

Whitepaper on Inter-Regional Commute Trends Between Riverside and San Diego County

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INTRODUCTION

Fehr & Peers' has completed this evaluation of inter-regional commute trends and vehicle miles of travel (VMT) generated by commuters who live in Riverside County and work in San Diego County. The purpose of this analysis is to understand the quantities of VMT and greenhouse gas (GHG) that could be avoided by reducing the number of people with inter-regional, Riverside County-based commutes through the provision of additional housing opportunities located within San Diego County.

This analysis specifically estimates the avoided VMT and GHG (as measured in metric tons of carbon dioxide equivalents, MT CO₂e) that could be achieved if commuters living in Riverside County instead lived in San Diego County communities, closer to their employers, along the I-15 corridor within North San Diego County, as illustrated on Exhibit "1."

This analysis defines the methodology, data sources, and assumptions that were used to determine the number of commuters living in Riverside County and working in San Diego County, as well as the parameters of the VMT and GHG reduction estimation.

SUMMARY OF RESULTS

Key Statistics

- Total number of people living in Riverside County with a workplace in San Diego County (as of 2015): **54,343 people** (see "Selection of Riverside County Commuter Statistics" below for additional information)
- Extra number of miles traveled per Riverside County resident commuting to San Diego County per roundtrip: **102 extra miles traveled** (see "Calculation of Extra VMT per Commuter" below for additional information)
- Average of 2 hours per car per commute
- Annual commute impacts:
 - 409,000 MT of CO₂e
 - 26 million hours spent commuting
 - 1.3 billion vehicle miles traveled (VMT). Table 1 displays the resulting extra annual VMT and GHG generated by people living in Riverside County with a workplace in San Diego County based on the standard number of working days per year.
- Based on StreetLight GPS data, 87% of all southbound traffic on I-15 destined for San Diego County originates in Riverside County (the remaining 13% of southbound traffic originates in areas north of Riverside County). This is 68,200 weekday trips.

TABLE 1: TOTAL EXTRA VMT AND GHG

Scenario	Daily Number of Commute Roundtrips Per Week Per Commuter	Total Number of Commute Roundtrips Per Year Per Commuter ¹	Annual Total Extra VMT	Annual Total Extra GHG (MT CO ₂ e)
Primary Results	5 days / week	240	1,329,378,564	409,449
Low Range	2 days / week	96	531,751,426	163,779
High Range	7 days / week	336	1,861,129,990	573,228

Notes: ¹ Total number of commute roundtrips per year is calculated using the number of daily commute round trips multiplied by 52 weeks per year, minus a provision for holiday/vacation/sick days.

Source: Fehr & Peers.

As shown in Table 1 above, Fehr & Peers found that, assuming a typical work week and work year, the 54,343 people living in Riverside County that commute to San Diego County for work travel an extra 1.33 billion miles per year and emit more than 409,000 MT CO₂e per year, when compared to what their commute would be if they lived in homes

along the I-15 corridor in North San Diego County. Annual extra miles traveled and GHG could be eliminated annually into the foreseeable future if Riverside commuters had a viable housing alternative closer to their primary jobs in San Diego County.

For comparison purposes, a GHG savings of more than 409,000 MT CO₂e is over 3 times the cumulative reduction from *all potential* mitigation strategies and measures identified in San Diego County's Climate Action Plan for calendar year 2020 (see Table 2 below). For context, the 409,000 MT CO₂e is equivalent to approximately 14 percent of *all* emissions sources within unincorporated San Diego County in 2020 (see Table 3 below).

TABLE 2: COUNTY CLIMATE ACTION PLAN GHG REDUCTIONS BY CATEGORY

Category	2020	2030	2050
Built Environment and Transportation	6,020	233,758	64,459
Energy	125,140	553,449	639,508
Solid Waste	0	79,052	86,052
Water and Wastewater	254	17,920	19,738
Agriculture and Conservation	791	12,965	16,384
Total Reductions	132,205	897,145	826,141
Notes: Columns may not add to totals due to rounding. GHG = greenhouse gas emissions MTCO ₂ e = metric tons of carbon dioxide equivalents Source: Data modeled by Ascent Environmental in 2017.			

Source: County of San Diego Climate Action Plan, Table 3.1

TABLE 3: PROJECTED EMISSIONS IN UNINCORPORATED SAN DIEGO COUNTY (1)

Emissions Source	2020	2030	2050
Projected Emissions without Legislative Reductions (BAU)	3,407,168	3,723,596	4,220,560
Reductions from State Legislative Actions	388,498	899,547	1,229,053
Legislative-Adjusted County Emissions	3,018,671	2,824,049	2,991,507
Reductions from CAP Measures	132,205	897,145	826,141
County Emissions with CAP (Percent below 2014)	2,886,465 (10%)	1,926,903 (40%)	2,165,367 (33%)
County Target Emissions (Percent below 2014)	3,147,275 (2%)	1,926,903 (40%)	738,646 (77%)
Additional GHG Reductions Needed to Meet Targets	0	0	1,426,721

Notes: Columns may not add to totals due to rounding.
BAU = Business-As-Usual
CAP = Climate Action Plan
GHG = greenhouse gas emissions
MTCO_{2e} = metric tons of carbon dioxide equivalents
Source: Data modeled by Ascent Environmental in 2017.

SOURCE: County of San Diego Climate Action Plan, Table 3.2

NOTE: This table illustrates the amount of emissions projected in the unincorporated County. In comparison, the amount of emissions generated by commuters from Riverside County, which is 409,000 MTCO_{2e}, would be the equivalent to 14% of all County Emissions Sources (with the CAP), in the year 2020.

CALCULATION OF EXTRA VMT PER COMMUTER

This section considers the distance traveled by people living in Riverside County and commuting to San Diego County for work, as compared to the distance traveled if residing along the I-15 corridor in North San Diego County. Fehr & Peers assumes that mileage driven north of the I-15 Corridor to and from Riverside commuters' homes is extra commuting mileage that would be eliminated if the Riverside commuting population had homes at a point along the I-15 Corridor within North San Diego County based on an average of where newly constructed development and potential future development may occur, which is approximately 17 miles south of the Riverside County/San Diego County line via I-15. Review of the existing major employment centers in San Diego County confirms that this assumption is reasonable as the vast majority of those centers are found further south than 17 miles south of the Riverside County/San Diego County line. (See <http://sdgis.sandag.org/map.aspx>, with the "Existing Land Use" layer selected.)

Additionally, research performed by Fehr & Peers reveals that the majority of trips originating in Riverside County stop at destinations in North San Diego County or continue further south, which would most typically utilize I-15 southbound.

Given these assumptions, Fehr & Peers defines the "total extra miles traveled" as the total distance the commuter travels on the northern portion of I-15 in San Diego County and on roads within Riverside County to the ZIP code in which the commuter resides.

Total extra miles traveled was calculated by summing two components:

$$\begin{aligned} & \text{(A) Extra miles traveled in San Diego County (17 miles)} \\ + & \text{(B) Extra miles traveled in Riverside County} \\ = & \text{(C) Total extra miles traveled (per Riverside commuter per work day)} \end{aligned}$$

Each component is defined as follows.

(A) Extra Miles Traveled in San Diego County

Extra miles traveled in San Diego County is calculated by determining the extra mileage a commuter travels on the northern segment of I-15 within San Diego County. For purposes of this analysis, the extra miles traveled in San Diego County is calculated to be 34 miles per work day (roundtrip = 17 average one way distance * 2 trips). This represents the average extra commute distance accrued by traveling the northern 17 miles of I-15 within San Diego County.

(B) Extra Miles Traveled in Riverside County

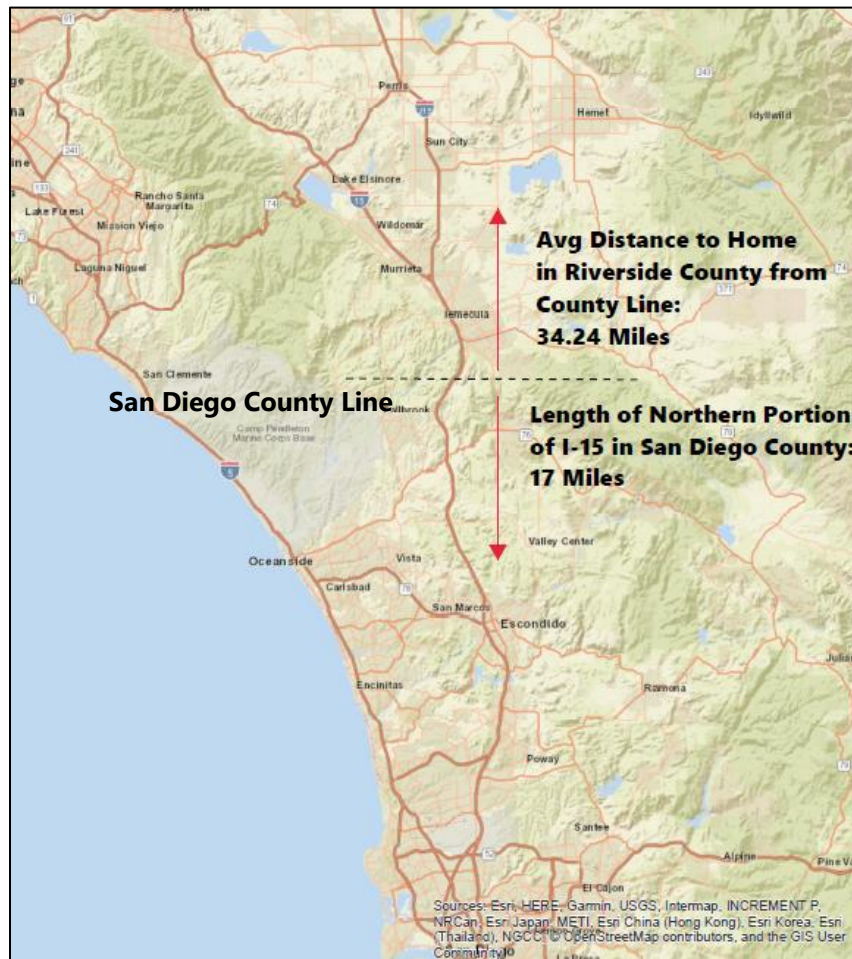
Extra miles traveled in Riverside County is calculated by determining the extra mileage the commuter travels from I-15 at the San Diego / Riverside County boundary line to the Riverside ZIP code in which the commuter lives.

Fehr & Peers used a Geographic Information System (GIS) methodology to calculate the length of the fastest route from I-15 where it crosses into San Diego County to each ZIP code in Riverside County. The routing was run on a road network from Open Street Map (OSM). OSM is a comprehensive open mapping platform that allows a large community of users to create, field check, and accurately document the transportation system. The roadway data for Riverside County was extracted and flattened into a network that accounts for one-way segments, freeway segments, and roadway speeds. Once the network is prepared and flattened it can then be used for routing trips.

The origins for each trip are the weighted centroids of the 70 ZIP codes in Riverside County. These points were determined by layering the 2010 population (most current published data year) by Census Block on the ZIP codes, then calculating a point to represent the mean center of the ZIP code, weighted by population.

To calculate the driving distance, an Origin and Destination relationship was set up with the ZIP code centroids as the origins and the point where I-15 crosses into San Diego County as the destination. Then, the GIS analysis program was instructed to find the route from origin to destination with the shortest drive time and calculate the distance in miles. The time and distance calculation are performed on the OSM road network. The result is a distance in miles that represents the fastest path from each ZIP code in Riverside County to the Riverside/San Diego County boundary line on I-15, which is approximately 34 miles (68 miles roundtrip). This is shown on Exhibit 1.

EXHIBIT 1: EXTRA MILES DRIVEN BETWEEN RIVERSIDE COMMUTERS' HOMES AND THE SAN DIEGO COUNTY LINE



(C) Total Extra Miles Traveled

Based on the calculations explained above, the average total extra miles traveled per Riverside County commuter is approximately 102 miles per work day (roundtrip).

CALCULATION OF EXTRA GHG PER COMMUTE TRIP

To calculate the total extra GHG emitted by commute trips from Riverside County to San Diego County, Fehr & Peers consulted with Ldn Consulting, Inc., an Air Quality, Greenhouse Gas and Traffic consultant.

Ldn Consulting provided a factor to be applied to each extra mile traveled of 0.000308 MT CO₂e/per mile.

“The Global Climate Change Analysis uses the California Emissions Estimator Model (CalEEMod), Version 2016.3.1, to estimate project emissions. CalEEMod 2016.3.2 uses EMFAC 2014 for the 2007 EMFAC categories (vehicle types based on size, fuel usage etc.) which are found on Page 158 at the following link: <https://www.arb.ca.gov/msei/downloads/emfac2014/emfac2014vol3-technical-documentation-052015.pdf>. CalEEMod calculates the average GHG emissions rates, as every mile driven is roughly 0.000308 MTCO₂e/per mile driven.” (Memo from Ldn Consulting, dated March 15, 2019.)

SELECTION OF RIVERSIDE COUNTY COMMUTER STATISTICS

The calculation methodology explained above was performed for the 54,343 commuters (as of 2015) living in 70 Riverside County ZIP codes who have their primary job in San Diego County.

The number of commuters was determined using U.S. Census Longitudinal Employer-Household Dynamics (LEHD) Origin-Destination Employment Statistics (LODES) data¹. LODES data are delivered through an online graphical interface application called OnTheMap. LODES is a dataset that describes geographic patterns of jobs by their employment locations and residential locations. It uses 2010 census block geography as the base geography. LODES Version 7 was used for the analysis presented in this memorandum. The dataset extracted is for people who lived in Riverside County and had a primary job in San Diego County in 2015². The data was extracted from the OnTheMap application using the following steps:

1. Determine the Riverside County geography by determining the ZIP Code Tabulation Areas (ZCTAs) in Riverside County. ZCTAs are generalized representations of U.S. Postal Service ZIP codes, and for purposes of the analysis presented herein represent ZIP codes. To determine the Riverside County ZCTAs, Fehr & Peers reviewed the relationship file of 2010 ZCTA to County, from the Census Bureau (https://www.census.gov/geo/maps-data/data/zcta_rel_download.html).

¹ Additional information about LODES data is available at https://lehd.ces.census.gov/applications/help/onthemap.html#!what_is_onthemap

² Using statistics from 2015 is considered conservative as inter-regional trend data indicates that the number of employees who commute from homes in Riverside County to places of employment in San Diego County is continuing to increase with time.

2. Only the ZCTAs in Riverside County were selected (the OnTheMap selections are State Code 6, County Code 65).
3. To account for ZCTAs that span multiple counties, Fehr & Peers reviewed the relationship file from step 1 above, which provides the population by ZIP code for each county it spans. Then the proportion of each ZIP code's population which is in Riverside County was calculated and all ZIP codes that have over 80% of their population in Riverside County were included.

Because the dataset includes only an individual's primary job (defined by the U.S. Census Bureau as the job that earned the individual the most money in the year), it is reasonable to assume the commuter commutes to work the same number of days per week and weeks per year as a typical worker working at their primary employment. The total estimated workdays per week per commuter (5 days per week) and work weeks per year (48 weeks per year) are based on methodology used in the Bureau of Labor Statistics' National Compensation Survey (see, "Work Schedules in the National Compensation Survey," Richard Schumann, Bureau of Labor Statistics, originally posted July 28, 2008). The primary analysis assumes that all 54,343 people living in Riverside County and working in San Diego County commute 5 days per week. However, a low and high estimate also was provided to show a range of the VMT and GHG savings because, while commuting 5 days per week is typical, there are weeks when employees have reason to commute more or fewer days.

StreetLight Data provides origin and destination information for trips along roadways based on GPS and Cell Phone Data. Data averaged for March, April, September, and October of 2017 showed that 87% of traffic on I-15 destined for San Diego County originates in Riverside County, which is approximately 68,200 weekday trips. Based on the analysis above, a significant portion of traffic on I-15 is therefore associated with commuters from Riverside County.