground cover.

b) All on site and off site unpaved roads will be effectively stabilized and visible emissions shall be limited to no greater than 20% opacity for dust emissions by paving, chemical stabilizers, dust suppressants and/or watering.

c) All unpaved traffic areas one (1) acre or more with 75 or more average vehicle trips per day will be effectively stabilized and visible emission shall be limited to no greater than 20% opacity for dust emissions by paving, chemical stabilizers, dust suppressants and/or watering. The transport of Bulk Materials shall be completely covered unless six inches of freeboard space from the top of the container is maintained with no spillage and loss of Bulk Material. In addition, the cargo compartment of all Haul Trucks is to be cleaned and/or washed at delivery site after removal of Bulk Material.

d) The transport of Bulk Materials shall be completely covered unless six inches of freeboard space from the top of the container is maintained with no spillage and loss of Bulk Material. In addition, the cargo compartment of all Haul Trucks is to be cleaned and/or washed at delivery site after removal of Bulk Material.

e) All Track-Out or Carry-Out will be cleaned at the end of each workday or immediately when mud or dirt extends a cumulative distance of 50 linear feet or more onto a paved road within an Urban area.

f) Movement of Bulk Material handling or transfer shall be stabilized prior to handling or at points of transfer with application of sufficient water, chemical stabilizers or by sheltering or enclosing the operation and transfer line.

g) The construction of any new Unpaved Road is prohibited within any area with a population of 500 or more unless the road meets the definition of a Temporary Unpaved Road. Any temporary unpaved road shall be effectively stabilized and visible emissions shall be limited to no greater than 20% opacity for dust emission by paving, chemical stabilizers, dust suppressants and/or watering.

To account for standard measures for fugitive dust, the project was assumed to include a water truck. This amounts to a 61 percent reduction in fugitive dust emissions (South Coast AQMD 2007).

5.1.2 Equipment Exhaust

The equipment anticipated to be used in each phase of construction of the project was provided by the project applicant and is shown below in Table 7.

Table 7
Anticipated Construction Schedule and Equipment

Equipment Type	Quantity	Horsepower*	Load Factor*	Hours/ Day
Site Preparation				
Graders	1	187	0.41	8
Scrapers	1	367	0.48	8
Brush Chippers	1	50	0.50	2
Rubber Tired Dozers	1	247	0.40	8
Water Trucks	1	189	0.50	2
Facility Installation				
Excavator	2	158	0.38	8
Mast Pile Drivers	10	49	0.50	8
Rough Terrain Forklifts	10	100	0.40	8
Trenchers	1	78	0.50	8
Water Trucks	1	189	0.50	2

* Horsepower and load factor were generally based on CARB's off-road diesel equipment emission factors database, OFFROAD2011. Factors for mast pile drivers were based on equipment typical of renewable energy projects. Factors for brush chippers were estimated.

As discussed previously, overall project construction has been assumed in this analysis to occur over an 18-month period. Site preparation equipment such as graders, scrapers, brush chippers, dozers, and water trucks would be active for approximately 3 months. Facility installation equipment such as mast pile drivers and trenchers would be active for up to 3 months. Facility installation equipment such as excavators, water trucks, and rough terrain forklifts would be active for up to 8 months. Non-equipment tasks such as electrical work and equipment testing would comprise the remainder of the 18-month period.

CalEEMod calculates emissions of all pollutants from construction equipment using emission factors from CARB's off-road diesel equipment emission factors database, OFFROAD 2011 (CARB 2011). Consistent with CARB requirements, all equipment was assumed to meet CARB Tier 3 In-Use Off-Road Diesel Engine Standards.

The Imperial County APCD requires that, regardless of the size of a project, all feasible standard measures for construction equipment must be implemented at construction sites. Standard measures from the Imperial County APCD handbook are listed below.

Standard Measures for Construction Combustion Equipment

a) Use of alternative fueled or catalyst equipped diesel construction equipment, including all off-road and portable diesel powered equipment.

b) Minimize idling time either by shutting equipment off when not in use or reducing the time of idling to 5 minutes as a maximum.

c) Limit, to the extent feasible, the hours of operation of heavy duty equipment and/or the amount of equipment in use.

d) Replace fossil fueled equipment with electrically driven equivalents (provided they are not run via a portable generator set).

5.1.3 On-road Vehicle Emissions

Construction would generate mobile source emissions from worker trips, hauling trips, and vendor trips. As discussed in the Project Traffic Impact Analysis, the number of workers expected on-site during construction would vary and would likely average up to 250 workers per day and would thereby result in up to 436 worker commute trips per day (LOS Engineering 2017). Deliveries of equipment and supplies to the site would also vary over the construction period but have the potential to result in up to 40 daily trips. CalEEMod calculates emissions of all pollutants from on-road trucks and passenger vehicles using emission factors derived from CARB's motor vehicle emission inventory program EMFAC2014 (CARB 2014b). Vehicle emission factors were multiplied by the total estimated number of trips and the average trip length to calculate the total mobile emissions.

The project site would be accessed via SR-98, Drew Road (County Highway S-29), Kubler Road and Pulliam Road. All these roadways are paved. Therefore, project-generated vehicle traffic was assumed to travel on paved roads.

5.1.4 Water Use

Water use for fugitive dust control would have indirect GHG emissions associated with it. These emissions are a result of the energy used to supply, treat, and distribute water. Construction of the project would be anticipated to require approximately 1,200 acre-feet of water for fugitive dust control. Either potable water or reclaimed water may be used for fugitive dust control. This analysis conservatively assumes potable water is used and thus accounts for energy used for supply, treatment, and distribution of potable water. Water use emissions are estimated based on regional efficiency factors for water supply, treatment, and distribution.

5.2 Operation-related Emissions

Operation-related sources of air pollutant emissions include the direct emission of criteria pollutants. Common direct emission sources include mobile sources such as project-generated traffic, and area sources such as the use of landscaping equipment. In addition to these direct emission sources, GHG emissions are also generated indirectly as a result of project electricity use, water use, and solid waste generation.

5.2.1 Mobile Sources

CalEEMod calculates mobile source emissions using emission factors derived from CARB's motor vehicle emission inventory program, EMFAC2014 (CARB 2014b). As discussed in the Project Traffic Impact Analysis, operation of the project would be anticipated to generate up to 20 trips per day from all maintenance and security personnel. Standard countywide trip lengths for each trip type were used to determine total project vehicle miles traveled (CAPCOA 2017). The vehicle emission factors and fleet mix used in CalEEMod are derived from EMFAC2014 and account for the effects of applicable regulations such as the Advanced Clean Cars Program.

5.2.2 Area Sources

An area source is any non-permitted stationary source of emission. Common area sources include fireplaces, natural gas used in space and water heating, consumer products, architectural coatings, dust from farming operations, landscaping equipment, and small combustion equipment such as boilers or backup generators. The proposed project does not include measurable amounts of fireplace use, natural gas use, consumer products, architectural coatings, or other area sources.

Consistent with the project's Fire Management Plan, routine weed abatement and landscape maintenance would occur as needed. The project site is bounded by roads, agricultural uses, and solar generation facilities. As the project is not adjacent to natural lands, landscaping maintenance for maintaining a fire-clearing zone would be minimal and would result in less than measureable emissions.

5.2.3 Electricity Demand/Generation

Energy use emissions typically include indirect GHG emissions associated with the generation of electricity from fossil fuels off-site in power plants. Project electricity demand for security lighting and O&M buildings would be extremely limited as compared to the electricity generated by project solar panels; the project would be a net generator of clean, renewable energy that would reduce GHG emissions associated with generation of electricity from fossil fuels at other power plants.

At this time it is not known whether electricity generated by the project would be sold to the IID, San Diego Gas & Electric, or a different utility provider. As the project site is within IID's service area, IID-specific energy intensity factors (i.e., the amount of CO_2, CH_4, and N_2O per kilowatt-hour) are used in the estimation of the GHG emission reductions from the project.

As discussed, the state mandate for renewable energy is 33 percent by 2020 and 50 percent by 2030; however, the energy-intensity factors included in CalEEMod only represent an 8.3

percent procurement of renewable energy (Senate Energy, Utilities and Communications Committee 2012). Project emission estimates were modeled accounting for reductions achieved by 33 percent renewable energy procurement in 2020 and 50 percent renewable energy procurement in 2030. IID energy intensity factors used in modeling are shown in Table 8.

Table 8
Imperial Irrigation District Energy Intensity Factors

Gas	2010 Factors (lbs/MWh)	2020 Factors (lbs/MWh)	2030 Factors (lbs/MWh)
Carbon Dioxide (CO_2)	1270.90	956.99	740.93
Methane (CH_4)	0.029	0.022	0.017
Nitrous Oxide (N_2O)	0.006	0.005	0.003

SOURCE: Senate Energy, Utilities and Communications Committee 2012.
lbs = pounds; MWh = megawatt hour

5.2.4 Water Use

The water use and wastewater generation of a project has indirect GHG emissions associated with it. These emissions are a result of the energy used to supply, distribute, and treat water and wastewater. In addition, wastewater treatment can also emit both CH_4 and N_2O.

During project operation, water would be used for domestic use, fire protection, and to wash the solar modules. Operation of the project would be anticipated to require approximately 60 acre-feet of water per year. The project would require less water than existing agricultural use. This analysis conservatively assesses the gross water use of the project. Water use emissions are estimated based on regional efficiency factors for water supply, treatment, and distribution.

5.2.5 Solid Waste Generation

The disposal of solid waste produces GHG emissions from anaerobic decomposition in landfills, incineration, and transportation of waste. Solar farms are not known to generate substantial quantities of biodegradable waste. As such, solid waste emissions would not represent a measurable increase in GHG emissions.

5.3 Facility Decommissioning

Consistent with decommissioning requirements, the project site would be restored to its existing condition upon project conclusion. Closure and decommissioning of the project site would be temporary and would include disassembly and removal of all detachable above-ground elements, removal of panel and racks and any other structural elements including those that penetrate the ground surface, re-grading of the project site to restore natural drainage patterns, and habitat restoration activities.

Decommissioning activities would include several sources of criteria pollutants and GHG emissions such as construction equipment, worker commute trips, and hauling trips. The equipment required for project decommissioning is not known at this time. Decommissioning activities would be anticipated to require fewer pieces of construction equipment than project construction, which would likely have lower emissions than equipment in use today. As such, GHG emissions associated with decommissioning are anticipated to be lower than the emissions associated with project construction. This analysis conservatively models GHG emissions associated with project decommissioning as equal to construction emissions.

5.4 Emission Estimates

5.4.1 Air Pollutant Emissions Estimate

Table 9 provides a summary of the criteria pollutant emissions generated by the project construction and operations. CalEEMod output files for project construction and operations are contained in Attachment 1. As noted above, the impact analysis for the project assumes a conservative worst case scenario where the entire project would be constructed in a single phase, which would be anticipated to last approximately 18 months.

Table 9
Maximum Daily Air Pollutant Emissions

Emission Source	Maximum Daily Emissions (pounds)					
	ROG	NO_X	CO	SO_X	PM_{10}	$PM_{2.5}$
Construction						
Total Construction	7	54	89	<1	13	6
Significance Threshold	*75*	*100*	*550*	-	*150*	-
Exceeds Threshold?	**No**	**No**	**No**	**-**	**No**	**-**
Operation						
Area Sources	<1	0	0	0	0	0
Energy Sources	0	0	0	0	0	0
Mobile Sources	<1	1	1	<1	<1	<1
Total Operations	<1	<1	1	<1	<1	<1
Significance Threshold	*137*	*137*	*550*	*150*	*150*	*550*
Exceeds Threshold?	**No**	**No**	**No**	**No**	**No**	**No**

SOURCE: Attachment 1
NOTE: Totals may vary due to independent rounding.

5.4.2 Greenhouse Gas Emissions Estimate

Table 10 provides a summary of the GHG emissions generated by the project construction, operations, and decommissioning. CalEEMod output files for project operation are contained in Attachment 1.

Table 10 Annual GHG Emissions		
Emission Source	GHG Emissions ($MT\ CO_2E$)	
Construction		
Mobile and Equipment	1,391	
Water Use	1,890	
Total Construction	3,281	
Amortized Construction	109	
Operation	*Year 2020*	*Year 2030*
Vehicles	53	43
Energy Use	-74,195	-57,424
Area Sources	<1	<1
Water Use	94	73
Solid Waste Disposal	<1	<1
Gross Operation	121	95
Total Operation	**-74,048**	**-57,308**
Total Emissions	*Year 2020*	*Year 2030*
Gross Construction, Operation, and Decommissioning	**366**	**335**
Net Construction, Operation, and Decommissioning	**-73,829**	**-57,089**

SOURCE: Attachment 1
NOTE: Totals may vary due to independent rounding.

5.5 Impact Analysis

As discussed in Section 4.1, the California Natural Resources Agency's State CEQA Guidelines includes questions that were developed to encourage thoughtful assessment of impacts. Project impact assessment consistent with these CEQA checklist questions is provided below.

5.5.1 Air Quality Impacts

1. *Would the project obstruct or conflict with the implementation of the applicable air quality plan?*

As discussed in Section 3.2.3, CARB is the lead agency for preparation of the California SIP, which outlines the State measures to achieve NAAQS. CARB delegates responsibility for preparation of SIP elements to local air districts and requires local air districts to prepare Air Quality Attainment Plans outlining measures required to achieve CAAQS.

The Imperial County APCD is the air district responsible for the project area. Applicable Imperial County APCD air quality plans include:

- *Imperial County 2009 State Implementation Plan for Particulate matter Less than 10 Microns in Aerodynamic Diameter*;
- *Imperial County 2013 State Implementation Plan for the 2006 24-Hour $PM_{2.5}$ Moderate Non-attainment Area*; and
- *Imperial County 2017 State Implementation Plan for the 2008 8-Hour Ozone Standard.*

The primary concern for assessing consistency with air quality plans is whether the project would induce growth that would result in a net increase in criteria pollutant emissions that exceeds the assumptions used to develop the plan. The basis for the air quality plans is SCAG's population growth and regional vehicle miles traveled projections, which are based in part on the land uses established by local general plans. As such, projects that propose development that is consistent with the local land use plans would be consistent with growth projections and air quality plans emissions estimates. In the event that a project would result in development that is less dense than anticipated by the growth projections, the project would be considered consistent with the air quality plans. In the event a project would result in development that results in greater than anticipated growth projections, the project would result in air pollutant emissions that may not have been accounted for in the air quality plans and thus may obstruct or conflict with the air quality plans.

The land use designation for the project site is agriculture which generally accommodates agricultural crop production with one associated single-family residence per 40-acre parcel. Based on trip generation rates from the Institute of Transportation Engineers (ITE) 9th Edition Handbook, a single-family residence would generate approximately 9.52 vehicle trips per day (ITE 2012); additional trips would be associated with agricultural uses. Thus, the existing land use designation would accommodate up to 20 single-family residences, which would generate approximately 190 vehicle trips per day in addition to vehicle trips associated with agricultural crop production.

Project operations would generate up to 20 trips per day from all maintenance and security personnel. As compared to the existing land use designation assumed in the SIP, the project would generate fewer trips and would thereby result in lesser air pollutant emissions.

Thus, the project emissions would be accounted for SCAG's growth projections and the Imperial County APCD's air quality plans. Therefore, the project would be consistent with the air quality plans. Impacts would be considered less than significant.

2. *Would the project result in emissions that would violate any air quality standard or contribute substantially to an existing or projected air quality violation?*

Construction Emissions

As shown in Table 9, air pollutant emissions associated with project construction would be less than all applicable Imperial County APCD significance thresholds. Therefore, project construction would not contribute to violations of NAAQS or CAAQS; impacts would be less than significant.

Operations Emissions

As shown in Table 9, air pollutant emissions associated with project operation would be less than all applicable Imperial County APCD significance thresholds. Therefore, the project would not contribute to violations of NAAQS or CAAQS; impacts would be less than significant.

3. *Would the project result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including release emissions which exceed quantitative thresholds for ozone precursors)?*

As discussed in Sections 3.1.1.1 and 3.1.2.1, project site is in non-attainment areas for NAAQS and CAAQS for ozone and particulate matter. The majority of regional PM_{10} and $PM_{2.5}$ emissions originate from dust stirred up by wind or by vehicle traffic on unpaved roads (Imperial County APCD 2009). Other PM_{10} and $PM_{2.5}$ emissions originate from grinding operations, combustion sources such as motor vehicles, power plants, wood burning, forest fires, agricultural burning, and industrial processes. Ozone is not emitted directly, but is a result of atmospheric activity on precursors. NO_X and ROG are known as the chief "precursors" of ozone. These compounds react in the presence of sunlight to produce ozone. Approximately 88 percent of NO_X and 40 percent of ROG regional emissions originate from on- and off-road vehicles (Imperial County APCD 2010). Other major sources include solvent evaporation and miscellaneous processes such as pesticide application.

As discussed under Threshold 1, the project would be consistent with Imperial County APCD air quality plans. As discussed under Issue 2, all construction- and operation-related emissions would be less than applicable significance thresholds. Therefore the project would not result in a cumulatively considerable net increase in criteria pollutants for which the region is in non-attainment of federal or state standards. Impacts would be less than significant.

4. *Would the project expose sensitive receptors to substantial pollutant concentration including air toxics such as diesel particulates?*

The term "sensitive receptor" refers to a person in the population who is more susceptible to health effects due to exposure to an air contaminant than the population at large or to a land use that may reasonably be associated with such a person. Examples include schools, day care centers, hospitals, retirement homes, convalescence facilities and residences. The project site is in a rural environment; there are no nearby schools, day care centers, hospitals, retirement homes, or convalescence facilities. Sensitive receptors in the vicinity of the project site include a single-family residence immediately west of the intersection of Drew Road and SR-98 (approximately 100 feet from project site) and another single-family residence northeast of the intersection of Kubler Road and Pulliam Road (approximately 400 feet from project site). A discussion of potential impacts to sensitive receptors from construction and operation of the project is provided below.

Construction-related Diesel Particulate Matter

Construction of the project would result in short-term diesel exhaust emissions from on-site heavy-duty equipment. Particulate exhaust emissions from diesel-fueled engines (diesel PM or DPM) were identified as a TAC by CARB in 1998. Project construction would result in the generation of DPM emissions from the use of off-road diesel construction equipment during site preparation and facility installation. Other lesser construction-related sources of DPM include material delivery trucks.

Construction of the project would occur over an approximate 18-month period. The dose to which the receptors are exposed is the primary factor used to determine health risk. Dose is a function of the concentration of a substance or substances in the environment and the extent of exposure that person has with the substance. Dose is positively correlated with time, meaning that a longer exposure period would result in a higher exposure level for the Maximally Exposed Individual; the risks estimated for a Maximally Exposed Individual are higher if a fixed exposure occurs over a longer period of time. According to the Office of Environmental Health Hazard Assessment (OEHHA), health risk assessments, which determine the exposure of sensitive receptors to toxic emissions, should be based on a 30-year exposure period; however, such assessments should be limited to the period/duration of activities associated with the project (OEHHA 2015). Thus, if the duration of proposed construction activities near any specific sensitive receptor was 18 months, the exposure would be five percent of the total exposure period used for health risk calculation.

Compared to typical construction projects, construction of solar generation facilities involves fewer pieces of heavy-duty diesel construction equipment which operate over larger areas; thus construction equipment is rarely proximate to any specific receptor for extended period of time. Due to the limited intensity of construction, DPM generated by project construction activities is not expected to create conditions where the incremental cancer risk exceeds the Imperial County APCD's ten in one million significance threshold. Therefore, project construction would not expose sensitive receptors to a substantial pollutant concentration. Localized air quality impacts from construction-related DPM emissions would be less than significant.

On-site Operation Sources

As discussed under Threshold 2, the construction and operation of the project would not result in substantial criteria pollutant emissions. Solar generation facilities are not known to result in substantial air toxic emissions. Localized air quality impacts from project operations would be less than significant.

Off-site Operation Sources – CO Hot Spots

Localized CO concentration is a direct function of motor vehicle activity at signalized intersections (e.g., idling time and traffic flow conditions), particularly during peak commute hours and meteorological conditions. Under specific meteorological conditions (e.g., stable conditions that result in poor dispersion), CO concentrations may reach unhealthy levels with respect to local sensitive land uses. CO hot spots due to traffic almost exclusively occur at signalized intersections that operate at a Level of Service (LOS) E or below. Projects may result in or contribute to a CO hot spot if they worsen traffic flow at signalized intersections operating at LOS E or F.

The project site is in a rural environment with no signalized traffic intersections within several miles of the project site. As discussed previously, the project would generate up to 20 trips per day.

The project is not in proximity to a signalized intersection and would not generate substantial traffic. Therefore, the project would not cause or contribute to a CO hot spot. Impacts would be less than significant.

5. *Would the project create objectionable odors affecting a substantial number of people?*

The potential for an odor impact is dependent on a number of variables including the nature of the odor source, distance between the receptor and odor source, and local meteorological conditions. Project construction would result in the emission of diesel fumes and other odors typically associated with construction activities. Odors are highest near the source and would quickly dissipate off the site. The nearest sensitive receptor is a single-family residence approximately 80 feet from the southern edge of the proposed grading area (50 feet from project site boundary). Any odors associated with construction activities would be transient and would cease upon completion. For these reasons, construction-related odor impacts would be less than significant.

Solar generation facilities are not known to emit odors during operation. Project operation would include inspection, maintenance, and washing activities. These processes are not known to emit odors. Therefore, operational odor impacts would also be less than significant.

5.5.2 GHG Emissions Impacts

6. *Would the project generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment.*

Project GHG emissions resulting from construction and operation of the project were calculated as described in Section 5.1 – Construction-related Emissions and Section 5.2 – Operation-related Emissions and are summarized in Table 10 (see Section 5.4.2). As shown, the combined gross construction, operations, and decommissioning emissions would be 366 MT CO_2E in 2020. Accounting for the GHG emissions offset by the renewable energy generation of the solar generation facility, the project would result in a net reduction of 73,829 MT CO_2E in 2020.

The project's gross annual GHG emissions and the GHG emissions offset by the renewable energy generation of the solar generation facility would gradually decline as a result of federal, state, and local implementation measures, such as increased fuel efficiency standards associated with the Advanced Clean Cars Program and reduced fossil fuel electricity generation in accordance with the State's RPS mandate. The combined gross construction, operations, and decommissioning emissions would be 335 MT CO_2E in 2030. Accounting for the GHG emissions offset by the renewable energy generation of the solar generation facility, the project would result in a 57,089 MT CO_2E reduction in 2030.

As discussed previously, the South Coast AQMD's 3,000 MT CO_2E screening level is appropriate for exempting projects that are too small to have significant impacts from further analysis. As project emissions would be less than the 3,000 MT CO_2E screening level, GHG emissions impacts would be less than significant.

Under CEQA an impact is a "substantial, or potentially substantial, *adverse* change in the environment…". This analysis concludes that project GHG emissions would result in less than significant impacts under CEQA. The project would be anticipated to offset GHG emissions through renewable energy generation and thereby result in environmental benefits by lessening the impacts of global climate change.

7. *Would the project conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emission of GHGs.*

EO S-3-05 and B-30-15 establish the GHG emission reduction policy of the Executive Branch for the state. AB 32 codified the 2020 goal of EO S-3-05 and launched the Original Scoping Plan (CARB 2008) that outlined the reduction measures needed to reach these goals. SB 32 codified the 2030 goal of B-30-15 and directed CARB to prepare a subsequent update to the Scoping Plan.

Subsequent to the adoption of AB 32 and the development of the Original Scoping Plan, several state agencies, including CARB, CEC, California Public Utilities Commission, Department of Resources Recycling and Recovery, California Department of Transportation, California Department of Forestry and Fire, the Department of Water Resources, the Department of Food and Agriculture, and the Department of Goods and Services have developed regulatory and incentive programs to reduce GHG emissions statewide. Policies related to the California Department of Food and Agriculture and California Department of Forestry and Fire are primarily related to the agriculture business and forest and rangeland management.

The project would not have a direct or indirect effect on the strategies outlined in the State Scoping Plan or subsequent policies adopted by state agencies. In fact, the project would promote the state's GHG policies by creating additional renewable energy resources. Project GHG emissions would not exceed applicable screening levels and therefore would be too small to have significant impact on achievement of statewide GHG emissions reduction targets. Impacts would be less than significant.

6.0 Conclusions and Recommendations

This report evaluates the significance of air quality and GHG emissions associated were assessed using criteria from the California Natural Resources Agency *State CEQA Guidelines,* the Imperial County APCD CEQA Air Quality Handbook, and GHG emission screening levels from the South Coast AQMD *Interim CEQA GHG Significance Thresholds for Stationary Sources, Rules, and Plans*.

A significant air quality impact would occur if the project would conflict with the Imperial County APCD's ozone and particulate matter air quality plans. Based on the project vehicle trip generation and associated air pollutant emission calculations, the project air pollutant emissions would be accounted for in regional growth projections and the air quality plan emission forecasts. As such, impacts would be considered less than significant.

A significant air quality impact would occur if construction or operation of the project would contribute to an air quality violation. As shown in Tables 9 and 10, construction- and operation-related emissions would be less than all applicable significance thresholds. Impacts associated with attainment of air quality standards would be less than significant.

A significant air quality impact would occur if the project would result in a cumulatively considerable net increase of any criteria pollutant for which the project region is a non-attainment area. As discussed in Sections 3.1.1.1 and 3.1.2.1, the project site is in non-attainment areas for ozone and particulate matter, $PM_{2.5}$ and PM_{10}, standards. Project ozone precursor and particulate matter emissions would be less than applicable significance thresholds. Thus, the project would not result in a cumulatively considerable net increase of ozone precursors or particulate matter emissions. Impacts would be less than significant.

A significant air quality impact would occur if the project would expose sensitive receptors to substantial pollutant concentration including air toxics. Sensitive receptors in the vicinity of the project site include a single-family residence immediately west of the intersection of Drew Road and State Route 98 and another single-family residence northwest of the intersection of Kubler Road and Pulliam Road. The project would result in the generation of DPM during construction and mobile-source CO during operation. Due to the limited intensity of construction, DPM generated by project construction activities is not expected to create conditions where the incremental cancer risk exceeds the Imperial County APCD's ten in one million significance threshold; thus impacts from DPM exposure would be less than significant. Due to the limited traffic generated by the project, the project would not substantially contribute to elevated CO concentrations; impacts from mobile-source CO emissions would be less than significant. The various components of solar generation facilities, including storage and transmission facilities, are not known to result in substantial air toxic emissions. Localized air quality impacts from project operations would be less than significant.

Project construction would result in temporary odors associated with diesel exhaust. Odors generated from construction would be temporary and intermittent, and would largely dissipate at short distances from the source. The various components of solar generation facilities, including storage and transmission facilities, are not known to emit odors during operation. Thus, the project would not create objectionable odors affecting a substantial number of people. Impacts would be less than significant.

No GHG emission significance threshold has been adopted by the Imperial County APCD. Project GHG emissions were evaluated against the South Coast AQMD screening level of 3,000 MT CO_2E. The project's combined gross construction, operational, and decommissioning GHG emissions would be 366 MT CO_2E in 2020; accounting for the GHG emissions offset by the renewable energy generation of the solar generation facility, the project would result in a net total reduction of 73,829 MT CO_2E in 2020. The project's gross annual GHG emissions and the GHG emissions offset by the renewable energy generation of the solar generation facility would gradually decline as a result of federal, state, and local implementation measures. As emissions do not exceed the South Coast AQMD's screening threshold, the project would not result in a cumulatively considerable impact to GHG emissions and would not conflict with the State GHG reduction targets. Impacts would be less than significant.

The proposed project would have a less than significant impact on air quality and global climate change through GHG emissions. No mitigation is required.

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ATTACHMENT 1

CalEEMod Output Files

Summary Book

Air Quality

Air Quality Emissions Estimate		Pollutant (lbs/day)					
		ROG	NO_X	CO	SO_2	PM_{10}	$PM_{2.5}$
Unmitigated Construction							
Summer	*2018*	7	54	89	0	13	6
	2019	7	53	85	0	13	6
	2020	4	11	34	0	4	1
Winter	*2018*	6	54	80	0	13	6
	2019	6	53	77	0	13	6
	2020	3	11	27	0	4	1
Maximum Daily Project Site Construction Emissions		**7**	**54**	**89**	**0**	**13**	**6**
Operation							
Summer	Area	0	0	0	0	0	0
	Energy	0	0	0	0	0	0
	Mobile	0	1	1	0	0	0
Winter	Area	0	0	0	0	0	0
	Energy	0	0	0	0	0	0
	Mobile	0	1	1	0	0	0
Maximum Daily Operation Emissions		**0**	**1**	**1**	**0**	**0**	**0**

Drew Solar 2020

Imperial County, Summer

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
General Light Industry	1.00	1000sqft	844.20	1,000.00	0

1.2 Other Project Characteristics

Urbanization	Rural	**Wind Speed (m/s)**	3.4	**Precipitation Freq (Days)**	12
Climate Zone	15			**Operational Year**	2020
Utility Company	Imperial Irrigation District				
CO2 Intensity (lb/MWhr)	956.99	**CH4 Intensity (lb/MWhr)**	0.022	**N2O Intensity (lb/MWhr)**	0.005

1.3 User Entered Comments & Non-Default Data

Project Characteristics - Energy intensity factors reduced to reflect 2020 renewable energy procurement mandate

Land Use - Modeled as 1 ksf industrial. Project site is 844.2 acres.

Construction Phase - Site Prep, Part A includes all facility installation equipment, Part B includes only excavators, water trucks, and forklifts, and Part C includes negligible equipment.

Off-road Equipment - Other construction equipment refers to mast pile drivers and water trucks

Off-road Equipment - Other construction equipment refers to mast pile drivers and water trucks

Off-road Equipment - Non-equipment related tasks.

Off-road Equipment - Other construction equipment refers to brush chippers and water trucks.

Trips and VMT - Conservatively assessed maximum trips assocaiated with project construction

On-road Fugitive Dust - Project site is along a major highway (SR-98). Trips are not anticipated to use unpaved routes.

Grading - Project site would be graded. All import/export would be balanced onsite.

Vehicle Trips - Project operation would generate up to 20 trips per day.

Road Dust - Project site is along a major highway (SR-98). Trips are not anticipated to use unpaved routes.

Energy Use - Project would have limited energy use.

Water And Wastewater - Project would use 60 acre-feet per year = 19,550,000 gallons. Project water use would not generate wastewater that requires offsite treatment.

Solid Waste - Project would generate limited waste.

Construction Off-road Equipment Mitigation - Fugitive dust control measures include site watering; Tier 3 equipment assumed for compliance with CARB regulations

Energy Mitigation - 100 MWh = 100,000 kWh; regional solar generation potential of 1,705.6 KWh/KW; 170,560,000 KWh/year

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2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2018	11.8897	59.2116	90.5786	0.1224	23.2859	3.3630	24.8218	5.7858	3.0962	7.2012	0.0000	12,308.1384	12,308.1384	2.5873	0.0000	12,372.8197
2019	11.2445	55.7382	87.2139	0.1211	10.3334	3.1218	13.4552	2.6221	2.8740	5.4961	0.0000	12,071.6677	12,071.6677	2.5544	0.0000	12,135.5287
2020	4.2977	11.0493	33.9730	0.0573	3.8243	0.2547	4.0790	1.0244	0.2513	1.2757	0.0000	5,723.7926	5,723.7926	0.3902	0.0000	5,733.5470
Maximum	**11.8897**	**59.2116**	**90.5786**	**0.1224**	**23.2859**	**3.3630**	**24.8218**	**5.7858**	**3.0962**	**7.2012**	**0.0000**	**12,308.1384**	**12,308.1384**	**2.5873**	**0.0000**	**12,372.8197**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2018	6.9559	53.8743	88.6449	0.1224	11.4143	2.9195	13.2529	2.8813	2.9151	5.5371	0.0000	12,308.1384	12,308.1384	2.5873	0.0000	12,372.8197
2019	6.5872	53.1332	85.3873	0.1211	10.3334	2.9097	13.2430	2.6221	2.9056	5.5277	0.0000	12,071.6676	12,071.6676	2.5544	0.0000	12,135.5286
2020	4.0302	10.5746	34.3238	0.0573	3.8243	0.2689	4.0932	1.0244	0.2656	1.2900	0.0000	5,723.7926	5,723.7926	0.3902	0.0000	5,733.5470
Maximum	**6.9559**	**53.8743**	**88.6449**	**0.1224**	**11.4143**	**2.9195**	**13.2529**	**2.8813**	**2.9151**	**5.5371**	**0.0000**	**12,308.1384**	**12,308.1384**	**2.5873**	**0.0000**	**12,372.8197**

	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	**35.94**	**6.68**	**1.61**	**0.00**	**31.71**	**9.52**	**27.78**	**30.79**	**2.18**	**11.58**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	0.0252	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0978	0.6449	1.4386	3.3200e-003	0.2027	2.9300e-003	0.2057	0.0544	2.7800e-003	0.0572		337.7500	337.7500	0.0223		338.3063
Total	**0.1230**	**0.6449**	**1.4387**	**3.3200e-003**	**0.2027**	**2.9300e-003**	**0.2057**	**0.0544**	**2.7800e-003**	**0.0572**		**337.7502**	**337.7502**	**0.0223**	**0.0000**	**338.3065**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	0.0252	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0978	0.6449	1.4386	3.3200e-003	0.2027	2.9300e-003	0.2057	0.0544	2.7800e-003	0.0572		337.7500	337.7500	0.0223		338.3063
Total	**0.1230**	**0.6449**	**1.4387**	**3.3200e-003**	**0.2027**	**2.9300e-003**	**0.2057**	**0.0544**	**2.7800e-003**	**0.0572**		**337.7502**	**337.7502**	**0.0223**	**0.0000**	**338.3065**

	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	Site Preparation	Site Preparation	7/2/2018	10/1/2018	5	66	
2	Facility Installation Part A	Building Construction	10/2/2018	1/1/2019	5	66	
3	Facility Installation Part B	Building Construction	1/2/2019	6/4/2019	5	110	
4	Facility Installation Part C	Building Construction	6/5/2019	1/1/2020	5	151	

Acres of Grading (Site Preparation Phase): 836.4

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

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Site Preparation	Graders	1	8.00	187	0.41
Site Preparation	Other Construction Equipment	1	2.00	50	0.50
Site Preparation	Other Construction Equipment	1	2.00	189	0.50
Site Preparation	Rubber Tired Dozers	1	8.00	247	0.40
Site Preparation	Scrapers	1	8.00	367	0.48
Facility Installation Part A	Excavators	2	8.00	158	0.38
Facility Installation Part A	Other Construction Equipment	10	8.00	49	0.50
Facility Installation Part A	Other Construction Equipment	1	2.00	189	0.50
Facility Installation Part A	Rough Terrain Forklifts	10	8.00	100	0.40
Facility Installation Part A	Trenchers	1	2.00	78	0.50
Facility Installation Part B	Excavators	2	8.00	158	0.38
Facility Installation Part B	Other Construction Equipment	10	8.00	49	0.50
Facility Installation Part B	Other Construction Equipment	1	2.00	189	0.50
Facility Installation Part C	Generator Sets	1	8.00	84	0.74

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
Site Preparation	5	436.00	40.00	0.00	10.20	11.90	20.00	LD_Mix	HDT_Mix	HHDT
Facility Installation Part A	24	436.00	40.00	0.00	10.20	11.90	20.00	LD_Mix	HDT_Mix	HHDT
Facility Installation Part A	24	0.00	0.00	0.00	10.20	11.90	20.00	LD_Mix	HDT_Mix	HHDT
Facility Installation Part A	24	0.00	0.00	0.00	10.20	11.90	20.00	LD_Mix	HDT_Mix	HHDT
Facility Installation Part B	13	436.00	40.00	0.00	10.20	11.90	20.00	LD_Mix	HDT_Mix	HHDT
Facility Installation Part C	1	436.00	40.00	0.00	10.20	11.90	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Use Cleaner Engines for Construction Equipment

Water Exposed Area

3.2 Site Preparation - 2018

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					19.4615	0.0000	19.4615	4.7614	0.0000	4.7614			0.0000			0.0000
Off-Road	2.9615	34.4601	15.6887	0.0309		1.4511	1.4511		1.3350	1.3350		3,115.4177	3,115.4177	0.9699		3,139.6645
Total	**2.9615**	**34.4601**	**15.6887**	**0.0309**	**19.4615**	**1.4511**	**20.9126**	**4.7614**	**1.3350**	**6.0964**		**3,115.4177**	**3,115.4177**	**0.9699**		**3,139.6645**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.2739	6.1332	1.8742	0.0164	0.4414	0.0615	0.5030	0.1271	0.0588	0.1859		1,713.6606	1,713.6606	0.0826		1,715.7246
Worker	4.3075	3.0199	34.4793	0.0369	3.3829	0.0234	3.4063	0.8973	0.0216	0.9189		3,633.0206	3,633.0206	0.3375		3,641.4581
Total	**4.5814**	**9.1530**	**36.3535**	**0.0533**	**3.8243**	**0.0849**	**3.9092**	**1.0244**	**0.0804**	**1.1048**		**5,346.6812**	**5,346.6812**	**0.4201**		**5,357.1826**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					7.5900	0.0000	7.5900	1.8569	0.0000	1.8569			0.0000			0.0000
Off-Road	0.7574	14.6900	16.5323	0.0309		0.5669	0.5669		0.5669	0.5669	0.0000	3,115.4177	3,115.4177	0.9699		3,139.6645
Total	**0.7574**	**14.6900**	**16.5323**	**0.0309**	**7.5900**	**0.5669**	**8.1569**	**1.8569**	**0.5669**	**2.4238**	**0.0000**	**3,115.4177**	**3,115.4177**	**0.9699**		**3,139.6645**

Mitigated Construction Off-Site

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

Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.2739	6.1332	1.8742	0.0164	0.4414	0.0615	0.5030	0.1271	0.0588	0.1859		1,713.6606	1,713.6606	0.0826		1,715.7246
Worker	4.3075	3.0199	34.4793	0.0369	3.3829	0.0234	3.4063	0.8973	0.0216	0.9189		3,633.0206	3,633.0206	0.3375		3,641.4581
Total	**4.5814**	**9.1530**	**36.3535**	**0.0533**	**3.8243**	**0.0849**	**3.9092**	**1.0244**	**0.0804**	**1.1048**		**5,346.6812**	**5,346.6812**	**0.4201**		**5,357.1826**

3.3 Facility Installation Part A - 2018

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	7.3083	50.0585	54.2251	0.0691		3.2781	3.2781		3.0158	3.0158		6,961.4572	6,961.4572	2.1672		7,015.6371
Total	**7.3083**	**50.0585**	**54.2251**	**0.0691**		**3.2781**	**3.2781**		**3.0158**	**3.0158**		**6,961.4572**	**6,961.4572**	**2.1672**		**7,015.6371**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.2739	6.1332	1.8742	0.0164	1.0708	0.0615	1.1323	0.2815	0.0588	0.3404		1,713.6606	1,713.6606	0.0826		1,715.7246
Worker	4.3075	3.0199	34.4793	0.0369	9.2626	0.0234	9.2860	2.3405	0.0216	2.3621		3,633.0206	3,633.0206	0.3375		3,641.4581
Total	**4.5814**	**9.1530**	**36.3535**	**0.0533**	**10.3334**	**0.0849**	**10.4183**	**2.6221**	**0.0804**	**2.7025**		**5,346.6812**	**5,346.6812**	**0.4201**		**5,357.1826**

Mitigated Construction On-Site

Category	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
	lb/day										lb/day					
Off-Road	2.3745	44.7212	52.2914	0.0691		2.8346	2.8346		2.8346	2.8346	0.0000	6,961.4572	6,961.4572	2.1672		7,015.6371
Total	**2.3745**	**44.7212**	**52.2914**	**0.0691**		**2.8346**	**2.8346**		**2.8346**	**2.8346**	**0.0000**	**6,961.4572**	**6,961.4572**	**2.1672**		**7,015.6371**

Mitigated Construction Off-Site

Category	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
	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.2739	6.1332	1.8742	0.0164	1.0708	0.0615	1.1323	0.2815	0.0588	0.3404		1,713.6606	1,713.6606	0.0826		1,715.7246
Worker	4.3075	3.0199	34.4793	0.0369	9.2626	0.0234	9.2860	2.3405	0.0216	2.3621		3,633.0206	3,633.0206	0.3375		3,641.4581
Total	**4.5814**	**9.1530**	**36.3535**	**0.0533**	**10.3334**	**0.0849**	**10.4183**	**2.6221**	**0.0804**	**2.7025**		**5,346.6812**	**5,346.6812**	**0.4201**		**5,357.1826**

3.3 Facility Installation Part A - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	7.0317	47.3263	54.1180	0.0691		3.0468	3.0468		2.8030	2.8030		6,847.5965	6,847.5965	2.1665		6,901.7592
Total	**7.0317**	**47.3263**	**54.1180**	**0.0691**		**3.0468**	**3.0468**		**2.8030**	**2.8030**		**6,847.5965**	**6,847.5965**	**2.1665**		**6,901.7592**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.2422	5.6735	1.6198	0.0163	1.0708	0.0524	1.1231	0.2815	0.0501	0.3316		1,702.4164	1,702.4164	0.0786		1,704.3820
Worker	3.9706	2.7384	31.4761	0.0357	9.2626	0.0227	9.2853	2.3405	0.0209	2.3614		3,521.6547	3,521.6547	0.3093		3,529.3875
Total	**4.2128**	**8.4119**	**33.0959**	**0.0520**	**10.3334**	**0.0750**	**10.4084**	**2.6221**	**0.0710**	**2.6930**		**5,224.0711**	**5,224.0711**	**0.3879**		**5,233.7695**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	2.3745	44.7212	52.2914	0.0691		2.8346	2.8346		2.8346	2.8346	0.0000	6,847.5965	6,847.5965	2.1665		6,901.7592

Total	**2.3745**	**44.7212**	**52.2914**	**0.0691**		**2.8346**	**2.8346**		**2.8346**	**2.8346**	**0.0000**	**6,847.5965**	**6,847.5965**	**2.1665**		**6,901.7592**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.2422	5.6735	1.6198	0.0163	1.0708	0.0524	1.1231	0.2815	0.0501	0.3316		1,702.4164	1,702.4164	0.0786		1,704.3820
Worker	3.9706	2.7384	31.4761	0.0357	9.2626	0.0227	9.2853	2.3405	0.0209	2.3614		3,521.6547	3,521.6547	0.3093		3,529.3875
Total	**4.2128**	**8.4119**	**33.0959**	**0.0520**	**10.3334**	**0.0750**	**10.4084**	**2.6221**	**0.0710**	**2.6930**		**5,224.0711**	**5,224.0711**	**0.3879**		**5,233.7695**

3.4 Facility Installation Part B - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	5.4988	27.8479	30.4704	0.0338		2.1485	2.1485		1.9767	1.9767		3,354.4781	3,354.4781	1.0613		3,381.0112
Total	**5.4988**	**27.8479**	**30.4704**	**0.0338**		**2.1485**	**2.1485**		**1.9767**	**1.9767**		**3,354.4781**	**3,354.4781**	**1.0613**		**3,381.0112**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.2422	5.6735	1.6198	0.0163	0.4414	0.0524	0.4938	0.1271	0.0501	0.1772		1,702.4164	1,702.4164	0.0786		1,704.3820
Worker	3.9706	2.7384	31.4761	0.0357	3.3829	0.0227	3.4056	0.8973	0.0209	0.9182		3,521.6547	3,521.6547	0.3093		3,529.3875
Total	**4.2128**	**8.4119**	**33.0959**	**0.0520**	**3.8243**	**0.0750**	**3.8994**	**1.0244**	**0.0710**	**1.0954**		**5,224.0711**	**5,224.0711**	**0.3879**		**5,233.7695**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.5073	24.9199	25.5524	0.0338		1.4471	1.4471		1.4471	1.4471	0.0000	3,354.4781	3,354.4781	1.0613		3,381.0112
Total	**1.5073**	**24.9199**	**25.5524**	**0.0338**		**1.4471**	**1.4471**		**1.4471**	**1.4471**	**0.0000**	**3,354.4781**	**3,354.4781**	**1.0613**		**3,381.0112**

Mitigated Construction Off-Site

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

Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.2422	5.6735	1.6198	0.0163	0.4414	0.0524	0.4938	0.1271	0.0501	0.1772		1,702.4164	1,702.4164	0.0786		1,704.3820
Worker	3.9706	2.7384	31.4761	0.0357	3.3829	0.0227	3.4056	0.8973	0.0209	0.9182		3,521.6547	3,521.6547	0.3093		3,529.3875
Total	**4.2128**	**8.4119**	**33.0959**	**0.0520**	**3.8243**	**0.0750**	**3.8994**	**1.0244**	**0.0710**	**1.0954**		**5,224.0711**	**5,224.0711**	**0.3879**		**5,233.7695**

3.5 Facility Installation Part C - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.4440	3.7779	3.7231	6.5800e-003		0.2258	0.2258		0.2258	0.2258		623.0346	623.0346	0.0395		624.0213
Total	**0.4440**	**3.7779**	**3.7231**	**6.5800e-003**		**0.2258**	**0.2258**		**0.2258**	**0.2258**		**623.0346**	**623.0346**	**0.0395**		**624.0213**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.2422	5.6735	1.6198	0.0163	0.4414	0.0524	0.4938	0.1271	0.0501	0.1772		1,702.4164	1,702.4164	0.0786		1,704.3820
Worker	3.9706	2.7384	31.4761	0.0357	3.3829	0.0227	3.4056	0.8973	0.0209	0.9182		3,521.6547	3,521.6547	0.3093		3,529.3875
Total	**4.2128**	**8.4119**	**33.0959**	**0.0520**	**3.8243**	**0.0750**	**3.8994**	**1.0244**	**0.0710**	**1.0954**		**5,224.0711**	**5,224.0711**	**0.3879**		**5,233.7695**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.1316	3.0039	4.0564	6.5800e-003		0.2105	0.2105		0.2105	0.2105	0.0000	623.0346	623.0346	0.0395		624.0213
Total	**0.1316**	**3.0039**	**4.0564**	**6.5800e-003**		**0.2105**	**0.2105**		**0.2105**	**0.2105**	**0.0000**	**623.0346**	**623.0346**	**0.0395**		**624.0213**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.2422	5.6735	1.6198	0.0163	0.4414	0.0524	0.4938	0.1271	0.0501	0.1772		1,702.4164	1,702.4164	0.0786		1,704.3820
Worker	3.9706	2.7384	31.4761	0.0357	3.3829	0.0227	3.4056	0.8973	0.0209	0.9182		3,521.6547	3,521.6547	0.3093		3,529.3875
Total	**4.2128**	**8.4119**	**33.0959**	**0.0520**	**3.8243**	**0.0750**	**3.8994**	**1.0244**	**0.0710**	**1.0954**		**5,224.0711**	**5,224.0711**	**0.3879**		**5,233.7695**

3.5 Facility Installation Part C - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.3991	3.4786	3.7055	6.5800e-003		0.1962	0.1962		0.1962	0.1962		623.0346	623.0346	0.0351		623.9116
Total	**0.3991**	**3.4786**	**3.7055**	**6.5800e-003**		**0.1962**	**0.1962**		**0.1962**	**0.1962**		**623.0346**	**623.0346**	**0.0351**		**623.9116**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.2082	5.0717	1.4192	0.0162	0.4414	0.0365	0.4780	0.1271	0.0349	0.1620		1,689.8906	1,689.8906	0.0732		1,691.7207
Worker	3.6904	2.4990	28.8483	0.0345	3.3829	0.0219	3.4048	0.8973	0.0202	0.9175		3,410.8674	3,410.8674	0.2819		3,417.9147
Total	**3.8986**	**7.5707**	**30.2675**	**0.0507**	**3.8243**	**0.0584**	**3.8827**	**1.0244**	**0.0551**	**1.0795**		**5,100.7580**	**5,100.7580**	**0.3551**		**5,109.6354**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.1316	3.0039	4.0564	6.5800e-003		0.2105	0.2105		0.2105	0.2105	0.0000	623.0346	623.0346	0.0351		623.9116

	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
Total	**0.1316**	**3.0039**	**4.0564**	**6.5800e-003**		**0.2105**	**0.2105**		**0.2105**	**0.2105**	**0.0000**	**623.0346**	**623.0346**	**0.0351**		**623.9116**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.2082	5.0717	1.4192	0.0162	0.4414	0.0365	0.4780	0.1271	0.0349	0.1620		1,689.8906	1,689.8906	0.0732		1,691.7207
Worker	3.6904	2.4990	28.8483	0.0345	3.3829	0.0219	3.4048	0.8973	0.0202	0.9175		3,410.8674	3,410.8674	0.2819		3,417.9147
Total	**3.8986**	**7.5707**	**30.2675**	**0.0507**	**3.8243**	**0.0584**	**3.8827**	**1.0244**	**0.0551**	**1.0795**		**5,100.7580**	**5,100.7580**	**0.3551**		**5,109.6354**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	0.0978	0.6449	1.4386	3.3200e-003	0.2027	2.9300e-003	0.2057	0.0544	2.7800e-003	0.0572		337.7500	337.7500	0.0223		338.3063
Unmitigated	0.0978	0.6449	1.4386	3.3200e-003	0.2027	2.9300e-003	0.2057	0.0544	2.7800e-003	0.0572		337.7500	337.7500	0.0223		338.3063

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
General Light Industry	20.00	20.00	20.00	94,268	94,268
Total	20.00	20.00	20.00	94,268	94,268

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
General Light Industry	16.40	9.50	11.90	59.00	28.00	13.00	92	5	3

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
General Light Industry	0.503420	0.033264	0.160883	0.129541	0.018929	0.005318	0.019165	0.118376	0.003239	0.001168	0.005214	0.000745	0.000738

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

Kilowatt Hours of Renewable Electricity Generated

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

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
General Light Industry	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
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**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
General Light Industry	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
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**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	0.0252	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004
Unmitigated	0.0252	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	3.8100e-003					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.0214					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	1.0000e-005	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004
Total	**0.0252**	**0.0000**	**1.0000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**2.2000e-004**	**2.2000e-004**	**0.0000**		**2.3000e-004**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e

SubCategory	lb/day										lb/day					
Architectural Coating	3.8100e-003					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.0214					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	1.0000e-005	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004
Total	**0.0252**	**0.0000**	**1.0000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**2.2000e-004**	**2.2000e-004**	**0.0000**		**2.3000e-004**

7.0 Water Detail

7.1 Mitigation Measures Water

8.0 Waste Detail

8.1 Mitigation Measures Waste

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

Drew Solar 2020

Imperial County, Winter

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
General Light Industry	1.00	1000sqft	844.20	1,000.00	0

1.2 Other Project Characteristics

Urbanization	Rural	**Wind Speed (m/s)**	3.4	**Precipitation Freq (Days)**	12
Climate Zone	15			**Operational Year**	2020
Utility Company	Imperial Irrigation District				
CO2 Intensity (lb/MWhr)	956.99	**CH4 Intensity (lb/MWhr)**	0.022	**N2O Intensity (lb/MWhr)**	0.005

1.3 User Entered Comments & Non-Default Data

Project Characteristics - Energy intensity factors reduced to reflect 2020 renewable energy procurement mandate

Land Use - Modeled as 1 ksf industrial. Project site is 844.2 acres.

Construction Phase - Site Prep, Part A includes all facility installation equipment, Part B includes only excavators, water trucks, and forklifts, and Part C includes negligible equipment.

Off-road Equipment - Other construction equipment refers to mast pile drivers and water trucks

Off-road Equipment - Other construction equipment refers to mast pile drivers and water trucks

Off-road Equipment - Non-equipment related tasks.

Off-road Equipment - Other construction equipment refers to brush chippers and water trucks.

Trips and VMT - Conservatively assessed maximum trips assocaiated with project construction

On-road Fugitive Dust - Project site is along a major highway (SR-98). Trips are not anticipated to use unpaved routes.

Grading - Project site would be graded. All import/export would be balanced onsite.

Vehicle Trips - Project operation would generate up to 20 trips per day.

Road Dust - Project site is along a major highway (SR-98). Trips are not anticipated to use unpaved routes.

Energy Use - Project would have limited energy use.

Water And Wastewater - Project would use 60 acre-feet per year = 19,550,000 gallons. Project water use would not generate wastewater that requires offsite treatment.

Solid Waste - Project would generate limited waste.

Construction Off-road Equipment Mitigation - Fugitive dust control measures include site watering; Tier 3 equipment assumed for compliance with CARB regulations

Energy Mitigation - 100 MWh = 100,000 kWh; regional solar generation potential of 1,705.6 KWh/KW; 170,560,000 KWh/year

Table Name	Column Name	Default Value	New Value
tblConstDustMitigation	WaterUnpavedRoadMoistureContent	0	0.5
tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	0	40
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	4.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	24.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	10.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstructionPhase	NumDays	13,950.00	66.00
tblConstructionPhase	NumDays	13,950.00	110.00

tblConstructionPhase	NumDays	13,950.00	151.00
tblConstructionPhase	NumDays	540.00	66.00
tblEnergyUse	LightingElect	2.93	0.00
tblEnergyUse	NT24E	5.02	0.00
tblEnergyUse	NT24NG	17.13	0.00
tblEnergyUse	T24E	2.20	0.00
tblEnergyUse	T24NG	15.36	0.00
tblGrading	AcresOfGrading	99.00	844.20
tblLandUse	LotAcreage	0.02	844.20
tblOffRoadEquipment	HorsePower	172.00	50.00
tblOffRoadEquipment	HorsePower	172.00	189.00
tblOffRoadEquipment	HorsePower	172.00	49.00
tblOffRoadEquipment	HorsePower	172.00	189.00
tblOffRoadEquipment	HorsePower	172.00	49.00
tblOffRoadEquipment	HorsePower	172.00	189.00
tblOffRoadEquipment	LoadFactor	0.42	0.50
tblOffRoadEquipment	LoadFactor	0.42	0.50
tblOffRoadEquipment	LoadFactor	0.42	0.50
tblOffRoadEquipment	LoadFactor	0.42	0.50
tblOffRoadEquipment	LoadFactor	0.42	0.50
tblOffRoadEquipment	LoadFactor	0.42	0.50
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	1.00
tblOnRoadDust	HaulingPercentPave	50.00	100.00
tblOnRoadDust	HaulingPercentPave	50.00	100.00
tblOnRoadDust	HaulingPercentPave	50.00	100.00
tblOnRoadDust	HaulingPercentPave	50.00	100.00
tblOnRoadDust	HaulingPercentPave	50.00	100.00
tblOnRoadDust	HaulingPercentPave	50.00	100.00
tblOnRoadDust	VendorPercentPave	50.00	100.00
tblOnRoadDust	VendorPercentPave	50.00	100.00

tblOnRoadDust	VendorPercentPave	50.00	100.00
tblOnRoadDust	VendorPercentPave	50.00	100.00
tblOnRoadDust	VendorPercentPave	50.00	100.00
tblOnRoadDust	VendorPercentPave	50.00	100.00
tblOnRoadDust	WorkerPercentPave	50.00	100.00
tblOnRoadDust	WorkerPercentPave	50.00	100.00
tblOnRoadDust	WorkerPercentPave	50.00	100.00
tblOnRoadDust	WorkerPercentPave	50.00	100.00
tblOnRoadDust	WorkerPercentPave	50.00	100.00
tblOnRoadDust	WorkerPercentPave	50.00	100.00
tblProjectCharacteristics	CH4IntensityFactor	0.029	0.022
tblProjectCharacteristics	CO2IntensityFactor	1270.9	956.99
tblProjectCharacteristics	N2OIntensityFactor	0.006	0.005
tblProjectCharacteristics	UrbanizationLevel	Urban	Rural
tblRoadDust	RoadPercentPave	50	100
tblSolidWaste	SolidWasteGenerationRate	1.24	0.00
tblTripsAndVMT	VendorTripNumber	0.00	40.00
tblTripsAndVMT	VendorTripNumber	0.00	40.00
tblTripsAndVMT	VendorTripNumber	0.00	40.00
tblTripsAndVMT	VendorTripNumber	0.00	40.00
tblTripsAndVMT	WorkerTripNumber	13.00	436.00
tblTripsAndVMT	WorkerTripNumber	0.00	436.00
tblTripsAndVMT	WorkerTripNumber	0.00	436.00
tblTripsAndVMT	WorkerTripNumber	0.00	436.00
tblVehicleTrips	ST_TR	1.32	20.00
tblVehicleTrips	SU_TR	0.68	20.00
tblVehicleTrips	WD_TR	6.97	20.00
tblWater	IndoorWaterUseRate	231,250.00	0.00
tblWater	OutdoorWaterUseRate	0.00	19,550,000.00

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

Year	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
	lb/day										lb/day					
2018	11.1707	59.6166	81.5408	0.1159	23.2859	3.3635	24.8224	5.7858	3.0968	7.2017	0.0000	11,670.0604	11,670.0604	2.5249	0.0000	11,733.1826
2019	10.5870	56.0832	78.9250	0.1148	10.3334	3.1223	13.4557	2.6221	2.8745	5.4966	0.0000	11,451.0297	11,451.0297	2.4976	0.0000	11,513.4701
2020	3.6947	11.3254	26.3534	0.0512	3.8243	0.2551	4.0794	1.0244	0.2517	1.2761	0.0000	5,120.9047	5,120.9047	0.3390	0.0000	5,129.3807
Maximum	**11.1707**	**59.6166**	**81.5408**	**0.1159**	**23.2859**	**3.3635**	**24.8224**	**5.7858**	**3.0968**	**7.2017**	**0.0000**	**11,670.0604**	**11,670.0604**	**2.5249**	**0.0000**	**11,733.1826**

Mitigated Construction

Year	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
	lb/day										lb/day					
2018	6.2369	54.2793	79.6072	0.1159	11.4143	2.9201	13.2535	2.8813	2.9156	5.5376	0.0000	11,670.0604	11,670.0604	2.5249	0.0000	11,733.1826
2019	5.9297	53.4782	77.0983	0.1148	10.3334	2.9102	13.2435	2.6221	2.9061	5.5282	0.0000	11,451.0297	11,451.0297	2.4976	0.0000	11,513.4701
2020	3.4272	10.8507	26.7042	0.0512	3.8243	0.2693	4.0936	1.0244	0.2660	1.2904	0.0000	5,120.9047	5,120.9047	0.3390	0.0000	5,129.3807
Maximum	**6.2369**	**54.2793**	**79.6072**	**0.1159**	**11.4143**	**2.9201**	**13.2535**	**2.8813**	**2.9156**	**5.5376**	**0.0000**	**11,670.0604**	**11,670.0604**	**2.5249**	**0.0000**	**11,733.1826**

	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	**38.73**	**6.63**	**1.83**	**0.00**	**31.71**	**9.51**	**27.78**	**30.79**	**2.17**	**11.58**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

2.2 Overall Operational

<u>Unmitigated Operational</u>

Category	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
	lb/day										lb/day					
Area	0.0252	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0763	0.6643	1.0807	2.9800e-003	0.2027	2.9700e-003	0.2057	0.0544	2.8200e-003	0.0572		303.8616	303.8616	0.0204		304.3714
Total	**0.1015**	**0.6643**	**1.0808**	**2.9800e-003**	**0.2027**	**2.9700e-003**	**0.2057**	**0.0544**	**2.8200e-003**	**0.0572**		**303.8618**	**303.8618**	**0.0204**	**0.0000**	**304.3717**

<u>Mitigated Operational</u>

Category	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
	lb/day										lb/day					
Area	0.0252	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0763	0.6643	1.0807	2.9800e-003	0.2027	2.9700e-003	0.2057	0.0544	2.8200e-003	0.0572		303.8616	303.8616	0.0204		304.3714
Total	**0.1015**	**0.6643**	**1.0808**	**2.9800e-003**	**0.2027**	**2.9700e-003**	**0.2057**	**0.0544**	**2.8200e-003**	**0.0572**		**303.8618**	**303.8618**	**0.0204**	**0.0000**	**304.3717**

	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	Site Preparation	Site Preparation	7/2/2018	10/1/2018	5	66	
2	Facility Installation Part A	Building Construction	10/2/2018	1/1/2019	5	66	
3	Facility Installation Part B	Building Construction	1/2/2019	6/4/2019	5	110	
4	Facility Installation Part C	Building Construction	6/5/2019	1/1/2020	5	151	

Acres of Grading (Site Preparation Phase): 836.4

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

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Site Preparation	Graders	1	8.00	187	0.41
Site Preparation	Other Construction Equipment	1	2.00	50	0.50
Site Preparation	Other Construction Equipment	1	2.00	189	0.50
Site Preparation	Rubber Tired Dozers	1	8.00	247	0.40
Site Preparation	Scrapers	1	8.00	367	0.48
Facility Installation Part A	Excavators	2	8.00	158	0.38
Facility Installation Part A	Other Construction Equipment	10	8.00	49	0.50
Facility Installation Part A	Other Construction Equipment	1	2.00	189	0.50
Facility Installation Part A	Rough Terrain Forklifts	10	8.00	100	0.40
Facility Installation Part A	Trenchers	1	2.00	78	0.50
Facility Installation Part B	Excavators	2	8.00	158	0.38
Facility Installation Part B	Other Construction Equipment	10	8.00	49	0.50
Facility Installation Part B	Other Construction Equipment	1	2.00	189	0.50
Facility Installation Part C	Generator Sets	1	8.00	84	0.74

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
Site Preparation	5	436.00	40.00	0.00	10.20	11.90	20.00	LD_Mix	HDT_Mix	HHDT
Facility Installation Part A	24	436.00	40.00	0.00	10.20	11.90	20.00	LD_Mix	HDT_Mix	HHDT
Facility Installation Part A	24	0.00	0.00	0.00	10.20	11.90	20.00	LD_Mix	HDT_Mix	HHDT
Facility Installation Part A	24	0.00	0.00	0.00	10.20	11.90	20.00	LD_Mix	HDT_Mix	HHDT
Facility Installation Part B	13	436.00	40.00	0.00	10.20	11.90	20.00	LD_Mix	HDT_Mix	HHDT
Facility Installation Part C	1	436.00	40.00	0.00	10.20	11.90	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Use Cleaner Engines for Construction Equipment

Water Exposed Area

3.2 Site Preparation - 2018

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					19.4615	0.0000	19.4615	4.7614	0.0000	4.7614			0.0000			0.0000
Off-Road	2.9615	34.4601	15.6887	0.0309		1.4511	1.4511		1.3350	1.3350		3,115.4177	3,115.4177	0.9699		3,139.6645
Total	**2.9615**	**34.4601**	**15.6887**	**0.0309**	**19.4615**	**1.4511**	**20.9126**	**4.7614**	**1.3350**	**6.0964**		**3,115.4177**	**3,115.4177**	**0.9699**		**3,139.6645**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.2804	6.3724	2.0490	0.0159	0.4414	0.0621	0.5035	0.1271	0.0594	0.1864		1,664.6784	1,664.6784	0.0907		1,666.9464
Worker	3.5820	3.1858	25.2668	0.0308	3.3829	0.0234	3.4063	0.8973	0.0216	0.9189		3,043.9248	3,043.9248	0.2670		3,050.5990
Total	**3.8624**	**9.5581**	**27.3158**	**0.0468**	**3.8243**	**0.0855**	**3.9098**	**1.0244**	**0.0810**	**1.1053**		**4,708.6032**	**4,708.6032**	**0.3577**		**4,717.5455**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					7.5900	0.0000	7.5900	1.8569	0.0000	1.8569			0.0000			0.0000
Off-Road	0.7574	14.6900	16.5323	0.0309		0.5669	0.5669		0.5669	0.5669	0.0000	3,115.4177	3,115.4177	0.9699		3,139.6645
Total	**0.7574**	**14.6900**	**16.5323**	**0.0309**	**7.5900**	**0.5669**	**8.1569**	**1.8569**	**0.5669**	**2.4238**	**0.0000**	**3,115.4177**	**3,115.4177**	**0.9699**		**3,139.6645**

Mitigated Construction Off-Site

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

	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
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.2804	6.3724	2.0490	0.0159	0.4414	0.0621	0.5035	0.1271	0.0594	0.1864		1,664.6784	1,664.6784	0.0907		1,666.9464
Worker	3.5820	3.1858	25.2668	0.0308	3.3829	0.0234	3.4063	0.8973	0.0216	0.9189		3,043.9248	3,043.9248	0.2670		3,050.5990
Total	**3.8624**	**9.5581**	**27.3158**	**0.0468**	**3.8243**	**0.0855**	**3.9098**	**1.0244**	**0.0810**	**1.1053**		**4,708.6032**	**4,708.6032**	**0.3577**		**4,717.5455**

3.3 Facility Installation Part A - 2018

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	7.3083	50.0585	54.2251	0.0691		3.2781	3.2781		3.0158	3.0158		6,961.4572	6,961.4572	2.1672		7,015.6371
Total	**7.3083**	**50.0585**	**54.2251**	**0.0691**		**3.2781**	**3.2781**		**3.0158**	**3.0158**		**6,961.4572**	**6,961.4572**	**2.1672**		**7,015.6371**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.2804	6.3724	2.0490	0.0159	1.0708	0.0621	1.1328	0.2815	0.0594	0.3409		1,664.6784	1,664.6784	0.0907		1,666.9464
Worker	3.5820	3.1858	25.2668	0.0308	9.2626	0.0234	9.2860	2.3405	0.0216	2.3621		3,043.9248	3,043.9248	0.2670		3,050.5990
Total	**3.8624**	**9.5581**	**27.3158**	**0.0468**	**10.3334**	**0.0855**	**10.4188**	**2.6221**	**0.0810**	**2.7030**		**4,708.6032**	**4,708.6032**	**0.3577**		**4,717.5455**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	2.3745	44.7212	52.2914	0.0691		2.8346	2.8346		2.8346	2.8346	0.0000	6,961.4572	6,961.4572	2.1672		7,015.6371
Total	**2.3745**	**44.7212**	**52.2914**	**0.0691**		**2.8346**	**2.8346**		**2.8346**	**2.8346**	**0.0000**	**6,961.4572**	**6,961.4572**	**2.1672**		**7,015.6371**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.2804	6.3724	2.0490	0.0159	1.0708	0.0621	1.1328	0.2815	0.0594	0.3409		1,664.6784	1,664.6784	0.0907		1,666.9464
Worker	3.5820	3.1858	25.2668	0.0308	9.2626	0.0234	9.2860	2.3405	0.0216	2.3621		3,043.9248	3,043.9248	0.2670		3,050.5990
Total	**3.8624**	**9.5581**	**27.3158**	**0.0468**	**10.3334**	**0.0855**	**10.4188**	**2.6221**	**0.0810**	**2.7030**		**4,708.6032**	**4,708.6032**	**0.3577**		**4,717.5455**

3.3 Facility Installation Part A - 2019

Unmitigated Construction On-Site

Category	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
	lb/day										lb/day					
Off-Road	7.0317	47.3263	54.1180	0.0691		3.0468	3.0468		2.8030	2.8030		6,847.5965	6,847.5965	2.1665		6,901.7592
Total	**7.0317**	**47.3263**	**54.1180**	**0.0691**		**3.0468**	**3.0468**		**2.8030**	**2.8030**		**6,847.5965**	**6,847.5965**	**2.1665**		**6,901.7592**

Unmitigated Construction Off-Site

Category	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
	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.2487	5.8737	1.7985	0.0158	1.0708	0.0529	1.1236	0.2815	0.0506	0.3321		1,653.6254	1,653.6254	0.0868		1,655.7954
Worker	3.3065	2.8833	23.0085	0.0298	9.2626	0.0227	9.2853	2.3405	0.0209	2.3614		2,949.8078	2,949.8078	0.2443		2,955.9155
Total	**3.5552**	**8.7570**	**24.8070**	**0.0457**	**10.3334**	**0.0755**	**10.4089**	**2.6221**	**0.0715**	**2.6935**		**4,603.4332**	**4,603.4332**	**0.3311**		**4,611.7109**

Mitigated Construction On-Site

Category	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
	lb/day										lb/day					
Off-Road	2.3745	44.7212	52.2914	0.0691		2.8346	2.8346		2.8346	2.8346	0.0000	6,847.5965	6,847.5965	2.1665		6,901.7592

Total	**2.3745**	**44.7212**	**52.2914**	**0.0691**		**2.8346**	**2.8346**		**2.8346**	**2.8346**	**0.0000**	**6,847.5965**	**6,847.5965**	**2.1665**		**6,901.7592**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.2487	5.8737	1.7985	0.0158	1.0708	0.0529	1.1236	0.2815	0.0506	0.3321		1,653.6254	1,653.6254	0.0868		1,655.7954
Worker	3.3065	2.8833	23.0085	0.0298	9.2626	0.0227	9.2853	2.3405	0.0209	2.3614		2,949.8078	2,949.8078	0.2443		2,955.9155
Total	**3.5552**	**8.7570**	**24.8070**	**0.0457**	**10.3334**	**0.0755**	**10.4089**	**2.6221**	**0.0715**	**2.6935**		**4,603.4332**	**4,603.4332**	**0.3311**		**4,611.7109**

3.4 Facility Installation Part B - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	5.4988	27.8479	30.4704	0.0338		2.1485	2.1485		1.9767	1.9767		3,354.4781	3,354.4781	1.0613		3,381.0112
Total	**5.4988**	**27.8479**	**30.4704**	**0.0338**		**2.1485**	**2.1485**		**1.9767**	**1.9767**		**3,354.4781**	**3,354.4781**	**1.0613**		**3,381.0112**

Unmitigated Construction Off-Site

Category	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
	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.2487	5.8737	1.7985	0.0158	0.4414	0.0529	0.4943	0.1271	0.0506	0.1776		1,653.6254	1,653.6254	0.0868		1,655.7954
Worker	3.3065	2.8833	23.0085	0.0298	3.3829	0.0227	3.4056	0.8973	0.0209	0.9182		2,949.8078	2,949.8078	0.2443		2,955.9155
Total	**3.5552**	**8.7570**	**24.8070**	**0.0457**	**3.8243**	**0.0755**	**3.8999**	**1.0244**	**0.0715**	**1.0959**		**4,603.4332**	**4,603.4332**	**0.3311**		**4,611.7109**

Mitigated Construction On-Site

Category	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
	lb/day										lb/day					
Off-Road	1.5073	24.9199	25.5524	0.0338		1.4471	1.4471		1.4471	1.4471	0.0000	3,354.4781	3,354.4781	1.0613		3,381.0112
Total	**1.5073**	**24.9199**	**25.5524**	**0.0338**		**1.4471**	**1.4471**		**1.4471**	**1.4471**	**0.0000**	**3,354.4781**	**3,354.4781**	**1.0613**		**3,381.0112**

Mitigated Construction Off-Site

Category	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
	lb/day										lb/day					

Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.2487	5.8737	1.7985	0.0158	0.4414	0.0529	0.4943	0.1271	0.0506	0.1776		1,653.6254	1,653.6254	0.0868		1,655.7954
Worker	3.3065	2.8833	23.0085	0.0298	3.3829	0.0227	3.4056	0.8973	0.0209	0.9182		2,949.8078	2,949.8078	0.2443		2,955.9155
Total	**3.5552**	**8.7570**	**24.8070**	**0.0457**	**3.8243**	**0.0755**	**3.8999**	**1.0244**	**0.0715**	**1.0959**		**4,603.4332**	**4,603.4332**	**0.3311**		**4,611.7109**

3.5 Facility Installation Part C - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category						lb/day								lb/day		
Off-Road	0.4440	3.7779	3.7231	6.5800e-003		0.2258	0.2258		0.2258	0.2258		623.0346	623.0346	0.0395		624.0213
Total	**0.4440**	**3.7779**	**3.7231**	**6.5800e-003**		**0.2258**	**0.2258**		**0.2258**	**0.2258**		**623.0346**	**623.0346**	**0.0395**		**624.0213**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category						lb/day								lb/day		
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.2487	5.8737	1.7985	0.0158	0.4414	0.0529	0.4943	0.1271	0.0506	0.1776		1,653.6254	1,653.6254	0.0868		1,655.7954
Worker	3.3065	2.8833	23.0085	0.0298	3.3829	0.0227	3.4056	0.8973	0.0209	0.9182		2,949.8078	2,949.8078	0.2443		2,955.9155
Total	**3.5552**	**8.7570**	**24.8070**	**0.0457**	**3.8243**	**0.0755**	**3.8999**	**1.0244**	**0.0715**	**1.0959**		**4,603.4332**	**4,603.4332**	**0.3311**		**4,611.7109**

Mitigated Construction On-Site

Category	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
	lb/day										lb/day					
Off-Road	0.1316	3.0039	4.0564	6.5800e-003		0.2105	0.2105		0.2105	0.2105	0.0000	623.0346	623.0346	0.0395		624.0213
Total	**0.1316**	**3.0039**	**4.0564**	**6.5800e-003**		**0.2105**	**0.2105**		**0.2105**	**0.2105**	**0.0000**	**623.0346**	**623.0346**	**0.0395**		**624.0213**

Mitigated Construction Off-Site

Category	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
	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.2487	5.8737	1.7985	0.0158	0.4414	0.0529	0.4943	0.1271	0.0506	0.1776		1,653.6254	1,653.6254	0.0868		1,655.7954
Worker	3.3065	2.8833	23.0085	0.0298	3.3829	0.0227	3.4056	0.8973	0.0209	0.9182		2,949.8078	2,949.8078	0.2443		2,955.9155
Total	**3.5552**	**8.7570**	**24.8070**	**0.0457**	**3.8243**	**0.0755**	**3.8999**	**1.0244**	**0.0715**	**1.0959**		**4,603.4332**	**4,603.4332**	**0.3311**		**4,611.7109**

3.5 Facility Installation Part C - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.3991	3.4786	3.7055	6.5800e-003		0.1962	0.1962		0.1962	0.1962		623.0346	623.0346	0.0351		623.9116
Total	**0.3991**	**3.4786**	**3.7055**	**6.5800e-003**		**0.1962**	**0.1962**		**0.1962**	**0.1962**		**623.0346**	**623.0346**	**0.0351**		**623.9116**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.2144	5.2190	1.5884	0.0157	0.4414	0.0369	0.4784	0.1271	0.0353	0.1624		1,641.2506	1,641.2506	0.0811		1,643.2788
Worker	3.0812	2.6278	21.0594	0.0289	3.3829	0.0219	3.4048	0.8973	0.0202	0.9175		2,856.6195	2,856.6195	0.2228		2,862.1902
Total	**3.2956**	**7.8468**	**22.6478**	**0.0446**	**3.8243**	**0.0588**	**3.8831**	**1.0244**	**0.0555**	**1.0799**		**4,497.8702**	**4,497.8702**	**0.3040**		**4,505.4690**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.1316	3.0039	4.0564	6.5800e-003		0.2105	0.2105		0.2105	0.2105	0.0000	623.0346	623.0346	0.0351		623.9116

Total	**0.1316**	**3.0039**	**4.0564**	**6.5800e-003**		**0.2105**	**0.2105**		**0.2105**	**0.2105**	**0.0000**	**623.0346**	**623.0346**	**0.0351**		**623.9116**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.2144	5.2190	1.5884	0.0157	0.4414	0.0369	0.4784	0.1271	0.0353	0.1624		1,641.2506	1,641.2506	0.0811		1,643.2788
Worker	3.0812	2.6278	21.0594	0.0289	3.3829	0.0219	3.4048	0.8973	0.0202	0.9175		2,856.6195	2,856.6195	0.2228		2,862.1902
Total	**3.2956**	**7.8468**	**22.6478**	**0.0446**	**3.8243**	**0.0588**	**3.8831**	**1.0244**	**0.0555**	**1.0799**		**4,497.8702**	**4,497.8702**	**0.3040**		**4,505.4690**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	0.0763	0.6643	1.0807	2.9800e-003	0.2027	2.9700e-003	0.2057	0.0544	2.8200e-003	0.0572		303.8616	303.8616	0.0204		304.3714
Unmitigated	0.0763	0.6643	1.0807	2.9800e-003	0.2027	2.9700e-003	0.2057	0.0544	2.8200e-003	0.0572		303.8616	303.8616	0.0204		304.3714

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
General Light Industry	20.00	20.00	20.00	94,268	94,268
Total	20.00	20.00	20.00	94,268	94,268

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
General Light Industry	16.40	9.50	11.90	59.00	28.00	13.00	92	5	3

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
General Light Industry	0.503420	0.033264	0.160883	0.129541	0.018929	0.005318	0.019165	0.118376	0.003239	0.001168	0.005214	0.000745	0.000738

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

Kilowatt Hours of Renewable Electricity Generated

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

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
General Light Industry	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
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**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
General Light Industry	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
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**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	0.0252	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004
Unmitigated	0.0252	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	3.8100e-003					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.0214					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	1.0000e-005	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004
Total	**0.0252**	**0.0000**	**1.0000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**2.2000e-004**	**2.2000e-004**	**0.0000**		**2.3000e-004**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e

SubCategory	lb/day										lb/day					
Architectural Coating	3.8100e-003					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.0214					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	1.0000e-005	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004
Total	**0.0252**	**0.0000**	**1.0000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**2.2000e-004**	**2.2000e-004**	**0.0000**		**2.3000e-004**

7.0 Water Detail

7.1 Mitigation Measures Water

8.0 Waste Detail

8.1 Mitigation Measures Waste

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

Summary Book

Greenhouse Gases

GHG Emissions Estimate (MTCO2e)

Construction	
Moible and Equipment	1,391
Water Use	1,890
Subtotal	3,281
30-Year Amortized	109

Construction	
30-Year Amortized	109

Operation		
	2020	2030
Mobile	53	43
Energy	-74,195	-57,424
Area	0	0
Water	94	73
Waste	0	0

Gross Operational Emissions	147	116
Renewable Energy Offset	-74,195	-57,424
Total Net Operational	-74,048	-57,308

Drew Solar 2020

Imperial County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
General Light Industry	1.00	1000sqft	844.20	1,000.00	0

1.2 Other Project Characteristics

Urbanization	Rural	**Wind Speed (m/s)**	3.4	**Precipitation Freq (Days)**	12
Climate Zone	15			**Operational Year**	2020
Utility Company	Imperial Irrigation District				
CO2 Intensity (lb/MWhr)	956.99	**CH4 Intensity (lb/MWhr)**	0.022	**N2O Intensity (lb/MWhr)**	0.005

1.3 User Entered Comments & Non-Default Data

Project Characteristics - Energy intensity factors reduced to reflect 2020 renewable energy procurement mandate

Land Use - Modeled as 1 ksf industrial. Project site is 844.2 acres.

Construction Phase - Site Prep, Part A includes all facility installation equipment, Part B includes only excavators, water trucks, and forklifts, and Part C includes negligible equipment.

Off-road Equipment - Other construction equipment refers to mast pile drivers and water trucks

Off-road Equipment - Other construction equipment refers to mast pile drivers and water trucks

Off-road Equipment - Non-equipment related tasks.

Off-road Equipment - Other construction equipment refers to brush chippers and water trucks.

Trips and VMT - Conservatively assessed maximum trips assocaiated with project construction

On-road Fugitive Dust - Project site is along a major highway (SR-98). Trips are not anticipated to use unpaved routes.

Grading - Project site would be graded. All import/export would be balanced onsite.

Vehicle Trips - Project operation would generate up to 20 trips per day.

Road Dust - Project site is along a major highway (SR-98). Trips are not anticipated to use unpaved routes.

Energy Use - Project would have limited energy use.

Water And Wastewater - Project would use 60 acre-feet per year = 19,550,000 gallons. Project water use would not generate wastewater that requires offsite treatment.

Solid Waste - Project would generate limited waste.

Construction Off-road Equipment Mitigation - Fugitive dust control measures include site watering; Tier 3 equipment assumed for compliance with CARB regulations

Energy Mitigation - 100 MWh = 100,000 kWh; regional solar generation potential of 1,705.6 KWh/KW; 170,560,000 KWh/year

Table Name	Column Name	Default Value	New Value
tblConstDustMitigation	WaterUnpavedRoadMoistureContent	0	0.5
tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	0	40
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	4.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	24.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	10.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstructionPhase	NumDays	13,950.00	66.00
tblConstructionPhase	NumDays	13,950.00	110.00

tblConstructionPhase	NumDays	13,950.00	151.00
tblConstructionPhase	NumDays	540.00	66.00
tblEnergyUse	LightingElect	2.93	0.00
tblEnergyUse	NT24E	5.02	0.00
tblEnergyUse	NT24NG	17.13	0.00
tblEnergyUse	T24E	2.20	0.00
tblEnergyUse	T24NG	15.36	0.00
tblGrading	AcresOfGrading	99.00	844.20
tblLandUse	LotAcreage	0.02	844.20
tblOffRoadEquipment	HorsePower	172.00	50.00
tblOffRoadEquipment	HorsePower	172.00	189.00
tblOffRoadEquipment	HorsePower	172.00	49.00
tblOffRoadEquipment	HorsePower	172.00	189.00
tblOffRoadEquipment	HorsePower	172.00	49.00
tblOffRoadEquipment	HorsePower	172.00	189.00
tblOffRoadEquipment	LoadFactor	0.42	0.50
tblOffRoadEquipment	LoadFactor	0.42	0.50
tblOffRoadEquipment	LoadFactor	0.42	0.50
tblOffRoadEquipment	LoadFactor	0.42	0.50
tblOffRoadEquipment	LoadFactor	0.42	0.50
tblOffRoadEquipment	LoadFactor	0.42	0.50
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	1.00
tblOnRoadDust	HaulingPercentPave	50.00	100.00
tblOnRoadDust	HaulingPercentPave	50.00	100.00
tblOnRoadDust	HaulingPercentPave	50.00	100.00
tblOnRoadDust	HaulingPercentPave	50.00	100.00
tblOnRoadDust	HaulingPercentPave	50.00	100.00
tblOnRoadDust	HaulingPercentPave	50.00	100.00
tblOnRoadDust	VendorPercentPave	50.00	100.00
tblOnRoadDust	VendorPercentPave	50.00	100.00

tblOnRoadDust	VendorPercentPave	50.00	100.00
tblOnRoadDust	VendorPercentPave	50.00	100.00
tblOnRoadDust	VendorPercentPave	50.00	100.00
tblOnRoadDust	VendorPercentPave	50.00	100.00
tblOnRoadDust	WorkerPercentPave	50.00	100.00
tblOnRoadDust	WorkerPercentPave	50.00	100.00
tblOnRoadDust	WorkerPercentPave	50.00	100.00
tblOnRoadDust	WorkerPercentPave	50.00	100.00
tblOnRoadDust	WorkerPercentPave	50.00	100.00
tblOnRoadDust	WorkerPercentPave	50.00	100.00
tblProjectCharacteristics	CH4IntensityFactor	0.029	0.022
tblProjectCharacteristics	CO2IntensityFactor	1270.9	956.99
tblProjectCharacteristics	N2OIntensityFactor	0.006	0.005
tblProjectCharacteristics	UrbanizationLevel	Urban	Rural
tblRoadDust	RoadPercentPave	50	100
tblSolidWaste	SolidWasteGenerationRate	1.24	0.00
tblTripsAndVMT	VendorTripNumber	0.00	40.00
tblTripsAndVMT	VendorTripNumber	0.00	40.00
tblTripsAndVMT	VendorTripNumber	0.00	40.00
tblTripsAndVMT	VendorTripNumber	0.00	40.00
tblTripsAndVMT	WorkerTripNumber	13.00	436.00
tblTripsAndVMT	WorkerTripNumber	0.00	436.00
tblTripsAndVMT	WorkerTripNumber	0.00	436.00
tblTripsAndVMT	WorkerTripNumber	0.00	436.00
tblVehicleTrips	ST_TR	1.32	20.00
tblVehicleTrips	SU_TR	0.68	20.00
tblVehicleTrips	WD_TR	6.97	20.00
tblWater	IndoorWaterUseRate	231,250.00	0.00
tblWater	OutdoorWaterUseRate	0.00	19,550,000.00

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					
2018	0.5924	3.3886	4.2292	6.5100e-003	1.1008	0.1600	1.2608	0.2753	0.1474	0.4226	0.0000	594.3846	594.3846	0.1153	0.0000	597.2664
2019	0.8107	2.9794	5.5146	8.6900e-003	0.4988	0.1465	0.6453	0.1336	0.1364	0.2700	0.0000	789.0401	789.0401	0.0978	0.0000	791.4849
2020	1.8700e-003	5.6600e-003	0.0142	3.0000e-005	1.9000e-003	1.3000e-004	2.0300e-003	5.1000e-004	1.3000e-004	6.3000e-004	0.0000	2.4390	2.4390	1.6000e-004	0.0000	2.4430
Maximum	**0.8107**	**3.3886**	**5.5146**	**8.6900e-003**	**1.1008**	**0.1600**	**1.2608**	**0.2753**	**0.1474**	**0.4226**	**0.0000**	**789.0401**	**789.0401**	**0.1153**	**0.0000**	**791.4849**

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					
2018	0.3593	2.5627	4.1942	6.5100e-003	0.7090	0.1164	0.8254	0.1794	0.1161	0.2956	0.0000	594.3843	594.3843	0.1153	0.0000	597.2661
2019	0.5654	2.7590	5.2682	8.6900e-003	0.4988	0.1066	0.6054	0.1336	0.1061	0.2397	0.0000	789.0398	789.0398	0.0978	0.0000	791.4847
2020	1.7400e-003	5.4200e-003	0.0144	3.0000e-005	1.9000e-003	1.3000e-004	2.0300e-003	5.1000e-004	1.3000e-004	6.4000e-004	0.0000	2.4390	2.4390	1.6000e-004	0.0000	2.4430
Maximum	**0.5654**	**2.7590**	**5.2682**	**8.6900e-003**	**0.7090**	**0.1164**	**0.8254**	**0.1794**	**0.1161**	**0.2956**	**0.0000**	**789.0398**	**789.0398**	**0.1153**	**0.0000**	**791.4847**

	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	**34.06**	**16.42**	**2.88**	**0.00**	**24.46**	**27.21**	**24.90**	**23.41**	**21.67**	**22.70**	**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)
1	7-2-2018	10-1-2018	1.6807	0.9587
2	10-2-2018	1-1-2019	2.3244	1.9880
3	1-2-2019	4-1-2019	1.4677	1.2453
4	4-2-2019	7-1-2019	1.2132	1.0446
5	7-2-2019	10-1-2019	0.5534	0.5177
6	10-2-2019	1-1-2020	0.5427	0.5071
		Highest	2.3244	1.9880

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	4.6000e-003	0.0000	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-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	0.0151	0.1213	0.2149	5.7000e-004	0.0366	5.4000e-004	0.0372	9.8300e-003	5.1000e-004	0.0103	0.0000	52.5658	52.5658	3.4300e-003	0.0000	52.6516
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	94.2831	94.2831	2.1700e-003	4.9000e-004	94.4841
Total	**0.0197**	**0.1213**	**0.2150**	**5.7000e-004**	**0.0366**	**5.4000e-004**	**0.0372**	**9.8300e-003**	**5.1000e-004**	**0.0103**	**0.0000**	**146.8490**	**146.8490**	**5.6000e-003**	**4.9000e-004**	**147.1358**

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	4.6000e-003	0.0000	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-005
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	-74,037.2583	-74,037.2583	-1.7020	-0.3868	-74,195.0822
Mobile	0.0151	0.1213	0.2149	5.7000e-004	0.0366	5.4000e-004	0.0372	9.8300e-003	5.1000e-004	0.0103	0.0000	52.5658	52.5658	3.4300e-003	0.0000	52.6516
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	94.2831	94.2831	2.1700e-003	4.9000e-004	94.4841
Total	**0.0197**	**0.1213**	**0.2150**	**5.7000e-004**	**0.0366**	**5.4000e-004**	**0.0372**	**9.8300e-003**	**5.1000e-004**	**0.0103**	**0.0000**	**-73,890.4093**	**-73,890.4093**	**-1.6964**	**-0.3863**	**-74,047.9465**

	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**	**50,417.28**	**50,417.28**	**30,393.21**	**78,942.86**	**50,426.27**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Site Preparation	Site Preparation	7/2/2018	10/1/2018	5	66	
2	Facility Installation Part A	Building Construction	10/2/2018	1/1/2019	5	66	
3	Facility Installation Part B	Building Construction	1/2/2019	6/4/2019	5	110	
4	Facility Installation Part C	Building Construction	6/5/2019	1/1/2020	5	151	

Acres of Grading (Site Preparation Phase): 836.4

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

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor

Site Preparation	Graders	1	8.00	187	0.41
Site Preparation	Other Construction Equipment	1	2.00	50	0.50
Site Preparation	Other Construction Equipment	1	2.00	189	0.50
Site Preparation	Rubber Tired Dozers	1	8.00	247	0.40
Site Preparation	Scrapers	1	8.00	367	0.48
Facility Installation Part A	Excavators	2	8.00	158	0.38
Facility Installation Part A	Other Construction Equipment	10	8.00	49	0.50
Facility Installation Part A	Other Construction Equipment	1	2.00	189	0.50
Facility Installation Part A	Rough Terrain Forklifts	10	8.00	100	0.40
Facility Installation Part A	Trenchers	1	2.00	78	0.50
Facility Installation Part B	Excavators	2	8.00	158	0.38
Facility Installation Part B	Other Construction Equipment	10	8.00	49	0.50
Facility Installation Part B	Other Construction Equipment	1	2.00	189	0.50
Facility Installation Part C	Generator Sets	1	8.00	84	0.74

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
Site Preparation	5	436.00	40.00	0.00	10.20	11.90	20.00	LD_Mix	HDT_Mix	HHDT
Facility Installation Part A	24	436.00	40.00	0.00	10.20	11.90	20.00	LD_Mix	HDT_Mix	HHDT
Facility Installation Part A	24	0.00	0.00	0.00	10.20	11.90	20.00	LD_Mix	HDT_Mix	HHDT
Facility Installation Part A	24	0.00	0.00	0.00	10.20	11.90	20.00	LD_Mix	HDT_Mix	HHDT
Facility Installation Part B	13	436.00	40.00	0.00	10.20	11.90	20.00	LD_Mix	HDT_Mix	HHDT
Facility Installation Part C	1	436.00	40.00	0.00	10.20	11.90	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Use Cleaner Engines for Construction Equipment

Water Exposed Area

3.2 Site Preparation - 2018

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					0.6422	0.0000	0.6422	0.1571	0.0000	0.1571	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0977	1.1372	0.5177	1.0200e-003		0.0479	0.0479		0.0441	0.0441	0.0000	93.2666	93.2666	0.0290	0.0000	93.9924
Total	**0.0977**	**1.1372**	**0.5177**	**1.0200e-003**	**0.6422**	**0.0479**	**0.6901**	**0.1571**	**0.0441**	**0.2012**	**0.0000**	**93.2666**	**93.2666**	**0.0290**	**0.0000**	**93.9924**

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	8.9900e-003	0.2112	0.0638	5.3000e-004	0.0145	2.0400e-003	0.0165	4.1700e-003	1.9500e-003	6.1200e-003	0.0000	50.6862	50.6862	2.5700e-003	0.0000	50.7504
Worker	0.1206	0.1034	0.9183	1.1000e-003	0.1108	7.7000e-004	0.1116	0.0294	7.1000e-004	0.0301	0.0000	98.3781	98.3781	8.6900e-003	0.0000	98.5952
Total	**0.1296**	**0.3146**	**0.9820**	**1.6300e-003**	**0.1253**	**2.8100e-003**	**0.1281**	**0.0336**	**2.6600e-003**	**0.0363**	**0.0000**	**149.0642**	**149.0642**	**0.0113**	**0.0000**	**149.3456**

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					0.2505	0.0000	0.2505	0.0613	0.0000	0.0613	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0250	0.4848	0.5456	1.0200e-003		0.0187	0.0187		0.0187	0.0187	0.0000	93.2665	93.2665	0.0290	0.0000	93.9923
Total	**0.0250**	**0.4848**	**0.5456**	**1.0200e-003**	**0.2505**	**0.0187**	**0.2692**	**0.0613**	**0.0187**	**0.0800**	**0.0000**	**93.2665**	**93.2665**	**0.0290**	**0.0000**	**93.9923**

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	8.9900e-003	0.2112	0.0638	5.3000e-004	0.0145	2.0400e-003	0.0165	4.1700e-003	1.9500e-003	6.1200e-003	0.0000	50.6862	50.6862	2.5700e-003	0.0000	50.7504
Worker	0.1206	0.1034	0.9183	1.1000e-003	0.1108	7.7000e-004	0.1116	0.0294	7.1000e-004	0.0301	0.0000	98.3781	98.3781	8.6900e-003	0.0000	98.5952
Total	**0.1296**	**0.3146**	**0.9820**	**1.6300e-003**	**0.1253**	**2.8100e-003**	**0.1281**	**0.0336**	**2.6600e-003**	**0.0363**	**0.0000**	**149.0642**	**149.0642**	**0.0113**	**0.0000**	**149.3456**

3.3 Facility Installation Part A - 2018

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	0.2375	1.6269	1.7623	2.2500e-003		0.1065	0.1065		0.0980	0.0980	0.0000	205.2482	205.2482	0.0639	0.0000	206.8456
Total	**0.2375**	**1.6269**	**1.7623**	**2.2500e-003**		**0.1065**	**0.1065**		**0.0980**	**0.0980**	**0.0000**	**205.2482**	**205.2482**	**0.0639**	**0.0000**	**206.8456**

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	8.8600e-003	0.2080	0.0628	5.3000e-004	0.0346	2.0100e-003	0.0366	9.0900e-003	1.9200e-003	0.0110	0.0000	49.9182	49.9182	2.5300e-003	0.0000	49.9814
Worker	0.1188	0.1019	0.9043	1.0800e-003	0.2987	7.6000e-004	0.2994	0.0755	7.0000e-004	0.0762	0.0000	96.8875	96.8875	8.5500e-003	0.0000	97.1014
Total	**0.1276**	**0.3099**	**0.9672**	**1.6100e-003**	**0.3332**	**2.7700e-003**	**0.3360**	**0.0846**	**2.6200e-003**	**0.0872**	**0.0000**	**146.8057**	**146.8057**	**0.0111**	**0.0000**	**147.0828**

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	0.0772	1.4534	1.6995	2.2500e-003		0.0921	0.0921		0.0921	0.0921	0.0000	205.2479	205.2479	0.0639	0.0000	206.8453
Total	**0.0772**	**1.4534**	**1.6995**	**2.2500e-003**		**0.0921**	**0.0921**		**0.0921**	**0.0921**	**0.0000**	**205.2479**	**205.2479**	**0.0639**	**0.0000**	**206.8453**

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	8.8600e-003	0.2080	0.0628	5.3000e-004	0.0346	2.0100e-003	0.0366	9.0900e-003	1.9200e-003	0.0110	0.0000	49.9182	49.9182	2.5300e-003	0.0000	49.9814
Worker	0.1188	0.1019	0.9043	1.0800e-003	0.2987	7.6000e-004	0.2994	0.0755	7.0000e-004	0.0762	0.0000	96.8875	96.8875	8.5500e-003	0.0000	97.1014
Total	**0.1276**	**0.3099**	**0.9672**	**1.6100e-003**	**0.3332**	**2.7700e-003**	**0.3360**	**0.0846**	**2.6200e-003**	**0.0872**	**0.0000**	**146.8057**	**146.8057**	**0.0111**	**0.0000**	**147.0828**

3.3 Facility Installation Part A - 2019

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	3.5200e-003	0.0237	0.0271	3.0000e-005		1.5200e-003	1.5200e-003		1.4000e-003	1.4000e-003	0.0000	3.1060	3.1060	9.8000e-004	0.0000	3.1306
Total	**3.5200e-003**	**0.0237**	**0.0271**	**3.0000e-005**		**1.5200e-003**	**1.5200e-003**		**1.4000e-003**	**1.4000e-003**	**0.0000**	**3.1060**	**3.1060**	**9.8000e-004**	**0.0000**	**3.1306**

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	1.2000e-004	2.9500e-003	8.4000e-004	1.0000e-005	5.3000e-004	3.0000e-005	5.6000e-004	1.4000e-004	3.0000e-005	1.6000e-004	0.0000	0.7629	0.7629	4.0000e-005	0.0000	0.7638
Worker	1.6900e-003	1.4200e-003	0.0127	2.0000e-005	4.6000e-003	1.0000e-005	4.6100e-003	1.1600e-003	1.0000e-005	1.1700e-003	0.0000	1.4446	1.4446	1.2000e-004	0.0000	1.4477
Total	**1.8100e-003**	**4.3700e-003**	**0.0135**	**3.0000e-005**	**5.1300e-003**	**4.0000e-005**	**5.1700e-003**	**1.3000e-003**	**4.0000e-005**	**1.3300e-003**	**0.0000**	**2.2076**	**2.2076**	**1.6000e-004**	**0.0000**	**2.2115**

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	1.1900e-003	0.0224	0.0262	3.0000e-005		1.4200e-003	1.4200e-003		1.4200e-003	1.4200e-003	0.0000	3.1060	3.1060	9.8000e-004	0.0000	3.1306
Total	**1.1900e-003**	**0.0224**	**0.0262**	**3.0000e-005**		**1.4200e-003**	**1.4200e-003**		**1.4200e-003**	**1.4200e-003**	**0.0000**	**3.1060**	**3.1060**	**9.8000e-004**	**0.0000**	**3.1306**

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	1.2000e-004	2.9500e-003	8.4000e-004	1.0000e-005	5.3000e-004	3.0000e-005	5.6000e-004	1.4000e-004	3.0000e-005	1.6000e-004	0.0000	0.7629	0.7629	4.0000e-005	0.0000	0.7638
Worker	1.6900e-003	1.4200e-003	0.0127	2.0000e-005	4.6000e-003	1.0000e-005	4.6100e-003	1.1600e-003	1.0000e-005	1.1700e-003	0.0000	1.4446	1.4446	1.2000e-004	0.0000	1.4477
Total	**1.8100e-003**	**4.3700e-003**	**0.0135**	**3.0000e-005**	**5.1300e-003**	**4.0000e-005**	**5.1700e-003**	**1.3000e-003**	**4.0000e-005**	**1.3300e-003**	**0.0000**	**2.2076**	**2.2076**	**1.6000e-004**	**0.0000**	**2.2115**

3.4 Facility Installation Part B - 2019

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	0.3024	1.5316	1.6759	1.8600e-003		0.1182	0.1182		0.1087	0.1087	0.0000	167.3722	167.3722	0.0530	0.0000	168.6961
Total	**0.3024**	**1.5316**	**1.6759**	**1.8600e-003**		**0.1182**	**0.1182**		**0.1087**	**0.1087**	**0.0000**	**167.3722**	**167.3722**	**0.0530**	**0.0000**	**168.6961**

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	0.0133	0.3247	0.0928	8.9000e-004	0.0241	2.8900e-003	0.0270	6.9500e-003	2.7700e-003	9.7200e-003	0.0000	83.9199	83.9199	4.0900e-003	0.0000	84.0221
Worker	0.1854	0.1561	1.3960	1.7700e-003	0.1847	1.2500e-003	0.1860	0.0490	1.1500e-003	0.0502	0.0000	158.9109	158.9109	0.0133	0.0000	159.2425
Total	**0.1987**	**0.4808**	**1.4888**	**2.6600e-003**	**0.2089**	**4.1400e-003**	**0.2130**	**0.0560**	**3.9200e-003**	**0.0599**	**0.0000**	**242.8308**	**242.8308**	**0.0174**	**0.0000**	**243.2646**

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	0.0829	1.3706	1.4054	1.8600e-003		0.0796	0.0796		0.0796	0.0796	0.0000	167.3720	167.3720	0.0530	0.0000	168.6959
Total	**0.0829**	**1.3706**	**1.4054**	**1.8600e-003**		**0.0796**	**0.0796**		**0.0796**	**0.0796**	**0.0000**	**167.3720**	**167.3720**	**0.0530**	**0.0000**	**168.6959**

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	0.0133	0.3247	0.0928	8.9000e-004	0.0241	2.8900e-003	0.0270	6.9500e-003	2.7700e-003	9.7200e-003	0.0000	83.9199	83.9199	4.0900e-003	0.0000	84.0221
Worker	0.1854	0.1561	1.3960	1.7700e-003	0.1847	1.2500e-003	0.1860	0.0490	1.1500e-003	0.0502	0.0000	158.9109	158.9109	0.0133	0.0000	159.2425
Total	**0.1987**	**0.4808**	**1.4888**	**2.6600e-003**	**0.2089**	**4.1400e-003**	**0.2130**	**0.0560**	**3.9200e-003**	**0.0599**	**0.0000**	**242.8308**	**242.8308**	**0.0174**	**0.0000**	**243.2646**

3.5 Facility Installation Part C - 2019

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	0.0333	0.2833	0.2792	4.9000e-004		0.0169	0.0169		0.0169	0.0169	0.0000	42.3906	42.3906	2.6900e-003	0.0000	42.4577

Total	**0.0333**	**0.2833**	**0.2792**	**4.9000e-004**		**0.0169**	**0.0169**		**0.0169**	**0.0169**	**0.0000**	**42.3906**	**42.3906**	**2.6900e-003**	**0.0000**	**42.4577**

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	0.0181	0.4427	0.1265	1.2100e-003	0.0329	3.9400e-003	0.0369	9.4800e-003	3.7700e-003	0.0133	0.0000	114.4362	114.4362	5.5800e-003	0.0000	114.5756
Worker	0.2528	0.2129	1.9037	2.4200e-003	0.2519	1.7000e-003	0.2536	0.0669	1.5700e-003	0.0684	0.0000	216.6967	216.6967	0.0181	0.0000	217.1489
Total	**0.2709**	**0.6556**	**2.0301**	**3.6300e-003**	**0.2848**	**5.6400e-003**	**0.2905**	**0.0763**	**5.3400e-003**	**0.0817**	**0.0000**	**331.1329**	**331.1329**	**0.0237**	**0.0000**	**331.7245**

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	9.8700e-003	0.2253	0.3042	4.9000e-004		0.0158	0.0158		0.0158	0.0158	0.0000	42.3905	42.3905	2.6900e-003	0.0000	42.4576
Total	**9.8700e-003**	**0.2253**	**0.3042**	**4.9000e-004**		**0.0158**	**0.0158**		**0.0158**	**0.0158**	**0.0000**	**42.3905**	**42.3905**	**2.6900e-003**	**0.0000**	**42.4576**

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	0.0181	0.4427	0.1265	1.2100e-003	0.0329	3.9400e-003	0.0369	9.4800e-003	3.7700e-003	0.0133	0.0000	114.4362	114.4362	5.5800e-003	0.0000	114.5756
Worker	0.2528	0.2129	1.9037	2.4200e-003	0.2519	1.7000e-003	0.2536	0.0669	1.5700e-003	0.0684	0.0000	216.6967	216.6967	0.0181	0.0000	217.1489
Total	**0.2709**	**0.6556**	**2.0301**	**3.6300e-003**	**0.2848**	**5.6400e-003**	**0.2905**	**0.0763**	**5.3400e-003**	**0.0817**	**0.0000**	**331.1329**	**331.1329**	**0.0237**	**0.0000**	**331.7245**

3.5 Facility Installation Part C - 2020

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	2.0000e-004	1.7400e-003	1.8500e-003	0.0000		1.0000e-004	1.0000e-004		1.0000e-004	1.0000e-004	0.0000	0.2826	0.2826	2.0000e-005	0.0000	0.2830
Total	**2.0000e-004**	**1.7400e-003**	**1.8500e-003**	**0.0000**		**1.0000e-004**	**1.0000e-004**		**1.0000e-004**	**1.0000e-004**	**0.0000**	**0.2826**	**0.2826**	**2.0000e-005**	**0.0000**	**0.2830**

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	1.0000e-004	2.6300e-003	7.4000e-004	1.0000e-005	2.2000e-004	2.0000e-005	2.4000e-004	6.0000e-005	2.0000e-005	8.0000e-005	0.0000	0.7573	0.7573	3.0000e-005	0.0000	0.7581
Worker	1.5700e-003	1.2900e-003	0.0116	2.0000e-005	1.6800e-003	1.0000e-005	1.6900e-003	4.5000e-004	1.0000e-005	4.6000e-004	0.0000	1.3991	1.3991	1.1000e-004	0.0000	1.4018
Total	**1.6700e-003**	**3.9200e-003**	**0.0124**	**3.0000e-005**	**1.9000e-003**	**3.0000e-005**	**1.9300e-003**	**5.1000e-004**	**3.0000e-005**	**5.4000e-004**	**0.0000**	**2.1564**	**2.1564**	**1.4000e-004**	**0.0000**	**2.1600**

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	7.0000e-005	1.5000e-003	2.0300e-003	0.0000		1.1000e-004	1.1000e-004		1.1000e-004	1.1000e-004	0.0000	0.2826	0.2826	2.0000e-005	0.0000	0.2830
Total	**7.0000e-005**	**1.5000e-003**	**2.0300e-003**	**0.0000**		**1.1000e-004**	**1.1000e-004**		**1.1000e-004**	**1.1000e-004**	**0.0000**	**0.2826**	**0.2826**	**2.0000e-005**	**0.0000**	**0.2830**

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	1.0000e-004	2.6300e-003	7.4000e-004	1.0000e-005	2.2000e-004	2.0000e-005	2.4000e-004	6.0000e-005	2.0000e-005	8.0000e-005	0.0000	0.7573	0.7573	3.0000e-005	0.0000	0.7581
Worker	1.5700e-003	1.2900e-003	0.0116	2.0000e-005	1.6800e-003	1.0000e-005	1.6900e-003	4.5000e-004	1.0000e-005	4.6000e-004	0.0000	1.3991	1.3991	1.1000e-004	0.0000	1.4018
Total	**1.6700e-003**	**3.9200e-003**	**0.0124**	**3.0000e-005**	**1.9000e-003**	**3.0000e-005**	**1.9300e-003**	**5.1000e-004**	**3.0000e-005**	**5.4000e-004**	**0.0000**	**2.1564**	**2.1564**	**1.4000e-004**	**0.0000**	**2.1600**

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	0.0151	0.1213	0.2149	5.7000e-004	0.0366	5.4000e-004	0.0372	9.8300e-003	5.1000e-004	0.0103	0.0000	52.5658	52.5658	3.4300e-003	0.0000	52.6516
Unmitigated	0.0151	0.1213	0.2149	5.7000e-004	0.0366	5.4000e-004	0.0372	9.8300e-003	5.1000e-004	0.0103	0.0000	52.5658	52.5658	3.4300e-003	0.0000	52.6516

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
General Light Industry	20.00	20.00	20.00	94,268	94,268
Total	20.00	20.00	20.00	94,268	94,268

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
General Light Industry	16.40	9.50	11.90	59.00	28.00	13.00	92	5	3

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
General Light Industry	0.503420	0.033264	0.160883	0.129541	0.018929	0.005318	0.019165	0.118376	0.003239	0.001168	0.005214	0.000745	0.000738

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

Kilowatt Hours of Renewable Electricity Generated

	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	- 74,037.25[illegible]	- 74,037.258[illegible]	-1.7020	-0.3868	- 74,195.08[illegible]
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					
General Light Industry	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					
General Light Industry	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			
General Light Industry	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			
General Light Industry	-1.7056e+008	-74,037.2583	-1.7020	-0.3868	-74,195.0823
Total		**-74,037.2583**	**-1.7020**	**-0.3868**	**-74,195.0823**

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	4.6000e-003	0.0000	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-005
Unmitigated	4.6000e-003	0.0000	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-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	7.0000e-004					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Consumer Products	3.9100e-003					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	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-005
Total	**4.6100e-003**	**0.0000**	**1.0000e-005**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**2.0000e-005**	**2.0000e-005**	**0.0000**	**0.0000**	**2.0000e-005**

<u>Mitigated</u>

	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	7.0000e-004					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	3.9100e-003					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	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-005
Total	**4.6100e-003**	**0.0000**	**1.0000e-005**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**2.0000e-005**	**2.0000e-005**	**0.0000**	**0.0000**	**2.0000e-005**

7.0 Water Detail

7.1 Mitigation Measures Water

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	94.2831	2.1700e-003	4.9000e-004	94.4841
Unmitigated	94.2831	2.1700e-003	4.9000e-004	94.4841

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
General Light Industry	0 / 19.55	94.2831	2.1700e-003	4.9000e-004	94.4841
Total		**94.2831**	**2.1700e-003**	**4.9000e-004**	**94.4841**

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
General Light Industry	0 / 19.55	94.2831	2.1700e-003	4.9000e-004	94.4841
Total		**94.2831**	**2.1700e-003**	**4.9000e-004**	**94.4841**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
General Light Industry	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			

General Light Industry	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

Drew Solar 2030

Imperial County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
General Light Industry	1.00	1000sqft	844.20	1,000.00	0

1.2 Other Project Characteristics

Urbanization	Rural	**Wind Speed (m/s)**	3.4	**Precipitation Freq (Days)**	12
Climate Zone	15			**Operational Year**	2030
Utility Company	Imperial Irrigation District				
CO2 Intensity (lb/MWhr)	740.93	**CH4 Intensity (lb/MWhr)**	0.017	**N2O Intensity (lb/MWhr)**	0.003

1.3 User Entered Comments & Non-Default Data

Project Characteristics - Energy intensity factors reduced to reflect 2030 renewable energy procurement mandate

Land Use - Modeled as 1 ksf industrial. Project site is 844.2 acres.

Construction Phase - Site Prep, Part A includes all facility installation equipment, Part B includes only excavators, water trucks, and forklifts, and Part C includes negligible equipment.

Off-road Equipment - Other construction equipment refers to mast pile drivers and water trucks

Off-road Equipment - Other construction equipment refers to mast pile drivers and water trucks

Off-road Equipment - Non-equipment related tasks.

Off-road Equipment - Other construction equipment refers to brush chippers and water trucks.

Trips and VMT - Conservatively assessed maximum trips assocaiated with project construction

On-road Fugitive Dust - Project site is along a major highway (SR-98). Trips are not anticipated to use unpaved routes.

Grading - Project site would be graded. All import/export would be balanced onsite.

Vehicle Trips - Project operation would generate up to 20 trips per day.

Road Dust - Project site is along a major highway (SR-98). Trips are not anticipated to use unpaved routes.

Energy Use - Project would have limited energy use.

Water And Wastewater - Project would use 60 acre-feet per year = 19,550,000 gallons. Project water use would not generate wastewater that requires offsite treatment.

Solid Waste - Project would generate limited waste.

Construction Off-road Equipment Mitigation - Fugitive dust control measures include site watering and limiting vehicle speeds on unpaved roads to 15 mph.

Energy Mitigation - 100 MWh = 100,000 kWh; regional solar generation potential of 1,705.6 KWh/KW; 170,560,000 KWh/year

Table Name	Column Name	Default Value	New Value
tblConstDustMitigation	WaterUnpavedRoadMoistureContent	0	0.5
tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	0	40
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	4.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	24.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	10.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstructionPhase	NumDays	13,950.00	66.00
tblConstructionPhase	NumDays	13,950.00	110.00

tblConstructionPhase	NumDays	13,950.00	151.00
tblConstructionPhase	NumDays	540.00	66.00
tblEnergyUse	LightingElect	2.93	0.00
tblEnergyUse	NT24E	5.02	0.00
tblEnergyUse	NT24NG	17.13	0.00
tblEnergyUse	T24E	2.20	0.00
tblEnergyUse	T24NG	15.36	0.00
tblGrading	AcresOfGrading	99.00	844.20
tblLandUse	LotAcreage	0.02	844.20
tblOffRoadEquipment	HorsePower	172.00	50.00
tblOffRoadEquipment	HorsePower	172.00	189.00
tblOffRoadEquipment	HorsePower	172.00	49.00
tblOffRoadEquipment	HorsePower	172.00	189.00
tblOffRoadEquipment	HorsePower	172.00	49.00
tblOffRoadEquipment	HorsePower	172.00	189.00
tblOffRoadEquipment	LoadFactor	0.42	0.50
tblOffRoadEquipment	LoadFactor	0.42	0.50
tblOffRoadEquipment	LoadFactor	0.42	0.50
tblOffRoadEquipment	LoadFactor	0.42	0.50
tblOffRoadEquipment	LoadFactor	0.42	0.50
tblOffRoadEquipment	LoadFactor	0.42	0.50
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	1.00
tblOnRoadDust	HaulingPercentPave	50.00	100.00
tblOnRoadDust	HaulingPercentPave	50.00	100.00
tblOnRoadDust	HaulingPercentPave	50.00	100.00
tblOnRoadDust	HaulingPercentPave	50.00	100.00
tblOnRoadDust	HaulingPercentPave	50.00	100.00
tblOnRoadDust	HaulingPercentPave	50.00	100.00
tblOnRoadDust	VendorPercentPave	50.00	100.00
tblOnRoadDust	VendorPercentPave	50.00	100.00

tblOnRoadDust	VendorPercentPave	50.00	100.00
tblOnRoadDust	VendorPercentPave	50.00	100.00
tblOnRoadDust	VendorPercentPave	50.00	100.00
tblOnRoadDust	VendorPercentPave	50.00	100.00
tblOnRoadDust	WorkerPercentPave	50.00	100.00
tblOnRoadDust	WorkerPercentPave	50.00	100.00
tblOnRoadDust	WorkerPercentPave	50.00	100.00
tblOnRoadDust	WorkerPercentPave	50.00	100.00
tblOnRoadDust	WorkerPercentPave	50.00	100.00
tblOnRoadDust	WorkerPercentPave	50.00	100.00
tblProjectCharacteristics	CH4IntensityFactor	0.029	0.017
tblProjectCharacteristics	CO2IntensityFactor	1270.9	740.93
tblProjectCharacteristics	N2OIntensityFactor	0.006	0.003
tblProjectCharacteristics	UrbanizationLevel	Urban	Rural
tblRoadDust	RoadPercentPave	50	100
tblSolidWaste	SolidWasteGenerationRate	1.24	0.00
tblTripsAndVMT	VendorTripNumber	0.00	40.00
tblTripsAndVMT	VendorTripNumber	0.00	40.00
tblTripsAndVMT	VendorTripNumber	0.00	40.00
tblTripsAndVMT	VendorTripNumber	0.00	40.00
tblTripsAndVMT	WorkerTripNumber	13.00	436.00
tblTripsAndVMT	WorkerTripNumber	0.00	436.00
tblTripsAndVMT	WorkerTripNumber	0.00	436.00
tblTripsAndVMT	WorkerTripNumber	0.00	436.00
tblVehicleTrips	ST_TR	1.32	20.00
tblVehicleTrips	SU_TR	0.68	20.00
tblVehicleTrips	WD_TR	6.97	20.00
tblWater	IndoorWaterUseRate	231,250.00	0.00
tblWater	OutdoorWaterUseRate	0.00	19,550,000.00

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					
2018	0.5924	3.3886	4.2292	6.5100e-003	1.1008	0.1600	1.2608	0.2753	0.1474	0.4226	0.0000	594.3846	594.3846	0.1153	0.0000	597.2664
2019	0.8107	2.9794	5.5146	8.6900e-003	0.4988	0.1465	0.6453	0.1336	0.1364	0.2700	0.0000	789.0401	789.0401	0.0978	0.0000	791.4849
2020	1.8700e-003	5.6600e-003	0.0142	3.0000e-005	1.9000e-003	1.3000e-004	2.0300e-003	5.1000e-004	1.3000e-004	6.3000e-004	0.0000	2.4390	2.4390	1.6000e-004	0.0000	2.4430
Maximum	**0.8107**	**3.3886**	**5.5146**	**8.6900e-003**	**1.1008**	**0.1600**	**1.2608**	**0.2753**	**0.1474**	**0.4226**	**0.0000**	**789.0401**	**789.0401**	**0.1153**	**0.0000**	**791.4849**

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					
2018	0.3593	2.5627	4.1942	6.5100e-003	0.7090	0.1164	0.8254	0.1794	0.1161	0.2956	0.0000	594.3843	594.3843	0.1153	0.0000	597.2661
2019	0.5654	2.7590	5.2682	8.6900e-003	0.4988	0.1066	0.6054	0.1336	0.1061	0.2397	0.0000	789.0398	789.0398	0.0978	0.0000	791.4847
2020	1.7400e-003	5.4200e-003	0.0144	3.0000e-005	1.9000e-003	1.3000e-004	2.0300e-003	5.1000e-004	1.3000e-004	6.4000e-004	0.0000	2.4390	2.4390	1.6000e-004	0.0000	2.4430
Maximum	**0.5654**	**2.7590**	**5.2682**	**8.6900e-003**	**0.7090**	**0.1164**	**0.8254**	**0.1794**	**0.1161**	**0.2956**	**0.0000**	**789.0398**	**789.0398**	**0.1153**	**0.0000**	**791.4847**

	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	**34.06**	**16.42**	**2.88**	**0.00**	**24.46**	**27.21**	**24.90**	**23.41**	**21.67**	**22.70**	**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)
1	**7-2-2018**	**10-1-2018**	1.6807	0.9587
2	**10-2-2018**	**1-1-2019**	2.3244	1.9880
3	**1-2-2019**	**4-1-2019**	1.4677	1.2453
4	**4-2-2019**	**7-1-2019**	1.2132	1.0446
5	**7-2-2019**	**10-1-2019**	0.5534	0.5177
6	**10-2-2019**	**1-1-2020**	0.5427	0.5071
		Highest	2.3244	1.9880

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	4.6000e-003	0.0000	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-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	0.0101	0.0669	0.1474	4.6000e-004	0.0366	2.0000e-004	0.0368	9.8200e-003	1.8000e-004	0.0100	0.0000	42.6961	42.6961	2.4100e-003	0.0000	42.7564
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	72.9968	72.9968	1.6700e-003	3.0000e-004	73.1267
Total	**0.0147**	**0.0669**	**0.1474**	**4.6000e-004**	**0.0366**	**2.0000e-004**	**0.0368**	**9.8200e-003**	**1.8000e-004**	**0.0100**	**0.0000**	**115.6929**	**115.6929**	**4.0800e-003**	**3.0000e-004**	**115.8831**

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	4.6000e-003	0.0000	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-005
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	-57,321.8380	-57,321.8380	-1.3152	-0.2321	-57,423.8821
Mobile	0.0101	0.0669	0.1474	4.6000e-004	0.0366	2.0000e-004	0.0368	9.8200e-003	1.8000e-004	0.0100	0.0000	42.6961	42.6961	2.4100e-003	0.0000	42.7564
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	72.9968	72.9968	1.6700e-003	3.0000e-004	73.1267
Total	**0.0147**	**0.0669**	**0.1474**	**4.6000e-004**	**0.0366**	**2.0000e-004**	**0.0368**	**9.8200e-003**	**1.8000e-004**	**0.0100**	**0.0000**	**-57,206.1451**	**-57,206.1451**	**-1.3111**	**-0.2318**	**-57,307.9989**

	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	49,546.55	49,546.55	32,235.29	77,363.33	49,553.27

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Site Preparation	Site Preparation	7/2/2018	10/1/2018	5	66	
2	Facility Installation Part A	Building Construction	10/2/2018	1/1/2019	5	66	
3	Facility Installation Part B	Building Construction	1/2/2019	6/4/2019	5	110	
4	Facility Installation Part C	Building Construction	6/5/2019	1/1/2020	5	151	

Acres of Grading (Site Preparation Phase): 836.4

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

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor

Site Preparation	Graders	1	8.00	187	0.41
Site Preparation	Other Construction Equipment	1	2.00	50	0.50
Site Preparation	Other Construction Equipment	1	2.00	189	0.50
Site Preparation	Rubber Tired Dozers	1	8.00	247	0.40
Site Preparation	Scrapers	1	8.00	367	0.48
Facility Installation Part A	Excavators	2	8.00	158	0.38
Facility Installation Part A	Other Construction Equipment	10	8.00	49	0.50
Facility Installation Part A	Other Construction Equipment	1	2.00	189	0.50
Facility Installation Part A	Rough Terrain Forklifts	10	8.00	100	0.40
Facility Installation Part A	Trenchers	1	2.00	78	0.50
Facility Installation Part B	Excavators	2	8.00	158	0.38
Facility Installation Part B	Other Construction Equipment	10	8.00	49	0.50
Facility Installation Part B	Other Construction Equipment	1	2.00	189	0.50
Facility Installation Part C	Generator Sets	1	8.00	84	0.74

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
Site Preparation	5	436.00	40.00	0.00	10.20	11.90	20.00	LD_Mix	HDT_Mix	HHDT
Facility Installation Part A	24	436.00	40.00	0.00	10.20	11.90	20.00	LD_Mix	HDT_Mix	HHDT
Facility Installation Part A	24	0.00	0.00	0.00	10.20	11.90	20.00	LD_Mix	HDT_Mix	HHDT
Facility Installation Part A	24	0.00	0.00	0.00	10.20	11.90	20.00	LD_Mix	HDT_Mix	HHDT
Facility Installation Part B	13	436.00	40.00	0.00	10.20	11.90	20.00	LD_Mix	HDT_Mix	HHDT
Facility Installation Part C	1	436.00	40.00	0.00	10.20	11.90	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Use Cleaner Engines for Construction Equipment

Water Exposed Area

Reduce Vehicle Speed on Unpaved Roads

3.2 Site Preparation - 2018

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					0.6422	0.0000	0.6422	0.1571	0.0000	0.1571	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0977	1.1372	0.5177	1.0200e-003		0.0479	0.0479		0.0441	0.0441	0.0000	93.2666	93.2666	0.0290	0.0000	93.9924
Total	**0.0977**	**1.1372**	**0.5177**	**1.0200e-003**	**0.6422**	**0.0479**	**0.6901**	**0.1571**	**0.0441**	**0.2012**	**0.0000**	**93.2666**	**93.2666**	**0.0290**	**0.0000**	**93.9924**

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	8.9900e-003	0.2112	0.0638	5.3000e-004	0.0145	2.0400e-003	0.0165	4.1700e-003	1.9500e-003	6.1200e-003	0.0000	50.6862	50.6862	2.5700e-003	0.0000	50.7504
Worker	0.1206	0.1034	0.9183	1.1000e-003	0.1108	7.7000e-004	0.1116	0.0294	7.1000e-004	0.0301	0.0000	98.3781	98.3781	8.6900e-003	0.0000	98.5952
Total	**0.1296**	**0.3146**	**0.9820**	**1.6300e-003**	**0.1253**	**2.8100e-003**	**0.1281**	**0.0336**	**2.6600e-003**	**0.0363**	**0.0000**	**149.0642**	**149.0642**	**0.0113**	**0.0000**	**149.3456**

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					0.2505	0.0000	0.2505	0.0613	0.0000	0.0613	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0250	0.4848	0.5456	1.0200e-003		0.0187	0.0187		0.0187	0.0187	0.0000	93.2665	93.2665	0.0290	0.0000	93.9923
Total	**0.0250**	**0.4848**	**0.5456**	**1.0200e-003**	**0.2505**	**0.0187**	**0.2692**	**0.0613**	**0.0187**	**0.0800**	**0.0000**	**93.2665**	**93.2665**	**0.0290**	**0.0000**	**93.9923**

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	8.9900e-003	0.2112	0.0638	5.3000e-004	0.0145	2.0400e-003	0.0165	4.1700e-003	1.9500e-003	6.1200e-003	0.0000	50.6862	50.6862	2.5700e-003	0.0000	50.7504
Worker	0.1206	0.1034	0.9183	1.1000e-003	0.1108	7.7000e-004	0.1116	0.0294	7.1000e-004	0.0301	0.0000	98.3781	98.3781	8.6900e-003	0.0000	98.5952
Total	**0.1296**	**0.3146**	**0.9820**	**1.6300e-003**	**0.1253**	**2.8100e-003**	**0.1281**	**0.0336**	**2.6600e-003**	**0.0363**	**0.0000**	**149.0642**	**149.0642**	**0.0113**	**0.0000**	**149.3456**

3.3 Facility Installation Part A - 2018

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	0.2375	1.6269	1.7623	2.2500e-003		0.1065	0.1065		0.0980	0.0980	0.0000	205.2482	205.2482	0.0639	0.0000	206.8456
Total	**0.2375**	**1.6269**	**1.7623**	**2.2500e-003**		**0.1065**	**0.1065**		**0.0980**	**0.0980**	**0.0000**	**205.2482**	**205.2482**	**0.0639**	**0.0000**	**206.8456**

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	8.8600e-003	0.2080	0.0628	5.3000e-004	0.0346	2.0100e-003	0.0366	9.0900e-003	1.9200e-003	0.0110	0.0000	49.9182	49.9182	2.5300e-003	0.0000	49.9814
Worker	0.1188	0.1019	0.9043	1.0800e-003	0.2987	7.6000e-004	0.2994	0.0755	7.0000e-004	0.0762	0.0000	96.8875	96.8875	8.5500e-003	0.0000	97.1014
Total	**0.1276**	**0.3099**	**0.9672**	**1.6100e-003**	**0.3332**	**2.7700e-003**	**0.3360**	**0.0846**	**2.6200e-003**	**0.0872**	**0.0000**	**146.8057**	**146.8057**	**0.0111**	**0.0000**	**147.0828**

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	0.0772	1.4534	1.6995	2.2500e-003		0.0921	0.0921		0.0921	0.0921	0.0000	205.2479	205.2479	0.0639	0.0000	206.8453
Total	**0.0772**	**1.4534**	**1.6995**	**2.2500e-003**		**0.0921**	**0.0921**		**0.0921**	**0.0921**	**0.0000**	**205.2479**	**205.2479**	**0.0639**	**0.0000**	**206.8453**

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	8.8600e-003	0.2080	0.0628	5.3000e-004	0.0346	2.0100e-003	0.0366	9.0900e-003	1.9200e-003	0.0110	0.0000	49.9182	49.9182	2.5300e-003	0.0000	49.9814
Worker	0.1188	0.1019	0.9043	1.0800e-003	0.2987	7.6000e-004	0.2994	0.0755	7.0000e-004	0.0762	0.0000	96.8875	96.8875	8.5500e-003	0.0000	97.1014
Total	**0.1276**	**0.3099**	**0.9672**	**1.6100e-003**	**0.3332**	**2.7700e-003**	**0.3360**	**0.0846**	**2.6200e-003**	**0.0872**	**0.0000**	**146.8057**	**146.8057**	**0.0111**	**0.0000**	**147.0828**

3.3 Facility Installation Part A - 2019

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	3.5200e-003	0.0237	0.0271	3.0000e-005		1.5200e-003	1.5200e-003		1.4000e-003	1.4000e-003	0.0000	3.1060	3.1060	9.8000e-004	0.0000	3.1306
Total	**3.5200e-003**	**0.0237**	**0.0271**	**3.0000e-005**		**1.5200e-003**	**1.5200e-003**		**1.4000e-003**	**1.4000e-003**	**0.0000**	**3.1060**	**3.1060**	**9.8000e-004**	**0.0000**	**3.1306**

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					

	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
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	1.2000e-004	2.9500e-003	8.4000e-004	1.0000e-005	5.3000e-004	3.0000e-005	5.6000e-004	1.4000e-004	3.0000e-005	1.6000e-004	0.0000	0.7629	0.7629	4.0000e-005	0.0000	0.7638
Worker	1.6900e-003	1.4200e-003	0.0127	2.0000e-005	4.6000e-003	1.0000e-005	4.6100e-003	1.1600e-003	1.0000e-005	1.1700e-003	0.0000	1.4446	1.4446	1.2000e-004	0.0000	1.4477
Total	**1.8100e-003**	**4.3700e-003**	**0.0135**	**3.0000e-005**	**5.1300e-003**	**4.0000e-005**	**5.1700e-003**	**1.3000e-003**	**4.0000e-005**	**1.3300e-003**	**0.0000**	**2.2076**	**2.2076**	**1.6000e-004**	**0.0000**	**2.2115**

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	1.1900e-003	0.0224	0.0262	3.0000e-005		1.4200e-003	1.4200e-003		1.4200e-003	1.4200e-003	0.0000	3.1060	3.1060	9.8000e-004	0.0000	3.1306
Total	**1.1900e-003**	**0.0224**	**0.0262**	**3.0000e-005**		**1.4200e-003**	**1.4200e-003**		**1.4200e-003**	**1.4200e-003**	**0.0000**	**3.1060**	**3.1060**	**9.8000e-004**	**0.0000**	**3.1306**

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	1.2000e-004	2.9500e-003	8.4000e-004	1.0000e-005	5.3000e-004	3.0000e-005	5.6000e-004	1.4000e-004	3.0000e-005	1.6000e-004	0.0000	0.7629	0.7629	4.0000e-005	0.0000	0.7638
Worker	1.6900e-003	1.4200e-003	0.0127	2.0000e-005	4.6000e-003	1.0000e-005	4.6100e-003	1.1600e-003	1.0000e-005	1.1700e-003	0.0000	1.4446	1.4446	1.2000e-004	0.0000	1.4477
Total	**1.8100e-003**	**4.3700e-003**	**0.0135**	**3.0000e-005**	**5.1300e-003**	**4.0000e-005**	**5.1700e-003**	**1.3000e-003**	**4.0000e-005**	**1.3300e-003**	**0.0000**	**2.2076**	**2.2076**	**1.6000e-004**	**0.0000**	**2.2115**

3.4 Facility Installation Part B - 2019

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	0.3024	1.5316	1.6759	1.8600e-003		0.1182	0.1182		0.1087	0.1087	0.0000	167.3722	167.3722	0.0530	0.0000	168.6961
Total	**0.3024**	**1.5316**	**1.6759**	**1.8600e-003**		**0.1182**	**0.1182**		**0.1087**	**0.1087**	**0.0000**	**167.3722**	**167.3722**	**0.0530**	**0.0000**	**168.6961**

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	0.0133	0.3247	0.0928	8.9000e-004	0.0241	2.8900e-003	0.0270	6.9500e-003	2.7700e-003	9.7200e-003	0.0000	83.9199	83.9199	4.0900e-003	0.0000	84.0221
Worker	0.1854	0.1561	1.3960	1.7700e-003	0.1847	1.2500e-003	0.1860	0.0490	1.1500e-003	0.0502	0.0000	158.9109	158.9109	0.0133	0.0000	159.2425
Total	**0.1987**	**0.4808**	**1.4888**	**2.6600e-003**	**0.2089**	**4.1400e-003**	**0.2130**	**0.0560**	**3.9200e-003**	**0.0599**	**0.0000**	**242.8308**	**242.8308**	**0.0174**	**0.0000**	**243.2646**

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	0.0829	1.3706	1.4054	1.8600e-003		0.0796	0.0796		0.0796	0.0796	0.0000	167.3720	167.3720	0.0530	0.0000	168.6959
Total	**0.0829**	**1.3706**	**1.4054**	**1.8600e-003**		**0.0796**	**0.0796**		**0.0796**	**0.0796**	**0.0000**	**167.3720**	**167.3720**	**0.0530**	**0.0000**	**168.6959**

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	0.0133	0.3247	0.0928	8.9000e-004	0.0241	2.8900e-003	0.0270	6.9500e-003	2.7700e-003	9.7200e-003	0.0000	83.9199	83.9199	4.0900e-003	0.0000	84.0221
Worker	0.1854	0.1561	1.3960	1.7700e-003	0.1847	1.2500e-003	0.1860	0.0490	1.1500e-003	0.0502	0.0000	158.9109	158.9109	0.0133	0.0000	159.2425
Total	**0.1987**	**0.4808**	**1.4888**	**2.6600e-003**	**0.2089**	**4.1400e-003**	**0.2130**	**0.0560**	**3.9200e-003**	**0.0599**	**0.0000**	**242.8308**	**242.8308**	**0.0174**	**0.0000**	**243.2646**

3.5 Facility Installation Part C - 2019

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	0.0333	0.2833	0.2792	4.9000e-004		0.0169	0.0169		0.0169	0.0169	0.0000	42.3906	42.3906	2.6900e-003	0.0000	42.4577

	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
Total	**0.0333**	**0.2833**	**0.2792**	**4.9000e-004**		**0.0169**	**0.0169**		**0.0169**	**0.0169**	**0.0000**	**42.3906**	**42.3906**	**2.6900e-003**	**0.0000**	**42.4577**

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	0.0181	0.4427	0.1265	1.2100e-003	0.0329	3.9400e-003	0.0369	9.4800e-003	3.7700e-003	0.0133	0.0000	114.4362	114.4362	5.5800e-003	0.0000	114.5756
Worker	0.2528	0.2129	1.9037	2.4200e-003	0.2519	1.7000e-003	0.2536	0.0669	1.5700e-003	0.0684	0.0000	216.6967	216.6967	0.0181	0.0000	217.1489
Total	**0.2709**	**0.6556**	**2.0301**	**3.6300e-003**	**0.2848**	**5.6400e-003**	**0.2905**	**0.0763**	**5.3400e-003**	**0.0817**	**0.0000**	**331.1329**	**331.1329**	**0.0237**	**0.0000**	**331.7245**

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	9.8700e-003	0.2253	0.3042	4.9000e-004		0.0158	0.0158		0.0158	0.0158	0.0000	42.3905	42.3905	2.6900e-003	0.0000	42.4576
Total	**9.8700e-003**	**0.2253**	**0.3042**	**4.9000e-004**		**0.0158**	**0.0158**		**0.0158**	**0.0158**	**0.0000**	**42.3905**	**42.3905**	**2.6900e-003**	**0.0000**	**42.4576**

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	0.0181	0.4427	0.1265	1.2100e-003	0.0329	3.9400e-003	0.0369	9.4800e-003	3.7700e-003	0.0133	0.0000	114.4362	114.4362	5.5800e-003	0.0000	114.5756
Worker	0.2528	0.2129	1.9037	2.4200e-003	0.2519	1.7000e-003	0.2536	0.0669	1.5700e-003	0.0684	0.0000	216.6967	216.6967	0.0181	0.0000	217.1489
Total	**0.2709**	**0.6556**	**2.0301**	**3.6300e-003**	**0.2848**	**5.6400e-003**	**0.2905**	**0.0763**	**5.3400e-003**	**0.0817**	**0.0000**	**331.1329**	**331.1329**	**0.0237**	**0.0000**	**331.7245**

3.5 Facility Installation Part C - 2020

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	2.0000e-004	1.7400e-003	1.8500e-003	0.0000		1.0000e-004	1.0000e-004		1.0000e-004	1.0000e-004	0.0000	0.2826	0.2826	2.0000e-005	0.0000	0.2830
Total	**2.0000e-004**	**1.7400e-003**	**1.8500e-003**	**0.0000**		**1.0000e-004**	**1.0000e-004**		**1.0000e-004**	**1.0000e-004**	**0.0000**	**0.2826**	**0.2826**	**2.0000e-005**	**0.0000**	**0.2830**

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					

	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
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	1.0000e-004	2.6300e-003	7.4000e-004	1.0000e-005	2.2000e-004	2.0000e-005	2.4000e-004	6.0000e-005	2.0000e-005	8.0000e-005	0.0000	0.7573	0.7573	3.0000e-005	0.0000	0.7581
Worker	1.5700e-003	1.2900e-003	0.0116	2.0000e-005	1.6800e-003	1.0000e-005	1.6900e-003	4.5000e-004	1.0000e-005	4.6000e-004	0.0000	1.3991	1.3991	1.1000e-004	0.0000	1.4018
Total	**1.6700e-003**	**3.9200e-003**	**0.0124**	**3.0000e-005**	**1.9000e-003**	**3.0000e-005**	**1.9300e-003**	**5.1000e-004**	**3.0000e-005**	**5.4000e-004**	**0.0000**	**2.1564**	**2.1564**	**1.4000e-004**	**0.0000**	**2.1600**

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	7.0000e-005	1.5000e-003	2.0300e-003	0.0000		1.1000e-004	1.1000e-004		1.1000e-004	1.1000e-004	0.0000	0.2826	0.2826	2.0000e-005	0.0000	0.2830
Total	**7.0000e-005**	**1.5000e-003**	**2.0300e-003**	**0.0000**		**1.1000e-004**	**1.1000e-004**		**1.1000e-004**	**1.1000e-004**	**0.0000**	**0.2826**	**0.2826**	**2.0000e-005**	**0.0000**	**0.2830**

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	1.0000e-004	2.6300e-003	7.4000e-004	1.0000e-005	2.2000e-004	2.0000e-005	2.4000e-004	6.0000e-005	2.0000e-005	8.0000e-005	0.0000	0.7573	0.7573	3.0000e-005	0.0000	0.7581
Worker	1.5700e-003	1.2900e-003	0.0116	2.0000e-005	1.6800e-003	1.0000e-005	1.6900e-003	4.5000e-004	1.0000e-005	4.6000e-004	0.0000	1.3991	1.3991	1.1000e-004	0.0000	1.4018
Total	**1.6700e-003**	**3.9200e-003**	**0.0124**	**3.0000e-005**	**1.9000e-003**	**3.0000e-005**	**1.9300e-003**	**5.1000e-004**	**3.0000e-005**	**5.4000e-004**	**0.0000**	**2.1564**	**2.1564**	**1.4000e-004**	**0.0000**	**2.1600**

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	0.0101	0.0669	0.1474	4.6000e-004	0.0366	2.0000e-004	0.0368	9.8200e-003	1.8000e-004	0.0100	0.0000	42.6961	42.6961	2.4100e-003	0.0000	42.7564
Unmitigated	0.0101	0.0669	0.1474	4.6000e-004	0.0366	2.0000e-004	0.0368	9.8200e-003	1.8000e-004	0.0100	0.0000	42.6961	42.6961	2.4100e-003	0.0000	42.7564

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
General Light Industry	20.00	20.00	20.00	94,268	94,268
Total	20.00	20.00	20.00	94,268	94,268

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
General Light Industry	16.40	9.50	11.90	59.00	28.00	13.00	92	5	3

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
General Light Industry	0.543244	0.029362	0.162875	0.099785	0.010956	0.004222	0.017706	0.120154	0.003861	0.001334	0.005275	0.000706	0.000522

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

Kilowatt Hours of Renewable Electricity Generated

Category	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
	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	-57,321.8380	-57,321.8380	-1.3152	-0.2321	-57,423.8821
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

Land Use	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
	kBTU/yr	tons/yr										MT/yr					
General Light Industry	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					
General Light Industry	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			
General Light Industry	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			
General Light Industry	- 1.7056e+008	- 57,321.838 0	-1.3152	-0.2321	- 57,423.88 21
Total		**- 57,321.838 0**	**-1.3152**	**-0.2321**	**- 57,423.88 21**

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	4.6000e-003	0.0000	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-005
Unmitigated	4.6000e-003	0.0000	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-005

6.2 Area by SubCategory

<u>Unmitigated</u>

	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	7.0000e-004					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	N2O	CO2e
Consumer Products	3.9100e-003					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	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-005
Total	**4.6100e-003**	**0.0000**	**1.0000e-005**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**2.0000e-005**	**2.0000e-005**	**0.0000**	**0.0000**	**2.0000e-005**

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	7.0000e-004					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	3.9100e-003					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	1.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.0000e-005	2.0000e-005	0.0000	0.0000	2.0000e-005
Total	**4.6100e-003**	**0.0000**	**1.0000e-005**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**2.0000e-005**	**2.0000e-005**	**0.0000**	**0.0000**	**2.0000e-005**

7.0 Water Detail

7.1 Mitigation Measures Water

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	72.9968	1.6700e-003	3.0000e-004	73.1267
Unmitigated	72.9968	1.6700e-003	3.0000e-004	73.1267

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
General Light Industry	0 / 19.55	72.9968	1.6700e-003	3.0000e-004	73.1267
Total		**72.9968**	**1.6700e-003**	**3.0000e-004**	**73.1267**

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
General Light Industry	0 / 19.55	72.9968	1.6700e-003	3.0000e-004	73.1267
Total		**72.9968**	**1.6700e-003**	**3.0000e-004**	**73.1267**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
General Light Industry	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			

General Light Industry	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

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