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Palmdale

Lancaster Los Angeles 17

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VEHICLE MILES TRAVELED (VMT) ANALYSIS

This memo summarizes potential strategies for the City of Palmdale to reduce Vehicle Miles Traveled (VMT) and Greenhouse Gas (GHG) impacts through proposed future development and transportation improvements in the City.

1. Population and Employment Growth Forecast

As part of the Palmdale General Plan update, various future land use alternatives were developed, one of which was determined to be the Preferred Plan alternative. The Preferred Plan alternative is the basis of the evaluation and mitigation analysis for VMT and GHG impacts included within this analysis. The Preferred Plan alternative comprises the geographic area covered by the Palmdale sphere of influence (SOI) which includes both the City of Palmdale and the designated surrounding area shown in **Figure 1**.

The Southern California Association of Governments (SCAG) region encompasses six counties (Imperial, Los Angeles, Orange, Riverside, San Bernardino, and Ventura) and 191 cities in an area covering more than 38,000 square miles. The agency develops long-range regional transportation and land use plans including sustainable community strategies and growth forecast components, regional transportation improvement programs, and regional housing needs allocations. The Palmdale General Plan land use projections are consistent with the SCAG regional assumptions. A summary of demographic forecasts for the Palmdale SOI is provided below in **Table 1**.

City of Palmdale Sphere of Influence	2017	2045 Preferred Plan	
Population	188,488	225,692	
Households	53,626	70,618	
Employment	49,501	74,804	

Table 1: Summary of Palmdale Demographic Forecasts





Figure 1: Palmdale Sphere of Influence



2. Quantification Approaches

A wide range of strategies were identified to reduce VMT and GHG related to mobile source emissions in Palmdale, including:

- Active Transportation Improvements
- Transit Improvements
- Vanpool Program
- Employer Trip Reduction Program
- Electric Vehicle Charging Infrastructure Incentive Program
- Transportation System Management (TSM) / Intelligent Transportation Systems (ITS)
- VMT Mitigation Banking

Future traffic forecasts for the General Plan update were prepared using the City of Palmdale Travel Demand model (City model) that was developed based on the 2016 SCAG Regional Travel Demand model. The resultant VMT and GHG impacts were quantified based on these traffic forecasts. Like other traditional four-step travel demand models, the City model cannot evaluate the impacts of all transportation policy and program strategies. Therefore, for some of these strategies, off-model analysis was performed to quantify the VMT and GHG reduction benefits. **Table 2** details the quantification approaches that were undertaken in support of reporting VMT and GHG results.







Sustainable Community Strategy	Quantification Approach
Targeted infill/increase density	Palmdale Model
Bus Service	Palmdale Model
Bicycle Projects	Off-Model
High Speed Rail	Off-Model
Brightline West Connection To Las Vegas	Off-Model
Antelope Valley Line Improvement	Off-Model
Telecommuting	Off-Model
Electric Vehicle Incentive Strategy	Off-Model
Electric Vehicle Infrastructure Charging Incentive Program	Off-Model
Transportation System Management/Intelligent Transportation	Off-Model
Systems	
Metro Vanpool Program	Off-Model
VMT Mitigation Banking	Palmdale/Off-
	Model

The quantification approaches identified above utilized the following tools for the purposes of informing the estimation of VMT and GHG emissions for the Sustainable Transportation Plan:

- Transportation Model City of Palmdale Model (City model)
- Active Transportation Evaluation Geographical Information System (GIS) analysis relying on NCHRP 552 methodologies
- Employer Trip Reduction Program TRIMMS Software
- Air Quality Model EMFAC 2021 Emissions Factor Model

A detailed discussion on the City of Palmdale Model and the off-model analyses completed are provided in the next section.

3. Travel Demand Modeling

SCAG develops and applies state-of-the-art models, integrated into a comprehensive modeling and forecasting framework to develop growth projections, travel forecasts, and emissions estimates to support the Region's various planning programs. The City model used for the Palmdale General Plan Update (Palmdale GP) is based on the SCAG 2016 Regional Transportation Plan (RTP) model and 2045 socio-economic data and network assumptions developed by the City of Palmdale.

The SCAG traffic analysis zone (TAZ) system was refined for the Palmdale SOI with the updated land use and network datasets. The SCAG model uses Tier zones, with Tier 1 zones



being the largest and most aggregated and Tier 3 being the smallest and most disaggregated. The SCAG model had 45 zones in the Tier 1 zone system within the Palmdale SOI. This zone system within the Palmdale SOI was disaggregated to the Tier 3 zone system with 336 zones. This disaggregation allowed more resolution in the analysis performed. During the City model development process, the SCAG model datasets were available for horizon year 2040 but not beyond; hence, the 2045 Palmdale GP scenarios with updated land use developed by the City were used for the areas within the Palmdale SOI. The 2045 socio-economic data for the Palmdale SOI represents the 2045 Preferred Plan used for the Palmdale General Plan update. The socio-economic data outside the Palmdale SOI is consistent with the 2016 RTP SCAG assumptions for the region in the year 2040.

The 2045 Base Highway network was reviewed by the City of Palmdale for the 2045 Preferred Plan and based on that review, several network modifications were made to accurately reflect planned future transportation improvements. In addition, High-Speed Rail ridership at the Palmdale station was incorporated into the City model assignment procedures. Model runs were performed for the 2045 Preferred Plan and various measures of effectiveness related to the trips and vehicle miles traveled within the Palmdale SOI were generated.

3.1 VMT Thresholds

The City of Palmdale is currently utilizing the LA County Guidelines for North County as the basis of its VMT thresholds and analysis methodology. The Los Angeles County Transportation Impact Analysis Guidelines call for land use plans to promote outcomes whereby total VMT per service population (residents and employees) should be 16.8 percent below the existing VMT per service population for the Baseline Area in which the Palmdale SOI is located. **Table 3** reports the North County and South County Baseline VMT metrics for the county as reported in the *Transportation Impact Analysis Guidelines Guidelines* document published by the Los Angeles County Public Works updated September 2, 2020. Future development projects and plans in each of these areas will be compared to the applicable Baseline VMT metrics to determine if they meet the thresholds for a VMT impact.

Baseline Area	Total VMT per Service Population	Residential VMT per Capita	Employment VMT per Employee
North County	43.1	22.3	19.0
South County	31.1	12.7	18.4

Table 3: Baseline VMT Thresholds for North and South County

3.2 Measures of Effectiveness

Table 4 shows the efficiency metrics used for SB 743 compliance for the Existing and Preferred Plan scenarios. As shown in, **Table 4** The 2045 Preferred Plan scenario significantly reduces home-based VMT per capita compared to the 2017 scenario, which is considered to representative of existing conditions. The home-based VMT per capita for 2045 Preferred Plan is 11 percent below threshold. The total VMT per service population is also reduced significantly. The total VMT per service population for 2045 Preferred Plan is 25 percent below



threshold. However, the home-based work VMT per employee for 2045 Preferred Plan increases significantly as compared to the 2017 Existing scenario and is 24 percent above threshold. **Table 4** shows these efficiency metrices specifically for only the growth resulting from the Preferred Plan.

Table 4: VMT Efficiency Metrics

Efficiency Metric	Threshold	2017 Existing	2045 Preferred Plan	
Employment VMT per employee	15.8	13.37	19.65	
Residential VMT per capita	18.6	26.19	16.57	
All trips—VMT per service population	35.9	34.3	27.0	

Table 5: VMT Efficiency Metrics - Palmdale SOI Growth Only

Efficiency Metric	Threshold	2045 Preferred Plan Growth	2045 Preferred Plan over/under Threshold
Employment VMT per employee	15.8	21.2	+5.3 (+34%)*
Residential VMT per capita	18.6	15.2	-3.4 (-18%)
Total VMT per service population	35.9	16.1	-19.7 (-55%)

*The increase in employment based VMT is driven by forecast growth in the Plant 42 Area. These employers currently draw much of their staff from other parts of the region, which significantly increases their VMT impact. The travel demand model assumes that trend will continue in the future. This special case may be mitigated by the provision of more local housing and lifestyle options that would appeal to workers in these industries.

Based on the traffic impact analysis conducted for the Palmdale GP, the 2045 Preferred Plan is well below the North County targets of 35.9 VMT per service population threshold. The traffic impact analysis considered the North County VMT thresholds as reported in Section 3.1.3— Impact Criteria of the Transportation Impact Analysis Guidelines document published by the Los Angeles County Public Works (July 23, 2020). As shown, the 2045 Preferred Plan scenario effectively reduces the total VMT per service population more than the required reduction needed. Although no mitigations are required for the 2045 Preferred Plan based on the VMT per service population threshold, employment based VMT is significantly higher as compared to the North County target of 15.8 for home-based work VMT per employee which will be considered as a threshold for significant impact for individual employment-based development projects. It is therefore useful to understand the mitigation strategies that may be applied in the future, if





As shown in **Table 4** and **Table 5** the Residential VMT per capita for the 2045 Preferred Plan is below the threshold for both the total Palmdale SOI and when considering the growth only in the Palmdale SOI, however the Employment VMT per employee is above the threshold. Using the City model, VMT thematic maps were created at the TAZ level for the Palmdale SOI to identify low, medium, and high VMT areas for 2017 Existing as well as 2045 Preferred Plan residential and employment-based land uses proposed in the Palmdale GP. **Figure 2** through **Figure 5** show the thematic maps for 2017 (representing existing conditions) and 2045 Preferred Plan VMT per Capita and VMT per Employee for the Palmdale SOI with respect to the North Los Angeles County thresholds which are utilized by the City. The maps also identify future household and employment growth locations.

As shown on the employment VMT thematic maps for the 2045 Preferred Plan scenario, the majority of the employment VMT that is over the threshold is within the area identified as Plant 42. Plant 42 is a classified aircraft manufacturing plant owned by the United States Air Force and shares a runway with Palmdale Regional Airport. Over 40% of the proposed employment under the Preferred Plan is within the Plant 42 area. This area has specific restrictions for land use development and only permit certain types of land uses. The uses that are deemed incompatible include hospitals, medical facilities and educational facilities. Other uses such as general retail, restaurants and manufacturing may be determined to be incompatible by the Air Force if such uses have an average density of greater than 25 persons per acre per hour during a 24-hour period resulting in greater than 50 persons per acre at any time. This zone is not intended for uses such as heavy industrial and manufacturing, agricultural, and residential. Due to the unique characteristics of the Plant 42 area, the commute travel patterns are not necessarily well represented in the travel demand model. Also due to its specific restrictions, the VMT reduction strategies may not be fully applicable for this area depending on specific regulatory requirements.







Figure 2: 2017 Residential VMT per Capita









Figure 3: 2017 Home-Based Work VMT per Employee







Figure 4: 2045 Preferred Plan Residential VMT per Capita









Figure 5: 2045 Preferred Plan Home-Based Work VMT per Employee





Traveled Analysis

Palmdale Vehicle Miles

Daily VMT generated by the Palmdale SOI was computed as part of the Palmdale GP traffic analysis and is summarized in **Table 6**. The VMT reported in **Table 6** was used as a primary input for determining Greenhouse Gas outcomes for this analysis.

Table 6: Palmdale Daily VMT

Palmdale SOI	2017 Existing	2045 Preferred Plan	% Change 2017 to 2045
Auto VMT Zone-Based	7,699,173	7,387,266	-4%
Total VMT Zone-Based (Includes Truck VMT)	8,153,876	8,111,684	-0.5%







Similar to other traditional four-step travel demand models, the City model is not sensitive to the impacts of all transportation policy and program strategies. In these instances, the City relies on "off-model" adjustments using methodologies commonly used or approved/cited methodologies identified by the California Air Resources Board (CARB). These VMT and GHG reduction strategies align with Statewide Plans such as the Caltrans California Transportation Plan (CTP) 2050, the Caltrans Strategic Management Plan 2020-2024, the Caltrans Climate Action Plan for Transportation Infrastructure (CAPTI), the California High Speed Rail Business Plan, the Caltrans Rail Plan, the Caltrans Transit Plan, and the Caltrans Bicycle and Pedestrian Plan. The STP also aligns with Regional Guidance Documents such as the Los Angeles North County Transportation Coalition Guidance, LA Metro 2020 Long Range Plan, and the Antelope Valley Transit Authority (AVTA) Strategic Plan. The following off-model adjustments were performed for quantification of VMT and GHG reduction benefits:

4.1 ACTIVE TRANSPORTATION PROJECTS

The City of Palmdale was awarded grant funding in 2015 to initiate a citywide Active Transportation Plan covering specific recommendations for Complete Streets, Bicycle Transportation, and Safe Routes to School (SRTS). The opportunities identified for each of the topics in the plans which were finalized in 2018, but were not formerly adopted, are summarized below and are shown in **Figure 6.** Class II facilities are unprotected bicycle lanes and Class VI facilities are separated bicycle lanes.

Complete Street

- Focus on design to improve community health, safety, and economic vitality
- Provide safe and convenient access for a variety of mobility types
- Develop a circulation network that enables travel to and from destinations in a safe and efficient manner
- Provide mobility for multiple modes of transportation,
- Reduce vehicle emissions from increased use of alternative transportation modes

Bicycle Transportation

- Develop a comprehensive bikeway network, that services the full spectrum of bicycle rider types
- Plan bikeways that will complement the SRTS access for schools located within the City of Palmdale
- Facilitate the provision of quality bicycle support facilities at public and private sites/buildings throughout the community
- Apply new technologies and innovative treatments on appropriate roads and bikeways
- Provide secure bicycle storage facilities where bicyclists connect with other forms of transportation
- Develop and enhance multimodal opportunities for bicyclists to connect with other forms of transportation







• Ensure that ongoing maintenance keeps bicycle facilities in good repair

Safe Routes to School

- Make it easier and safer for students to walk and bicycle to school
- Increase the active mode share for student travel





Figure 6: City of Palmdale Proposed Bikeway Facilities (Long Term)





New improvements to the City's active transportation is expected to have an impact on VMT in Palmdale. The methodology to quantify VMT reductions from these strategies is described below.

Methodology

The number of new cyclists was estimated using the National Cooperative Highway Research Program (NCHRP) 552 methodology provided in the Guidelines for Analysis of Investment in Bicycle Facilities. The NCHRP 552 report provides national level research that suggests commute mode share can be used to extrapolate a more general mode share for bicycles using a best fit formula. In subsequent validation, the report suggests that the results of this analysis are typically within the 95% confidence interval, and when they are not, they provide a conservative estimate.

NCHRP 552 provides methodology and assumptions to measure and forecast the demand for bicycling based on population and employment data. The total number of new cyclists anticipated is based on the 2045 Preferred Plan population and employment data. Given that population is a model parameter, future year population by TAZ was estimated from the City model.

Using the Palmdale model zone structure and associated 2045 land use data used for the Palmdale GP, the amount of population and employment within a half mile, mile and mile and a half of the proposed bicycle facilities included in the City's Active Transportation Plan was determined. Only those improvements reported in sufficient detail, including location and improvement limits, were analyzed. Other inputs, such as bicycle mode share of commute trips (1%), and adult population percentage of the total population (70%), were based on NCHRP recommended values. Similarly, several projects include pedestrian improvements that would likely increase walking activity, were not captured by this analysis as project specific details of these projects are not available.

Applying the NCHRP 552 methodology to the pedestrian/bicycle improvements yields 119 new commute cyclists and 1,553 new non-commute cyclists. The total reduction in commuter vehicle miles traveled is estimated to be 714 miles. This is based on an estimated 6-mile average roundtrip commute distance, assuming adult cyclist trips replace vehicle trips. Bike trips for recreational/health benefits were excluded from this estimate, because although they are still important from the perspective of quality of life, these trips do not reduce VMT. The NCHRP 552 analysis generates three demand response estimates: low, moderate, and high. In this case, the medium estimate was chosen for the following reasons:

- 1. This assessment does not capture the full extent of active transportation investments, as many bicycle improvement descriptions lacked the requisite detail to include in the analysis.
- 2. Some residents will not travel by foot or bike due to high summer temperatures.
- 3. Many of the active transportation improvements included new Class I and Class II facilities, which typically encourage bicycle use.







4.2 TRANSIT IMPROVEMENT PROJECTS

Three major rail projects are considered as part of the transit VMT and GHG reducing strategy, California High-Speed Rail (CAHSR), Brightline West, and Antelope Velley Line.

The California High-Speed Rail Authority (CHSRA) is committed to completing the environmental review for all High-Speed Rail project segments (Merced/San Francisco—Los Angeles/Anaheim) by 2022. This includes the highspeed rail line sections between Bakersfield and Palmdale, and between Palmdale and Los Angeles Union Station Angeles/Anaheim) which were considered in this analysis. To accommodate the HSR station, the Palmdale Transportation Center would be relocated south of the existing location to between Avenue Q and Palmdale Boulevard. The new HSR station will be serving some of the highest density employment as well as residential neighborhoods in the City as proposed in the Preferred Plan.

Brightline West is a proposed privately run high-speed rail route linking the Las Vegas Valley and Rancho Cucamonga to the Greater Los Angeles area through the California high desert region. A high-speed rail feeder service is also proposed to link the California HSR and the Brightline West services. The high-speed rail feeder may be built within the High-Desert-Corridor (HDC) right-of-way, primarily within the highway median. The stop serving Brightline West would be at the Palmdale Multimodal Rail Station to be located south of the existing Palmdale Transportation Center between Avenue Q and Palmdale Boulevard. The initial Southern California station is proposed to be in Victorville and intends to add stations and provide connections to Metrolink and future California High-Speed Rail.

The Antelope Valley Line is currently Metrolink's third busiest line with approximately 7,000 passengers per weekday. The Antelope Valley Line Study identifies rail infrastructure projects needed to deliver the track capacity necessary for increased service levels, including potential doubletracking of portions of the line that are currently single track, extension of passing sidings, additional platforms at stations, and improved signaling systems. Adding late night train service, more frequent service and bidirectional service are also some of the recommendations likely to move forward.

These major transit projects provide Palmdale with a unique opportunity to establish critical connections and plan the appropriate locations for expansion of the local transit network. Some of the key implementation actions for this strategy are list below:

- Future transit service may be expanded by working with Antelope Valley Transit Authority to adjust routes to enhance connectivity between Palmdale Transportation Center and eastern part of the City with high VMT areas.
- Transit signal priority may be installed to give buses priority at intersections to enhance speed and reliability.
- Bus stop improvements including real-time information displays, enhanced lighting, and upgraded shelters may be included to improve the transit riding experience.





Methodology

The proposed CAHSR service was assumed to run with 20-minute headways during peak periods with a total of 60 round trips each day. Ridership was estimated from the *California High-Speed Rail 2020 Business Plan, Ridership and Revenue Forecasting report.* The future daily ridership estimates were determined to be 5,600 one-way trips per day. Since, the High-Speed Rail trips at the Palmdale Station were included in the model for the 2045 Preferred Plan scenario, the VMT reductions were not calculated separately as part of the off-model analysis.

VMT reductions from the Brightline West line were evaluated qualitatively since this line is not expected to be built before 2050 and it is currently not fully funded. Ridership for the proposed Brightline West was estimated based on information provided in the High Desert Corridor FEIR/EIS report1. Based on the daily ridership estimates and average trip length to the Victorville station, the VMT reductions could be as high as 25,000 per day. However, these estimates were not considered for the overall reductions as part of the off-model strategies.

The future ridership for the Antelope Valley Line was determined to be 1,000 additional trips per day. Ridership was estimated based on current ridership and line characteristics and proposed increase in frequencies. Considering the average trip length from Palmdale to Downtown Los Angeles and other intermediate stops as well as accounting for drive to station, the VMT reductions were calculated to be approximately 52,000 per day.

4.3 METRO VANPOOL PROGRAM

The LA Metro Vanpool Program is an industry leader in providing a mobility option to employers and commuters that significantly reduces traffic congestion while improving air quality throughout Southern California. Vanpool participants lease the vehicle directly from the vehicle supplier of their choice and then apply to the Metro Vanpool Program to receive a subsidy. Van pools are composed of five to 15 commuters who regularly travel together to work. LA Metro also encourages employers to participate in this program and let their employees know about the benefits of ridesharing.

The City of Palmdale plans to commit towards the expansion of this program by:

- Marketing and promoting the service through public outreach.
- Providing incentives to new employment-based development for vanpool as part of the VMT policy.
- Providing local Employee Transportation Coordinator (ETC) Support for residents and employers

Methodology

¹ High Desert Corridor Project, Final Environmental Impact Report/Environmental Impact Statement, June 2016.





An off-model analysis was performed to quantify the projected number of in-service vans and resultant GHG reduction based on the historic demand response in other areas of the state with similar programs relative to an assumed passenger market capture and travel distance within the Palmdale SOI. This was completed using the following steps:

- 1. Calculate the number of full vans implemented by the program.
- Calculate the number of private automobile trips reduced annually based on the occupancy of vanpool vans. It is assumed one private automobile equals one vanpool passenger.
- 3. Calculate the adjusted automobile miles traveled per trip. The formula takes into account the variability in driving behaviors of potential vanpool participants prior to the launch of the project, including the number of drivers that would drive to a vanpool location and the number of vanpool riders that drive alone.
- 4. Calculate total adjusted automobile VMT reduced by multiplying the number of trips produced by the average trip length.
- Obtain displaced private automobile trip CO₂ emission rates from the current version of EMFAC.
- 6. Calculate the CO₂ emissions of private automobile trips reduced by vanpool service trips.

As a result of implementing this strategy, and as shown in **Table 7**, the region's VMT and GHG would be reduced by 0.1%, accounting for 1.4 tons of daily GHG emissions

4.4 EMPLOYER TRIP REDUCTION PROGRAM

The South Coast Air Quality Management District has established an employer trip reduction program called Rule 2202 for employers with at least 200 employees. The Rule provides employers with a menu of emission reduction strategies that can be implemented to reduce mobile source emissions from employee commutes. Implementation of this program is strictly optional under Rule 2202. There is a similar program listed for by Mojave Desert Air Quality Management District known as Rule 1701, but it does not provide specific implementation guidelines. Because of this, the City of Palmdale could establish a similar program for employers with 100 or more employees in order to reduce VMT and emissions throughout the city and the region:

Methodology

An off-model analysis was performed to quantify the benefits of an Employer Trip Reduction Program using TRIMMS software. The model takes into consideration the total number of affected commuters, the average commute trip length, travel mode share in the City and program subsidies.

As shown in **Table 7**, as a result of implementing this strategy, which includes associated reductions related to telecommuting, the Palmdale SOI's VMT and GHG emissions would be reduced by 4.6%, accounting for 82.2 tons of daily GHG emissions.

4.5 ELECTRIC VEHICLE CHARGING INFRASTRUCTURE INCENTIVE PROGRAM



As part of the implementation of the 2011 Palmdale Energy Action Plan, the City has installed 21 publicly accessible electric vehicle (EV) chargers, including five DC Fast Chargers to support the transition to EVs. Installing EV charging stations enables EV and Plugin Hybrid (PHEV) drivers to drive a larger share of miles in electric mode (eVMT), as opposed to gasoline-powered mode, thereby displacing GHG emissions from gasoline consumption with a lesser amount of indirect emissions from electricity. Some strategies related to expansion of EV charging infrastructure in the City are as below:

- The City plans to include incentives for developers to include EV charging infrastructure.
- The selection of additional EV charging stations will be based on high traffic areas with considerable EV population.

Methodology

An off-model analysis was performed to quantify the benefits of providing additional electric vehicle charging infrastructure. The GHG emission reduction calculations were completed using the following method:

- 1. Estimate CO₂ emission reductions from PHEV eVMT based on estimated average VMT shift per PHEV from gasoline to electricity (cVMT to eVMT) as a result of increased workplace and public charges.
 - a. Part 1: Estimate EV population associated with the strategy.
 - b. Part 2: Estimate eVMT associated with the strategy.
 - c. Part 3: Estimate CO₂ emissions associated with the strategy.

As a result of implementing this strategy, and as shown in **Table 7**, the region's VMT and GHG would be reduced by 0.2%, accounting for 4.0 tons of daily GHG emissions.

4.6 TRANSPORTATION SYSTEM MANAGEMENT (TSM)/INTELLIGENT TRANSPORTATION SYSTEMS (ITS) STRATEGY

Transportation Systems Management (TSM) employs a series of techniques designed to maximize the capacity and efficiency of the existing transportation system. Effective TSM strategies reduce traffic congestion, improve air quality and reduce or eliminate the need to construct new and expensive transportation infrastructure. Many TSM strategies seek to optimize the operation of the existing transportation system through use of Intelligent Transportation Systems (ITS). For example, advanced technologies can anticipate changing traffic conditions and inform drivers about driving conditions on a real-time basis so that drivers can make more informed decisions. SCAG recently updated the Regional ITS Architecture which identifies a significant number of planned ITS projects in the region, including those related to connected vehicle applications, transit signal priority, emergency response, express lanes and goods movement. The opportunities identified for this strategy related to the Palmdale SOI are summarized below:

• Corridor System Management Plans (CSMPs) and system management initiatives (e.g., signal synchronization, ramp metering, etc.)





Methodology

An off-model analysis was performed to quantify the benefits of implementing the above strategies using evaluation methodology provided in the *Development of Network-Level Evaluation Tool for Managing ITS Infrastructure, Final Report, June 2021*. The methodology focuses on reduction in vehicular delay related to ITS infrastructure. As a conservative approach, the overall reduction in delay was limited to 2% for this analysis. As a result of implementing this strategy, and as shown in **Table 7**, the region's VMT and GHG would be reduced by 1.8%, accounting for 32.5 tons of daily GHG emissions.

4.7 VEHICLE MILES TRAVELED (VMT) MITIGATION BANK PROGRAM

Under a VMT Banking framework, unfunded projects that would reduce VMT if constructed, such as new transit and active transportation projects, are grouped together and their associated VMT reductions are monetized in the form of credits. These credits are then purchased for the purposes of mitigating VMT in excess of determined significant impact thresholds. The City anticipates establishing a VMT Banking program as part of its VMT Policy. The purpose of this VMT Bank will be to provide another option for development and transportation projects to mitigate VMT impacts to a less than significant after TDM and other onsite measures have been exhausted. Note that although this strategy specifically refers to VMT Banking, the ultimate program might instead be a VMT Exchange, VMT Impact Fee Program, or another fee based VMT mitigation program format. A study to determine the desired program format will be carried out in advance of implementation.

Methodology

An off-model analysis was completed to determine the reduction that a VMT Mitigation Bank program could have on vehicle miles traveled and GHG emissions by 2045. The focus of this analysis was to quantity the VMT that would need to be mitigated to reach a threshold of 16.8% below the regional average for new residential (VMT/capita) and employment based (VMT/employee) development under the preferred scenario. This value was used to establish a reasonable regional VMT and GHG percent reduction that can be attributed to the VMT Bank/Exchange's implementation. For the purposes of establishing a conservative value, the following was also assumed:

- Only new development that is anticipated to occur by 2045 was considered in this analysis.
- It was assumed that participation in the VMT Bank would be capped at 20%, irrespective of the amount of VMT that may be required to mitigate a future development. This was done to maintain a conservative estimate as to the limits of feasible mitigation based on the assumption that it may not be financially feasible to fully mitigate all development projects requiring mitigation.
- Employment-based VMT analysis was limited to an evaluation of employee commute trips only.



Traveled Analysis

Palmdale Vehicle Miles

As described earlier, the majority of the employment VMT that is over the threshold is within the Plant 42 area of the City. Due to the unique characteristics of the Plant 42 area, the commute travel patterns are not necessarily well represented in the travel demand model. Also due to its specific restrictions, the VMT reduction strategies may not be fully applicable for this area depending on specific regulatory requirements.

The anticipated VMT reduction that will result from the implementation of a VMT Mitigation Bank is summarized in **Table 7**. As shown, for the total reduction estimated for this strategy is 88,745 VMT. For the purposes of analysis, it is assumed that the resultant VMT reduction as compared to the total daily regional VMT would be the same for GHG emissions.

VMT Reduction Summary - 2045	Quantity
Residential	
2045 New Households over Threshold	2,155
2045 Total Residential VMT over Threshold	43,178
2045 Estimated Residential VMT to be Mitigated (20%	26,436
Employment	
2045 New Employment over Threshold	25,923
2045 Total Work VMT over Threshold	159,823
2045 Total Work VMT over Threshold - Plant 42	85,864
2045 Estimated Work VMT to be Mitigated (20% Max)	62,309
Total	
2045 Estimated VMT to be Mitigated (20% Max)	88,745

Table 7: Estimate of VMT Reduction

The following Figure 7 and Figure 8 show the location and magnitude of future residential and employment growth VMT above the threshold that may require mitigation.





Figure 7: Future Residential Growth Mitigation Needs



Residential VMT > 6K

Figure 8: Future Employment Growth Mitigation Needs







As described previously, the City model was used to evaluate the land use and transportation project scenarios for the 2045 Preferred Plan as part of the Palmdale GP. The model provided VMT estimates and other performance metrics for each scenario. Despite significant improvements to the policy sensitivity and multi-modal utility of travel demand models, the effects of implementing some programs in support of some of the City's developed must still be handled by post-processing techniques/operations (Off-Model). Specifically, the model has limitations in its ability to calculate the benefits of transportation improvements/programs such as bike and pedestrian projects, rideshare programs, electrical vehicle market incentives, Transportation Demand Management and Transportation Systems Management (TDM/TSM) projects, such as ridesharing programs and Intelligent Transportation Systems (ITS), respectively.

As shown in **Table 8** By applying off-model strategies, the benefits of GHG reducing programs included in the plan, which could not be estimated by the Travel Demand Model, were accounted for.

STP Strategy	Quantification Approach	2017 Existing	2045 Preferred Plan	
Population	GP Forecast	188,488	225,692	
Total Auto VMT	Travel Demand	7,699,173	7	,387,266
Initial GHG Results (Transportation)		GHG (tons)	GHG (tons)	GHG Change (%)
GHG Scenario Results	EMFAC 2021	2,912	1,779	-38.9%
Off-Model Reductions			GHG (tons)	GHG Change (%)
Bicycle Projects	Off-Model	-	-1.4	-0.1%
Transit Improvements	Off-Model	-	-12.5	-0.7%
Electric Vehicle Infrastructure Charging Incentive Program	Off-Model	-	-4.0	-0.2%
Transportation System Management/Intelligent Transportation Systems	Off-Model	-	-32.5	-1.8%
Metro Van Pool Program	Off-Model	-	-1.4	-0.1%
Employer Trip Reduction	Off-Model	-	-82.2	-4.6%
VMT Banking/Exchange	City Model/Off- Model	-	-21.4	-1.2%
Results		GHG (tons)	GHG (tons)	GHG Change (%)
Total Off Model GHG Reduction	-	-155.4	-8.7%	
Total Emissions per Weekday (2,912	1624	-	

Table 8: Daily Transportation GHG Reduction Quantification







