Chapter 16. Transportation and Circulation

16.1 Overview

This chapter describes the existing transportation characteristics of the ARC and the surrounding area. It also summarizes regulations applicable to the local and regional transportation systems as well as relevant plans, programs, policies, and measures that address potential transportation and traffic effects of operations and future development at ARC. Information presented in this chapter was obtained from the November 2009 NASA ARC ERD (NASA 2009), NADP EIS (Design, Community & Environment 2002), and the standards and guidelines of the California Department of Transportation (Caltrans), the City of Mountain View, the City of Sunnyvale, and the Santa Clara Valley Transportation Authority (VTA).

16.2 Regulatory Background

16.2.1 Federal Regulations

16.2.1.1 *NASA's Site Circulation Standards*

Roadways within ARC are under the governance of NASA. Previous publications by the Federal Highway Administration and the Federal Transit Administration indicated that operations of all transportation facilities are typically designed and maintained based on standard engineering practice and may adhere to local standards. However, the federal government does not employ its own specific standards for intersection operation or other modes that would be used to identify significant environmental impacts. To determine the environmental impacts of its actions, NASA uses the criteria of the local, county, and state jurisdictions.

16.2.1.2 *National Environmental Policy Act*

NEPA requires federal agencies to include in their decision-making process appropriate and careful consideration of all environmental effects of a proposed action and of possible alternative actions. Measures to avoid or minimize the adverse effects of proposed actions and to restore and enhance environmental quality as much as possible must be developed and discussed where feasible.

16.2.2 State Regulations

Caltrans has jurisdiction over all state routes (SRs), including interstate freeways, U.S. highways, and state highways. Caltrans strives to maintain a target level of service (LOS) at the transition between LOS C and LOS D on state highway facilities. In cases where this level of service is not feasible, the lead agency should consult with Caltrans to establish an appropriate LOS threshold. If an existing state highway facility is operating worse than the

appropriate target LOS, the existing Measures of Effectiveness should be maintained[12] (Caltrans 2002).

Any modifications to facilities within the Caltrans right-of-way must be approved by the State. Although impacts to freeway segments are identified as part of the transportation impact analysis process established by VTA, Caltrans can request additional information to determine anticipated impacts to state facilities. Caltrans has an Environmental Review Section to address new developments in local jurisdictions.

16.2.3 Local Regulations

16.2.3.1 *Santa Clara County*

VTA both maintains roadways and expressway facilities in unincorporated areas of Santa Clara County and serves as the County's congestion management agency. The Congestion Management Program (CMP), which VTA oversees, monitors operations of all freeways and selected expressways and regional arterials through a biennial count program and determines the need for deficiency plans to reduce overall congestion.

VTA has also established uniform methods and guidelines for evaluating the transportation impacts of land use decisions on CMP facilities. All of the cities and towns within Santa Clara County have adopted the same transportation impact analysis methodology and significance criteria except for selected areas that are governed by special policies (North San Jose and the Evergreen area in San Jose). This common set of methods and guidelines allows each CMP member agency to understand the impacts of development in adjacent jurisdictions. By projecting against significant impacts to CMP facilities, VTA can better anticipate the effect of land use changes and improve the planning process for the overall regional transportation system. Impacts to CMP facilities must be addressed as part of the environmental review process just as the policies of affected local jurisdictions must be used to determine impact significance. The CMP facilities in the study area includeUS-101, SR 237, SR 85, and Central Expressway. The county strives to maintain an LOS D standard for roadway operations and follows the CMP criteria for regional facilities (VTA 2012).

16.2.3.2 *City of Mountain View*

The Mobility Element of the City of Mountain View General Plan states specific goals, policies, and actions designed to maintain acceptable traffic operations and reduce congestion, and includes plans for future bicycle facilities and walkways. Improved circulation is expected to be provided through enhancement of transit, bicycle, and pedestrian modes, as well as the use of aggressive Transportation Demand Management measures to reduce single-occupant vehicle trips (City of Mountain View 2012). The City has adopted LOS D as the minimum overall performance standard for City-controlled roadways.

[12] Caltrans consider LOS by itself to be an inadequate measure of effectiveness (MOE) for describing traffic operational conditions. For intersection operations, the accepted MOEs used by Caltrans include flow, average control delay, queue, and volume/capacity ratio. For freeway and ramp operations, flow, speed, and travel/time delay are the accepted MOEs in addition to LOS.

16.2.3.3 *City of Sunnyvale*

Circulation issues for the City of Sunnyvale are listed in the Land Use and Transportation Chapter of the city's general plan. The stated transportation goals, policies, and action statements in the chapter delineate the operating standard for city streets (LOS D) and regional roadways and intersections (LOS E). Specific action items call for participating in coordinated regional land use and transportation planning, supporting alternative modes of transportation, optimizing the use of existing transportation facilities to minimize roadway widenings, and integrating complementary land uses to reduce overall travel and enhance the community environment (City of Sunnyvale 2011).

16.3 **Regional Setting**

ARC is located along the southern end of the San Francisco Bay, bounded by USFWS ponds to the north, Stevens Creek and the City of Mountain View to the west, US-101 to the south, and the City of Sunnyvale to the east.

US-101 is a major north-south route through the San Francisco Bay area, although it is aligned in an east-west direction in the vicinity of ARC. The other major freeways within the study area are SR 85 and SR 237. SR 85 is a north-south facility that begins at US-101 just west of ARC. SR 237 is an east-west facility that intersects with US-101 near the southeast corner of ARC.

The primary access points to ARC are provided along US-101 at the Moffett Boulevard and Ellis Street interchanges. The main gate to ARC is located on Moffett Boulevard, and provides connections to both US-101 and SR 85. A second major gate is located on Ellis Street, and provides a direct connection to US-101. Ellis Street may also be accessed from SR 237 via the Mathilda Avenue interchange and Manila Drive/Moffett Park Drive. Secondary gates are located to the west of Moffett Boulevard (Gate 17) and along the eastern boundary on 5th Avenue west of H Street (Lockheed-Martin gate). These routes to ARC are shown on Figure 16-1.

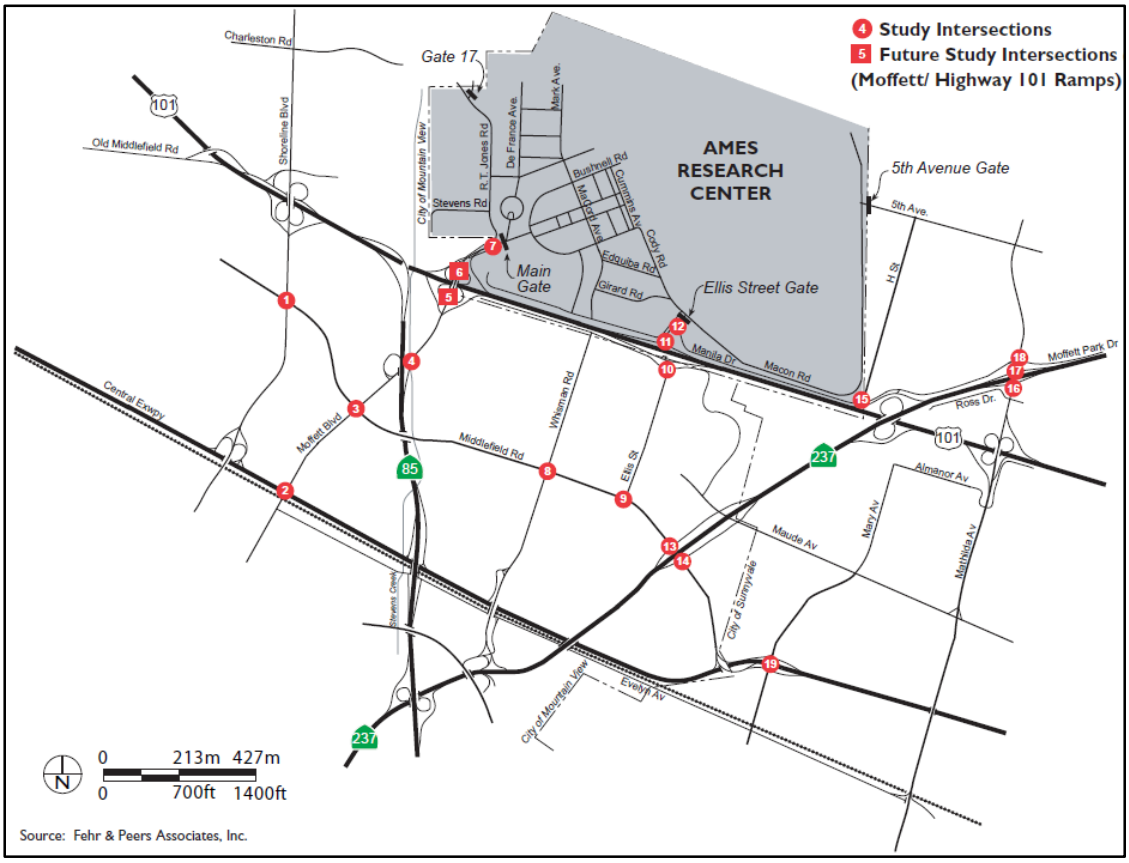

Figure 16-1. Primary Access Points

(Source: NASA 2009)

16.4 Existing Conditions

16.4.1 Regional Roadway Network

The major regional roadways that are most significant for ARC are summarized below.

16.4.1.1 *U.S. Highway 101*

US-101 is a major north-south route in California extending from Los Angeles past the Oregon state line. To the north, US-101 provides connections to San Francisco and cities throughout San Mateo County. To the south, it provides connections to Santa Clara and San Jose. Near ARC, US-101 has four lanes in each direction, with inside lanes designated as High Occupancy Vehicle (HOV) lanes during the peak commute periods on weekdays. There is also a US-101 and SR 85 connector, which includes new ramps and HOV lanes for Shoreline Blvd, Old Middlefield Road and access for US-101 and SR 85.

16.4.1.2 *State Route 85*

SR 85 is a circumferential freeway that originates at US-101 near ARC and goes south then east to rejoin US-101 in south San Jose. From ARC, SR 85 provides connections to Sunnyvale, Cupertino, and southern San Jose. For most of its length, SR 85 is a six-lane facility, with the inside lanes designated as HOV lanes during the peak commute periods. Ramps to and from SR 85 are provided on Moffett Boulevard southeast of US-101.

16.4.1.3 *State Route 237*

SR 237 is aligned to the southeast of ARC, running between SR 85 and Interstate 680(I-680) with connections to US-101 and Interstate 880 (I-880). On the key segment between US-101 and I-880, SR 237 is primarily a six-lane freeway, with the inside lanes designated as HOV lanes during the peak commute periods. It provides access to ARC from Milpitas to the east, as well as from East Bay further north up I-880 andI-680. Access from ARC to SR 237 is typically provided via US-101 from either the Ellis Street or Moffett Boulevard interchanges, although direct access is provided via Manila Drive/Moffett Park Drive and the SR 237/Mathilda Avenue interchange.

16.4.1.4 *Moffett Boulevard*

Moffett Boulevard is a four-lane arterial that serves as the primary connector into ARC. Regional access to ARC from Moffett Boulevard is provided via interchanges with both US-101 and SR 85 (to and from the south only).

16.4.1.5 *Ellis Street*

Ellis Street is four-lane arterial running between the South/Ellis Gate at ARC and Middlefield in Mountain View. Between Middlefield and the interchange with US-101, Ellis Street includes marked bicycle lanes in each direction.

16.4.1.6 *Manila Drive/Moffett Park Drive*

This two-lane roadway runs between Ellis Street and Mathilda Avenue along the edge of ARC. It runs mostly parallel to US-101. It provides access to the new light rail transit station and a connection between ARC and the SR 237/Mathilda interchange.

16.4.1.7 *H Street*

H Street is a two-lane roadway extending between Manila Drive and 3rd Avenue east of the airfield. This street crosses the VTA light rail line.

16.4.1.8 *5th Avenue*

5th Avenue is a two-lane roadway linking Macon Road within the airfield to Borregas Drive east of Mathilda Avenue. A security gate is located at the west end of the street. This street also crosses the VTA light rail line at Mathilda Avenue.

16.4.1.9 *Mathilda Avenue*

Mathilda Avenue is a multi-lane arterial southeast of ARC with interchanges at both US-101 and SR 237. In conjunction with Manila/Moffett Park Drive, Mathilda Avenue offers an alternative route for accessing these two freeways.

16.4.1.10 *Middlefield Road*

This two- to four-lane arterial extends through the study area roughly parallel to US-101. Middlefield Road intersects with both Ellis Street and Moffett Boulevard. Through the study area, Middlefield Road has two lanes in each direction.

16.4.1.11 *Central Expressway*

Central Expressway is a four-lane limited access arterial extending from southeast of Charleston Road in the City of Palo Alto to De La Cruz Boulevard in the City of Santa Clara. It provides a local alternate to US-101 and includes an at-grade intersection at Moffett Boulevard, as well as grade-separated interchanges at SR 85 (to and from the north only) and Middlefield Road.

16.4.2 Level of Service

LOS is a qualitative measure for stating the operating quality of a roadway facility, ranging from LOS A (free-flow conditions) to LOS F (congested conditions). Methodologies used to evaluate traffic LOS for regional roadways and intersections are described in the Traffic Level of Service Analysis Guidelines produced by VTA (VTA 2003). VTA administers the Santa Clara County's CMP and monitors the impact of land use decisions by the member jurisdictions. The methodology for evaluating intersection and freeway performance is described below.

The method for evaluating an intersection's operation is based on the average stopped vehicular delay. The average delay for signalized intersections is correlated to an LOS designation as shown in Table 16-1.

Table 16-1. Signalized Intersection Criteria

Level of Service	Average Delay Per Vehicle (Seconds)
A	delay ≤ 10.0
B+	10.0 < delay ≤ 12.0
B	12.0 < delay ≤ 18.0
B-	18.0 < delay ≤ 20.0
C+	20.0 < delay ≤ 23.0
C	23.0 < delay ≤ 32.0
C-	32.0 < delay ≤ 35.0
D+	35.0 < delay ≤ 39.0
D	39.0 < delay ≤ 51.0
D-	51.0 < delay ≤ 55.0
E+	55.0 < delay ≤ 60.0
E	60.0 < delay ≤ 75.0
E-	75.0 < delay ≤ 80.0

Level of Service	Average Delay Per Vehicle (Seconds)
F	delay > 80.0
Source: VTA 2003.	

Operations of unsignalized intersections are calculated using the procedures outlined in the current Highway Capacity Manual. The LOS rating is based on the average control delay for each minor street movement measured in seconds per vehicle. For all-way stop control intersections, LOS is defined for the intersection as a whole based on a weighted average control delay. Only the worst-case delay is used to identify LOS for two-way stop-controlled intersections (that is, stop signs on the minor street approaches). Table 16-2 presents the range of control delay that corresponds to each LOS designation.

Table 16-2. Level of Service Criteria for Unsignalized Intersections

Level of Service	Average Control Delay per Vehicle (Seconds)
A	≤ 10
B	10.1 to 15.0
C	15.1 to 25.0
D	25.1 to 35.0
E	35.1 to 50.0
F	> 50
Source: Transportation Research Board 2000.	

The method for evaluating freeway operations is based on density expressed as passenger cars per mile per lane. The LOS criteria for freeway operations are shown in Table 16-3.

Table 16-3. Freeway Level of Service Criteria

Level of Service	Density (vehicles per mile per lane)	Travel Speed (MPH)
A	≤ 11	60 – 65
B	11 < density ≤ 18	57 – 60
C	18 < density ≤ 26	54 – 57
D	26 < density ≤ 46	46 – 54
E	46 < density ≤ 58	35 – 46
F	> 58	< 35
Source: VTA 2003.		

Roadway system deficiencies and impacts are defined as occurring where the calculated LOS falls below the acceptable level of performance. VTA has established LOS E as the standard for signalized intersections on CMP facilities. In general, both Mountain View and Sunnyvale consider LOS D to be the minimum acceptable level of peak-hour operation for signalized intersections on non-CMP routes. Neither VTA nor the cities have established a minimum LOS standard for stop sign-controlled intersections. However, typical practice in these jurisdictions has been to accept LOS E operation for a particular movement or shared approach, but to investigate the possibility of signalization in cases where LOS F operations occur or are projected. Caltrans warrant criteria in the Highway Capacity Manual are used to help identify the need for signalization, especially in cases where vehicles on the minor street approaches are expected to experience extensive delay.

Both the cities of Mountain View and Sunnyvale have established LOS D to be the LOS standard for local roadways, and LOS E for regional roadways. Santa Clara County has also established LOS D as the standard for roadways in unincorporated areas and expressway facilities. In addition, Caltrans has a target level of service LOS at the transition between LOS C and LOS D on all SRs, including Interstate 280, US-101, SR 85, and SR 237.[13]

16.4.2.1 *Intersection Level of Service*

Based on the VTA's 2012 CMP Monitoring and Conformance Report (VTA 2012), most intersections in the vicinity of ARC currently operate at an acceptable LOS in conformance with local standards. Only two CMP study intersection in the neighboring jurisdictions, the El Camino Real/Grant Road intersection in Mountain View and the Lawrence Expressway/ Arques Avenue in Sunnyvale, currently operate at a deficient level (LOS E); however, neither of these intersections is in located close proximity to ARC. While traffic operations near ARC generally perform at an acceptable level, it should be noted that several locations operate at worse LOS based due to special circumstances. For example, at the Moffett Boulevard-Castro Street/Central Expressway intersection, crossing gates closing the south leg of the intersection to accommodate Caltrain passenger rail operations periodically disrupt normal traffic signal cycle operations. This activity increases delay for some movements and worsens overall LOS. It can take several cycles or more for operations to return to normal until the next train requires lowering of the crossing arms.

16.4.2.2 *Freeway Level of Service*

Several of the freeway segments near ARC operate at LOS F during one or both peak periods, including SR 85, SR 237, and US-101 (VTA 2012). These results illustrate the high level of existing congestion on the area's freeway system, particularly northbound on US-101.

16.4.2.3 *Internal Roadway Segment Level of Service*

With the closure of Moffett Field as a military base, most roadways within ARC carry relatively low volumes of traffic. There are currently no capacity or delay problems at any of the key internal intersections.

16.4.3 Bicycle and Pedestrian Facilities

Currently, there are bicycle facilities at two locations within ARC. To the north, there are marked bicycle lanes on Wright Avenue between the Moffett Extension and Hunsaker Road. To the south, a separate bicycle path was recently constructed adjacent to Macon Road between Ellis Street and the Lockheed Gate. Throughout the remainder of ARC, the low traffic volumes and the availability of sidewalks and shoulders result in a reasonable environment for cyclists.

[13] The transition between C and D corresponds on freeways to a volume to capacity ratio of 0.71 and a maximum freeway flow rate would be is 1,680 vehicles per hour per lane, as specified by Caltrans' "Guide for the Preparation of Traffic Impact Studies" (Caltrans 2002).

The Santa Clara County Bikeways map (VTA 2011) identifies several bicycle facilities near ARC. To the west, the Stevens Creek Trail intersects with Moffett Boulevard and Middlefield Road, and both cyclists and pedestrians can access ARC via a bridge over the creek and a bicycle and pedestrian path that extends from the Stevens Creek Regional Trail to the former Wright Avenue Gate (Gate 17). Moffett Boulevard is a designated bike route between the main gate of ARC and downtown Mountain View. Bike lanes have been marked on Moffett Boulevard on the east and west side of the US-1011 interchange, and on Ellis Street, west of the junction with US-101. Combined, these facilities provide for a high level of bicycle access to ARC. However, there are gaps in the system immediately adjacent to ARC. For example, the bike lanes on both Moffett Boulevard and Ellis Street do not extend through the respective interchanges. This creates a gap leading up to the main gate, and between the Ellis Street bike lanes and the Manila Drive bike lane. Existing bicycle facilities are shown on Figure 16-2.

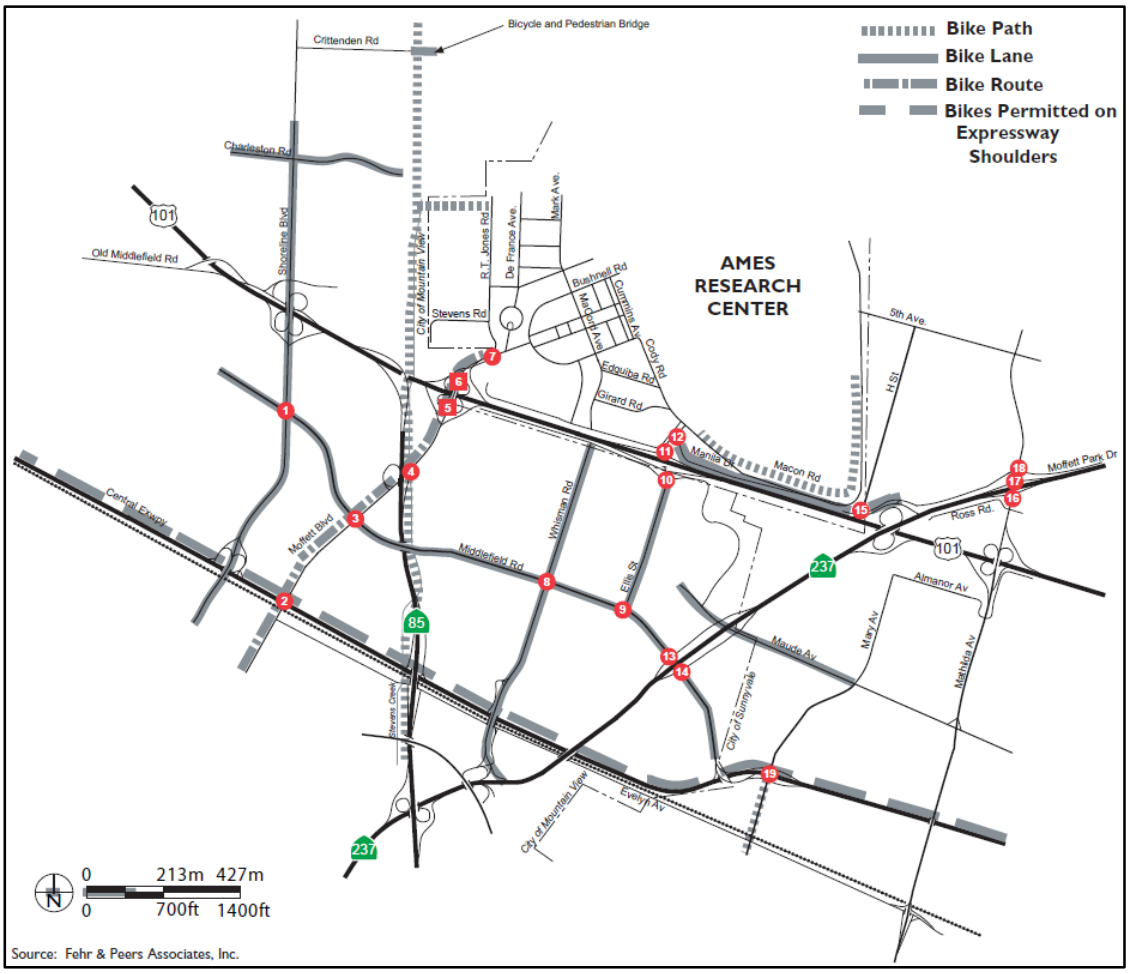

Figure 16-2. Existing Bicycle Facilities

(Source: NASA 2009)

Sidewalks currently exist on many ARC roadways, including most of those within the Ames campus area and the Shenandoah Plaza Historic District. In the remaining area of ARC, the

provision of pedestrian facilities is less consistent. For example, there are no sidewalks on Cody Road, and sidewalks are missing on parts of Edquiba and Girard roads. Outside of ARC, sidewalks currently exist on Moffett Boulevard, Ellis Street, and Manila Drive. Similar to the existing bicycle facilities, the lack of exclusive pedestrian facilities across US-101severely limits the viability of pedestrian activity as an alternative travel mode.

16.4.3.1 *Transit Service*

Public transportation is available through the Santa Clara County Transit System and Caltrain (Figure 16-3). In addition, VTA has extended light rail service from Campbell to Mountain View. The light rail line traverses the southern edge of ARC.

The primary transit service provider in the ARC area is VTA, which operates bus and light rail service throughout Santa Clara County. Only one transit bus route (Route 51) provides direct service to ARC. Route 51 operates between De Anza College in Cupertino and the ARC area, including service to downtown Mountain View. Service is provided at 20- to 60-minute headways. Additional express and fixed-route bus service is provided in the Moffett Park area in Sunnyvale (Routes 26, 54, 122, 321, and 328) and on Ellis Street, Whisman Road, and Middlefield Road (Routes 32 and 40) in Mountain View. However, these routes do not provide service close enough to the project site to generate substantial ridership.

The light rail connects ARC to downtown San Jose and downtown Mountain View, including the Mountain View Caltrain station. Trains run 24 hours a day at 15-minute headways during the peak periods and 30- to 60-minute headways during other periods (VTA 2014).

Caltrain operates between Gilroy and San Francisco, with the nearest station located in downtown Mountain View. NASA currently operates a shuttle between ARC and the Mountain View Caltrain station.

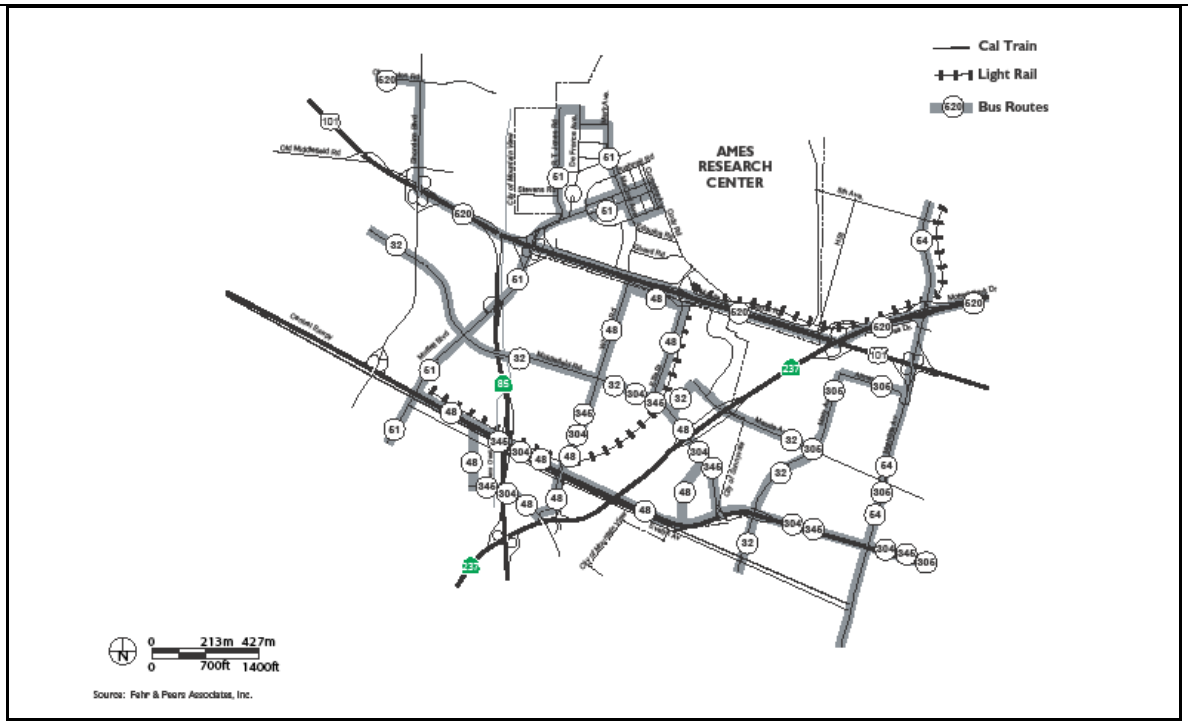

Figure 16-3. Existing Transit Service

(Source: NASA 2009)

16.4.4 Parking

Parking is currently accommodated at a number of lots and on-street locations throughout ARC. An inventory conducted in February and March 1999 identified more than 10,000 parking stalls or spaces within the entire ARC complex. Parking lots in the existing interior portion of ARC are relatively small and scattered and tend to be centralized near highly populated buildings. Parking also occurs on the internal road system at the facility and on adjacent areas. Visitor parking for about 50 cars and one bus is provided next to the visitor center, along Moffett Boulevard next to Building 943.

Overall, a concentration of people working in certain areas has caused a demand for parking spaces that often exceeds supply. Overflow parking must be utilized in these areas. This results in parking congestion, particularly during periodic conferences. Although the parking situation is inconvenient at times, it does not constitute a serious environmental problem.

16.5 Environmental Requirements

NASA has identified the following environmental plans, programs, policies, and measures that address potential transportation and traffic effects of operations and future development at ARC.

16.5.1 NASA Procedural Directive 8500.1, NASA Environmental Management

Per NPD 8500.1, it is NASA policy to: maintain compliance with all applicable federal, state, and local environmental requirements; to incorporate environmental risk reduction and sustainable practices to the extent practicable throughout NASA's programs, projects, and activities; and to consider environmental factors throughout the life cycle of programs, projects, and activities (as defined in NPD 7120.4, *NASA Engineering and Program/Project Management Policy*, and related documents), including planning, development, execution, and disposition activities. Examples of environmental factors include consideration of environmental impacts as required by the NEPA and NHPA; the proposed use of hazardous materials; the potential for waste generation; the need to acquire necessary permits, waivers, and authorizations; and the use of environmentally-preferable materials and processes wherever practicable.

16.5.2 NASA Procedural Requirements 8553.1, NASA Environmental Management System

NPR 8553.1 sets forth requirements for the NASA EMS, which functions primarily to: (1) incorporate people, procedures, and work practices into a formal structure to ensure that the important environmental impacts of the organization are identified and addressed; (2) promote continual improvement, including periodically evaluating environmental performance; (3) involve all members of the organization, as appropriate; and (4) actively involve senior management in support of the EMS.

Agencywide, the EMS employs a standardized approach to managing environmental activities that allows for efficient, prioritized system execution, while at the same time helping to improve environmental performance and to maintain compliance with applicable environmental regulations and requirements. NASA's EMS approach involves identifying all activities, products, and services under each NASA center's control, and the environmental aspects associated with each centers' continued engagement in those activities, products, and services. Once identified, priority environmental aspects are assigned a risk ranking (from 1 to 4, based on its severity and frequency of occurrence) and are evaluated on a continual basis as means of highlighting associated positive or negative impacts and setting objectives and targets to reduce environmental risk. Each center's EMS also identifies methods for ensuring compliance by keeping abreast of environmental requirements. This includes requirements by law (EOs, federal regulations, state and local laws) and voluntary commitments made by the center or NASA.

16.5.3 Ames Procedural Requirements 8500.1, Ames Environmental Procedural Requirements

APR 8500.1 sets forth general procedural requirements to ensure compliance with applicable federal, state, and local environmental laws; regulations and EOs; and NASA policies and procedures. Organizational directors, division chiefs, branch chiefs, section heads, supervisors, managers, and CORs are responsible for planning, designing, constructing, managing, operating, and maintaining facilities in conformance with applicable regulatory directives, and should obtain environmental review from the

Environmental Management Division early in project planning consistent with NASA's NEPA implementing procedures (NPR 8580.1 and EO 12114), NASA policies and procedures for programs and projects (NPR 7120), and NASA regulations related to environmental quality (14 CFR 1216). Program and project managers should coordinate with the Environmental Management Division in a timely manner to ensure that any new or modified programs, projects, and activities comply with regulatory requirements.

16.5.4 Ames Procedural Requirements 8553.1, Ames Environmental Management System

APR 8553.1 sets forth requirements for the Center-level EMS in accordance with NPR 8553.1B, *NASA Environmental Management Systems*. The ARC EMS also includes consideration of the findings of NASA Headquarters' triennial (3-year) Environmental Functional Review and other external EMS audits, as required.

Under the ARC EMS, the Center conducts an annual risk analysis across Center activities to determine which of 16 environmental aspects are of high or medium priority. The Center then identifies objectives (goals) and targets and develops action plans known as Environmental Management Plans to reduce identified risks. Currently, the high- and medium-priority environmental aspects of Center business activities are *Air Emissions*, *Hazardous Material Management*, *Water and Energy Conservation*, and *Other Sustainability Practices*. Objectives associated with these high- and medium-priority environmental aspects include:

- Reducing air (including GHG) emissions through energy efficiency
- Improving hazardous material management
- Improving energy and water efficiency
- Providing for the integration of other sustainability practices into Center activities

16.5.5 Ames Environmental Work Instructions

Ames's EWIs, which replace the previous Ames Environmental Handbook (APR 8800.3), set forth requirements to ensure that programs, projects, and activities at ARC comply with applicable federal, state, and local laws; regulations and EOs; and NASA policies and procedures. Each EWI lists relevant regulatory authorities and documents, assigns individual and organizational responsibilities within ARC, and identifies specific requirements applicable to the work being performed.

The following EWIs are relevant to operations and future development at ARC with the potential to impact traffic and transportation.

- EWI 12, Public Involvement
- EWI 14, NEPA and Environmental Justice
- EWI 18, Environmental Requirements for Construction Projects (Under review)

16.5.6 ARC Transportation Demand Management Programs

NASA has established a number of TDM or similar programs for employees that help reduce the number of automobiles trips generated by the existing uses in the Ames Campus and NASA Research Park areas. Such programs are governed by a variety of federal environmental statutes, regulations, and EOs, which require federal agencies to address transportation issues with the goal of eliminating environmentally wasteful or harmful practices, increasing energy efficiency, and reducing GHG emissions (see Chapter 2, *Existing Facilities, Operations, and Their Impacts*).

16.5.6.1 *Ames Commute Alternatives Program*

ARC actively supports automobile trip reduction through the Ames Commute Alternatives Program (ACAP). Through the ACAP, ARC provides information on ridesharing, mass transit, and telecommuting; promotes participation in Bike-to-Work and Spare-the-Air events; and operates a shuttle bus that runs to and from the Mountain View Caltrain station and Bayshore VTA light rail station during morning and afternoon commute hours.

Overall, NASA's existing programs for the NASA-controlled portion of ARC results in an estimated 21% reduction in the number of single-occupant vehicle trips generated by the ARC personnel relative to the typical number of single-occupant trips that would otherwise be expected from a similar number of employees in Santa Clara County. For further details on the ACAP, refer to the discussion in Chapter 20, *Sustainability*.

16.5.6.2 *NASA Research Park and Bay View Transportation Demand Management Plan*

Under the NADP, NASA has developed an aggressive TDM plan that governs all NRP partners, lessees, and tenants in the NRP and Bay View areas. The plan includes TDM strategies designed to achieve the greatest, reasonable level of vehicle trip reduction, such as parking fees, site-wide EcoPass, a robust shuttle service combined, marketing, guaranteed ride home, and on-site housing.

The goal of the TDM plan for the NRP and Bay View areas is to achieve an Average Vehicle Ridership (AVR) of 1.72 at project build-out. A 1.72 AVR means that for every 100 employees/students coming to the site, 58 vehicles are utilized for transportation (100/58 = 1.72).

Based on the projected numbers of off-site employees, students, and visitors that would be generated by NADP projects, it was estimated that this non-resident population could achieve a 22 percent trip reduction under the TDM plan. In addition, with the provision of onsite housing under the NADP, it was estimated that there would be an additional reduction in project-generated vehicle trips of 10 % or more, since onsite residents would be expected to work or attend classes within the NRP. As designed, the TDM Plan for the NADP and Bay View Areas includes four phases to ensure that the programs are implemented in a manner that is supported by the level of development on site. The NRP and Bay View TDM Plan's phasing requirements are based upon the total number of employees working at proposed NADP sites plus CUP EA sites. Upon commencement of

Phase 1, the plan relies on the formation of a Transportation Management Agency, or TMA, composed of dues-paying NRP and Bay View partners, lessees, and tenants as the means for running the site-wide TDM programs, managing the parking supply, and providing support to employers for any employer-specific programs.

The NRP and Bay View TDM Plan is included in Appendix B of the NADP EIS.

16.5.7 NASA Ames Development Plan Final Programmatic Environmental Impact Statement (NADP EIS)

The NADP EIS identifies the following mitigation measures to address potential transportation and traffic impacts from build out of NADP Mitigated Alternative 5.

16.5.7.1 *Mitigation Measure CIR-1*

As part of the NADP, NASA and its partners shall implement an aggressive Transportation Demand Management (TDM) program designed to reduce trip generation by a total of at least 22 percent. TDM measures are phased as described in Appendix B of the FPEIS. Each phase specifies an Average Vehicle Ridership (AVR) goal. NASA will not proceed to the next phase of development until the AVR goal of the previous phase is achieved. In addition, on-site housing will be constructed to reduce vehicle trip generation to external streets and freeways by internalizing trips to onsite employment centers and amenities.

To completely mitigate the highway impacts of the proposed project under any of the development alternatives, each highway segment would have to be widened to provide an additional travel lane in at least one direction or other capacity improvements would have to be made. In many cases, widening is infeasible due to right-of-way constraints and the proximity of existing building structures and development. Immediately adjacent to the project site, for example, Highway 101 could not be widened because of the proximity of Manila Drive and the VTA light rail line. In addition, large-scale freeway widening projects are beyond the scope of a single project and could only garner a relatively small fair-share contribution towards the improvement. Therefore, despite the substantial trip reductions from implementation of the TDM program, the increase in vehicle trips and congestion on the highway system associated with implementation of the NADP would be a significant, unavoidable impact. NASA will work with VTA and Caltrans to consider other mitigations.

16.5.7.2 *Mitigation Measure CIR-3*

Intersection of Moffett Boulevard/Clark Memorial Drive/R.T. Jones Road. Development under the NADP would include the following improvements to achieve acceptable operations and minimize queuing at this intersection:

- *Installation of a traffic signal.*
- *Provision of the following lane configurations:*
    - *Northbound (from Space Camp/base housing): one left - turn lane, one shared lane through/right turn lane.*
    - *Southbound (from Bay View): one left-turn lane, one through lane, and one "free" right-turn lane (i.e., the right-turn movement would not be controlled by the signal and would require a third westbound receiving lane on Moffett Boulevard).*
    - *Westbound (from Clark Memorial Drive): one left-turn lane, two through lanes, and one right-turn lane.*
    - *Eastbound (from Highway 101): two left-turn lanes, one through lane, and one shared through/right turn lane.*

This measure would provide LOS C or D operations or better during all periods under all alternatives.

16.5.7.3 *Mitigation Measure CIR-6*

Development under the NADP would modify the Ellis Street underpass to better accommodate bicyclists. Two options are proposed.

One option would be to shift all of the vehicle travel lanes to the north by 4 to 5 meters (12 to 15 feet). Currently, two travel lanes are provided in each direction between three sets of concrete piers. By moving the westbound lane to the north side of the northernmost piers and shifting the other lanes accordingly, additional width could be provided to accommodate bicycle lanes. The northern abutment would have to be rebuilt with a retaining wall similar to the design that was implemented to accommodate the light rail tracks. If this option were implemented, bike lanes would be at least 1.5 meters (5 feet) wide, and adequate signage and lighting would be provided. Figure 4.3-6 illustrates this measure. The feasibility of this improvement would have to be evaluated by a structural engineer and by Caltrans since the intersection configurations at the two adjacent ramp intersections would have to be modified.

Another option would be modify the intersection to provide reversible 2.4-meter (8-foot) lanes that would allow for two lanes of car traffic and one lane of eastbound bike traffic in the morning and only one lane of car traffic and one lane for bikes in a westbound direction. In the afternoon/evening, the extra lane would provide westbound traffic flows.

Again, adequate signage and lighting would be provided. Implementation of this mitigation measure would reduce the potential impact on bicyclist safety to less-than-significant levels. If this improvement is determined to be infeasible and no alternative is found, then the impact would remain significant and unavoidable.

16.5.7.4 *Mitigation Measure CIR-7*

Improvements to facilities within Caltrans right-of-way associated with the development proposed under the NADP shall adhere to the conditions and requirements of Caltrans statewide NPDES Permit CAS #000003, Order #99-06-DWQ and NPDES General Permit CAS #000002, Order #99-08-DWQ, and shall incorporate Treatment Best Management Practices described in Section 4.4 of the Storm Water Management Plan which implements the statewide NPDES permit, as such requirements specifically apply to the proposed improvements. In general, this would include the preparation and implementation of a Storm Water Pollution Prevention Plan and Best Management Practices for construction and post-construction conditions for each such project.