City of SACRAMENTO
Community Development

February 5, 2019

Re: Harvard Park Project (P17-061)

Mitigated Negative Declaration: Written Comments (Updated)

The City circulated the Mitigated Negative Declaration for the Harvard Park project for public comments from October 11, 2019 to November 1, 2019 and received written comments from the following:

Date	Commenter
Agencies and Organizations	
October 11, 2018	PG&E
November 1, 2018	SMUD
November 1, 2018	Caltrans
November 1, 2018	PG&E

Each of the written comments is included below. The comments have been considered as appropriate.

Caltrans has requested additional information regarding the vehicle traffic that could be generated by the project. The City has further evaluated the project in response to Caltrans comment. The report from DKS reporting on the additional analysis is attached to this Memorandum. The additional analysis shows the project would have negligible impacts to a.m./p.m. peak hour ramp queuing and levels of Service at ramp intersections. No further review is required. The report does not affect the analysis or conclusions in the MND.

The remaining comments do not affect the environmental analysis or conclusions included in the Mitigated Negative Declaration.

Pacific Gas and Electric Company

Plan Review Team
Land Management

PGEPlanReview@pge.com

6111 Bollinger Canyon Road 3370A
San Ramon, CA 94583

October 11, 2018

Tom Buford
City of Sacramento
300 Richards Blvd., 3rd Floor
Sacramento, CA 95811

Ref: Gas and Electric Transmission and Distribution

Dear Mr. Buford,

Thank you for submitting Harvard Park (P17-061) plans for our review. PG&E will review the submitted plans in relationship to any existing Gas and Electric facilities within the project area. If the proposed project is adjacent/or within PG&E owned property and/or easements, we will be working with you to ensure compatible uses and activities near our facilities.

Attached you will find information and requirements as it relates to Gas facilities (Attachment 1) and Electric facilities (Attachment 2). Please review these in detail, as it is critical to ensure your safety and to protect PG&E's facilities and its existing rights.

Below is additional information for your review:

1. This plan review process does not replace the application process for PG&E gas or electric service your project may require. For these requests, please continue to work with PG&E Service Planning: https://www.pge.com/en_US/business/services/building-and-renovation/overview/overview.page.

2. If the project being submitted is part of a larger project, please include the entire scope of your project, and not just a portion of it. PG&E's facilities are to be incorporated within any CEQA document. PG&E needs to verify that the CEQA document will identify any required future PG&E services.

3. An engineering deposit may be required to review plans for a project depending on the size, scope, and location of the project and as it relates to any rearrangement or new installation of PG&E facilities.

Any proposed uses within the PG&E fee strip and/or easement, may include a California Public Utility Commission (CPUC) Section 851 filing. This requires the CPUC to render approval for a conveyance of rights for specific uses on PG&E's fee strip or easement. PG&E will advise if the necessity to incorporate a CPUC Section 851filing is required.

This letter does not constitute PG&E's consent to use any portion of its easement for any purpose not previously conveyed. PG&E will provide a project specific response as required.

Sincerely,

Plan Review Team
Land Management

Attachment 1 – Gas Facilities

There could be gas transmission pipelines in this area which would be considered critical facilities for PG&E and a high priority subsurface installation under California law. Care must be taken to ensure safety and accessibility. So, please ensure that if PG&E approves work near gas transmission pipelines it is done in adherence with the below stipulations. Additionally, the following link provides additional information regarding legal requirements under California excavation laws: http://usanorth811.org/wp-content/uploads/2017/05/CA-LAW-English.pdf

1. Standby Inspection: A PG&E Gas Transmission Standby Inspector must be present during any demolition or construction activity that comes within 10 feet of the gas pipeline. This includes all grading, trenching, substructure depth verifications (potholes), asphalt or concrete demolition/removal, removal of trees, signs, light poles, etc. This inspection can be coordinated through the Underground Service Alert (USA) service at 811. A minimum notice of 48 hours is required. Ensure the USA markings and notifications are maintained throughout the duration of your work.

2. Access: At any time, PG&E may need to access, excavate, and perform work on the gas pipeline. Any construction equipment, materials, or spoils may need to be removed upon notice. Any temporary construction fencing installed within PG&E's easement would also need to be capable of being removed at any time upon notice. Any plans to cut temporary slopes exceeding a 1:4 grade within 10 feet of a gas transmission pipeline need to be approved by PG&E Pipeline Services in writing PRIOR to performing the work.

3. Wheel Loads: To prevent damage to the buried gas pipeline, there are weight limits that must be enforced whenever any equipment gets within 10 feet of traversing the pipe.

Ensure a list of the axle weights of all equipment being used is available for PG&E's Standby Inspector. To confirm the depth of cover, the pipeline may need to be potholed by hand in a few areas.

Due to the complex variability of tracked equipment, vibratory compaction equipment, and cranes, PG&E must evaluate those items on a case-by-case basis prior to use over the gas pipeline (provide a list of any proposed equipment of this type noting model numbers and specific attachments).

No equipment may be set up over the gas pipeline while operating. Ensure crane outriggers are at least 10 feet from the centerline of the gas pipeline. Transport trucks must not be parked over the gas pipeline while being loaded or unloaded.

4. Grading: PG&E requires a minimum of 36 inches of cover over gas pipelines (or existing grade if less) and a maximum of 7 feet of cover at all locations. The graded surface cannot exceed a cross slope of 1:4.

5. Excavating: Any digging within 2 feet of a gas pipeline must be dug by hand. Note that while the minimum clearance is only 12 inches, any excavation work within 24 inches of the edge of a pipeline must be done with hand tools. So to avoid having to dig a trench entirely with hand tools, the edge of the trench must be over 24 inches away. (Doing the math for a 24 inch wide trench being dug along a 36 inch pipeline, the centerline of the trench would need to be at least 54 inches [24/2 + 24 + 36/2 = 54] away, or be entirely dug by hand.)

Water jetting to assist vacuum excavating must be limited to 1000 psig and directed at a 40° angle to the pipe. All pile driving must be kept a minimum of 3 feet away.

Any plans to expose and support a PG&E gas transmission pipeline across an open excavation need to be approved by PG&E Pipeline Services in writing PRIOR to performing the work.

6. Boring/Trenchless Installations: PG&E Pipeline Services must review and approve all plans to bore across or parallel to (within 10 feet) a gas transmission pipeline. There are stringent criteria to pothole the gas transmission facility at regular intervals for all parallel bore installations.

For bore paths that cross gas transmission pipelines perpendicularly, the pipeline must be potholed a minimum of 2 feet in the horizontal direction of the bore path and a minimum of 12 inches in the vertical direction from the bottom of the pipe with minimum clearances measured from the edge of the pipe in both directions. Standby personnel must watch the locator trace (and every ream pass) the path of the bore as it approaches the pipeline and visually monitor the pothole (with the exposed transmission pipe) as the bore traverses the pipeline to ensure adequate clearance with the pipeline. The pothole width must account for the inaccuracy of the locating equipment.

7. Substructures: All utility crossings of a gas pipeline should be made as close to perpendicular as feasible (90° +/- 15°). All utility lines crossing the gas pipeline must have a minimum of 12 inches of separation from the gas pipeline. Parallel utilities, pole bases, water line 'kicker blocks', storm drain inlets, water meters, valves, back pressure devices or other utility substructures are not allowed in the PG&E gas pipeline easement.

If previously retired PG&E facilities are in conflict with proposed substructures, PG&E must verify they are safe prior to removal. This includes verification testing of the contents of the facilities, as well as environmental testing of the coating and internal surfaces. Timelines for PG&E completion of this verification will vary depending on the type and location of facilities in conflict.

8. Structures: No structures are to be built within the PG&E gas pipeline easement. This includes buildings, retaining walls, fences, decks, patios, carports, septic tanks, storage sheds, tanks, loading ramps, or any structure that could limit PG&E's ability to access its facilities.

9. Fencing: Permanent fencing is not allowed within PG&E easements except for perpendicular crossings which must include a 16 foot wide gate for vehicular access. Gates will be secured with PG&E corporation locks.

10. Landscaping: Landscaping must be designed to allow PG&E to access the pipeline for maintenance and not interfere with pipeline coatings or other cathodic protection systems. No trees, shrubs, brush, vines, and other vegetation may be planted within the easement area. Only those plants, ground covers, grasses, flowers, and low-growing plants that grow unsupported to a maximum of four feet (4') in height at maturity may be planted within the easement area.

11. Cathodic Protection: PG&E pipelines are protected from corrosion with an "Impressed Current" cathodic protection system. Any proposed facilities, such as metal conduit, pipes,

service lines, ground rods, anodes, wires, etc. that might affect the pipeline cathodic protection system must be reviewed and approved by PG&E Corrosion Engineering.

12. Pipeline Marker Signs: PG&E needs to maintain pipeline marker signs for gas transmission pipelines in order to ensure public awareness of the presence of the pipelines. With prior written approval from PG&E Pipeline Services, an existing PG&E pipeline marker sign that is in direct conflict with proposed developments may be temporarily relocated to accommodate construction work. The pipeline marker must be moved back once construction is complete.

13. PG&E is also the provider of distribution facilities throughout many of the areas within the state of California. Therefore, any plans that impact PG&E's facilities must be reviewed and approved by PG&E to ensure that no impact occurs which may endanger the safe operation of its facilities.

Attachment 2 – Electric Facilities

It is PG&E's policy to permit certain uses on a case by case basis within its electric transmission fee strip(s) and/or easement(s) provided such uses and manner in which they are exercised, will not interfere with PG&E's rights or endanger its facilities. Some examples/restrictions are as follows:

1. Buildings and Other Structures: No buildings or other structures including the foot print and eave of any buildings, swimming pools, wells or similar structures will be permitted within fee strip(s) and/or easement(s) areas. PG&E's transmission easement shall be designated on subdivision/parcel maps as "**RESTRICTED USE AREA – NO BUILDING."**

2. Grading: Cuts, trenches or excavations may not be made within 25 feet of our towers. Developers must submit grading plans and site development plans (including geotechnical reports if applicable), signed and dated, for PG&E's review. PG&E engineers must review grade changes in the vicinity of our towers. No fills will be allowed which would impair ground-to-conductor clearances. Towers shall not be left on mounds without adequate road access to base of tower or structure.

3. Fences: Walls, fences, and other structures must be installed at locations that do not affect the safe operation of PG&'s facilities. Heavy equipment access to our facilities must be maintained at all times. Metal fences are to be grounded to PG&E specifications. No wall, fence or other like structure is to be installed within 10 feet of tower footings and unrestricted access must be maintained from a tower structure to the nearest street. Walls, fences and other structures proposed along or within the fee strip(s) and/or easement(s) will require PG&E review; submit plans to PG&E Centralized Review Team for review and comment.

4. Landscaping: Vegetation may be allowed; subject to review of plans. On overhead electric transmission fee strip(s) and/or easement(s), trees and shrubs are limited to those varieties that do not exceed 15 feet in height at maturity. PG&E must have access to its facilities at all times, including access by heavy equipment. No planting is to occur within the footprint of the tower legs. Greenbelts are encouraged.

5. Reservoirs, Sumps, Drainage Basins, and Ponds: Prohibited within PG&E's fee strip(s) and/or easement(s) for electric transmission lines.

6. Automobile Parking: Short term parking of movable passenger vehicles and light trucks (pickups, vans, etc.) is allowed. The lighting within these parking areas will need to be reviewed by PG&E; approval will be on a case by case basis. Heavy equipment access to PG&E facilities is to be maintained at all times. Parking is to clear PG&E structures by at least 10 feet. Protection of PG&E facilities from vehicular traffic is to be provided at developer's expense AND to PG&E specifications. Blocked-up vehicles are not allowed. Carports, canopies, or awnings are not allowed.

7. Storage of Flammable, Explosive or Corrosive Materials: There shall be no storage of fuel or combustibles and no fueling of vehicles within PG&E's easement. No trash bins or incinerators are allowed.

8. Streets and Roads: Access to facilities must be maintained at all times. Street lights may be allowed in the fee strip(s) and/or easement(s) but in all cases must be reviewed by PG&E for

proper clearance. Roads and utilities should cross the transmission easement as nearly at right angles as possible. Road intersections will not be allowed within the transmission easement.

9. Pipelines: Pipelines may be allowed provided crossings are held to a minimum and to be as nearly perpendicular as possible. Pipelines within 25 feet of PG&E structures require review by PG&E. Sprinklers systems may be allowed; subject to review. Leach fields and septic tanks are not allowed. Construction plans must be submitted to PG&E for review and approval prior to the commencement of any construction.

10. Signs: Signs are not allowed except in rare cases subject to individual review by PG&E.

11. Recreation Areas: Playgrounds, parks, tennis courts, basketball courts, barbecue and light trucks (pickups, vans, etc.) may be allowed; subject to review of plans. Heavy equipment access to PG&E facilities is to be maintained at all times. Parking is to clear PG&E structures by at least 10 feet. Protection of PG&E facilities from vehicular traffic is to be provided at developer's expense AND to PG&E specifications.

12. Construction Activity: Since construction activity will take place near PG&E's overhead electric lines, please be advised it is the contractor's responsibility to be aware of, and observe the minimum clearances for both workers and equipment operating near high voltage electric lines set out in the High-Voltage Electrical Safety Orders of the California Division of Industrial Safety (https://www.dir.ca.gov/Title8/sb5g2.html), as well as any other safety regulations. Contractors shall comply with California Public Utilities Commission General Order 95 (http://www.cpuc.ca.gov/gos/GO95/go_95_startup_page.html) and all other safety rules. No construction may occur within 25 feet of PG&E's towers. All excavation activities may only commence after 811 protocols has been followed.

Contractor shall ensure the protection of PG&E's towers and poles from vehicular damage by (installing protective barriers) Plans for protection barriers must be approved by PG&E prior to construction.

13. PG&E is also the owner of distribution facilities throughout many of the areas within the state of California. Therefore, any plans that impact PG&E's facilities must be reviewed and approved by PG&E to ensure that no impact occurs that may endanger the safe and reliable operation of its facilities.

Pacific Gas and Electric Company

Plan Review Team
Land Management

PGEPlanReview@pge.com

6111 Bollinger Canyon Road 3370A
San Ramon, CA 94583

November 1, 2018

Mr. Tom Buford
City of Sacramento
300 Richards Boulevard, 3rd Floor
Sacramento, CA 95811

Re: Harvard Park P17-061
2241 Harvard Street, Sacramento

Mr. Buford:

Thank you for giving us the opportunity to review the subject plans. The proposed Harvard Park project is within the same vicinity of PG&E's existing facilities that impact this property. PG&E has existing gas distribution facilities impacting this parcel that could potentially be affected by your proposed development.

Please contact the Building and Renovation Center (BRSC) for facility map requests at BRSCSSR@pge.com and PG&E's Service Planning department at www.pge.com/cco for any modification or relocation requests, or for any additional services you may require. Additionally, please contact Underground Service Alert (USA) by calling 811 prior to commencing any construction activities to that all underground facilities may be accurately located and marked.

If you have any questions regarding our response, please contact me at john.spigott@pge.com.

Sincerely,

John Spigott
Land Management
925-328-5122

SMUD®

Sent Via E-Mail

November 1, 2018

Tom Buford
Community Development Department
300 Richards Blvd.
Sacramento, CA 95811
tbuford@cityofsacramento.org

Subject: Harvard Park / MND / P17-061

Dear Mr. Buford:

The Sacramento Municipal Utility District (SMUD) appreciates the opportunity to provide comments on the Mitigated Negative Declaration (MND) for the Harvard Park Project (Project, P17-061). SMUD is the primary energy provider for Sacramento County and the proposed Project area. SMUD's vision is to empower our customers with solutions and options that increase energy efficiency, protect the environment, reduce global warming, and lower the cost to serve our region. As a Responsible Agency, SMUD aims to ensure that the proposed Project limits the potential for significant environmental effects on SMUD facilities, employees, and customers.

It is our desire that the Project MND will acknowledge any Project impacts related to the following:

- If alternative locations are not provided, existing overhead/underground 12/69kV facilities along Arden Way, Harvard St, Silica Ave, and within the project site will need to remain in order to maintain existing services not part of development.
- Overhead and or underground transmission and distribution line easements. Please view the following links on smud.org for more information regarding transmission encroachment:
  - https://www.smud.org/en/Business-Solutions-and-Rebates/Design-and-Construction-Services
  - https://www.smud.org/en/Corporate/Do-Business-with-SMUD/Land-Use/Transmission-Right-of-Way
- Utility line routing
- Electrical load needs/requirements
- Energy Efficiency
- Climate Change
- Cumulative impacts related to the need for increased electrical delivery

SMUD would like to be involved with discussing the above areas of interest as well as discussing any other potential issues. We aim to be partners in the efficient and sustainable delivery of the proposed Project. Please ensure that the information included in this response is conveyed to the Project planners and the appropriate Project proponents. Environmental leadership is a core value of SMUD and we look forward to collaborating with you on this Project. Again, we appreciate the opportunity to provide input on this MND.

If you have any questions regarding this letter, please contact SMUD's Environmental Management Specialist, Rob Ferrera, at rob.ferrera@smud.org or 916.732.6676.

Sincerely,

Nicole Goi
Regional & Local Government Affairs
Sacramento Municipal Utility District
6301 S Street, Mail Stop A313
Sacramento, CA 95817
nicole.goi@smud.org

Cc: Rob Ferrera

DEPARTMENT OF TRANSPORTATION
DISTRICT 3
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PHONE (530) 634-7616
FAX (530) 741-4111
TTY 711
www.dot.ca.gov/dist3

Making Conservation a California Way of Life.

November 1, 2018

GTS# 03-SAC-00320
03-SAC-51 PM 4.035L
P17-061

Tom Buford
Principal Planner
City of Sacramento
300 Richards Blvd
Sacramento, CA 95811

Harvard Park – Initial Study/Mitigated Negative Declaration (IS/MND)

Dear Tom Buford:

Thank you for including the California Department of Transportation (Caltrans) in the review process for the Harvard Park project. Caltrans' new mission, vision, and goals signal a modernization of our approach to California's transportation system. We review this local development for impacts to the State Highway System (SHS) in keeping with our mission, vision and goals for sustainability/livability/economy, and safety/heath. We provide these comments consistent with the state's mobility goals that support a vibrant economy and build communities.

The proposed project would include subdivision of the approximately 23.3-acre site into three parcels (Lots A, B, and C) for development of two new office buildings totaling approximately 253,750 square feet. Lot A, located in the northeast portion of the site, would consist of approximately 12.8 acres and would include the existing four-story and six-story office buildings, the existing single-story service building/fitness center and single-story child development center, and the existing five-story parking structure. Lot B, located near the central portion of the site, would consist of approximately 5.4 acres and would include the existing on-site recreation facilities, including an approximately 3,000 structure housing two restroom stalls, a canopy, and small utility rooms. Lot C, located at the southern portion of the site, would consist of approximately 5.1 acres. Lot C is currently vacant and undeveloped. The project proposes to add approximately 945 new parking stalls. Based on the IS/MND, Caltrans provides the following comments.

Freeway Operations

The proposed project is expected to create impacts to the SHS along State Route 51 (SR-

51) and at the Arden Way/SR-51 interchange due to an increase in volumes from the project site. The increase in traffic volumes has the potential to create merge and weave impacts to the SR-51 mainline. To ameliorate the conditions exacerbated by the proposal, Caltrans envisions a project that address congestion along SR-51 near the project site such as the SR-51 Corridor Improvements Project (CAL20689). This project is not funded through completion, and as such represents an opportunity for the city to mitigate impacts through a proportional share contribution. For this to be successful, we will need to work with the city to agree upon a reasonable proportional share of the project cost. Normally, this proportional share is identified through a Traffic Impact Study (TIS). We believe we can come to an agreement without asking for the proponent to make the additional expenditures of a TIS.

In addition, we request the project to consider the following local streets improvements to mitigate queuing along Arden Way and potential conflicts with the traffic exiting and entering SR-51:

- Create a bus pullout for the existing bus stop on WB Arden Way to reduce impact for right turn movement coming from proposed Harvard Park project.
- Coordinate the signal phasing at intersections along Arden Way to optimize throughput based on demand.
- Add/Extend turn lanes at intersections along Arden Way and at SR-51 ramp intersections to alleviate queuing at the off ramps.

Please provide our office with copies of any further actions regarding this project. We would appreciate the opportunity to review and comment on any changes related to this development.

If you have any question regarding these comments or require additional information, please contact Todd Rogers, Intergovernmental Review Coordinator, by phone (530) 741-4507 or via email to todd.rogers@dot.ca.gov.

Sincerely,

Alex Fong, Branch Chief
Office of Transportation Planning
Regional Planning Branch—South

DKS

8950 Cal Center Drive, Suite 340
Sacramento, CA 95826-3225
916.368.2000
www.dksassociates.com

MEMORANDUM

DATE:	January 31, 2019
TO:	Aelita Milatzo, City of Sacramento
FROM:	Vic Maslanka
SUBJECT:	Harvard Park – Supplemental Freeway Intersection Analysis

DKS has conducted technical analyses of the Arden Way intersections with the Business 80 Freeway. This work supplements the transportation analysis documented in our report dated January 30, 2018. This supplemental analysis is consistent with the data, methodologies, and assumptions summarized in the earlier report.

METHODOLOGY

The following tasks were undertaken in this supplemental analysis:

1. Collect weekday a.m. and p.m. peak period traffic volume and queuing data at the subject intersections / ramps.
2. Estimate "existing plus project" traffic volumes utilizing the methodology and assumptions of the earlier report.
3. Conduct level of service (LOS) analysis at the subject intersections, both without and with the project.
4. Estimate queue lengths on the freeway ramps affected by project traffic and compare the queue lengths to available storage space.

DATA COLLECTION

Peak period (7:00 to 9:00 a.m. and 4:00 to 6:00 p.m.) intersection turning movement traffic counts were collected on Wednesday, January 23, 2019. Peak hour volumes are illustrated in Figure 1. Coincident with the traffic counts, freeway ramp queues were recorded on the following ramps:

- Slip ramp from Westbound Business 80 to Arden Way
- Loop ramp from Eastbound Business 80 to westbound Arden Way

Table 1 summarizes the maximum observed queues.

Figure 1: Existing Peak Hour Traffic Volumes

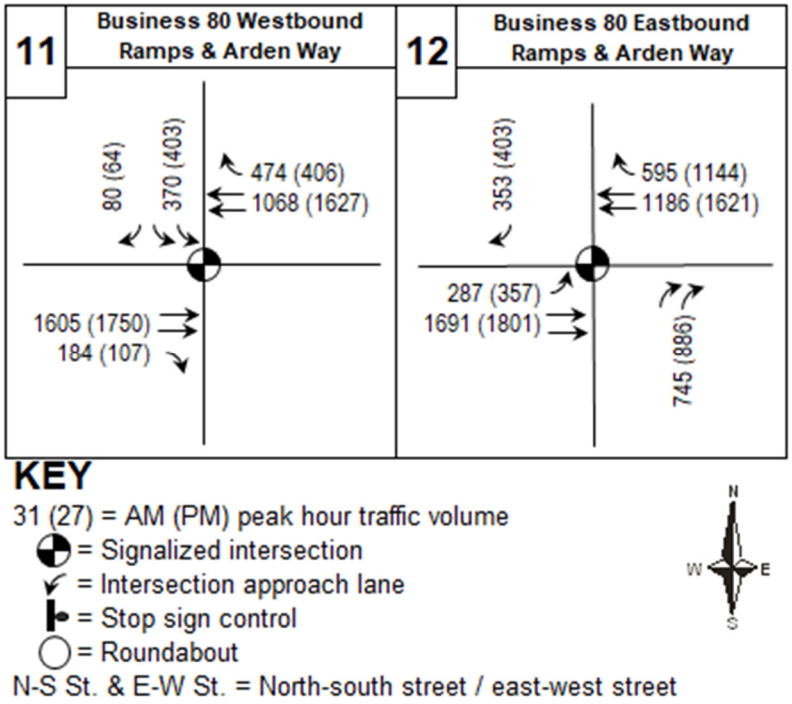


Table 1: Existing Observed Freeway Ramp Queues

Direction	Location	Available Storage Length (feet / lane)	Maximum Queue Length (feet / lane)	
			AM Peak Hour	PM Peak Hour
Business 80 Westbound Slip Ramp	Arden Way	1,155	330	265
Business 80 Eastbound Loop Ramp	Arden Way	1,385	225	260

EXISTING PLUS PROJECT TRAFFIC VOLUMES

Existing Plus Project Traffic Volumes were estimated utilizing the trip generation and trip distribution described in the earlier report. The project is estimated to generate 258 entering and 35 exiting trips during the a.m. peak hour, and 48 entering and 236 exiting trips during the p.m. peak hour. Figure 2 illustrates the trip distribution at the Arden Way interchange. Figure 3 illustrates the Existing Plus Project peak hour traffic volumes.

Figure 2: Project Trip Distribution

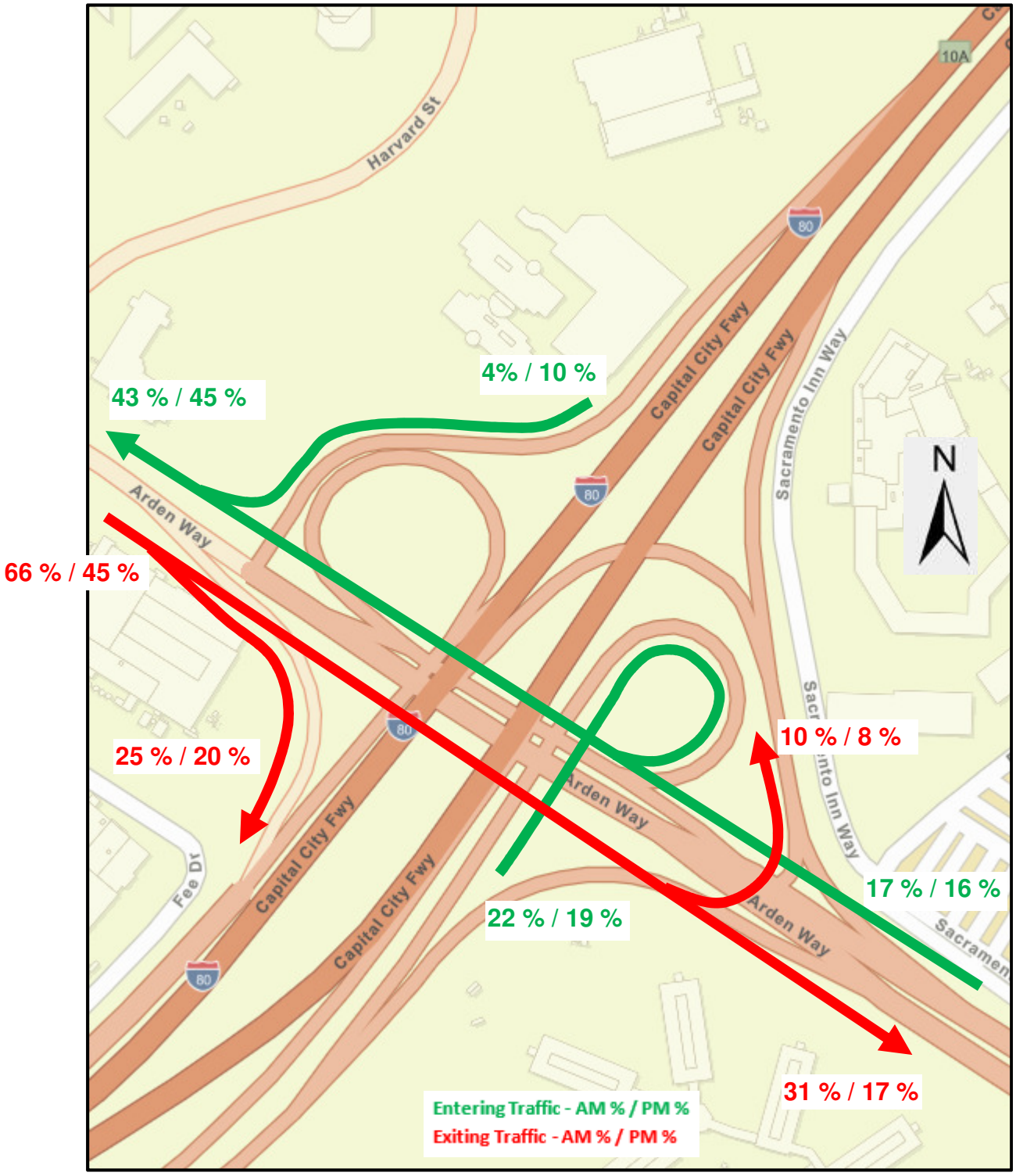
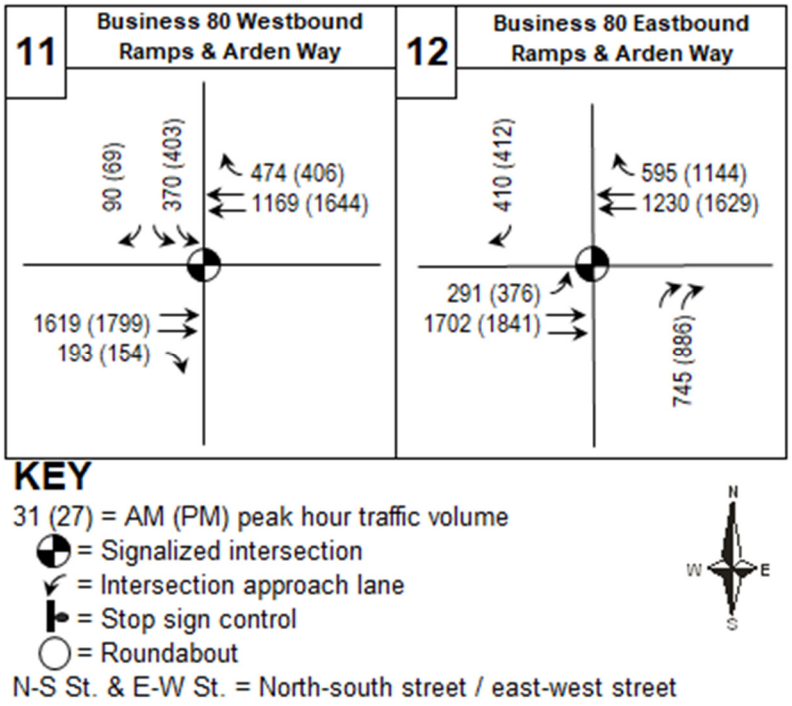


Figure 3: Existing Plus Project Peak Hour Traffic Volumes



INTERSECTION AND RAMP QUEUING ANALYSIS

Peak hour intersection LOS analysis was conducted to determine operating conditions without and with the project. Based upon the City's level of service policy, Intersection 11 (Business 80 Westbound Ramps and Arden Way) has a LOS E goal, while Intersection 12 (Business 80 Eastbound Ramps and Arden Way) has a LOS F goal. Table 2 summarizes the intersection operating conditions. Both intersections operate at an acceptable LOS B or better with the project. With the addition of project traffic, the intersections operate at 65 percent of capacity or less during the a.m. peak hour, and at 80 percent of capacity or less during the p.m. peak hour.

Table 3 summarizes the freeway ramp queuing analysis. The addition of project traffic will result in longer queues, but the queues do not exceed the available storage space. With the addition of project traffic, the westbound slip ramp queue will be at 29 percent or less than the available storage space, and the eastbound loop ramp queue will be at 20 percent or less of the available storage space.

SUMMARY

With the addition of project traffic, the subject freeway ramp intersections will continue to operate at acceptable levels of service. The increase in queueing on the ramp termini does not exceed the available storage space.

Table 2: Intersection Operating Conditions

Intersection	A.M. Peak Hour		P.M. Peak Hour	
	Delay (seconds)	LOS	Delay (seconds)	LOS
Existing Conditions				
Business 80 Westbound Ramps & Arden Way	10.3	B	12.7	B
Business 80 Eastbound Ramps & Arden Way	9.2	A	10.3	B
Existing Plus Project Conditions				
Business 80 Westbound Ramps & Arden Way	11.0	B	15.3	B
Business 80 Eastbound Ramps & Arden Way	9.6	A	11.1	B

Table 3: Estimated Existing Plus Project Freeway Ramp Queues

Direction	Location	Available Storage Length (feet / lane)	Maximum Queue Length (feet / lane)	
			AM Peak Hour	PM Peak Hour
Existing Conditions				
Business 80 Westbound Slip Ramp	Arden Way	1,155	330	265
Business 80 Eastbound Loop Ramp	Arden Way	1,385	225	260
Existing Plus Project Conditions				
Business 80 Westbound Slip Ramp	Arden Way	1,155	330	265
Business 80 Eastbound Loop Ramp	Arden Way	1,385	275	260

TECHNICAL APPENDIX

TRAFFIC COUNTS

Prepared by National Data & Surveying Services

SB I-80 Ramps & Arden Way

Peak Hour Turning Movement Count

ID: 19-07011-001
City: Sacramento

Day: Wednesday
Date: 01/23/2019

PEAK HOURS

AM	07:30 AM - 08:30 AM
NOON	NONE
PM	04:30 PM - 05:30 PM

COUNT PERIODS

AM	07:00 AM - 09:00 AM
NOON	NONE
PM	04:00 PM - 06:00 PM

SB I-80 Ramps — SOUTHBOUND

AM	80	0	370	0	474	AM
NOON	0	0	0	0	0	NOON
PM	64	0	403	0	406	PM

EASTBOUND — Arden Way

AM	NOON	PM	
1148	0	1691	
0	0	0	0
0	0	0	0
1605	0	1750	0
184	0	107	0

WESTBOUND — Arden Way

PM	NOON	AM	
406	0	474	0
1627	0	1068	0
0	0	0	0
0	0	0	0
2153	0	1975	

CONTROL

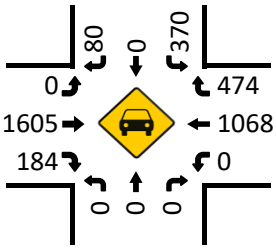
0

TEV	3781 AM	0 NOON	4357 PM
PHF	0.95		0.95

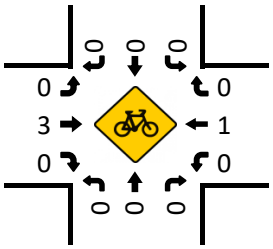
NORTHBOUND — SB I-80 Ramps

PM	107	0	0	0	0	PM
NOON	0	0	0	0	0	NOON
AM	184	0	0	0	0	AM

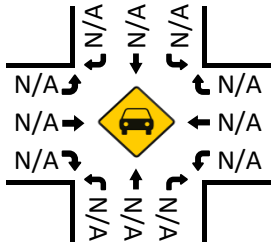
Total Vehicles (AM)



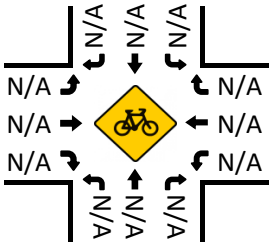
Bikes (AM)



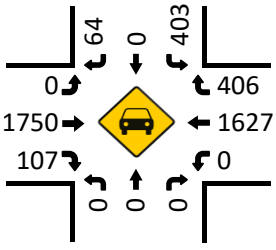
Total Vehicles (Noon)



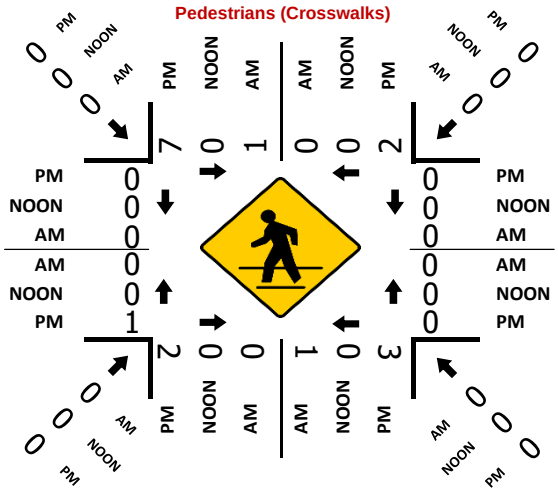
Bikes (NOON)



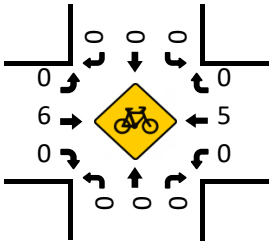
Total Vehicles (PM)



Pedestrians (Crosswalks)



Bikes (PM)



Prepared by National Data & Surveying Services

NB I-80 Ramps & Arden Way

Peak Hour Turning Movement Count

ID: 19-07011-002
City: Sacramento

Day: Wednesday
Date: 01/23/2019

PEAK HOURS

AM: 07:30 AM - 08:30 AM
NOON: NONE
PM: 04:30 PM - 05:30 PM

COUNT PERIODS

AM: 07:00 AM - 09:00 AM
NOON: NONE
PM: 04:00 PM - 06:00 PM

NB I-80 Ramps — SOUTHBOUND

AM	353	0	0	0	882	AM
NOON	0	0	0	0	0	NOON
PM	403	0	0	0	1501	PM

EASTBOUND — Arden Way

AM	NOON	PM	
1539	0	2024	⇦
0	0	0	↶ 0
287	0	357	↱ 0
1691	0	1801	→ 0
0	0	0	↴ 0
AM	NOON	PM	

WESTBOUND — Arden Way

PM	NOON	AM	
1144	0	595	0 ↰
1621	0	1186	0 ←
0	0	0	0 ↰
0	0	0	0 ↰
			⇨
2687	0	2436	
PM	NOON	AM	

CONTROL

0

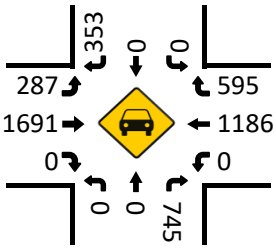
TEV	4857	0	6212
	AM	NOON	PM
PHF	0.96		0.94

NB I-80 Ramps — NORTHBOUND

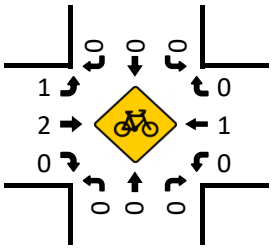
PM	0	0	0	0	886	PM
NOON	0	0	0	0	0	NOON
AM	0	0	0	0	745	AM

0 0 0 0 ↰ ↰ ↑ ↱

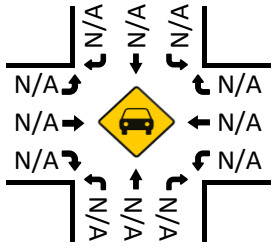
Total Vehicles (AM)



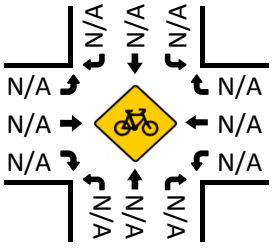
Bikes (AM)



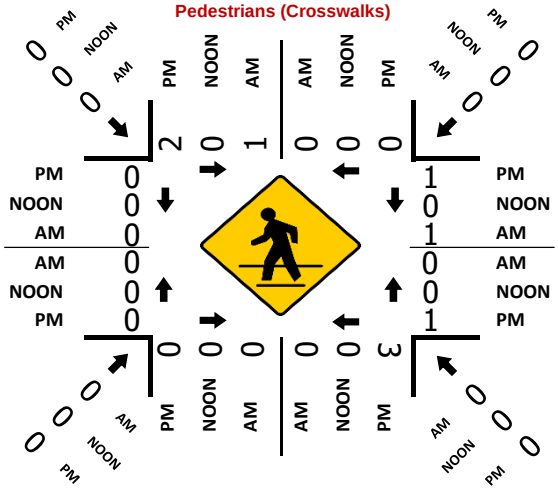
Total Vehicles (Noon)



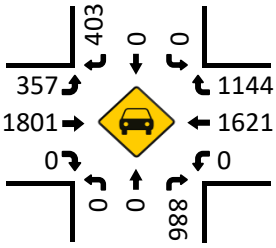
Bikes (NOON)



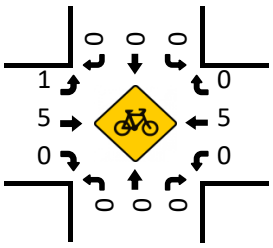
Pedestrians (Crosswalks)



Total Vehicles (PM)



Bikes (PM)



EXISTING QUEUES

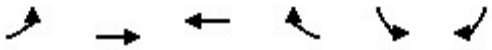
Prepared by National Data & Surveying Services

Max Queue Study

Date:01/23/2019 **Day:** Wednesday

Location	Time	Max Queue Length
160 SB Diagonal Off-Ramp @ Arden Way, Sacramento, CA	8:25 AM	330'
	4:45 PM	265'
160 NB loop off-ramp @ Arden Way, Sacramento, CA	8:19 AM	225'
	5:13 PM	260'

INTERSECTION AND QUEUING ANALYSIS



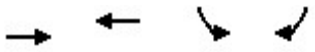
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	1605	1068	474	370	80
Future Volume (vph)	0	1605	1068	474	370	80
Ideal Flow (vphpl)	1900	1900	1900	1900	1950	1900
Total Lost time (s)		3.7	3.7		4.0	4.0
Lane Util. Factor		0.95	0.95		0.97	1.00
Frt		1.00	0.95		1.00	0.85
Flt Protected		1.00	1.00		0.95	1.00
Satd. Flow (prot)		3539	3376		3523	1583
Flt Permitted		1.00	1.00		0.95	1.00
Satd. Flow (perm)		3539	3376		3523	1583
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1605	1068	474	370	80
RTOR Reduction (vph)	0	0	76	0	0	66
Lane Group Flow (vph)	0	1605	1466	0	370	14
Turn Type		NA	NA		Prot	Prot
Protected Phases		2	6		4	4
Permitted Phases						
Actuated Green, G (s)		41.2	41.2		10.0	10.0
Effective Green, g (s)		42.1	42.1		10.2	10.2
Actuated g/C Ratio		0.70	0.70		0.17	0.17
Clearance Time (s)		4.6	4.6		4.2	4.2
Vehicle Extension (s)		2.2	2.2		1.7	1.7
Lane Grp Cap (vph)		2483	2368		598	269
v/s Ratio Prot		c0.45	0.43		c0.11	0.01
v/s Ratio Perm						
v/c Ratio		0.65	0.62		0.62	0.05
Uniform Delay, d1		4.9	4.7		23.1	20.8
Progression Factor		1.13	1.91		1.00	1.00
Incremental Delay, d2		1.1	1.2		1.3	0.0
Delay (s)		6.6	10.2		24.4	20.9
Level of Service		A	B		C	C
Approach Delay (s)		6.6	10.2		23.8	
Approach LOS		A	B		C	

Intersection Summary			
HCM 2000 Control Delay	10.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	7.7
Intersection Capacity Utilization	61.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

11: Arden Way #1 #2 #3 & Capital City Fwy WB Off Ramp

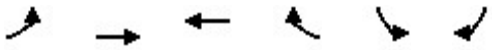
01/30/2019



Lane Group	EBT	WBT	SBL	SBR
Lane Group Flow (vph)	1605	1542	370	80
v/c Ratio	0.65	0.63	0.62	0.24
Control Delay	7.0	9.0	27.7	7.9
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	7.0	9.0	27.7	7.9
Queue Length 50th (ft)	183	275	64	0
Queue Length 95th (ft)	m46	455	98	30
Internal Link Dist (ft)	135	175	433	
Turn Bay Length (ft)			419	98
Base Capacity (vph)	2485	2447	704	380
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.65	0.63	0.53	0.21

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.



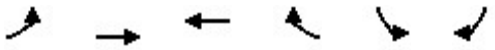
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	287	1691	1186	0	0	0
Future Volume (vph)	287	1691	1186	0	0	0
Ideal Flow (vphpl)	1950	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	3.7	3.7			
Lane Util. Factor	1.00	0.95	0.95			
Frpb, ped/bikes	1.00	1.00	1.00			
Flpb, ped/bikes	1.00	1.00	1.00			
Frt	1.00	1.00	1.00			
Flt Protected	0.95	1.00	1.00			
Satd. Flow (prot)	1816	3539	3539			
Flt Permitted	0.95	1.00	1.00			
Satd. Flow (perm)	1816	3539	3539			
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	287	1691	1186	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	287	1691	1186	0	0	0
Confl. Peds. (#/hr)	4			4		
Confl. Bikes (#/hr)				8		
Turn Type	Prot	NA	NA			
Protected Phases	2	5	1			
Permitted Phases						
Actuated Green, G (s)	25.7	103.6	85.7			
Effective Green, g (s)	25.7	104.5	86.6			
Actuated g/C Ratio	0.21	0.87	0.72			
Clearance Time (s)	4.0	4.6	4.6			
Vehicle Extension (s)	1.0	2.0	2.0			
Lane Grp Cap (vph)	388	3081	2553			
v/s Ratio Prot	c0.16	c0.48	0.34			
v/s Ratio Perm						
v/c Ratio	0.74	0.55	0.46			
Uniform Delay, d1	44.0	1.9	7.0			
Progression Factor	1.04	0.93	1.19			
Incremental Delay, d2	5.4	0.6	0.6			
Delay (s)	51.0	2.4	8.9			
Level of Service	D	A	A			
Approach Delay (s)		9.4	8.9		0.0	
Approach LOS		A	A		A	

Intersection Summary			
HCM 2000 Control Delay	9.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	7.7
Intersection Capacity Utilization	81.2%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBT
Lane Group Flow (vph)	287	1691	1186
v/c Ratio	0.84	0.52	0.45
Control Delay	67.1	5.0	8.1
Queue Delay	0.0	0.0	0.0
Total Delay	67.1	5.0	8.1
Queue Length 50th (ft)	233	0	319
Queue Length 95th (ft)	310	631	429
Internal Link Dist (ft)		325	385
Turn Bay Length (ft)	182		
Base Capacity (vph)	484	3262	2648
Starvation Cap Reductn	0	0	0
Spillback Cap Reductn	0	0	0
Storage Cap Reductn	0	0	0
Reduced v/c Ratio	0.59	0.52	0.45

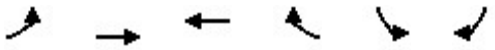
Intersection Summary



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			↱
Traffic Volume (veh/h)	0	0	1186	0	0	353
Future Volume (Veh/h)	0	0	1186	0	0	353
Sign Control		Free	Free		Yield	
Grade		0%	0%		0%	
Peak Hour Factor	0.96	0.96	0.89	0.89	0.87	0.87
Hourly flow rate (vph)	0	0	1333	0	0	406
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		780	405			
pX, platoon unblocked	0.85				0.85	0.85
vC, conflicting volume	1333				1333	666
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1050				1050	271
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	35
cM capacity (veh/h)	563				190	622

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	0	0	666	666	406
Volume Left	0	0	0	0	0
Volume Right	0	0	0	0	406
cSH	1700	1700	1700	1700	622
Volume to Capacity	0.00	0.60	0.39	0.39	0.65
Queue Length 95th (ft)	0	0	0	0	120
Control Delay (s)	0.0	0.0	0.0	0.0	21.0
Lane LOS					C
Approach Delay (s)	0.0		0.0		21.0
Approach LOS					C

Intersection Summary			
Average Delay	4.9		
Intersection Capacity Utilization	61.3%	ICU Level of Service	B
Analysis Period (min)	15		



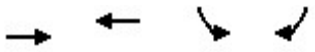
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	1740	1627	406	403	64
Future Volume (vph)	0	1740	1627	406	403	64
Ideal Flow (vphpl)	1900	1900	1900	1900	1950	1900
Total Lost time (s)		3.7	3.7		4.0	4.0
Lane Util. Factor		0.95	0.95		0.97	1.00
Frt		1.00	0.97		1.00	0.85
Flt Protected		1.00	1.00		0.95	1.00
Satd. Flow (prot)		3539	3433		3523	1583
Flt Permitted		1.00	1.00		0.95	1.00
Satd. Flow (perm)		3539	3433		3523	1583
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1740	1627	406	403	64
RTOR Reduction (vph)	0	0	34	0	0	35
Lane Group Flow (vph)	0	1740	1999	0	403	29
Turn Type		NA	NA		Prot	Prot
Protected Phases		2	6		4	4
Permitted Phases						
Actuated Green, G (s)		40.9	40.9		10.3	10.3
Effective Green, g (s)		41.8	41.8		10.5	10.5
Actuated g/C Ratio		0.70	0.70		0.18	0.18
Clearance Time (s)		4.6	4.6		4.2	4.2
Vehicle Extension (s)		2.2	2.2		1.7	1.7
Lane Grp Cap (vph)		2465	2391		616	277
v/s Ratio Prot		0.49	c0.58		c0.11	0.02
v/s Ratio Perm						
v/c Ratio		0.71	0.84		0.65	0.11
Uniform Delay, d1		5.4	6.6		23.1	20.8
Progression Factor		1.31	1.58		1.00	1.00
Incremental Delay, d2		1.5	3.0		1.9	0.1
Delay (s)		8.6	13.4		25.0	20.9
Level of Service		A	B		C	C
Approach Delay (s)		8.6	13.4		24.4	
Approach LOS		A	B		C	

Intersection Summary			
HCM 2000 Control Delay	12.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	7.7
Intersection Capacity Utilization	75.8%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

11: Arden Way #1 #2 #3 & Capital City Fwy WB Off Ramp

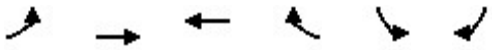
01/30/2019



Lane Group	EBT	WBT	SBL	SBR
Lane Group Flow (vph)	1740	2033	403	64
v/c Ratio	0.71	0.84	0.66	0.21
Control Delay	9.1	13.7	28.3	12.3
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	9.1	13.7	28.3	12.3
Queue Length 50th (ft)	206	338	70	7
Queue Length 95th (ft)	m57	m221	107	34
Internal Link Dist (ft)	135	175	433	
Turn Bay Length (ft)			419	98
Base Capacity (vph)	2466	2426	704	350
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.71	0.84	0.57	0.18

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	357	1801	1621	0	0	0
Future Volume (vph)	357	1801	1621	0	0	0
Ideal Flow (vphpl)	1950	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	3.7	3.7			
Lane Util. Factor	1.00	0.95	0.95			
Frpb, ped/bikes	1.00	1.00	1.00			
Flpb, ped/bikes	1.00	1.00	1.00			
Frt	1.00	1.00	1.00			
Flt Protected	0.95	1.00	1.00			
Satd. Flow (prot)	1816	3539	3539			
Flt Permitted	0.95	1.00	1.00			
Satd. Flow (perm)	1816	3539	3539			
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	357	1801	1621	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	357	1801	1621	0	0	0
Confl. Peds. (#/hr)	4			4		
Confl. Bikes (#/hr)				8		
Turn Type	Prot	NA	NA			
Protected Phases	2	5	1			
Permitted Phases						
Actuated Green, G (s)	29.6	103.2	81.8			
Effective Green, g (s)	29.6	104.1	82.7			
Actuated g/C Ratio	0.25	0.87	0.69			
Clearance Time (s)	4.0	4.6	4.6			
Vehicle Extension (s)	1.0	2.0	2.0			
Lane Grp Cap (vph)	447	3070	2438			
v/s Ratio Prot	c0.20	0.51	c0.46			
v/s Ratio Perm						
v/c Ratio	0.80	0.59	0.66			
Uniform Delay, d1	42.4	2.1	10.7			
Progression Factor	1.00	1.04	0.80			
Incremental Delay, d2	7.4	0.7	1.3			
Delay (s)	49.7	2.9	9.8			
Level of Service	D	A	A			
Approach Delay (s)		10.6	9.8		0.0	
Approach LOS		B	A		A	

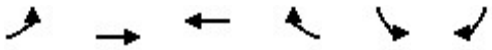
Intersection Summary			
HCM 2000 Control Delay	10.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	7.7
Intersection Capacity Utilization	81.2%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

12: Arden Way #1 #2 #3 & Capital City Freeway EB Ramps

Lane Group	EBL	EBT	WBT
Lane Group Flow (vph)	357	1801	1621
v/c Ratio	0.89	0.55	0.64
Control Delay	65.9	6.4	9.0
Queue Delay	0.0	0.0	0.0
Total Delay	65.9	6.4	9.1
Queue Length 50th (ft)	283	0	508
Queue Length 95th (ft)	369	729	436
Internal Link Dist (ft)		325	385
Turn Bay Length (ft)	182		
Base Capacity (vph)	484	3252	2532
Starvation Cap Reductn	0	0	62
Spillback Cap Reductn	0	0	0
Storage Cap Reductn	0	0	0
Reduced v/c Ratio	0.74	0.55	0.66

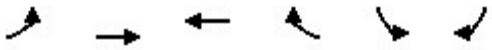
Intersection Summary



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			↱
Traffic Volume (veh/h)	0	0	1621	0	0	403
Future Volume (Veh/h)	0	0	1621	0	0	403
Sign Control		Free	Free		Yield	
Grade		0%	0%		0%	
Peak Hour Factor	0.96	0.96	0.89	0.89	0.87	0.87
Hourly flow rate (vph)	0	0	1821	0	0	463
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		780	405			
pX, platoon unblocked	0.72				0.72	0.72
vC, conflicting volume	1821				1821	910
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1364				1364	101
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	31
cM capacity (veh/h)	360				100	674

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	0	0	910	910	463
Volume Left	0	0	0	0	0
Volume Right	0	0	0	0	463
cSH	1700	1700	1700	1700	674
Volume to Capacity	0.00	0.00	0.54	0.54	0.69
Queue Length 95th (ft)	0	0	0	0	137
Control Delay (s)	0.0	0.0	0.0	0.0	21.2
Lane LOS					C
Approach Delay (s)	0.0		0.0		21.2
Approach LOS					C

Intersection Summary			
Average Delay	4.3		
Intersection Capacity Utilization	76.4%	ICU Level of Service	D
Analysis Period (min)	15		



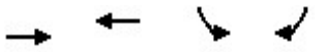
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑		↰↰	↱
Traffic Volume (vph)	0	1619	1169	474	370	90
Future Volume (vph)	0	1619	1169	474	370	90
Ideal Flow (vphpl)	1900	1900	1900	1900	1950	1900
Total Lost time (s)		3.7	3.7		4.0	4.0
Lane Util. Factor		0.95	0.95		0.97	1.00
Frt		1.00	0.96		1.00	0.85
Flt Protected		1.00	1.00		0.95	1.00
Satd. Flow (prot)		3539	3386		3523	1583
Flt Permitted		1.00	1.00		0.95	1.00
Satd. Flow (perm)		3539	3386		3523	1583
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1619	1169	474	370	90
RTOR Reduction (vph)	0	0	66	0	0	75
Lane Group Flow (vph)	0	1619	1577	0	370	15
Turn Type		NA	NA		Prot	Prot
Protected Phases		2	6		4	4
Permitted Phases						
Actuated Green, G (s)		41.2	41.2		10.0	10.0
Effective Green, g (s)		42.1	42.1		10.2	10.2
Actuated g/C Ratio		0.70	0.70		0.17	0.17
Clearance Time (s)		4.6	4.6		4.2	4.2
Vehicle Extension (s)		2.2	2.2		1.7	1.7
Lane Grp Cap (vph)		2483	2375		598	269
v/s Ratio Prot		0.46	c0.47		c0.11	0.01
v/s Ratio Perm						
v/c Ratio		0.65	0.66		0.62	0.06
Uniform Delay, d1		4.9	5.0		23.1	20.9
Progression Factor		1.15	2.01		1.00	1.00
Incremental Delay, d2		1.1	1.5		1.3	0.0
Delay (s)		6.8	11.5		24.4	20.9
Level of Service		A	B		C	C
Approach Delay (s)		6.8	11.5		23.8	
Approach LOS		A	B		C	

Intersection Summary			
HCM 2000 Control Delay	11.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	7.7
Intersection Capacity Utilization	64.4%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

11: Arden Way #1 #2 #3 & Capital City Fwy WB Off Ramp

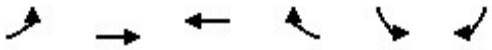
01/30/2019



Lane Group	EBT	WBT	SBL	SBR
Lane Group Flow (vph)	1619	1643	370	90
v/c Ratio	0.65	0.67	0.62	0.26
Control Delay	7.1	10.6	27.7	7.8
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	7.1	10.6	27.7	7.8
Queue Length 50th (ft)	185	313	64	0
Queue Length 95th (ft)	m46	520	98	31
Internal Link Dist (ft)	135	175	433	
Turn Bay Length (ft)			419	98
Base Capacity (vph)	2485	2444	704	388
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.65	0.67	0.53	0.23

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.



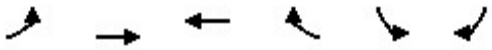
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	291	1702	1230	0	0	0
Future Volume (vph)	291	1702	1230	0	0	0
Ideal Flow (vphpl)	1950	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	3.7	3.7			
Lane Util. Factor	1.00	0.95	0.95			
Frpb, ped/bikes	1.00	1.00	1.00			
Flpb, ped/bikes	1.00	1.00	1.00			
Frt	1.00	1.00	1.00			
Flt Protected	0.95	1.00	1.00			
Satd. Flow (prot)	1816	3539	3539			
Flt Permitted	0.95	1.00	1.00			
Satd. Flow (perm)	1816	3539	3539			
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	291	1702	1230	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	291	1702	1230	0	0	0
Confl. Peds. (#/hr)	4			4		
Confl. Bikes (#/hr)				8		
Turn Type	Prot	NA	NA			
Protected Phases	2	5	1			
Permitted Phases						
Actuated Green, G (s)	26.0	103.5	85.4			
Effective Green, g (s)	26.0	104.4	86.3			
Actuated g/C Ratio	0.22	0.87	0.72			
Clearance Time (s)	4.0	4.6	4.6			
Vehicle Extension (s)	1.0	2.0	2.0			
Lane Grp Cap (vph)	393	3078	2545			
v/s Ratio Prot	c0.16	c0.48	0.35			
v/s Ratio Perm						
v/c Ratio	0.74	0.55	0.48			
Uniform Delay, d1	43.9	2.0	7.3			
Progression Factor	1.00	1.00	1.21			
Incremental Delay, d2	6.4	0.7	0.7			
Delay (s)	50.3	2.7	9.5			
Level of Service	D	A	A			
Approach Delay (s)		9.6	9.5		0.0	
Approach LOS		A	A		A	

Intersection Summary			
HCM 2000 Control Delay	9.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	7.7
Intersection Capacity Utilization	61.3%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBT
Lane Group Flow (vph)	291	1702	1230
v/c Ratio	0.85	0.52	0.47
Control Delay	68.0	5.6	8.7
Queue Delay	0.0	0.0	0.0
Total Delay	68.0	5.6	8.7
Queue Length 50th (ft)	219	0	343
Queue Length 95th (ft)	298	595	452
Internal Link Dist (ft)		325	385
Turn Bay Length (ft)	182		
Base Capacity (vph)	484	3260	2640
Starvation Cap Reductn	0	0	0
Spillback Cap Reductn	0	0	0
Storage Cap Reductn	0	0	0
Reduced v/c Ratio	0.60	0.52	0.47

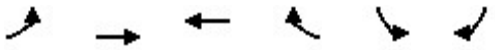
Intersection Summary



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			↱
Traffic Volume (veh/h)	0	0	1230	0	0	410
Future Volume (Veh/h)	0	0	1230	0	0	410
Sign Control		Free	Free		Yield	
Grade		0%	0%		0%	
Peak Hour Factor	0.96	0.96	0.89	0.89	0.87	0.87
Hourly flow rate (vph)	0	0	1382	0	0	471
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		780	405			
pX, platoon unblocked	0.84				0.84	0.84
vC, conflicting volume	1382				1382	691
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1085				1085	267
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	24
cM capacity (veh/h)	540				178	618

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	0	0	691	691	471
Volume Left	0	0	0	0	0
Volume Right	0	0	0	0	471
cSH	1700	1700	1700	1700	618
Volume to Capacity	0.00	0.60	0.41	0.41	0.76
Queue Length 95th (ft)	0	0	0	0	174
Control Delay (s)	0.0	0.0	0.0	0.0	27.1
Lane LOS					D
Approach Delay (s)	0.0		0.0		27.1
Approach LOS					D

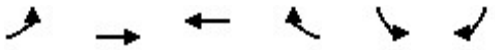
Intersection Summary			
Average Delay	6.9		
Intersection Capacity Utilization	66.1%	ICU Level of Service	C
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑		↰↰	↱
Traffic Volume (vph)	0	1799	1644	406	403	69
Future Volume (vph)	0	1799	1644	406	403	69
Ideal Flow (vphpl)	1900	1900	1900	1900	1950	1900
Total Lost time (s)		3.7	3.7		4.0	4.0
Lane Util. Factor		0.95	0.95		0.97	1.00
Frt		1.00	0.97		1.00	0.85
Flt Protected		1.00	1.00		0.95	1.00
Satd. Flow (prot)		3539	3434		3523	1583
Flt Permitted		1.00	1.00		0.95	1.00
Satd. Flow (perm)		3539	3434		3523	1583
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	1799	1644	406	403	69
RTOR Reduction (vph)	0	0	33	0	0	33
Lane Group Flow (vph)	0	1799	2017	0	403	36
Turn Type		NA	NA		Prot	Prot
Protected Phases		2	6		4	4
Permitted Phases						
Actuated Green, G (s)		40.9	40.9		10.3	10.3
Effective Green, g (s)		41.8	41.8		10.5	10.5
Actuated g/C Ratio		0.70	0.70		0.18	0.18
Clearance Time (s)		4.6	4.6		4.2	4.2
Vehicle Extension (s)		2.2	2.2		1.7	1.7
Lane Grp Cap (vph)		2465	2392		616	277
v/s Ratio Prot		0.51	c0.59		c0.11	0.02
v/s Ratio Perm						
v/c Ratio		0.73	0.84		0.65	0.13
Uniform Delay, d1		5.6	6.7		23.1	20.9
Progression Factor		1.38	2.21		1.00	1.00
Incremental Delay, d2		1.7	3.7		1.9	0.1
Delay (s)		9.4	18.5		25.0	21.0
Level of Service		A	B		C	C
Approach Delay (s)		9.4	18.5		24.4	
Approach LOS		A	B		C	

Intersection Summary			
HCM 2000 Control Delay	15.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	7.7
Intersection Capacity Utilization	76.3%	ICU Level of Service	D
Analysis Period (min)	15		

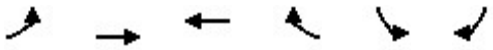
c Critical Lane Group



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1950	1900
Storage Length (ft)	0			0	419	98
Storage Lanes	0			0	1	1
Taper Length (ft)	25				25	
Right Turn on Red				Yes		Yes
Link Speed (mph)		35	35		35	
Link Distance (ft)		215	255		513	
Travel Time (s)		4.2	5.0		10.0	
Lane Group Flow (vph)	0	1799	2050	0	403	69
v/c Ratio		0.73	0.85		0.66	0.22
Control Delay		9.9	18.8		28.3	13.2
Queue Delay		0.0	0.0		0.0	0.0
Total Delay		9.9	18.8		28.3	13.2
Queue Length 50th (ft)		214	650		70	9
Queue Length 95th (ft)		m80	623		107	37
Internal Link Dist (ft)		135	175		433	
Turn Bay Length (ft)					419	98
Base Capacity (vph)		2466	2426		704	348
Starvation Cap Reductn		0	0		0	0
Spillback Cap Reductn		0	0		0	0
Storage Cap Reductn		0	0		0	0
Reduced v/c Ratio		0.73	0.85		0.57	0.20

Intersection Summary	
Area Type:	Other

m Volume for 95th percentile queue is metered by upstream signal.



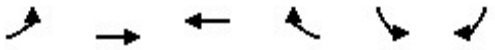
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	376	1841	1629	0	0	0
Future Volume (vph)	376	1841	1629	0	0	0
Ideal Flow (vphpl)	1950	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	3.7	3.7			
Lane Util. Factor	1.00	0.95	0.95			
Frpb, ped/bikes	1.00	1.00	1.00			
Flpb, ped/bikes	1.00	1.00	1.00			
Frt	1.00	1.00	1.00			
Flt Protected	0.95	1.00	1.00			
Satd. Flow (prot)	1816	3539	3539			
Flt Permitted	0.95	1.00	1.00			
Satd. Flow (perm)	1816	3539	3539			
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	376	1841	1629	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	376	1841	1629	0	0	0
Confl. Peds. (#/hr)	4			4		
Confl. Bikes (#/hr)				8		
Turn Type	Prot	NA	NA			
Protected Phases	2	5	1			
Permitted Phases						
Actuated Green, G (s)	30.8	103.2	80.6			
Effective Green, g (s)	30.8	104.1	81.5			
Actuated g/C Ratio	0.26	0.87	0.68			
Clearance Time (s)	4.0	4.6	4.6			
Vehicle Extension (s)	1.0	2.0	2.0			
Lane Grp Cap (vph)	466	3070	2403			
v/s Ratio Prot	c0.21	0.52	c0.46			
v/s Ratio Perm						
v/c Ratio	0.81	0.60	0.68			
Uniform Delay, d1	41.8	2.2	11.4			
Progression Factor	1.00	1.00	0.83			
Incremental Delay, d2	9.3	0.9	1.4			
Delay (s)	51.1	3.1	10.9			
Level of Service	D	A	B			
Approach Delay (s)		11.2	10.9		0.0	
Approach LOS		B	B		A	

Intersection Summary			
HCM 2000 Control Delay	11.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	7.7
Intersection Capacity Utilization	76.4%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

12: Arden Way #1 #2 #3 & Capital City Freeway EB Ramps

01/30/2019

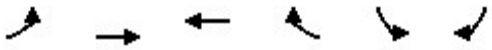


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Ideal Flow (vphpl)	1950	1900	1900	1900	1900	1900
Storage Length (ft)	182			0	0	0
Storage Lanes	1			0	0	0
Taper Length (ft)	25				25	
Right Turn on Red				Yes		Yes
Link Speed (mph)		35	35		35	
Link Distance (ft)		405	465		418	
Travel Time (s)		7.9	9.1		8.1	
Lane Group Flow (vph)	376	1841	1629	0	0	0
v/c Ratio	0.90	0.57	0.65			
Control Delay	69.8	6.5	9.9			
Queue Delay	0.0	0.0	0.0			
Total Delay	69.8	6.5	9.9			
Queue Length 50th (ft)	281	0	514			
Queue Length 95th (ft)	#409	723	439			
Internal Link Dist (ft)		325	385		338	
Turn Bay Length (ft)	182					
Base Capacity (vph)	484	3252	2498			
Starvation Cap Reductn	0	0	56			
Spillback Cap Reductn	0	0	0			
Storage Cap Reductn	0	0	0			
Reduced v/c Ratio	0.78	0.57	0.67			

Intersection Summary

Area Type: Other

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			↱
Traffic Volume (veh/h)	0	0	1629	0	0	412
Future Volume (Veh/h)	0	0	1629	0	0	412
Sign Control		Free	Free		Yield	
Grade		0%	0%		0%	
Peak Hour Factor	0.96	0.96	0.89	0.89	0.87	0.87
Hourly flow rate (vph)	0	0	1830	0	0	474
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		780	405			
pX, platoon unblocked	0.71				0.71	0.71
vC, conflicting volume	1830				1830	915
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1351				1351	61
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	33
cM capacity (veh/h)	359				100	703

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	0	0	915	915	474
Volume Left	0	0	0	0	0
Volume Right	0	0	0	0	474
cSH	1700	1700	1700	1700	703
Volume to Capacity	0.00	0.00	0.54	0.54	0.67
Queue Length 95th (ft)	0	0	0	0	131
Control Delay (s)	0.0	0.0	0.0	0.0	20.0
Lane LOS					C
Approach Delay (s)	0.0		0.0		20.0
Approach LOS					C

Intersection Summary			
Average Delay	4.1		
Intersection Capacity Utilization	77.2%	ICU Level of Service	D
Analysis Period (min)	15		