# APPENDIX

Transportation Master Plan

Draft Transportation Impact Analysis

# Elk Grove Sphere of Influence Amendment and Multi-Sport Park Complex

March 2017

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# I. INTRODUCTION

## PURPOSE

This study analyzes the transportation impacts associated with development of the proposed City of Elk Grove Sphere of Influence Amendment and Multi-Sport Park Complex (EGMSC), which is proposed to be located in the southern portion of the City (Project). The sports complex would be located directly south of Grant Line Road at the Grant Line Road/Waterman Road intersection. This study analyzes expected transportation conditions with development of the proposed Project.

The following analyses were selected for study based on the Project's expected operations and input from City of Elk Grove staff and comments received on the Notice of Preparation from Caltrans, the County of Sacramento, and the Capital Southeast Connector JPA:

| Analysis Facility | Peak Hour | Existing Conditions | Existing Plus Project Conditions | | Cumulative Conditions | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Plus Project Buildout | | | | |
| | | | Phase 1 | Buildout | No Project | Plus Phase 1 | Practice | Tournament | Stage Events | League Events | County Fair |
| Intersection | AM | X | | X | X | | X | | | | |
| | PM | X | X | X | X | X | X | | X | | |
| | Saturday | X | X | | X | X | | | | | |
| Roadway | PM | X | X | X | X | X | X | | X | X | X |
| | Saturday | X | X | | X | X | | X | | | |
| Freeway | AM | X | | X | X | | X | | | | |
| | PM | X | X | X | X | X | X | | | | |

- Analysis of background and Project traffic impacts at 18 study intersections, under existing conditions, and 20 study intersections under cumulative conditions, during typical weekday peak hour operations and analysis of seven intersections (Bradshaw Road to Promenade Parkway) on Saturday serving the Project under existing and cumulative conditions.
- Analysis of background and Project-related typical weekday PM and Saturday peak hour roadway segment operations. Typical weekday roadway operations were conducted for 22 study segments. Saturday peak roadway segment operations were conducted for the following special uses of the sports facility:
    - Regional/national soccer tournament
    - Local/semi-regional soccer tournament

- Analysis of background and Project traffic impacts on SR 99 and at the SR 99/Grant Line Road interchange, including mainline, merge, and diverge operations.

The rationale for studying each of these scenarios is described in more detail in the following chapters.

## PROJECT DESCRIPTION

**Figure 1** shows the Project area in the context of the study area, including study intersections. As shown, the Project would be located southeast of, but adjacent to, Grant Line Road at the Grant Line Road/Waterman Road intersection east of State Route 99 (SR 99) east of the Union Pacific Railroad. The Project area is located southwest of, but adjacent to, the existing City of Elk Grove boundary.


The proposed Project consists of amending the City of Elk Grove's Sphere of Influence by approximately 579 acres and constructing and operating a 100-acre Multi-Sport Park Complex on City-owned property. The following summarizes the components of the City's Phase 1 Project and Project buildout.

### *CITY PHASE 1 PROJECT*

The City's Phase 1 Project is the 100-acre Multi-Sport Park Complex. Phase 1 would consist of 16 multi-purpose sports fields that includes 12 full-sized lighted soccer fields (80 x 120 yards) and 4 training fields (80 x 50 yards), amenity concourses (of unspecified size), and an indoor sports facility of up to 100,000 square feet in area. The indoor sports facility would provide space for support facilities that could include restrooms, food and beverage sales, merchandising space, and office space (i.e., in support of tournament and practice activities).

Access for Phase 1 would be provide by a full-access driveway that would create the fourth leg of the Grant Line Road/Waterman Road intersection. The access driveway would traverse the perimeter of the sports fields and create a new right-in/right-out driveway at Grant Line Road. As development occurs in the lands adjacent to the Multi-Sport Park Complex, the access to at the Grant Line Road/Waterman Road intersection will be upgraded from a driveway to a public street. In addition, a signalized full-access intersection will be provided at the Grant Line Road/Mosher Road intersection.

Phase 1 would provide a minimum of 1,160 paved parking spaces, located along the southwest property line and a gravel overflow parking lot along the northeast property line.

***CITY SITE BUILDOUT***

Buildout of the Project would add the following uses to the 100-acre Multi-Sport Park Complex:

- A stadium park that would have 7,500 fixed seats for field events with an additional on-field seating capacity of 1,500 seats that would accommodate up to 9,000 attendees for stage events.
- A 15-acre Fairgrounds that would provide facilities to support the County Fair and other agricultural-based events.
- 285 acres of commercial/industrial land use.
- 185 acres of mixed use

Refer to Chapter III for a discussion of the Project's expected operations during weekdays and on weekends.

**Figure 1: Study Area**

## STUDY AREA AND PERIODS

The City of Elk Grove typically relies on the weekday AM and PM peak hours to characterize its street system operations and need for capital improvements because these hours generally represent the busiest hours of travel during a typical weekday. Accordingly, this study includes an analysis of potential EGMSC impacts associated with its typical weekday AM and PM peak hour operations. However, in recognition of the peaks in traffic associated with different uses of Phase 1, AM peak hour operations may be omitted and/or Saturday operations may be added. For planned weekend soccer tournaments, a focused analysis along Grant Line Road during the Saturday peak hour is also presented that includes intersections 5 through 11. Similarly, analysis of practice activities at the Multi-Sports Complex is presented during PM peak hour conditions, since practice activities occur in the evenings.

The study area includes the following 18 intersections on Grant Line Road, Kammerer Road, and Waterman Road:

1. I-5 SB Ramps/Hood Franklin Road
2. I-5 NB Ramps/Hood Franklin Road
3. Bruceville Road/Kammerer Road
4. Lent Ranch Parkway/Kammerer Road
5. Promenade Parkway/Kammerer Road
6. SR 99 SB Ramps/Grant Line Road
7. SR 99 NB Ramps/Grant Line Road
8. E. Stockton Boulevard/Grant Line Road
9. Waterman Road/Grant Line Road
10. Mosher Road/Grant Line Road
11. Bradshaw Road/Grant Line Road
12. Grant Line Road/Elk Grove Boulevard
13. Grant Line Road/Bond Road
14. Grant Line Road/Wilton Road
15. Grant Line Road/Sheldon Road
16. Grant Line Road/Calvine Road
17. Waterman Road/Elk Grove Boulevard
18. Waterman Road/Bond Road

These intersections were selected in consultation with City of Elk Grove staff and consider the Project's size, location, and expected generation/distribution of trips. Under cumulative conditions, the planned Big Horn Boulevard/Kammerer Road and Lotz Parkway/Kammerer Road intersections are also analyzed. As shown in **Figure 1**, the study area includes all signalized intersections and key stop controlled intersections on Grant Line Road and Kammerer Road.

The study area also includes 37 and 41 roadway segments under existing and cumulative conditions, respectively. The roadway segments are located on arterial streets. Whereas intersections are analyzed on a peak hour basis to identify impacts and mitigations and size Project access needs, roadways are evaluated to describe to decision-makers and the public the expected change in traffic under various activities at the EGMSC. Roadway segments are not analyzed for impacts. However, the data may be used in support of air quality, noise, and greenhouse gas evaluations by the City.

The following describes the study time periods:

- Weekday AM Peak Hour: occurs between 7:00 to 9:00 AM.
- Weekday PM Peak Hour: occurs between 4:00 to 6:00 PM.
- Saturday Peak Hour: occurs between 9:00 to 11:00 AM. The Saturday peak hour represents the busiest 60 minutes of travel during surveyed tournaments. This information was derived by conducting traffic counts at comparable soccer tournaments in the Sacramento region, and is discussed in detail in Chapter III.

## ANALYSIS METHODOLOGIES

Project analysis includes both Level of Service (LOS) and Vehicle Miles of Travel (VMT).

LOS is a qualitative measure of traffic operating conditions whereby a letter grade, from A (the best) to F (the worst), is assigned. These grades represent the perspective of drivers and are an indication of the comfort and convenience associated with driving. In general, LOS A represents free-flow conditions with no congestion, and LOS F represents severe congestion, over-capacity conditions.

VMT is a metric for measuring transportation impacts on the natural environment. It considers the number of miles traveled by motor vehicles (i.e., passenger cars and light trucks) that are produced by or attracted to a project. This allows for an accounting of both the effects of a project's features and its surroundings, as well as its location within the region. VMT considers only motor vehicle trips and excludes trips by other modes. Therefore, the benefits of transit and active transportation trips are captured through reductions in VMT.

Analysis methodologies for LOS and VMT are discussed below.

### *INTERSECTIONS*

All study intersections were analyzed using procedures from the *Highway Capacity Manual* (HCM), Transportation Research Board, 2010 as follows:

- For weekday AM and PM peak hour operations, most study intersections were analyzed using the Synchro 8 software program, which utilizes HCM procedures. HCM 2000 was used to analyze two intersections (Kammerer Road/Lent Ranch Parkway and Grant Line Road/Calvine Road) due to unique signal timing involving the northbound pedestrian phase that occurs simultaneously with the westbound left-turn movement.
- For Saturday peak hour conditions at the project accesses, key intersections on Grant Line Road and Kammerer Road between Bradshaw Road and Promenade Parkway, using the Synchro 8 software program, which utilizes HCM procedures. The state-of-the-practice SimTraffic

microsimulation model, which considers the effects of signal coordination, vehicle queue spillbacks, and other conditions on at the Grant Line Road/Waterman Road and Grant Line Road/Mosher Road (under cumulative conditions) intersections (i.e., the main Project access) to confirm that the proposed access would not result in vehicle queue spillback that would impede traffic flow on Grant Line.

The LOS at signalized and all-way stop-control intersections is based on the average delay experienced by all motorists travelling through the intersection as described in the 2010 HCM. **Table 1** relates the delay range for each LOS category for signalized and unsignalized intersections. For side-street stop-controlled intersections, the delay and LOS is based on the minor street movement with the greatest average delay.

**TABLE 1:**
**LEVEL OF SERVICE THRESHOLDS – INTERSECTIONS**

| Level of Service | Average Control Delay (seconds per vehicle) | |
|---|---|---|
| | Signalized Intersections[1] | Unsignalized Intersections[1] |
| A | ≤ 10 | ≤ 10 |
| B | > 10 to 20 | > 10 to 15 |
| C | > 20 to 35 | > 15 to 25 |
| D | > 35 to 55 | > 25 to 35 |
| E | > 55 to 80 | > 35 to 50 |
| F | > 80 | > 50 |

Notes: [1] Delay values rounded to the nearest second and evaluated for LOS based on the above thresholds (i.e, 10 sec = LOS A).
Source: Fehr & Peers, 2016

***ROADWAY SEGMENTS***

Roadway segments were evaluated by comparing peak hour directional traffic volumes and volume-to-capacity (VC) ratios for key study roadway segments.

Consistent with the General Plan transportation analysis, the analysis presented in this report is based on peak hour directional traffic volumes to address traffic flow directionality that occurs on some study facilities associated with morning and evening work commute patterns.

**Table 2** displays peak hour roadway segment service volume thresholds used to evaluation roadway capacity. Service volume thresholds to capacity thresholds presented in the City of Elk Grove's Traffic Impact Analysis Guidelines (July 2000). Consistent with assumptions in the City's General Plan

background report, study segments were analyzed using thresholds for arterial roadways with moderate access control.

**TABLE 2:**
**PEAK HOUR ROADWAY SEGMENT SERVICE VOLUME THRESHOLDS**

| | Directional Service Volume Threshold (vehicles per lane) |
|---|---|
| Connector JPA Segments[1] | 910 |
| Other Study Segments[2] | 990 |

Notes:
[1]Capital SouthEast Connector – *Planning and Evaluation Traffic Conditions White Paper*, January 25, 2017.
[2]City of Elk Grove – *Traffic Impact Analysis Guidelines*, July 2000. Service volume applies to arterial roadways with moderate access control.
Source: Fehr & Peers, 2017

***FREEWAY FACILITIES***

Per Caltrans standards, the freeway ramps and mainline were analyzed using procedures from the Highway Capacity Manual, 2010

This procedure determines the LOS based on the computed density, which is expressed in passenger cars per lane, per mile. **Table 3** displays the density ranges associated with each LOS category for basic segments and ramp merge/diverge movements.

**TABLE 3:**
**LEVEL OF SERVICE THRESHOLDS – FREEWAYS**

| Level of Service | Density (Passenger Cars per Mile per Lane)[1] | |
|---|---|---|
| | Signalized Intersections | Unsignalized Intersections |
| A | ≤ 11 | ≤ 10 |
| B | > 11 to 18 | > 10 to 20 |
| C | > 18 to 26 | > 20 to 28 |
| D | > 26 to 35 | > 28 to 35 |
| E | > 35 to 45 | > 35 |
| F | > 45 or any v/c ratio > 1.00[1] | Demand Exceeds Capacity[2] |

Notes: [1]V/C ratio = demand flow rate divided by the capacity of a given segment.
[2] Occurs when freeway demand exceeds upstream (diverge) or downstream (merge) freeway segment capacity, or if off-ramp demand exceeds off-ramp capacity.
Source: Fehr & Peers, 2016

As outlined below, SR 99 from just south of Elk Grove Boulevard through the City includes one high occupancy vehicle (HOV) lane and two general purpose lanes in each direction. Therefore, to account for HOV lane utilization, the freeway segment analysis is based on the traffic volume in the general purpose lanes, by removing vehicles using the HOV lanes from the analysis, based on measured HOV volumes documented in Caltrans' District 3 High Occupancy Vehicle Lanes Status Report, Sacramento Metropolitan Area (July 2011).

***VEHICLE MILES TRAVELED***

The City uses total daily VMT and VMT per service population as the basis for VMT analysis. VMT was calculated using a modified version of SACOG's SACMET regional travel demand forecasting model. The following describes these two VMT metrics and their intended use:

- Total Daily VMT – Includes the sum of all daily VMT produced by all uses within the City of applicable Study Area. The total daily VMT metric is used to assess a project against the Citywide or Study Area total VMT limits. The project is located in the City's East Study Area, so consistency with the East Study Area total daily VMT limit is evaluated.
- VMT per Service Population – Includes the sum of all home generated residential and worker VMT produced by uses in the applicable land use designation, divided by the sum of total employees and population in the subject area. The VMT per service population metric is used to assess a project against specific land use VMT limits.

Using the modified version of SACOG's SACMET forecasting model, VMT per service population is calculated by first measuring daily home-based residential VMT per capita is calculated. This considers all home-based auto vehicle trips, traced back to the residence of the trip-maker, including home-based work, home-based other, home-based school, and home-based shopping trips. Non-home-based trips are excluded. Second, the home-based work VMT per worker is calculated. This looks at all vehicle trips between home and work. Commercial vehicle trips (e.g., delivery trucks) are excluded from the analysis.

***TRAVEL DEMAND FORECASTING***

A modified version of SACOG's MTP/SCS travel demand forecasting (TDF) model was used to develop traffic volumes for the study facilities. The official version of the base year model is generally representative of 2012 conditions and the future year model has a 2036 forecast year. However, as is standard practice with large area travel demand models, a thorough model review was completed and the model was refined to ensure that it produced reasonable results in the study area.

The following refinements were implemented in the study area:

- Added roadway network detail
- Updated land use to reflect 2015 conditions in the study area

- Refined the traffic analysis zones (TAZs) in order to get more refined loading of trips in the study area
- Updated network attributes in the study area to reflect existing conditions (e.g. verified roadway network speeds, number of lanes on the roadway, and roadway capacities to reflect existing conditions)
- Updated the future year roadway network in the study area to only reflect the SACOG Metropolitan Transportation Plan/Sustainable Communities Strategy (MTP/SCS) constrained roadway network.
- Updated the future land use information to reflect approved and reasonably foreseeable projects in the study area

Specific information related to the model's performance is described below:

Base Year Model Validation

Before any model can be applied for use in a major specific plan application, it should be evaluated against specific validation criteria identified by Caltrans, the Federal Highways Administration (FHWA), and the California Transportation Commission (CTC). These criteria were developed to ensure that a model is developed such that it can accurately forecast existing conditions based on land use and roadway network information, which improves the model's ability to accurately forecast future conditions. The state-of-the-practice for developing defensible forecasts for changes in the roadway network and/or changes in proposed land use is to use a valid base year model.

The first step of any model validation is to ensure that the model generally produces similar results to existing counts. Please note that, since the model is being used to generate AM peak hour and PM peak hour forecasts, the model must be valid at our study facilities for both time periods.

Key metrics for model validation guidelines are described below:

- The volume-to-count ratio is computed by dividing the volume assigned by the model and the actual traffic count for individual roadways (or intersections). The volume-to-count ratio should be less than 10%.
- The deviation is the difference between the model volume and the actual count divided by the actual count. Caltrans provides guidance on the maximum allowable deviation by facility type (e.g. lower-volume roadways can have a higher deviation than higher-volume roadways). 75% of the study facilities should be within the maximum allowable deviation.
- The correlation coefficient estimates the correlation between the actual traffic counts and the estimated traffic volumes from the model. The correlation coefficient should be greater than 0.88.

- The percent Root Mean Square Error (RMSE) is the square root of the model volume minus the actual count squared divided by the number of counts. It is a measure similar to standard deviation in that it assesses the accuracy of the entire model. The RMSE should be less than 40%.

The model validation statistics are summarized in **Table 4**. As shown in **Table 4**, the model meets or exceeds the identified model validation target criteria in the study area. As such, the model is deemed appropriate for use in this assessment.

**TABLE 4:**
**TRAVEL DEMAND FORECASTING MODEL SUB AREA VALIDATION**

| Performance Metric | Target Criteria | Peak Hour Model Validation Results | |
|---|---|---|---|
| | | AM | PM |
| Model to Count Ratio | Between 0.90 and 1.10 | 0.91 | 0.95 |
| Percent Within Maximum Deviation | > 75% | 91% | 91% |
| Percent Root Mean Square Error | < 40% | 22% | 19% |
| Correlation Coefficient | > 0.88 | 0.93 | 0.94 |

Notes: Validation based on 35 count locations.
Source: Fehr & Peers, 2017

## Traffic Volume Forecasts

The TDF model was used to develop traffic volume forecasts for Project buildout conditions under existing and cumulative conditions except for Phase 1 (i.e., the 100-acre Multi-Sport Park Complex) and analysis that includes stadium events (i.e., concerts and tournaments). Due to the unique trip generation and distribution characteristics of Phase 1 and stadium events, trips for these uses were manually added to the study facilities under existing and cumulative conditions. The future year TDF model was modified to reflect buildout development levels in the City of Elk Grove, including buildout of the Laguna Ridge Specific Plan, Sterling Meadows, the Elk Grove Promenade, and buildout of the following projects considered to be reasonably foreseeable:

- Wilton Rancheria Casino Resort Project
- Bilby Ridge Sphere of Influence Amendment
- Kammerer Road/Highway 99 Sphere of Influence Amendment
- Elk Grove Promenade

Year 2036 levels of development are assumed outside the City of Elk Grove.

All forecasts are adjusted using a growth increment method (i.e., the difference method) that adds the growth in forecasts travel demand to existing traffic counts. The base year TDF model transportation network (in the study area) was modified to account of changes to the network that have occurred between 2008 and 2015 (i.e., when the traffic counts were collected). The 2036 transportation network is consistent with programmed improvements listed in the Final MTP/SCS 2016 project list.

## STANDARDS OF SIGNIFICANCE

Consistent with the City of Elk Grove's Traffic Impact Analysis Guidelines (July 2000) and the City's proposed VMT policy, the following evaluation criteria were used to determine the significance of project impacts:

### *INTERSECTIONS*

An impact to a roadway segment is considered significant, and mitigation measures must be identified when:

- The traffic generated by the Project degrades the LOS from an acceptable LOS D or better (without the Project) to an unacceptable LOS E or LOS F (with the Project)
- The level of service (without Project) is unacceptable and Project generated traffic increases the average vehicle delay by more than five seconds

### *FREEWAY FACILITIES*

An impact is considered significant on freeway facilities if the Project causes the facility to change from acceptable to unacceptable LOS.

For facilities, which are or will be (in the cumulative condition), operating at unacceptable LOS without the Project, an impact is considered significant if the Project:

- Increases the V/C ratio on a freeway mainline segment or freeway ramp junction by 0.05
- Increase the number of peak hour vehicles on a freeway mainline segment or freeway ramp junction ramp junction by more than five percent

According to the Guide for the Preparation of Traffic Impact Studies (Caltrans, June 2001), Caltrans strives to maintain a target LOS at the transition between LOS C and LOS D on State highway facilities; therefore, LOS D was selected as the minimum standard for all study freeway facilities.

### *BICYCLE / PEDESTRIAN / TRANSIT FACILITIES*

An impact is considered significant if implementation of the Project will disrupt or interfere with existing or planned bicycle, pedestrian, or transit facilities.

***VEHICLE MILES TRAVELED***

The City desires to achieve a reduction in the travel distances of automobile trips, referred to as Vehicle Miles Traveled (VMT). Reductions in VMT can be accomplished through a combination of land use and mobility actions. To reduce VMT, the City has established the following metrics and limits.

The following VMT Screening Map identifies areas in the City that are exempt from VMT analysis. These include sites that have been pre-screened through Citywide VMT analysis. Pre-screened areas are shown in white and have been determined to result in 15 percent or below the average service population VMT established for that land use designation if built to the specifications of the Land Use Plan. With an average VMT per service population of 12.0, the City's target VMT per service population threshold is 10.2.

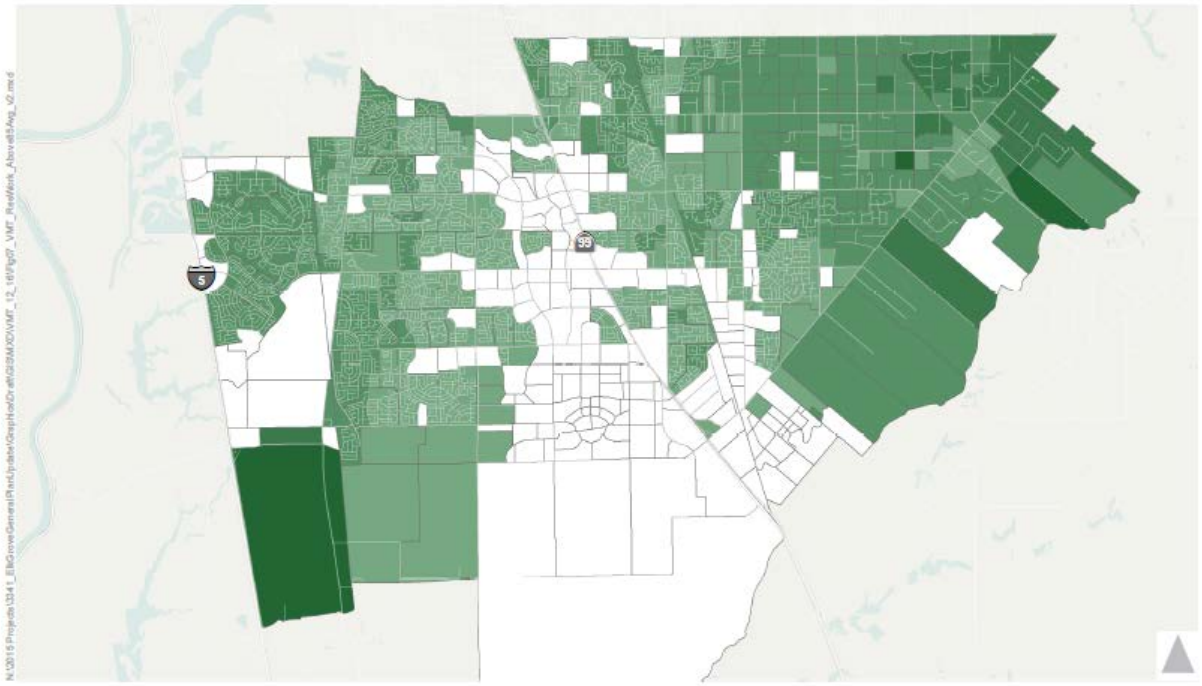



Figure 7
City of Elk Grove
Residential and Work VMT
by Traffic Analysis Zone

For projects that have not been pre-screened and that do not achieve the limits outlined below shall be subject to all feasible mitigation measures necessary to reduce the VMT for, or induced by, the project to the applicable limits. If the VMT for or induced by the project cannot be reduced consistent with the performance metrics outlined below, the City may consider approval of the project, subject to a finding

of overriding consideration and mitigation of transportation impacts to the extent feasible, provided some other form of community benefit is achieved by the project.

- **New Development** – Any new land use plans (and amendments to such plans) and other discretionary development proposals (referred to as "development projects") are required to demonstrate a 15 percent reduction in VMT from existing (2015) conditions. To demonstrate this reduction, conformance with following land use and cumulative VMT limits is required:

    1. **Land Use** – Development projects shall demonstrate that the VMT produced by the project at buildout is equal to or less than the VMT limit of the underlying land use designation, as shown in the following table, which incorporates the 15 percent reduction:

**Vehicle Miles Traveled Limits by Land Use Designation**

| Land Use Designation | VMT Limit (daily per service population) |
|---|---|
| **Commercial and Employment Land Use Designations** | |
| Community Commercial | 69.2 |
| Regional Commercial | 40.9 |
| Employment Center | 11.9 |
| Light Industrial/Flex | 26.2 |
| Light Industrial | 42.2 |
| Heavy Industrial | 31.1 |
| **Mixed Use Land Use Designations** | |
| Village Center Mixed Use | 27.2 |
| Residential Mixed Use | 17.5 |
| **Public/Quasi Public and Open Space Land Use Designations** | |
| Parks and Open Space | 01 |
| Resource Management and Conservation | 01 |
| Public Services | 20 |
| **Residential Land Use Designations** | |
| Rural Residential | 20.1 |
| Estate Residential | 18 |
| Low Density Residential | 12 |
| Medium Density Residential | 10.9 |

| Land Use Designation | VMT Limit (daily per service population) |
|---|---|
| High Density Residential | 7.8 |
| **Other Land Use Designations** | |
| Agriculture | 30.5 |

*Notes:*
*1. These land use designations are not anticipated to produce substantial VMT, as they have no residents and limited to no employees. These land use designations therefore have no limit and are exempt from analysis.*

2. **Cumulative for Development Projects within the Existing City (2017)** – Development projects located within the existing (2017) City limits shall demonstrate that cumulative VMT would be equal to or less than the established Citywide limit of 5,565,587 VMT (total daily VMT), which incorporates the 15 percent reduction.

3. **Cumulative for Development Projects within Growth Areas** – Development projects located within Study Areas shall demonstrate that cumulative VMT within the applicable Study Area would be equal to or less than the established limit shown in the following table, which incorporates the 15 percent reduction.

**Study Area Total Vehicle Miles Traveled Limits**

| Study Area | VMT Limit (total VMT at buildout) |
|---|---|
| East Study Area | 342,855 |
| South Study Area | 1,219,516 |
| West Study Area | 550,040 |

The project is located in a portion for the East Study area. The project and remainder of the East Study Area will meet the buildout VMT Limit 342,855.

# II. EXISTING CONDITIONS

This chapter describes the existing transportation system including the roadway, bicycle, pedestrian, and transit systems within the study area.

The City of Elk Grove is generally located in south Sacramento County about 15 miles south of the City of Sacramento. Regional freeway access to Elk Grove is provided by SR 99 and I-5. Grant Line Road provides access to regional destinations northeast of Elk Grove like the City of Rancho Cordova, City of Folsom, and community of El Dorado Hills. Elk Grove is generally served by a network of arterial-level roadways on a one-mile grid with interchanges on SR 99. I-5 has two interchanges that provide direct access to the city.

## ROADWAY SYSTEM

- **Grant Line Road** traverses Elk Grove in a southwest to northeast direction. Grant Line Road extends from SR 99 through Elk Grove to White Rock Road in Rancho Cordova. Grant Line Road is six lanes between SR 99 and East Stockton Boulevard. Grant Line Road is four lanes between East Stockton Boulevard and Waterman Road with a grade-separated crossing of the Union Pacific Railroad. Grant Line Road is two lanes east of Waterman Road. Grant line Road is designated as an eight lane arterial between SR 99 and Bradshaw Road and as a six lane arterial east of Bradshaw Road. Grant Line Road between Calvine Road and just east of Equestrian Drive is subject to the Elk Grove Rural Road Improvement Policy. Grant Line Road is also part of the Capital SouthEast Connector project.

- **Kammerer Road** is an east-west road extending from Bruceville Road to West Stockton Boulevard. Kammerer Road is two lanes from just west of Lent Ranch Parkway to Bruceville Road. Kammerer Road is part of the Capital SouthEast Connector project and is designated in the General Plan as an eight lane arterial from SR 99 to Lent Ranch Parkway and as a six-lane arterial from Lent Ranch Parkway to Franklin Boulevard. The general plan includes the extension of Kammerer Road from Bruceville Road to Franklin Boulevard.

- **Waterman Road** is a north-south roadway that extends from Calvine Road to Grant Line Road in the city. Waterman Road is generally two lanes with widening at improved intersection to accommodate it general plan designation as a four-lane arterial. The segment of Waterman Road ½ mile north and south of Sheldon Road is subject to the Elk Grove Rural Road Improvement Policy.

- **State Route 99 (SR 99)** is a north-south freeway that provides a connection between all of the major cities in the Central Valley, from Sacramento and Stockton in the north to the cities of Modesto, Merced, Fresno, and Bakersfield in the south. Access to SR 99 is provided through interchanges at Grant Line Road, Elk Grove Boulevard, Laguna Boulevard/Bond Road, and

Sheldon Road. This section of SR 99 has two mainline travel lanes and one high occupancy vehicle (HOV) lane in either direction with a posted speed limit of 65 mph.

- **Interstate 5 (I-5)** is a north-south freeway that traverses California and is a major national freeway that connects between Mexico and Canada. Near the Hood Franklin Road interchange, I-5 is a four-lane freeway.

Weekday AM and PM peak hour traffic count data was collected in April 21, 2015 and included identification of heavy vehicles, automobiles, bicycles and pedestrian by movement/approach. Saturday peak hour traffic count data was collected on May 21, 2016. All traffic counts included identification of heavy vehicles, automobiles, bicycles and pedestrian by movement/approach. Existing traffic counts are shown on the following figures:

- **Figure 2** shows weekday AM and PM peak hour turning movement counts, lane configurations, and traffic control at each study intersection.
- **Figure 3** shows Saturday peak hour turning movement counts, lane configurations, and traffic control at Intersections 5 through 11.

## TRAFFIC OPERATIONS

The following summarizes traffic operations under existing conditions, including peak hour roadway segment volume-to-capacity, intersection operations, and freeway operations at the SR 99/Grant Line Road interchange.

### Peak Hour Roadway Segment Volume-to-Capacity

**Table 5** displays directional roadway segment traffic volumes and volume-to-capacity ratio for weekday PM and Saturday peak hour conditions for key roadway segment that will provide primary access to the proposed project, including Grant Line Road between SR 99 and Bradshaw Road. As discussed previously, roadways are evaluated to describe to decision-makers and the public the expected change in traffic under various activities at the EGMSC. As shown in **Table 5**, all of the segments will operate below capacity at VC ratio less than 1.00.

### Peak Hour Intersection Operations

**Table 6** displays the existing weekday AM, PM, and Saturday peak hour traffic operations analysis results at the 18 study intersections (refer to Appendix A for detailed calculations). Most of the existing study intersections have signal control, except for the following:

***Side-Street Stop Control***

- Hood Franklin Road/I-5 SB Ramps
- Hood Franklin Road/I-5 NB Ramps
- Kammerer Road/Bruceville Road
- Grant Line Road/Mosher Road
- Grant Line Road/Bradshaw Road

***All-Way Stop Control***

- Grant Line Road/Elk Grove Boulevard

Operation of these intersection will likely degrade sooner than the signal-controlled intersections with the addition of project traffic. As shown, all study intersections currently operate at LOS D or better.

Peak Hour Freeway Operations

**Table 7** displays the existing weekday AM and PM peak hour traffic operations analysis results at the 10 study freeway facilities (refer to Appendix A for detailed calculations). As shown, all study freeway facilities at the SR 99/Grant Line Road interchange operate at LOS C or better. However, peak period operations on SR 99 may be worse than reported due to reoccurring bottlenecks. As documented in the California Department of Transportation Mobility Performance Report, 2009, several bottleneck locations exist on SR 99 that meter traffic northbound in the morning and southbound in the evening. These bottlenecks cause congested conditions (i.e., vehicle speed of 35 miles per hour or less) and vehicle queuing on northbound SR 99 during the AM peak period. Similarly, bottlenecks on southbound SR 99 in the evening meter traffic on SR 99 through Elk Grove.

**Figure 2: Weekday Peak Hour Traffic Volumes and Lane Configurations - Existing Conditions**

**Figure 3: Saturday Peak Hour Traffic Volumes and Lane Configurations - Existing Conditions**

**TABLE 5:**
**PEAK HOUR ROADWAY SEGMENT OPERATIONS – EXISTING CONDITIONS**

| Roadway | Segment | | Direction | Lanes[1] | Hourly Capacity (Per Lane) | Weekday PM Peak Hour | | Saturday Peak Hour | |
|---|---|---|---|---|---|---|---|---|---|
| | From | To | | | | Volume[1] | VC[2] | Volume[1] | VC[2] |
| Bradshaw Rd | Elk Grove Blvd | Grant Line Rd | SB | 2 | 990 | 250 | 0.25 | 165 | 0.17 |
| | | | NB | 2 | 990 | 254 | 0.26 | 135 | 0.14 |
| Grant Line Rd | SR 99 SB Ramps | SR 99 NB Ramps | EB | 6 | 910 | 618 | 0.23 | 425 | 0.16 |
| | | | WB | 6 | 910 | 1,108 | 0.41 | 595 | 0.22 |
| | SR 99 NB Ramps | E. Stockton Blvd | EB | 6 | 910 | 1,022 | 0.37 | 761 | 0.28 |
| | | | WB | 6 | 910 | 1,234 | 0.45 | 695 | 0.25 |
| | E. Stockton Blvd | Waterman Rd | EB | 4 | 910 | 826 | 0.45 | 622 | 0.34 |
| | | | WB | 4 | 910 | 911 | 0.50 | 570 | 0.31 |
| | Waterman Rd | Mosher Rd | EB | 2 | 910 | 631 | 0.69 | 454 | 0.50 |
| | | | WB | 2 | 910 | 680 | 0.75 | 429 | 0.47 |
| | Mosher Rd | Bradshaw Rd | EB | 2 | 910 | 564 | 0.62 | 432 | 0.47 |
| | | | WB | 2 | 910 | 645 | 0.71 | 382 | 0.42 |
| | Bradshaw Rd | Elk Grove Blvd | EB | 2 | 910 | 304 | 0.33 | 309 | 0.34 |
| | | | WB | 2 | 910 | 402 | 0.44 | 217 | 0.24 |
| Kammerer Rd | Lent Ranch Pkwy | Promenade Pkwy | EB | 6 | 910 | 285 | 0.10 | 214 | 0.08 |
| | | | WB | 6 | 910 | 433 | 0.16 | 171 | 0.06 |
| | Promenade Pkwy | SR 99 SB Ramps | EB | 6 | 910 | 547 | 0.20 | 316 | 0.12 |
| | | | WB | 6 | 910 | 655 | 0.24 | 296 | 0.11 |
| Mosher Rd | Waterman Rd | Grant Line Rd | SB | 2 | 990 | 75 | 0.08 | 77 | 0.08 |
| | | | NB | 2 | 990 | 98 | 0.10 | 56 | 0.06 |
| Waterman Rd | Mosher Rd | Grant Line Rd | SB | 2 | 990 | 260 | 0.26 | 151 | 0.15 |
| | | | NB | 2 | 990 | 231 | 0.23 | 147 | 0.15 |

[1] Both directions excluding center turn lanes or right-turn deceleration lanes.
[2] VC – Volume-to-Capacity Ratio
Source: Fehr & Peers, 2017

**TABLE 6:**
**PEAK HOUR INTERSECTION LEVEL OF SERVICE – EXISTING CONDITIONS**

| Intersection | Control | AM Peak Hour | | PM Peak Hour | | Saturday Peak Hour | |
|---|---|---|---|---|---|---|---|
| | | Delay[1] | LOS[1] | Delay[1] | LOS[1] | Delay[1] | LOS[1] |
| 1. Hood Franklin Rd/I-5 SB Ramps | SSSC | 5 (10) | A (A) | 8 (11) | A (B) | | |
| 2. Hood Franklin Rd/I-5 NB Ramps | SSSC | 2 (11) | A (B) | 2 (11) | A (B) | | |
| 3. Kammerer Rd/Bruceville Rd | SSSC | 10 (19) | A (C) | 10 (15) | B (C) | | |
| 4. Kammerer Rd/Lent Ranch Pkwy[2] | Signal | 5 | A | 4 | A | | |
| 5. Kammerer Rd/Promenade Pkwy | Signal | 14 | B | 15 | B | 10 | A |
| 6. Kammerer Rd/SR 99 SB Ramps | Signal | 7 | A | 7 | A | 5 | A |
| 7. Kammerer Rd /SR 99 NB Ramps | Signal | 7 | A | 8 | A | 4 | A |
| 8. Grant Line Rd/E. Stockton Blvd | Signal | 17 | B | 21 | C | 16 | B |
| 9. Grant Line Rd/Waterman Rd | Signal | 12 | B | 8 | A | 9 | A |
| 10. Grant Line Rd/Mosher Rd | SSSC | 3 (27) | A (D) | 2 (20) | A (C) | 2 (13) | A (B) |
| 11. Grant Line Rd/Bradshaw Rd | SSSC | 4 (13) | A (B) | 5 (15) | A (C) | 4 (11) | A (B) |
| 12. Grant Line Rd/Elk Grove Blvd | AWSC | 29 | D | 14 | B | | |
| 13. Grant Line Rd/Bond Rd | Signal | 19 | B | 18 | B | | |
| 14. Grant Line Rd/Wilton Rd | Signal | 37 | D | 27 | C | | |
| 15. Grant Line Rd/Sheldon Rd[2] | Signal | 29 | C | 20 | C | | |
| 16. Grant Line Rd/Calvine Rd[2] | Signal | 21 | C | 14 | B | | |
| 17. Waterman Rd/Elk Grove Blvd | Signal | 26 | C | 26 | C | | |
| 18. Waterman Rd/Bond Rd | Signal | 27 | C | 23 | C | | |

Notes:

AWSC = All-way Stop Control. SSSC = Side-street Stop Control.
[1]Average delay (rounded to the nearest second) and LOS for signalized and all-way stop-controlled intersections is the weighted average for all movements. Average delay and LOS at side-street stop-controlled intersections shown for both worst-case side street movement (in parentheses) and intersection as a whole.
[2]HCM 2000 was used due to unique signal timing or to be consistent with other scenarios.
Source: Fehr & Peers, 2017

**TABLE 7:**
**PEAK HOUR FREEWAY ANALYSIS – EXISTING CONDITIONS**

| Freeway Facility | Type | Weekday AM Peak Hour | | Weekday PM Peak Hour | |
|---|---|---|---|---|---|
| | | Density | LOS | Density | LOS |
| 1. NB SR 99 South of Grant Line Road | Basic Segment | 22.7 | C | 24.0 | C |
| 2. NB SR 99 Grant Line Road Slip Off-Ramp | Diverge | 17.6 | B | 18.7 | B |
| 3. NB SR 99 Grant Line Road Loop On-Ramp | Basic Segment | 11.5 | B | 12.5 | B |
| 4. NB SR 99 Grant Line Road Slip On-Ramp | Merge | 15.4 | B | 17.1 | B |
| 5. NB SR 99 North of Grant Line Road | Basic Segment | 16.1 | B | 18.8 | C |
| 6. SB SR 99 North of Grant Line Road | Basic Segment | 13.9 | B | 14.2 | B |
| 7. SB SR 99 Grant Line Road Slip Off-Ramp | Diverge | 7.4 | A | 7.9 | A |
| 8. SB SR 99 Grant Line Road Loop On-Ramp | Basic Segment | 9.6 | A | 10.7 | A |
| 9. SB SR 99 Grant Line Road Slip On-Ramp | Merge | 12.9 | B | 13.9 | B |
| 10. SB SR 99 South of Grant Line Road | Basic Segment | 15.8 | B | 17.3 | B |

Notes:

Source: Fehr & Peers, 2017

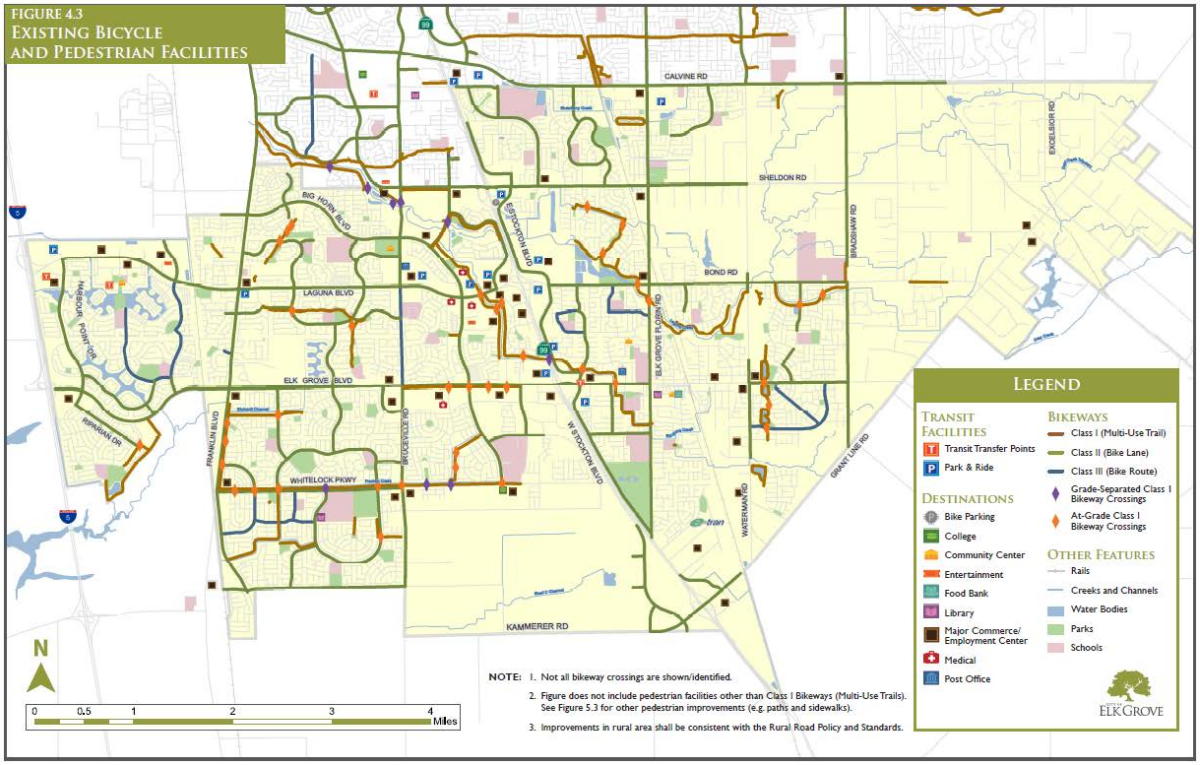
## BICYCLE/PEDESTRIAN SYSTEM

Based on the 2009-2013 American Community Survey, in Elk Grove and the State of California, most residents commute by automobile (drive alone or in carpool) to get to work. In Elk Grove, fewer Elk Grove residents (about 1 percent) rely on active transportation including walking and bicycling to work than the state as a whole (about 4 percent).

Most of the bike paths in the city limits are Class II lanes, which are located on existing streets or highways and are striped for one-way bicycle travel. Below are descriptions of bicycle paths and their classifications.

- **Class I** Bike Paths provide a completely separated right-of-way for the exclusive use of bicycles and pedestrian with cross-flow minimized.
- **Class II** Bike Lanes are striped lanes for one-way bike travel on a street or highway.
- **Class III** Bike Routes provide for shared use with pedestrians or motor vehicle traffic.

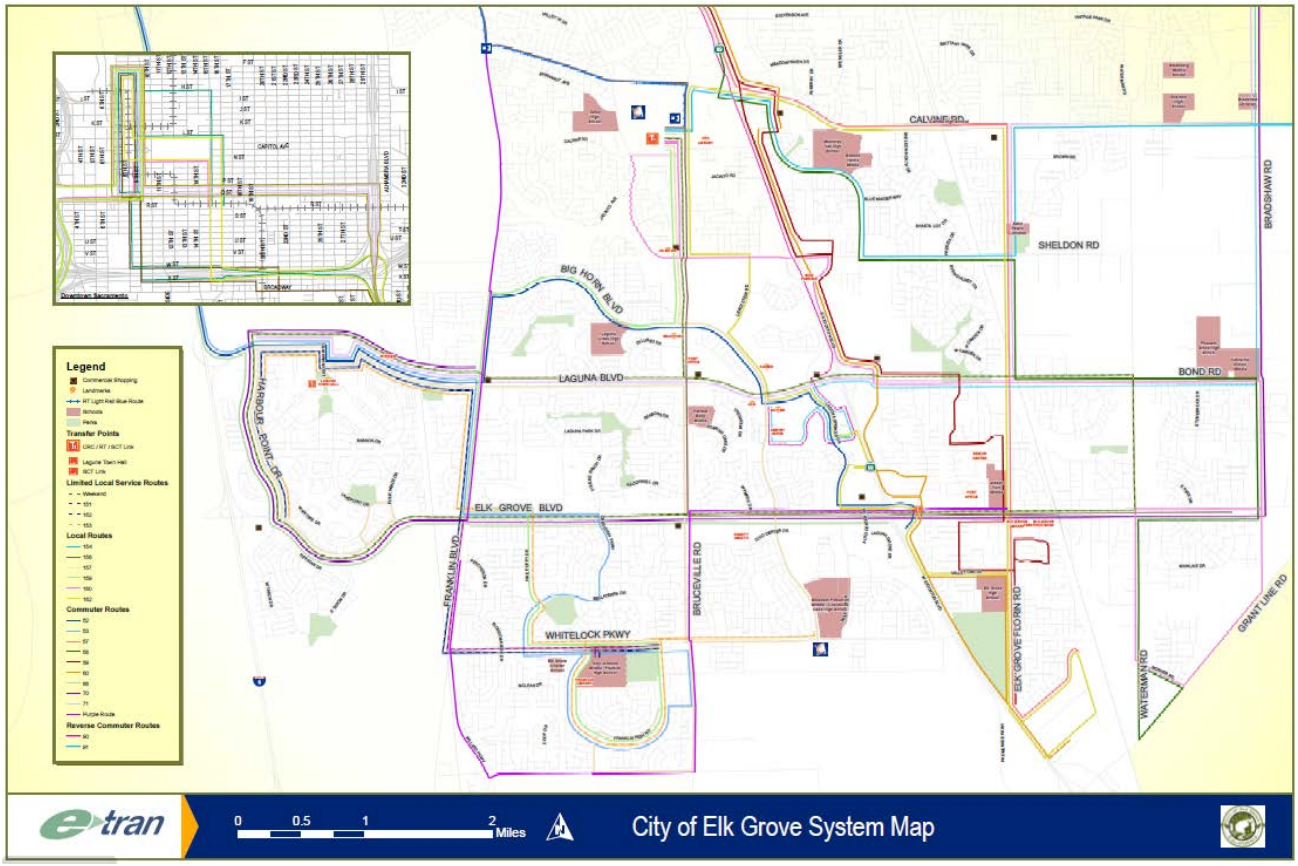
The City adopted the City of Elk Grove Bicycle, Pedestrian, and Trails Master Plan (BPTMP) in July 2014. The BPTMP identifies existing facilities opportunities, constraints and destination points for bicycle users and pedestrians in the City of Elk Grove. Existing bicycle facilities, including Class I Bikeways (Multi-Use Trails) that accommodate pedestrians, documented in the BPTMP are shown in the following graphic (Figure 4.3 of the BPTMP).




## TRANSIT SYSTEM

Based on the 2009-2013 American Community Survey, using public transit to work accounted for the next highest share (about 2 percent)  In Elk Grove, fewer residents use public transportation to get to work compared to California (about 5 percent).

The City of Elk Grove is served by its own transit system, e-Tran, including e-Tran neighborhood shuttle service (ez-tran), limited local transit service, and commuter routes. Local transit service is provided on weekdays (six routes) and weekends (three routes). e-Tran provides nine commuter routes that operate mid-week, including two reverse commuter routes. The current e-Trans system map is shown below. Commuter Route 58 is the closest service to the Project site. Route 58 has a stop on Mosher Road at Berens Park with three morning and evening scheduled stops. The service operates Monday through Friday.



# III. PROJECT TRAVEL CHARACTERISTICS

This chapter describes the expected operations of the proposed Project during typical weekdays and on weekends in which soccer tournaments are being held.

## PROPOSED OPERATIONS

The City of Elk Grove provided anticipated operations for Phase 1 and Buildout of the proposed project, which represent anticipated maximum conditions. Therefore, the assumptions are conservative (i.e., on the high side) of conditions that would likely occur for a typical day that would represent average conditions. According to information provided by the City of Elk Grove, the Project would operate as follows:

Phase 1

- **Practice Activities** – The Multi-Sport Park Complex will be available Monday through Friday for practice activities between 5:00 PM and 9:00 PM in one-hour sessions. These activities would generally focus on the local market youth soccer market. Arrival patterns for the first session would coincide with the peak hour of adjacent street traffic. The distribution of trips to/from the Project would follow the general distribution of population with a large share of trips occurring between the project and the Elk Grove area, consistent with the location of Elk Grove-area recreational and club-level soccer teams.
- **Tournament Activities** – The Multi-Sport Park Complex would be available on weekends for tournaments. Tournaments would consist of regional/national and local/semi-regional events. Tournaments are anticipated to be held 20 weekends per year. Peak arrival patterns would occur on Saturday. The distribution of trips to/from the Project would follow the general distribution of population and the ease of access to the regional transportation network.

Buildout

- **Stadium Park** – The stadium park would provide fixed capacity of 7,500 seats with an additional on-field seating capacity of 1,500 seats that would provide maximum capacity of 9,000. The stadium park is anticipated to be used for the following special events.
    - Tournaments – During tournaments, the championship game could be held in the stadium park. This use would not add any additional event participation beyond the tournament activities.

- High School Games – During fall and spring, the stadium could be used to host high school sporting events. Games would occur weekday nights with attendance levels similar to other high school stadiums (i.e., typically up to 3,000 seats). Spectators would generally be local, except for visiting teams.

- Stage Performances – Throughout the year, the stadium could be used for outdoor stage performances (e.g., concerts). Average events would occur during the evening hours, likely beginning at 7:00 PM. Maximum attendance could be 9,000 people. With a 7:00 PM start, some attendee's arrival patterns would coincide with the peak hour of adjacent street traffic. The distribution of trips to/from the Project would follow the general distribution of population in the region.

- Small League Sporting Events – The facility could host other smaller league, long field sporting events, including minor league and women's soccer, lacrosse, and Drum Corps show. Attendance for these types of events could reach the maximum of 7,500 people, but would likely average an attendance of 5,000. Some attendee's arrival patterns would coincide with the peak hour of adjacent street traffic. The distribution of trips to/from the Project would be similar to that of the Sacramento Republic FC, which are held at Bonny Field at Cal Expo in the City of Sacramento.

- Fairgrounds – The County Fair generally operates over Memorial Weekend at the end of May (Thursday through Monday). According to the Fair operator, total attendance for the event is 75,000. It is anticipated that for any single day, the largest attendance would likely be 22,000 with up to 75 percent of the day's spectators (up to 16,500) on site at the same time and are assumed to have an average vehicle occupancy of three people per vehicle. Spectators and workers are estimated at 800 and are assumed to drive alone. The distribution of trips to/from the Project would follow the general distribution of population in the region.

- **Lands Adjacent to the Phase 1 (Multi-Sport Park Complex)** – The 479 (+-) acres adjacent to the Multi-Sport Park Complex include industrial, commercial, and mixed use designations. Travel characteristics (i.e., trip generation, distribution, and similar) for these uses would follow similar land uses throughout the Sacramento Region. Peak hour travel will occur Monday through Friday between 7:00 AM and 9:00 AM in the mornings and between 4:00 PM and 6:00 PM in the evenings. The level of travel on weekends will depend on the nature of businesses and tenant mix, which is unknown at this time. However, it is anticipated that some of the commercial land us will support the Multi-Sport Park Complex, including hotels and other service uses.

Based on the proposed operations and use descriptions, the following analysis of the Project under Phase 1 and Buildout conditions is included. For Phase 1, detailed operations analysis is conducted for typical weekday practice activities during the PM peak hour and for Saturday tournament activities.

Under cumulative conditions with Project buildout, the stage event is analyzed in detail, since it would result in the largest number Project-related trips occurring during the weekday PM peak hour, relative to the other special events. The other special events are evaluated by comparing peak hour directional roadway segment traffic volumes and corresponding VC ratio.

| Analysis Facility | Peak Hour | Existing Conditions | Existing Plus Project Conditions | | Cumulative Conditions | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | No Project | Plus Phase 1 | Plus Project Buildout | | | | |
| | | | Phase 1 | Buildout | | | Practice | Tournament | Stage Events | League Events | County Fair |
| Intersection | AM | X | | X | X | | X | | | | |
| | PM | X | X | X | X | X | X | | X | | |
| | Saturday | X | X | | X | X | | | | | |
| Roadway | PM | X | X | X | X | X | X | | X | X | |
| | Saturday | X | X | | X | X | | X | | | X |
| Freeway | AM | X | | X | X | | X | | | | |
| | PM | X | X | X | X | X | X | | | | |

## PROPOSED VEHICULAR ACCESS

With Phase 1, Project access would be provide by a full-access driveway that would create the fourth leg of the Grant Line Road/Waterman Road intersection. The access driveway would traverse the perimeter of the sports fields and create a new right-in/right-out driveway at Grant Line Road.

As development occurs in the lands adjacent to the Multi-Sport Park Complex, the access to at the Grant Line Road/Waterman Road intersection will be upgraded from a driveway to a public street. In addition, a signalized full-access intersection will be provided at the Grant Line Road/Mosher Road intersection.

## NEED FOR LOCALLY-VALIDATED TRIP GENERATION DATA FOR SATURDAY TOURNAMENTS

The *Trip Generation Manual, 9th Edition* (Institute of Transportation Engineers, 2012) is a nationally recognized source of trip generation information for a wide variety of land use types. This resource includes the Soccer Complex (488) Land Use Category. The applicable pages pertaining to this land use indicate the following:

- An average Saturday daily trip rate of 117 trips per field was reported based on a single site observation consisting of seven fields. This data point is not suitable for use in estimating the proposed Project's trip generation for the following reasons: the location and age of the count is unknown, the number of fields in use is unknown, and the presence/absence of a local versus regional tournament is unknown. In fact, page 903 of the *Trip Generation Manual*, which contains this information, states the following: "*Users are cautioned to use data with care because of the small sample size.*"

- An average Saturday peak hour of generator trip rate of 30.34 trips per field was reported based on six studies, which ranged in size from three to 20 fields (for an average size of 11 fields). This data is also not suitable for use in estimating the proposed Project's trip generation for the following reasons: the 60-minute period corresponding to the peak hour was not provided, the degree of peaking within the peak hour was not provided (and is referenced as a shortcoming of the data in the Manual), the number of fields in use is unknown, and the presence/absence of a local versus regional tournament is unknown.

Page 26 of the *Trip Generation Handbook, 3rd Edition* (Institute of Transportation Engineers, 2014) states the following: "Collect local data when data plot has only one or two data points." The analysis methodology for tournament activities presented in this study follows this guidance.

## DATA COLLECTION AT SOCCER TOURNAMENTS

Saturday traffic counts and field observations were collected at the following soccer tournaments:

- Rick Hitch Roseville Tournament at Maidu Regional Park on Saturday, August 15, 2015
- Placer United Girls Cup at Cherry Island Soccer Complex on Saturday, October 24, 2015

This section describes each tournament in detail, data collection methods, resulting data, and conclusions.

Overview of Soccer Tournaments

**Table 8** provides details for the two tournaments, including the date, number of soccer fields in use, game times, parking conditions, etc.

Although the soccer tournaments held at Cherry Island Soccer Complex and Maidu Regional Park were similar in some respects, they were also different in many key respects including:

- Number of fields – Cherry Island had 10 fields in use, whereas Maidu had 5 fields in use.
- Parking price – Cherry Island charged $8 to park on-site and also had free on-street parking, whereas parking at Maidu was free.
- Field Location / Accessibility – Cherry Island may be considered by many to have fewer quality restaurants and stores within a 15-minute drive than Maidu Regional Park. Additionally, it is likely that Cherry Island provided a more robust snack bar than Maidu given the larger size of the event. Finally, the primary entry to Maidu (signalized access from a four-lane arterial) provides greater ease of access than the two unsignalized accesses onto the two-lane streets serving Cherry Island.

- Soccer Team Change of Venue – Whereas most teams playing at Maidu for the Rick Hitch Tournament played both games at that location, nearly 50 percent of teams who played a game at Cherry Island also played a game at a different location on that same Saturday.

**TABLE 8:**
**OVERVIEW OF OBSERVED SOCCER TOURNAMENTS IN SACRAMENTO REGION**

| Characteristics | Rick Hitch Tournament at Maidu Regional Park | Placer United Girls Cup at Cherry Island Soccer Complex |
|---|---|---|
| Date of Count | Saturday, August 15, 2015 | Saturday, October 24, 2015 |
| Number of Fields in Use | 5 | 10 |
| Location | Roseville | Sacramento County |
| Game Times | 8:00, 9:15, 10:30, 11:45, 1:00, 2:15, and 3:30 | 8:00, 9:20, 10:40, 12:00, 1:20, 2:40, and 4:00 |
| Use of fields throughout day | Games played continuously on all fields for first 6 time slots. Slightly reduced use for 7th slot. | Games played continuously on all fields tor all 7 time slots. |
| Tournament Games Also Held at Other Venues | Yes | Yes |
| Soccer Team Change of Venue | Vast majority of teams played all Saturday games at Maidu | 44 teams played two Saturday games at Cherry Island. 40 teams played one Saturday game at Cherry Island and one game at a different venue. 10 teams played a single Saturday game at Cherry Island. |
| Parking Fee | Free | $8 for vehicles parking on-site. No fee for vehicles parked on-street. |
| Adequacy of Parking Supply | Abundant parking was available | Parking demand nearly reached capacity. Some attendees had to park far from complex and walk. |
| Weather Conditions | Dry | Dry |
| Site proximity to nearby restaurants and amenities | 5 minute drive to various restaurants and stores along Douglas Blvd. | 5 minute drive to restaurants along Watt Avenue |
| Percentage of Local (within SACOG region) vs. Non-Local Teams | 83% | 37% |

Note:
Fehr & Peers, 2017

- Origin of Soccer Teams – Whereas 83 percent of teams in the Rick Hitch Tournament (played at Maidu Regional Park and other venues) were from the SACOG region, only 37 percent of teams in the Placer United Girls Cup (played at Cherry Island and other venues) were from the SACOG

region. The out of area teams traveled from the San Francisco Bay Area, Fresno, San Luis Obispo, Central San Joaquin Valley, and Nevada.

Overview of Data Collection Process

**Table 9** describes the data collection process undertaken to perform traffic counts at each tournament. We retained the count firm National Data Services (NDS) to assist us on these efforts.

Field observations indicated that the parking areas for both facilities were well utilized during the counts. At Maidu Regional Park, although the main lots (closest to the fields) were often full, parking was always available along the gravel parking aisle on the south portion of the park. Fehr & Peers did not notice any recurring patterns of motorists entering the area, not finding parking, and then exiting to find a more remote space. However, some soccer-related groups were observed (and recorded) who chose to park in a parking area just beyond the traffic count location and walk to the fields.

Cherry Island Soccer Complex provides both paved parking as well as several unpaved areas within the complex. On-street parking is permitted along the site frontage on U Street and 28th Street, but not on the opposite side of the street ("No Parking" signs are posted).

**TABLE 9:**
**OVERVIEW OF TRAFFIC DATA COLLECTION**

| Characteristics | Rick Hitch Tournament at Maidu Regional Park | Placer United Girls Cup at Cherry Island Soccer Complex |
|---|---|---|
| Date of Count | Saturday, August 15, 2015 | Saturday, October 24, 2015 |
| Count Duration [1] | 7 AM to 5 PM. In addition, parked vehicles were counted prior to 7 AM and after 5 PM. | 7 AM to 6 PM. In addition, parked vehicles were counted prior to 7 AM and after 6 PM. |
| Other Activities On-Site | Adult softball on two nearby fields. Traffic counters separately classified vehicles associated with adult soccer and softball. | None |
| Description of Parking Facilities | Large surface lot near fields with two entry/exits. Secondary parking at nearby Maidu School. | On-site parking with entry/exit off U Street and exit-only off 28th Street. On-street parking permitted on U Street and 28th Street. |
| Data Collection Techniques | Traffic count personnel were stationed at each entry/exit lot. A camera was situated at the driveway entry to Maidu School. | Cameras were situated at the U Street and 28th Street driveways. Traffic count personnel were situated on U Street and 28th Street to record parking maneuvers. |
| On-Site Data Collection Oversight | John Gard, P.E. | David Stanek, P.E. |

Note:
[1]Vehicles present at each facility prior to the beginning of the count or after the end of the count period were considered tournament-related and included as part of the daily traffic estimate.
Fehr & Peers, 2017

In summary, the physical characteristics of each site, coupled with the use of experienced traffic count personnel, allowed for a high-quality empirical observations of the travel demand associated with each soccer tournament.

Traffic Count Results

**Table 10** displays the estimated daily and peak hour trip generation of each soccer tournament on each count day. Key findings from this table include:

- The Rick Hitch Tournament at Maidu Regional Park was estimated to generate about 4,000 daily vehicles trips (2,000 inbound and 2,000 outbound). The peak hour of travel occurred from 10:15 to 11:15 AM with 537 trips (48 percent inbound and 52 percent outbound).
- The Placer United Girls Cup at Cherry Island Soccer Complex was estimated to generate about 4,300 daily vehicle trips (2,135 inbound and 2,174 outbound). The peak hour of traveled occurred from 9:00 to 10:00 AM with 540 trips (59 percent inbound and 41 percent outbound).

**TABLE 10:**
**RESULTS OF TRAFFIC DATA COLLECTION**

| Characteristics | Rick Hitch Tournament at Maidu Regional Park | Placer United Girls Cup at Cherry Island Soccer Complex |
|---|---|---|
| Date of Count | Saturday, August 15, 2015 | Saturday, October 24, 2015 |
| *Daily Conditions* | | |
| Total Trips | 4,000 vehicles (50% in / 50% out)[1] | 4,300 vehicles (50% in / 50% out)[1] |
| *Peak Hour of Generator* | | |
| Busiest Hour of Travel | 10:15 – 11:15 AM | 9:00 – 10:00 AM |
| Inbound Trips | 263 vehicles (49%) | 317 vehicles (59%) |
| Outbound Trips | 274 vehicles 51%) | 223 vehicles (41%) |
| Total Trips | 537 vehicles | 540 vehicles |

Notes:
[1]Actual count consists of 1,941 inbound trips and 1,877 outbound trips recorded between 6:45 AM and 5:00 PM. Daily estimate of 2,000 inbound trips based on some vehicles that had already been parked prior to 6:45 AM, and infrequent parking along Johnson Ranch Drive (which was not counted). Field observations revealed that a number of vehicles were still parked on-site after 5 PM.
[2]Actual count consists of 2,135 inbound trips and 2,174 outbound trips recorded between 7 AM and 6:00 PM (including parked vehicles prior to 7 AM and after 6 PM). Minor discrepancy in inbound versus outbound travel likely due to inherent challenges of counting parking maneuvers.
Fehr & Peers, 2017

Refer to Appendix B for charts showing 15-minute arrival and departure traffic flows during each tournament. Key findings from these charts include:

- The Rick Hitch Tournament at Maidu Regional Park showed fairly modest peaks in 15-minute arrivals, but much more pronounced spikes in 15-minute departure flows beginning at 9:15 AM, 10:30 AM, 11:45 AM, and 1 PM. These periods correspond with the completion of the first four games of the day being played simultaneously on all fields.

- Similar to the Maidu observations, the Placer United Girls Cup at Cherry Island Soccer Complex showed spikes in departure flows at 9:15 AM, 10:45 AM, 12:00 PM, 1:15 PM, 2:30 PM, and 4:00 PM. These peaks occurred slightly later (by 15 minutes) due to the longer duration between successive games at Cherry Island versus Maidu.

- The Cherry Island counts indicated that 48 percent of all inbound traffic arrived before 10 AM. In contrast, 37 percent of all inbound traffic at Maidu arrived before 10 AM. The Cherry Island counts also showed a spike in departing traffic from 5:15 to 5:45 PM, in which 352 vehicles (16 percent of total) departed. The Maidu counts did not show a similar end of day spike in outbound travel.

- Appendix B includes a plot that compares the total 15-minute trip generation of Maidu Regional Park and Cherry Island. Between 10 AM and 2:30 PM, Maidu Regional Park generated 367 more trips than Cherry Island despite having half the number of fields.

**Table 11** displays the trip generation rates per field for each soccer tournament. This table shows that the Rick Hitch Tournament at Maidu Regional Park had a measured trip rate that was nearly twice the rate observed for the Placer United Girls Cup at Cherry Island Soccer Complex.

**TABLE 11:**
**SATURDAY TRIP GENERATION RATES AT SOCCER TOURNAMENTS**

| Soccer Tournament | Occupied Fields | Peak Hour [3] | | Daily | |
|---|---|---|---|---|---|
| | | Trips | Trip Rate | Trips | Trip Rate |
| Rick Hitch Tournament at Maidu Regional Park [1] | 5 | 537 | 107.4 trips/field | 4,000 | 800 trips/field |
| Placer United Girls Cup at Cherry Island Soccer Complex [2] | 10 | 540 | 54 trips/field | 4,300 | 430 trips/field |

Notes:
[1]Observations on Saturday, August 15, 2015.
[2]Observations on Saturday, October 24, 2015.
[3]Peak hour of travel at Maidu Regional Park occurred from 10:15 to 11:15 AM. Peak hour of travel at Cherry Island Soccer Complex occurred from 9:00 to 10:00 AM.
Fehr & Peers, 2017

This data has yielded the following key conclusions:

- The Rick Hitch Tournament at Maidu Regional Park had a 'per field' trip rate of nearly twice the rate observed at the Placer United Girls Cup at Cherry Island Soccer Complex. The difference in trip rates between these tournaments is a function of local versus regional team participation. This will be a critical distinction when analyzing the travel characteristics of the proposed Project.
- The Rick Hitch Tournament showed substantially greater levels of mid-day departure and return activity than the Placer United Girls Cup. The Placer United Girls Cup had a greater proportion of early arrivals and late departures associated with a longer duration of stay. [1]

## TRIP GENERATION

Trip generation for the practice activities, tournaments, and special events, including stage events, league events, and the County fair is presented below.

Practice Activities

**Table 12** displays weekday AM and PM peak hour trip generation for practice activities at the proposed Multi-Sport Park Complex, developed using trip generation rates presented in Trip Generation, 9th Edition (Institute of Transportation Engineers). Specifically, we developed weekday AM and PM peak hour trip generation using trip rates for Soccer Complex (Land Use Code 488).

**TABLE 12:**
**WEEKDAY AM AND PM PEAK HOUR TRIP GENERATION FOR PRACTICE ACTIVITIES**

| Land Use (Practice Activities) | Occupied Fields | Weekday Peak Hour Trip Generation | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Trip Rate [trips/field] | | Trips | | | | | |
| | | | | AM | | | PM | | |
| | | AM | PM | Total | In | Out | Total | In | Out |
| Soccer Complex[1] | 16 | 1.12 | 17.7 | 18 | 10 | 8 | 283 | 190 | 93 |

Notes:
[1]ITE Land Use Code 488. Trip rates are for peak hour of adjacent street traffic.
Fehr & Peers, 2017

As shown in Table 12, a typical weekday PM peak hour would generate about 283 trips with most trips entering the Project.

[1] There are several potential explanations for these differences in travel behaviors. They may be associated with the proximity/quality of nearby eating and shopping establishments, differences in weather conditions (August versus October), and/or differences in the degree of preparation between the different levels of competition at each tournament.

Tournament Activities

**Table 13** displays Saturday peak hour trip generation for local/semi-regional and regional/national soccer tournaments, based on the measured trip generation rates presented in **Table 11**. As shown, the local/semi-regional tournament would generate nearly twice as many trips per day as the national/regional tournament.

**TABLE 13:**
**SATURDAY PEAK HOUR TRIP GENERATION FOR TOURNAMENTS ACTIVITIES**

| Soccer Tournament | Occupied Fields | Saturday Peak Hour [1] | |
|---|---|---|---|
| | | Trip Rate [trips/field} | Trips |
| Local/Semi-Regional Tournament | 16 | 107.4 | 1,718 |
| Regional/National Tournament | 16 | 54 | 864 |

Notes:
[1]Based on observations Rick Hitch Tournament at Maidu Regional Park in Roseville and Placer Girls Cup at Cherry Island Sports Complex in Sacramento County.
Fehr & Peers, 2017

League and Stage Events

The trip generation for league and stage events was developed based on travel behavior collected at Sacramento area entertainment venues, including Bonney Field at Cal Expo and Sleep Train Arena in the North Natomas.

The following summarizes key finding from travel behavior data collected at Bonney Field on Saturday, September 20, 2014. During this event, the Sacramento Republic FC hosted a home playoff match with an announced sell-out crowd of 8,000 persons:

- The gates opened at 6:00 PM and the match started at 7:30 PM. The following shows the vehicular arrival percentages in 30-minute increments. This data indicates 6.1 percent of inbound traffic arrived during the 4:00 to 6:00 PM peak period (i.e., the peak hour of adjacent street traffic) and that 70 percent of inbound traffic arrived during the one hour prior to the start of the event.

| Time | Inbound Percentage |
|---|---|
| 5:30 to 6:00 PM | 6.1% |
| 6:00 to 6:30 PM | 16.7% |
| 6:30 to 7:00 PM | 38.0% |
| 7:00 to 7:30 PM | 32.0% |
| 7:30 to 8:00 PM | 7.2% |
| Total | 100% |

- During the pre-event peak hour, there was approximately one outbound trip for every 30 inbound trips. These trips were presumably made by employees, delivery, or attendee drop-off.
- Vehicle occupancy was recorded for over 1,900 inbound vehicles, with the average vehicle occupancy being 2.23 persons per vehicle.
- Travel to Bonney Field by walk or bike was negligible.

These findings were compared to counts conducted on April 5, 2012 during a Sacramento Kings game at Sleep Train Arena. During that game, 67.4 of inbound traffic arrived during the one hour before the start of the event with an observed average vehicle occupancy of 2.27 persons per vehicle.

**Table 14** displays weekday PM peak hour trip generation for league and stage events, based on the use description and the travel behavior characteristics outlined above. The trip generation is provided for the peak hour of adjacent street traffic and for the pre-event peak hour.

**TABLE 14:**
**WEEKDAY PM PEAK HOUR TRIP GENERATION FOR LEAGUE AND STAGE EVENTS**

| Use | Seats | Average Vehicle Occupancy | Vehicles | Weekday Peak Hour Trip Generation By Analysis Period | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Peak Hour of Adjacent Street Traffic | | | Pre-Event Peak Hour | | |
| | | | | Total | Inbound | Outbound | Total | Inbound | Outbound |
| League Events | 7,500 | 2.23 | 3,363 | 212 | 205 | 7 | 2,433 | 2,354 | 78 |
| Stage Events | 9,000 | | 4,036 | 951 | 920 | 31 | 2,919 | 2,825 | 94 |

Notes:
Fehr & Peers, 2017

County Fair

**Table 15**, displays weekday PM peak hour trip generation for the County Fair special event. The trip generation for the County Fair was estimated based on the use description provided to the City of Elk Grove by the Sacramento County Fair operator. For this portion of the Project, a County Fair represents the anticipated highest-operating event and will likely operate annually on the five days prior to and during the Memorial Day Holiday weekend. The Fair would operate Thursday through Sunday from 10:00 AM to 10:00 PM and from 10:00 AM to 7:00 PM on Memorial Day.

The Fair is anticipated to average 70,000 to 75,000 spectators per year, which would represent an average daily attendance of up to 15,000 spectators per day. Accounting for all potential simultaneous events that could occur at the Fair (i.e., concerts and rodeos), the largest attendance on any single day is estimated to be 22,000 and would likely occur on the weekend. Since the Fair would operate on the

Memorial Day Holiday weekend, we estimated trip generation for Fair-related activities on the first day of the Fair (i.e., the Thursday) to coincide with mid-week PM peak hour commute activities prior to the Holiday weekend.

- Estimated Thursday Attendance – Thursday attendance was calculated at 15 percent of average annual attendance of 75,000 spectators, which represents 75% of the average daily attendance of 15,000. Thursday attendance was estimated at 11,250 spectators.

**TABLE 15:**
**WEEKDAY PM PEAK HOUR TRIP GENERATION FOR COUNTY FAIR[1]**

| Use | Thursday Spectators Attendance [persons][2] | Average Vehicle Occupancy[3] | Thursday Spectator Vehicles | Participant and Worker Vehicles[4] | Thursday Vehicle Trip Ends | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Daily[5] | Peak Hour to Daily Factor[6] | Peak Hour | | |
| | | | | | | | Total | Inbound | Outbound |
| County Fair | 11,250 | 3.00 | 3,750 | 800 | 9,100 | 10% | 910 | 528 | 382 |

Notes:
[1]Trip generation developed based on use descriptions provided to City of Elk Grove by Sacramento County Fair operator.
[2]Thursday attendance was estimated at 75 percent of the average daily attendance of 15,000, which represents 15 percent of the average annual attendance of 75,000 spectators. Thursday attendance was estimated at 11,250 spectators.
[3]Average vehicle occupancy based on operational characteristics provided by Sacramento County Fair and is within the range of rates documented in *Managing Travel for Planned Special Events*, FHWA.
[4]Participants and workers are assumed to drive alone.
[5]Peak day vehicles developed by multiplying peak day spectator and participant and worker vehicles by two to account for vehicles entering and exiting the Project.
[6]Peak hour to daily factor based on the peak hour to daily trip generation factor for Amusement Park (ITE 9th Edition Land Use Code 480). For the Amusement Park land use, the peak hour of the generator represents 10 percent of daily trip generation.
Fehr & Peers, 2017

Adjacent Lands

The TDF model was used to develop trip generation for the lands adjacent to Phase 1 (i.e., the 100-acre Multi-Sport Park Complex). **Table 16** displays total AM peak hour and PM peak hour trip generation for the lands adjacent to Phase 1, based on the validated TDF model. About 19 percent of the AM peak hour trips and 24 percent of the PM peak hour trips remain internal to the Project.

**TABLE 16:**
**WEEKDAY PEAK HOUR TRIP GENERATION FOR LANDS ADJACENT TO PHASE 1**

| Soccer Tournament | AM Peak Hour | PM Peak Hour |
|---|---|---|
| Lands Adjacent to Phase 1 | 4,140 | 5,380 |

Notes:
Trip generation based on validated modified version of the SACMET regional travel demand forecasting model.
Fehr & Peers, 2017

## TRIP DISTRIBUTION

**Figure 4** displays the expected distribution of trips for Phase 1 activities under existing conditions, based on general population distribution. **Figure 5** displays the expected distribution of trips for Phase 1 activities and special events under cumulative conditions. **Figure 5** includes two distributions. The distribution based on general population is for assignment of trips for practice activities, tournaments, stage events and activities associated with the County Fair. These events are expected to have origins/destinations representative of the region's population. The distribution for league events is based on anonymous cell phone data collected for attendees at a Sacramento Republic FC matches. Like the Sacramento Republic FC matches, league events are expected to be attended by a segment of the general population. Therefore, cell phone data was used to capture the origins/destination of this population.

**Table 17** displays the trip distribution for lands adjacent to Phase 1 under existing and cumulative conditions. The validated TDF model was used to distribute trips to/from the lands adjacent to Phase 1.

**TABLE 17:**
**TRIP DISTRIBUTION FOR LANDS ADJACENT TO PHASE 1**

| Analysis Scenario | Trip Distribution To/From | | |
|---|---|---|---|
| | North | East | West |
| Existing | 25% | 17% | 58% |
| Cumulative | 24% | 23% | 53% |

Notes:
Trip distribution based on validated modified version of the SACMET regional travel demand forecasting model.
Fehr & Peers, 2017

**Figure 4: Trip Distribution (Phase 1 and Special Events) – Existing Conditions**

**Figure 5: Trip Distribution (Phase 1 and Special Events) – Cumulative Conditions**

# IV. EXISTING PLUS PROJECT CONDITIONS

This chapter analyzes the potential impact of the proposed Project to the surrounding roadway network under an "Existing Plus Project" scenario. This analysis scenario considers potential impacts due to implementation of Phase 1, including weekday PM peak hour practice activities and Saturday peak hour tournaments and Project buildout.

## TRAFFIC OPERATIONS

The following summarizes traffic operations under Existing Plus Project conditions, including peak hour roadway segment volume-to-capacity, intersection operations, and freeway operations at the SR 99/Grant Line Road interchange.

Traffic volume forecasts were developed using the methodology discussed Chapter 1, which includes manual assignment of Phase 1 and stadium events and use of the validated TDF model for assignment of lands adjacent to Phase 1. Intersection turning movement forecasts under Existing Plus Project conditions are show on the following figures:

- **Figure 6** shows weekday PM peak hour turning movement forecasts, lane configurations, and traffic control at each study intersection for Phase 1 Practice Activity conditions.
- **Figure 7** shows Saturday peak hour turning movement forecasts, lane configurations, and traffic control at Intersections 5 through 11 for Phase 1 Local/Semi-Regional Tournament conditions.
- **Figure 8** shows Saturday peak hour turning movement forecasts, lane configurations, and traffic control at Intersections 5 through 11 for Phase 1 Regional/National Tournament conditions.
- **Figure 9** shows weekday AM and PM peak hour turning movement forecasts, lane configurations, and traffic control at each study intersection for Buildout conditions.

**Figure 6: Weekday PM Peak Hour Traffic Volumes and Lane Configurations - Existing Plus Phase 1 Conditions – Practice Activities**

**Figure 7: Saturday Peak Hour Traffic Volumes and Lane Configurations - Existing Plus Phase 1 Conditions – Local/Semi-Regional Tournament**

**Figure 8: Saturday Peak Hour Traffic Volumes and Lane Configurations - Existing Plus Phase 1 Conditions – Regional/National Tournament**

**Figure 9: Weekday Peak Hour Traffic Volumes and Lane Configurations - Existing Plus Phase Buildout Conditions – Practice Activities**

Peak Hour Roadway Segment Volume-to-Capacity

**Table 18** displays directional roadway segment traffic volumes and VC ratio with the addition of Phase 1 trips. The following two analysis scenarios are presented: weekday PM peak hour conditions with the addition vehicle trips from practice activities; and Saturday peak hour conditions with trips from tournament activities. As shown in **Table 18**, all of the segments will operate below capacity at VC ratio less than 1.00 under both analysis scenarios.

**Table 19** displays directional roadway segment traffic volumes and VC ratio with the addition trips from Phase 1 and Project Buildout. Both analysis scenarios are presented for weekday PM peak hour conditions with the addition vehicle trips from practice activities. As shown in **Table 19**, most of the segments would continue to operate below capacity, except for segments of Grant Line Road between E. Stockton Boulevard and Bradshaw Road

Peak Hour Intersection Operations

**Table 20** displays the existing weekday AM, PM, and Saturday peak hour traffic operations analysis results at the 18 study intersections with the addition of Phase 1 trips (refer to Appendix A for detailed calculations). The following two analysis scenarios are presented: weekday PM peak hour conditions with the addition vehicle trips from practice activities; and Saturday peak hour conditions with trips from tournament activities. As shown in **Table 20**, all study intersections would continue to operate acceptably at LOS D or better.

**Table 21** displays the existing weekday AM and PM peak hour traffic operations analysis results at the 18 study intersections with the addition trips from Project Buildout with practice activities occurring at the Multi-Sport Park Complex (refer to Appendix A for detailed calculations). As shown in **Table 21**, most of the study intersections would continue to operate acceptably at LOS D or better, except for the following intersections with Project Buildout:

- Kammerer Road/Bruceville Road – LOS F on the controlled (i.e., Kammerer Road) approach
- Grant Line Road/Waterman Road – LOS F operations
- Grant Line Road/Mosher Road – LOS F on the controlled (i.e., Mosher Road) approach
- Grant Line Road/Bradshaw Road – LOS E on the controlled (i.e., Bradshaw Road) approach
- Grant Line Road/Elk Grove Boulevard – LOS E operations

Peak Hour Freeway Operations

**Table 22** displays the existing weekday AM and PM peak hour traffic operations analysis results at the 10 study freeway facilities with the addition of trips from Phase 1 and Project Buildout conditions (refer to

Appendix A for detailed calculations). AM peak hour analysis is only presented under the Buildout scenario do to the low trip generation of Practice Activities during the AM peak hour.

As shown in **Table 22**, all study freeway facilities at the SR 99/Grant Line Road interchange would continue to operate acceptably at LOS D or better.

**TABLE 18:**
**PEAK HOUR ROADWAY SEGMENT OPERATIONS – EXISTING PLUS PHASE 1 PROJECT CONDITIONS**

| Roadway | Segment | | Direction | Lanes[1] | Hourly Capacity (Per Lane) | Weekday PM Peak Hour | | | | Saturday Peak Hour | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Existing | | Existing Plus Phase 1 (Practice Activities) | | Existing | | Existing Plus Phase 1 (Tournaments) | | | |
| | | | | | | | | | | | | Regional/National | | Local/Semi-Regional | |
| | From | To | | | | Volume[1] | VC[2] | Volume[1] | VC[2] | Volume[1] | VC[2] | Volume[1] | VC[2] | Volume[1] | VC[2] |
| Bradshaw Rd | Elk Grove Blvd | Grant Line Rd | SB | 2 | 990 | 250 | 0.25 | 254 | 0.26 | 165 | 0.17 | 175 | 0.18 | 182 | 0.18 |
| | | | NB | 2 | 990 | 254 | 0.26 | 256 | 0.26 | 135 | 0.14 | 142 | 0.14 | 153 | 0.15 |
| Grant Line Rd | SR 99 SB Ramps | SR 99 NB Ramps | EB | 6 | 910 | 618 | 0.23 | 753 | 0.28 | 425 | 0.16 | 787 | 0.29 | 1,023 | 0.37 |
| | | | WB | 6 | 910 | 1,108 | 0.41 | 1,120 | 0.41 | 595 | 0.22 | 641 | 0.23 | 709 | 0.26 |
| | SR 99 NB Ramps | E. Stockton Blvd | EB | 6 | 910 | 1,022 | 0.37 | 1,176 | 0.43 | 761 | 0.28 | 1,174 | 0.43 | 1,443 | 0.53 |
| | | | WB | 6 | 910 | 1,234 | 0.45 | 1,309 | 0.48 | 695 | 0.25 | 981 | 0.36 | 1,404 | 0.51 |
| | E. Stockton Blvd | Waterman Rd | EB | 4 | 910 | 826 | 0.45 | 941 | 0.52 | 622 | 0.34 | 1,035 | 0.57 | 1,304 | 0.72 |
| | | | WB | 4 | 910 | 911 | 0.50 | 986 | 0.54 | 570 | 0.31 | 856 | 0.47 | 1,279 | 0.70 |
| | Waterman Rd | Mosher Rd | EB | 2 | 910 | 631 | 0.69 | 644 | 0.71 | 454 | 0.50 | 605 | 0.66 | 740 | 0.81 |
| | | | WB | 2 | 910 | 680 | 0.75 | 713 | 0.78 | 429 | 0.47 | 516 | 0.57 | 572 | 0.63 |
| | Mosher Rd | Bradshaw Rd | EB | 2 | 910 | 564 | 0.62 | 580 | 0.64 | 432 | 0.47 | 492 | 0.54 | 581 | 0.64 |
| | | | WB | 2 | 910 | 645 | 0.71 | 678 | 0.74 | 382 | 0.42 | 469 | 0.52 | 525 | 0.58 |
| | Bradshaw Rd | Elk Grove Blvd | EB | 2 | 910 | 304 | 0.33 | 317 | 0.35 | 309 | 0.34 | 362 | 0.40 | 440 | 0.48 |
| | | | WB | 2 | 910 | 402 | 0.44 | 430 | 0.47 | 217 | 0.24 | 294 | 0.32 | 343 | 0.38 |
| Kammerer Rd | Lent Ranch Pkwy | Promenade Pkwy | EB | 6 | 910 | 285 | 0.10 | 291 | 0.11 | 214 | 0.08 | 229 | 0.08 | 239 | 0.09 |
| | | | WB | 6 | 910 | 433 | 0.16 | 436 | 0.16 | 171 | 0.06 | 182 | 0.07 | 197 | 0.07 |
| | Promenade Pkwy | SR 99 SB Ramps | EB | 6 | 910 | 547 | 0.20 | 553 | 0.20 | 316 | 0.12 | 331 | 0.12 | 341 | 0.13 |
| | | | WB | 6 | 910 | 655 | 0.24 | 658 | 0.24 | 296 | 0.11 | 307 | 0.11 | 322 | 0.12 |
| Mosher Rd | Waterman Rd | Grant Line Rd | SB | 2 | 990 | 75 | 0.08 | 75 | 0.08 | 77 | 0.08 | 77 | 0.08 | 77 | 0.08 |
| | | | NB | 2 | 990 | 98 | 0.10 | 98 | 0.10 | 56 | 0.06 | 56 | 0.06 | 56 | 0.06 |
| Waterman Rd | Mosher Rd | Grant Line Rd | SB | 2 | 990 | 260 | 0.26 | 264 | 0.27 | 151 | 0.15 | 161 | 0.16 | 168 | 0.17 |
| | | | NB | 2 | 990 | 231 | 0.23 | 233 | 0.24 | 147 | 0.15 | 154 | 0.16 | 165 | 0.17 |

Notes:
[1] Both directions excluding center turn lanes or right-turn deceleration lanes.
[2] VC – Volume-to-Capacity Ratio
Source: Fehr & Peers, 2017

**TABLE 19:**
**PEAK HOUR ROADWAY SEGMENT OPERATIONS – EXISTING PLUS PROJECT BUILDOUT CONDITIONS**

| Roadway | Segment | | Direction | Lanes[1] | Hourly Capacity (Per Lane) | Weekday PM Peak Hour | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Existing | | Phase 1 (Practice Activities) | | Buildout (Practice Activities) | |
| | From | To | | | | Volume[1] | VC[2] | Volume[1] | VC[2] | Volume[1] | VC[2] |
| Bradshaw Rd | Elk Grove Blvd | Grant Line Rd | SB | 2 | 990 | 250 | 0.25 | 254 | 0.26 | 324 | 0.33 |
| | | | NB | 2 | 990 | 254 | 0.26 | 256 | 0.26 | 452 | 0.46 |
| Grant Line Rd | SR 99 SB Ramps | SR 99 NB Ramps | EB | 6 | 910 | 618 | 0.23 | 753 | 0.28 | 1,350 | 0.49 |
| | | | WB | 6 | 910 | 1,108 | 0.41 | 1,120 | 0.41 | 1,592 | 0.58 |
| | SR 99 NB Ramps | E. Stockton Blvd | EB | 6 | 910 | 1,022 | 0.37 | 1,176 | 0.43 | 1,983 | 0.73 |
| | | | WB | 6 | 910 | 1,234 | 0.45 | 1,309 | 0.48 | 2,369 | 0.87 |
| | E. Stockton Blvd | Waterman Rd | EB | 4 | 910 | 826 | 0.45 | 941 | 0.52 | 1,842 | **1.01** |
| | | | WB | 4 | 910 | 911 | 0.50 | 986 | 0.54 | 2,142 | **1.18** |
| | Waterman Rd | Mosher Rd | EB | 2 | 910 | 631 | 0.69 | 644 | 0.71 | 893 | 0.98 |
| | | | WB | 2 | 910 | 680 | 0.75 | 713 | 0.78 | 928 | **1.02** |
| | Mosher Rd | Bradshaw Rd | EB | 2 | 910 | 564 | 0.62 | 580 | 0.64 | 911 | **1.00** |
| | | | WB | 2 | 910 | 645 | 0.71 | 678 | 0.74 | 795 | 0.87 |
| | Bradshaw Rd | Elk Grove Blvd | EB | 2 | 910 | 304 | 0.33 | 317 | 0.35 | 429 | 0.47 |
| | | | WB | 2 | 910 | 402 | 0.44 | 430 | 0.47 | 446 | 0.49 |
| Kammerer Rd | Lent Ranch Pkwy | Promenade Pkwy | EB | 6 | 910 | 285 | 0.10 | 291 | 0.11 | 396 | 0.14 |
| | | | WB | 6 | 910 | 433 | 0.16 | 436 | 0.16 | 598 | 0.22 |
| | Promenade Pkwy | SR 99 SB Ramps | EB | 6 | 910 | 547 | 0.20 | 553 | 0.20 | 701 | 0.26 |
| | | | WB | 6 | 910 | 655 | 0.24 | 658 | 0.24 | 868 | 0.32 |
| Mosher Rd | Waterman Rd | Grant Line Rd | SB | 2 | 990 | 75 | 0.08 | 75 | 0.08 | 310 | 0.31 |
| | | | NB | 2 | 990 | 98 | 0.10 | 98 | 0.10 | 440 | 0.44 |
| Waterman Rd | Mosher Rd | Grant Line Rd | SB | 2 | 990 | 260 | 0.26 | 264 | 0.27 | 434 | 0.44 |
| | | | NB | 2 | 990 | 231 | 0.23 | 233 | 0.24 | 512 | 0.52 |

Notes:
[1] Both directions excluding center turn lanes or right-turn deceleration lanes.
[2] VC – Volume-to-Capacity Ratio
Source: Fehr & Peers, 2017

**TABLE 20:**
**PEAK HOUR INTERSECTION LEVEL OF SERVICE – EXISTING PLUS PHASE 1 PROJECT CONDITIONS**

| Intersection | Control | Weekday PM Peak Hour | | | | Saturday Peak Hour | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Existing | | Existing Plus Phase 1 (Practice Activities) | | Existing | | Existing Plus Phase 1 (Tournaments) | | | |
| | | | | | | | | Regional/National | | Local/Semi-Regional | |
| | | Delay[1] | LOS[1] | Delay[1] | LOS[1] | Delay[1] | LOS[1] | Delay[1] | LOS[1] | Delay[1] | LOS[1] |
| 1. Hood Franklin Rd/I-5 SB Ramps | SSSC | 8 (11) | A (B) | 8 (11) | A (B) | | | | | | |
| 2. Hood Franklin Rd/I-5 NB Ramps | SSSC | 2 (11) | A (B) | 2 (11) | A (B) | | | | | | |
| 3. Kammerer Rd/Bruceville Rd | SSSC | 10 (15) | B (C) | 10 (16) | B (C) | | | | | | |
| 4. Kammerer Rd/Lent Ranch Pkwy[2] | Signal | 4 | A | 4 | A | | | | | | |
| 5. Kammerer Rd/Promenade Pkwy | Signal | 15 | B | 15 | B | 10 | A | 10 | A | 10 | A |
| 6. Kammerer Rd/SR 99 SB Ramps | Signal | 7 | A | 7 | A | 5 | A | 6 | A | 7 | A |
| 7. Grant Line Rd/SR 99 NB Ramps | Signal | 8 | A | 10 | A | 4 | A | 6 | A | 8 | A |
| 8. Grant Line Rd/E. Stockton Blvd | Signal | 21 | C | 22 | C | 16 | B | 17 | B | 19 | B |
| 9. Grant Line Rd/Waterman Rd | Signal | 8 | A | 16 | B | 9 | A | 17 | B | 36 | D |
| 10. Grant Line Rd/Mosher Rd | SSSC | 2 (20) | A (C) | 2 (21) | A (C) | 2 (13) | A (B) | 1 (15) | A (C) | 1 (17) | A (C) |
| 11. Grant Line Rd/Bradshaw Rd | SSSC | 5 (15) | A (C) | 5 (16) | A (C) | 4 (11) | A (B) | 3 (12) | A (B) | 3 (13) | A (B) |
| 12. Grant Line Rd/Elk Grove Blvd | AWSC | 14 | B | 16 | C | | | | | | |
| 13. Grant Line Rd/Bond Rd | Signal | 18 | B | 18 | B | | | | | | |
| 14. Grant Line Rd/Wilton Rd | Signal | 27 | C | 28 | C | | | | | | |
| 15. Grant Line Rd/Sheldon Rd[2] | Signal | 20 | C | 21 | C | | | | | | |
| 16. Grant Line Rd/Calvine Rd[2] | Signal | 14 | B | 14 | B | | | | | | |
| 17. Waterman Rd/Elk Grove Blvd | Signal | 26 | C | 26 | C | | | | | | |
| 18. Waterman Rd/Bond Rd | Signal | 23 | C | 23 | C | | | | | | |

AWSC = All-way Stop Control. SSSC = Side-street Stop Control.
[1]Average delay (rounded to the nearest second) and LOS for signalized and all-way stop-controlled intersections is the weighted average for all movements. Average delay and LOS at side-street stop-controlled intersections shown for both worst-case side street movement (in parentheses) and intersection as a whole.
[2]HCM 2000 was used due to unique signal timing or to be consistent with other scenarios..
Source: Fehr & Peers, 2017

**TABLE 21:**
**PEAK HOUR INTERSECTION LEVEL OF SERVICE – EXISTING PLUS PROJECT BUILDOUT CONDITIONS**

| Intersection | Control | Weekday AM Peak Hour | | | | Weekday PM Peak Hour | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Existing | | Existing Plus Buildout (Practice Activities) | | Existing | | Existing Plus Buildout (Practice Activities) | |
| | | Delay[1] | LOS[1] | Delay[1] | LOS[1] | Delay[1] | LOS[1] | Delay[1] | LOS[1] |
| 1. Hood Franklin Rd/I-5 SB Ramps | SSSC | 5 (10) | A (A) | 5 (10) | A (B) | 8 (11) | A (B) | 8 (12) | A (B) |
| 2. Hood Franklin Rd/I-5 NB Ramps | SSSC | 2 (11) | A (B) | 2 (12) | A (B) | 2 (11) | A (B) | 3 (12) | A (B) |
| 3. Kammerer Rd/Bruceville Rd | SSSC | 10 (19) | A (C) | 65 (212) | **F (F)** | 10 (15) | B (C) | 14 (21) | B (C) |
| 4. Kammerer Rd/Lent Ranch Pkwy[2] | Signal | 5 | A | 8 | A | 4 | A | 4 | A |
| 5. Kammerer Rd/Promenade Pkwy | Signal | 14 | B | 15 | B | 15 | B | 16 | B |
| 6. Kammerer Rd/SR 99 SB Ramps | Signal | 7 | A | 11 | B | 7 | A | 11 | B |
| 7. Kammerer Rd/SR 99 NB Ramps | Signal | 7 | A | 17 | B | 8 | A | 17 | B |
| 8. Grant Line Rd/E. Stockton Blvd | Signal | 17 | B | 21 | C | 21 | C | 41 | D |
| 9. Grant Line Rd/Waterman Rd | Signal | 12 | B | 93 | **F** | 8 | A | 190 | **F** |
| 10. Grant Line Rd/Mosher Rd | SSSC | 3 (27) | A (D) | 2(>500) | **A (F)** | 2 (20) | A (C) | 1 (>500) | **A (F)** |
| 11. Grant Line Rd/Bradshaw Rd | SSSC | 4 (13) | A (B) | 14 (49) | **B (E)** | 5 (15) | A (C) | 12 (43) | **B (E)** |
| 12. Grant Line Rd/Elk Grove Blvd | AWSC | 29 | D | 39 | **E** | 14 | B | 20 | C |
| 13. Grant Line Rd/Bond Rd | Signal | 19 | B | 22 | C | 18 | B | 19 | B |
| 14. Grant Line Rd/Wilton Rd | Signal | 37 | D | 46 | D | 27 | C | 35 | D |
| 15. Grant Line Rd/Sheldon Rd[2] | Signal | 29 | C | 32 | C | 20 | C | 23 | C |
| 16. Grant Line Rd/Calvine Rd[2] | Signal | 21 | C | 22 | C | 14 | B | 15 | B |
| 17. Waterman Rd/Elk Grove Blvd | Signal | 26 | C | 44 | D | 26 | C | 39 | D |
| 18. Waterman Rd/Bond Rd | Signal | 27 | C | 33 | C | 23 | C | 26 | C |

Notes:
AWSC = All-way Stop Control. SSSC = Side-street Stop Control.
[1]Average delay (rounded to the nearest second) and LOS for signalized and all-way stop-controlled intersections is the weighted average for all movements. Average delay and LOS at side-street stop-controlled intersections shown for both worst-case side street movement (in parentheses) and intersection as a whole.
[2]HCM 2000 was used due to unique signal timingor to be consistent with other scenarios.
Source: Fehr & Peers, 2017

**TABLE 22:**
**PEAK HOUR FREEWAY ANALYSIS – EXISTING PLUS PHASE 1 AND BUILDOUT CONDITIONS**

| Freeway Facility | Type | Weekday AM Peak Hour | | | | Weekday PM Peak Hour | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Existing | | Existing Plus Buildout (Practice Activities) | | Existing | | Existing Plus Practice Activities | | | |
| | | | | | | | | Phase 1 | | Buildout | |
| | | Density | LOS | Density | LOS | Density | LOS | Density | LOS | Density | LOS |
| 1. NB SR 99 South of Grant Line Road | Basic Segment | 22.7 | C | 24.9 | C | 24.0 | C | 34.8 | D | 33.2 | D |
| 2. NB SR 99 Grant Line Road Slip Off-Ramp | Diverge | 17.6 | B | 19.6 | B | 18.7 | B | 26.9 | C | 26.0 | C |
| 3. NB SR 99 Grant Line Road Loop On-Ramp | Basic Segment | 11.5 | B | 11.5 | B | 12.5 | B | 19.7 | C | 18.4 | C |
| 4. NB SR 99 Grant Line Road Slip On-Ramp | Merge | 15.4 | B | 18.7 | B | 17.1 | B | 24.8 | C | 25.9 | C |
| 5. NB SR 99 North of Grant Line Road | Basic Segment | 16.1 | B | 19.0 | C | 18.8 | C | 31.4 | D | 33.9 | D |
| 6. SB SR 99 North of Grant Line Road | Basic Segment | 13.9 | B | 18.8 | C | 14.2 | B | 21.9 | C | 23.9 | C |
| 7. SB SR 99 Grant Line Road Slip Off-Ramp | Diverge | 7.4 | A | 13.4 | B | 7.9 | A | 16.7 | B | 18.7 | B |
| 8. SB SR 99 Grant Line Road Loop On-Ramp | Basic Segment | 9.6 | A | 10.1 | A | 10.7 | A | 7.9 | A | 8.8 | A |
| 9. SB SR 99 Grant Line Road Slip On-Ramp | Merge | 12.9 | B | 13.5 | B | 13.9 | B | 17.6 | B | 18.4 | B |
| 10. SB SR 99 South of Grant Line Road | Basic Segment | 15.8 | B | 16.6 | B | 17.3 | B | 20.2 | C | 21.6 | C |

Notes:
Source: Fehr & Peers, 2017

# V. CUMULATIVE CONDITIONS

This chapter analyzes the potential impacts of the proposed Project on the surrounding roadway network under cumulative conditions without and with the proposed Project. This analysis scenario considers potential impacts due to implementation of Phase 1 and Project Buildout. Prior to presenting the analysis results, the planned transportation network and population and employment growth assumptions are discussed to provide context for the impact analysis.

## CUMULATIVE SETTING

As discussed in Chapter 1, a modified version of SACOG's MTP/SCS travel demand forecasting (TDF) model was used to develop traffic volumes for the study facilities. The off-the-shelf version of the base year model is generally representative of 2012 conditions and the future year model has a 2036 forecast year. However, as is standard practice with large area travel demand models, a thorough model review was completed and the model was refined to ensure that it produced reasonable results in the study area. The future year TDF model was modified to reflect buildout development levels in the City of Elk Grove, including buildout of the Laguna Ridge Specific Plan, Sterling Meadows, the Elk Grove Promenade, and buildout of the following projects considered to be reasonably foreseeable for the transportation impact analysis:

- Wilton Rancheria Casino Resort Project
- Bilby Ridge Sphere of Influence Amendment
- Kammerer Road/Highway 99 Sphere of Influence Amendment
- Elk Grove Promenade

The transportation network includes programmed improvements included in the SACOG Metropolitan Transportation Plan/Sustainable Communities Strategy (MTP/SCS) 2016 constrained roadway network, with construction anticipated by 2036. The following compares the MTP/SCS 2016 transportation network on Kammerer Road and Grant Line Road to the planned SouthEast Connector JPA and the City of Elk Grove General Plan.

In an effort to better match planned improvements on Kammerer Road with available funding and to improve accessibility, The City of Elk Grove investigated and recommended an Interim Phasing concept to the Connector JPA. The Interim Phase for Kammerer Road would reconstruct the existing two-lane roadway from Lent Ranch Parkway to Bruceville Road and construct a new two-lane road extension from Bruceville Road to I-5. The original improvements planned by the City of Elk Grove on Kammerer Road were to reconstruct Kammerer Road between Lent Ranch Parkway and Bruceville Road as a four-lane roadway without the extension to I-5. The Interim Phase would accommodate future SouthEast Connector improvements.

| Source | Planned Network | | |
|---|---|---|---|
| | Roadway | Segment | Facility |
| MTP/SCS 2016 | Kammerer Road | I-5 to Bruceville Road | 4-Lane Arterial |
| | | Bruceville Road to Lent Ranch Parkway | 4-Lane Arterial |
| | | Lent Ranch Parkway to E. Stockton Boulevard | 6-Lane Arterial |
| | Grant Line Road | E. Stockton Boulevard to Bradshaw Road | 4-Lane Arterial |
| | | Bradshaw Road to Calvine Road | 2-Lane Arterial |
| SouthEast Connector JPA (Interim Phase) | Kammerer Road | I-5 to Bruceville Road | 2-Lane Expressway |
| | | Bruceville Road to Lent Ranch Parkway | 2/5-Lane Arterial |
| | | Lent Ranch Parkway to E. Stockton Boulevard | 6-Lane Arterial |
| | Grant Line Road | E. Stockton Boulevard to Waterman Road | 4-Lane Arterial |
| | | Bradshaw Road to Calvine Road | 2-Lane Arterial |
| SouthEast Connector JPA (Phase 1 Connector) | Kammerer Road | I-5 to Bruceville Road | 4-Lane Expressway |
| | | Bruceville Road to Lent Ranch Parkway | 4-Lane Thoroughfare |
| | | Lent Ranch Parkway to E. Stockton Boulevard | 6-Lane Thoroughfare |
| | Grant Line Road | E. Stockton Boulevard to Bradshaw Road | 4-Lane Thoroughfare |
| | | Bradshaw Road to Calvine Road | 4-Lane Thoroughfare |
| SouthEast Connector JPA (Ultimate Connector) | Kammerer Road | I-5 to Bruceville Road | 4-Lane Expressway |
| | | Bruceville Road to Lent Ranch Parkway | 6-Lane Thoroughfare |
| | | Lent Ranch Parkway to E. Stockton Boulevard | 6-Lane Thoroughfare |
| | Grant Line Road | E. Stockton Boulevard to Bond Road | 6-Lane Thoroughfare |
| | | Bond Road to Calvine Road | 4-Lane Thoroughfare |
| Elk Grove General Plan | Kammerer Road | I-5 to Bruceville Road | 6-Lane Arterial |
| | | Bruceville Road to Lent Ranch Parkway | 6-Lane Arterial |
| | | Lent Ranch Parkway to E. Stockton Boulevard | 8-Lane Arterial |
| | Grant Line Road | E. Stockton Boulevard to Bradshaw Road | 8-Lane Arterial |
| | | Bradshaw Road to Calvine Road | 6-Lane Arterial |

## TRAFFIC OPERATIONS – CUMULATIVE NO PROJECT CONDITIONS

The following summarizes traffic operations under Cumulative No Project conditions, including peak hour roadway segment volume-to-capacity, intersection operations, and freeway operations at the SR 99/Grant Line Road interchange.

Traffic volume forecasts were developed using the methodology discussed Chapter 1. Intersection turning movement forecasts under Cumulative No Project conditions are show on the following figures:

- **Figure 10** shows weekday peak hour turning movement forecasts, lane configurations, and traffic control at each study intersection.
- **Figure 11** shows Saturday peak hour turning movement forecasts, lane configurations, and traffic control at Intersections 5 through 11.

**Figure 10: Weekday Peak Hour Traffic Volumes and Lane Configurations – Cumulative No Project Conditions**

**Figure 11: Saturday Peak Hour Traffic Volumes and Lane Configurations – Cumulative No Project Conditions**

Peak Hour Roadway Segment Volume-to-Capacity

**Table 23** displays directional roadway segment traffic volumes and VC ratio for weekday PM and Saturday peak hour conditions for key roadway segment that will provide primary access to the proposed Project, including Grant Line Road between SR 99 and Bradshaw Road. As discussed previously, roadways are evaluated to describe to decision-makers and the public the expected change in traffic under various activities at the EGMSC.

As shown in **Table 23**, substantial growth in weekday and Saturday peak hour and would occur on Kammerer Road and Grant Line Road as a result of planned and reasonably foreseeable land use growth in the study area. Of particular note are the Bilby Ridge and Kammerer Road/Highway 99 Sphere of Influence amendments west of SR 99. These projects were not assumed in the MTP/SCS 2016 or in the transportation analysis for the SouthEast Connector. Consequently, there is an imbalance created with the constrained transportation network. As a result of this imbalance, seven segments during the weekday PM peak hour and two segment during the Saturday peak hour would operate above capacity, VC greater than 1.00.

Peak Hour Intersection Operations

**Table 24** displays the existing weekday AM, PM, and Saturday peak hour traffic operations analysis results at the 20 study intersections (refer to Appendix D for detailed calculations) under Cumulative No Project conditions. As shown in **Table 24**, ten intersections during the weekday AM and PM peak hours and two intersections during the Saturday peak hour would operate unacceptably at LOS E or F under Cumulative No Project conditions. These results are due largely to land use growth in the study area.

Peak Hour Freeway Operations

**Table 25** displays weekday AM and PM peak hour traffic operations analysis results at the 10 study freeway facilities under Cumulative No Project conditions (refer to Appendix D for detailed calculations). As shown in **Table 25**, all study freeway facilities at the SR 99/Grant Line Road interchange would operate at LOS D or better.

**TABLE 23:**
**PEAK HOUR ROADWAY SEGMENT OPERATIONS – CUMULATIVE NO PROJECT CONDITIONS**

| Roadway | Segment | | Direction | Existing | Cumulative | | Weekday PM Peak Hour | | | | Saturday Peak Hour | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Existing | | Cumulative | | Existing | | Cumulative | |
| | From | To | | Hourly Capacity (Per Lane) | Lanes[1] | Hourly Capacity (Per Lane) | Volume[1] | VC[2] | Volume[1] | VC[2] | Volume[1] | VC[2] | Volume[1] | VC[2] |
| Bradshaw Rd | Elk Grove Blvd | Grant Line Rd | SB | 990 | 4 | 990 | 250 | 0.25 | 650 | 0.33 | 165 | 0.17 | 578 | 0.29 |
| | | | NB | 990 | 4 | 990 | 254 | 0.26 | 860 | 0.43 | 135 | 0.14 | 370 | 0.19 |
| Grant Line Rd | SR 99 SB Ramps | SR 99 NB Ramps | EB | 910 | 6 | 910 | 618 | 0.23 | 4,060 | **1.49** | 425 | 0.16 | 1,744 | 0.64 |
| | | | WB | 910 | 6 | 910 | 1,108 | 0.41 | 3,450 | **1.26** | 595 | 0.22 | 2,934 | **1.07** |
| | SR 99 NB Ramps | E. Stockton Blvd | EB | 910 | 6 | 910 | 1,022 | 0.37 | 3,044 | **1.12** | 761 | 0.28 | 1,599 | 0.59 |
| | | | WB | 910 | 6 | 910 | 1,234 | 0.45 | 2,742 | **1.00** | 695 | 0.25 | 2,086 | 0.76 |
| | E. Stockton Blvd | Waterman Rd | EB | 910 | 5 | 910 | 826 | 0.45 | 2,329 | 0.85 | 622 | 0.34 | 1,299 | 0.48 |
| | | | WB | 910 | 5 | 910 | 911 | 0.50 | 2,016 | **1.11** | 570 | 0.31 | 1,456 | 0.80 |
| | Waterman Rd | Mosher Rd | EB | 910 | 5 | 910 | 631 | 0.69 | 1,675 | 0.61 | 454 | 0.50 | 961 | 0.35 |
| | | | WB | 910 | 5 | 910 | 680 | 0.75 | 1,385 | 0.76 | 429 | 0.47 | 1,088 | 0.60 |
| | Mosher Rd | Bradshaw Rd | EB | 910 | 4 | 910 | 564 | 0.62 | 1,520 | 0.84 | 432 | 0.47 | 784 | 0.43 |
| | | | WB | 910 | 4 | 910 | 645 | 0.71 | 1,148 | 0.63 | 382 | 0.42 | 1,047 | 0.58 |
| | Bradshaw Rd | Elk Grove Blvd | EB | 910 | 2 | 910 | 304 | 0.33 | 605 | 0.66 | 309 | 0.34 | 359 | 0.39 |
| | | | WB | 910 | 2 | 910 | 402 | 0.44 | 485 | 0.53 | 217 | 0.24 | 471 | 0.52 |
| Kammerer Rd | Lent Ranch Pkwy | Promenade Pkwy | EB | 910 | 6 | 910 | 285 | 0.10 | 2,588 | 0.95 | 214 | 0.08 | 1,038 | 0.38 |
| | | | WB | 910 | 6 | 910 | 433 | 0.16 | 2,573 | 0.94 | 171 | 0.06 | 2,074 | 0.76 |
| | Promenade Pkwy | SR 99 SB Ramps | EB | 910 | 7 | 910 | 547 | 0.20 | 4,810 | **1.32** | 316 | 0.12 | 1,855 | 0.51 |
| | | | WB | 910 | 7 | 910 | 655 | 0.24 | 4,270 | **1.56** | 296 | 0.11 | 3,808 | **1.39** |
| Mosher Rd | Waterman Rd | Grant Line Rd | SB | 990 | 2 | 990 | 75 | 0.08 | 345 | 0.35 | 77 | 0.08 | 141 | 0.14 |
| | | | NB | 990 | 2 | 990 | 98 | 0.10 | 225 | 0.23 | 56 | 0.06 | 221 | 0.22 |
| Waterman Rd | Mosher Rd | Grant Line Rd | SB | 990 | 2 | 990 | 260 | 0.26 | 680 | 0.69 | 151 | 0.15 | 379 | 0.38 |
| | | | NB | 990 | 2 | 990 | 231 | 0.23 | 715 | 0.72 | 147 | 0.15 | 349 | 0.35 |

Notes:
[1] Both directions excluding center turn lanes or right-turn deceleration lanes.
[2] VC – Volume-to-Capacity Ratio
Source: Fehr & Peers, 2017

**TABLE 24:**
**PEAK HOUR INTERSECTION LEVEL OF SERVICE – CUMULATIVE NO PROJECT CONDITIONS**

| Intersection | Control | Weekday AM Peak Hour | | | | Weekday PM Peak Hour | | | | Saturday Peak Hour | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Existing | | Cumulative | | Existing | | Cumulative | | Existing | | Cumulative | |
| | | Delay[1] | LOS[1] | Delay[1] | LOS[1] | Delay[1] | LOS[1] | Delay[1] | LOS[1] | Delay[1] | LOS[1] | Delay[1] | LOS[1] |
| 1. Hood Franklin Rd/I-5 SB Ramps | Signal | 5 (10) | A (A) | 12 | B | 8 (11) | A (B) | 12 | B | | | | |
| 2. Hood Franklin Rd/I-5 NB Ramps | Signal | 2 (11) | A (B) | 17 | B | 2 (11) | A (B) | 12 | B | | | | |
| 3. Kammerer Rd/Bruceville Rd | Signal | 10 (19) | A (C) | 63 | **E** | 10 (15) | B (C) | 53 | D | | | | |
| 4. Kammerer Rd/Lent Ranch Pkwy[2] | Signal | 5 | A | 105 | **F** | 4 | A | 161 | **F** | | | | |
| 5. Kammerer Rd/Promenade Pkwy | Signal | 14 | B | 156 | **F** | 15 | B | 276 | **F** | 10 | A | 39 | D |
| 6. Kammerer Rd/SR 99 SB Ramps | Signal | 7 | A | 182 | **F** | 7 | A | 141 | **F** | 5 | A | 67 | **E** |
| 7. Kammerer Rd/SR 99 NB Ramps | Signal | 7 | A | 50 | D | 8 | A | 35 | D | 4 | A | 20 | C |
| 8. Grant Line Rd/E. Stockton Blvd | Signal | 17 | B | 138 | **F** | 21 | C | 195 | **F** | 16 | B | 84 | **F** |
| 9. Grant Line Rd/Waterman Rd | Signal | 12 | B | 34 | C | 8 | A | 25 | C | 9 | A | 8 | A |
| 10. Grant Line Rd/Mosher Rd | Signal | 3 (27) | A (D) | 13 | B | 2 (20) | A (C) | 14 | B | 2 (13) | A (B) | 11 | B |
| 11. Grant Line Rd/Bradshaw Rd | Signal | 4 (13) | A (B) | 36 | D | 5 (15) | A (C) | 14 | B | 4 (11) | A (B) | 14 | B |
| 12. Grant Line Rd/Elk Grove Blvd | AWSC | 29 | D | 110 | **F** | 14 | B | 49 | **E** | | | | |
| 13. Grant Line Rd/Bond Rd | Signal | 19 | B | 30 | C | 18 | B | 29 | C | | | | |
| 14. Grant Line Rd/Wilton Rd | Signal | 37 | D | 83 | **F** | 27 | C | 76 | **E** | | | | |
| 15. Grant Line Rd/Sheldon Rd[2] | Signal | 29 | C | 34 | C | 20 | C | 35 | D | | | | |
| 16. Grant Line Rd/Calvine Rd[2] | Signal | 21 | C | 26 | C | 14 | B | 15 | B | | | | |
| 17. Waterman Rd/Elk Grove Blvd | Signal | 26 | C | 58 | **E** | 26 | C | 55 | **D** | | | | |
| 18. Waterman Rd/Bond Rd | Signal | 27 | C | 46 | D | 23 | C | 34 | C | | | | |
| 19. Kammerer Rd/Big Horn Blvd | Signal | | | 53 | D | | | 60 | **E** | | | | |
| 20. Kammerer Rd/Lotz Pkwy | Signal | | | 67 | **E** | | | 75 | **E** | | | | |

Notes:
AWSC = All-way Stop Control. SSSC = Side-street Stop Control.
[1]Average delay (rounded to the nearest second) and LOS for signalized and all-way stop-controlled intersections is the weighted average for all movements. Average delay and LOS at side-street stop-controlled intersections shown for both worst-case side street movement (in parentheses) and intersection as a whole.
[2]HCM 2000 was used due to unique signal timing or to be consistent with other scenarios.
Source: Fehr & Peers, 2017

**TABLE 25:**
**PEAK HOUR FREEWAY ANALYSIS – CUMULATIVE NO PROJECT CONDITIONS**

| Freeway Facility | Type | Weekday AM Peak Hour | | | | Weekday PM Peak Hour | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Existing | | Cumulative | | Existing | | Cumulative | |
| | | Density | LOS | Density | LOS | Density | LOS | Density | LOS |
| 1. NB SR 99 South of Grant Line Road | Basic Segment | 22.7 | C | 35.9 | E | 24.0 | C | 34.5 | D |
| 2. NB SR 99 Grant Line Road Slip Off-Ramp | Diverge | 17.6 | B | 27.6 | C | 18.7 | B | 26.8 | C |
| 3. NB SR 99 Grant Line Road Loop On-Ramp | Basic Segment | 11.5 | B | 14.9 | B | 12.5 | B | 19.7 | C |
| 4. NB SR 99 Grant Line Road Slip On-Ramp | Merge | 15.4 | B | 18.8 | B | 17.1 | B | 24.3 | C |
| 5. NB SR 99 North of Grant Line Road | Basic Segment | 16.1 | B | 20.9 | C | 18.8 | C | 32.3 | D |
| 6. SB SR 99 North of Grant Line Road | Basic Segment | 13.9 | B | 30.5 | D | 14.2 | B | 20.7 | C |
| 7. SB SR 99 Grant Line Road Slip Off-Ramp | Diverge | 7.4 | A | 24.1 | C | 7.9 | A | 15.5 | B |
| 8. SB SR 99 Grant Line Road Loop On-Ramp | Basic Segment | 9.6 | A | 9.8 | A | 10.7 | A | 7.8 | A |
| 9. SB SR 99 Grant Line Road Slip On-Ramp | Merge | 12.9 | B | 16.9 | B | 13.9 | B | 17.5 | B |
| 10. SB SR 99 South of Grant Line Road | Basic Segment | 15.8 | B | 20.1 | C | 17.3 | B | 20.1 | C |

Notes:

Source: Fehr & Peers, 2017

## TRAFFIC OPERATIONS – CUMULATIVE PLUS PROJECT CONDITIONS

The following summarizes traffic operations under Cumulative Plus Project conditions, including peak hour roadway segment volume-to-capacity, intersection operations, and freeway operations at the SR 99/Grant Line Road interchange.

Traffic volume forecasts were developed using the methodology discussed Chapter 1, which includes manual assignment of Phase 1 and stadium events and use of the validated TDF model for assignment of lands adjacent to Phase 1. Intersection turning movement forecasts under Cumulative Plus Project conditions are show on the following figures:

- **Figure 12** shows weekday PM peak hour turning movement forecasts, lane configurations, and traffic control at each study intersection for Phase 1 Practice Activity conditions.
- **Figure 13** shows Saturday peak hour turning movement forecasts, lane configurations, and traffic control at Intersections 5 through 11 for Phase 1 Local/Semi-Regional Tournament conditions.
- **Figure 14** shows Saturday peak hour turning movement forecasts, lane configurations, and traffic control at Intersections 5 through 11 for Phase 1 Regional/National Tournament conditions.
- **Figure 15** shows weekday peak hour turning movement forecasts, lane configurations, and traffic control at each study intersection for Buildout Practice Activity conditions.
- **Figure 16** shows weekday PM peak hour turning movement forecasts, lane configurations, and traffic control at each study intersection for Buildout Stage Event conditions.

**Figure 12: Weekday Peak Hour Traffic Volumes and Lane Configurations – Cumulative Plus Phase 1 Conditions – Practice Activities**

**Figure 13: Saturday Peak Hour Traffic Volumes and Lane Configurations – Cumulative Plus Phase 1 Conditions – Local/Semi-Regional Tournament**

**Figure 14: Saturday Peak Hour Traffic Volumes and Lane Configurations – Cumulative Plus Phase 1 Conditions – Regional/National Tournament**

**Figure 15: Weekday Peak Hour Traffic Volumes and Lane Configurations – Cumulative Plus Buildout Conditions – Practice Activities**

**Figure 16: Weekday Peak Hour Traffic Volumes and Lane Configurations – Cumulative Plus Buildout Conditions – Stage Events**

Peak Hour Roadway Segment Volume-to-Capacity

**Table 26** displays directional roadway segment traffic volumes and VC ratio under Cumulative Plus Project conditions for weekday PM peak hour conditions for key roadway segment that will provide primary access to the proposed Project, including Grant Line Road between SR 99 and Bradshaw Road. As discussed previously, roadways are evaluated to describe to decision-makers and the public the expected change in traffic under various activities at the EGMSC. As shown in **Table 26**, the addition of Project trips will increase the VC of on most study segments compared to cumulative conditions. The addition of trips from Stage Events, League Events, and the County Fair would cause the segment of Grant Line Road between E. Stockton Boulevard and Waterman Road (Eastbound) to exceed capacity compared to cumulative conditions.

**Table 27** displays directional roadway segment traffic volumes and volume-to-capacity VC ratio for weekday Saturday peak hour conditions under Cumulative Plus Project conditions for key roadway segment that will provide primary access to the proposed Project, including Grant Line Road between SR 99 and Bradshaw Road. As shown in **Table 27**, the addition of trips from a Local/Semi-Regional tournament would cause segments of Grant Line Road between the SR 99 NB Ramp and Waterman Road (Westbound) to exceed capacity compared to cumulative conditions.

Peak Hour Intersection Operations

**Table 28** displays the weekday PM and Saturday peak hour traffic operations analysis results at the 20 study intersections under Cumulative Plus Phase 1 conditions (refer to Appendix D for detailed calculations). As shown in **Table 28**, the addition of trips from Phase 1 (Practice Activities) would impact operations at the following intersections:

- Kammerer Road/Lent Ranch Parkway – The addition of Project trips would exacerbate unacceptable LOS F conditions.
- Kammerer Road/Promenade Pkwy – The addition of Project trips would exacerbate unacceptable LOS F conditions.
- Kammerer Rd/SR 99 SB Ramps – The addition of Project trips would exacerbate unacceptable LOS F conditions.
- Grant Line Road/E. Stockton Boulevard – The addition of Project trips would exacerbate unacceptable LOS F conditions.
- Grant Line Road/Waterman Road – The addition of Project trips would result in unacceptable LOS E conditions.

- Grant Line Road/Elk Grove Boulevard– The addition of Project trips would exacerbate unacceptable LOS E conditions.
- Grant Line Road/Wilton Boulevard – The addition of Project trips would exacerbate unacceptable LOS E conditions.
- Kammerer Road/Big Horn Boulevard – The addition of Project trips would exacerbate unacceptable LOS E conditions.
- Kammerer Road/Lotz Parkway – The addition of Project trips would exacerbate unacceptable LOS E conditions.

The addition of trips from Phase 1 (Tournaments) would impact operations at the following intersections during Saturday peak hour conditions:

- Kammerer Rd/SR 99 SB Ramps – The addition of Project trips would exacerbate unacceptable LOS E operation.
- Grant Line Road/Waterman Road – The addition of Project trips would result in unacceptable LOS F conditions.
- Grant Line Road/E. Stockton Blvd– The addition of Project trips would exacerbate unacceptable LOS F operation.

**Table 29** displays the weekday AM and PM peak hour traffic operations analysis at the 20 study intersections under Cumulative Plus Project Buildout conditions with Practice Activities and Stage Events. (Refer to Appendix D for detailed calculations). As shown in **Table 29**, Buildout of the Project would impact the following study intersections:

- Kammerer Road/Bruceville Road – The addition of Project trips would result in unacceptable LOS E operations in the PM peak hour.
- Kammerer Rd/SR 99 SB Ramps – The addition of Project trips would exacerbate unacceptable LOS F operation.
- Grant Line Road/E. Stockton Blvd– The addition of Project trips would exacerbate unacceptable LOS F operations in the PM peak hour.
- Grant Line Road/Waterman Road – The addition of Project trips would result in LOS E operations in the AM peak hour and would result in LOS F operations in the PM peak hour.
- Grant Line Road/Mosher Road – The addition of Project trips would result in LOS F operations in the AM and PM peak hours.

- Grant Line Road/Bradshaw Road – The addition of Project trips would result in LOS E operations in the AM peak hour.
- Grant Line Road/Elk Grove Boulevard– The addition of Project trips would exacerbate unacceptable LOS F conditions in the AM peak hour and unacceptable LOS E conditions in the PM peak hour.
- Grant Line Road/Wilton Boulevard – The addition of Project trips would exacerbate unacceptable LOS F conditions in the AM peak hour and unacceptable LOS E conditions in the PM peak hour..
- Waterman Road/Elk Grove Boulevard – The addition of Project trips would exacerbate unacceptable LOS E conditions in the AM peak hour and would result in unacceptable LOS E operations in the PM peak hour.
- Kammerer Road/Big Horn Boulevard – The addition of Project trips would result in unacceptable LOS E conditions in the AM peak hour and would exacerbate unacceptable LOS E conditions in the PM peak hour.
- Kammerer Road/Lotz Parkway – The addition of Project trips would exacerbate unacceptable LOS E conditions in the PM peak hour.

Peak Hour Freeway Operations

**Table 30** displays the weekday AM and PM peak hour traffic operations analysis results at the 10 study freeway facilities under Cumulative Plus Project conditions. During the AM peak hour, Project Buildout with Practice Activities was analyzed. During PM peak hour conditions, operations with Practice Activities with Phase 1 and Project Buildout were analyzed (refer to Appendix D for detailed calculations). As shown in **Table 30**, all study freeway facilities at the SR 99/Grant Line Road interchange would operate at LOS D or better.

**TABLE 26:**
**PEAK HOUR ROADWAY SEGMENT OPERATIONS – CUMULATIVE PLUS PROJECT WEEKDAY CONDITIONS**

| Roadway | Segment | | Direction | Lanes[1] | Hourly Capacity (Per Lane) | Weekday PM Peak Hour | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Cumulative | | Cumulative Plus Project | | | | | | | |
| | | | | | | | | Practice Activities | | Stage Event | | League Event | | County Fair | |
| | From | To | | | | Volume[1] | VC[2] | Volume[1] | VC[2] | Volume[1] | VC[2] | Volume[1] | VC[2] | Volume[1] | VC[2] |
| Bradshaw Rd | Elk Grove Blvd | Grant Line Rd | SB | 4 | 990 | 650 | 0.33 | 704 | 0.36 | 718 | 0.36 | 709 | 0.36 | 711 | 0.36 |
| | | | NB | 4 | 990 | 860 | 0.43 | 932 | 0.47 | 931 | 0.47 | 930 | 0.47 | 938 | 0.47 |
| Grant Line Rd | SR 99 SB Ramps | SR 99 NB Ramps | EB | 6 | 910 | 4,060 | **1.49** | 4,039 | **1.48** | 4,572 | **1.67** | 4,691 | **1.72** | 4286 | **1.57** |
| | | | WB | 6 | 910 | 3,450 | **1.26** | 3,528 | **1.29** | 3,514 | **1.29** | 3,511 | **1.29** | 3601 | **1.32** |
| | SR 99 NB Ramps | E. Stockton Blvd | EB | 6 | 910 | 3,044 | **1.12** | 3,210 | **1.18** | 3,802 | **1.39** | 3,867 | **1.42** | 3485 | **1.28** |
| | | | WB | 6 | 910 | 2,742 | **1.00** | 3,212 | **1.18** | 3,163 | **1.16** | 3,165 | **1.16** | 3446 | **1.26** |
| | E. Stockton Blvd | Waterman Rd | EB | 5 | 910 | 2,329 | 0.85 | 2,525 | 0.92 | 3,116 | **1.14** | 3,181 | **1.17** | 2799 | **1.03** |
| | | | WB | 5 | 910 | 2,016 | **1.11** | 2,539 | **1.39** | 2,490 | **1.37** | 2,492 | **1.37** | 2773 | **1.52** |
| | Waterman Rd | Mosher Rd | EB | 5 | 910 | 1,675 | 0.61 | 1,581 | 0.58 | 1,687 | 0.62 | 1,697 | 0.62 | 1667 | 0.61 |
| | | | WB | 5 | 910 | 1,385 | 0.76 | 1,253 | 0.69 | 1,308 | 0.72 | 1,282 | 0.70 | 1389 | 0.76 |
| | Mosher Rd | Bradshaw Rd | EB | 4 | 910 | 1,520 | 0.84 | 1,766 | 0.97 | 1,756 | 0.96 | 1,753 | 0.96 | 1815 | **1.00** |
| | | | WB | 4 | 910 | 1,148 | 0.63 | 1,163 | 0.64 | 1,286 | 0.71 | 1,231 | 0.68 | 1220 | 0.67 |
| | Bradshaw Rd | Elk Grove Blvd | EB | 2 | 910 | 605 | 0.66 | 809 | 0.89 | 800 | 0.88 | 798 | 0.88 | 852 | 0.94 |
| | | | WB | 2 | 910 | 485 | 0.53 | 476 | 0.52 | 586 | 0.64 | 540 | 0.59 | 527 | 0.58 |
| Kammerer Rd | Lent Ranch Pkwy | Promenade Pkwy | EB | 6 | 910 | 2,588 | 0.95 | 2,530 | 0.93 | 2,653 | 0.97 | 2,635 | 0.97 | 2587 | 0.95 |
| | | | WB | 6 | 910 | 2,573 | 0.94 | 2,654 | 0.97 | 2,644 | 0.97 | 2,643 | 0.97 | 2703 | 0.99 |
| | Promenade Pkwy | SR 99 SB Ramps | EB | 7 | 910 | 4,810 | **1.32** | 4,655 | **1.28** | 4,778 | **1.31** | 4,760 | **1.31** | 4711 | **1.29** |
| | | | WB | 7 | 910 | 4,270 | **1.56** | 4,376 | **1.60** | 4,366 | **1.60** | 4,365 | **1.60** | 4425 | **1.62** |
| Mosher Rd | Waterman Rd | Grant Line Rd | SB | 2 | 990 | 345 | 0.35 | 565 | 0.57 | 565 | 0.57 | 565 | 0.57 | 565 | 0.57 |
| | | | NB | 2 | 990 | 225 | 0.23 | 460 | 0.46 | 460 | 0.46 | 460 | 0.46 | 460 | 0.46 |
| Waterman Rd | Mosher Rd | Grant Line Rd | SB | 2 | 990 | 680 | 0.69 | 524 | 0.53 | 538 | 0.54 | 529 | 0.53 | 531 | 0.54 |
| | | | NB | 2 | 990 | 715 | 0.72 | 602 | 0.61 | 601 | 0.61 | 600 | 0.61 | 608 | 0.61 |

Notes:
[1] Both directions excluding center turn lanes or right-turn deceleration lanes.
[2] VC – Volume-to-Capacity Ratio
[3] LOS – Level of Service
Source: Fehr & Peers, 2017

**TABLE 27:**
**PEAK HOUR ROADWAY SEGMENT OPERATIONS – CUMULATIVE PLUS PROJECT SATURDAY CONDITIONS**

| Roadway | Segment | | Direction | Lanes[1] | Hourly Capacity (Per Lane) | Saturday Peak Hour | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Cumulative | | Cumulative Plus Project (Tournaments) | | | |
| | | | | | | | | Regional/National | | Local/Semi-Regional | |
| | From | To | | | | Volume[1] | VC[2] | Volume[1] | VC[2] | Volume[1] | VC[2] |
| Bradshaw Rd | Elk Grove Blvd | Grant Line Rd | SB | 4 | 990 | 578 | 0.29 | 638 | 0.32 | 644 | 0.33 |
| | | | NB | 4 | 990 | 370 | 0.19 | 354 | 0.18 | 364 | 0.18 |
| Grant Line Rd | SR 99 SB Ramps | SR 99 NB Ramps | EB | 6 | 910 | 1,744 | 0.64 | 2,309 | 0.85 | 2,552 | 0.93 |
| | | | WB | 6 | 910 | 2,934 | **1.07** | 2,937 | **1.08** | 3,067 | **1.12** |
| | SR 99 NB Ramps | E. Stockton Blvd | EB | 6 | 910 | 1,599 | 0.59 | 2,244 | 0.82 | 2,513 | 0.92 |
| | | | WB | 6 | 910 | 2,086 | 0.76 | 2,424 | 0.89 | 2,847 | **1.04** |
| | E. Stockton Blvd | Waterman Rd | EB | 5 | 910 | 1,299 | 0.48 | 1,973 | 0.72 | 2,241 | 0.82 |
| | | | WB | 5 | 910 | 1,456 | 0.80 | 1,796 | 0.99 | 2,219 | **1.22** |
| | Waterman Rd | Mosher Rd | EB | 5 | 910 | 961 | 0.35 | - | - | - | - |
| | | | WB | 5 | 910 | 1,088 | 0.60 | - | - | - | - |
| | Mosher Rd | Bradshaw Rd | EB | 4 | 910 | 784 | 0.43 | 682 | 0.37 | 771 | 0.42 |
| | | | WB | 4 | 910 | 1,047 | 0.58 | 1,291 | 0.71 | 1,348 | 0.74 |
| | Bradshaw Rd | Elk Grove Blvd | EB | 2 | 910 | 359 | 0.39 | 342 | 0.38 | 420 | 0.46 |
| | | | WB | 2 | 910 | 471 | 0.52 | 667 | 0.73 | 717 | 0.79 |
| Kammerer Rd | Lent Ranch Pkwy | Promenade Pkwy | EB | 6 | 910 | 1,038 | 0.38 | 1,143 | 0.42 | 1,200 | 0.44 |
| | | | WB | 6 | 910 | 2,074 | 0.76 | 2,070 | 0.76 | 2,159 | 0.79 |
| | Promenade Pkwy | SR 99 SB Ramps | EB | 7 | 910 | 1,855 | 0.51 | 1,987 | 0.55 | 2,043 | 0.56 |
| | | | WB | 7 | 910 | 3,808 | **1.39** | 3,761 | **1.38** | 3,850 | **1.41** |
| Mosher Rd | Waterman Rd | Grant Line Rd | SB | 2 | 990 | 141 | 0.14 | - | - | - | - |
| | | | NB | 2 | 990 | 221 | 0.22 | - | - | - | - |
| Waterman Rd | Mosher Rd | Grant Line Rd | SB | 2 | 990 | 379 | 0.38 | - | - | - | - |
| | | | NB | 2 | 990 | 349 | 0.35 | - | - | - | - |

Notes:
[1] Both directions excluding center turn lanes or right-turn deceleration lanes.
[2] VC – Volume-to-Capacity Ratio
Source: Fehr & Peers, 2017

**TABLE 28:**
**PEAK HOUR INTERSECTION LEVEL OF SERVICE – CUMULATIVE PLUS PHASE 1 CONDITIONS**

| Intersection | Control | Weekday PM Peak Hour | | | | Saturday Peak Hour | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cumulative | | Cumulative Plus Phase 1 (Practice Activities) | | Cumulative | | Cumulative Plus Phase 1 (Tournaments) | | | |
| | | | | | | | | Regional/National | | Local/Semi-Regional | |
| | | Delay[1] | LOS[1] | Delay[1] | LOS[1] | Delay[1] | LOS[1] | Delay[1] | LOS[1] | Delay[1] | LOS[1] |
| 1. Hood Franklin Rd/I-5 SB Ramps | Signal | 12 | B | 13 | B | | | | | | |
| 2. Hood Franklin Rd/I-5 NB Ramps | Signal | 12 | B | 13 | B | | | | | | |
| 3. Kammerer Rd/Bruceville Rd | Signal | 53 | D | 55 | D | | | | | | |
| 4. Kammerer Rd/Lent Ranch Pkwy[2] | Signal | 161 | **F** | 164 | **F** | | | | | | |
| 5. Kammerer Rd/Promenade Pkwy | Signal | 276 | **F** | 278 | **F** | 39 | D | 35 | D | 40 | D |
| 6. Kammerer Rd/SR 99 SB Ramps | Signal | 141 | **F** | 146 | **F** | 67 | **E** | 68 | **E** | 93 | **F** |
| 7. Kammerer Rd/SR 99 NB Ramps | Signal | 35 | D | 36 | D | 20 | C | 19 | B | 23 | C |
| 8. Grant Line Rd/E. Stockton Blvd | Signal | 195 | **F** | 205 | **F** | 84 | **F** | 96 | **F** | 145 | **F** |
| 9. Grant Line Rd/Waterman Rd | Signal | 25 | C | 67 | **E** | 8 | A | 31 | C | 82 | **F** |
| 10. Grant Line Rd/Mosher Rd | Signal | 14 | B | 14 | B | 11 | B | 10 | A | 11 | B |
| 11. Grant Line Rd/Bradshaw Rd | Signal | 14 | B | 14 | B | 14 | B | 12 | B | 15 | B |
| 12. Grant Line Rd/Elk Grove Blvd | AWSC | 49 | **E** | 57 | **F** | | | | | | |
| 13. Grant Line Rd/Bond Rd | Signal | 29 | C | 31 | C | | | | | | |
| 14. Grant Line Rd/Wilton Rd | Signal | 76 | **E** | 78 | **E** | | | | | | |
| 15. Grant Line Rd/Sheldon Rd[2] | Signal | 35 | D | 37 | D | | | | | | |
| 16. Grant Line Rd/Calvine Rd[2] | Signal | 15 | B | 15 | B | | | | | | |
| 17. Waterman Rd/Elk Grove Blvd | Signal | 55 | **D** | 55 | **D** | | | | | | |
| 18. Waterman Rd/Bond Rd | Signal | 34 | C | 34 | C | | | | | | |
| 19. Kammerer Rd/Big Horn Blvd | Signal | 60 | **E** | 62 | **E** | | | | | | |
| 20. Kammerer Rd/Lotz Pkwy | Signal | 75 | **E** | 77 | **E** | | | | | | |

Notes:
AWSC = All-way Stop Control. SSSC = Side-street Stop Control.
[1]Average delay (rounded to the nearest second) and LOS for signalized and all-way stop-controlled intersections is the weighted average for all movements. Average delay and LOS at side-street stop-controlled intersections shown for both worst-case side street movement (in parentheses) and intersection as a whole.
[2]HCM 2000 was used due to unique signal timing or to be consistent with other scenarios.
Source: Fehr & Peers, 2017

**TABLE 29:**
**PEAK HOUR INTERSECTION LEVEL OF SERVICE – CUMULATIVE PLUS PROJECT BUILDOUT CONDITIONS**

| Intersection | Control | Weekday AM Peak Hour | | | | Weekday PM Peak Hour | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cumulative | | Cumulative Plus Buildout (Practice Activities) | | Cumulative | | Cumulative Plus Buildout | | | |
| | | | | | | | | Practice Activities | | Stage Events | |
| | | Delay[1] | LOS[1] | Delay[1] | LOS[1] | Delay[1] | LOS[1] | Delay[1] | LOS[1] | Delay[1] | LOS[1] |
| 1. Hood Franklin Rd/I-5 SB Ramps | Signal | 12 | B | 13 | B | 12 | B | 13 | B | 16 | B |
| 2. Hood Franklin Rd/I-5 NB Ramps | Signal | 17 | B | 21 | C | 12 | B | 14 | B | 20 | B |
| 3. Kammerer Rd/Bruceville Rd | Signal | 63 | **E** | 66 | **E** | 53 | D | 62 | **E** | 62 | **E** |
| 4. Kammerer Rd/Lent Ranch Pkwy[2] | Signal | 105 | **F** | 106 | **F** | 161 | **F** | 155 | **F** | 164 | **F** |
| 5. Kammerer Rd/Promenade Pkwy | Signal | 156 | **F** | 152 | **F** | 276 | **F** | 263 | **F** | 269 | **F** |
| 6. Kammerer Rd/SR 99 SB Ramps | Signal | 182 | **F** | 180 | **F** | 141 | **F** | 139 | **F** | 158 | **F** |
| 7. Kammerer Rd/SR 99 NB Ramps | Signal | 50 | D | 51 | D | 35 | D | 35 | C | 51 | D |
| 8. Grant Line Rd/E. Stockton Blvd | Signal | 138 | **F** | 139 | **F** | 195 | **F** | 253 | **F** | 272 | **F** |
| 9. Grant Line Rd/Waterman Rd | Signal | 34 | C | 60 | **E** | 25 | C | 108 | **F** | 107 | **F** |
| 10. Grant Line Rd/Mosher Rd | Signal | 13 | B | 233 | **F** | 14 | B | 162 | **F** | 216 | **F** |
| 11. Grant Line Rd/Bradshaw Rd | Signal | 36 | D | 67 | **E** | 14 | B | 15 | B | 17 | B |
| 12. Grant Line Rd/Elk Grove Blvd | AWSC | 110 | **F** | 145 | **F** | 49 | **E** | 114 | **F** | 120 | **F** |
| 13. Grant Line Rd/Bond Rd | Signal | 30 | C | 32 | C | 29 | C | 31 | C | 37 | D |
| 14. Grant Line Rd/Wilton Rd | Signal | 83 | **F** | 88 | **F** | 76 | **E** | 97 | **F** | 93 | **F** |
| 15. Grant Line Rd/Sheldon Rd[2] | Signal | 34 | C | 37 | D | 35 | D | 42 | D | 55 | D |
| 16. Grant Line Rd/Calvine Rd[2] | Signal | 26 | C | 26 | C | 15 | B | 16 | B | 20 | B |
| 17. Waterman Rd/Elk Grove Blvd | Signal | 58 | **E** | 68 | **E** | 55 | **D** | 71 | **E** | 72 | **E** |
| 18. Waterman Rd/Bond Rd | Signal | 46 | D | 47 | D | 34 | C | 36 | D | 36 | D |
| 19. Kammerer Rd/Big Horn Blvd | Signal | 53 | D | 55 | **E** | 60 | **E** | 64 | **E** | 73 | **E** |
| 20. Kammerer Rd/Lotz Pkwy | Signal | 67 | **E** | 68 | **E** | 75 | **E** | 78 | **E** | 89 | **F** |

Notes:
AWSC = All-way Stop Control. SSSC = Side-street Stop Control.
[1]Average delay (rounded to the nearest second) and LOS for signalized and all-way stop-controlled intersections is the weighted average for all movements. Average delay and LOS at side-street stop-controlled intersections shown for both worst-case side street movement (in parentheses) and intersection as a whole.
[2]HCM 2000 was used due to unique signal timing or to be consistent with other scenarios.
Source: Fehr & Peers, 2017

**TABLE 30:**
**PEAK HOUR FREEWAY ANALYSIS – CUMULATIVE PLUS PHASE 1 AND BUILDOUT CONDITIONS**

| Freeway Facility | Type | Weekday AM Peak Hour | | | | Weekday PM Peak Hour | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cumulative | | Cumulative Plus Buildout (Practice Activities) | | Cumulative | | Cumulative Plus Practice Activities | | | |
| | | | | | | | | Phase 1 | | Buildout | |
| | | Density | LOS | Density | LOS | Density | LOS | Density | LOS | Density | LOS |
| 1. NB SR 99 South of Grant Line Road | Basic Segment | 35.9 | E | 35.0 | D | 34.5 | D | 34.8 | D | 33.2 | D |
| 2. NB SR 99 Grant Line Road Slip Off-Ramp | Diverge | 27.6 | C | 27.1 | C | 26.8 | C | 26.9 | C | 26.0 | C |
| 3. NB SR 99 Grant Line Road Loop On-Ramp | Basic Segment | 14.9 | B | 13.9 | B | 19.7 | C | 19.7 | C | 18.4 | C |
| 4. NB SR 99 Grant Line Road Slip On-Ramp | Merge | 18.8 | B | 19.7 | B | 24.3 | C | 24.8 | C | 25.9 | C |
| 5. NB SR 99 North of Grant Line Road | Basic Segment | 20.9 | C | 21.2 | C | 32.3 | D | 31.4 | D | 33.9 | D |
| 6. SB SR 99 North of Grant Line Road | Basic Segment | 30.5 | D | 33.3 | D | 20.7 | C | 21.9 | C | 23.9 | C |
| 7. SB SR 99 Grant Line Road Slip Off-Ramp | Diverge | 24.1 | C | 26.0 | C | 15.5 | B | 16.7 | B | 18.7 | B |
| 8. SB SR 99 Grant Line Road Loop On-Ramp | Basic Segment | 9.8 | A | 10.0 | A | 7.8 | A | 7.9 | A | 8.8 | A |
| 9. SB SR 99 Grant Line Road Slip On-Ramp | Merge | 16.9 | B | 17.1 | B | 17.5 | B | 17.6 | B | 18.4 | B |
| 10. SB SR 99 South of Grant Line Road | Basic Segment | 20.1 | C | 20.3 | C | 20.1 | C | 20.2 | C | 21.6 | C |

Notes:

Source: Fehr & Peers, 2017

# VI. PROPOSED IMPROVEMENTS

This chapter presents improvement recommendations for off-site and on-site transportation facilities that would be degraded by the addition of Project traffic under existing and cumulative conditions.

**EXISTING CONDITIONS**

Phase 1

No improvements required.

Buildout

Implementation of the following improvements is recommended to provide acceptable, LOS D or better operations:

Improvement 1 – Kammerer Road/Bruceville Road Intersection

Installation of all-way stop control would provide acceptable LOS C operation in the AM peak hour.

OR

Installation of traffic signal control would provide acceptable LOS A operation in the AM peak hour. Traffic volumes at the intersection would satisfy the peak hour volume warrant for installation of traffic signal control.

Improvement 2 – Grant Line Road/Waterman Road Intersection

Provide the following lane configurations at the intersection:

- Two left-turn lane, one through lane, and one right-turn lane on the northbound approach
- One left-turn lane, one through lane, and two right-turn lanes on the southbound approach
- Two left-turn lanes, three through lanes, and one right-turn lane on the eastbound approach

- Two left-turn lanes, three through lanes, and one right-turn lane on the westbound approach

With this improvement, the intersection would operate acceptably at LOS D in the AM and PM peak hours.

Improvement 3 – Grant Line Road/Mosher Road Intersection

Install traffic signal control and provide the following lane configurations at the intersection:

- One left-turn lane, one through lane, and one right-turn lane on the northbound approach
- One left-turn lane, one through lane, and a right-turn lane on the southbound approach
- One left-turn lane, two through lanes, and one right-turn lane on the eastbound approach
- One left-turn lane, two through lanes, and one right-turn lane on the westbound approach

With this improvement, the intersection would operate acceptably at LOS D in the AM and PM peak hours. Traffic volumes at the intersection would satisfy the peak hour volume warrant for installation of traffic signal control.

Improvement 4 – Grant Line Road/Bradshaw Road Intersection

Realign Bradshaw Road to intersect Grant Line Road at 90 degrees. Install traffic signal control and provide the following lane configurations at the intersection:

- One left-turn lane, one right-turn lane on the southbound approach
- One left-turn lane and one through lane on the eastbound approach
- One through lane and one right-turn lane on the westbound approach

With this improvement, the intersection would operate acceptably at LOS A in the AM and LOS D in the PM peak hour. Traffic volumes at the intersection would satisfy the peak hour volume warrant for installation of traffic signal control.

Improvement 5 – Grant Line Road/Elk Grove Boulevard Intersection

Realign Elk Grove Boulevard to intersect Grant Line Road at 90 degrees. Install traffic signal control and provide the following lane configurations at the intersection:

- One left-turn lane, one right-turn lane on the southbound approach
- One left-turn lane and one through lane on the eastbound approach
- One through lane and one right-turn lane on the westbound approach

With this improvement, the intersection would operate acceptably at LOS C in the AM and PM peak hours. Traffic volumes at the intersection would satisfy the peak hour volume warrant for installation of traffic signal control.

## CUMULATIVE CONDITIONS

Implementation of the following improvements is recommended to provide acceptable, LOS D or better operations:

Improvement 6 – Bruceville Road/Kammerer Road

Provide six lane on Kammerer Road east of Bruceville Road. Six lanes on this section of Kammerer Road would be consistent with the Connector JPA ultimate project. Provide the following lane configurations at the intersection:

- One left-turn lane, one through lane, and one right-turn lane on the northbound approach
- Two left-turn lanes, one through lane, and a right-turn lane on the southbound approach
- One left-turn lane, three through lanes, and one right-turn lane on the eastbound approach
- One left-turn lanes, three through lanes, and one right-turn lane on the westbound approach

With this improvement, the intersection would operate acceptably at LOS D in the PM peak hour.

Improvement 7 – Lent Ranch Parkway/Kammerer Road

Provide the following lane configurations at the intersection:

- One left-turn lane, one through lane, and one right-turn lanes on the northbound approach
- Two left-turn lanes, one through lane, and one right-turn lane on the southbound approach
- Two left-turn lanes, three through lanes, and one right-turn lane on the eastbound approach
- Two left-turn lanes, three through lanes, and one right-turn lane on the westbound approach

With this improvement, delay would be less than delay under cumulative conditions without the project. The intersection would continue to operate at LOS F during the PM peak hours.

Improvement 8 – SR 99 SB Ramps/Grant Line Road

Widen in the median to provide the following lane configurations on the westbound and eastbound approaches:

- Four through lanes and one right-turn lane on the eastbound approach
- Four through lanes and one right-turn lane on the westbound approach

With this improvement, delay would be less than delay under cumulative conditions without the Project. The intersection would continue to operate at LOS F during the PM peak hours. Widening to eight lanes on this section of Grant Line Road would be consistent with the Elk Grove General Plan.

Improvement 9 – E. Stockton Boulevard/Grant Line Road

Widen in the median to provide the following lane configurations on the westbound and eastbound approaches:

- Two left-turn lanes, four through lanes, and one right-turn lane on the eastbound approach
- One left-turn lane, three through lanes, and one shared through/right-turn lane on the westbound approach

With this improvement, delay would be less than delay under cumulative conditions without the Project. The intersection would continue to operate at LOS F during the PM peak hours. Widening to eight lanes on this section of Grant Line Road would be consistent with the Elk Grove General Plan.

Improvement 10 – Waterman Road/Grant Line Road Intersection

Widen Grant Line Road to provide eight through lanes and provide the following lane configurations:

- Three left-turn lanes, one through lane, and one right-turn lane on the northbound approach
- Two left-turn lanes, one through lane, and one right-turn lane on the southbound approach
- Two left-turn lanes, four through lanes, and two right-turn lanes on the eastbound approach
- One left-turn lanes, four through lanes, and one right-turn lane on the westbound approach

With this improvement, delay would be less than delay under cumulative conditions without the project. The intersection would continue to operate at LOS F during the PM peak hours. Widening to eight lanes on this section of Grant Line Road would be consistent with the Elk Grove General Plan.

Improvement 11 – Mosher Road/Grant Line Road Intersection

Widen Grant Line Road to provide six through lanes and provide the following lane configurations:

- One left-turn lane, one through lane, and one right-turn lane on the northbound approach
- One left-turn lane, one through lane, and one right-turn lane on the southbound approach
- One left-turn lane, three through lanes, and one right-turn lane on the eastbound approach

- One left-turn lanes, three through lanes, and one right-turn lane on the westbound approach

With this improvement, the intersection would operate acceptably at LOS D in the PM peak hour. Widening to six lanes on this section of Grant Line Road would be consistent with the Connector JPA ultimate project with the Elk Grove General Plan.

Improvement 12 – Grant Line Road/Elk Grove Boulevard Intersection

Install traffic signal control and provide the following lane configurations:

- One left-turn lane and one through lane on the northbound approach
- One through lane and one right-turn lane on the southbound approach
- One left-turn lane and one right-turn lane on the eastbound approach

With this improvement, the intersection would operate acceptably at LOS A in the PM peak hour.

Improvement 13 – Grant Line Road/Wilton Road Intersection

Provide the following lane configurations at the intersection:

- One left-turn lane, one through lane, and one right-turn lane on the northbound approach
- One left-turn lane, and a shared through/right-turn lane on the southbound, eastbound, and westbound approaches.

With this improvement, the intersection would operate at LOS E in the PM peak hour.

Improvement 14 – Waterman Road/Elk Grove Boulevard

Provide the following lane configurations at the intersection:

- Two left-turn lanes, two through lanes, and one right-turn lane on the northbound approach
- One left-turn lane, one through lane, and one right-turn lane on the southbound, eastbound, and westbound approaches.

With this improvement, the intersection would operate at LOS D in the PM peak hour.

Improvement 15 – Big Horn Boulevard/Kammerer Road

Provide six lane on Kammerer Road east of Bruceville Road. Six lanes on this section of Kammerer Road would be consistent with the Connector JPA ultimate project. Provide the following lane configurations at the intersection:

- Two left-turn lanes, two through lanes, and one right-turn lane on the northbound approach
- Two left-turn lanes, two through lanes, and one right-turn lane on the southbound approach
- Two left-turn lanes, three through lanes, and one right-turn lane on the eastbound approach
- Two left-turn lanes, three through lanes, and one right-turn lane on the westbound approach

With this improvement, the intersection would operate acceptably at LOS D in the PM peak hour.

Improvement 16 – Lotz Parkway/Kammerer Road

Provide six lane on Kammerer Road east of Bruceville Road. Six lanes on this section of Kammerer Road would be consistent with the Connector JPA ultimate project. Provide the following lane configurations at the intersection:

- Two left-turn lanes, two through lanes, and one right-turn lane on the northbound approach
- Two left-turn lanes, two through lanes, and one right-turn lane on the southbound approach
- Two left-turn lanes, three through lanes, and one right-turn lane on the eastbound approach
- Two left-turn lanes, three through lanes, and one right-turn lane on the westbound approach

With this improvement, the intersection would operate acceptably at LOS D in the PM peak hour.

## ON-SITE CIRCULATION

This chapter presents recommended roadway travel lanes (two-way total) and intersection traffic control for site access and on-site roadways. **Figure 17** shows the concept roadway system. The cumulative buildout travel demand forecasting model was used to develop peak hour and roadway segment traffic volume forecasts for on-site facilities. On-site roadway and intersections are discussed below.

Roadways

**Table 31** summarizes on-site roadway travel lanes and level of service for the roadways identified on **Figure 17**, using the daily roadway segment capacities from the City's traffic impact study guidelines.

**TABLE 31:**
**ON-SITE ROADWAY SEGMENT OPERATIONS – CUMULATIVE (PROJECT BUILDOUT) CONDITIONS**

| On-Site Roadway Segment | Lanes[1] | Daily Capacity[2] | Volume[1] | VC[3] | Level of Service |
|---|---|---|---|---|---|
| 1 | 2 | 18,000 | 9,400 | 0.52 | A |
| 2 | 2 | 18,000 | 5,200 | 0.29 | A |
| 3 | 2 | 18,000 | 11,100 | 0.62 | B |
| 4 | 2 | 18,000 | 10,900 | 0.61 | B |
| 5 | 4 | 36,000 | 31,000 | 0.86 | D |
| 6 | 4 | 36,000 | 8,200 | 0.23 | A |
| 7 | 4 | 36,000 | 22,700 | 0.63 | B |
| 8 | 2 | 18,000 | 8,500 | 0.47 | A |
| 9 | 2 | 18,000 | 5,200 | 0.29 | A |
| 10 | 2 | 18,000 | 8,500 | 0.47 | A |
| 11 | 2 | 18,000 | 6,400 | 0.36 | A |
| 12 | 2 | 18,000 | 2,300 | 0.13 | A |
| 13 | 2 | 18,000 | 4,100 | 0.23 | A |
| 14 | 2 | 18,000 | 4,800 | 0.27 | A |
| 15 | 2 | 18,000 | 2,400 | 0.13 | A |
| 16 | 2 | 18,000 | 2,000 | 0.11 | A |
| 17 | 2 | 18,000 | 2,900 | 0.16 | A |
| 18 | 2 | 18,000 | 1,000 | 0.06 | A |
| 19 | 2 | 18,000 | 2,700 | 0.15 | A |

Notes:
[1] Both directions excluding center turn lanes or right-turn deceleration lanes.
[2] City of Elk Grove – *Traffic Impact Analysis Guidelines*, July 2000. Service volume applies to arterial roadways with moderate access control.
[3] VC – Volume-to-Capacity Ratio
Source: Fehr & Peers, 2017

Intersections

The on-site study intersections were evaluated using the MUTCD peak hour volume warrant for traffic signal installation. As shown, there are 10 major intersections on-site. Of the 10, traffic signal control would be warranted at the first two internal intersections along Mahon Ranch Road, south of Grant Line Road.

**Figure 17: Site Access and On-Site Circulation**

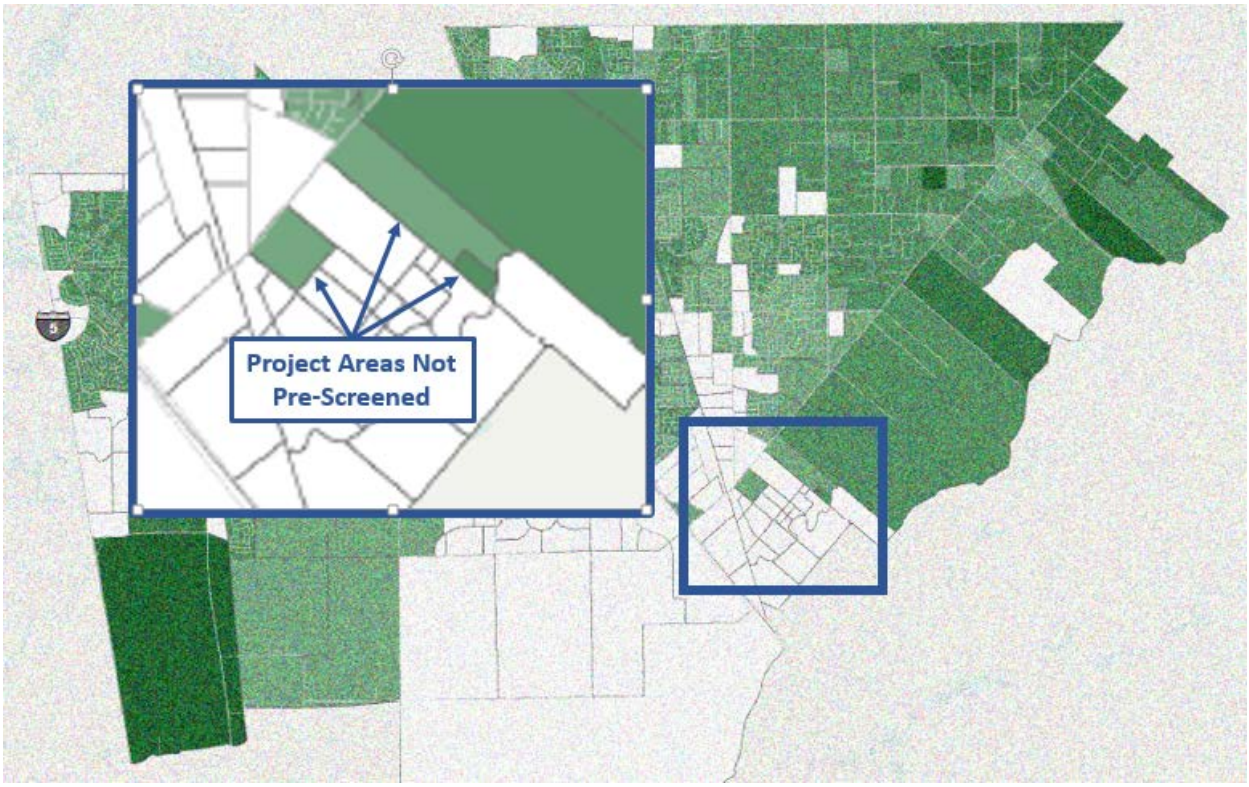
# VII. VEHICLE MILES OF TRAVEL

This chapter presents analysis of Project vehicle miles traveled (VMT) under cumulative conditions, relative to the threshold of significance presented in Chapter 1. The VMT analysis includes all of the roadway improvements included as part of the General Plan VMT analysis.

## VMT SCREENING

The VMT Screening Map presented in Chapter 1 identifies areas in the City that are exempt from VMT analysis. These include sites that have been pre-screened through Citywide VMT analysis. Pre-screened areas are shown in white and have been determined to result in 15 percent or below the average service population VMT established for that land use designation if built to the specifications of the Land Use Plan.

The Project area is identified on the VMT Screening Map shown below. As shown, most of the Project is exempt form VMT analysis, except for three areas. The non-exempt areas include commercial and mixed-used designated land uses.



## VMT LIMITS BY LAND USE DESIGNATION

As outlined in Chapter 1, the non-exempt areas of the Project must demonstrate that the VMT produced by the Project at buildout is equal to or less than the VMT limit of the underlying land use designation. **Table 32** compares the Project's VMT per service population for the non-exempt portions of the Project to the City's VMT limit for those land uses. As shown in **Table 32**, the non-exempt portion of the Project will not exceed the City's VMT limits for their land use designations.

**TABLE 32:**
**VMT BY LAND USE DESIGNATION LIMITS – CUMULATIVE (PROJECT BUILDOUT) CONDITIONS**

| Non-Exempt Land Use Designation | VMT Per Service Population | | Limit Exceeded? |
|---|---|---|---|
| | City VMT Limit | Project VMT | |
| Community Commercial | 69.2 | 60.8 | No |
| Residential Mixed Use | 17.5 | 12.3 | No |

Source: Fehr & Peers, 2017

## STUDY AREA VMT LIMITS

As outlined in Chapter 1, development Projects located in Study Areas shall demonstrate that cumulative VMT within the Study Area should be equal to or less than the City's established total VMT limits. The proposed Project is located in the East Study Area. **Table 33** compares the total VMT limit for the East Study Area to the City's total VMT limit for the East Study Area. As shown in **Table 33**, the East Study Area would not exceed the City's total VMT limit for the area.

**TABLE 33:**
**STUDY AREA VMT LIMITS – CUMULATIVE (PROJECT BUILDOUT) CONDITIONS**

| Non-Exempt Land Use Designation | Total VMT | | Limit Exceeded? |
|---|---|---|---|
| | City VMT Limit | Project VMT | |
| East Study Area | 342,855 | 299,108 | No |

Source: Fehr & Peers, 2017

# Appendix B

## Elk Grove Multi-Sports Complex VMT Analysis and Transportation Management plan Review

Fehr and Peers – August 24, 2020

FEHR PEERS

# MEMORANDUM

Date: August 24, 2020

To: Christopher Jordan, City of Elk Grove

From: David B. Robinson, Fehr & Peers

**Subject**: **Elk Grove Multi-Sport Complex VMT Analysis and Transportation Management plan Review**

RS20-3924

Fehr & Peers completed a vehicle miles of travel (VMT) analysis of a proposed land use plan to the Elk Grove Multi-Sport Park Complex and the review of the Transportation Management Plan (TMP). The purpose of the VMT analysis is to determine if the proposed land use alterative complies with City of Elk Grove General Plan Policy adopted to reduce VMT and achieve State-mandated reductions in VMT. The TMP review focuses on the adequacy of site access and on-site circulation to accommodate proposed development.

This memorandum compares the land use plan analyzed in the DEIR for the Multi-Sport Park Complex project to the proposed land use plan relative to trip generation and VMT, summarizes the site access and on-site circulation review, and evaluates off-ramp queuing at the SR 99/Grant Line Road intrechange.

**Land Use Comparison**

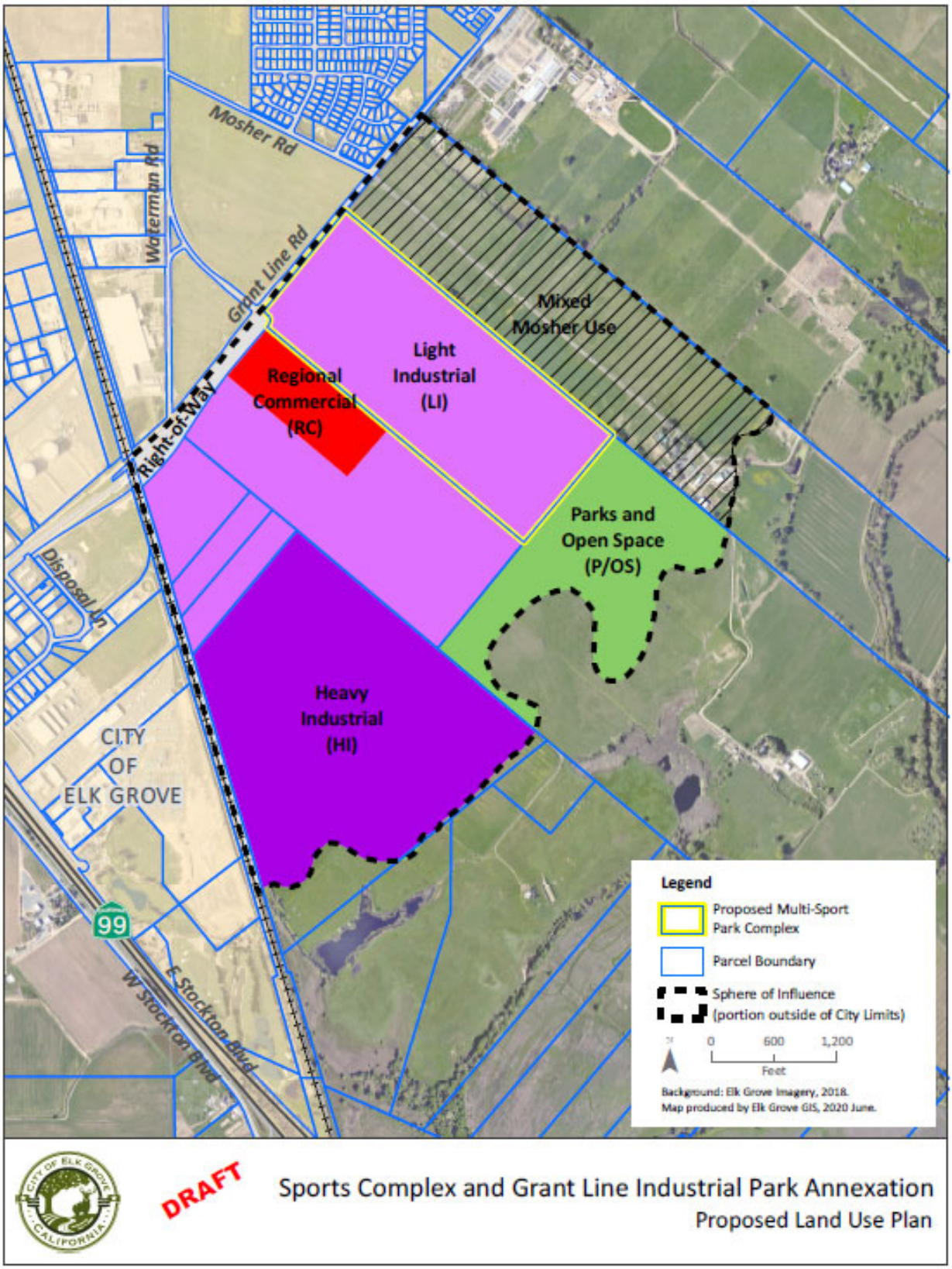
The proposed land use will consist of mixed use, parks and open space, regional commercial, light industrial, and heavy industrial. Figure 1 illustrates the proposed land use plan. The proposed zoning for the City's 103.9-acre parcel is industrial and allows a range of land use activities, including warehousing and manufacturing, as well as the proposed sports complex. Table 1 compares the proposed land use plan to the land use analyzed in the DEIR for the Multi-Sport Park Complex project. As shown, the proposed land use plan shifts Parks/Open Space and Regional Commercial to Light Industrial land use.

**Table 1: Land Use Comparison**

| Land Use | Area[1] (Acres) | | Difference (Alt B - DEIR) |
|---|---|---|---|
| | DEIR | Proposed Project | |
| Existing Right-of-Way (ROW) | 8.2 | 8.2 | **0.0** |
| Heavy Industrial (HI) | 143.2 | 143.2 | **0.0** |
| Light Industrial (LI) | 74.4 | 216.2 | **141.8** |
| Mixed Mosher Use | 118.9 | 118.9 | **0.0** |
| Parks and Open Space (P/OS) | 169.0 | 65.1 | **-103.9** |
| Regional Commercial (RC) | 57.9 | 20.0 | **-37.9** |
| **Total** | **571.6** | **571.6** | **0.0** |

Source: [1]City of Elk Grove

**Figure 1 – Proposed Land Use Plan**



**Trip Generation and VMT**

We used the following steps to estimate trip generation and vehicle miles of travel (VMT) for both land use plans:

- Estimated Building Area – Estimated building area using floor-to-area ratios applied in the analysis of the DEIR for the Multi-Sport Park Complex project.
- Trip Generation – Used trip rates published in the Institute of Transportation Engineers (ITE) 10th Edition Trip Generation Manual to estimate typical weekday, AM peak hour, and PM peak hour trip generation for each land use plan.
- Vehicle Mix (Cars, Light Trucks, Heavy Vehicles) – Estimated the mix of cars, light trucks, and heavy vehicles associated with the proposed industrial land uses, based on trip generation data collected at a warehouse facility in Patterson CA.
- Service Population – Estimated employment for each land use plan using per acre employment densities used in the analysis of the DEIR for the Multi-Sport Park Complex project. Estimated population based using an average of 3.23 persons per household for single family residential land use (i.e., Mixed Mosher Use), based on Table 3.2 of Planning Framework chapter of the General Plan.
- VMT Per Service Population – Calculated VMT per service population by land use category using a modified version of SACOG's SACSIM regional travel demand forecasting model
- Automobile VMT – Estimated automobile VMT, consistent with CEQA Section 15064.3 and OPR's Technical Advisory on Evaluating Transportation Impacts in CEQA. Multiplied daily trip generation for cars and light trucks (i.e., automobiles) by the applicable VMT per service population by land use. Estimated automobile VMT for soccer fields by multiplying daily trip generation for cars and light trucks by and an average trip length of five miles.

Table 2 compares the trip generation and VMT for the proposed land use plan to the land use analyzed in the DEIR for the Multi-Sport Park Complex project. As shown, the proposed project would generate about 8,200 fewer trips per day and 700 fewer trips during the PM peak hour. The proposed project would generate about 1,100 more trips during the AM peak hour than was analyzed in the DEIR. The proposed project would result in 22,185 less VMT than the land use plan analyzed in the DEIR. Attachment A includes the detailed inputs and calculations for these travel characteristics.

**Table 2: Trip Generation and VMT**

| Land Use | Trip Generation | | | VMT |
|---|---|---|---|---|
| | Daily | AM | PM | |
| DEIR | 52,400 | 3,620 | 5,910 | 231,766 |
| Proposed Project | 44,230 | 4,711 | 5,220 | 209,581 |
| Difference (Proposed Project – DEIR) | -8,180 | 1,090 | -690 | -22,185 |

Source: Fehr & Peers, 2020

**Site Access and On-Site Circulation**

Table 3 compares the recommended roadway travel lanes (two-way total) from the DEIR to the average daily traffic design target based on the proposed land use plan. Attachment B includes the circulation exhibit for the proposed project that shows the study roadway segments.

As shown in Table 3, the proposed land use plan would result in lower on-site daily roadway volumes. The forecasted daily volumes on all on-site roadways would be less than the average daily traffic design targets. Therefore, the proposed roadway system (i.e., number of travel lanes) is adequate to support the proposed project.

**Table 3: On-site Roadway Design Targets – Project Buildout**

| Segment | Lanes | Average Daily Traffic Design Target | DEIR | | Proposed Project | |
|---|---|---|---|---|---|---|
| | | | Daily Volume | Target Exceeded? | Daily Volume | Target Exceeded? |
| 1 | 2 | 16,500 | 9,400 | No | 8,900 | No |
| 2 | 2 | 16,500 | 5,200 | No | 4,900 | No |
| 3 | 2 | 16,500 | 11,100 | No | 10,500 | No |
| 4 | 2 | 16,500 | 10,900 | No | 10,300 | No |
| 5 | 4 | 33,300 | 31,000 | No | 29,300 | No |
| 6 | 4 | 33,300 | 8,200 | No | 7,800 | No |
| 7 | 4 | 33,300 | 22,700 | No | 21,500 | No |
| 8 | 2 | 16,500 | 8,500 | No | 8,000 | No |
| 9 | 2 | 16,500 | 5,200 | No | 4,900 | No |
| 10 | 2 | 16,500 | 8,500 | No | 8,000 | No |
| 11 | 2 | 16,500 | 6,400 | No | 6,100 | No |
| 12 | 2 | 16,500 | 2,300 | No | 2,200 | No |
| 13 | 2 | 16,500 | 4,100 | No | 3,900 | No |
| 14 | 2 | 16,500 | 4,800 | No | 4,500 | No |
| 15 | 2 | 16,500 | 2,400 | No | 2,300 | No |
| 16 | 2 | 16,500 | 2,000 | No | 1,900 | No |
| 17 | 2 | 16,500 | 2,900 | No | 2,700 | No |
| 18 | 2 | 16,500 | 1,000 | No | 1,000 | No |
| 19 | 2 | 16,500 | 2,700 | No | 2,600 | No |

[1]Both directions excluding center turn lanes or right-turn deceleration lanes.

[2]City of Elk Grove Transportation Analysis Guidelines, Adopted February 2019 and Updated December 2019 – Roadway performance targets based on 2/4 lane facilities with median and 35 mile per hour speed.

Source: Fehr & Peers, 2020

Attachment C summarizes peak hour traffic volume forecasts with the proposed project with buildout of the project, which were developed using the trip distribution assumptions from the DEIR. As outlined in

Table 2, the proposed project would generate about 1,090 more AM peak hour trips (i.e., compared to the DEIR), which is due to the shift from parks and open space and commercial land use to industrial land use. Most of this increase (i.e., 1,081 trips) in AM peak hour trip generation are inbound movements. As a result, we recommend the following turn lane configurations at the Waterman Road/Grant Line Road intersection with buildout of the proposed project:

Waterman Road/Grant Line Road Intersection (Proposed Project)

Widen Grant Line Road to provide eight through lanes and provide the following lane configurations:

- Three left-turn lanes, one through lane, and one right-turn lane on the northbound approach
- Two left-turn lanes, one through lane, and one right-turn lane on the southbound approach
- Two left-turn lanes, four through lanes, and two right-turn lanes on the eastbound approach
- **Two left-turn lanes**, four through lanes, and one right-turn lane on the westbound approach

As identified with the **bold and underlined text**, we recommend two left-turn lanes on the westbound approach to accommodate the increase in inbound volume during the AM peak hour.

Based on the analysis presented above, no other modifications to the on-site roadway segments or intersection traffic control are recommended.

**Off-Ramp Vehicle Queues**

Table 4 compares off-ramp vehicle queues to available storage at the SR 99/Grant Line Road interchange under cumulative conditions with build out of the proposed project. As shown, the calculated 95$^{th}$ percentile vehicle queues would not exceed available storage.

**Table 4: SR 99/Grant Line Road Off-Ramp Vehicle Queuing – Cumulative Conditions**

| Off-Ramp | Available Storage[1] (Feet) | 95$^{th}$ Percentile Vehicle Queue[2] (Feet) | Queue Exceed Available Storage? |
|---|---|---|---|
| NB | 1,500 | 775 | No |
| SB | 1,600 | 1,075 | No |

Source: Fehr & Peers, 2020

[1]Available storage measured from intersection stop bar to off-ramp gore point.
[2]Vehicle queues estimated using Synchro 8 software program.

FEHR PEERS

## Attachment A - Travel Characteristics

### DEIR

| Land Use | Acres | FAR | Square Feet | 1,000 Square Feet | Residential Density (Units/Acre) | Single Family Dwelling Units | Soccer Fields | Emp/Pop Yields[1] | Service Population | | | Trip Generation Rates[2] | | | Trip Generation | | | | | | | Daily | | VMT | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | Peak Hour | | | AM | | | PM | | | | | | |
| | | | | | | | | | Population | Employment | Total | Daily | AM | PM | Daily | In | Out | Total | In | Out | Total | Heavy Vehicles[3] | Cars & Light Trucks | VMT Per Service Population | Daily VMT[4] |
| Existing Right-of-Way (ROW) | 8.2 | | | | | | | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Heavy Industrial (HI) | 143.2 | 0.36 | 2,245,605 | 2,246 | | | | 20 | | 2,864 | 2,864 | 4.96 | 0.70 | 0.63 | 11,138 | 1,383 | 189 | 1,572 | 184 | 1,231 | 1,415 | 2,339 | 8,799 | 28.5 | 64,483 |
| Light Industrial (LI) | 74.4 | 0.36 | 1,166,711 | 1,167 | | | | 20 | | 1,488 | 1,488 | 4.96 | 0.70 | 0.63 | 5,787 | 719 | 98 | 817 | 96 | 639 | 735 | 1,215 | 4,572 | 23.5 | 27,625 |
| Mixed Mosher Use | 118.9 | | | | 6 | 713 | | 3.23 | 2,304 | | 2,304 | 9.44 | 0.74 | 0.99 | 6,734 | 132 | 396 | 528 | 445 | 261 | 706 | - | 6,734 | 12.3 | 28,343 |
| Parks and Open Space (P/OS) | 169 | | | | | | 16 | | - | - | - | 71.33 | 0.99 | 16.43 | 1,141 | 10 | 6 | 16 | 174 | 89 | 263 | - | 1,141 | - | 5,706 |
| Regional Commercial (RC) | 57.9 | 0.29 | 731,416 | 731 | | | | 30 | | 1,737 | 1,737 | 37.75 | 0.94 | 3.81 | 27,611 | 426 | 261 | 688 | 1,338 | 1,449 | 2,787 | - | 27,611 | 60.8 | 105,610 |
| **Total** | **571.6** | | **4,143,732** | **4,144** | | **713** | | | **2,304** | **6,089** | **8,393** | | | | **52,412** | **2,670** | **950** | **3,620** | **2,236** | **3,670** | **5,906** | **3,554** | **48,858** | **-** | **231,766** |

### Proposed Project

| Land Use | Acres | FAR | Square Feet | 1,000 Square Feet | Residential Density (Units/Acre) | Single Family Dwelling Units | Soccer Fields | Emp/Pop Yields[1] | Service Population | | | Trip Generation Rates | | | Trip Generation | | | | | | | | | VMT | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | Peak Hour | | | AM | | | PM | | | | | | |
| | | | | | | | | | Population | Employment | Total | Daily | AM | PM | Daily | In | Out | Total | In | Out | Total | Heavy Vehicles | Cars & Light Trucks | VMT Per Service Population | Daily VMT |
| Existing Right-of-Way (ROW) | 8.2 | | | | | | | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Heavy Industrial (HI) | 143.2 | 0.36 | 2,245,605 | 2,246 | | | | 20 | | 2,864 | 2,864 | 4.96 | 0.70 | 0.63 | 11,138 | 1,383 | 189 | 1,572 | 184 | 1,231 | 1,415 | 2,339 | 8,799 | 28.5 | 64,483 |
| Light Industrial (LI) | 216.2 | 0.36 | 3,390,362 | 3,390 | | | | 20 | | 4,324 | 4,324 | 4.96 | 0.70 | 0.63 | 16,816 | 2,088 | 285 | 2,373 | 278 | 1,858 | 2,136 | 3,531 | 13,285 | 23.5 | 80,275 |
| Mixed Mosher Use | 118.9 | | | | 6 | 713 | | 3.23 | 2,304 | | 2,304 | 9.44 | 0.74 | 0.99 | 6,734 | 132 | 396 | 528 | 445 | 261 | 706 | - | 6,734 | 12.3 | 28,343 |
| Parks and Open Space (P/OS) | 65.1 | | | | | | 0 | | - | - | - | 71.33 | 0.99 | 16.43 | - | - | - | - | - | - | - | - | - | - | |
| Regional Commercial (RC) | 20 | 0.29 | 252,648 | 253 | | | | 30 | | 600 | 600 | 37.75 | 0.94 | 3.81 | 9,537 | 147 | 90 | 237 | 462 | 501 | 963 | - | 9,537 | 60.8 | 36,480 |
| **Total** | **571.6** | | **5,888,615** | **5,889** | | **713** | | | **2,304** | **7,788** | **10,092** | | | | **44,226** | **3,751** | **960** | **4,711** | **1,369** | **3,851** | **5,220** | **5,870** | **38,356** | **-** | **209,581** |

[1] Emplyment yields per acre. Residential land use persons/household density based on General Plan Planning Framework Table 3.2.

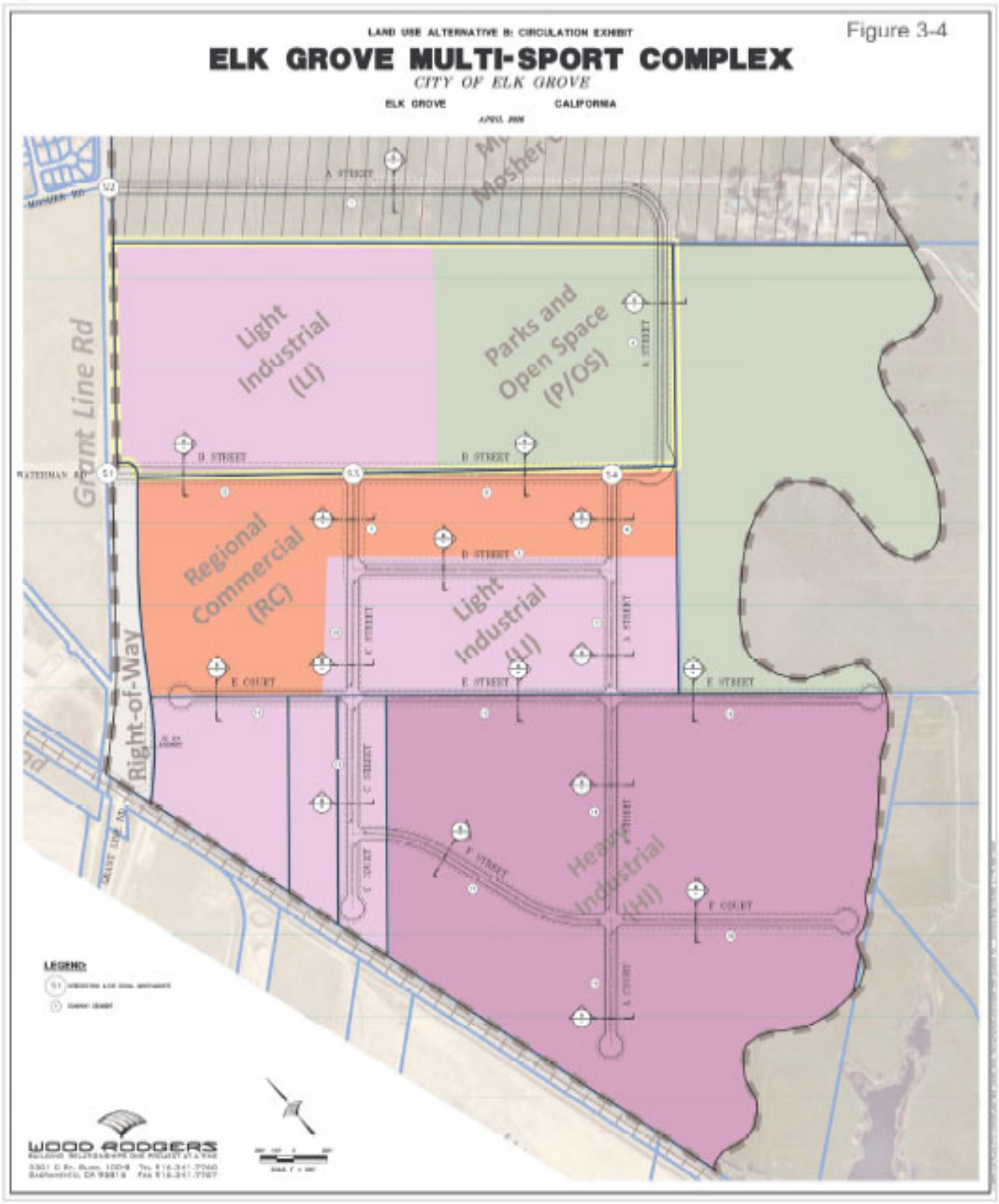
[2] Institute of Transportation Engineers (ITE) 10th Edition Trip Generation Manual. Following rates applied:
Heavy Industrial - Code 110 (General Light Industrial)
Light Industrial - Code 110 (General Light Industrial)
Mixed Mosher Use - Code 210 (Single Family Detached Housing)
Parks & Open Space (Soccer Fields) - Code 488 (Soccer Complex)
Regional Commercial - Code 820 (Shopping Center)

[3] Heavy vehicles percentage (21% of daily traffic) based on data collected at warehouse facility in Patterson, CA. Applied to industrial land uses.

[4] Trip length for sports fields estimated at 70% of average single family residential trip length, 5 miles.

Fehr & Peers, 2020

Figure 3-4


LAND USE ALTERNATIVE B: CIRCULATION EXHIBIT
ELK GROVE MULTI-SPORT COMPLEX
CITY OF ELK GROVE
ELK GROVE
CALIFORNIA
Grant Line Rd
Right-of-Way
Light Industrial (LI)
Parks and Open Space (P/OS)
Regional Commercial (RC)
Light Industrial (LI)
Heavy Industrial (HI)
A STREET
B STREET
C STREET
E COURT
E STREET
F STREET
LEGEND:
WOOD RODGERS

FEHR PEERS

## Attachment C - Peak Hour Traffic Volume Forecast With Proposed Project Buildout

### Waterman Road/Grant Line Road

| Approach | Movement | DEIR AM | DEIR PM | AM | PM | Total Volume Change AM In | AM Out | AM Total | PM In | PM Out | PM Total | Total External Volume Change AM In | AM Out | AM Total | PM In | PM Out | PM Total | Allocation to Intersection AM | PM | External Project Volume Proposed Project AM | Proposed Project PM | Change from DEIR AM | Change from DEIR PM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NB | L | 556 | 1,100 | 27% | 42% | | | | | | | | | | | | | | | 702 | 967 | 146 | -133 |
| | T | 150 | 322 | 7% | 12% | | | | | | | | | | | | | | | 189 | 283 | 39 | -39 |
| | R | 103 | 98 | 5% | 4% | | | | | | | | | | | | | | | 130 | 86 | 27 | -12 |
| WB | L | 175 | 113 | 9% | 4% | 1,081 | 10 | 1,091 | -867 | 181 | -686 | 845 | 8 | 853 | -661 | 138 | -523 | 62% | 60% | 221 | 99 | 46 | -14 |
| SB | T | 198 | 172 | 10% | 7% | | | | | | | | | | | | | | | 250 | 151 | 52 | -21 |
| EB | R | 842 | 787 | 42% | 30% | | | | | | | | | | | | | | | 1,063 | 692 | 221 | -95 |
| | | **2,024** | **2,592** | **100%** | **100%** | | | | | | | | | | | | | | | **2,555** | **2,278** | **531** | **-314** |

### Waterman Road/Mosher Road

| Approach | Movement | DEIR AM | DEIR PM | AM | PM | Total Volume Change AM In | AM Out | AM Total | PM In | PM Out | PM Total | Total External Volume Change AM In | AM Out | AM Total | PM In | PM Out | PM Total | Allocation to Intersection AM | PM | External Project Volume Proposed Project AM | Proposed Project PM | Change from DEIR AM | Change from DEIR PM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NB | L | 150 | 225 | 12% | 13% | | | | | | | | | | | | | | | 189 | 198 | 39 | -27 |
| | T | 110 | 270 | 9% | 16% | | | | | | | | | | | | | | | 139 | 237 | 29 | -33 |
| | R | 140 | 490 | 11% | 28% | | | | | | | | | | | | | | | 177 | 431 | 37 | -59 |
| WB | L | 367 | 290 | 30% | 17% | 1,081 | 10 | 1,091 | -867 | 181 | -686 | 845 | 8 | 853 | -661 | 138 | -523 | 38% | 40% | 463 | 255 | 96 | -35 |
| SB | T | 290 | 280 | 24% | 16% | | | | | | | | | | | | | | | 366 | 246 | 76 | -34 |
| EB | R | 170 | 170 | 14% | 10% | | | | | | | | | | | | | | | 215 | 149 | 45 | -21 |
| | | **1,227** | **1,725** | **100%** | **100%** | | | | | | | | | | | | | | | **1,549** | **1,516** | **322** | **-209** |

Kimley»Horn

# Memorandum

**To:** Ryan Chapman, P.E.

**From:** Matt Weir, P.E., T.E., PTOE
Stephen M. Dillon, E.I.T.

**Re:** Traffic Assessment
*NSIXD – Elk Grove, CA*

**Date:** July 21, 2021

Per request, we have prepared this traffic assessment for the above referenced project located just north of the State Highway 99 (CA-99) interchange with Grant Line Road in Elk Grove, California, proximate to the Waterman Road intersection.

## Key Findings

The proposed project represents a land use consistent with the City of Elk Grove's intended development pattern for the East Study Area. After multiple rounds of revision and coordination with the City, the proposed Site Plan is judged to impact near-future and built out traffic operations within the East Study Area to an extent that requires deviations from infrastructure proposed within the City's General Plan. The Site Plan provides appropriate queue storage on-site to accommodate peak-hour employee operations. Realignment of Street C closer to the Grant Line Road/Waterman Road intersection is anticipated to require a Street A, Street E, and the associated Street A/E intersection redesign from the City's General Plan in order to accommodate future built-out traffic operations within the East Study Area. No additional traffic mitigations are anticipated to be required beyond what is presented in the City's General Plan.

## Project Overview

The project site is located near the intersection of CA-99 and Grant Line Road in the City of Elk Grove's East Study Area. The proposed warehouse project totals 629,186-square feet (sf) along with 1,009 automobile parking stalls and 833 total trailer locations. The facility will be served by a planned extension of Waterman Road beyond its existing intersection with Grant Line Road. A comprehensive transportation impact analysis[1] was previously completed for the part of the East Study Area containing the project site. An adjacent site across the planned Waterman Road extension will be developed for a Kubota distribution facility. Both the proposed project and Kubota development will generate AM/PM peak-hour volumes associated with employee shift changes and product deliveries. The proposed Site Plan orientation requires shifting the future Street C/Waterman Road intersection closer to Grant Line Road. The Street C/Waterman Road intersection was planned to be full-access signalized, but is now being treated as right-in, right-out only. This traffic assessment examines operations along Waterman Road, Street E, and Street A, in addition to potential impacts to project's on-site operations resulting from anticipated traffic conditions.

## Trip Generation and Distribution

Proposed trips generated by the warehouse were provided by the client. Trips anticipated to be generated by the adjacent Kubota facility were gathered via a coordination meeting held on May 7, 2021. The Kubota facility will staff approximately 150 employees across multiple shifts throughout the day. The Kubota site will not receive routine overnight truck deliveries, with 100 truck trips anticipated between 6 AM and 6 PM. Trips generated by the Kubota site are not anticipated to interfere with project site

[1] *Elk Grove Sphere of Influence Amendment and Multi-Sport Park Complex Draft TIA*, Fehr & Peers, March, 2017.

operations or general operations along Waterman Road due to the Kubota driveway locations (see **Exhibit 1**). As such, their volumes are not included in the Study Intersection analysis. The trip generation assumed for project is summarized in **Table 1**.

**Table 1** – Project Trip Generation

| Code (NSIXD) | Size (KSF) | Daily Trips | AM Peak-Hour | | | | | PM Peak-Hour | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Total Trips | In | | Out | | Total Trips | In | | Out | |
| | | | | % | Trips | % | Trips | | % | Trips | % | Trips |
| Site Peak | 629.186 | 4,910 | 734 | 85% | 620 | 15% | 114 | 1,007 | 38% | 379 | 62% | 628 |
| Commuter Peak | | | 106 | 68% | 72 | 32% | 34 | 151 | 38% | 56 | 62% | 95 |
| *Source: Provided by Client* | | | | | | | | | | | | |

Trips generated from the project were assigned across the Study Intersections using knowledge of site access points and operations obtained using proposed plans. Information provided by the project client shows AM/PM Site Peak-Hours at 5 AM and 2 PM respectively with 439 staff on-site for each shift. The project warehouse anticipates 233 truck trips over the day, with most arriving between the AM/PM commuter peak periods and during the overnight hours.

Per the Site Plan, the project truck access driveway will be located on Waterman Road across from the Kubota truck access driveway as a signalized intersection. Employee access to the Kubota site across from Street C will be left-in, right-out. The project truck access driveway on Waterman Road will be ingress only. To ease operations for through traffic along Waterman Road, a right turn pocket may be necessary leading into the truck access driveway. Trucks will leave the site onto E Street, which is projected to experience lower traffic volumes than Waterman Road. Trucks will get to Grant Line Road via A Street and Waterman Road, as access to Grant Line Road via Street C will not be possible.

The proposed Site Plan provides three potential access points for associates (one full-access on Waterman Road, two full-access on Street A) with Driveway 1 anticipated receive the majority of both inbound and outbound trips. All intersections are to be side-street stop controlled (SSSC). Providing multiple access points on Street A will serve to ease traffic conflicts directly along Waterman Road and ensure that adequate on-site queue storage is provided. **Table 2** presents the Minimum Required Throat Depth for the project driveways based on analysis queuing results.

**Table 2** – MRTD for Site Access Driveways

| Intersection | | Minimum Required Throat Depth (MRTD) | Available Storage |
|---|---|---|---|
| 1 | Driveway 1 @ Waterman Road | 160 | 180 |
| 3 | Driveway 2 @ Street A | 50 | 180 |
| 4 | Driveway 3 @ Street A | 50 | 180 |
| 6 | Driveway 4 @ Street E | 75 | 180 |

-MRTD per queuing results from analysis

In order to provide a conservative assessment of the project's proposed impacts, traffic ADT segment volumes generated by Fehr & Peers and provided by the City (Appendix A) were used to approximate peak-hour background traffic volumes along Waterman Road, Street A, and Street E. These same traffic ADT segment volumes were used to develop Trip Distribution and Assignment for volumes being diverted from Street C onto Street E and Street A. Higher levels of conflict were expected to occur at the Study Intersections during the background PM peak-hour due to the higher numbers of left-turn movements required to exit the East Study Area. The project's AM/PM peak-hour associate and truck volumes were modeled as occurring simultaneously on top of the background PM peak-hour volumes to create one combined "peak-hour" for the analysis scenarios and provide a conservative study of the potential project impacts and mitigations required.

## Impacts and Mitigations

The proposed Site Plan results in Street C shifting closer to the Grant Line Road/Waterman Road signalized intersection than initially proposed in the City's General Plan. As a result of this geometric shift, the Street C/Waterman Road intersection is no longer able to be signalized due to its revised proximity to Grant Line/Waterman. The revised Street C/Waterman Road intersection will operate as a Right-In, Right-Out (RIRO) access point. Traffic previously destined to leave the East Study Area via the Street C intersection will be anticipated to egress primarily by taking Street E to Street A to Waterman Road to Grant Line Road. The ultimate proposed configuration of the East Study Area reflecting revised locations of Street C and Street A is presented in Exhibit 3.

The revised Trip Distribution results in deviations from the Street A and Street E geometrics provided in the City's General Plan. Both Street A and Street E will increase from two lanes to four lanes and the Street A/E intersection will be signalized as opposed to side-street stop controlled (SSSC). Table 3 presents the ultimate findings for Study Intersection delays. Exhibit 4 presents the ultimate proposed lane configurations. All Study Intersections in the mitigated scenario satisfy the Intersection Performance Targets as outlined in Table 6-3 of the City's Traffic Congestion Management Plan[2].

Table 3 – Intersection Delay

| ID | Intersection | Control | Study | Intersection Performance Targets |
|---|---|---|---|---|
| | | | Delay (s) | Delay (s) |
| 1 | Driveway 1 @ Waterman Road | SSSC* | 12.4 (NBL) | 35.1 |
| 2 | Waterman Road @ Street A | Signal | 15.1 | 55.1 |
| 3 | Driveway 2 @ Street A | SSSC* | 6.8 (EBL) | 35.1 |
| 4 | Driveway 3 @ Street A | SSSC* | 6.1 (EBL) | 35.1 |
| 5 | Street A @ Street E | Signal | 24.9 | 55.1 |
| 6 | Driveway 4 @ Street E | SSSC* | 4.5 (SBL) | 35.1 |

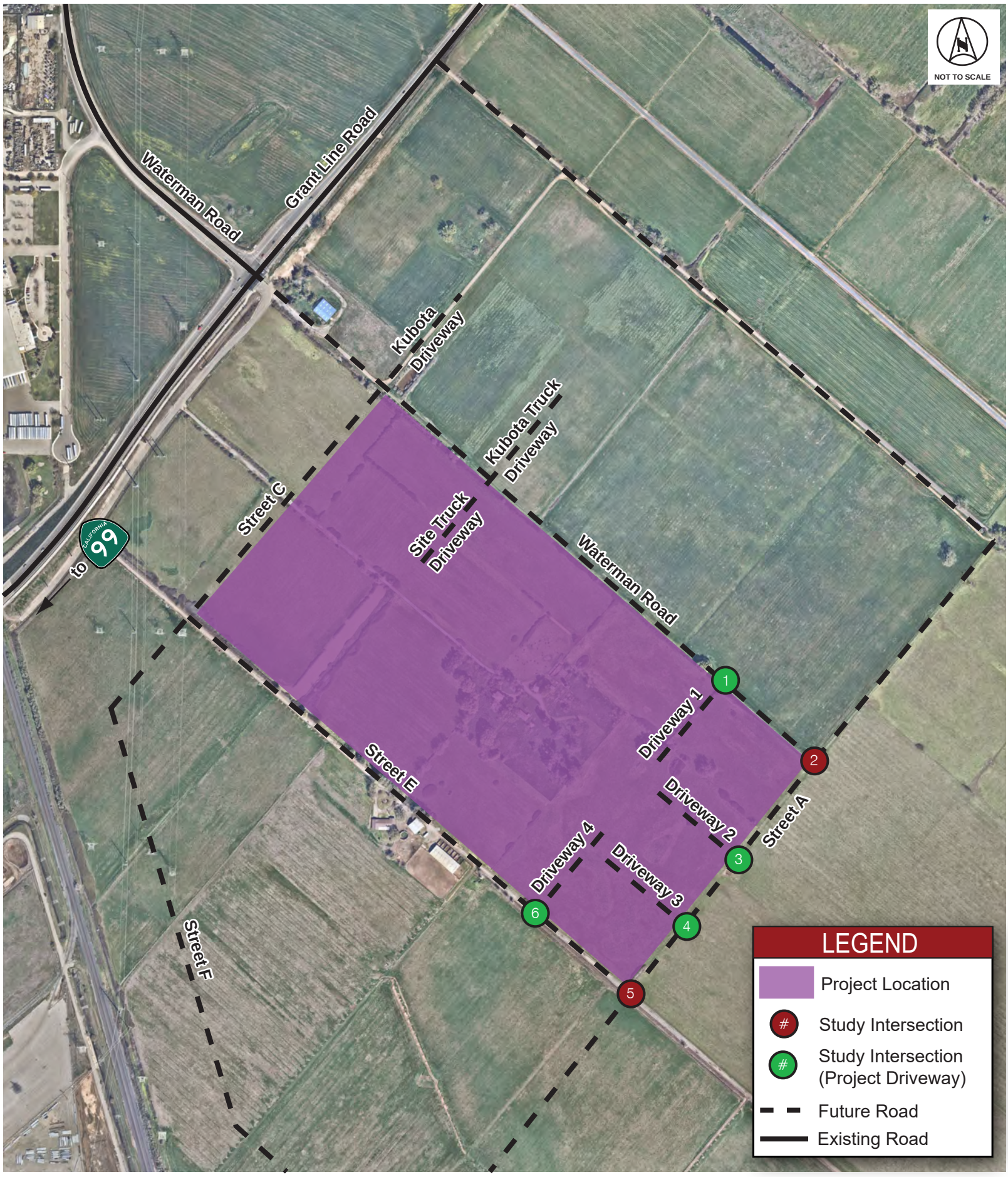
*Side Street Stop Controlled (SSSC) intersections are reported as the worst approach's delay.
-Intersection Performance Targets for Delay per Elk Grove Traffic Congestion Management Plan.

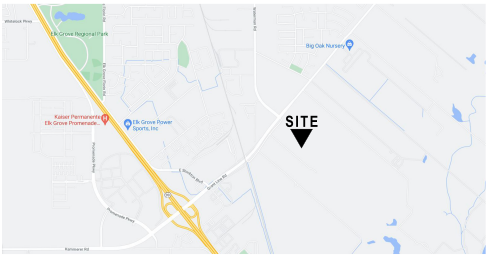
[2] *Traffic Congestion Management Plan*, City of Elk Grove, 2019

Attachments:

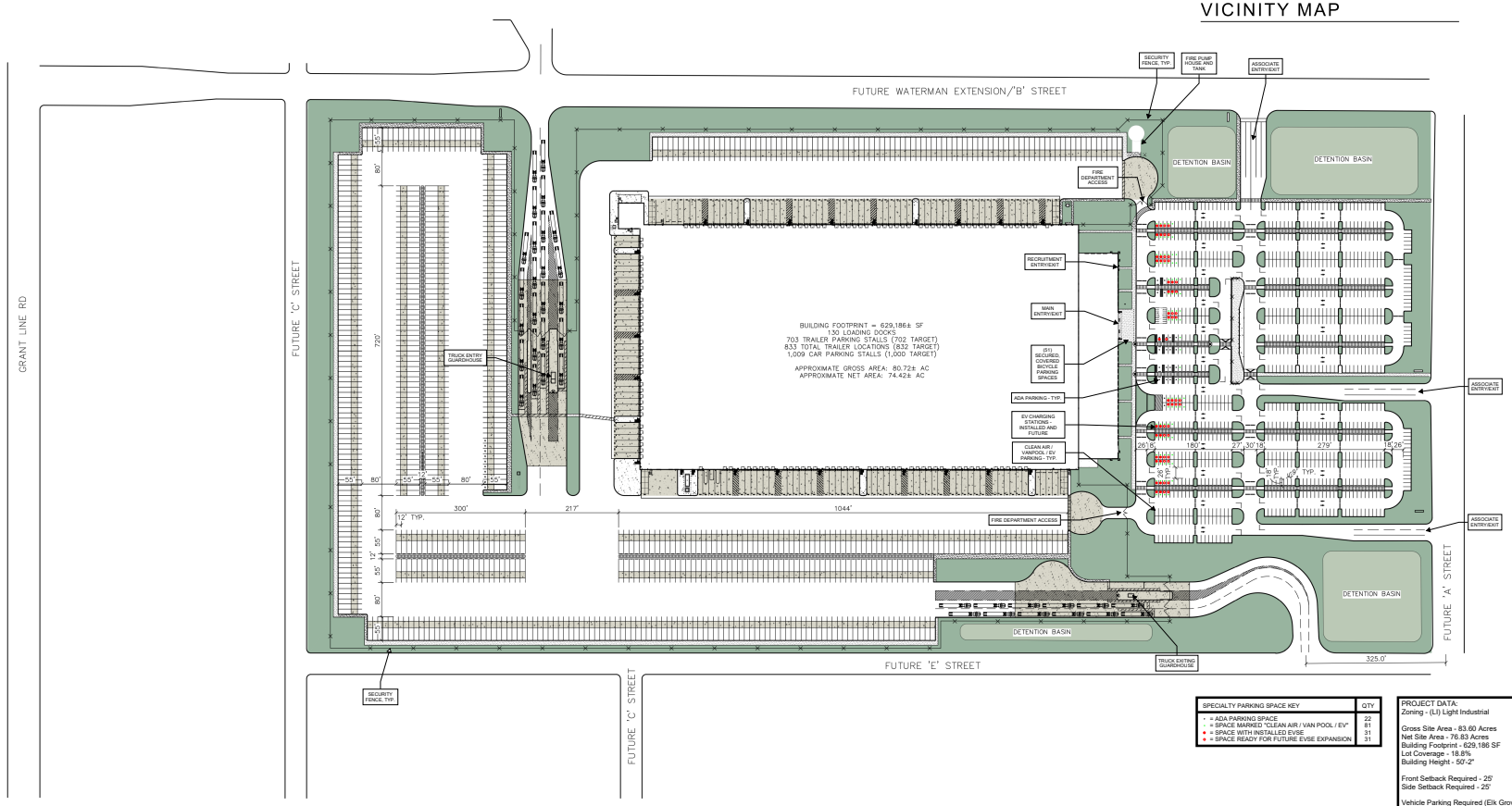
**Exhibit 1** – Project Location Map
**Exhibit 2** – Preliminary Site Plan
**Exhibit 3** – Post-project Road Configuration
**Exhibit 4** – Study Intersections, Traffic Control, and Proposed Lane Geometries
**Exhibit 5** – Study Volumes

**Appendix A** – Background Peak-hour Traffic Volume ADT
**Appendix B** – Analysis Worksheets


NOT TO SCALE
Waterman Road
Grant Line Road
Kubota Driveway
Kubota Truck Driveway
Street C
Site Truck Driveway
Waterman Road
to 99
Driveway 1
Street E
Driveway 2
Street A
Driveway 4
Driveway 3
Street F
1
2
3
4
5
6
LEGEND
Project Location
# Study Intersection
# Study Intersection (Project Driveway)
Future Road
Existing Road




VICINITY MAP




| SPECIALTY PARKING SPACE KEY | QTY. |
|---|---|
| = ADA PARKING SPACE | 22 |
| = SPACE MARKED "CLEAN AIR / VAN POOL / EV" | 81 |
| = SPACE WITH INSTALLED EVSE | 31 |
| = SPACE READY FOR FUTURE EVSE EXPANSION | 31 |

PROJECT DATA:
Zoning - (LI) Light Industrial

Gross Site Area - 83.60 Acres
Net Site Area - 76.83 Acres
Building Footprint - 629,186 SF
Lot Coverage - 18.8%
Building Height - 50'-2"

Front Setback Required - 25'
Side Setback Required - 25'

Vehicle Parking Required (Elk Grove) - 1/2,000 SF = 315 spaces
Vehicle Parking Provided - 1,009 spaces
Bicycle Parking Required (CALGreen) - .05 x 1,009 = 51
Bicycle Parking Provided - 51 spaces
CLEAN AIR / VAN POOL / EV Required (CALGreen) - .08 x 1,009 = 81 spaces
CLEAN AIR / VAN POOL / EV Provided - 81 spaces
EVSE Installed Required (Elk Grove) - .03 x 1,009 = 31 spaces
EVSE Installed Provided - 31 spaces
EVSE Future Ready Required (Elk Grove) - .03 x 1,009 = 31 spaces
EVSE Future Ready Provided - 31 spaces

N

**SITE PLAN**
SCALE: 1" = 100'-0"
0 25 50 100 200
07-20-2021

**PROJECT WATERMAN**
ELK GROVE, CA

OWNER
Panattoni Development Company, Inc.
8775 Folsom Blvd., Suite 200
Sacramento, CA 95826
ph: 916.379.1106
Contact: Steve Beauchamp

ARCHITECT
DLR Group
6225 North 24th Street, Suite 250
Phoenix, AZ 85016
ph: 602.381.8580
Contact: Ben Foth

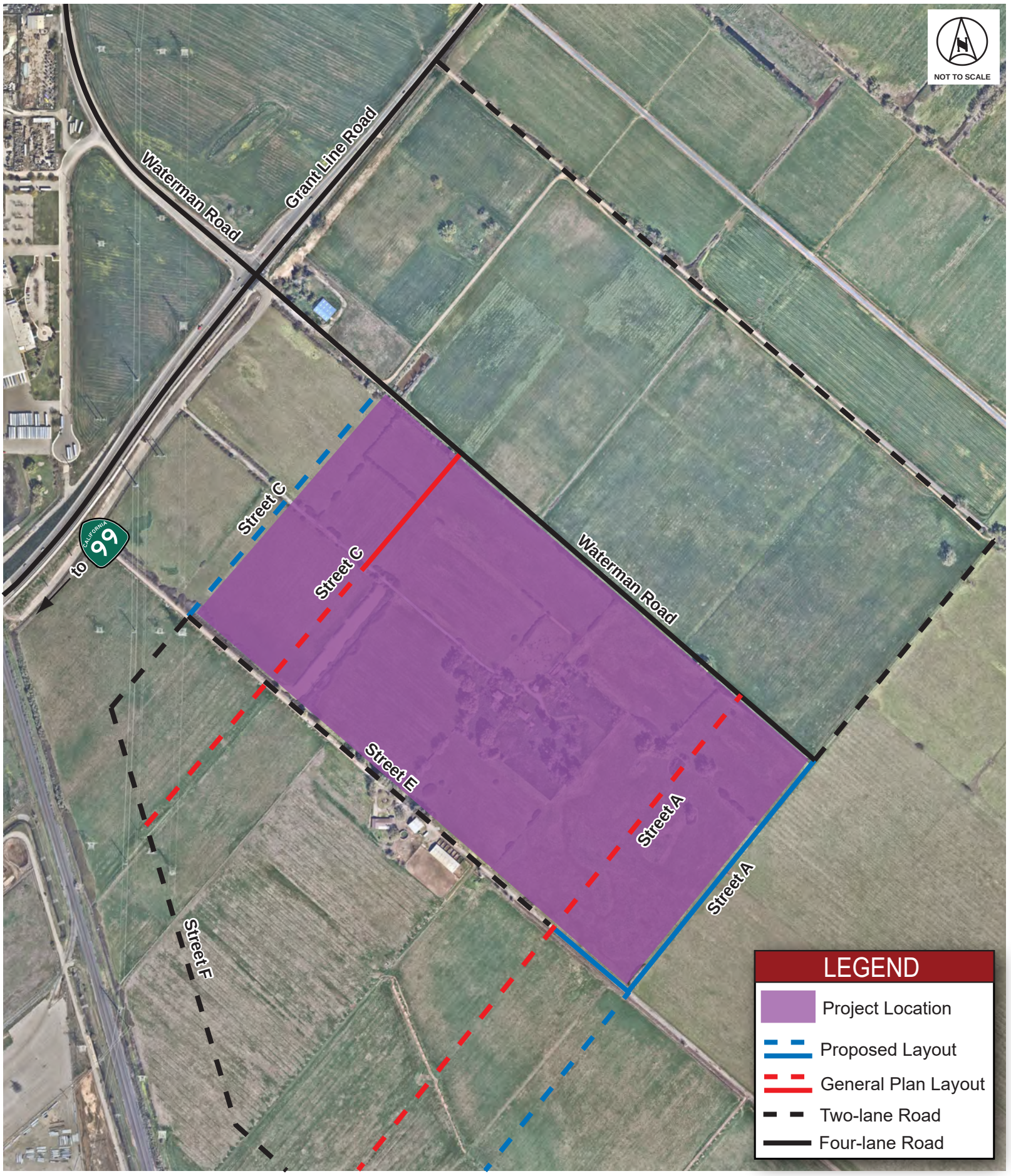
**NOT FOR CONSTRUCTION**

PANATTONI®

DLR Group
© DLR Group

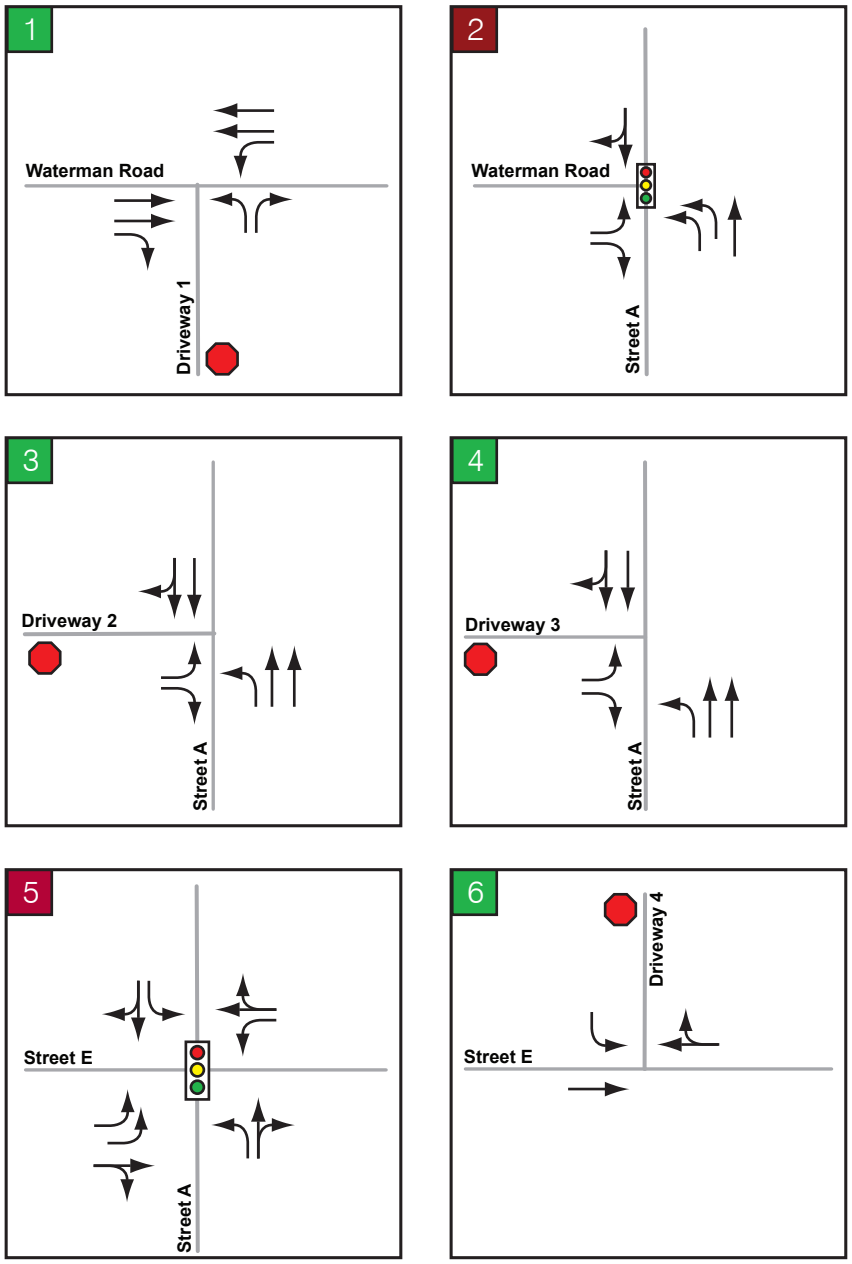
Kimley»Horn

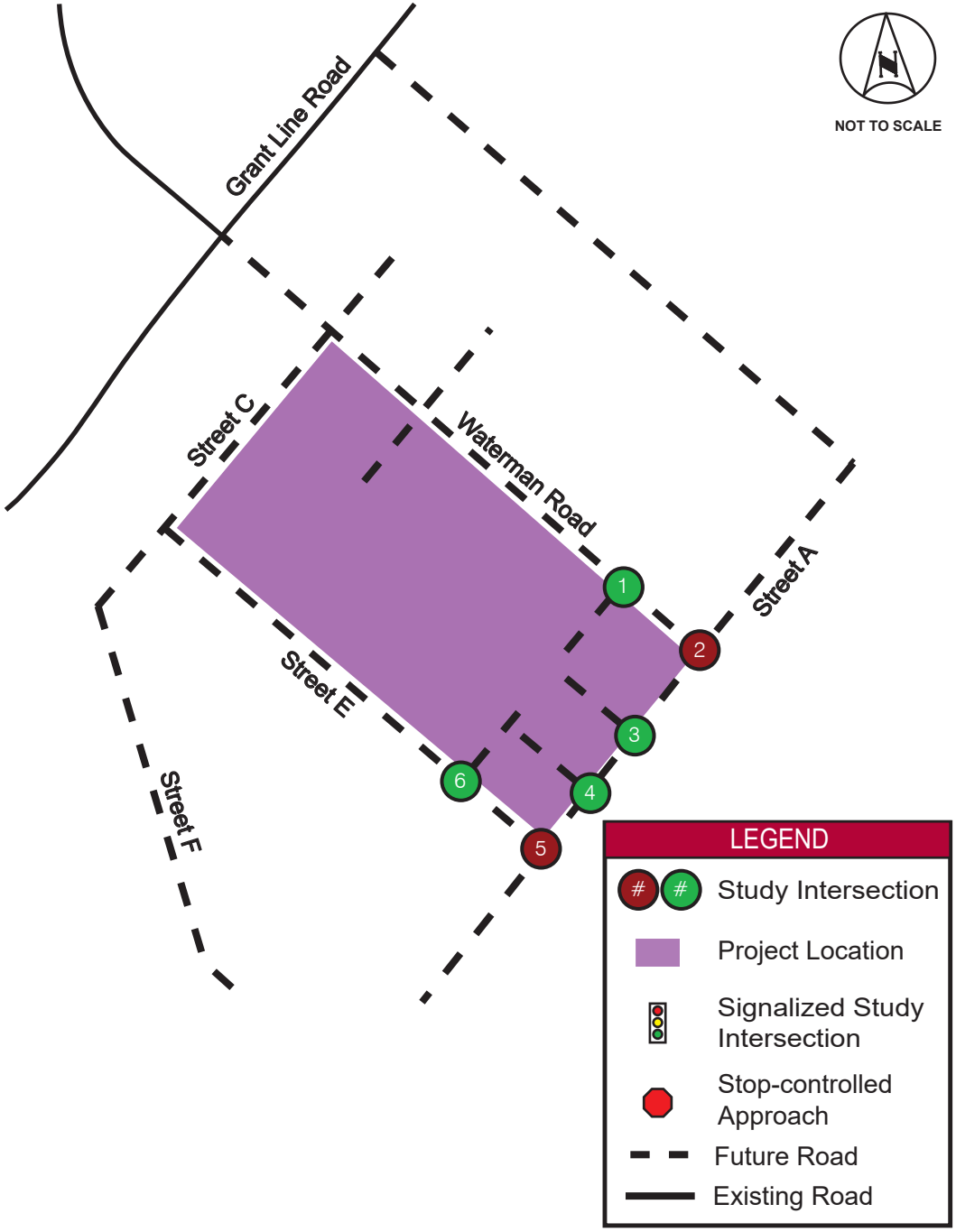
*Exhibit 2*
*Site Plan*




Kimley»Horn

*Exhibit 3*
*Post-project Road Configuration*



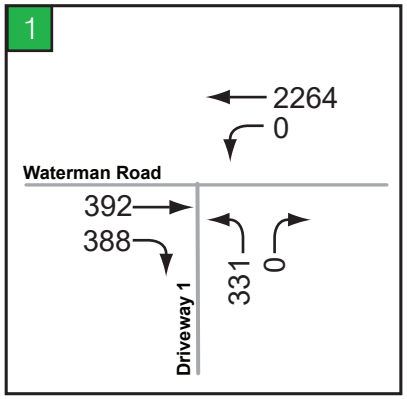



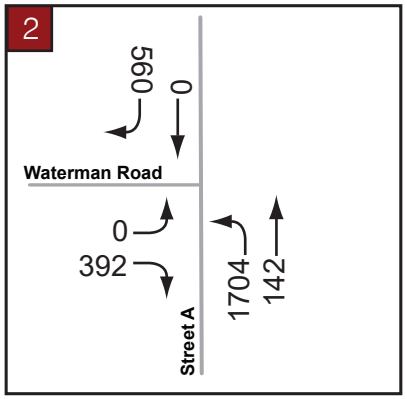

Kimley»Horn

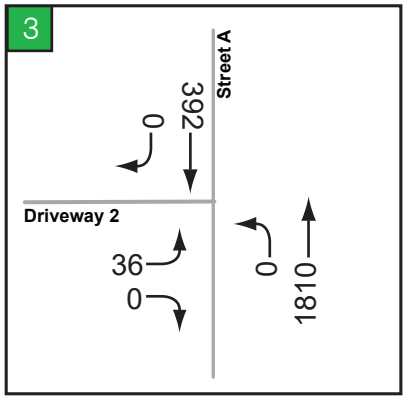
*Exhibit 4*

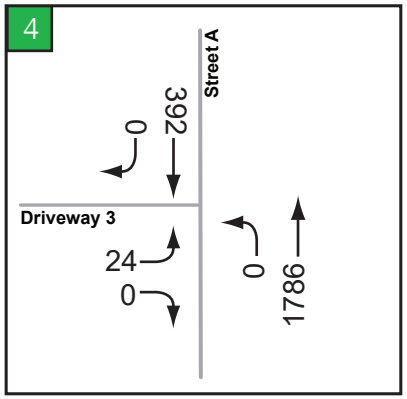
*Study Intersections, Traffic Control, and Lane Geometries*

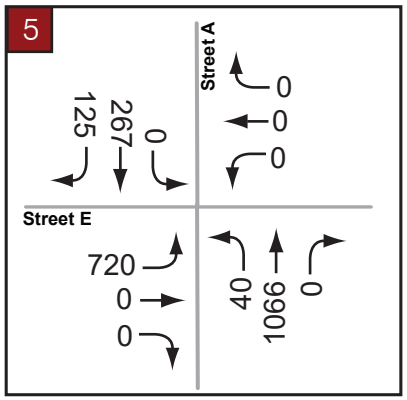
## Background Trips plus Project Volumes

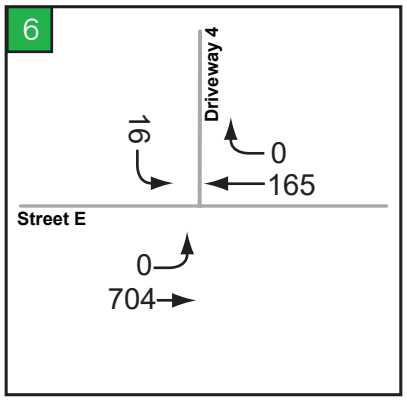


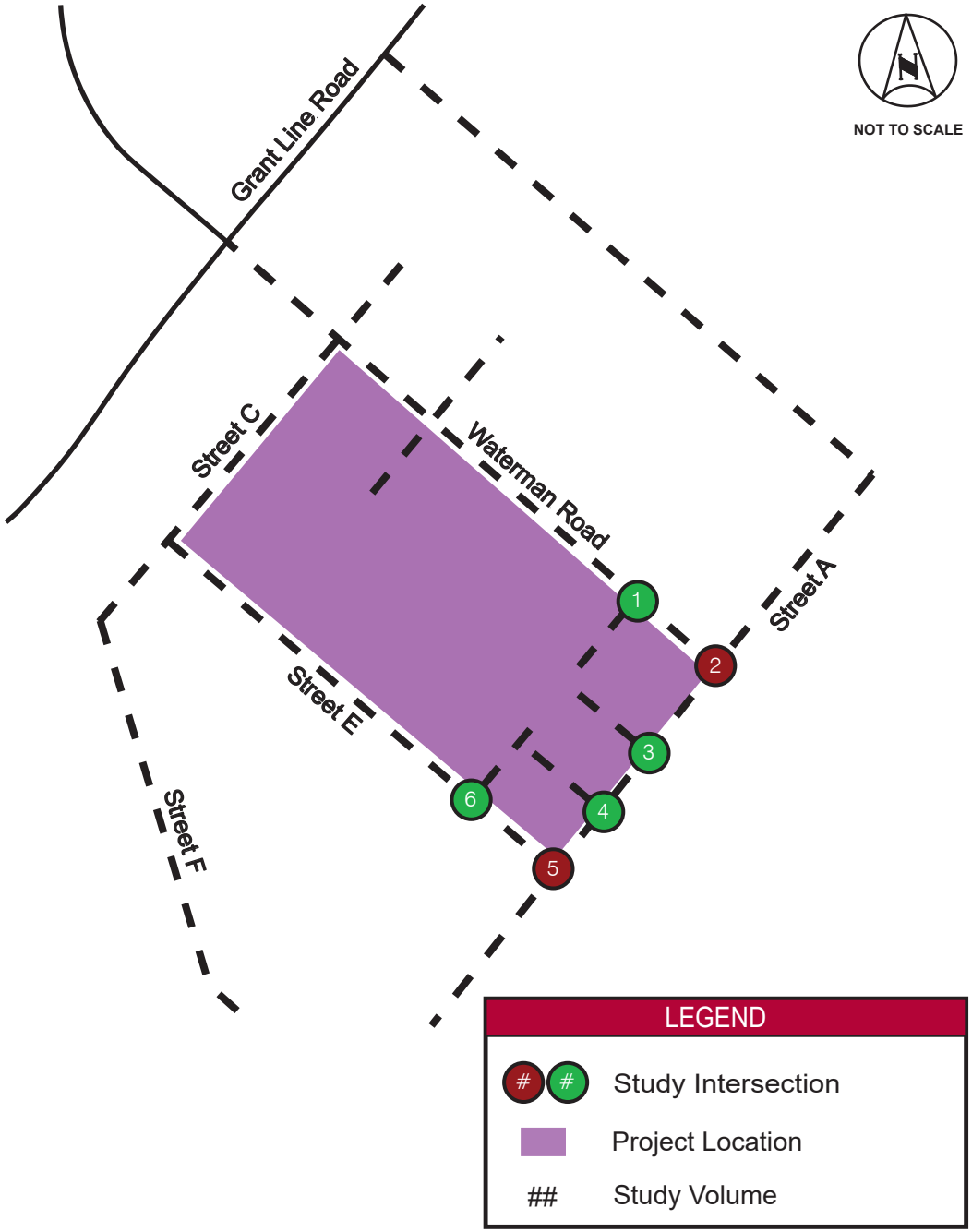



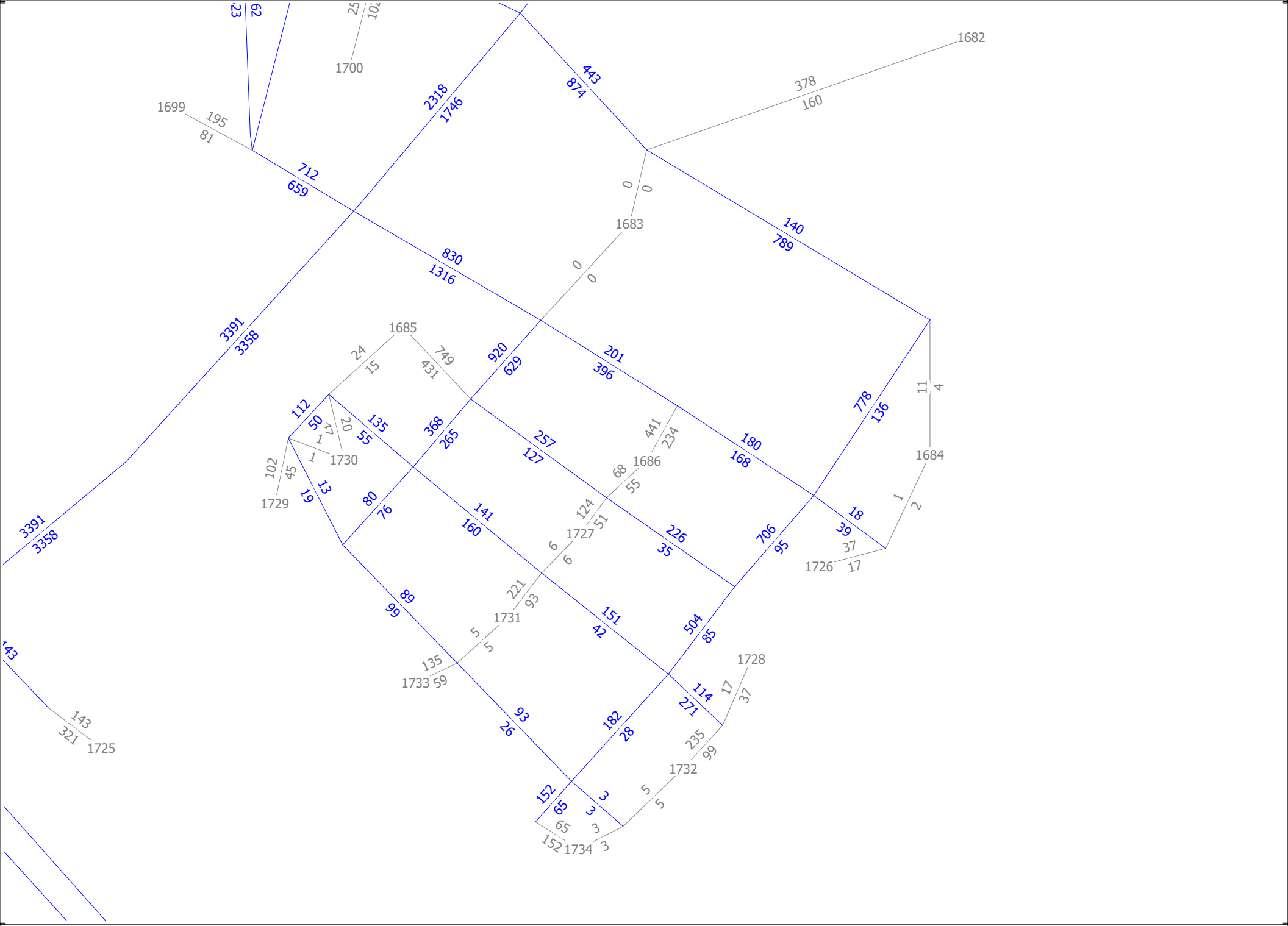




Kimley»Horn

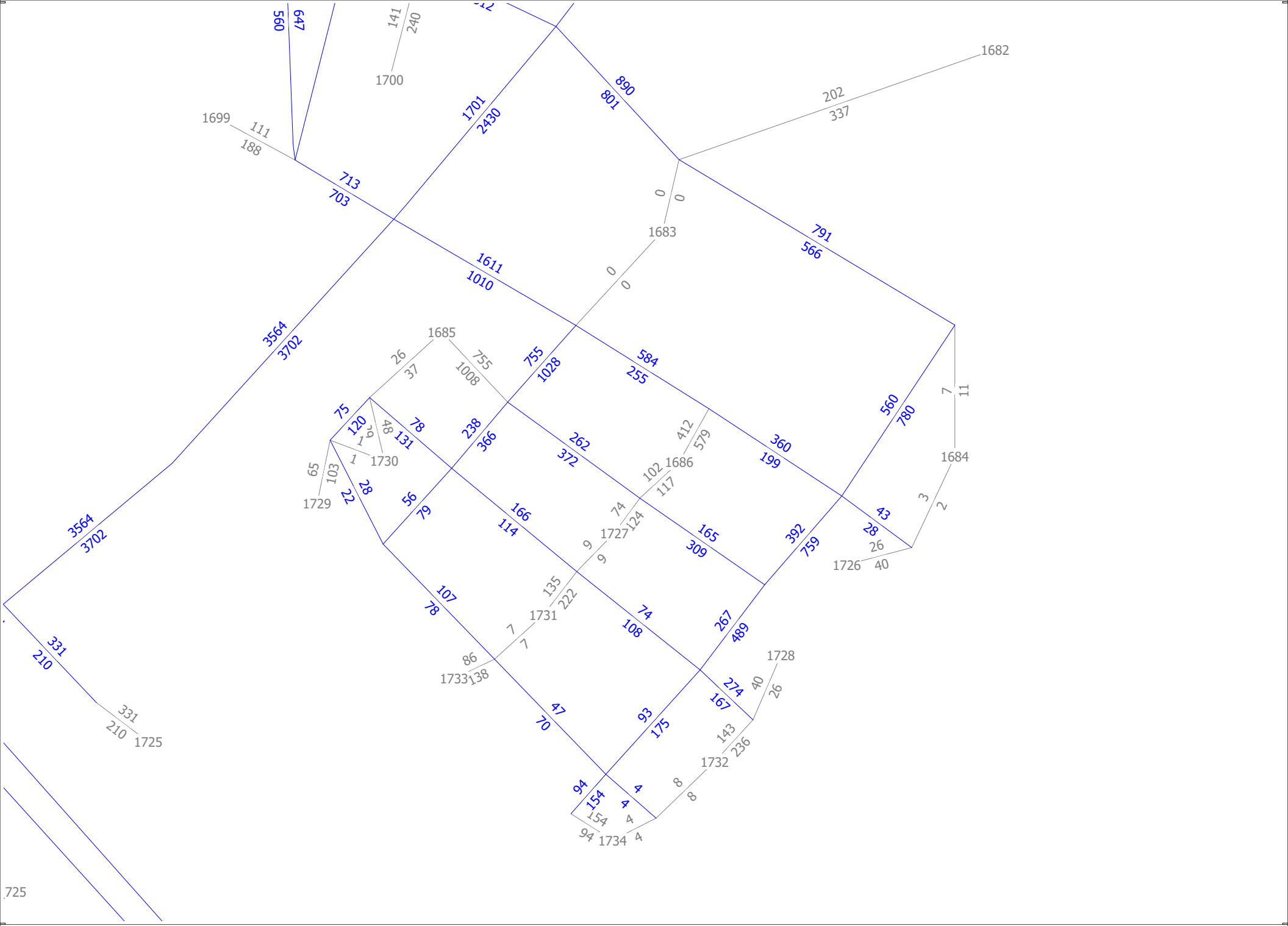
*Exhibit 5*
*Study Volumes*

# Appendix A

Background Peak-hour Traffic Volume ADT



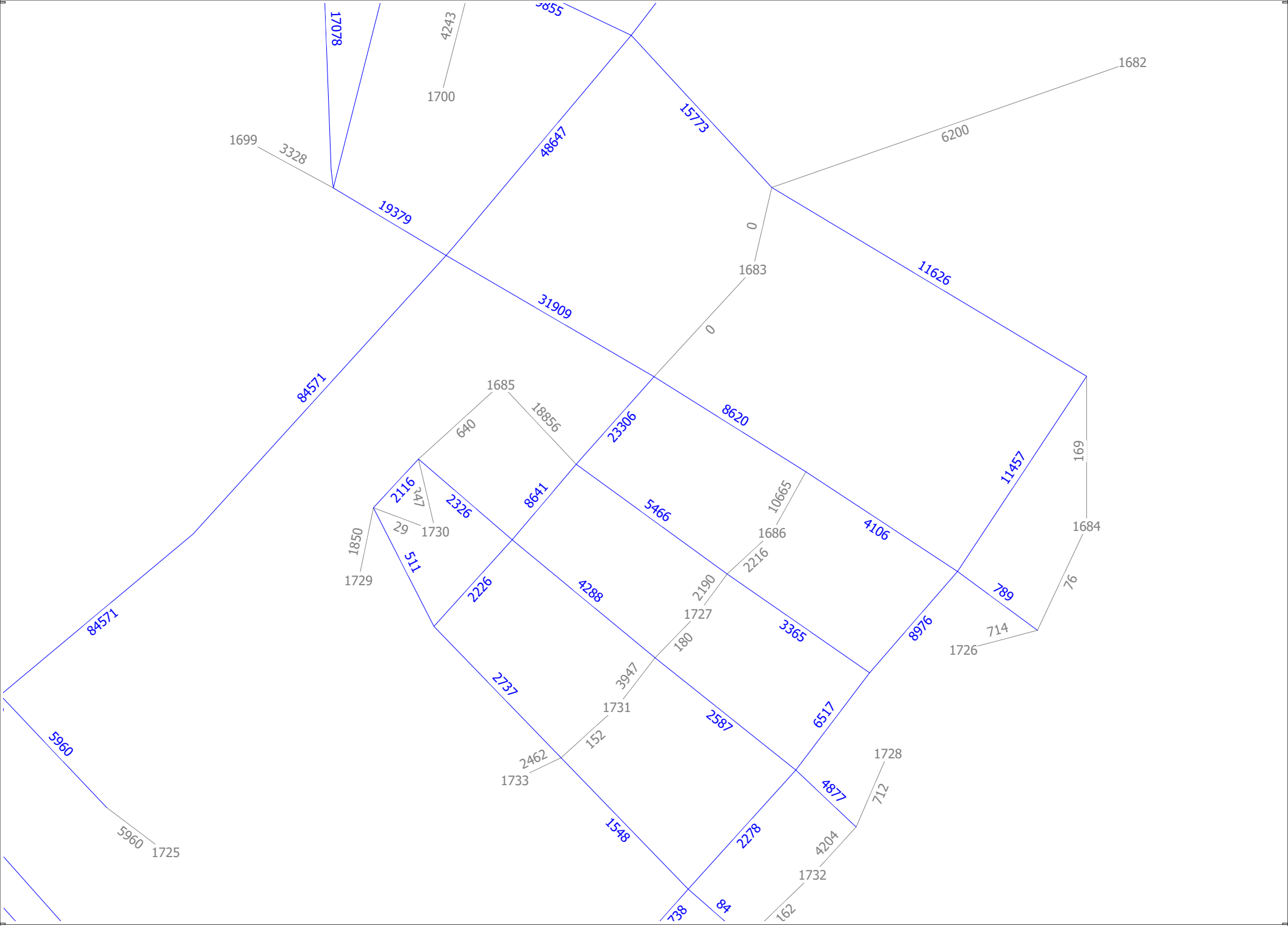

# AM Peak Hour Traffic Volume Forecasts




# PM Peak Hour Traffic Volume Forecasts

cube

(Licensed to Fehr Peers)




# Daily Traffic Volume Forecasts (Two-way Total)

# Appendix B
Analysis Worksheets

## Summary of All Intervals

| Run Number | 1 | 10 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|
| Start Time | 1:50 | 1:50 | 1:50 | 1:50 | 1:50 | 1:50 | 1:50 |
| End Time | 3:00 | 3:00 | 3:00 | 3:00 | 3:00 | 3:00 | 3:00 |
| Total Time (min) | 70 | 70 | 70 | 70 | 70 | 70 | 70 |
| Time Recorded (min) | 60 | 60 | 60 | 60 | 60 | 60 | 60 |
| # of Intervals | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| # of Recorded Intervals | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| Vehs Entered | 3576 | 3566 | 3677 | 3555 | 3536 | 3632 | 3617 |
| Vehs Exited | 3573 | 3560 | 3669 | 3539 | 3553 | 3620 | 3613 |
| Starting Vehs | 109 | 121 | 118 | 92 | 134 | 107 | 108 |
| Ending Vehs | 112 | 127 | 126 | 108 | 117 | 119 | 112 |
| Travel Distance (mi) | 2113 | 2112 | 2174 | 2082 | 2091 | 2131 | 2125 |
| Travel Time (hr) | 115.8 | 119.2 | 134.4 | 113.8 | 115.2 | 120.9 | 118.4 |
| Total Delay (hr) | 39.5 | 42.8 | 56.0 | 38.5 | 39.5 | 44.2 | 41.4 |
| Total Stops | 3786 | 4160 | 5567 | 3662 | 3774 | 4332 | 4090 |
| Fuel Used (gal) | 85.0 | 86.0 | 91.1 | 83.7 | 84.2 | 87.7 | 86.5 |

## Summary of All Intervals

| Run Number | 7 | 8 | 9 | Avg |
|---|---|---|---|---|
| Start Time | 1:50 | 1:50 | 1:50 | 1:50 |
| End Time | 3:00 | 3:00 | 3:00 | 3:00 |
| Total Time (min) | 70 | 70 | 70 | 70 |
| Time Recorded (min) | 60 | 60 | 60 | 60 |
| # of Intervals | 5 | 5 | 5 | 5 |
| # of Recorded Intervals | 4 | 4 | 4 | 4 |
| Vehs Entered | 3594 | 3543 | 3526 | 3581 |
| Vehs Exited | 3575 | 3535 | 3531 | 3576 |
| Starting Vehs | 110 | 112 | 115 | 110 |
| Ending Vehs | 129 | 120 | 110 | 115 |
| Travel Distance (mi) | 2127 | 2098 | 2117 | 2117 |
| Travel Time (hr) | 124.7 | 115.4 | 130.4 | 120.8 |
| Total Delay (hr) | 47.9 | 39.5 | 54.2 | 44.4 |
| Total Stops | 4542 | 3876 | 5582 | 4338 |
| Fuel Used (gal) | 87.6 | 85.1 | 88.1 | 86.5 |

## Interval #0 Information Seeding

| | |
|---|---|
| Start Time | 1:50 |
| End Time | 2:00 |
| Total Time (min) | 10 |

Volumes adjusted by Growth Factors.

No data recorded this interval.

## Interval #1 Information

| | |
|---|---|
| Start Time | 2:00 |
| End Time | 2:15 |
| Total Time (min) | 15 |

Volumes adjusted by Growth Factors.

| Run Number | 1 | 10 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|
| Vehs Entered | 890 | 877 | 937 | 886 | 846 | 956 | 913 |
| Vehs Exited | 887 | 874 | 908 | 860 | 866 | 936 | 899 |
| Starting Vehs | 109 | 121 | 118 | 92 | 134 | 107 | 108 |
| Ending Vehs | 112 | 124 | 147 | 118 | 114 | 127 | 122 |
| Travel Distance (mi) | 527 | 531 | 543 | 507 | 519 | 548 | 532 |
| Travel Time (hr) | 28.7 | 31.6 | 34.8 | 27.1 | 29.3 | 32.7 | 28.7 |
| Total Delay (hr) | 9.6 | 12.4 | 15.3 | 8.8 | 10.5 | 12.9 | 9.5 |
| Total Stops | 922 | 1349 | 1325 | 784 | 1101 | 1257 | 886 |
| Fuel Used (gal) | 21.2 | 21.7 | 22.9 | 20.4 | 20.9 | 23.0 | 21.5 |

## Interval #1 Information

| | |
|---|---|
| Start Time | 2:00 |
| End Time | 2:15 |
| Total Time (min) | 15 |

Volumes adjusted by Growth Factors.

| Run Number | 7 | 8 | 9 | Avg |
|---|---|---|---|---|
| Vehs Entered | 875 | 880 | 900 | 895 |
| Vehs Exited | 873 | 876 | 874 | 884 |
| Starting Vehs | 110 | 112 | 115 | 110 |
| Ending Vehs | 112 | 116 | 141 | 124 |
| Travel Distance (mi) | 511 | 524 | 522 | 527 |
| Travel Time (hr) | 27.6 | 27.8 | 32.9 | 30.1 |
| Total Delay (hr) | 9.1 | 8.8 | 14.1 | 11.1 |
| Total Stops | 846 | 839 | 1292 | 1059 |
| Fuel Used (gal) | 20.5 | 21.0 | 22.0 | 21.5 |

## Interval #2 Information

| | |
|---|---|
| Start Time | 2:15 |
| End Time | 2:30 |
| Total Time (min) | 15 |

Volumes adjusted by Growth Factors.

| Run Number | 1 | 10 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|
| Vehs Entered | 856 | 926 | 909 | 918 | 869 | 845 | 885 |
| Vehs Exited | 854 | 909 | 932 | 930 | 887 | 869 | 893 |
| Starting Vehs | 112 | 124 | 147 | 118 | 114 | 127 | 122 |
| Ending Vehs | 114 | 141 | 124 | 106 | 96 | 103 | 114 |
| Travel Distance (mi) | 504 | 536 | 551 | 538 | 512 | 514 | 526 |
| Travel Time (hr) | 25.9 | 31.4 | 35.3 | 28.7 | 26.9 | 28.2 | 28.0 |
| Total Delay (hr) | 7.6 | 11.9 | 15.5 | 9.3 | 8.4 | 9.7 | 8.9 |
| Total Stops | 770 | 1052 | 1714 | 942 | 812 | 995 | 873 |
| Fuel Used (gal) | 19.8 | 22.2 | 23.3 | 21.5 | 20.4 | 20.9 | 20.9 |

## Interval #2 Information

| | |
|---|---|
| Start Time | 2:15 |
| End Time | 2:30 |
| Total Time (min) | 15 |

Volumes adjusted by Growth Factors.

| Run Number | 7 | 8 | 9 | Avg |
|---|---|---|---|---|
| Vehs Entered | 955 | 895 | 898 | 893 |
| Vehs Exited | 931 | 876 | 907 | 898 |
| Starting Vehs | 112 | 116 | 141 | 124 |
| Ending Vehs | 136 | 135 | 132 | 119 |
| Travel Distance (mi) | 557 | 521 | 546 | 530 |
| Travel Time (hr) | 37.2 | 28.7 | 37.1 | 30.7 |
| Total Delay (hr) | 17.2 | 9.9 | 17.5 | 11.6 |
| Total Stops | 1547 | 955 | 1889 | 1153 |
| Fuel Used (gal) | 23.9 | 20.9 | 23.4 | 21.7 |

## Interval #3 Information

| | |
|---|---|
| Start Time | 2:30 |
| End Time | 2:45 |
| Total Time (min) | 15 |

Volumes adjusted by Growth Factors.

| Run Number | 1 | 10 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|
| Vehs Entered | 925 | 921 | 909 | 907 | 896 | 925 | 899 |
| Vehs Exited | 914 | 949 | 908 | 882 | 874 | 890 | 902 |
| Starting Vehs | 114 | 141 | 124 | 106 | 96 | 103 | 114 |
| Ending Vehs | 125 | 113 | 125 | 131 | 118 | 138 | 111 |
| Travel Distance (mi) | 552 | 551 | 537 | 527 | 521 | 527 | 532 |
| Travel Time (hr) | 32.0 | 31.0 | 30.8 | 29.5 | 28.4 | 29.2 | 33.3 |
| Total Delay (hr) | 12.1 | 11.1 | 11.4 | 10.4 | 9.6 | 10.2 | 14.0 |
| Total Stops | 1194 | 1044 | 1123 | 987 | 898 | 994 | 1432 |
| Fuel Used (gal) | 22.6 | 22.4 | 22.1 | 21.2 | 20.9 | 21.2 | 22.6 |

## Interval #3 Information

| | |
|---|---|
| Start Time | 2:30 |
| End Time | 2:45 |
| Total Time (min) | 15 |

Volumes adjusted by Growth Factors.

| Run Number | 7 | 8 | 9 | Avg |
|---|---|---|---|---|
| Vehs Entered | 875 | 867 | 847 | 896 |
| Vehs Exited | 891 | 907 | 867 | 899 |
| Starting Vehs | 136 | 135 | 132 | 119 |
| Ending Vehs | 120 | 95 | 112 | 117 |
| Travel Distance (mi) | 531 | 523 | 515 | 532 |
| Travel Time (hr) | 30.2 | 30.0 | 31.0 | 30.5 |
| Total Delay (hr) | 11.0 | 11.0 | 12.4 | 11.3 |
| Total Stops | 1114 | 1166 | 1411 | 1135 |
| Fuel Used (gal) | 21.8 | 21.6 | 21.2 | 21.8 |

## Interval #4 Information Recording

| | |
|---|---|
| Start Time | 2:45 |
| End Time | 3:00 |
| Total Time (min) | 15 |

Volumes adjusted by Growth Factors.

| Run Number | 1 | 10 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|
| Vehs Entered | 905 | 842 | 922 | 844 | 925 | 906 | 920 |
| Vehs Exited | 918 | 828 | 921 | 867 | 926 | 925 | 919 |
| Starting Vehs | 125 | 113 | 125 | 131 | 118 | 138 | 111 |
| Ending Vehs | 112 | 127 | 126 | 108 | 117 | 119 | 112 |
| Travel Distance (mi) | 530 | 494 | 543 | 510 | 538 | 543 | 535 |
| Travel Time (hr) | 29.2 | 25.3 | 33.4 | 28.4 | 30.6 | 30.9 | 28.4 |
| Total Delay (hr) | 10.1 | 7.4 | 13.9 | 10.0 | 11.0 | 11.4 | 9.0 |
| Total Stops | 900 | 715 | 1405 | 949 | 963 | 1086 | 899 |
| Fuel Used (gal) | 21.4 | 19.7 | 22.8 | 20.6 | 22.0 | 22.5 | 21.5 |

## Interval #4 Information Recording

| | |
|---|---|
| Start Time | 2:45 |
| End Time | 3:00 |
| Total Time (min) | 15 |

Volumes adjusted by Growth Factors.

| Run Number | 7 | 8 | 9 | Avg |
|---|---|---|---|---|
| Vehs Entered | 889 | 901 | 881 | 894 |
| Vehs Exited | 880 | 876 | 883 | 894 |
| Starting Vehs | 120 | 95 | 112 | 117 |
| Ending Vehs | 129 | 120 | 110 | 115 |
| Travel Distance (mi) | 528 | 530 | 533 | 528 |
| Travel Time (hr) | 29.6 | 28.9 | 29.4 | 29.4 |
| Total Delay (hr) | 10.5 | 9.9 | 10.2 | 10.3 |
| Total Stops | 1035 | 916 | 990 | 984 |
| Fuel Used (gal) | 21.5 | 21.6 | 21.5 | 21.5 |

## 1: Performance by movement

| Movement | EBT | EBR | WBT | NBL | All |
|---|---|---|---|---|---|
| Denied Delay (hr) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Denied Del/Veh (s) | 0.0 | 0.0 | 0.0 | 0.3 | 0.0 |
| Total Delay (hr) | 0.1 | 0.1 | 1.5 | 1.1 | 2.8 |
| Total Del/Veh (s) | 0.6 | 0.7 | 2.4 | 12.4 | 3.0 |
| Stop Delay (hr) | 0.0 | 0.0 | 0.0 | 1.0 | 1.0 |
| Stop Del/Veh (s) | 0.0 | 0.0 | 0.0 | 10.5 | 1.0 |

## 2: Performance by movement

| Movement | EBT | EBR | NBL | NBT | SBR | All |
|---|---|---|---|---|---|---|
| Denied Delay (hr) | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 |
| Denied Del/Veh (s) | 0.0 | 0.1 | 0.0 | 0.0 | 0.5 | 0.1 |
| Total Delay (hr) | 0.0 | 0.7 | 10.0 | 0.1 | 0.9 | 11.7 |
| Total Del/Veh (s) | 0.0 | 6.3 | 21.3 | 3.5 | 5.7 | 15.1 |
| Stop Delay (hr) | 0.0 | 0.6 | 5.9 | 0.0 | 0.3 | 6.9 |
| Stop Del/Veh (s) | 0.0 | 5.7 | 12.6 | 0.9 | 2.2 | 8.9 |

## 3: Performance by movement

| Movement | EBL | NBT | SBT | All |
|---|---|---|---|---|
| Denied Delay (hr) | 0.0 | 0.0 | 0.0 | 0.0 |
| Denied Del/Veh (s) | 0.1 | 0.0 | 0.0 | 0.0 |
| Total Delay (hr) | 0.1 | 2.0 | 0.0 | 2.0 |
| Total Del/Veh (s) | 6.8 | 3.9 | 0.0 | 3.3 |
| Stop Delay (hr) | 0.1 | 0.8 | 0.0 | 0.8 |
| Stop Del/Veh (s) | 5.3 | 1.5 | 0.0 | 1.3 |

## 4: Performance by movement

| Movement | EBL | NBT | SBT | All |
|---|---|---|---|---|
| Denied Delay (hr) | 0.0 | 0.0 | 0.0 | 0.0 |
| Denied Del/Veh (s) | 0.1 | 0.0 | 0.0 | 0.0 |
| Total Delay (hr) | 0.0 | 0.9 | 0.0 | 1.0 |
| Total Del/Veh (s) | 6.1 | 1.9 | 0.3 | 1.6 |
| Stop Delay (hr) | 0.0 | 0.2 | 0.0 | 0.2 |
| Stop Del/Veh (s) | 4.6 | 0.3 | 0.0 | 0.3 |

## 5: Performance by movement

| Movement | EBL | EBT | NBL | NBT | SBT | SBR | All |
|---|---|---|---|---|---|---|---|
| Denied Delay (hr) | 0.0 | 0.0 | 0.1 | 1.3 | 0.0 | 0.0 | 1.4 |
| Denied Del/Veh (s) | 0.0 | 0.0 | 5.9 | 4.6 | 0.0 | 0.0 | 2.3 |
| Total Delay (hr) | 8.6 | 0.0 | 0.6 | 5.1 | 0.9 | 0.3 | 15.5 |
| Total Del/Veh (s) | 42.2 | 2.9 | 54.6 | 17.3 | 12.7 | 7.3 | 24.9 |
| Stop Delay (hr) | 7.5 | 0.0 | 0.5 | 2.7 | 0.7 | 0.2 | 11.7 |
| Stop Del/Veh (s) | 36.9 | 1.4 | 49.2 | 9.3 | 9.7 | 6.4 | 18.8 |

## 6: Performance by movement

| Movement | EBT | WBT | SBL | All |
|---|---|---|---|---|
| Denied Delay (hr) | 0.1 | 0.0 | 0.0 | 0.1 |
| Denied Del/Veh (s) | 0.5 | 0.0 | 0.1 | 0.4 |
| Total Delay (hr) | 0.2 | 0.0 | 0.0 | 0.3 |
| Total Del/Veh (s) | 1.1 | 0.8 | 4.5 | 1.1 |
| Stop Delay (hr) | 0.0 | 0.0 | 0.0 | 0.0 |
| Stop Del/Veh (s) | 0.0 | 0.2 | 3.3 | 0.1 |

## Total Network Performance

| | |
|---|---|
| Denied Delay (hr) | 1.7 |
| Denied Del/Veh (s) | 1.8 |
| Total Delay (hr) | 42.6 |
| Total Del/Veh (s) | 41.6 |
| Stop Delay (hr) | 21.8 |
| Stop Del/Veh (s) | 21.3 |

## Intersection: 1:

| Movement | B11 | WB | WB | B21 | NB |
|---|---|---|---|---|---|
| Directions Served | T | T | T | T | L |
| Maximum Queue (ft) | 3 | 10 | 29 | 11 | 200 |
| Average Queue (ft) | 0 | 0 | 1 | 0 | 85 |
| 95th Queue (ft) | 3 | 8 | 12 | 6 | 156 |
| Link Distance (ft) | 1106 | 220 | 220 | 114 | 231 |
| Upstream Blk Time (%) | | | | | 0 |
| Queuing Penalty (veh) | | | | | 0 |
| Storage Bay Dist (ft) | | | | | |
| Storage Blk Time (%) | | | | | 6 |
| Queuing Penalty (veh) | | | | | 0 |

## Intersection: 2:

| Movement | EB | NB | NB | NB | B20 | B20 | B20 | SB |
|---|---|---|---|---|---|---|---|---|
| Directions Served | R | L | L | T | | T | T | TR |
| Maximum Queue (ft) | 137 | 274 | 473 | 401 | 27 | 211 | 138 | 159 |
| Average Queue (ft) | 75 | 226 | 286 | 101 | 1 | 63 | 29 | 78 |
| 95th Queue (ft) | 115 | 315 | 512 | 364 | 16 | 200 | 108 | 132 |
| Link Distance (ft) | 114 | | 368 | 368 | 108 | 108 | 108 | 518 |
| Upstream Blk Time (%) | 1 | | 13 | 1 | 0 | 10 | 1 | |
| Queuing Penalty (veh) | 2 | | 116 | 9 | 0 | 60 | 4 | |
| Storage Bay Dist (ft) | | 250 | | | | | | |
| Storage Blk Time (%) | | 7 | 3 | | | | | |
| Queuing Penalty (veh) | | 56 | 28 | | | | | |

## Intersection: 3:

| Movement | EB | NB | NB | B19 | B19 | B19 |
|---|---|---|---|---|---|---|
| Directions Served | L | T | T | | T | T |
| Maximum Queue (ft) | 52 | 213 | 172 | 14 | 129 | 102 |
| Average Queue (ft) | 22 | 47 | 29 | 0 | 25 | 14 |
| 95th Queue (ft) | 47 | 190 | 131 | 9 | 114 | 70 |
| Link Distance (ft) | 232 | 142 | 142 | 100 | 100 | 100 |
| Upstream Blk Time (%) | | 9 | 1 | | 4 | 1 |
| Queuing Penalty (veh) | | 80 | 11 | | 24 | 3 |
| Storage Bay Dist (ft) | | | | | | |
| Storage Blk Time (%) | | 9 | | | | |
| Queuing Penalty (veh) | | 0 | | | | |

## Intersection: 4:

| Movement | EB | NB | NB | B18 | B18 | SB |
|---|---|---|---|---|---|---|
| Directions Served | L | T | T | T | T | T |
| Maximum Queue (ft) | 40 | 83 | 55 | 32 | 37 | 14 |
| Average Queue (ft) | 16 | 13 | 8 | 4 | 3 | 1 |
| 95th Queue (ft) | 42 | 87 | 63 | 39 | 39 | 12 |
| Link Distance (ft) | 244 | 127 | 127 | 110 | 110 | 100 |
| Upstream Blk Time (%) | | 2 | 0 | 0 | 0 | 0 |
| Queuing Penalty (veh) | | 16 | 4 | 1 | 1 | 0 |
| Storage Bay Dist (ft) | | | | | | |
| Storage Blk Time (%) | | | | | | |
| Queuing Penalty (veh) | | | | | | |

## Intersection: 5:

| Movement | EB | EB | EB | NB | NB | SB | B18 |
|---|---|---|---|---|---|---|---|
| Directions Served | L | L | TR | L | TR | TR | T |
| Maximum Queue (ft) | 320 | 369 | 239 | 237 | 401 | 184 | 105 |
| Average Queue (ft) | 221 | 217 | 25 | 56 | 313 | 111 | 6 |
| 95th Queue (ft) | 311 | 331 | 165 | 173 | 463 | 184 | 46 |
| Link Distance (ft) | | 516 | 516 | | 370 | 110 | 127 |
| Upstream Blk Time (%) | | 0 | 0 | | 9 | 8 | 0 |
| Queuing Penalty (veh) | | 0 | 0 | | 0 | 16 | 1 |
| Storage Bay Dist (ft) | 300 | | | 250 | | | |
| Storage Blk Time (%) | 2 | 2 | | 0 | 13 | | |
| Queuing Penalty (veh) | 6 | 6 | | 0 | 5 | | |

## Intersection: 6:

| Movement | EB | WB | SB |
|---|---|---|---|
| Directions Served | T | T | L |
| Maximum Queue (ft) | 6 | 2 | 78 |
| Average Queue (ft) | 0 | 0 | 26 |
| 95th Queue (ft) | 6 | 2 | 73 |
| Link Distance (ft) | 1117 | 516 | 138 |
| Upstream Blk Time (%) | | | |
| Queuing Penalty (veh) | | | |
| Storage Bay Dist (ft) | | | |
| Storage Blk Time (%) | | | |
| Queuing Penalty (veh) | | | |

## Intersection: 11: Bend

| Movement | NW | NW | NW |
|---|---|---|---|
| Directions Served | | T | T |
| Maximum Queue (ft) | 3 | 72 | 78 |
| Average Queue (ft) | 0 | 5 | 7 |
| 95th Queue (ft) | 3 | 39 | 40 |
| Link Distance (ft) | 129 | 129 | 129 |
| Upstream Blk Time (%) | | 0 | 0 |
| Queuing Penalty (veh) | | 0 | 0 |
| Storage Bay Dist (ft) | | | |
| Storage Blk Time (%) | | | |
| Queuing Penalty (veh) | | | |

## Network Summary

Network wide Queuing Penalty: 450