Agenda Item No. 9C
January 26, 2021

TO: Honorable Mayor and City Council
Attention: Aaron Busch, City Manager

FROM: Girum Awoke, Public Works Director
Fred Buderi, Acting Community Development Director
(Gwen Owens, City Traffic Engineer; Christina Love, Senior Planner)

SUBJECT: STUDY SESSION ON POTENTIAL STRATEGIES RELATED TO VEHICLE MILES TRAVELED (VMT) AND THE ENERGY AND CONSERVATION ACTION STRATEGY (ECAS)

BACKGROUND:

As of July 1, 2020, any project subject to the California Environmental Quality Act (CEQA) is required to address potential impacts related to vehicle miles traveled (VMT). The City proposes to update its General Plan Transportation Element policies to implement the VMT analysis metric and to be consistent with the recommendations of California Office of Planning and Research (OPR). The City will also be updating the City's Energy and Conservation Action Strategy (ECAS) to include measures that will help reduce VMT, as transportation directly relates to greenhouse gas (GHG) emissions. These actions together comprise the "project."

This presentation will address VMT and the ECAS, and how they relate to development. The first part will provide more background about VMT and the City's travel demand model. The second part will provide more information about Transportation Demand Management (TDM) strategies and their effectiveness in reducing VMT. The third part will describe how the General Plan Update and the Draft Supplemental Environmental Impact Report (DSEIR) will implement State policies for reducing VMT and Greenhouse Gas Emissions (GHG), and how the project will facilitate the community's General Plan and land development review process. Lastly, the presentation will provide background, information, and categories of strategies for the ECAS. This presentation will be both technical in nature, addressing questions received during Planning Commission study sessions, and process-oriented, describing how separate VMT and Level of Service (LOS) policies will continue to be applied when land development proposals are reviewed. Much of the presentation will be led by the City's VMT consultant – John Gard with Fehr & Peers Transportation Consultants; and the City's ECAS consultants – Brian Grattidge and Rose Newberry with Dudek.

A variety of exhibits have also been attached to this staff report for additional information and background. These same attachments were provided to the Planning Commission at two Commission Study Sessions held on January 5, 2021; and January 19, 2021.

HISTORY:

In 2014, the state legislature adopted a new metric for measuring traffic impacts on the environment, called VMT. The state directed the OPR to update and revise the CEQA Guidelines to define the VMT metric, define thresholds, and create new guidelines to be implemented in the review of any new project that is subject to CEQA. The purpose for the dramatic change is the State's continued efforts to better address and reduce GHG emissions by means of limiting or decreasing the distance a person needs to travel in a vehicle in order to meet their daily living needs – hence the tracking of vehicle miles traveled.
August 2015: Vacaville City Council adopted the Environmental Impact Report for the General Plan Update and Energy and Conservation Action Strategy, and approved the new General

Plan and Energy and Conservation Action Strategy (ECAS) documents. The General Plan set the community's long-term vision for growth, economic development, and conservation of the natural environment.

July 1, 2020: Senate Bill (SB) 743 went into effect. This bill required the California Office of Planning and Research to revise the California Environmental Quality Act (CEQA) Guidelines to revise analysis of traffic impacts by removing the Level of Service metric and replacing it with VMT. The City's General Plan EIR used the Level of Service method for evaluating traffic impacts of the new General Plan.

October 20, 2020: To address these changes to State planning law, the City initiated an amendment to the Transportation Element of the General Plan and to the ECAS. The amendments are changes to the General Plan documents that were analyzed for environmental impacts in the General Plan and Energy and Conservation Action Strategy Environmental Impact Report. As such, the amendments require a Supplemental Environmental Impact Report (SEIR) to analyze any new potential impacts that may be caused. The amendments would establish policies for evaluating projects based on their effect on VMT and would incorporate strategies to help new development reduce impacts to GHG emissions. The Planning Commission held a scoping hearing for the SEIR during the Notice of Preparation comment period of September 28, 2020, to October 28, 2020. The SEIR will analyze the environmental effects of the proposed General Plan Amendment to the Transportation Element to create and incorporate the new Vehicle Miles Traveled policies and actions, and of the update to the ECAS to include additional measures to reduce GHG. The Planning Commission made and received comments on the scope for staff to consider during the analysis of the amendments.

January 5, 2021: Staff presented information related to the ECAS, its importance and purpose in reducing greenhouse gases, and how strategies can be created for the City and development in an effort to reduce greenhouse gases consistent with state law. The information also included how the ECAS related to VMT.

January 12, 2021: Public Works staff and the VMT consultant – Fehr & Peers, held a lengthy meeting with Discovery Builders for a detailed and technical discussion about the specifics of the City's traffic model and guidelines. Questions related to how the model was calibrated for VMT, how VMT is calculated, and thresholds of significance for land use projects and potential mitigations.

DISCUSSION:

Vehicle Miles Traveled

The State of California has changed the rules about how traffic impacts are analyzed under CEQA. In the past, project related traffic impacts were assessed based on how new traffic would increase wait times at local intersections – Level of Service (LOS). Now, instead of analyzing how traffic changes road congestion, the traffic analysis is based on how the project changes trip lengths, measured in VMT.

In 2013, Senate Bill (SB) 743 was signed into law to promote the State's goals of encouraging infill development, alternative transportation, and reduced GHG emissions. To promote these goals, SB 743 directed the OPR to consider new methods of evaluating transportation impacts under the CEQA as an alternative to existing measures of congestion and delay (typically expressed as level-of-service). As a result of SB 743, the CEQA Guidelines were revised to identify VMT as the most appropriate metric to evaluate a project's transportation impacts. The State recommends creating strategies that support mode shift (walking, bicycling), higher vehicle occupancy (ridesharing), shorter average vehicle trips (land use planning strategies),

and transportation demand management (reducing demand for automobile use) as ways that can mitigate, or reduce VMT.

- Compared to Level of Service
  LOS describes the operating conditions experienced by roadway users, and applies quantifiable traffic measures such as average speed, intersection delays, and volume-to-capacity ratios to approximate driver satisfaction. Levels of service are designated LOS A through F, from best to worst, and are evaluated differently for different road facility types.

  The LOS standard currently provides a means to measure whether the performance of the transportation system meets the goals and vision for the city. The LOS standard is used by the City to identify needed capital improvements to accommodate growth and to define the level against which future development is evaluated.

  The standard LOS metric is referred to as "car-centric" in that it is focused on the speed/flow of the traffic. This focus results in more and/or wider roadways as a way to resolve traffic congestion issues, whereas VMT focuses on the average trip length – or ways to reach common destinations. In focusing on average trip length, measures to reduce the impact tend to focus more of how development is designed. For example, as commercial areas became more disconnected from residential neighborhoods, it is less convenient to reach these destinations by means other than a car. This can be compounded when bike paths, trails, or public transportation are not present.

  At this time, staff has not been directed by City Council to remove the LOS standard from the City's General Plan. The General Plan will also continue to use the LOS metric to measure intersection congestion since this is an important planning issue for new growth. This approach is in part due to the new-ness of VMT, and because VMT thresholds and measures have not yet been adopted. Additionally, the City's existing Capital Improvement Plan and Traffic Impact Projects list are modeled and based on the LOS standard. For the foreseeable future, projects in Vacaville will still be subject to the LOS standard of review for purposes of being consistent with the General Plan, but not for environmental analysis purposes.

  Staff and the consultants will discuss how VMT and LOS impacts may likely interface and will discuss how some other jurisdictions are doing evaluating these issues. However, per state law, VMT will be the only metric relied on for measuring environmental impacts in CEQA analysis.

  There is a correlation between VMT and the surrounding land use. Areas that are easier to traverse without the use of a personal vehicle are those that have dense population and employment, a diversity of land use mixes, are designed to be walk and bike friendly, and have close proximity to transit. These characters allow for shorter walk, bike or transit trips to access goods, services, and employment for surrounding residents. Urban areas typically have many of these characteristic, whereas suburban areas will have some but to a lesser degree.

- Interim Traffic Analysis Plan
  Interim Traffic Analysis is to follow OPR's Technical Advisory dated December 2018. This is the basis for the City's guidelines that will be followed for future GP amendments.

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Energy and Conservation Action Strategy (ECAS) and Travel Demand Management (TDM)

Additionally, staff will present potential ECAS polices and strategies for reducing greenhouse gas emissions generated by and in the city. Staff seeks comments and input on the direction of the actions and strategies.

Over the past several years, California's State legislature has adopted a series of laws mandating reductions in GHG emissions. In response to the targets set by State legislators, as well as to make Vacaville a more sustainable city, the ECAS was adopted concurrently with the updated General Plan in 2015. The ECAS includes a long-range strategy to reduce GHG emissions and achieve greater conservation of resources with regard to transportation and land use, energy, water, solid waste, and open space to align with the state's goal of reducing statewide GHG emissions.

CEQA required the General Plan EIR to identify and mitigate, to the extent feasible, all significant environmental impacts caused by implementation of the General Plan. Since the General Plan would allow development that would generate an increase in GHG emissions, resulting in significant environmental impacts related to this increase in emissions, the City identified mitigation measures in the form of GHG reduction measures in the ECAS.

The ECAS is required to be reviewed and updated, where necessary, every five years. Since there is an inextricable link between transportation and GHG emissions, staff is taking the opportunity to update the ECAS simultaneously with the updated Transportation Element VMT policies. This course will also ensure that the ECAS best captures and mitigates for impacts as they may relate to the new metric of VMT.

- ECAS Relationship to Planning Commission Actions
  The Planning Commission plays a central role in the planning process in three important ways. First, the Commission assures that the General Plan is implemented by reviewing development applications on a case-by-case basis for consistency with the General Plan. Second, in some circumstances, the Commission acts as a recommending body to the main governing body on planning and development issues. Third, in other circumstances, the Commission functions as the decision-making body for project proposals. The main governing documents the Planning Commission relies on are the General Plan, Municipal Code – Land Use and Development Code, any applicable policy plans/specific plans and the ECAS.

  The ECAS is evaluating future development within Vacaville, pursuant to CEQA. It serves as the CEQA threshold of significance for GHG emissions by which all applicable developments within the city are reviewed. Because Planning Commission is the responsible body for reviewing development projects based on consistency with the General Plan and ECAS, Commissioners are responsible for reviewing staff's recommendation on a project and how the ECAS was applied. New development projects should incorporate ECAS measures to implement in the design to mitigation GHG impacts.

- ECAS Relationship to City Council
  Any development project, private or public, is required to be consistent with the General Plan and ECAS. As such, similar to Planning Commission, City Council is also

responsible for considering staff's recommendation on a project's consistency with the General Plan and ECAS.

Many projects are first reviewed by Planning Commission, then sent to City Council with a recommendation for an action by Planning Commission. Some projects are only required to be reviewed by City Council – most often, these are city improvement projects that are part of the approved CIP list and budget. However, all projects must comply with the General Plan and ECAS.

Supplemental Environmental Impact Report

The project is an amendment to the 2015 General Plan and ECAS. Both the General Plan and ECAS were certified through an Environmental Impact Report with statements and findings of overriding consideration for impacts that could potentially be significant and unavoidable. In amending the General Plan and updating the ECAS, an updated environmental analysis must also be completed. For this project, a supplemental environmental impact report (SEIR) will focus on analysis of new potential environmental impacts caused by changes proposed to the Transportation Element related to VMT, and to any changes to the ECAS.

In doing a SEIR for VMT and the ECAS, environmental review of future development within Vacaville that is consistent with the General Plan may be able to rely on the original EIR and the SEIR instead of doing repetitive analysis for each individual project. This form of streamlining is encouraged by CEQA §15183.

The SEIR is anticipated to be released for the 45-day public review and comment period in mid-February. It is possible that the SEIR may include significant and unavoidable impacts – much like the original EIR. However, the goal of this process is to streamline future development projects that are consistent with the General Plan.

CONCLUSIONS & RECOMMENDATION

Staff anticipates the completion of the draft General Plan Amendment and ECAS Update and the public release of the SEIR by mid-February. City Council and community comments at this study session will assist the project team in preparing the draft policies and strategies to incorporate VMT reduction strategies into the City's planning process. Staff will hold a public comment hearing at the Planning Commission to receive public comments on the policies and strategies, and on the SEIR analysis during a 45-day public review period for the environmental analysis. Additional public notice of all meetings will be provided prior to publication of the SEIR.

Staff requests that the City Council receive the information, and provide direction regarding the types of strategies and actions to include in the proposed amendments to the Energy and Conservation Action Strategy and the General Plan Transportation Element policies and actions. Attachments 2, 3, 4, 5, and 6 provide further background and include examples of possible strategies for discussion.

FISCAL IMPACT:

Amount Requested: There are no funds being requested at this time.

Funding Source: Not applicable

Budget Distribution: Not applicable

ATTACHMENTS:

Attachment 1: Interim SB 743 Implementation Guidelines for City of Vacaville
Attachment 2: City of Vacaville Screening Maps
Attachment 3: Introduction of the City's Current Energy and Conservation Action Strategy
Attachment 4: Education and Background Memorandum on the Energy and Conservation Action Strategy
Attachment 5: California Air Pollution Control Office Association's Chart 6-2: Transportation Category from *Quantifying Greenhouse Gas Mitigation Measures*.
Attachment 6: Example VMT Strategies from City of Santa Clara
Attachment 7: Link to ECAS website: https://www.ci.vacaville.ca.us/government/community-development/advanced-planning/adopted-plans/general-plan/energy-and-conservation-action-strategy
Attachment 8: Link to General Plan: https://www.ci.vacaville.ca.us/government/community-development/advanced-planning/adopted-plans/general-plan/general-plan-documents

ATTACHMENT 1

Interim

SB 743 Implementation Guidelines for

City of Vacaville

January 2021

Prepared By:

FEHR PEERS

Prepared for:

City of Vacaville

I. INTRODUCTION

This report presents recommendations for implementing Senate Bill (SB) 743 in the City of Vacaville. This report, which has been written in plain English for non-technical persons, is organized into the following chapters:

- *Chapter I (Introduction)* – describes background information on SB 743, relevant CEQA Guidelines, and a simple definition of Vehicle Miles of Travel (VMT).
- *Chapter II (VMT Calculations)* – presents VMT calculations by land use type using the City of Vacaville base year and cumulative year travel demand models.
- *Chapter III (Proposed VMT Thresholds of Significance for Land Use Projects)* – presents specific thresholds of significance the City may consider using when evaluating land use projects under CEQA including project types that are presumed to be less-than-significant.
- *Chapter IV (Proposed VMT Thresholds of Significance for Roadway Projects)* – presents specific thresholds of significance the City may consider using when evaluating roadway projects under CEQA including project types that are presumed to be less-than-significant.
- *Chapter V (Mitigation Measures and Updates)* – discusses mitigation measure opportunities to offset the significance of significant land use or roadway project transportation impacts, and updates to the significance criteria and VMT thresholds.

Background

On September 27, 2013, Governor Jerry Brown signed SB 743 into law and started a process intended to fundamentally change transportation impact analysis as part of CEQA compliance. These changes include elimination of *auto delay, level of service (LOS), and other similar measures of vehicular capacity or traffic congestion* as a basis for determining significant impacts. The law directed the Governor's Office of Planning and Research (OPR) to update the CEQA Guidelines to include new criteria (e.g., metrics) for determining the significance of transportation impacts.

OPR selected VMT as the transportation impact metric, recommended its application statewide, and submitted updates to the CEQA Guidelines that were certified by the Natural Resources Agency in December 2018. The requirements of SB 743 became effective statewide on July 1, 2020.

To help aid lead agencies with SB 743 implementation, OPR produced the *Technical Advisory on Evaluating Transportation Impacts in CEQA* (December 2018). The *Technical Advisory* helps lead agencies think about the variety of implementation questions they face with respect to shifting to a VMT metric. The guidance is not a recipe for SB 743 implementation since lead agencies must still make their own specific decisions about methodology, thresholds, and mitigation.

OPR hosted a series of webinars in Spring 2020, in which they provided verbal interpretations and clarifications of the Te*chnical Advisory*. Fehr & Peers regularly attends these webinars and notes these staff interpretations such that their latest guidance is reflected in reports such as this.

Intent of SB 743

The following two legislative intent statements are contained in the SB 743 statute:

1) Ensure that the environmental impacts of traffic, such as noise, air pollution, and safety concerns, continue to be properly addressed and mitigated through the CEQA.

2) More appropriately balance the needs of congestion management with statewide goals related to infill development, promotion of public health through active transportation, and reduction of greenhouse gas emissions.

These statements are important because they provide direction to OPR and to lead agencies. For OPR, the direction is largely about what the new metrics should achieve. For lead agencies, the direction is about expected changes in transportation analysis plus what factors to consider for significance thresholds.

SB 743 does not prevent a city or county from continuing to analyze delay or LOS as part of other plans (i.e. the general plan), fee programs, or on-going network monitoring, but these metrics will no form a determination of significant impacts under CEQA. Cities or counties can still use vehicle LOS outside of the CEQA process if they determine it is an important part of their transportation analysis process. The most common applications will likely occur for jurisdictions wanting to use vehicle LOS to size roadways in their general plan or determine nexus relationships for their impact fee programs. Jurisdictions can also continue to condition projects to build transportation improvements through the entitlement process (i.e., conditions of approval) in a variety of ways, such as using general plan policy consistency findings.

Relevant CEQA Guidelines

This section presents the precise language contained in the most recent CEQA guidelines pertaining to this topic.

CEQA Section 15064.3 (Determining the Significance of Transportation Impacts)

This section defines VMT as "the amount and distance of automobile travel attributable to a project". It describes certain conditions (e.g., proximity to a transit stop) for land use projects that should be presumed to cause a less than significant transportation impact. It concludes that projects that decrease VMT compared to existing conditions should be presumed to have a less than significant transportation impact.

> ***New*** **Section 15064.3. Determining the Significance of Transportation Impacts.**
>
> **(a) Purpose.**
>
> **This section describes specific considerations for evaluating a project's transportation impacts. Generally, vehicle miles traveled is the most appropriate measure of transportation impacts. For the purposes of this section, "vehicle miles traveled" refers to the amount and distance of automobile travel attributable to a project. Other relevant considerations may include the effects of the project on transit and non-motorized travel. Except as provided in subdivision (b)(2) below (regarding roadway capacity), a project's effect on automobile delay shall not constitute a significant environmental impact.**
>
> **(b) Criteria for Analyzing Transportation Impacts.**
>
> **(1) Land Use Projects. Vehicle miles traveled exceeding an applicable threshold of significance may indicate a significant impact. Generally, projects within one-half mile of either an existing major transit stop or a stop along an existing high quality transit corridor should be presumed to cause a less than significant transportation impact. Projects that decrease vehicle miles traveled in the project area compared to existing conditions should be presumed to have a less than significant transportation impact.**

CEQA Section 15064.3, Part 4

This section states that the lead agency has the discretion to choose the most appropriate methodology for evaluating a project's VMT.

> **(4) Methodology. A lead agency has discretion to choose the most appropriate methodology to evaluate a project's vehicle miles traveled, including whether to express the change in absolute terms, per capita, per household or in any other measure. A lead agency may use models to estimate a project's vehicle miles traveled, and may revise those estimates to reflect professional judgment based on substantial evidence. Any assumptions used to estimate vehicle miles traveled and any revisions to model outputs should be documented and explained in the environmental document prepared for the project. The standard of adequacy in Section 15151 shall apply to the analysis described in this section.**
>
> **(c) Applicability.**
>
> **The provisions of this section shall apply prospectively as described in section 15007. A lead agency may elect to be governed by the provisions of this section immediately. Beginning on July 1, 2020, the provisions of this section shall apply statewide.**

CEQA Guidelines Section 15064.7 (Thresholds of Significance)

This section encourages public agencies to develop and publish thresholds of significance to be used in determining the significance of environmental effects. This report and its recommended significance thresholds, which are supported by substantial evidence, will ultimately be reviewed and adopted by the City of Vacaville City Council.

> **§ 15064.7. Thresholds of Significance.**
>
> (a) ~~**Each public agency is encouraged to develop and publish thresholds of significance that the agency uses in the determination of the significance of environmental effects.**~~ A threshold of significance is an identifiable quantitative, qualitative or performance level of a particular environmental effect, non-compliance with which means the effect will normally be determined to be significant by the agency and compliance with which means the effect normally will be determined to be less than significant.
>
> (b) **Each public agency is encouraged to develop and publish thresholds of significance that the agency uses in the determination of the significance of environmental effects.** Thresholds of significance to be adopted for general use as part of the lead agency's environmental review process must be adopted by ordinance, resolution, rule, or regulation, and developed through a public review process and be supported by substantial evidence. **Lead agencies may also use thresholds on a case-by-case basis as provided in Section 15064(b)(2).**

Technical Advisory on Evaluating Transportation Impacts in CEQA

The 26-page *Technical Advisory* provides guidance for how professional planners and CEQA practitioners should approach SB 743 implementation including recommendations regarding assessment of VMT, thresholds of significance, and mitigation measures.

Page 1 of the document states the following:

- The *Technical Advisory* does not alter lead agency discretion in preparing environmental documents subject to CEQA.
- The *Technical Advisory* should not be construed as legal advice.
- OPR is not enforcing or attempting to enforce any part of the recommendations.

Given the length, technical depth, and wide range of topics addressed in the *Technical Advisory*, it is not summarized here. However, it is cited frequently in the following chapters.

VMT 101

This subsection presents a high level overview of what VMT is and what it is not.

1. By definition, one (1) VMT is defined as one mile driven by a vehicle (regardless of the number of occupants).
2. VMT is commonly expressed as a daily value (in miles) for a typical weekday when schools are in session.
3. All VMT metrics presented in this report comprise all components of vehicle travel (i.e., all vehicle types and trip purposes). Consistent with the *Technical Advisory,* VMT estimates do not truncate trips at political or model boundaries. Chapter III discusses the VMT calculations in more detail.

While VMT is a useful metric for quantifying the efficiency of a given mix of land uses and roadway network enhancements, it is not a direct measure of congestion or delay.

The following link provides a brief instructional video further defining VMT: http://www.fehrandpeers.com/sb743/

II. VMT CALCULATIONS

This chapter presents the VMT calculations that were performed for the City of Vacaville using its base year and cumulative year travel demand model.

City of Vacaville Travel Demand Model

The City of Vacaville travel demand model has a base year of 2015 and a cumulative year corresponding to 2050. It is a traditional three-step (trip generation, distribution, assignment) model that covers the entire City. The roadways and freeways that provide access to the City (e.g., I-80, I-505, Peabody Road, etc.) are coded as external gateways.

Table 1 displays the land use totals within the City for primary land use types under the base and cumulative models. As shown in the table below, the City is anticipating a substantial increase in office and industrial land uses and moderate increases in single- and multi-family dwelling units, highway commercial, general retail, and warehouse land uses. The net result of this growth is a better match between jobs and housing.

Table 1 –
City of Vacaville Land Use Totals

	Base Year (2015)	Cumulative (2050)	
Land Use Type	**DU's or KSF**	**DU's or KSF**	**Percent Increase**
Single-Family Units	24,867	34,476	39%
Multi-Family Units	7,187	10,197	42%
Age-Restricted Units	2,707	2,790	3%
Office	928	3,165	240%
Highway Commercial	1,491	2,499	68%
General Retail	7,186	10,927	52%
Industrial	3,751	11,744	213%
Warehouse	4,385	6,346	45%
Students	15,648	23,147	48%

Note: Land use comparison limited to land uses within the City that are the primary trip generators.
Source: City of Vacaville travel demand model.

VMT Calculation Details

Prior to presenting any specific outputs from the model for land use projects, it is important for users to understand how VMT is being estimated and what the values represent. The following four points are particularly important for readers' comprehension of the VMT estimates:

1. **Residential VMT represents "home-based trip productions" only** – As the Vacaville model is a trip-based model, it is not possible to associate non-home-based (NHB) trips back to an individual household (though NHB trips are included in the model). Thus, all residential VMT is associated with trip productions at the home (e.g., to work, to shop, to school, to recreate, etc.). Additionally, the small proportion of home-based trips that are "attractions" (e.g., pizza delivery, UPS delivery, etc.) are excluded due to complexity of tracking this particular metric. Since the exclusion is applied for all residential uses and is linear in nature, it does not affect residential VMT efficiency.

2. **VMT estimates reflect the full length of trips that enter/exit the City** – some trips produced or attracted by land uses in Vacaville have trip origins or destinations outside the City (e.g., in Sacramento, Fairfield, Bay Area, etc.). The entire length of these trips is reflected in the VMT estimates by virtue of "appending external trip lengths" to those trips that have an origin/destination at a model gateway. For instance, a home-based-work trip by a Vacaville resident who works in Vallejo would generate perhaps three miles of travel within the Vacaville City limits and 20 miles of travel (one-way) outside of the City to reach Vallejo. Hence, the full length of the trip, 23 miles, would be captured in that household's VMT.

3. **VMT estimates reflect travel by all vehicle types** – The *Technical Advisory* frequently cites "automobile travel" versus trips made by all vehicle types. The automobile travel reference applied to activity based models, in which the number of tours made by all members of a household or office building employees can be tracked, thereby allowing deliveries and heavy vehicle trucks to be excluded. This is not possible with trip-based models. Therefore, the VMT estimates shown here represent all types of trips ranging from private vehicles, deliveries, and heavy vehicles.

4. **VMT efficiency is expressed on a "per dwelling unit" and "per KSF" by land use type basis** – During webinars in May 2020, OPR staff expressed a preference for using these types of metrics over others (which are cited in the *Technical Advisory*) such as 'per capita' and 'per service population'. The rationale for expressing transportation efficiency using these metrics is that it focuses on the relative efficiency of the placement of a given type of land use within a city. In contrast, the 'per capita' and 'per service population' metrics have been shown to create 'winners and losers' based on specific land use travel behavior, which may not be aligned with the intent of SB 743.

VMT Calculations

Table 2 displays the average VMT per dwelling unit and KSF for various land uses within the City of Vacaville from the base and cumulative year versions of the City of Vacaville travel demand model. The results in Table 2 make sense intuitively for base year conditions:

- The single-family average of 86 VMT per unit is heavily influenced by the 74 percent of Vacaville employed persons who commute to workplaces outside the City. Those long-distance commutes (i.e., over 30 miles one-way on average) are contributing to this VMT result.
- The average VMT per multi-family unit is about two-thirds of the single-family unit average VMT. This result is reasonable based on the same ratio of multi-family to single-family daily trips (i.e., 6.5 versus 9.5, a one-third reduction).
- Age-restricted units generate much lower levels of VMT than the other uses for two reasons. First, they generate fewer daily trips, and second, relatively few of those trips are for commute purposes.
- Highway commercial has greater VMT generation rates than standard retail due primarily to its greater daily trip generation rate and the nature of trips along I-80, which are often long distance.
- Industrial and warehouse have relatively low VMT per KSF based on the majority of their buildings being used for storage, manufacturing, etc.

Table 2 –
Average VMT per DU and KSF for Land Uses within the City of Vacaville [1]

Residential Uses			Non-Residential Uses		
	VMT Per Dwelling Unit			VMT Per KSF	
Use	Base Year (2015)	Cumulative (2050)	Use	Base Year (2015)	Cumulative (2050)
Single-Family Units	86.4	76.5	Office	90.8	83.4
Multi-Family Units	58.5	55.5	Highway Commercial	158.2	158.1
Age-Restricted Units	37.6	35	General Retail	121.5	125.1
			Industrial	34.6	28.3
			Warehouse	17.9	15.7

Notes:
[1] Derived from City of Vacaville travel demand model. Refer to previous pages for VMT calculation details.
[2] Source: Fehr & Peers, 2020.

Similarly, the cumulative year results are also reasonable as evidenced by the following:

- The VMT per single-family and multi-family dwelling unit values are lower in the cumulative year compared to the base year. These reductions are due to the increase in local employment opportunities that City is expecting in the 2050 scenario, which are shown in Table 1. Fewer residents will have to travel outside of the City to work.

The importance of producing consistent VMT estimates is described in the *Technical Advisory*, stating that "The agency should be consistent in its VMT measurement approach throughout the analysis to maintain an apples-to-apples comparison. For example, if the agency uses a home-based VMT for the threshold, it should also use home-based VMT for calculating project VMT and VMT reduction due to mitigation measures

III. PROPOSED VMT THRESHOLDS OF SIGNIFICANCE FOR LAND USE PROJECTS

This chapter presents the thresholds of significance pertaining to VMT that Vacaville will apply when analyzing the transportation impacts of land use projects under CEQA. Note that analyses of a land use project's impacts on bicycle/pedestrian facilities, transit, construction, emergency access, nonstandard design features, etc. are still permitted under SB 743.

Efficiency Threshold

Page 10 of the *Technical Advisory* states that OPR recommends that a per capita or per employee VMT that is 15 percent below that of existing development may be a reasonable threshold. Lacking any other information that would suggest a different threshold should be applied, the City of Vacaville has concluded that this threshold should be applied for land use projects in the City.

Project Screening

The *Technical Advisory* offers guidance regarding land use projects that are presumed to be less-than-significant. Here, five such project types are presented. Each project type is followed by an evaluation of its general reasonableness and defensibility under CEQA.

1. *Small Projects* – The *Technical Advisory* concludes that, absent any information to the contrary, projects that generate 110 trips per day or less may be assumed to cause a less-than-significant transportation impact. This level of trip generation equates to about 10,000 square feet of office space, 11 single-family dwelling units, or 17 multi-family dwelling units.
   Evaluation: This type of screening is generally reasonable, if not more stringent than many City Transportation Impact Study (TIS) Guidelines that typically do not even require studies unless projects generate 500 or more daily trips.

2. *Projects near Transit Stations* – projects located within ½ mile of an "existing major transit stop" or an "existing stop along a high quality transit corridor" would have a less-than-significant impact on VMT.
   Evaluation: This type of screening is also reasonable. Analysts will need to carefully determine whether the site-specific conditions meet the "major transit stop" and "high quality transit corridor" definitions. Additionally, there are specific conditions on projects that must also be met.

3. *Affordable Residential Development* – projects consisting of a high percentage of affordable housing may be assumed to cause a less-than-significant transportation impact on VMT because they may improve jobs-housing balance and/or otherwise generate less VMT than market-based units.

   Evaluation: While it is correct that affordable housing projects generate fewer trips per unit than market based units, they nonetheless would generate new VMT. At issue is whether these units should be considered as a separate land use similar to active-adult units, and then evaluated for their relative efficiency within the City (similar to how single-family and multi-family is being treated). When the City receives a development application for this type of use, a detailed evaluation of this topic should occur.

4. *Redevelopment Projects* – If a proposed redevelopment project leads to a net overall decrease in VMT (when compared against the VMT of the existing land uses), the project would lead to a less-than-significant transportation impact.

   Evaluation: This is a generally reasonable conclusion. However, in most instances, redevelopment occurs on sites that may not be operating at optimal levels (e.g., an underperforming mall or strip retail center). Hence, a question that must be answered pertains to whether the comparison should be based on the existing VMT of the site or VMT of the site if operating at full capacity. When the City receives an application to redevelop a large existing property, a detailed evaluation of this topic should occur.

5. *Local Serving Retail* – Trip lengths may be shortened and VMT reduced by adding "local-serving" retail opportunities that improve retail destination proximity. Page 17 of the *Technical Advisory* generally describes retail development including stores less than 50,000 square feet as locally-serving.

   Evaluation: This screening opportunity has generally been interpreted as applying to a retail center whose total building size does not exceed 50,000 square feet. When the City receives a development application for this type of retail use, a detailed evaluation of this project should occur for two reasons. First, a 50,000 square foot retail center would typically generate about 5,000 VMT, which is more than five times that allowed under the Small Projects definition above. Second, Page 16 of the *Technical Advisory* states that a net increase in total VMT caused by a retail project may indicate a significant transportation impact. If the hypothetical 50,000 square foot retail center had a project-generated VMT of 5,000, it is not clear whether an equivalent amount of VMT would be offset/reduced elsewhere in the City to result in no net increase in VMT.

Proposed VMT Thresholds of Significance – Residential Land Uses

For projects that do not qualify for any of the screening opportunities presented on the prior pages, the City of Vacaville will apply the following thresholds of significance when analyzing the VMT transportation impacts of residential land use projects under CEQA.

1. The project would cause a significant transportation impact if it would generate an average VMT per dwelling unit that is greater than 85 percent of the city-wide average for that land use type.
2. If the above threshold is exceeded, the project's VMT impact could still be found to be less-than-significant if it did not cause the total VMT generated by the City of Vacaville to increase.

The above calculations will be performed using the City's travel demand model for both base year and cumulative conditions. **Table 3** shows the specific thresholds for each residential land use type.

Table 3 –
Average VMT per DU Thresholds for Residential Land Uses within the City of Vacaville [1]

Use	Base Year (2015)		Cumulative (2050)	
	SB 743 VMT Threshold [2]	Average VMT Per Dwelling Unit	SB 743 VMT Threshold [2]	Average VMT Per Dwelling Unit
Single-Family Units	73.4	86.4	65.0	76.5
Multi-Family Units	49.7	58.5	47.2	55.5
Age-Restricted Units	32.0	37.6	29.8	35

Notes:
[1] Derived from City of Vacaville travel demand model. Refer to previous pages for VMT calculation details.
[2] Threshold applied here is 85 percent of the average for that land use type.
Source: Fehr & Peers, 2020.

Proposed VMT Thresholds of Significance – Non-Residential Land Uses

For projects that do not qualify for any of the screening opportunities presented on the prior pages, the City of Vacaville will apply the following thresholds of significance when analyzing the VMT transportation impacts of non-residential land use projects under CEQA.

1. The project would cause a significant transportation impact if it would generate an average VMT per KSF that is greater than 85 percent of the city-wide average for that land use type.
2. If the above threshold is exceeded, the project's VMT impact could still be found to be less-than-significant if it did not cause the total VMT generated by the City of Vacaville to increase.

The above calculations will be performed using the City's travel demand model for both base year and cumulative conditions. **Table 4** shows the specific thresholds for the most common non-residential land use types.

Table 4 –
Average VMT per KSF Thresholds for Non-Residential Land Uses within the City of Vacaville [1]

Use	Base Year (2015)		Cumulative (2050)	
	SB 743 VMT Threshold [2]	Average VMT Per KSF	SB 743 VMT Threshold [2]	Average VMT Per KSF
Office	77.2	90.8	70.9	83.4
Highway Commercial	134.5	158.2	134.4	158.1
General Retail	103.3	121.5	106.3	125.1
Industrial	29.4	34.6	24.1	28.4
Warehouse	15.2	17.9	13.3	15.7

Notes:
[1] Derived from City of Vacaville travel demand model. Refer to previous pages for VMT calculation details.
[2] Threshold applied here is 85 percent of the average for that land use type.
Source: Fehr & Peers, 2020.

Proposed VMT Thresholds of Significance – Atypical and Mixed-Use Projects

Special consideration will be necessary to analyze VMT impacts for land uses that do not fit into any of the above eight categories. Common examples are: hotels, medical centers, churches, schools/colleges, specialty retail uses, etc. These uses should be analyzed on a case-by-case basis using available information and applying the general intent of the *Technical Advisory*.

Additionally, projects that feature a mix of complementary land uses on-site should be analyzed using a technical approach geared toward the specifics of the project. The *Technical Advisory* describes two possible approaches: (1) analyze (considering internal trips) and determine significant impacts of each project component separately, or (2) consider significant impacts based on the project's dominant land use.

IV. PROPOSED VMT THRESHOLDS OF SIGNIFICANCE FOR TRANSPORTATION PROJECTS

This chapter provides an introductory discussion of how transportation projects should be evaluated under CEQA. Since this is a complex and evolving topic, only a high-level overview is provided at this point.

Technical Advisory Guidance on VMT Impacts from Transportation Projects

Pages 19- 28 of the Technical Advisory discuss a number of aspects of this topic. Following are some of the key recommendations from it:

1. *The "induced vehicle travel" caused by certain transportation projects must be quantified*. Projects that would likely lead to a "measurable and substantial" increase in vehicle travel (i.e., VMT) generally include: addition of through lanes on existing or new highways, including general purposes lanes, carpool lanes, auxiliary lanes, or lanes through grade-separated interchanges.
2. *A variety of transportation projects would not be expected to induce more vehicle travel*. The following page lists these project types, though it is noted that evidence is not provided to support that conclusion of no net VMT.
3. *A generally accepted interpretation of the Technical Advisory is that a transportation project that causes a net increase in VMT would be considered to have a significant impact*. Although a specific significance threshold is not provided in the *Technical Advisory*, it states on multiple occasions that transportation projects that do not generate additional VMT are presumed to have less-than-significant impacts. Part 2b of Section 15064.3 of the CEQA Guidelines (Determining the Significance of Transportation Impacts) states that "Transportation projects that reduce, or have no impact on VMT should be presumed to cause a less than significant transportation impact."
4. *VMT attributable to a project should represent the difference in VMT with and without the project across the full area in which driving patterns are expected to change.* VMT should be not truncated at model or jurisdictional boundaries.
5. *Mitigation for VMT impacts caused by transportation projects may include tolling new lanes, converting general purpose lanes to carpool/express lanes, funding/implementing travel demand management strategies, and implementing Intelligent Transportation Systems (ITS) strategies.*

Proposed VMT Threshold of Significance – Transportation Projects

The City of Vacaville will apply the following threshold of significance when analyzing the VMT transportation impacts of transportation projects under CEQA.

- A transportation project would cause a significant transportation impact if it would lead to induced travel and increased VMT.

- Roadway shoulder enhancements to provide "breakdown space," dedicated space for use only by transit vehicles, to provide bicycle access, or to otherwise improve safety, but which will not be used as automobile vehicle travel lanes
- Addition of an auxiliary lane of less than one mile in length designed to improve roadway safety
- Installation, removal, or reconfiguration of traffic lanes that are not for through traffic, such as left, right, and U-turn pockets, two-way left turn lanes, or emergency breakdown lanes that are not utilized as through lanes
- Addition of roadway capacity on local or collector streets provided the project also substantially improves conditions for pedestrians, cyclists, and, if applicable, transit
- Conversion of existing general purpose lanes (including ramps) to managed lanes or transit lanes, or changing lane management in a manner that would not substantially increase vehicle travel
- Addition of a new lane that is permanently restricted to use only by transit vehicles
- Reduction in number of through lanes
- Grade separation to separate vehicles from rail, transit, pedestrians or bicycles, or to replace a lane in order to separate preferential vehicles (e.g., HOV, HOT, or trucks) from general vehicles
- Installation, removal, or reconfiguration of traffic control devices, including Transit Signal Priority (TSP) features
- Installation of traffic metering systems, detection systems, cameras, changeable message signs and other electronics designed to optimize vehicle, bicycle, or pedestrian flow
- Timing of signals to optimize vehicle, bicycle, or pedestrian flow
- Installation of roundabouts or traffic circles
- Installation or reconfiguration of traffic calming devices
- Adoption of or increase in tolls
- Addition of tolled lanes, where tolls are sufficient to mitigate VMT increase
- Initiation of new transit service
- Conversion of streets from one-way to two-way operation with no net increase in number of traffic lanes
- Removal or relocation of off-street or on-street parking spaces
- Adoption or modification of on-street parking or loading restrictions (including meters, time limits, accessible spaces, and preferential/reserved parking permit programs)
- Addition of traffic wayfinding signage
- Rehabilitation and maintenance projects that do not add motor vehicle capacity
- Addition of new or enhanced bike or pedestrian facilities on existing streets/highways or within existing public rights-of-way
- Addition of Class I bike paths, trails, multi-use paths, or other off-road facilities that serve non-motorized travel
- Installation of publicly available alternative fuel/charging infrastructure
- Addition of passing lanes, truck climbing lanes, or truck brake-check lanes in rural areas that do not increase overall vehicle capacity along the corridor

Projects on Page 21 of the *Technical Advisory* that are presumed to not cause a significant transportation impact.

V. MITIGATION MEASURES AND PLAN UPDATES

This chapter provides an overview of potential mitigation measures to address significant VMT impacts. Additionally, it describes the extent to which this plan should be updated.

Overview of Mitigation Measure Strategies

Feasible mitigation measures will be recommended for land use projects that exceed the applicable VMT threshold and cause a significant impact. While an abundance of potential VMT reduction strategies exist, not all of these are applicable to suburban settings, and many have not undergone sufficient academic/technical review to demonstrate their effectiveness. In CEQA, it is important to demonstrate that any recommended mitigation measures are both feasible and effective.

Mitigation measures for VMT impacts will principally focus on modifying the project to generate less VMT, often through the implementation of transportation demand management (TDM) strategies. This is in contrast to pre-SB 743 environmental review efforts, in which significant transportation impacts were based on traffic operations and would be mitigated by typically adding roadway capacity at the impacted facilities. Since the latter solution would not reduce a project's VMT, off-site capacity-increasing improvements to address significant transportation improvements will no longer be recommended in CEQA documents (but may still be included as conditions of approval). The City's "Energy and Conservation Action Strategy" (ECAS), which pertains to City goals to reduce greenhouse gas emissions, should be also referenced for consistency when considering VMT reduction strategies and effectiveness.

Alternative approaches available to the City could include a VMT mitigation bank or impact fee program, in which a project pays a proportionate fee into the program that will fund certain improvements (e.g., bikeway projects, transit enhancements, etc.) within the City that would reduce VMT. However, these programs can be very complex, and time-intensive to establish and operate.

Like most travel demand models, the City's model is not sensitive to most policies and actions associated with TDM. For instance, it does not include a mode split component, does not consider the effects of the completeness of bicycle/pedestrian facilities on auto travel, doesn't account for parking pricing, and doesn't consider employer-sponsored TDM programs. For these reasons, it is unlikely that the City's model will be able to accurately estimate how a given set of mitigation measures will reduce VMT. However, several off-model analytical tools are available including:

- Customized VMT estimation tools have been built for a number of large jurisdictions in California including Los Angeles, San Jose, San Francisco, and a tool for the entire SANDAG (San Diego) region.

Although the applicability of those tools to Vacaville is not known, they could at least represent a starting point for analysis.

- Fehr & Peers, working in conjunction with researchers at UC Berkeley (for the ARB Zero Carbon Buildings Study) developed a spreadsheet-based tool known as TDM+ that estimates a percent reduction in VMT due to a single TDM strategy or combinations of strategies. TDM+ incorporates the effects of numerous land use and design strategies as well as various travel incentives and disincentives. TDM+ allows a user to select strategies whose reduction percentages are highly defensible and suitable for use in environmental analysis documents because they have been derived from academically prepared, peer-reviewed studies that would represent substantial evidence regarding the effectiveness of the given strategy.

Subsequent Updates to SB 743 Implementation Plan

This report should be periodically updated as necessary to reflect any of the following:

- Changes in planned/proposed land uses (both within and outside of Vacaville) that could have a substantial effect on VMT thresholds.
- Changes in the planned roadway system (both within and outside of Vacaville) that could have a substantial effect on VMT thresholds.
- Changes in state-of-the-practice or technical guidance from agencies with respect to how VMT should be calculated and/or VMT thresholds should be set.
- Changes in mobility options that could have a substantial effect on travel and VMT calculations.

The last bullet is particularly noteworthy because the City's travel demand model, like nearly all models, does not currently consider the effects of a variety of anticipated disruptions in transportation such as:

- Implementation of connected autonomous vehicles (AVs)
- Changes in travel to brick-and-mortar retail due to online shopping
- New mobility choices such as bikeshare, more widespread Transportation Network Company (TNC) saturation, and micro-mobility.

ATTACHMENT 2

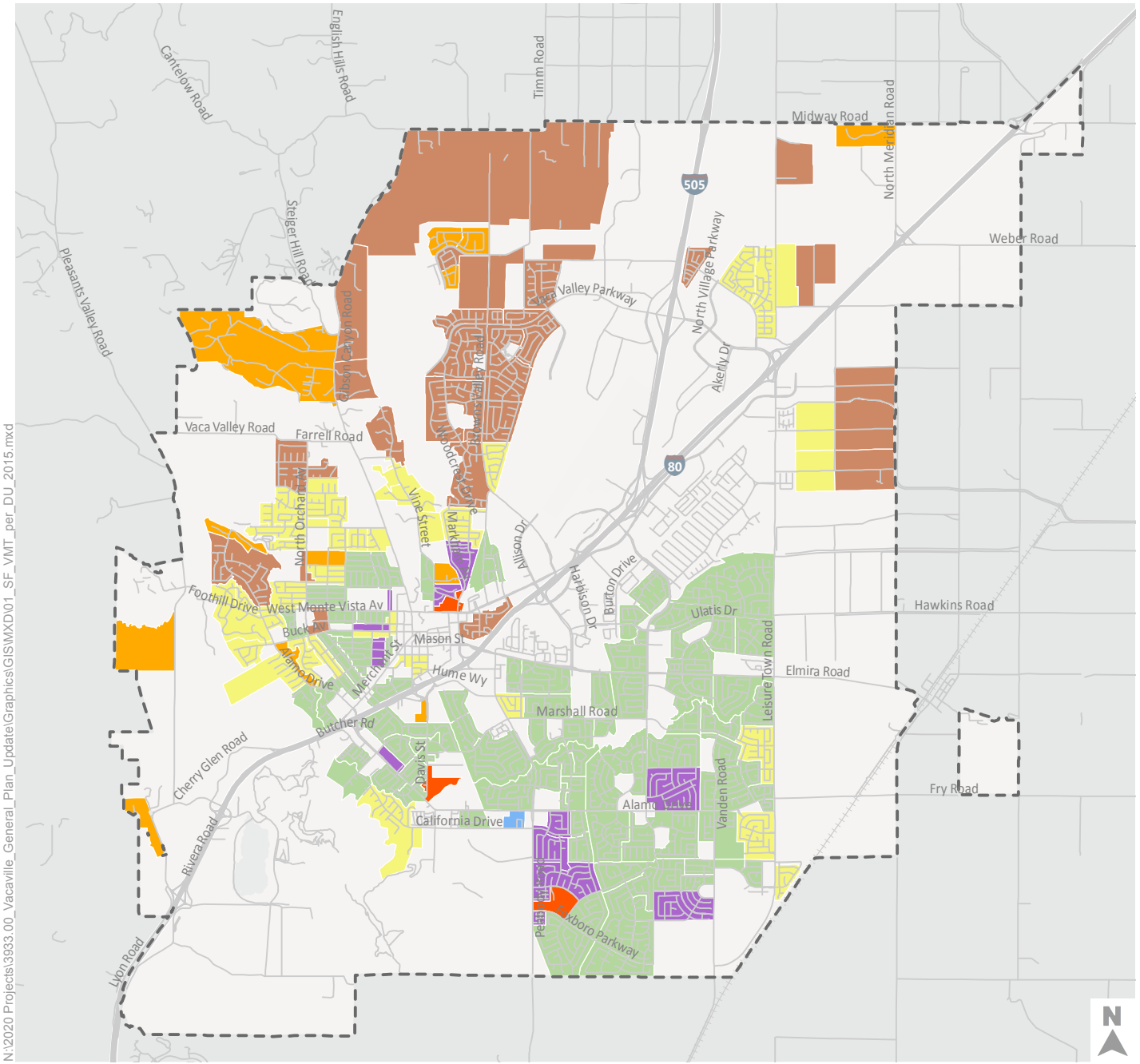

Figure 1

% Difference from Citywide Average Home-based VMT per DU (86.40)

- ≤ - 15%
- -10% to -14.9%
- -5% to -9.9%
- 0% to -4.9%
- +5% to +0.1%
- +10% to +5.1%
- +20% to +10.1%
- > +20%

Urban Growth/Model Boundary

TAZs with <10 Single Family DU

All Traffic Analysis Zones (TAZs) with at least 10 dwelling units are allocated a color according to its relative VMT efficiency to the left. In many instances, a single TAZ may include multiple land uses, which means they show VMT efficiency on multiple figures. All VMT estimates are derived from the City of Vacaville travel demand model. VMT includes all home-based weekday daily travel (with trip lengths not truncated at political boundaries).

Home-based VMT per Single Family Dwelling Unit
Base Year (2015) Conditions

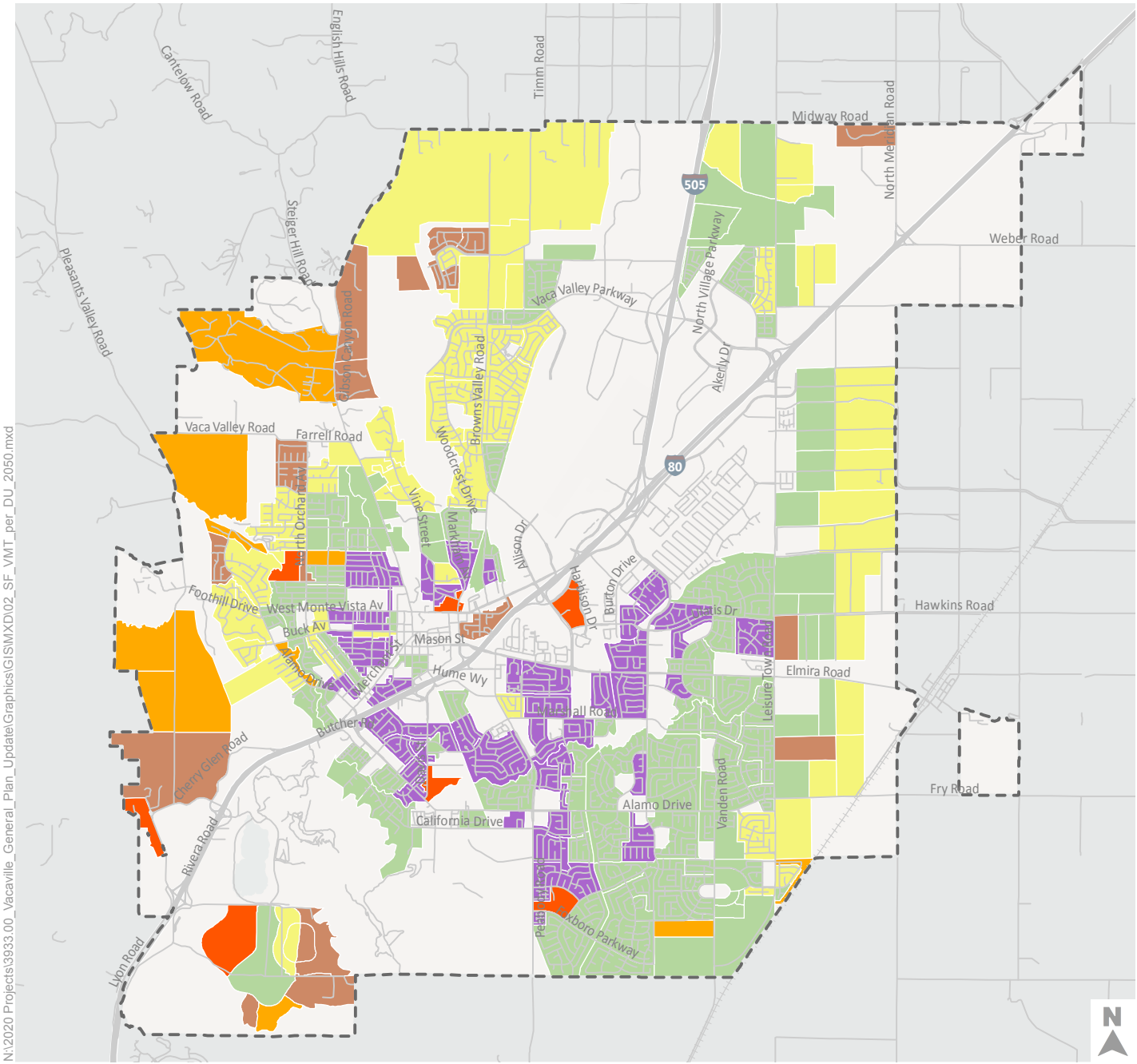

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Figure 2

% Difference from Citywide Average Home-based VMT per DU (76.54)

- ≤ -15%
- -10% to -14.9%
- -5% to -9.9%
- 0% to -4.9%
- +5% to +0.1%
- +10% to +5.1%
- +20% to +10.1%
- > +20%

Urban Growth/Model Boundary

TAZs with <10 Single Family DU

All Traffic Analysis Zones (TAZs) with at least 10 dwelling units are allocated a color according to its relative VMT efficiency to the left. In many instances, a single TAZ may include multiple land uses, which means they show VMT efficiency on multiple figures. All VMT estimates are derived from the City of Vacaville travel demand model. VMT includes all home-based weekday daily travel (with trip lengths not truncated at political boundaries).

Home-based VMT per Single Family Dwelling Unit
Buildout Minus Northeast New Growth Area Scenario

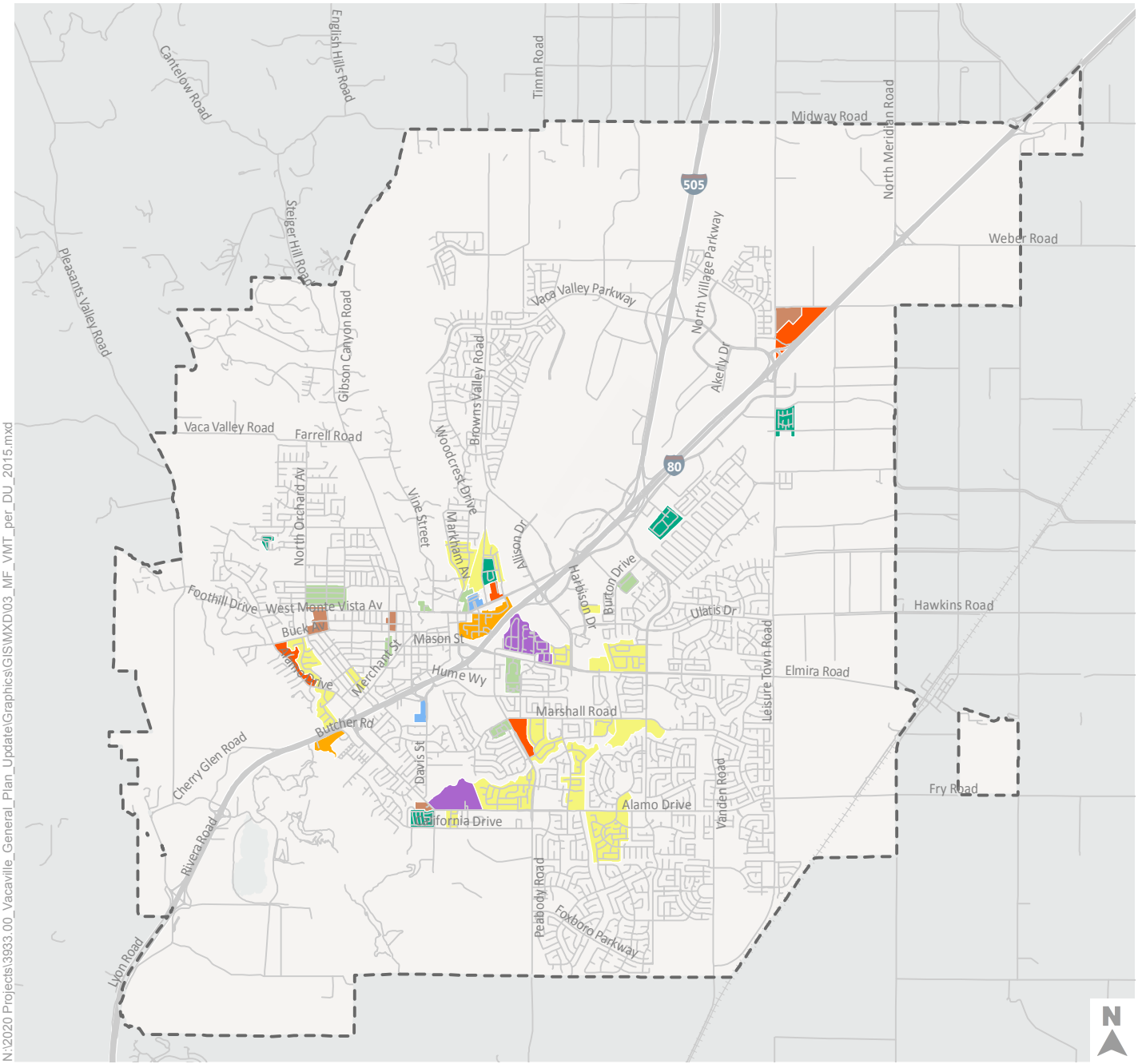

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Figure 3

% Difference from Citywide Average Home-based VMT per DU (58.49)

- ≤ -15%
- -10% to -14.9%
- -5% to -9.9%
- 0% to -4.9%
- +5% to +0.1%
- +10% to +5.1%
- +20% to +10.1%
- > +20%

Urban Growth/Model Boundary

TAZs with <10 Multifamily DU

All Traffic Analysis Zones (TAZs) with at least 10 dwelling units are allocated a color according to its relative VMT efficiency to the left. In many instances, a single TAZ may include multiple land uses, which means they show VMT efficiency on multiple figures. All VMT estimates are derived from the City of Vacaville travel demand model. VMT includes all home-based weekday daily travel (with trip lengths not truncated at political boundaries).

Home-based VMT per Multifamily Dwelling Unit
Base Year (2015) Conditions

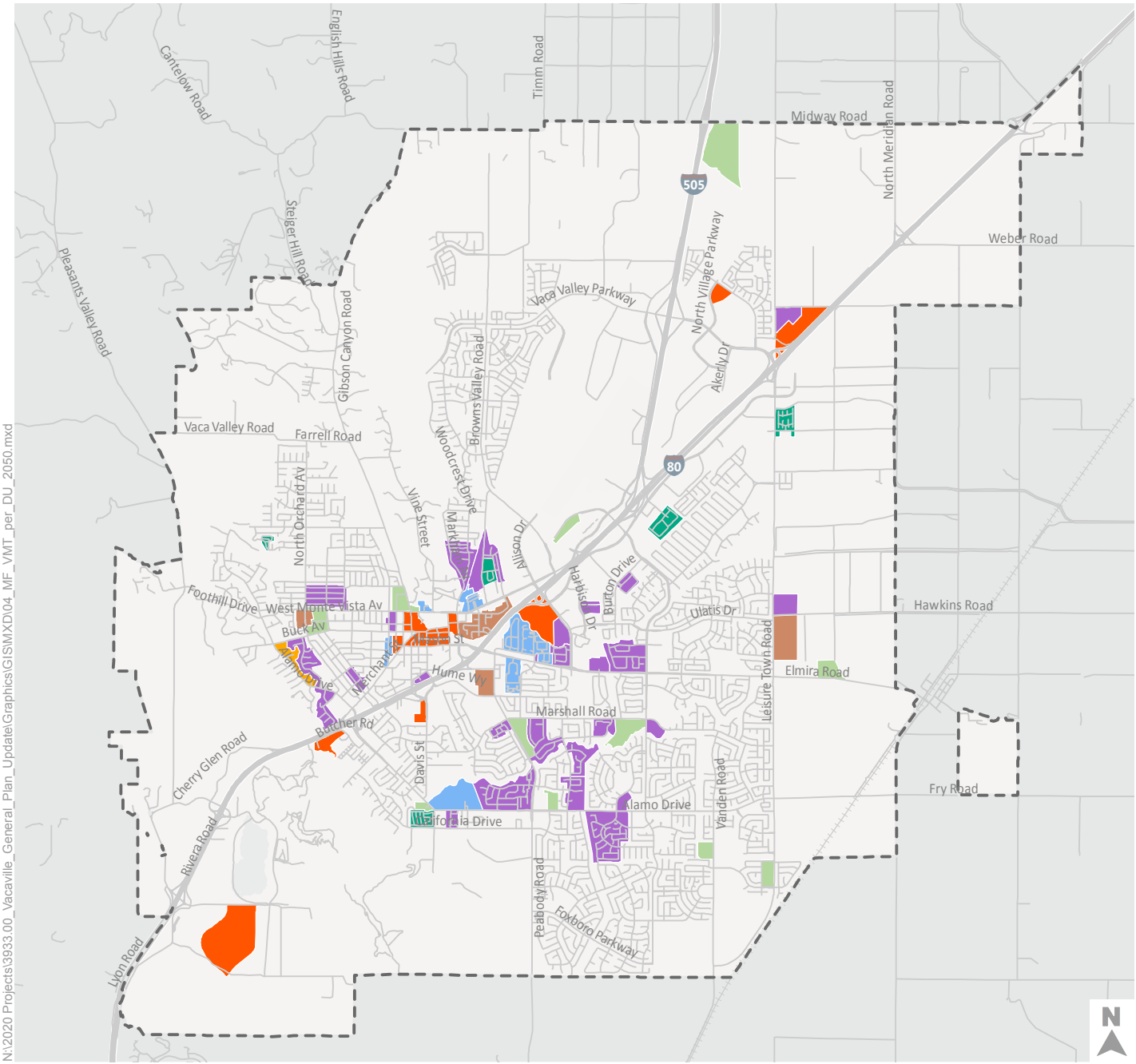

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Figure 4

% Difference from Citywide Average Home-based VMT per DU (55.49)

- ≤ -15%
- -10% to -14.9%
- -5% to -9.9%
- 0% to -4.9%
- +5% to +0.1%
- +10% to +5.1%
- +20% to +10.1%
- > +20%

Urban Growth/Model Boundary

TAZs with <10 Multifamily DU

All Traffic Analysis Zones (TAZs) with at least 10 dwelling units are allocated a color according to its relative VMT efficiency to the left. In many instances, a single TAZ may include multiple land uses, which means they show VMT efficiency on multiple figures. All VMT estimates are derived from the City of Vacaville travel demand model. VMT includes all home-based weekday daily travel (with trip lengths not truncated at political boundaries).

Home-based VMT per Multifamily Dwelling Unit
Buildout Minus Northeast New Growth Area Scenario

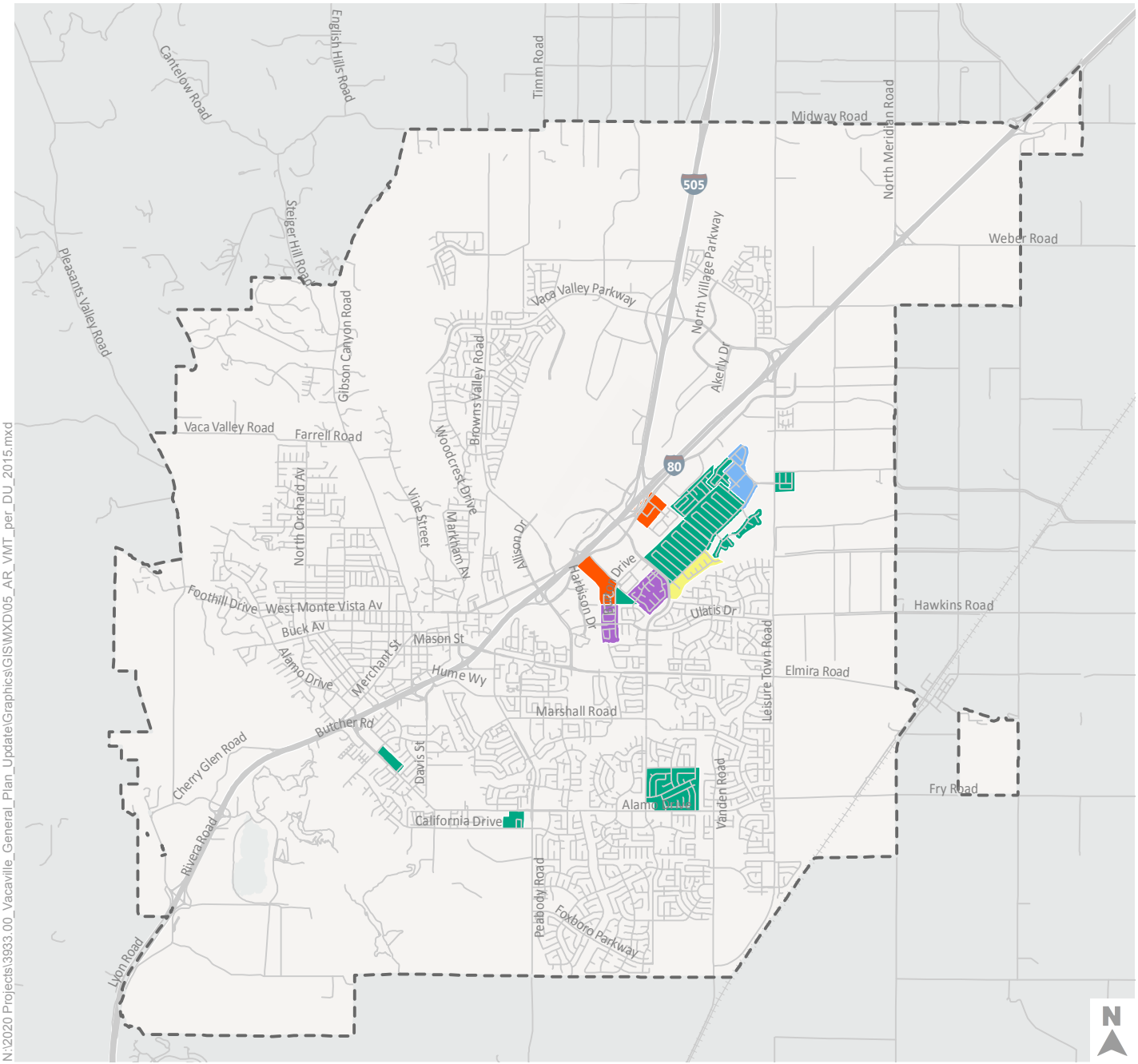

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Figure 5

% Difference from Citywide Average Home-based VMT per DU (37.62)

- ≤ -15%
- -10% to -14.9%
- -5% to -9.9%
- 0% to -4.9%
- +5% to +0.1%
- +10% to +5.1%
- +20% to +10.1%
- > +20%

Urban Growth/Model Boundary

TAZs with <10 Age-Restricted DU

All Traffic Analysis Zones (TAZs) with at least 10 dwelling units are allocated a color according to its relative VMT efficiency to the left. In many instances, a single TAZ may include multiple land uses, which means they show VMT efficiency on multiple figures. All VMT estimates are derived from the City of Vacaville travel demand model. VMT includes all home-based weekday daily travel (with trip lengths not truncated at political boundaries).

Home-based VMT per Age-Restricted Dwelling Unit
Base Year (2015) Conditions

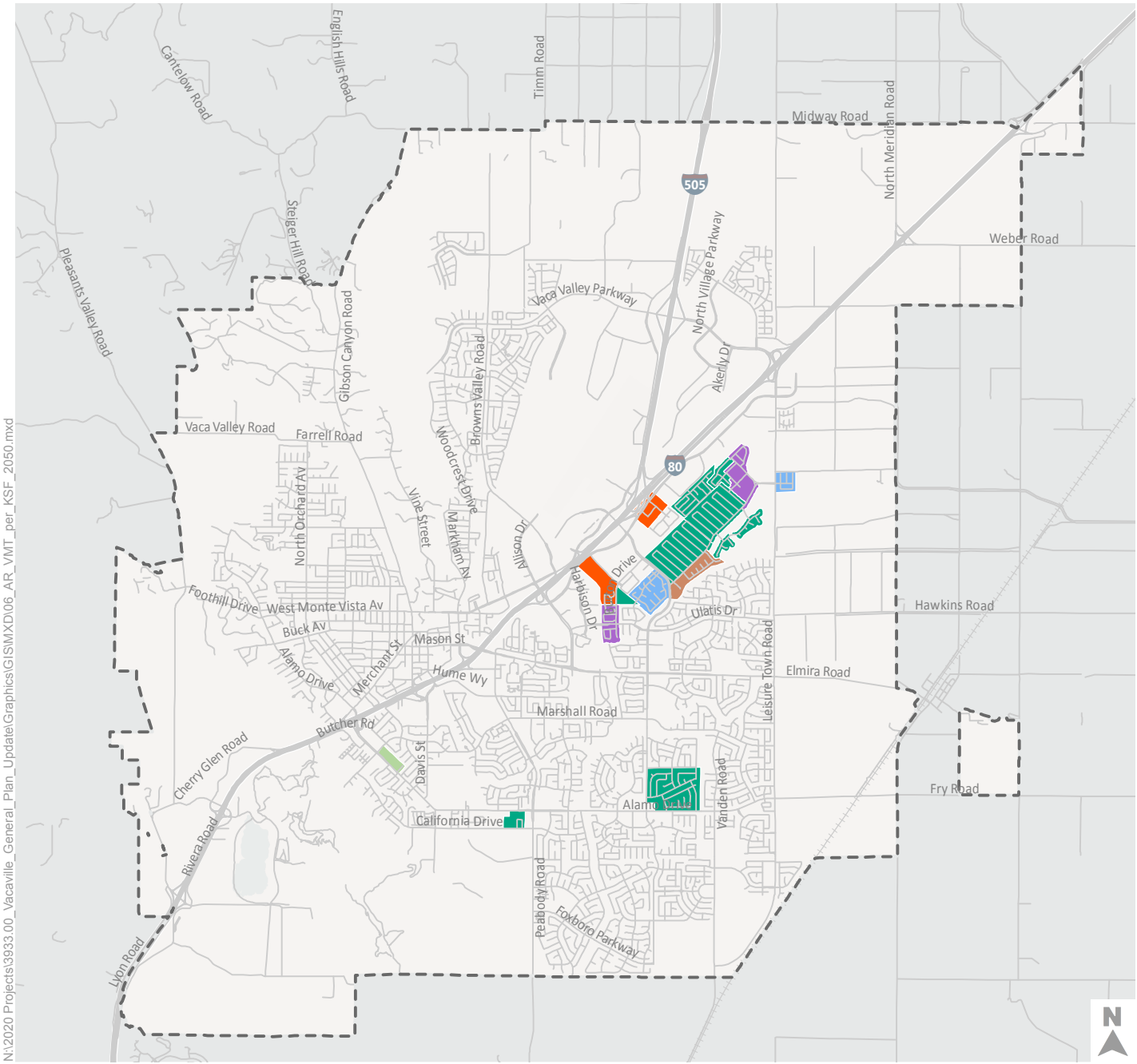

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Figure 6

% Difference from Citywide Average VMT per DU (35.00)

- ≤ -15%
- -10% to -14.9%
- -5% to -9.9%
- 0% to -4.9%
- +5% to +0.1%
- +10% to +5.1%
- +20% to +10.1%
- > +20%

Urban Growth/Model Boundary

TAZs with <10 Age-Restricted DU

All Traffic Analysis Zones (TAZs) with at least 10 dwelling units are allocated a color according to its relative VMT efficiency to the left. In many instances, a single TAZ may include multiple land uses, which means they show VMT efficiency on multiple figures. All VMT estimates are derived from the City of Vacaville travel demand model. VMT includes all home-based weekday daily travel (with trip lengths not truncated at political boundaries).

Home-based VMT per Age-Restricted Dwelling Unit
Buildout Minus Northeast New Growth Area Scenario

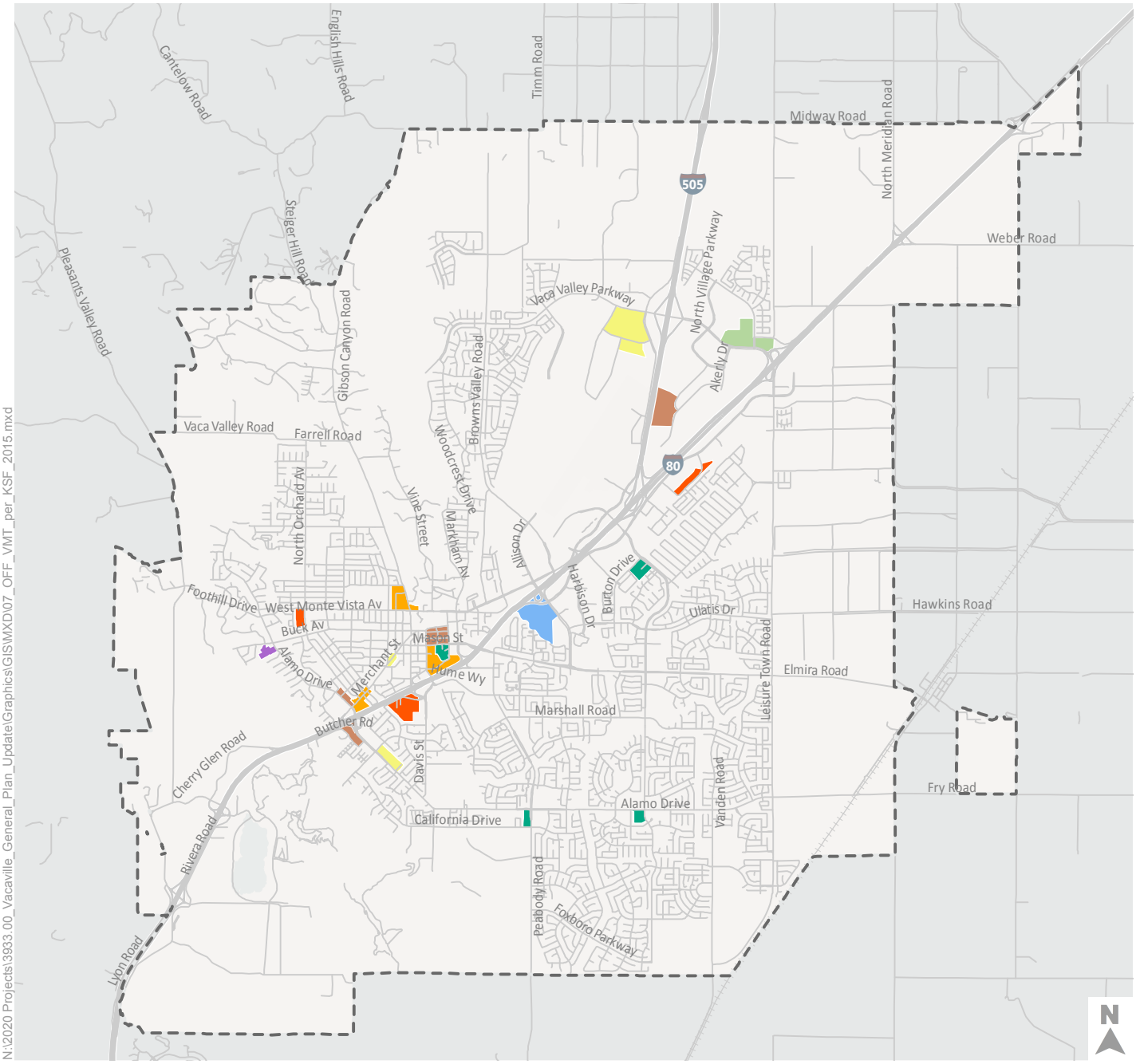

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Figure 7

% Difference from Citywide Average VMT per KSF (90.75)

- ≤ -15%
- -10% to -14.9%
- -5% to -9.9%
- 0% to -4.9%
- +5% to +0.1%
- +10% to +5.1%
- +20% to +10.1%
- > +20%

Urban Growth/Model Boundary

TAZs with <10 Office KSF

All Traffic Analysis Zones (TAZs) with at least 10 KSF are allocated a color according to its relative VMT efficiency to the left. In many instances, a single TAZ may include multiple land uses, which means they show VMT efficiency on multiple figures. All VMT estimates are derived from the City of Vacaville travel demand model. VMT includes all home-based weekday daily travel (with trip lengths not truncated at political boundaries).

VMT per Office KSF
Base Year (2015) Conditions

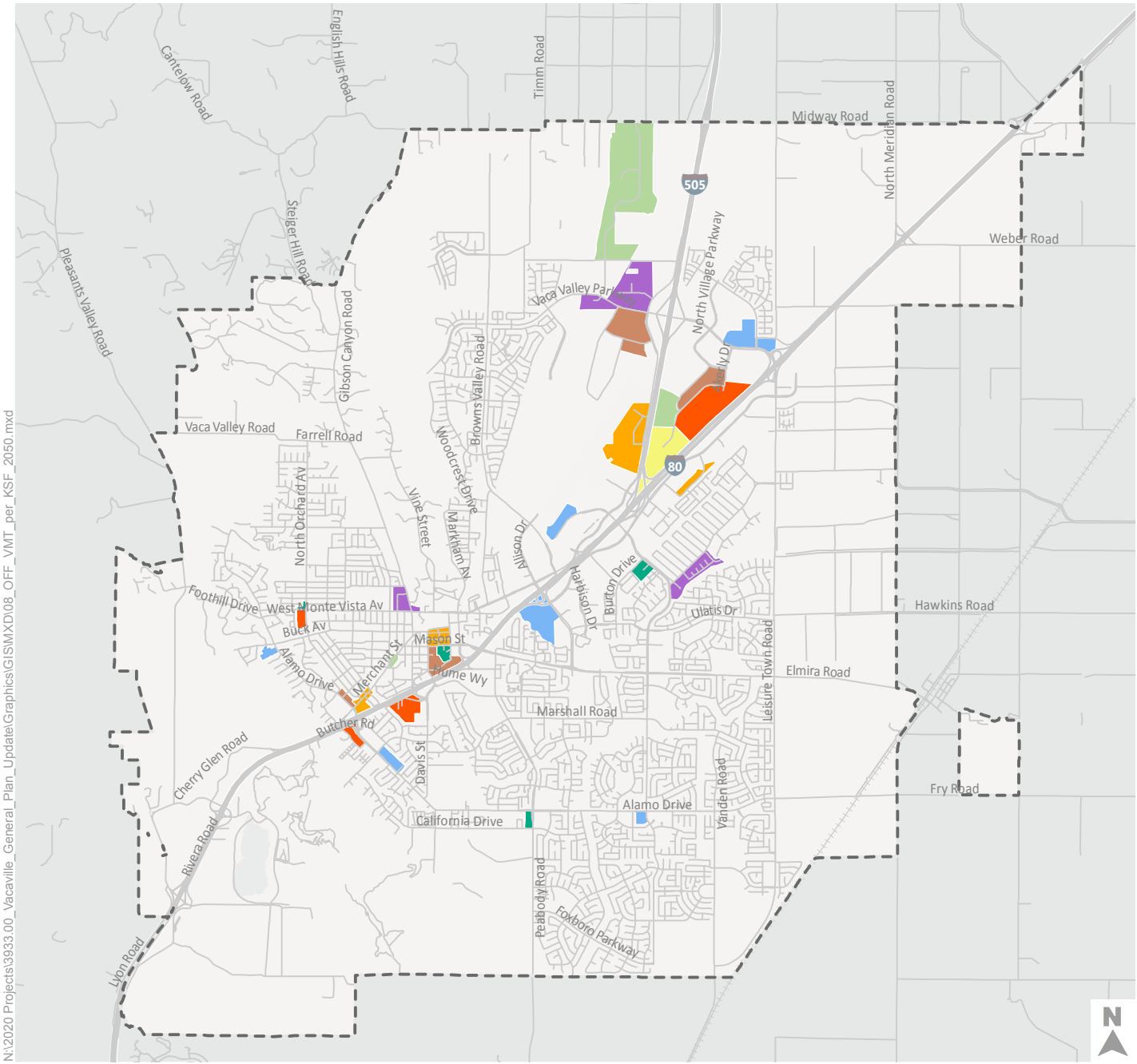

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Figure 8

% Difference from Citywide Average VMT per KSF (83.43)

- ≤ -15%
- -10 to -14.9%
- -5% to -9.9%
- 0% to -4.9%
- +5% to +0.1%
- +10% to +5.1%
- +20% to +10.1%
- > +20%

Urban Growth/Model Boundary

TAZs with <10 Office KSF

All Traffic Analysis Zones (TAZs) with at least 10 KSF are allocated a color according to its relative VMT efficiency to the left. In many instances, a single TAZ may include multiple land uses, which means they show VMT efficiency on multiple figures. All VMT estimates are derived from the City of Vacaville travel demand model. VMT includes all home-based weekday daily travel (with trip lengths not truncated at political boundaries).

VMT per Office KSF
Buildout Minus Northeast New Growth Area Scenario

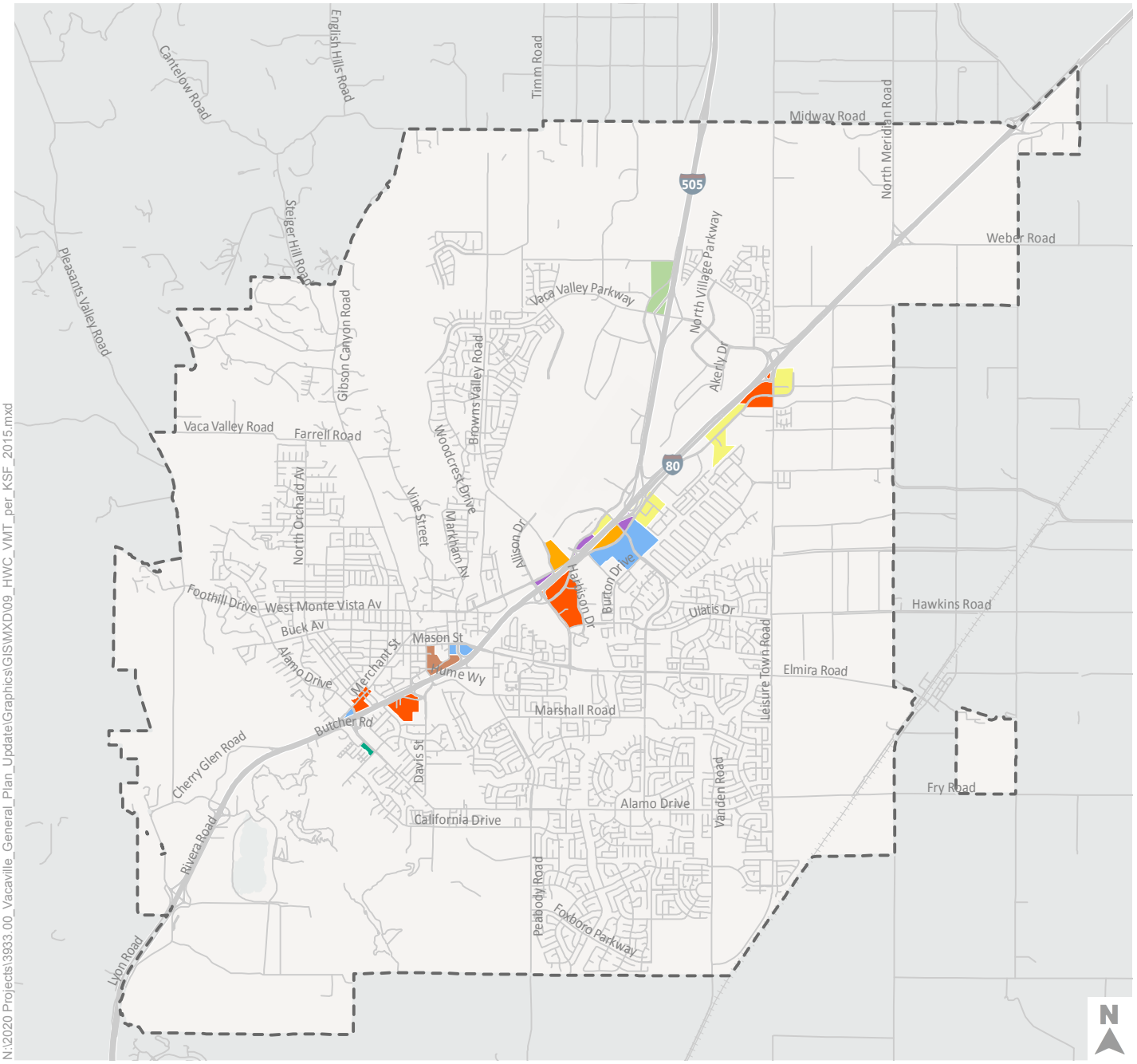

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Figure 9

% Difference from Citywide Average VMT per KSF (158.17)

- ≤ -15%
- -10% to -14.9%
- -5% to -9.9%
- 0% to -4.9%
- +5% to +0.1%
- +10% to +5.1%
- +20% to +10.1%
- > +20%

Urban Growth/Model Boundary

TAZs with <10 Highway Commercial KSF

All Traffic Analysis Zones (TAZs) with at least 10 KSF are allocated a color according to its relative VMT efficiency to the left. In many instances, a single TAZ may include multiple land uses, which means they show VMT efficiency on multiple figures. All VMT estimates are derived from the City of Vacaville travel demand model. VMT includes all home-based weekday daily travel (with trip lengths not truncated at political boundaries).

VMT per Highway Commercial KSF
Base Year (2015) Conditions

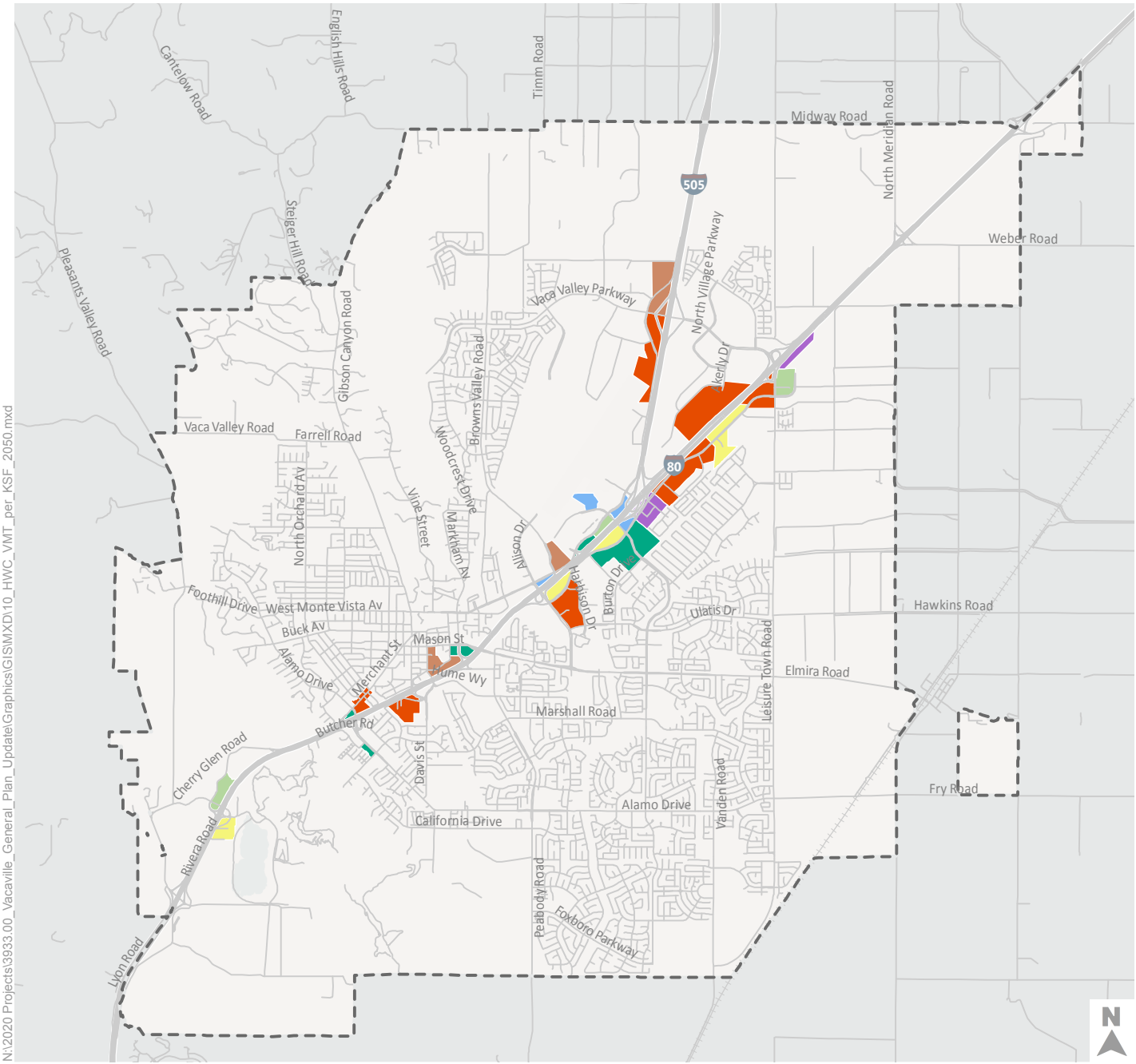

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Figure 10

% Difference from Citywide Average VMT per KSF (158.14)

- ≤ -15%
- -10% to -14.9%
- -5% to -9.9%
- 0% to -4.9%
- +5% to +0.1%
- +10% to +5.1%
- +20% to +10.1%
- > +20%

Urban Growth/Model Boundary

TAZs with <10 Highway Commercial KSF

All Traffic Analysis Zones (TAZs) with at least 10 KSF are allocated a color according to its relative VMT efficiency to the left. In many instances, a single TAZ may include multiple land uses, which means they show VMT efficiency on multiple figures. All VMT estimates are derived from the City of Vacaville travel demand model. VMT includes all home-based weekday daily travel (with trip lengths not truncated at political boundaries).

VMT per Highway Commercial KSF
Buildout Minus Northeast New Growth Area Scenario

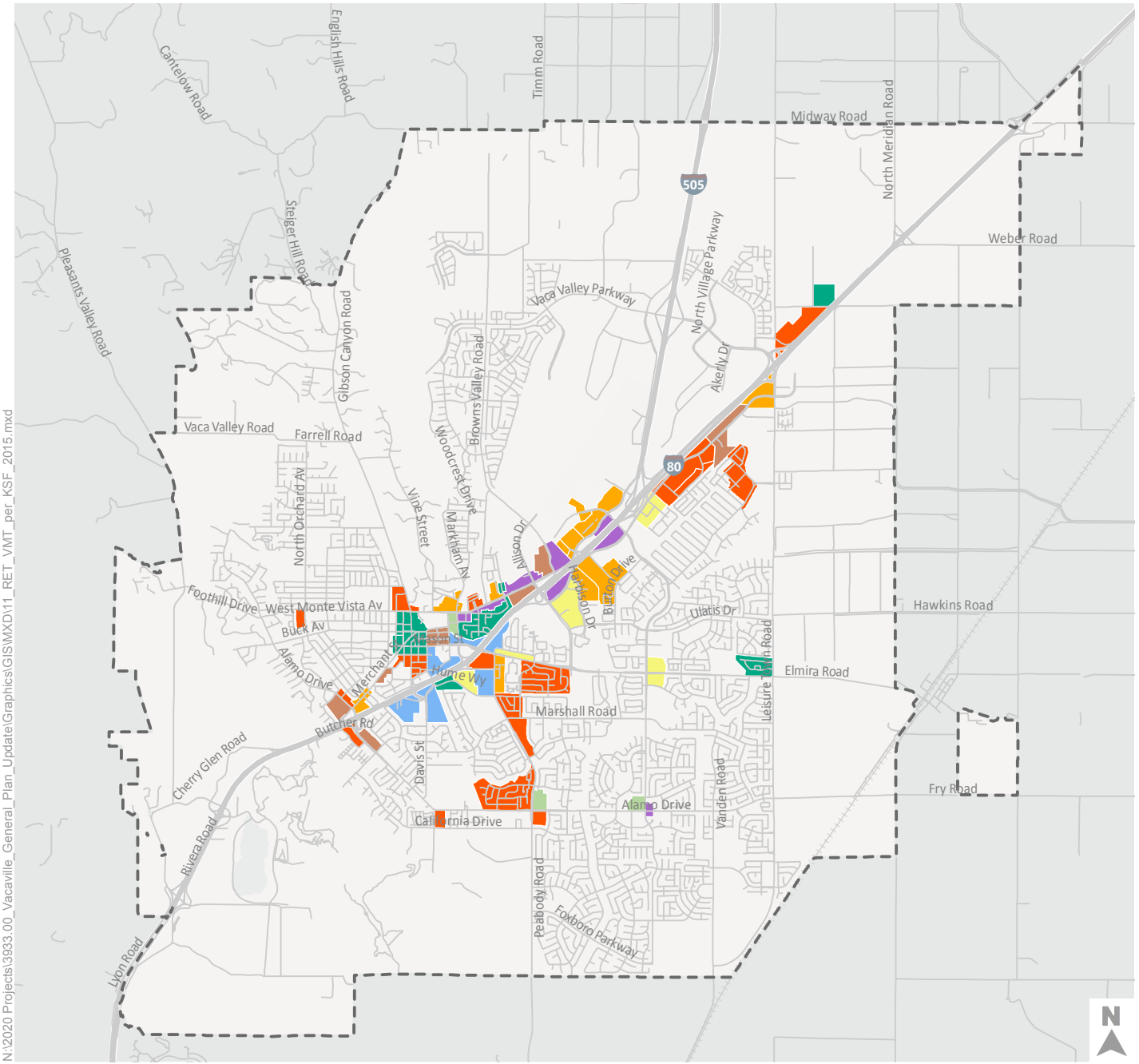

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Figure 11

% Difference from Citywide Average VMT per KSF (121.50)

- ≤ -15%
- -10% to -14.9%
- -5% to -9.9%
- 0% to -4.9%
- +5% to +0.1%
- +10% to +5.1%
- +20% to +10.1%
- > +20%

Urban Growth/Model Boundary

TAZs with <10 Retail KSF

All Traffic Analysis Zones (TAZs) with at least 10 KSF are allocated a color according to its relative VMT efficiency to the left. In many instances, a single TAZ may include multiple land uses, which means they show VMT efficiency on multiple figures. All VMT estimates are derived from the City of Vacaville travel demand model. VMT includes all home-based weekday daily travel (with trip lengths not truncated at political boundaries).

VMT per Retail KSF
Base Year (2015) Conditions

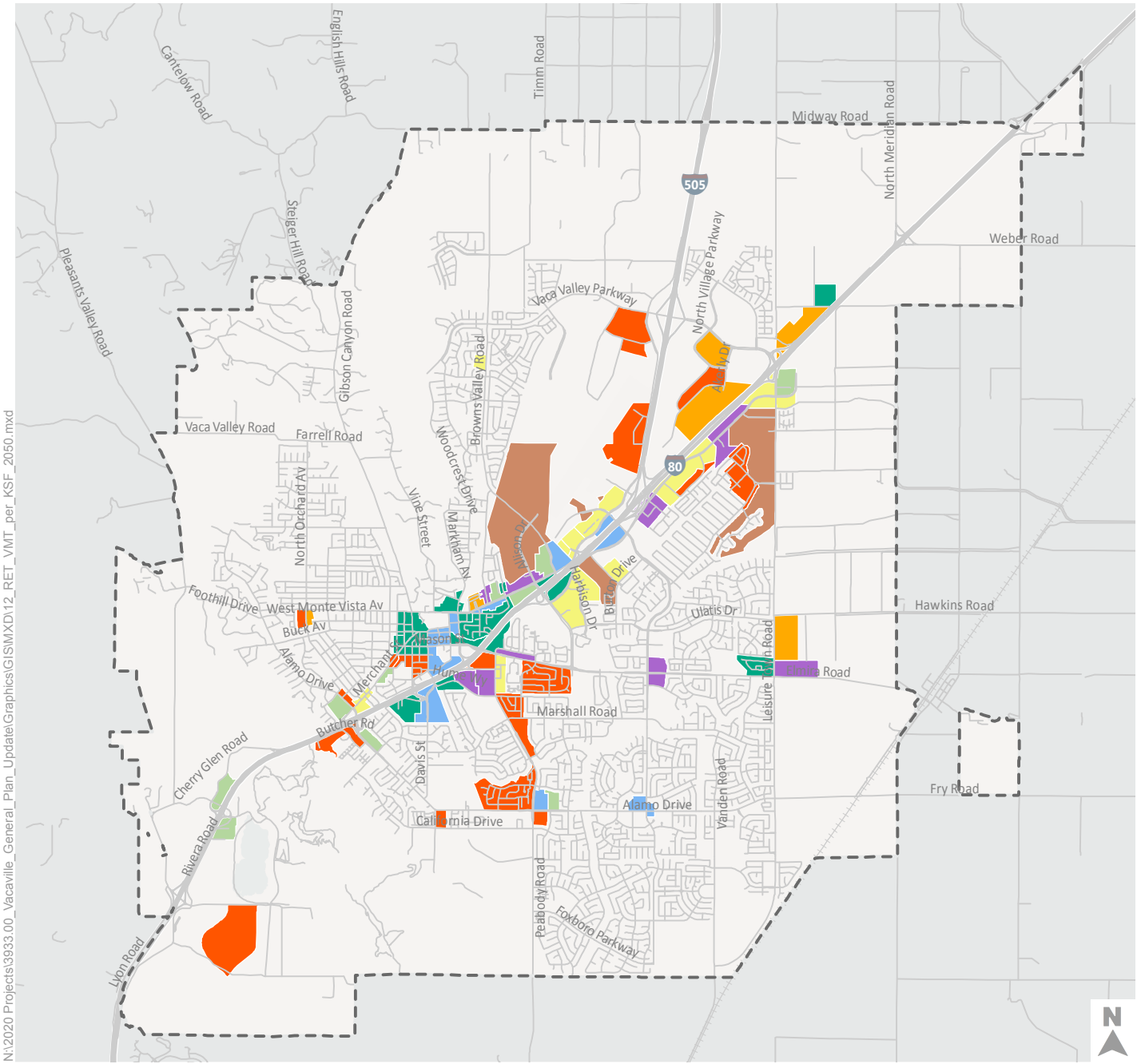

Figure 12

% Difference from Citywide Average VMT per KSF (125.10)

- ≤ -15%
- -10% to -14.9%
- -5% to -9.9%
- 0% to -4.9%
- +5% to +0.1%
- +10% to +5.1%
- +20% to +10.1%
- > +20%

Urban Growth/Model Boundary

TAZs with <10 Retail KSF

All Traffic Analysis Zones (TAZs) with at least 10 KSF are allocated a color according to its relative VMT efficiency to the left. In many instances, a single TAZ may include multiple land uses, which means they show VMT efficiency on multiple figures. All VMT estimates are derived from the City of Vacaville travel demand model. VMT includes all home-based weekday daily travel (with trip lengths not truncated at political boundaries).

VMT per Retail KSF
Buildout Minus Northeast New Growth Area Scenario

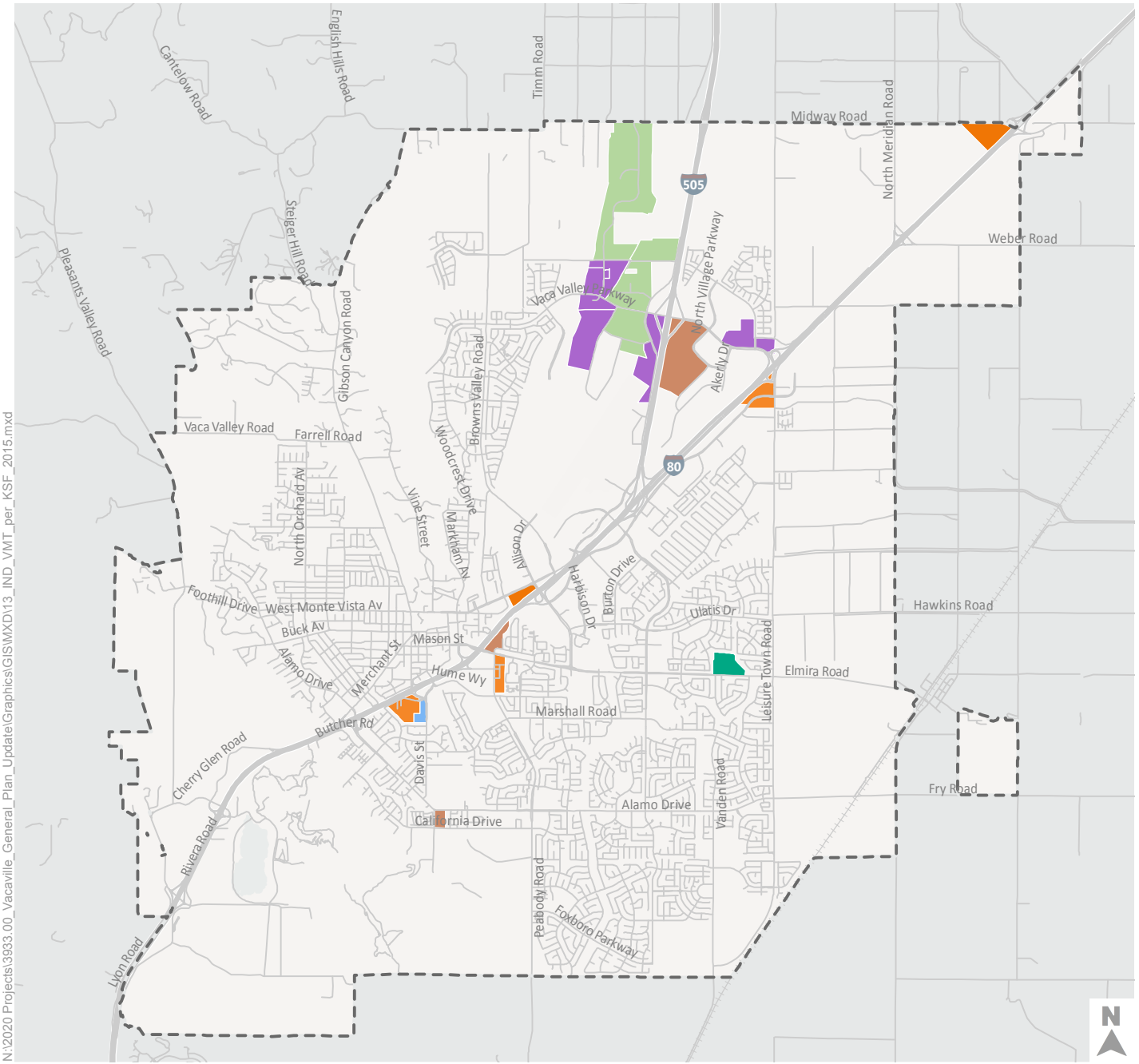

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Figure 13

% Difference from Citywide Average VMT per KSF (34.56)

- ≤ -15%
- -10% to -14.9%
- -5% to -9.9%
- 0% to -4.9%
- +5% to +0.1%
- +10% to +5.1%
- +20% to +10.1%
- > +20%

Urban Growth/Model Boundary

TAZs with <10 Industrial KSF

All Traffic Analysis Zones (TAZs) with at least 10 KSF are allocated a color according to its relative VMT efficiency to the left. In many instances, a single TAZ may include multiple land uses, which means they show VMT efficiency on multiple figures. All VMT estimates are derived from the City of Vacaville travel demand model. VMT includes all home-based weekday daily travel (with trip lengths not truncated at political boundaries).

VMT per Industrial KSF
Base Year (2015) Conditions

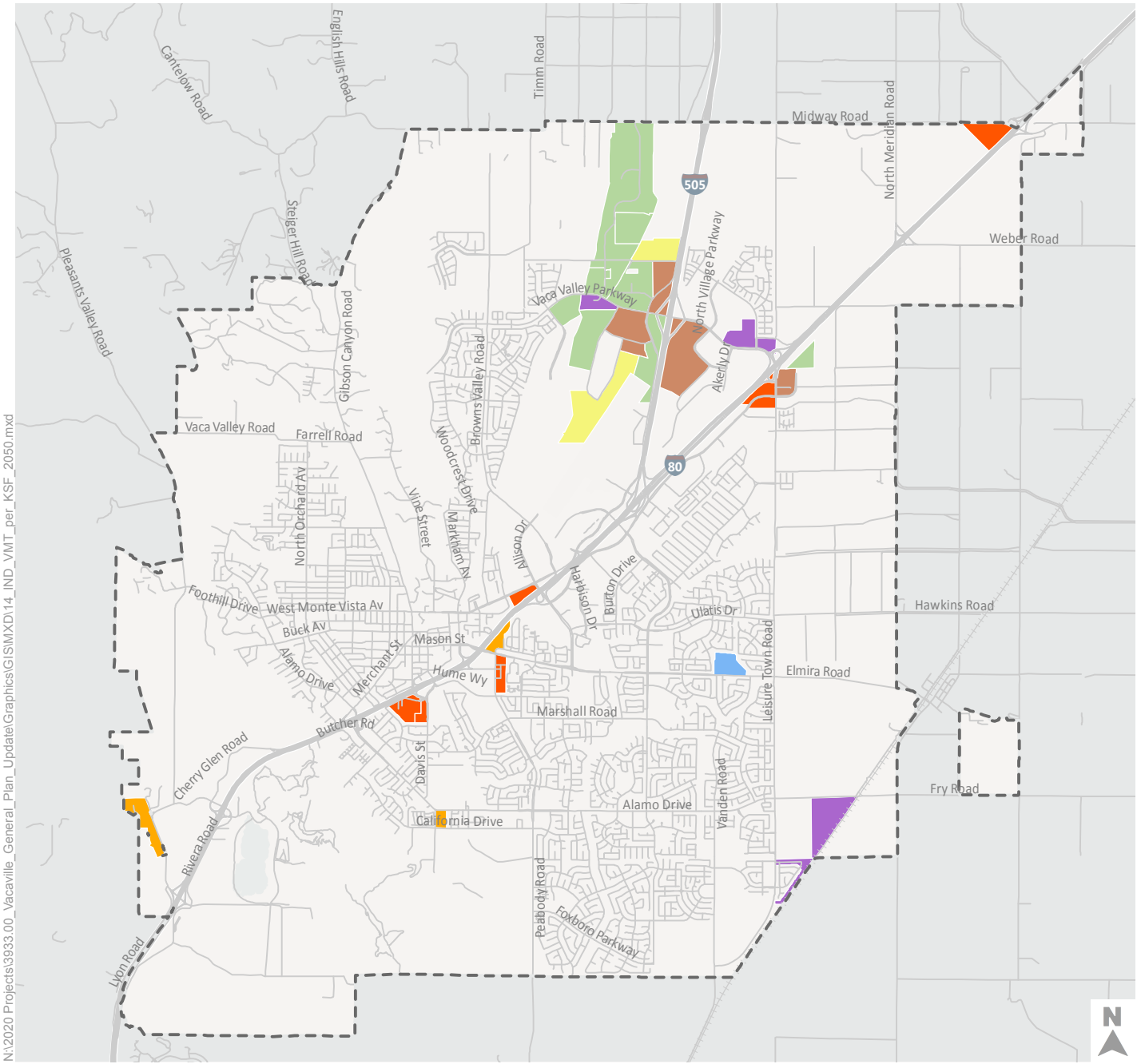

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Figure 14

% Difference from Citywide Average VMT per KSF (28.27)

- ≤ -15%
- -10% to -14.9%
- -5% to -9.9%
- 0% to -4.9%
- +5% to +0.1%
- +10% to +5.1%
- +20% to +10.1%
- > +20%

Urban Growth/Model Boundary

TAZs with <10 Industrial KSF

All Traffic Analysis Zones (TAZs) with at least 10 KSF are allocated a color according to its relative VMT efficiency to the left. In many instances, a single TAZ may include multiple land uses, which means they show VMT efficiency on multiple figures. All VMT estimates are derived from the City of Vacaville travel demand model. VMT includes all home-based weekday daily travel (with trip lengths not truncated at political boundaries).

VMT per Industrial KSF
Buildout Minus Northeast New Growth Area Scenario

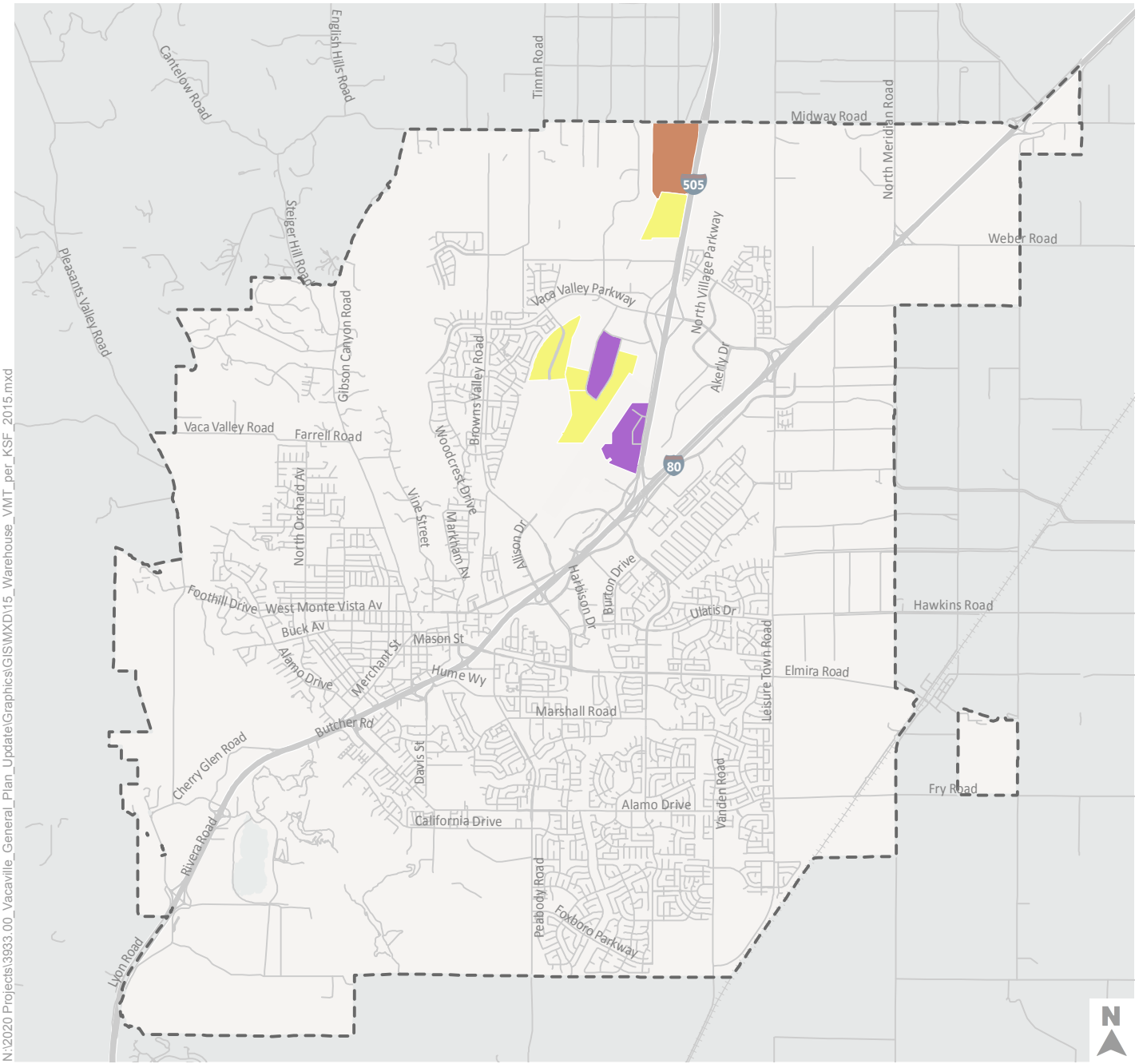


Figure 15

% Difference from Citywide Average VMT per KSF (17.89)

- ≤ -15%
- -10% to -14.9%
- -5% to -9.9%
- 0% to -4.9%
- +5% to +0.1%
- +10% to +5.1%
- +20% to +10.1%
- > +20%

Urban Growth/Model Boundary

TAZs with <10 Warehouse KSF

All Traffic Analysis Zones (TAZs) with at least 10 KSF are allocated a color according to its relative VMT efficiency to the left. In many instances, a single TAZ may include multiple land uses, which means they show VMT efficiency on multiple figures. All VMT estimates are derived from the City of Vacaville travel demand model. VMT includes all home-based weekday daily travel (with trip lengths not truncated at political boundaries).

VMT per High-Cube Warehouse KSF
Base Year (2015) Conditions

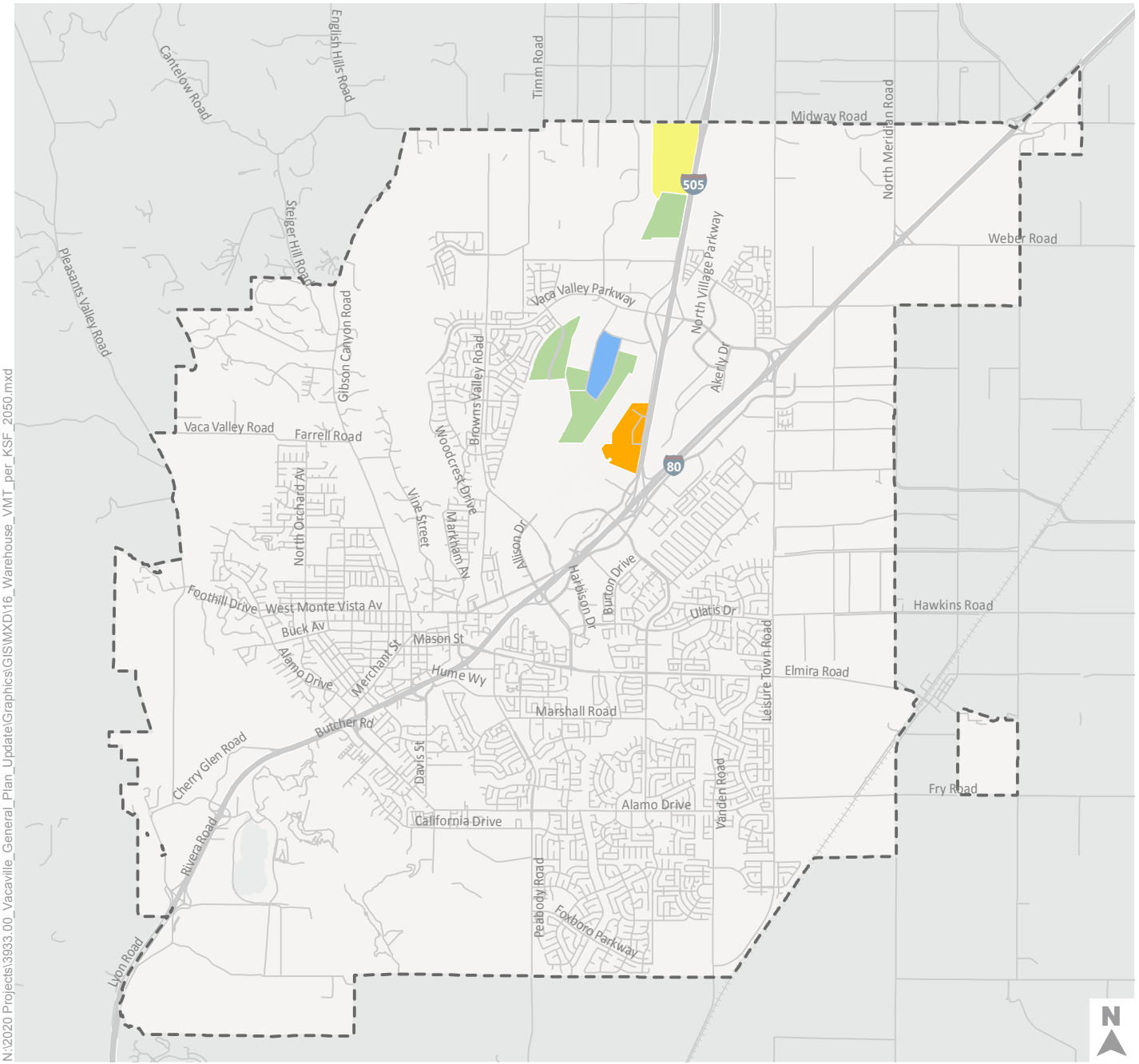


Figure 16

% Difference from Citywide Average VMT per KSF (15.67)

- ≤ -15%
- -10% to -14.9%
- -5% to -9.9
- 0% to -4.9%
- +5% to +0.1%
- +10% to +5.1%
- +20% to +10.1%
- > +20%

Urban Growth/Model Boundary

TAZs with <10 Warehouse KSF

All Traffic Analysis Zones (TAZs) with at least 10 KSF are allocated a color according to its relative VMT efficiency to the left. In many instances, a single TAZ may include multiple land uses, which means they show VMT efficiency on multiple figures. All VMT estimates are derived from the City of Vacaville travel demand model. VMT includes all home-based weekday daily travel (with trip lengths not truncated at political boundaries).

VMT per High-Cube Warehouse KSF
Buildout Minus Northeast New Growth Area Scenario

1 INTRODUCTION

Vacaville is a vibrant community with a family-friendly atmosphere and a high quality of life. Due to its location, Vacaville serves as a gateway to the Bay Area and the Central Valley, and as such, has achieved impressive growth. Through thoughtful planning over the 120 years since incorporation in 1892, Vacaville's growth reflects respect for its beautiful natural setting, preservation of its historic character, and distinct sense of place. Throughout its history, and as it moves into the 21st century, the residents and leaders of Vacaville recognize that a healthy and prosperous community must consider economic, environmental, and social goals when planning for the future, and must grow in a way that continues to promote the City's values.

Under the leadership of a Steering Committee and the City Council, and with input from the community, the City prepared an updated General Plan concurrent with this Energy and Conservation Action Strategy that is focused on maintaining a high quality of life, improving the environment, and promoting sustainable growth. **S*ustainability*** is commonly defined as "using resources in the present in a manner that does not compromise the choices and quality of life of future generations." The updated General Plan recognizes a variety of ways

that sustainability goals can be met, such as increasing alternative modes of transportation, maintaining a healthy local economy, and preserving open space.

This Energy and Conservation Action Strategy is a strategic tool to implement the General Plan. It is a detailed, long-range strategy to reduce greenhouse gas (GHG) emissions and achieve greater conservation of resources with regards to transportation and land use, energy, water, solid waste, and open space. Collectively addressing community development and conservation through these lenses will help Vacaville remain attractive, prosperous, and adaptive to social, political, and environmental changes.

This Energy and Conservation Action Strategy has been created for Vacaville to be in compliance with State requirements that address the reduction of major sources of GHG emissions. It establishes a strategy that the City and community can implement to achieve the City's GHG emissions reduction target, as identified and required by State legislation.

Implementation of this Energy and Conservation Action Strategy will guide Vacaville's actions through a series of communitywide and municipal GHG emissions reduction measures to decrease the city's contribution to GHG emissions. Communitywide GHG emission reduction measures are exclusively aimed to increase energy independence; reduce spending on gas, electricity, and water; and improve air quality from non-City operations. Municipal GHG emission reduction measures apply exclusively to City operations. Communitywide and municipal GHG emission reduction measures are discussed in Chapters 5 and 6 of this document, respectively.

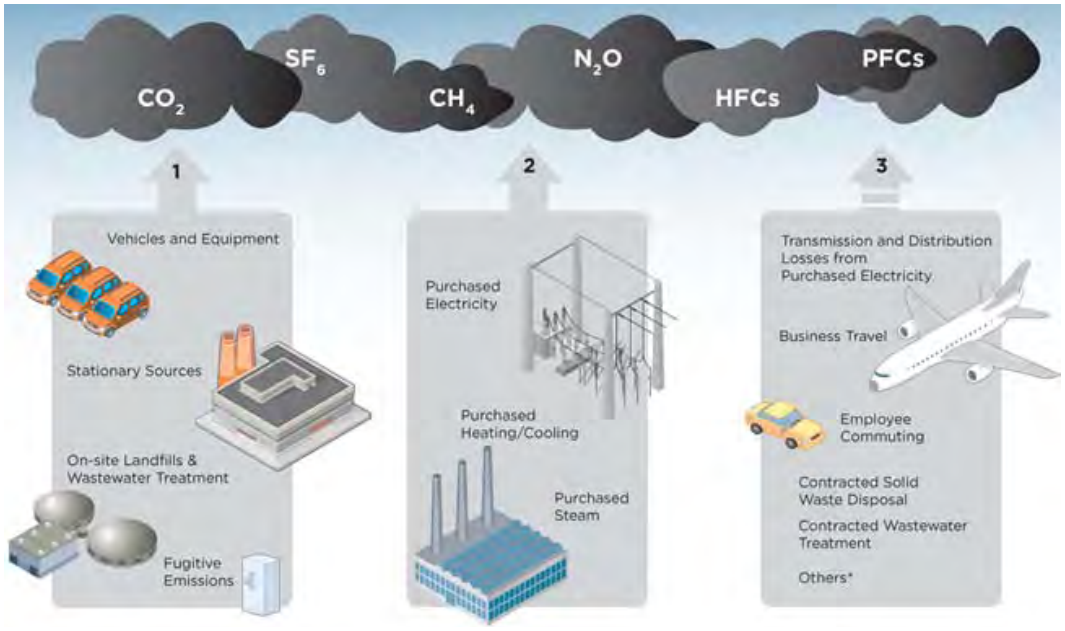
Communitywide measures aim to reduce GHG emissions from activities that occur within Vacaville.

Municipal measures apply exclusively to City government operations.

This Energy and Conservation Action Strategy will support ambitious GHG emission reduction targets adopted by the State and will ensure that Vacaville is eligible for transportation and land use grant funding. The federal, State, and regional requirements are discussed in detail under the heading *Regulatory Action on Greenhouse Gas Emissions* further in this chapter.

This Energy and Conservation Action Strategy will also be utilized for tiering and streamlining future development within Vacaville, pursuant to California Environmental Quality Act (CEQA) Guideline Sections 15152 and 15183.5. It serves as the CEQA

threshold of significance within the city for GHG emissions, by which all applicable developments within the city will be reviewed.



COMMON SOURCES OF GREENHOUSE GAS EMISSIONS

This chapter provides background information on the following topics:

- Greenhouse gases and the theory of global climate change.
- Federal, State, and regional regulatory action on GHG emissions.
- Public participation in the City's sustainability planning processes.

WHAT ARE GREENHOUSE GASES?

Greenhouse gases are vapors that trap heat in the Earth's atmosphere. Federal and California State law identifies the following six gases as GHGs: [1]

- Carbon dioxide (CO_2)
- Methane (CH_4)
- Nitrous oxide (N_2O)

[1] California Health and Safety Code, Section 38505(g).

- Hydrofluorocarbons (HFCs)
- Perfluorocarbons (PFCs)
- Sulfur hexafluoride (SF_6)

Greenhouse gases emissions are measured in terms of their Global Warming Potential (GWP). The GWP is the ability of a GHG to trap heat in the Earth's atmosphere when compared to an equal amount of carbon dioxide, which assumes a GWP value of 1. The GWP is used to estimate the contribution a GHG will emit in the Earth's atmosphere.

Based on the GWP, all GHGs can be converted into carbon dioxide equivalents (CO_2e), which then enables decision-makers to consider different GHGs in comparable terms. The conversion of GHGs is done by comparing the GWP of each GHG to carbon dioxide. The carbon dioxide equivalent is a quantity that describes the amount of carbon dioxide that would have the same GWP. For example, methane is approximately 21 times more powerful than carbon dioxide on a per weight basis in its ability to trap heat. Therefore, 1 metric ton of methane would be calculated as 21 metric tons of carbon dioxide equivalent ($MTCO_2e$).

What is a metric ton of carbon dioxide?

- *About 1 metric ton of CO_2 is produced to the meet the average monthly energy demand of the typical American household for heating, cooling, cooking, electricity use, and other energy needs. This results in 12 metric tons per house per year.*
- *About 1 metric ton of CO_2 is produced for approximately each 100 gallons of gasoline used. This means if you drive a car that gets 20 miles per gallon, 1 metric ton of CO_2 is released into the atmosphere for every 2,000 miles driven. This is about two months of driving for many US drivers.*

Source: EPA

A brief description of each of the six GHGs is provided below.

Carbon Dioxide (CO_2)

The primary source of carbon dioxide from human activity is burning fossil fuels such as petroleum, coal, and natural gas in factories, electrical power plants, cars, trucks, and other similar sources. Energy use and driving are directly linked to global warming. While carbon dioxide is the most common GHG, it is the least powerful and has a GWP of 1.

METHANE (CH_4)

Methane is the primary component of natural gas, which is used for space and water heating, steam production, and power generation. As provided in the example above, the GWP of methane is 21, or 21 times that of carbon dioxide. Methane in the Earth's atmosphere occurs when organic material breaks down. Modern solid waste landfills, agricultural operations, coal mines, and oil and natural gas operations are the primary sources of human-generated methane emissions.

NITROUS OXIDE (N_2O)

The majority of nitrous oxide is produced from agricultural practices, including nitrogen fertilizers and animal waste, which promote nitrous oxide production from naturally occurring bacteria. Industrial processes and internal combustion engines also produce nitrous oxide. The GWP of nitrous oxide is 310, which means that nitrous oxide is 310 times more powerful than carbon dioxide and would be calculated as 310 metric tons of CO_2e.

HYDROFLUOROCARBONS (HFCS)

Hydrofluorocarbons are typically used as foam-blown insulation and as refrigerants for both stationary refrigeration and mobile air conditioning, and do not occur naturally. The use of hydrofluorocarbons for cooling and foam blowing is growing as the continued phase-out of chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs) increases. The GWP of hydrofluorocarbons ranges from 140 to 6,300.

PERFLUOROCARBONS (PFCS)

Perfluorocarbons are compounds consisting of carbon and fluorine, primarily created as byproducts of aluminum production and semiconductor (e.g. radios, computers, and telephones) manufacturing; they do not occur naturally. Perfluorocarbons are powerful GHGs that range in GWP from 5,700 to 11,900. Perfluorocarbons are a particular concern

because they can remain in the Earth's atmosphere for up to 50,000 years after they are released.

SULFUR HEXAFLUORIDE (SF_6)

This gas is most commonly used as an electrical insulator in high voltage equipment that transmits and distributes electricity, and does not occur naturally. Like perfluorocarbons described above, sulfur hexafluoride is an extremely powerful GHG and has a GWP of 23,900. However, sulfur hexafluorides have a small occurrence and contribute very little to overall GHGs in the Earth's atmosphere.

OTHER COMPOUNDS

In addition to the six major GHGs discussed above, many other compounds have the potential to build up in the Earth's atmosphere. Some of these compounds have been identified as the cause of ozone damage and their gradual phase-out is currently in effect. These compounds include ozone, 1,1,1-trichloroethane,[2] hydrochlorofluorocarbons, and chlorofluorocarbons.

GLOBAL CLIMATE CHANGE THEORY

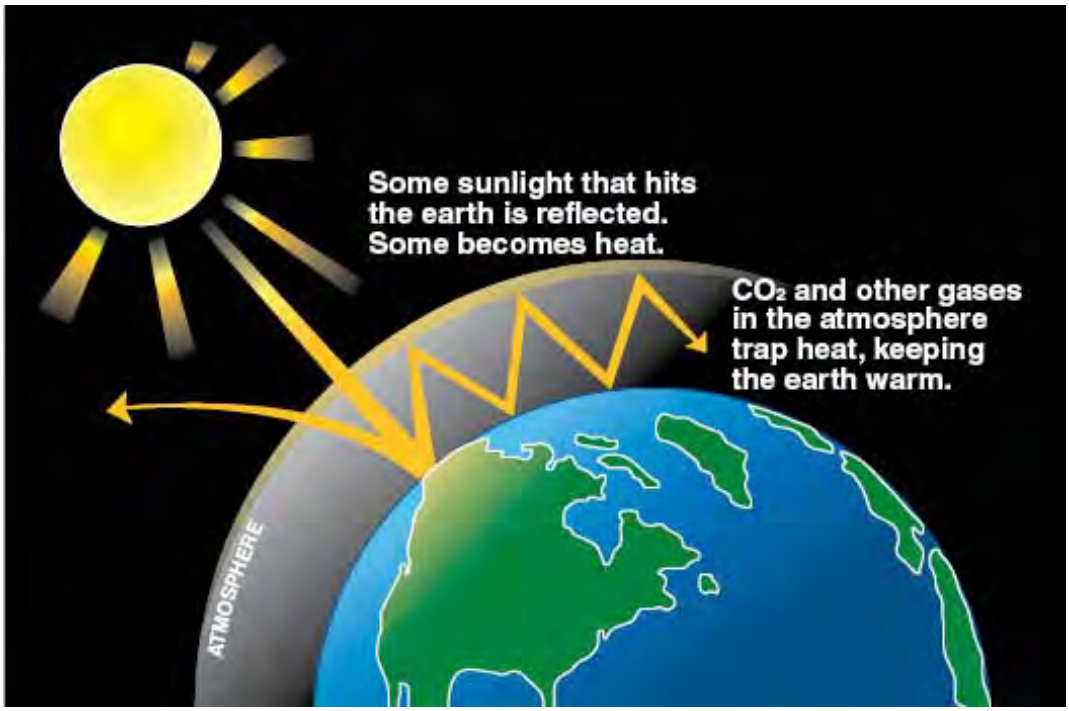
Currently, global climate change is a controversial topic in the United States. Some people disagree that the climate is changing; others assert that changes in the Earth's climate are part of natural cycles and are not caused by human activity. Although there is extensive scientific research and documentation that supports theories of human-caused global climate change, some scientists believe that the evidence is inconclusive. This section presents the basic concepts underlying the science of global climate change in order to explain why those who are concerned about global climate change, such as California legislators, are seeking to reduce the impacts of specific human activities on the Earth's atmosphere.

The Earth's atmosphere is composed of naturally occurring and human-caused GHGs that trap heat in the atmosphere and regulate the Earth's temperature. This phenomenon, known as the greenhouse effect, is responsible for maintaining a climate suitable for human life. Greenhouse gases in the Earth's atmosphere play an important role in maintaining the

[2] 1,1,1-trichloroethane was used as an industrial solvent before being banned under the Montreal Protocol in 1996.

Earth's temperature as they trap heat emitted from the Earth's surface which otherwise would have escaped to space, as shown in Figure 1-1.

FIGURE 1-1 THE GREENHOUSE EFFECT



Source: State of Washington Department of Ecology, "What is Climate Change," http://www.ecy.wa.gov/climatechange/whatis.htm, accessed on October 11, 2012.

Water vapor and carbon dioxide are the most abundant GHGs in the Earth's atmosphere. As discussed above, the six GHGs that are considered the main contributors to man-made global climate change are:

- Carbon dioxide (CO_2)
- Methane (CH_4)
- Nitrous oxide (N_2O)
- Hydrofluorocarbons (HFCs)
- Perfluorocarbons (PFCs)
- Sulfur hexafluoride (SF_6)

While human activity results in the release of some GHGs that occur naturally, such as carbon dioxide and methane, other gases, like hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride, are completely human-made.

Human activities, including but not limited to burning fossil fuels and removing trees, result in the release of carbon in the form of carbon dioxide into the Earth's atmosphere. Without these human activities, carbon dioxide would be naturally stored underground in sediments, such as petroleum, coal, and natural gas, or on the Earth's surface as plant life. As these types of human activities have increased from the time of the industrial revolution over 200 years ago, the amounts of GHGs in the atmosphere also increased, consequently enhancing the natural greenhouse effect.

It is believed that this enhanced greenhouse effect has contributed to global warming, which is defined as an increased rate of warming of the Earth's surface temperature. As more GHGs build up in the Earth's atmosphere, more heat is trapped in the Earth's atmosphere, thereby increasing evaporation rates and temperatures near the surface. The warming of the Earth induces large-scale changes in ocean circulation patterns, precipitation patterns, global ice cover, biological distributions, and other large-scale changes to the Earth's systems that are collectively referred to as global climate change.

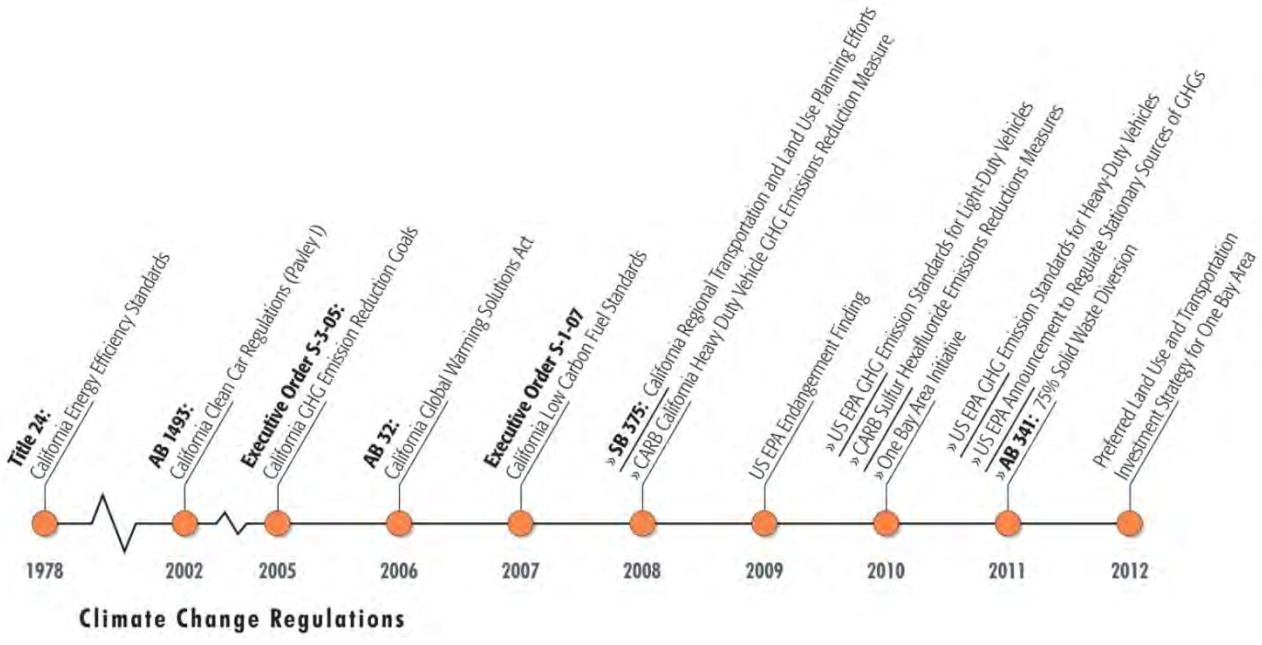
REGULATORY ACTION ON GREENHOUSE GAS EMISSIONS

Many federal, State, and regional government agencies and organizations are working to develop and implement solutions to control GHG emissions and slow their effects on natural ecosystems.

At the federal level, in December 2009, the US Environmental Protection Agency (EPA) found that elevated concentrations of the six key GHGs in the atmosphere, which are discussed earlier in this chapter, endanger the public health and welfare of current and future generations. In collaboration with the National Highway Traffic Safety Administration, the EPA established GHG emission standards for light-duty vehicles (e.g. cars) in 2010 and heavy-duty vehicles (e.g. trucks) in 2011. Additionally, on January 2, 2011, the EPA announced that it would regulate GHG emissions from major stationary sources of GHGs, including oil refineries and fossil fuel burning power plants, through modifications to the existing Clean Air Act permitting programs. At the State level, California's major laws and regulations include:

- **Energy Efficiency Standards (1978)** to reduce the State's energy consumption by providing regularly updated standards that incorporate new energy efficiency goals, methods, and technologies.

- **Clean Car Regulations (Assembly Bill 1493, 2002)** to decrease GHG emissions from new passenger vehicles and light duty trucks through California Air Resources Board (CARB) adopted regulations.
- **Executive Order S-3-05 (2005)** to reduce emissions to 2000 levels by 2010, to 1990 levels by 2020, and to 80 percent below 1990 levels by 2050 through a California Environmental Protection Agency (Cal/EPA) led multi-agency effort that identified GHG emission reduction strategies and measures.
- **Global Warming Solutions Act (AB 32, 2006)** to cap California's GHG emissions at 1990 levels by 2020 through CARB-identified discrete, early and easy-to-implement actions to reduce emissions and through a CARB-developed statewide scoping plan to identify how to meet the emissions reduction targets.
- **Executive Order S-01-07 (2007)** to reduce the carbon content of passenger vehicle fuels by 10 percent by 2020 through establishing a low carbon fuel standard (LCFS) for transportation fuels sold in California.[3]



[3] On December 29, 2011, the US District Court for the Eastern District of California issued several rulings in federal lawsuits challenging the LCFS. One of the court's rulings preliminarily prohibits CARB from enforcing the regulation during the time of the litigation. In January 2012, CARB appealed the decision and on April 23, 2012, the Ninth Circuit Court granted CARB's motion for a stay of the injunction while it continues to consider CARB's appeal of the lower court's decision.

- **Regional Transportation and Land Use Planning Efforts (SB 375, 2008)** to support AB 32 by requiring California metropolitan planning organizations (MPOs) to prepare a sustainable communities strategy to reduce vehicle miles traveled (VMT) in their regions and demonstrate their ability to reach CARB targets for 2020 and 2035 and by providing incentives for governments and developers to implement compact and efficient growth patterns.
- **Heavy Duty Vehicle GHG Emissions Reduction Measure (2008)** to improve the fuel economy of heavy duty vehicles through requiring long-haul truckers to retrofit their trailers with fuel-efficient tires and aerodynamic devices.
- **Sulfur Hexafluoride Emissions Reductions Measures (2010)** to reduce sulfur hexafluoride emissions from semiconductor (e.g. radios, computers, and telephones) and non-semiconductor applications through CARB-adopted regulations including reporting and reduction requirements for semiconductor operations and new restrictions on the use and sale of sulfur hexafluoride.
- **Solid Waste Diversion (AB 341, Chesbro, 2011)** to reduce waste diversion by 75 percent by 2020 through requiring the Department of Resources, Recycling, and Recovery (CalRecycle) to provide strategies for achieving the reduction, certain businesses to arrange for recycling services, and local governments to implement a commercial recycling program, and through revising technical and procedural facets of solid waste facility regulatory laws.

In addition to federal- and State-level regulations and policies, there are regional-level regulations and policies relating to GHG emissions. The majority of Vacaville is within the Yolo-Solano Air Quality Management District (YSAQMD), and the extreme southeast corner of Vacaville is in the Bay Area Air Quality Management District (BAAQMD). The YSAQMD reports its emissions from business operations to the Climate Registry, a national nonprofit registry that provides tools and resources to help calculate, verify, report, and manage GHG emissions in a publicly transparent and credible way.[4] The YSAQMD does not yet have its own GHG standards; however, the BAAQMD has a regional Climate Protection Program with measures to help meet GHG reductions. The YSAQMD has allowed projects to use the BAAQMD GHG emissions thresholds while the YSAQMD develops its own GHG standards and criteria.

[4] See www.theclimateregistry.org.

In addition to its Climate Protection Program with measures to help meet GHG reductions, the BAAQMD also requires that all pollution sources warranting an air quality permit estimate what their GHG emissions would be and pay a fee[5] based on the metric ton of carbon dioxide equivalent ($MTCO_2e$) emissions. Consistent with SB 375, the BAAQMD, the Association of Bay Area Governments (ABAG), the Metropolitan Transportation Commission (MTC), and the Bay Area Conservation and Development Commission (BCDC) established One Bay Area, an initiative to coordinate regional GHG emission reduction efforts. One Bay Area's Plan Bay Area has a sustainable communities strategy, which links land use and transportation to GHG emission reduction goals. Vacaville's plans, projects, and development must be consistent with Plan Bay Area in order for the City to be eligible for transportation and land use grant funding.

Additionally, the MTC has committed the Bay Area region, including Vacaville, to a 15 percent reduction in GHG emissions by 2035 and has adopted a Preferred Land Use and Transportation Investment Strategy. This includes a commitment to locate new development in core urban areas and guidelines for evaluating projects and potential grants against the stated goals of Plan Bay Area.

SUSTAINABILITY CHALLENGES

Like other communities in California and around the world, the City of Vacaville faces a number of sustainability challenges. This section describes sustainability challenges related to the GHG emission-generating sources covered in this Energy and Conservation Action Strategy.

TRANSPORTATION AND LAND USE

During the second half of the 20th century, transportation and driving patterns in the US shifted dramatically. Vehicle miles traveled (VMT) per person increased by around 140 percent between 1956 and 1998.[6] This growth in VMT is the result of increasing car trips and increasing average trip length. These increases have been driven by a variety of factors, including changes in demographics, land use, urban design, and public transportation

[5] A fee of $0.042 per metric ton of carbon dioxide equivalent (MTCO2e) was required at the time this document was prepared and could be subject to change over time.

[6] Puentes, Robert and Adie Tomer, 2008, *The Road…Less Traveled: An Analysis of Vehicle Miles Traveled Trends in the US,* Brookings Institution, Washington D.C.

systems. It means that the number of miles driven in America has increased much more dramatically than the increase in population.

As the proportion of two-income households grew, and as jobs shifted to areas further from the traditional town center, long car commutes became more common. This has been true of Vacaville, as more residents work outside of Vacaville in places like Fairfield, Vallejo, and Benicia. In addition, changes in land use and in building and streetscape design also contributed to increased car trips. The separation of uses and driver convenience often came at the expense of pedestrians and other non-automotive users. As commercial areas became more disconnected from residential neighborhoods, it became less convenient to reach these destinations by means other than a car. Auto-oriented designs, which can be unpleasant, intimidating, or even dangerous for non-drivers, have made non-automotive transportation modes more difficult and less appealing to use. Additionally, public transit systems have seen their coverage decreased and their services cut as funding declines, and in some cases they have been removed completely.

Because of the obstacles created by development and design, driving is often the only viable mode of transportation. Consequently, residents have fewer opportunities for physical activity, and those who cannot drive, including children, seniors, and disabled people, can have trouble accessing services.

ENERGY

Energy production is a major economic, security, and environmental challenge at the local, national, and global levels. Although Vacaville receives its energy from Pacific Gas & Electric Company (PG&E), which provides an energy mix that is cleaner than what many other US utilities provide, it still relies on fossil fuels – coal, oil, and natural gas – for about half of its energy.[7]

[7] Pacific Gas and Electric website, http://www.pge.com/myhome/environment/pge/cleanenergy/, accessed on May 1, 2012.

The US imports approximately 60 percent of its petroleum from foreign countries. This dependence potentially makes our economy and security vulnerable to political and resource instability in other parts of the world.

The combustion of fossil fuels to produce heat or electricity, or to power internal combustion engines, is a main contributor to GHG emissions and other environmental problems. Because fossil fuels are found deep in the ground, they must be extracted and transported to provide energy. Surface and groundwater pollution can occur during extraction, storage, and transportation. Land subsidence can result when oil and gas are removed from below ground with nothing left to support the land above. There is also the potential for storage tank leakage and oil spills during transportation, causing widespread pollution and requiring costly cleanup efforts.

WATER

Water conservation is important both to protect water resources, which are expected to be negatively impacted by GHG emissions, and to reduce these GHG emissions that occur when water is treated and transported.

Though the 2010-2011 water year brought some relief to drought conditions in California, the winter of 2011-2012 marked the fourth year of dry conditions within the past five years. The year 2009 featured the driest spring and summer on record, low water content in the Sierra snowpack, and a historic low in the State's reservoir levels. As of early 2009, the drought had damaged crops and prevented farmers from planting or replanting 100,000 acres of agricultural land, causing agricultural revenue losses of more than $300 million.[8] Such drought conditions also threaten aquatic ecosystems, increase the risk of wildfires, increase food prices, and harm livelihoods dependent on agriculture, natural resources, and tourism. Responding to these wide-ranging impacts, the Governor proclaimed a State of

[8] Office of the Governor, State of California, February 27, 2009, Press Release, *Gov. Schwarzenegger Takes Action to Address California's Water Shortage.*

Emergency in February 2009, calling for an immediate 20 percent reduction in water use by urban water users and the use of efficient water management practices by agricultural users.[9]

SOLID WASTE

The production and transport of consumer products creates large amounts of GHGs. A large percentage of these products are disposed of after only one use, requiring more raw materials to be extracted to replace these products. Making new products or buildings from raw materials generally requires more energy, uses more water, and creates more air and water pollution

[9] Office of the Governor, State of California, February 27, 2009, Press Release, *Gov. Schwarzenegger Takes Action to Address California's Water Shortage.*

than reusing materials or making the same product from recycled materials, thereby increasing GHG emissions.

Once in the landfill, solid waste continues to emit GHGs as it rots, most notably methane, which as previously noted is approximately 21 times more potent than carbon dioxide in terms of its global warming impacts. Landfills also release harmful contaminants such as vinyl chloride and benzene. In addition, as rainwater filters through the layers of solid waste in a landfill, it absorbs harmful chemicals, which are then carried into soil, surface water, and groundwater contamination. Poor management of landfills can increase disease carriers and create nuisances related to odor, litter, and dust.

The GHG emissions and other environmental problems associated with solid waste can be reduced through diverting waste from landfills by reducing consumption of single-use or disposable products, reusing, and recycling.

Open Space and Agriculture

Within its Sphere of Influence and Urban Growth Boundary, Vacaville has approximately 2,500 acres of public open space and 2,500 acres of agricultural land. These open space areas can store carbon in trees and plants. Conversion of these open space lands to development can release GHGs into the Earth's atmosphere. Forests, orchards, and other open spaces with long-lived plants can store significant carbon.[10]

Depending on the types of farming practices used, agricultural land uses can serve to "sequester," or hold, varying amounts of carbon dioxide and other GHGs. When trees and plants are removed as part of the process of converting agricultural land to other uses, the carbon that is stored in the plants and trees is released into the Earth's atmosphere. This process eliminates the possibility of using the land for plants that would store carbon in the

[10] International Panel on Climate Change (IPCC), 2006. *IPCC Guidelines for National Greenhouse Gas Inventories*; and IPCC, 2000, *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories.*

future and disrupts the biological processes that allow land to hold GHGs. In addition, developing on forest land or agricultural land can result in the release of nitrous oxide emissions from the soil when it comes into contact with oxygen.

PUBLIC OUTREACH AND PARTICIPATION

Preliminary measures to include in this Energy and Conservation Action Strategy were drafted based on measures that have been successful in other California and Bay Area communities. These preliminary measures were then reviewed by a technical advisory committee made up of City staff from multiple departments. Based on this direction, the measures were refined in preparation for review and input by the public and Steering Committee.

The City held a community workshop on March 17, 2012 to discuss draft sustainability targets and measures for this Energy and Conservation Action Strategy. The workshop included a formal presentation to acquaint participants with the principles of sustainability planning. Participants were given the opportunity to view and comment upon comprehensive lists of potential communitywide and municipal measures for GHG reduction, as well as to suggest other potential measures. These comments served to influence which measures were emphasized and included in the Energy and Conservation Action Strategy. A summary of the input from the workshop is provided as Appendix A.

Following this workshop, the General Plan Steering Committee, which is composed of members of three different city commissions, the Planning Commission, Community Services Commission, and Housing and Redevelopment Commission, held a public meeting on March 22, 2012 to review the draft GHG reduction measures. The public was invited to provide comments, and the Steering Committee provided direction on edits to the draft measures, which were incorporated into this Energy and Conservation Action Strategy.

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ATTACHMENT 4

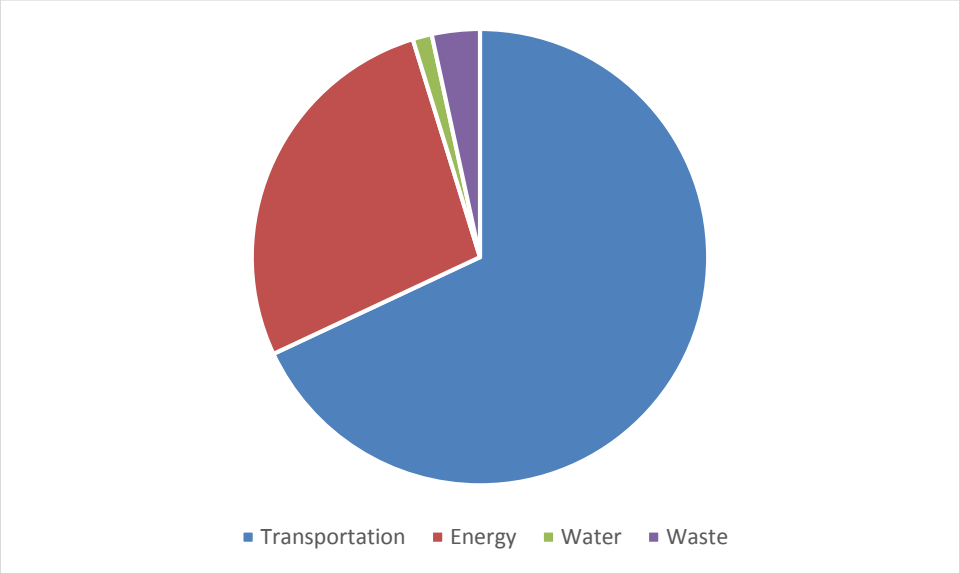
VACAVILLE ECAS

This memorandum serves as background for the 2020 update to the ECAS, major sources of greenhouse gases (GHGs), including legislative background, and sample menu of GHG reduction measures taken by similarly sized cities.

Greenhouse Gases

Greenhouse gases in a community are generally made up of four sources: transportation, energy, waste, and water. Transportation is the largest source of emissions in California and the City of Vacaville and often the slowest to change. Transportation emissions come from how far a person drives and how clean the fuel they use is. Energy emissions come from the use of electricity and natural gas. Energy is driven by how clean the energy is and the total demand for energy. Solid waste emissions are associated with the disposal of solid and organic waste. Emission reductions can be driven by reducing total waste or diverting or composting recyclables and organic waste respectively. Water emissions are a result of the energy used to supply, convey, and treat water to residents and businesses. These emissions could be reduced by reducing the demand for water. Projected emissions for the City in 2030 are presented in Figure 1.

Figure 1 – City-wide GHG Emissions in 2030



Legislative Background

GHG Reduction Targets

In 2006, California passed AB 32 which set a state-wide goal of reducing GHG emissions to 1990 levels by 2020. This became central to the work of cities after then Attorney General Brown sued San Bernardino County's General Plan update for not complying with AB 32, and GHGs were eventually added to the CEQA checklist. In 2016, The state adopted SB 32 which included a GHG reduction goal of 40% below 1990 levels.

State of California Reductions

The annual level of change between 2020 and 2030 is much higher than the rate of change leading into 2020. Many of these reductions will be the responsibility of the State. These State reductions, which include new building code provisions and fuel standards, is referred to as "Adjusted Business as Usual".[1] This refers to the anticipated GHG reductions if the State implemented all of their existing plans and policies, and the City takes no action. Some key State that are included in the "Adjusted Business as Usual" are:

- Title 24 (building code)
    - Net-zero energy residential starting in 2020
    - Net-zero energy commercial starting in 2030
- Advance clean cars
- Renewable portfolio standards

Sample Reduction Measures

Table 1 illustrates sample reduction measures taken by similar jurisdictions. Each measure is ranked "low", "medium", or "high" for their potential to reduce GHGs, cost, and feasibility.

[1] Business as usual refers to both the City and the State taking no action.

Table 1 – Potential reduction measures

Measure	GHG	Cost	Feasibility
Energy			
Residential Energy Conservation Ordinance	Medium	Low	Medium
Commercial Energy Conservation Ordinance	Medium	Low	Medium
Low Income Weatherization Program	Medium	Medium	High
Residential Energy Efficiency Education	Medium	Low	High
Transportation			
Promote Density	High	Low	Medium
Promote Diversity of Land Uses	High	Low	Medium
Traffic Calming	Low	Low	High
Measure	**GHG**	**Cost**	**Feasibility**
Promote Telework	Medium	Low	Medium
Paid Parking	Medium	*	Low
Reduce Parking Requirements	Medium	Low	Medium
Waste			
Residential Composting Collection	High	High	Medium
Water			
Low Flow Faucet Retrofit Program	Low	Low	High
Residential Toilet Retrofit Program	Low	Low	High

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Table 6-2: Transportation Category

Transportation						
Category	Measure Number	Strategy	BMP	Grouped With #	Range of Effectiveness	
					Percent Reduction in GHG Emissions	Basis
Land Use / Location	LUT-1	Increase Density			1.5-30.0%	VMT
	LUT-2	Increase Location Efficiency			10-65%	VMT
	LUT-3	Increase Diversity of Urban and Suburban Developments (Mixed Use)			9-30%	VMT
	LUT-4	Incr. Destination Accessibility			6.7-20%	VMT
	LUT-5	Increase Transit Accessibility			0.5-24.6%	VMT
	LUT-6	Integrate Affordable and Below Market Rate Housing			0.04-1.20%	VMT
	LUT-7	Orient Project Toward Non-Auto Corridor			NA	
	LUT-8	Locate Project near Bike Path/Bike Lane			NA	
	LUT-9	Improve Design of Development			3.0-21.3%	VMT
Neighborhood / Site Design	SDT-1	Provide Pedestrian Network Improvements			0-2%	VMT
	SDT-2	Traffic Calming Measures			0.25-1.00%	VMT
	SDT-3	Implement a Neighborhood Electric Vehicle (NEV) Network			0.5-12.7%	VMT
	SDT-4	Urban Non-Motorized Zones		SDT-1	NA	
	SDT-5	Incorporate Bike Lane Street Design (on-site)		LUT-9	NA	
	SDT-6	Provide Bike Parking in Non-Residential Projects		LUT-9	NA	
	SDT-7	Provide Bike Parking in Multi-Unit Residential Projects		LUT-9	NA	
	SDT-8	Provide EV Parking		SDT-3	NA	
	SDT-9	Dedicate Land for Bike Trails		LUT-9	NA	
Parking Policy / Pricing	PDT-1	Limit Parking Supply			5-12.5%	
	PDT-2	Unbundle Parking Costs from Property Cost			2.6-13%	
	PDT-3	Implement Market Price Public Parking (On-Street)			2.8-5.5%	
	PDT-4	Require Residential Area Parking Permits		PDT-1, 2 & 3	NA	

Transportation - continued

Category	Measure Number	Strategy	BMP	Grouped With #	Range of Effectiveness	
					Percent Reduction in GHG Emissions	Basis
Trip Reduction Programs	TRT-1	Implement Voluntary CTR Programs			1.0-6.2%	Commute VMT
	TRT-2	Implement Mandatory CTR Programs – Required Implementation/Monitoring			4.2-21.0%	Commute VMT
	TRT-3	Provide Ride-Sharing Programs			1-15%	Commute VMT
	TRT-4	Implement Subsidized or Discounted Transit Prog.			0.3-20.0%	Commute VMT
	TRT-5	Provide End of Trip Facilities		TRT-1, 2 & 3	NA	
	TRT-6	Telecommuting and Alternative Work Schedules			0.07-5.50%	Commute VMT
	TRT-7	Implement Commute Trip Reduction Marketing			0.8-4.0%	Commute VMT
	TRT-8	Implement Preferential Parking Permit Program		TRT-1, 2 & 3	NA	
	TRT-9	Implement Car-Sharing Program			0.4-0.7%	VMT
	TRT-10	Implement School Pool Program			7.2-15.8%	School VMT
	TRT-11	Provide Employer-Sponsored Vanpool/Shuttle			0.3-13.4%	Commute VMT
	TRT-12	Implement Bike-Sharing Program		SDT-5, LUT-9	NA	
	TRT-13	Implement School Bus Program			38-63%	School VMT
	TRT-14	Price Workplace Parking			0.1-19.7%	Commute VMT
	TRT-15	Implement Employee Parking "Cash-Out"			0.6-7.7%	Commute VMT

Transportation - continued						
Category	Measure Number	Strategy	BMP	Grouped With #	Range of Effectiveness	
					Percent Reduction in GHG Emissions	Basis
Transit System Improvements	TST-1	Provide a Bus Rapid Transit System			0.02-3.2%	VMT
	TST-2	Implement Transit Access Improvements		TST-3, TST-4	NA	
	TST-3	Expand Transit Network			0.1-8.2%	VMT
	TST-4	Increase Transit Service Frequency/Speed			0.02-2.5%	VMT
	TST-5	Provide Bike Parking Near Transit		TST-3, TST-4	NA	
	TST-6	Provide Local Shuttles		TST-3, TST-4	NA	
Road Pricing / Management	RPT-1	Implement Area or Cordon Pricing			7.9-22.0%	VMT
	RPT-2	Improve Traffic Flow			0-45%	VMT
	RPT-3	Require Project Contributions to Transportation Infrastructure Improvement Projects		RPT-2, TST-1 to 6	NA	
	RPT-4	Install Park-and-Ride Lots		RPT-1, TRT-11, TRT-3, TST-1 to 6	NA	
Vehicles	VT-1	Electrify Loading Docks and/or Require Idling-Reduction Systems			26-71%	Truck Idling Time
	VT-2	Utilize Alternative Fueled Vehicles			Varies	
	VT-3	Utilize Electric or Hybrid Vehicles			0.4-20.3%	Fuel Use

Table 6-3: Water Category

Water						
Category	Measure Number	Strategy	BMP	Grouped With #	Range of Effectiveness	
					Percent Reduction in GHG Emissions	Basis
Water Supply	WSW-1	Use Reclaimed Water			up to 40% for Northern Californiaup to 81% for Southern California	Outdoor Water Use
	WSW-2	Use Gray Water			0-100%	Outdoor Water Use
	WSW-3	Use Locally-Sourced Water Supply			0-60% for Northern and Central California; 11-75% for Southern California	Indoor and Outdoor Water Use
Water Use	WUW-1	Install Low-Flow Water Fixtures.			Residential: 20% Non-Residential: 17-31%	Indoor Water Use
	WUW-2	Adopt a Water Conservation Strategy.			varies	
	WUW-3	Design Water-Efficient Landscapes			0-70%	Outdoor Water Use
	WUW-4	Use Water-Efficient Landscape Irrigation Systems			6.1%	Outdoor Water Use
	WUW-5	Reduce Turf in Landscapes and Lawns			varies	
	WUW-6	Plant Native or Drought-Resistant Trees and Vegetation			BMP	

Table 6-4: Area Landscaping

Area Landscaping						
Category	Measure Number	Strategy	BMP	Grouped With #	Range of Effectiveness	
					Percent Reduction in GHG Emissions	Basis
Area Landscaping	A-1	Prohibit Gas Powered Landscape Equipment.			LADWP: 2.5-46.5% PG&E: 64.1-80.3% SCE: 49.5-72.0% SDGE: 38.5-66.3% SMUD: 56.3-76.0%	Fuel Use
	A-2	Implement Lawnmower Exchange Program			BMP	
	A-3	Electric Yard Equipment Compatibility		A-1 or A-2	BMP	

Table 6-5: Solid Waste Category

Solid Waste						
Category	Measure Number	Strategy	BMP	Grouped With #	Range of Effectiveness	
					Percent Reduction in GHG Emissions	Basis
Solid Waste	SW-1	Institute or Extend Recycling and Composting Services			BMP	
	SW-2	Recycle Demolished Construction Material			BMP	

Table 6-6: Vegetation Category

Vegetation						
Category	Measure Number	Strategy	BMP	Grouped With #	Range of Effectiveness	
					Percent Reduction in GHG Emissions	Basis
Vegetation	V-1	Urban Tree Planting		GP-4	varies	
	V-2	Create new vegetated open space.			varies	

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VMT Reduction Strategies

Project

- Project Density
- Land Use Diversity
- Project Design
- Affordable Housing

Infrastructure

- Internal pedestrian/ bike network
- Accessibility and quality of external pedestrian/bike network
- Neighborhood traffic calming improvements
- Accessibility to and quality of transit network

Parking

- Project parking supply
- Unbundled parking
- Internal bike facilities
- Bike Parking
- Working parking pricing

Transportation Demand Management (TDM)

- Transportation Management Associations
- Ride-sharing
- Telecommuting and alternative schedules
- Commute trip reduction marketing/education
- Car-sharing

ATTACHMENT 6