Section 3.6
Community Services

3.6.1 Introduction

This chapter includes an analysis of community services along the Connector project corridor. Community services, such as fire protection, emergency response services, and police services, are essential for ensuring the health and safety of citizens and their property. This section includes an assessment of existing community services along the project corridor, as well as an analysis of potential impacts to these community services related to the construction and operation of the preferred alternative.

Impacts to parks are addressed in Section 5, Section 4(f) Evaluation.

3.6.2 Existing Conditions

Fire Protection and Emergency Response Service

Service Provider and Level of Service

The City of Oakland Fire Department provides fire protection and emergency services to the entire City of Oakland, including, as of January 17, 1998, the Oakland International Airport (OIA). There are 496 firefighters on the force, with a minimum of 131 individuals on duty at any one time.

For the entire Fire Department, approximately 73 percent of all responses are medically related, while approximately 6 percent are for structural fires. The remaining responses are related to a wide range of incidents, including commercial fire alarms, hazardous material incidents, vehicle and confined space extrications, vehicle fires, and outdoor fires (Kelly, 2000).

Average response time in the City of Oakland is 4½ minutes, with a response time of under five minutes occurring 95 percent of the time (Kelly, 2000). Each fire station is capable at all times of providing fire protection, fire rescue, and emergency response, including emergency medical services. In addition, each station is expected to be able to provide paramedics service by 2000 (Wittmer, February 11, 2000).

- The project corridor is primarily served by four fire stations, each located within 0.5 mile of the project corridor (see Figure 3.6-1):

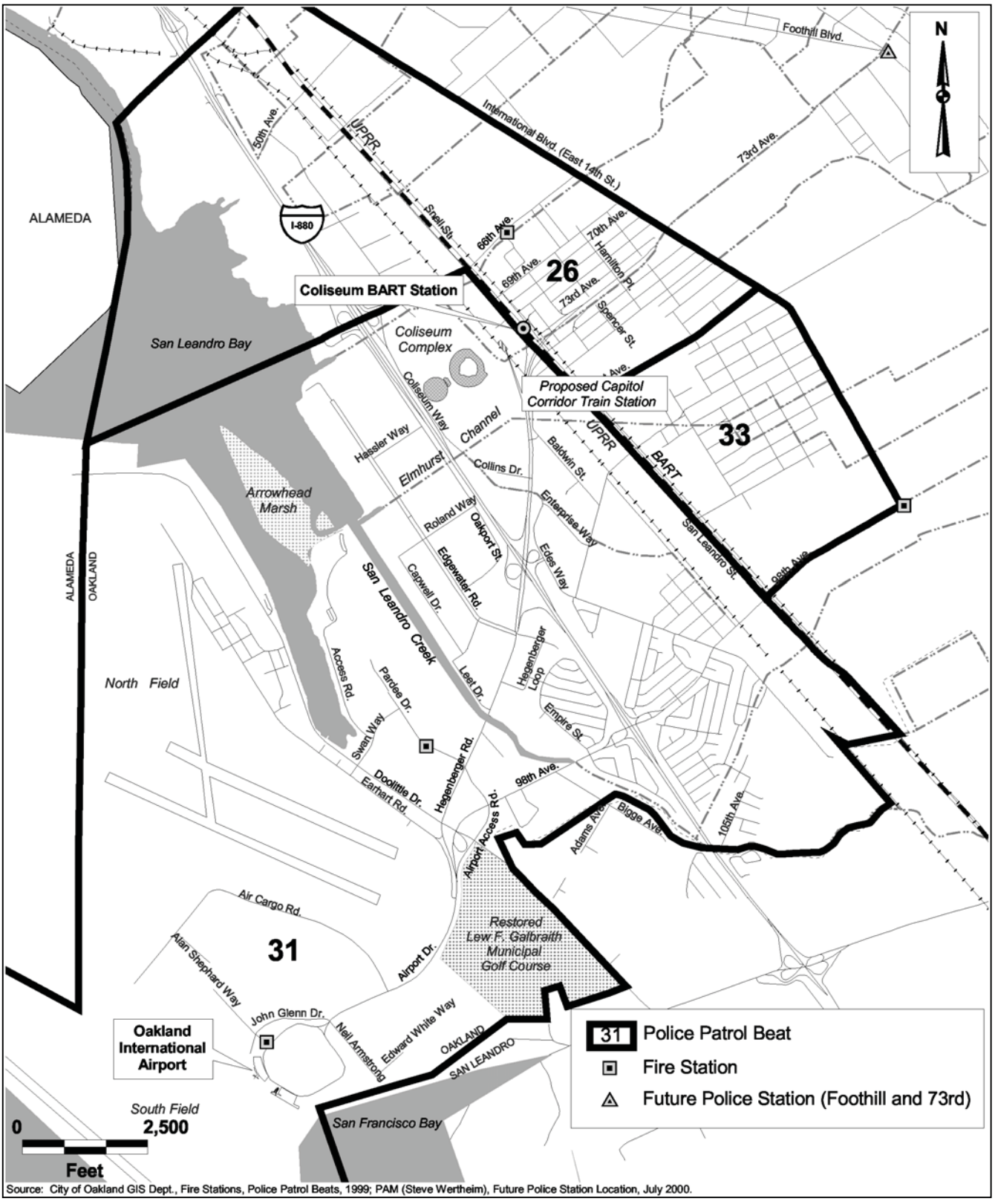

Figure 3.6-1
Police Patrol Beats and Fire Stations in the Study Area

- Station 20 at 1401 98th Avenue is staffed with two units, including a minimum of eight firefighters at any one time and the Battalion Chief. This station provides support to Stations 22, 27, and 29. In 1999, Station 20 responded to 4,654 calls. Of those calls, 64 percent were for medical response and 11 percent were for structural fires. The remaining 25 percent of call dealt with a wide range of issues including commercial alarms, outside fires, extrications, natural and grassland fires, and vehicle fires.

- Station 22 at 751 Air Cargo Road (located at the OIA) is staffed with a minimum of seven firefighters at any one time. Within the project corridor, this station handles calls at the OIA. In 1999, Station 22 responded to 644 calls. Of those calls, 73 percent were for medical response and three percent were for structural fires. Nine percent of all calls were by the OIA to address airplane-related issues. The remaining 15 percent of calls were related to a wide range of issues, including commercial fire alarms, smoke investigations, and outside fires.

- Station 27 at 8501 Pardee Drive is staffed with a minimum of four firefighters at any one time. Within the project corridor, this station handles calls between I-880 and OIA. In 1999, Station 27 responded to 2,319 calls. Of those calls, 72 percent were for medical response and 8 percent were for structural fires. The remaining 20 percent of calls were related to a wide range of issues, including commercial fire alarms, vehicle fires, OIA-related incidents, outside fires, and extrications.

- Station 29 at 1016 66th Avenue is staffed with a minimum of four firefighters at any one time. Within the project corridor, this station handles calls between I-880 and the Coliseum BART Station. In 1999, Station 29 responded to 3,025 calls. Of those calls, 70 percent were for medical response and 12 percent were for structural fires. The remaining 18 percent of calls were related to a wide range of issues, including commercial fire alarms, outside fires, vehicle fires, OIA-related incidents, and smoke investigations.

The City of Oakland Fire Department has seven ladder trucks. The closest ladder truck to the project corridor is located at Station 20. Another ladder truck that could respond to calls within the project corridor is located at Station 18, at 1700 50th Avenue. The City of Oakland also maintains a heavy rescue truck at Station 1, located at 1601 Martin Luther King Way in downtown Oakland.

Although the Fire Department does not have any formal agreements with BART, they do have a close working relationship (Flanigan, 2000). BART trains Fire Department personnel on handling situations on BART facilities, including the Transbay Tube from San Francisco to Oakland. In addition, BART and the Fire Department hold debriefing sessions after major incidents, to discuss techniques and approach used. Finally, BART has a Fire Liaison Committee that has representatives from each fire district in which BART has service, including the Oakland Fire Department.

While the Fire Department handles day-to-day emergencies within the City of Oakland, the Office of Emergency Services (OES) plans for and coordinates major emergency response efforts involving major natural and technological disasters. The City's emergency response plans are documented in the Emergency Operations Plan (EOP, draft 1993, no final) and the Disaster

Operations Manual (adopted March 10, 1998). The EOP does not address ordinary day-to-day emergencies. These incidents are addressed by established fire and police departmental procedures. The EOP was developed to be in compliance with the State's Standardized Emergency Management System (SEMS). The City of Oakland must follow SEMS to be eligible for disaster-related assistance and reimbursement of personnel costs.

Applicable Policies and Regulations

The City of Oakland's Adopted Policy Budget (1999-2001) contains the City's goals for fire protection and emergency services. These goals include:

- Providing comprehensive emergency services, including fire suppression, heavy rescue, emergency and medical services, hazardous material emergency services, public education and training, emergency preparedness and fire prevention to the Oakland community in the most effective manner.

- Introducing, implementing, expanding, and enforcing new and existing fire codes and regulations to protect the citizens and property in the City of Oakland.

- Implementing a firefighter paramedic program.

Specific policies for day-to-day operations are contained within the Fire Department's Policy and Procedures Manual (no date) and Operations Manual (no date).

Police Service

Service Provider and Level of Service

City of Oakland

The City of Oakland Police Department provides police protection to the City of Oakland, including the OIA. The Port of Oakland, which operates OIA, does not maintain its own police force, but pays the City of Oakland to provide police protection on its property. There are 648 sworn officers in Oakland, with 40 to 100 officers on patrol at any given time. The officers are centrally headquartered in downtown Oakland at 455 7th Street. However, a new precinct is expected to open before the end of 2000 at the intersection of 73rd Street and Foothill Boulevard. Once completed, this precinct would serve the project area.

The project corridor is predominantly within Patrol Beat 31 (see Figure 3.6-1). Calls in the vicinity of the Coliseum BART Station are handled by Patrol Beat 26. Based on FAA regulations (Dunbar, 2000a), there are also two officers at OIA during hours of operation, in the terminal and parking lots.

Within the project corridor, and in the City of Oakland in general, response times vary. High priority incidents (i.e., life-threatening situations) are dispatched immediately. Medium priority incidents are typically dispatched within 5 to 10 minutes, and low priority incidents (i.e., report writing for incidents that have already occurred) may take over an hour (Brunning, 2000).

In the vicinity of the project corridor, the following crimes were reported to the Oakland Police Department for the three-year period between 1997-1999 (Oakland Police Department Crime Analysis Section, 2000):

- 307 stolen vehicles
- 80 armed robberies
- 5 carjackings
- 24 assaults with a deadly weapon
- 90 commercial burglaries
- 496 locked automobile burglaries
- 2 residential burglaries
- 1 kidnapping for robbery

BART Police

BART maintains its own police force. The BART Police Department protects the safety and security of patrons, employees and property throughout the BART District.

BART has 180 sworn officers, with a minimum of 25 officers available during the day and evening. Between the hours of 1:30am and 5:30am there are generally six officers on duty. Average emergency response time is 4 minutes or less. Average non-emergency response time is 9 minutes or less (Gomes, 2000a). For special events at the Coliseum, up to 12 officers are assigned to the Coliseum BART Station and immediate vicinity.

BART Police also provides police coverage of the AirBART service at the Coliseum BART Station. This coverage is provided approximately 40 hours a week and is staffed by existing BART Police staff on overtime (White, 2000).

Within the project corridor, the following crimes were reported to the BART Police during 1997-1999:

- 101 auto thefts
- 612 other thefts
- 2 burglaries
- 40 armed robberies
- 1 aggravated assault.

BART considers the high level of "other thefts" to be an anomaly, because criminals had discovered how to defraud BART ticket machines during 1998/1999, which is a felony theft (Gomes, 2000b). BART has resolved this problem.

- BART Police has established working relationships with Oakland Police Department, especially around the Coliseum BART Station. Both BART Police and the Oakland Police Department are members of the Coliseum Task Force, Coliseum Complex Security Committee, and the Coliseum Commerce Center Advisory Committee.

Applicable Plans and Policies

City of Oakland

The City of Oakland's Adopted Policy Budget (1999-2001) contains the City's goals for police protection. These goals include:

- Reducing crime, traffic, and quality of life offenses through the community-oriented policing philosophy and strategies.
- Maintaining a high level of citizen satisfaction with police services.

Specific policies for day-to-day operations are contained in the Police Department's general orders and training bulletins.

BART Police

BART Police's applicable policies are compiled in the Department's Goals and Objectives document (BART Police Department, 2000). Goals identified by the BART Police Department include:

- Providing effective and efficient police services to customers and employees to deter crime and enhance the perception of safety to the public and employees.
- Maintain a high level of readiness to deal with major critical incidents within the District, either natural or man-made.
- Objectives identified by the BART Police Department include:
- Maintain the rate of Part I crimes[1] against persons at or below 1.75 crimes per million trips per quarter.
- Maintain average emergency response time at four minutes or less.
- Maintain an overall police presence of at least 14 percent based on Passenger Environmental Survey statistics.
- Conduct monthly training and drills to maintain a level of preparedness within the Department's Special Problems and Rescue Team to address high-risk search entries, barricaded suspects, hostage situations, or other law enforcement situations which can be anticipated within the District that may require special tactics or equipment.

[1] Part I Crimes include: murder, rape, robbery, aggravated assault, battery, assault, burglary, theft and arson.

3.6.3 Impact Assessment and Mitigation Measures

Standards of Significance

The significance criteria utilized in analyzing impacts to community services are based upon Appendix G of the CEQA Guidelines. According to CEQA, a proposed project would result in significant community services impacts if the proposed project would:

- trigger the need for new police department or fire department facilities in order to maintain acceptable service ratios, response times, or other performance associated with fire protection or police protection, and the construction of those facilities were to cause significant environmental impacts.

Methodology

The primary data source for this analysis was information from emergency service providers in the project area. These include the City of Oakland Police and Fire Departments and the BART Police Department. To determine potential impacts of the preferred alternative, representatives from each of the emergency service providers were consulted. A description of the preferred alternative, including information about construction activities and operational characteristics, was provided. The representatives of the emergency service providers were asked to estimate potential impacts of the preferred alternative on existing service and staffing levels. The results of these consultations are presented below.

Preferred Alternative Environmental Analysis

Impact CS-1. Increased need for fire protection and emergency response during operation phase

The AGT guideway is required to have an emergency walkway for use by passengers and service providers (fire fighters and emergency personnel). The emergency walkway would extend the length of the guideway or be incorporated into the guideway structure. The elevated portion of the guideway would not obstruct access to other properties. Emergency vehicles and personnel could move freely under it and around it (see photo simulations in Section 3.4, Visual Quality). The Oakland Fire Department has confirmed that operation of the elevated portions of the AGT would not impact the City of Oakland Fire Department (Whittmer, July 13, 2000). Presence of the guideway would be a less-than-significant impact.

The operation of a BART Station at the Airport and the increased intensity of use of the Coliseum BART Station would increase the workload for the City of Oakland Fire Department and may require additional staffing at Station 22, at OIA (Wittmer, July 14, 2000). However, this station has the capacity to handle increased staffing (Wittmer, July 24, 2000). The tunnel constructed for this alignment under Doolittle Drive would present an obstacle for firefighters if it is not constructed with amenities to improve fire response services. (S)

Median Option. In the event engineering design refinements require the use of the median instead of the preferred alternative alignment, impacts to the City of Oakland Fire Department would not differ from those resulting from other aerial guideway segments of the preferred alternative. (LTS)

Mitigation Measures. The following mitigation measure would reduce the impacts of the AGT to a less-than-significant level. (LTS)

CS-1(i) Incorporate Fire Protection Measures Into the Tunnel Under Doolittle Drive. Water supply, lighting, and communication systems shall be incorporated into the design of the tunnel beneath Doolittle Drive consistent with BART design criteria to ensure that the Oakland Fire Department can provide necessary fire protection and emergency response.

Impact CS-2. Increased need for police services during operation phase.

The preferred alternative would not significantly increase the amount of work required of the City of Oakland Police Department (Dunbar, 2000). The BART Police Department would be required to hire additional officers to provide full coverage of the Coliseum AGT Station. These officers would utilize the existing facilities at the Coliseum BART Station.

If the Airport AGT Station is under BART jurisdiction, the BART Police Department would be required to create a new beat to provide service. The creation of a new beat would require additional staffing, equipment and facilities (White, 2000). Reporting facilities for BART police would consist of a room with a telephone and perhaps some other communications equipment. This provides a location other than the station agent's booth or a police car for the BART officers to use. The reporting facilities themselves do not generate an impact, but lack of the facilities can hinder community services and security work.

The creation of intermediate stops would require additional patrolling by BART Police and therefore would place additional demands on the BART Police Department (White, 2000). The intermediate stops would be patrolled from the new beat created to service the Airport AGT Station as discussed above. (PS)

Median Option. The incorporation of the Median Option into the project alignment would have no impact on the potential project need for BART police facilities at AGT stations. (NI)

Mitigation Measures. The following mitigation measures would help reduce the impacts of the AGT to a less-than-significant level. (LTS)

CS-2(i) Incorporate a Full BART Police Reporting Station into the Airport Station. If the Airport BART Station is under the jurisdiction of the BART Police, then provision of police reporting facilities at OIA shall be incorporated into the design of the new OIA station. This shall include a secure parking area for two BART Police vehicles at OIA.

CS-2(ii) Improve Coliseum BART Police Reporting Station. If the Airport BART Station is not under the jurisdiction of the BART Police, reporting facilities at the Coliseum BART Station will be improved as necessary to accommodate the extra police activity related to the intermediate stops.

Partial ADP Scenario

The Partial ADP scenario would not change the demand for community service personnel or facilities identified for the preferred alternative with the ADP. Impacts to the Oakland Police Department, the BART Police Department, and the Oakland Fire Department would be the same as described above.

Cumulative Analysis

ABAG *Projections 2000* estimates for the year 2020 acknowledges future population, housing, and employment growth that is envisioned by the City of Oakland General Plan, the Coliseum Redevelopment Plan, the Coliseum Station Area Plan, and the Gateway Development Study. The ABAG projections for the City of Oakland anticipate a 9.3 percent growth in population, a 22.2 percent growth in employment, and a 3.3 percent growth in housing from 2005 to 2020. The ABAG projections for the project study area anticipates a 8.3 percent growth in population, a 21.0 percent growth in employment, and a 4.1 percent growth in housing from 2000 to 2020. In addition to the ABAG projections, eight development projects in the project corridor area are expected to be completed by 2005. The eight projects include 730 hotel rooms and nearly 2 million square feet of office, research and development, and distribution space. The analysis conducted for the City of Oakland General Plan EIR (1998) concluded that these increases would not cause harmful growth and are consistent with the public policies created for the study area.

The expected increase in population and employment in the vicinity of the project area may cause cumulative impacts related to the fire protection and emergency response services. However, as discussed above, the preferred alternative would have no effect on the ability of the City of Oakland Fire Department to provide fire protection and emergency response services in the vicinity of the project. Therefore, the project would not contribute to any cumulative impacts related to fire protection and emergency response services.

The expected increase in population and employment in the vicinity of the project area may also cause cumulative impacts related to the police services. This increase would not cause a cumulative impact to BART Police, as the jurisdiction of the BART Police is limited to BART property. In addition, this increase would not cause a cumulative impact to the City of Oakland Police Department. As discussed above, the preferred alternative would have no effect on the ability of the City of Oakland Police Department to provide police service in the vicinity of the project.

References

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City of Oakland Police Department Crime Analysis Section, Crime Statistics for the Project Corridor, received February 11, 2000.

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City of Oakland Fire Department, *Operations Manual*, no date.

City of Oakland Office of Emergency Services, *Emergency Response Plan*, 1993.

City of Oakland Office of Emergency Services, *Disaster Operations Manual*, March 1998.

Deputy Chief Peter Dunbar, City of Oakland Police Department, telephone conversation, February 4, 2000.

Mike Flanigan, BART Safety Department, telephone conversation, June 7, 2000.

Commander Wade Gomes, BART Police Department, personal conversation, February 8, 2000.

Commander Wade Gomes, BART Police Department, Coliseum Station crime statistics, received February 10, 2000.

Captain Mike Kelly, Oakland Fire Department, telephone conversation, February 15, 2000, faxed information, March 21, 2000

Stan Kopaz, MOIA Airport Safety Supervisor, telephone conversation, February 8, 2000.

Henry Renteria, City of Oakland Office of Emergency Services, in person conversation, February 4, 2000

Lieutenant Maria White, BART Police Department, telephone communication, July 8, 2000.

Captain Bill Wittmer, Oakland Fire Department, telephone conversation regarding existing conditions, February 11, 2000

Captain Bill Wittmer, Oakland Fire Department, fax transmission regarding project impacts, July 14, 2000

Captain Bill Wittmer, Oakland Fire Department, telephone conversation regarding project impacts, July 24, 2000

Section 3.7
Utilities

3.7.1 Introduction

This section of the FEIR/FEIS identifies the existing utility lines along the project corridor and describes potential impacts to these lines from construction of the Connector. The utilities covered include drinking water, wastewater, stormwater, and telephone, natural gas, and electricity service. The discussion focuses on major utility corridors that could be adversely affected by project construction. Issues concerning energy consumption can be found in Section 3.13, Energy.

3.7.2 Existing Conditions

Drinking Water

The East Bay Municipal Utility District (EBMUD) supplies drinking water to customers within the Connector study area. The approximate locations of the water supply lines are shown on Figure 3.7-1. General diameter ranges for pipelines within the project corridor are summarized in Table 3.7-1. Generally, the water lines run through the middle of the northbound side of Hegenberger Road from the Union Pacific Railroad (UPRR) corridor north of Baldwin Street to Coliseum Way, through the median of Hegenberger Road from Coliseum Way to Doolittle Drive, and then along the east side of Airport Drive from Doolittle Drive to the airport (City of Oakland, 2000). The waterline location will change as part of the Airport Roadway Project. Along Airport Drive from Doolittle Drive to Air Cargo Road, the waterline will be located on the west side of Airport Drive. The waterline will be relocated along the east side of Airport Drive south from Air Cargo Road (Port of Oakland, 2000b).

Wastewater and Stormwater

Sanitary wastewater and stormwater service in the area of the project corridor is provided by EBMUD. Wastewater and stormwater lines are owned by the City of Oakland. EBMUD owns and operates the pump and lift stations and interceptors that transport the gravity-fed wastewater to EBMUD's wastewater treatment plant.

Wastewater Lines

In general, wastewater lines are located along the north side of San Leandro Street at the Hegenberger Road off-ramp; along Baldwin Street and south to the east side of Hegenberger at Coliseum Way; along the east side of Hegenberger Road from Collins Drive to Coliseum Way; and along both the west and east sides of Hegenberger Road for approximately 500 feet south from Collins Drive. The EBMUD 42-inch diameter interceptor enters the project corridor near Edes Avenue and follows the southbound lanes of Hegenberger Road south to Leet Drive. Additional wastewater lines are located along the west side of Hegenberger Road from south of

Table 3.7-1
Drinking Water Pipelines in the Project Corridor

Street	*Location*	*Size (inches)*
San Leandro Street	71st Street to 81st Street	12" – 20"
71st Avenue	San Leandro Street to end	6" - 10"
73rd Avenue	San Leandro Street to end	6" – 10"
77th Avenue	San Leandro Street to Hegenberger Road	6" – 10"
Hegenberger Road	77th Avenue to Edes Avenue	6" – 10"
	Oakport Street to Edgewater Drive	12" – 20"
	Edgewater Drive to Hegenberger Loop	6" – 10"
	Hegenberger Loop to Leet Drive	12" – 20"
	Leet Drive to Hegenberger Court	6" – 10"
	Hegenberger Court to Pardee Drive	12" – 20"
	Pardee Drive to Doolittle Drive	6" – 10"
Baldwin Street	Hegenberger Road to 85th Avenue	6" – 10"
Collins Drive	All piping along street	6" – 10"
Edes Avenue	Hegenberger Road to Enterprise Way	6" – 10"
Oakport Street	Roland Way to Hegenberger Road	12" – 20"
Edgewater Drive	Pendelton Way to Hegenberger Road	6" – 10"
Hegenberger Loop	All piping along street	6" – 10"
Pardee Drive	All piping along street	12" – 20"
Doolittle Drive	Swan Way to Hegenberger Road (north side)	10"
	Hegenberger Road to Adams Avenue	12" – 20"
Earhart Road	Swan Way to Hegenberger Road	6"
98th Avenue	Airport Drive to Empire Road	12" – 20"
Airport Drive	Doolittle Drive to middle of OIA Long Term Parking	12"
	OIA Long Term Parking southwest to Airport Drive	10"
	Northwest side of Airport Drive circle	6"
	Southwest side of Airport Drive circle	12"
	Airport Access Road and Airport Drive, turning at John Glenn Drive	20"
Sally Ride Way	All piping along street	20"
Neil Armstrong Way	All piping along street	8"
John Glenn Drive	All piping along street	12" – 20"
--	Northwest-southeast through Long Term Parking	6" – 8", 12"

Source: EBMUD, 1997a; EBMUD, 1997b; Port of Oakland, 1997.

Leet Drive to Pardee Drive; the line along Hegenberger Place crosses Hegenberger Road and connects to the line along the west side of Hegenberger Road; a separate line extends along the west side of Hegenberger Road from south of Pardee Drive to Doolittle Drive, with a connection crossing Hegenberger Road at Doolittle and connecting to the line along 98th Avenue that extends from south of Airport Access Road.

South of Doolittle Drive, the Port of Oakland wastewater lines extend from along Earhart Road along the west side of Airport Drive until south of John Glenn Drive where the lines diverge and follow the circular loop of Airport Drive to the passenger terminals.

EBMUD's Wastewater Pump Station G, located between Doolittle Drive and Earhart Road on Swan Way, handles flows from OIA and other dischargers in the Connector area. From Pump Station G, a 3,000-foot force main conveys wastewater to the south end of the EBMUD gravity interceptor, near the intersection of Hegenberger Road and Leet Drive. The 42-inch interceptor, which also accepts flows from project corridor area, feeds the wastewater by gravity to EBMUD's treatment plant at the foot of the Bay Bridge (Port of Oakland, 1997).

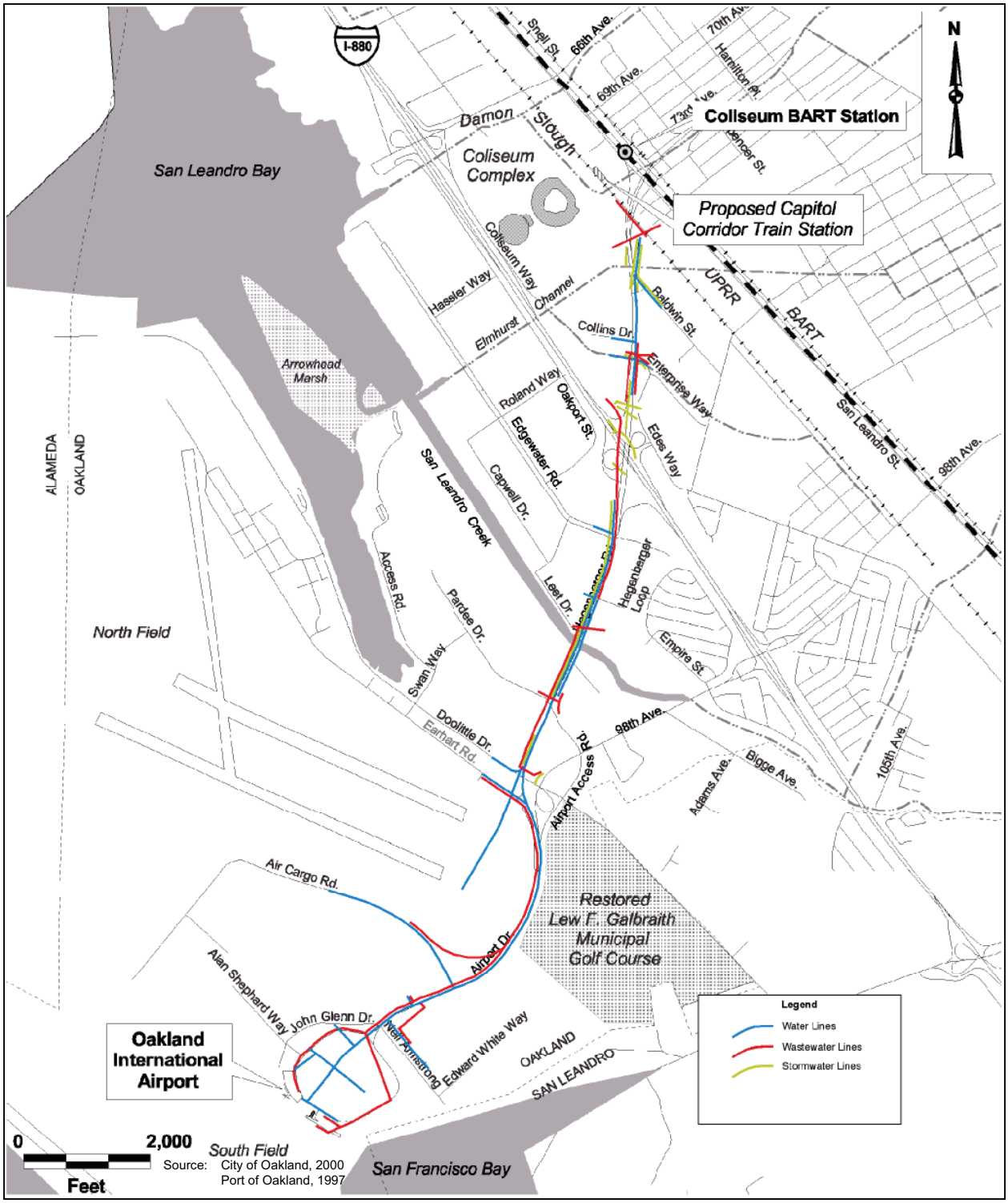

Figure 3.7-1
Water, Wastewater, and Stormwater Lines
Along the Project Corridor

Stormwater Lines

In general, the stormwater lines are located along the north side of San Leandro Street at the Hegenberger Road off-ramp; along the east side of Hegenberger Road from the UPRR corridor south to Elmhurst Channel; along the west side of Hegenberger Road north from near Baldwin Street to Elmhurst Channel; across Hegenberger Road at Collins Drive and Coliseum Way, and along the west side of Hegenberger Road between these two streets. Six lines cross Hegenberger Road, along with a line along the median and along the western side of Hegenberger Road between Coliseum Way and I-880; along the west side of Hegenberger Road from south of I-880 to Pardee Drive, with crossings south of Hegenberger Court, south of Hegenberger Loop, and at San Leandro Creek, Hegenberger Place, and Pardee Drive. Near Doolittle Drive, the stormwater line extends along the west side of Hegenberger Road south of Airport Access Road to the south side of Doolittle Drive, with separate lines at the intersection of Airport Access Road and Doolittle Drive, and at the intersection of 98th Avenue and Doolittle Drive; and along the west side of Airport Drive to OIA (City of Oakland, 2000). A stormwater pumping plant is located directly east of the intersection of Doolittle Drive and 98th Avenue (Port of Oakland, 2000b). General locations of wastewater and stormwater pipelines are shown on Figure 3.7-1. General diameter ranges for pipelines within the project corridor are summarized in Table 3.7-2.

Table 3.7-2
Wastewater and Stormwater Pipelines in the Project Corridor

Street	*Location*	*Size (inches)*
San Leandro Street	69th Avenue to 73rd Avenue 75th Avenue to 81st Avenue	8" – 30 " 8" – 60"
71st Avenue	UPRR to Hamilton Street	15" – 30"
72nd Avenue	Snell to Hawley Street	8"
73rd Avenue	Snell to Hawley Street	8"
75th Avenue	San Leandro Street to Hawley Street	8" – 18"
77th Avenue	Hegenberger Road to Hamilton Street	8" – 60"
Snell Street	69th Avenue to 73rd Avenue	8" – 42"
Hegenberger Road	UPRR Corridor to Collins Drive Collins Drive to I-880 ramp I-880 to Earhart Road	6" – 15" 8" – 48" 8" – 66"
Baldwin Street	Hegenberger Road to 85th Avenue	8" – 12"
Coliseum Way	Hegenberger Road to channel	8" – 15"
Edes Avenue	Hegenberger Road to Enterprise Way	12" – 18"
Edgewater Drive	Pendelton Way to Hegenberger Road	12" – 21"
Hegenberger Loop	All piping along loop	10" – 21"
Hegenberger Place	All piping along street	8" – 18"
Pardee Drive	All piping along street	6" – 30"
98th Avenue	Airport Drive to Bigge Street	6" – 39"
Earhart Road	Hegenberger Road to Swan Way	15"
Airport Drive	Doolittle Drive to Terminal 2	12"
Sally Ride Way	All piping along street	12"
Neil Armstrong Way	Hegenberger Road to Edward White Way	12"
Alan Shepard Way	All piping along street	10"
John Glenn Drive	All piping along street	10" – 12"

Source: Port of Oakland, 1997; City of Oakland 2000.

Telephone

Pacific Bell provides telephone and communications services in the area of the project corridor. Telephone lines are located underground in ducts shared with other utilities such as electrical power lines. In general, the telephone lines run along the edges of Hegenberger Road from north of Baldwin Drive to South Coliseum way, and then along the east side of northbound Hegenberger Road from I-880 to Doolittle Drive (City of Oakland, 2000). OIA's telephone lines lie beneath Airport Drive and connect to a cable plant on airport property. Pacific Bell and OIA share responsibility for communication services on the airport (Port of Oakland, 1997). The general locations of telephone lines in the project area are shown in Figure 3.7-2.

Natural Gas

The Pacific Gas and Electric Company's (PG&E) natural gas pipelines are located along roadways within the project corridor. PG&E owns and operates the pipeline system at OIA. The pipelines located in airport property are all four inches in diameter (Port of Oakland, 1997). In general, the natural gas lines run down the middle of Hegenberger Road from the UPRR corridor to Coliseum Way and then along alternate outer edges of Hegenberger Road from Hegenberger Loop to Airport Access Road/Airport Drive (City of Oakland, 2000). The general locations of natural gas pipelines in the project area are shown in Figure 3.7-2.

Electricity

PG&E provides electricity and natural gas to the project study area. Electrical lines are below ground in utility ducts. In general, the electrical lines run along the east side of southbound Hegenberger Road from north of Baldwin Street to I-880 and then alternate along edges of Hegenberger Road to Doolittle Drive (City of Oakland, 2000). The Port of Oakland-operated lines run underneath Airport Drive, through John Glenn and Alan Shepard Ways towards the runways (Port of Oakland, 1997). The Port of Oakland owns and maintains the electrical system at OIA, assuming responsibility of the power lines at the PG&E manhole near the intersection of Hegenberger Road and Doolittle Drive. The general locations of electrical lines are shown on Figure 3.7-2.

National Geodetic Survey Monuments

The National Geodetic Survey (NGS) defines and manages the National Spatial Reference System (NSRS) – the framework for latitude, longitude, height, scale, gravity, orientation and shoreline throughout the United States. NSRS provides the foundation for transportation, communication, and defense systems, boundary and property surveys, land records systems, mapping and charting, and a multitude of scientific and engineering applications. Survey control monuments inventoried and maintained by NGS are present within the project corridor, most notably in the vicinity of Airport Drive and Doolittle Drive, and near the Union Pacific railroad right of way near San Leandro Street. Coordinates for all maintained control monuments are available through the NGS web site at http://www.ngs.noaa.gov.

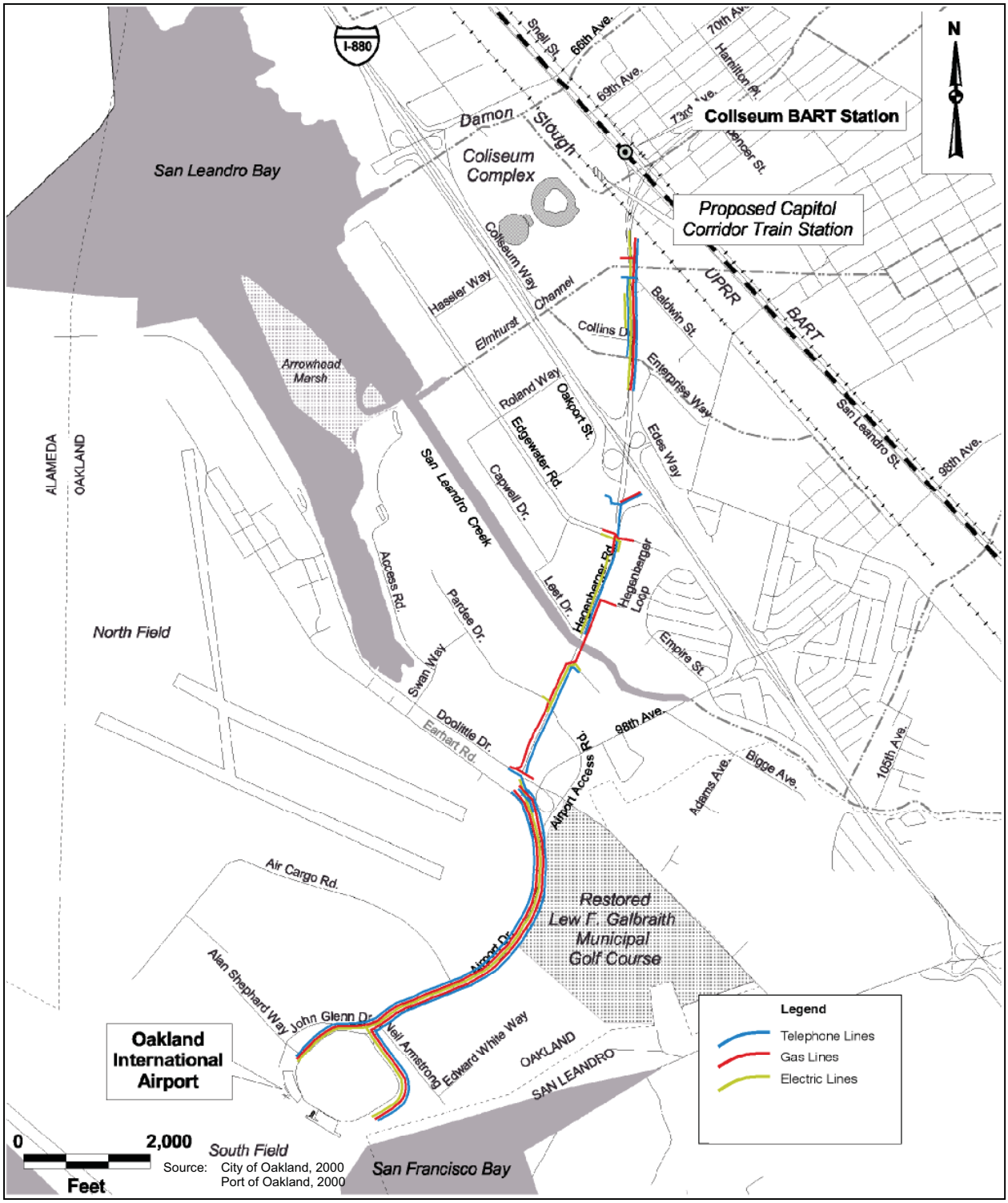

Figure 3.7-2
Telephone, Gas, and Electric Lines

Applicable Policies and Regulations

The City of Oakland's General Plan recommends that all utility lines lie underground to reduce visual impacts (Port of Oakland, 1997).

3.7.3 Impact Assessment and Mitigation Measures

Standards of Significance

According to CEQA Guidelines, the standards of significance for evaluating the impact of a project are related to the project's impacts on utility system capacities. Specifically, a project would be considered to have a significant adverse impact on the environment if it would:

- Exceed available water supplies, such that new or expanded entitlements are needed; or
- Exceed available wastewater treatment capacity.

For a discussion of construction-related impacts associated with utility relocation and service disruption, the reader is referred to Section 3.16 in this document.

Preferred Alternative Environmental Analysis

Impact UT-1. Demand for utilities during operation

There are no impacts to utility service from the operation phase of the preferred alternative. The project is designed to respond to passenger increases to OIA. Expected increases in utility service at OIA are due to the projected OIA demand increase, not to the existence of the Connector. The AGT would involve limited increases in demand for water and wastewater services related to employee and passenger restrooms. BART's existing maintenance shops are estimated to use 700 gallons of water per day (gpd), based on the number of trains utilizing the car wash system and the amount of water used per train wash and per system washdown (Port of Oakland, 1997). Due to the smaller operation of the proposed AGT maintenance facility, a more reasonable estimate for the AGT is 62 gpd of additional waste use. (LTS)

Energy usage associated with the preferred alternative is discussed in Section 3.13, Energy.

Median Option. Substitution of the Median Option for the segment of alignment between Elmhurst Channel and Coliseum Way would have no effect on any of the preceding analyses. (NI)

Partial ADP Scenario

Under the Partial ADP scenario, utility impacts of the Connector would be the same as described above in the Preferred Alternative Environmental Analysis. The difference between these two scenarios primarily concerns the consolidation and enlargement of the terminals, the construction of a parking garage, and roadway improvements. The construction of any of those elements has no effect on the Connector's impacts regarding utilities. Any utility lines that are relocated or constructed for those projects that affect the Connector area would have to be dealt with in the same manner as the existing lines described above. In other segments of the

Connector route, the ADP and Partial ADP scenarios are identical. Consequently, the effects of the preferred alternative are the same under the Partial ADP as they are under the full ADP.

Cumulative Analysis

There are no cumulative impacts to utility service from the construction or operation of the preferred alternative. Similar to the Preferred Alternative Environmental Analysis, the Connector does not create an increase in utility service in the project corridor on a cumulative basis with the development of the eight project sites under construction or anticipated to be occupied by 2005. It will be built to accommodate an expected increase in passengers at OIA, which would likely bring an increase in utility demand at OIA. The Connector itself does not cause such utility service increases.

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Section 3.8
Geology, Soils, and Seismicity

3.8.1 Introduction

This section presents a discussion of existing geologic conditions in a regional and site-specific context. Geologic conditions described include topography, stratigraphy, faulting and seismicity. Particular emphasis is placed on features/conditions that potentially could pose engineering problems or hazards for Connector passengers, facilities and operations. Examples of these hazards include ground shaking, liquefaction, settlement, lateral-spreading, lurching and expansive soil, all of which can cause long-term concerns about the structural integrity of Connector facilities and operations.

3.8.2 Existing Conditions

Regional Geology

The project corridor is situated on the eastern margin of the San Francisco Bay in the geologically diverse Coast Ranges geomorphic province of California. In this portion of the province, the San Francisco Bay is a filled basin bounded by major faults. Sedimentary deposition in the basin has occurred in a combination of alluvial and estuary environments. The San Andreas and Hayward Faults are both active faults trending parallel to the western and eastern margins of the basin, respectively. The region is underlain by sedimentary rocks ranging from Pliocene to Cretaceous age, or approximately 1.5 million to 140 million years old. Fluvial and alluvial deposits overlie the sedimentary rocks and are Holocene to Pleistocene age, or approximately 0.01 million to 1.5 million years old. Regional geologic features are depicted in Figure 3.8-1. The locations of major active faults and historically significant earthquake epicenters are displayed in Figure 3.8-2.

Project Corridor Geologic Conditions

Topography

The project corridor encompasses flatland topography. Elevations range from approximately 5 to 15 feet above sea level. A vast majority of the land within the project corridor was once a tidal marsh that has since been capped with artificial fill. This is evidenced by a map of the historic eastern margin of the San Francisco Bay and marshlands (USGS, 1971). Historic filling operations have taken the land out of submergence and raised elevations in the project corridor 8 to 15 feet. The filling operations have occurred since 1927 and have resulted in very flat topography, only interrupted by shallow drainage ditches, transportation grade separations, dikes abutting estuaries, and landscaped berms (Sorensen, 1989).

Slope gradients vary from near horizontal over most of the project corridor to very steep along some embankments. A very steep, upward embankment, up to 1 vertical to 1 horizontal (1:1), abuts the southeast edge of the project corridor along the Lew F. Galbraith Golf Course. Future golf course grading may change this embankment configuration. In addition, short, steep slopes, up to 1:1, exist along drainage features, such as San Leandro and Arroyo Viejo Creeks. Other slopes, up to 1.5:1, exist at the I-880 and UPRR line overcrossings.

Stratigraphy

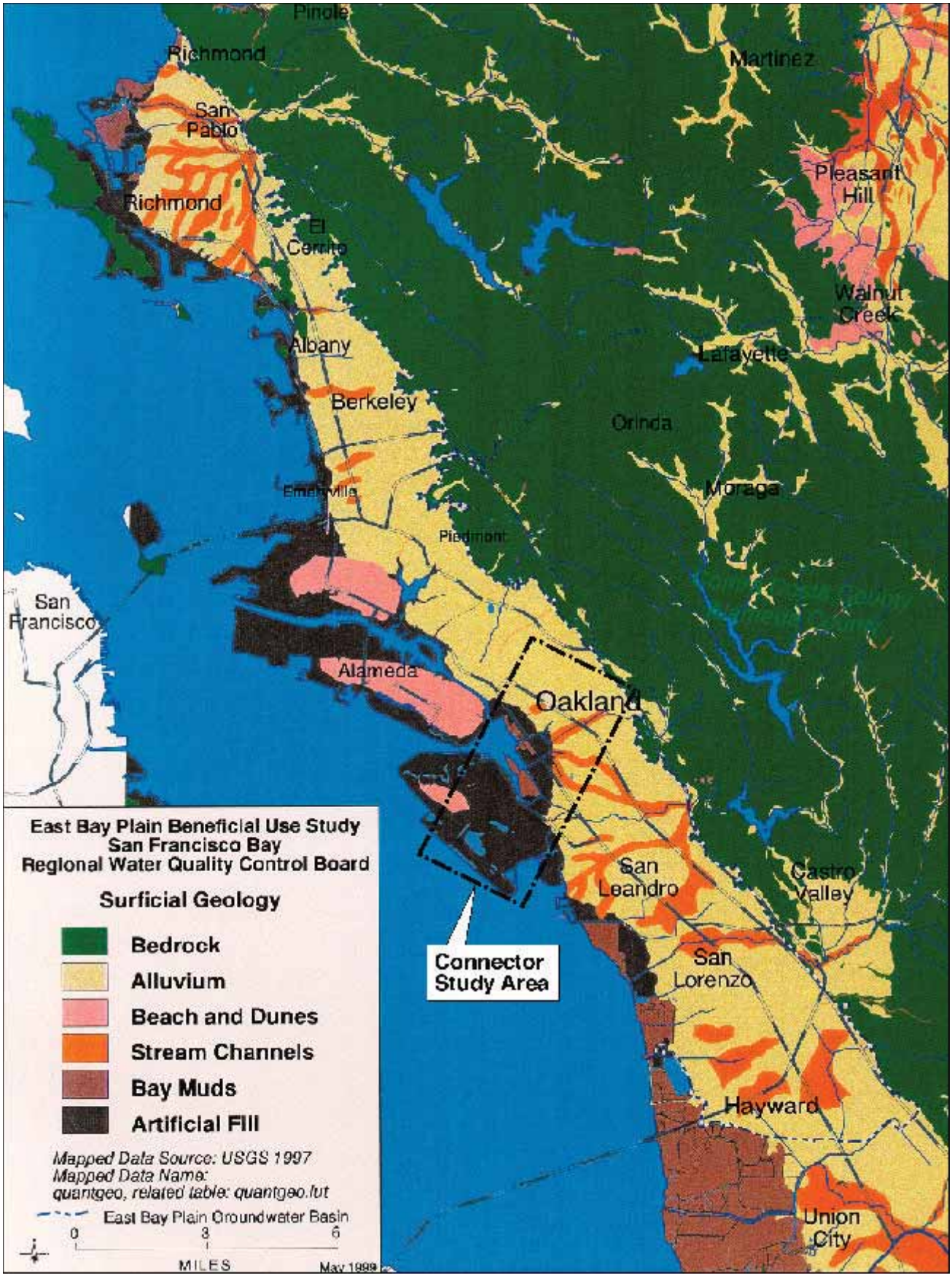
Interpretations of the geologic conditions in the Connector corridor are depicted in Figure 3.8-3, and include unconsolidated deposits, having weak strength characteristics and low-to-high expansion properties. Types of geologic deposits mapped by scientists in the project corridor include inter-fluvial basin deposits, young Bay Mud, and old Bay Mud (USGS, 1972; Helley and Graymer 1997; RWQCB, 1999). Whereas the project corridor is entirely capped by artificial fill, a layer of young Bay Mud immediately underlies the artificial fill that thins eastward. Interfluvial basin deposits are mapped on the surface at the extreme northeastern end of the project corridor and immediately underlie the thin layer of young Bay Mud under the remainder of the project corridor. Layers of old Bay Mud can exist beneath either the young Bay Mud or the interfluvial basin deposits. All deposits could be encountered in shallow (less than 20 feet deep) excavations along the project corridor.

Artificial Fill

Artificial fill exists over most of the project corridor from the ground surface to a depth of approximately 10 feet. The vast majority of the artificial fill underlying the project corridor is comprised of hydraulic fill generated from nearby dredging operations conducted from the late 1920s to the late 1950s, as tidal flats along the margin of the San Francisco Bay were filled for development. According to a report compiled for the Port of Oakland, much of the hydraulic fill is sand along the southern half of the project corridor, from Doolittle Drive southward (Sorensen, 1989). Thin layers of fine silt may be present in the hydraulic fill within the project corridor, but were generally selectively deposited in adjacent areas. Filling operations after the late 1950s consisted of fills of random engineered "dry" materials associated with roadways, parking areas and building pads. Random concrete rubble, rip-rap boulders and other coarse materials may be present in this heterogeneous fill material, particularly in embankments and dikes. Due to the heterogeneous nature of fill materials placed along the project corridor and unknowns regarding their sources, these materials have potential corrosive characteristics.

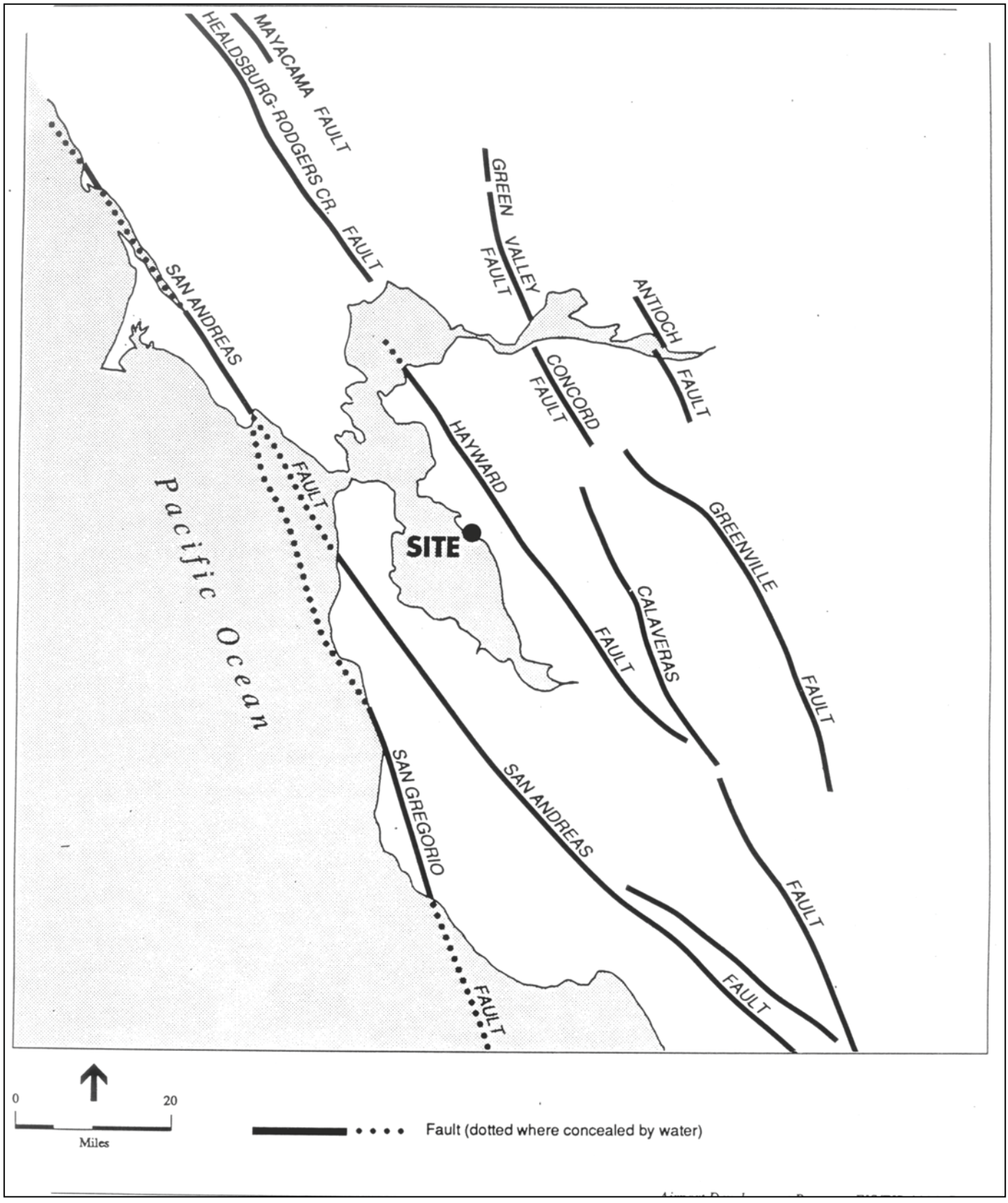
Interfluvial Basin Deposits

Interfluvial basin deposits underlie most of the project corridor below the depth of 10 feet, particularly at its eastern end. According to previous studies, the interfluvial basin deposits are composed of plastic, poorly sorted, organic rich clay and silty clay (USGS, 1972; RWQCB, 1999; Figuers, 1998). The deposits inter-finger with alluvial fan and fluvial deposits to the east and young and old Bay Mud to the west. The unit is generally less than 10 feet thick and locally contains gastropods (e.g., snails) and pelecypods (i.e., clams) (USGS, 1972). Interfluvial basin deposits have reasonably good engineering characteristics but locally can be expansive.



Source: RWQCB, 1999

Figure 3.8-1
Regional Geology Map



Source: Environmental Science Associates 1991

Figure 3.8.2
Regional Fault Map

Young Bay Mud
Young Bay Mud is marine deposit consisting of a soft, blue-gray, organic clay material having poor engineering characteristics and high water content. Occasionally, thin tidal sand layers are locally present in the young Bay Mud. Much, if not all, of the project corridor is likely underlain by young Bay Mud beginning at depths not greater than 15 feet below the existing ground surface. Young Bay Mud has the potential to have corrosive, expansive, and low foundation bearing-capacity characteristics.

Old Bay Mud
Old Bay Mud is a marine deposit consisting of relatively stiff, dark gray, consolidated organic clay of distinct geologic origin. Its deposition is related to the Sagamon sea interglacial high water stand that occurred approximately 120,000 years ago. Old Bay Mud may occur below 15 feet in depth in the project corridor. In fact, geotechnical studies for the Galbraith Golf Course adjacent to the central portion of the project corridor and OAC indicated Old Bay Mud at depths greater than 15 feet below the existing ground surface (HLA, 1993; SCI, 1998). Old Bay Mud has the potential to have corrosive, expansive, and low foundation bearing-capacity characteristics.

Soil
Undisturbed native topsoil is generally not present in the project corridor since the area was formerly a tidal marsh and estuary. However, small, localized areas are overlain by native soil, especially in the extreme eastern end of the project corridor at the eastern margin of the former tidal flat. If present, native soil consists of high plasticity silty clay. U.S. Department of Agriculture Soils Conservation Service would classify soil in the project corridor as Urban Land (non-specific unit of heterogeneous fill) and Xeropsamments (dredged sand fill), which both exhibit high permeability, slow runoff, low erosion potential, and high wind blowing characteristics. Two other soil types, Langenour loam and Omni silty clay loam, occur in the vicinity of 98th Avenue. These are native soil types that both exhibit slow runoff, slight erosion, low strength and high shrink/swell ratio hazards.

Summary of Earthen Materials

In summary, earthen materials likely to be encountered along the project corridor include artificial fill, native soil, young and old Bay Mud, and interfluvial basin deposits. Table 3.8-1 below presents some of the geotechnical constraints that these materials may present to project construction.

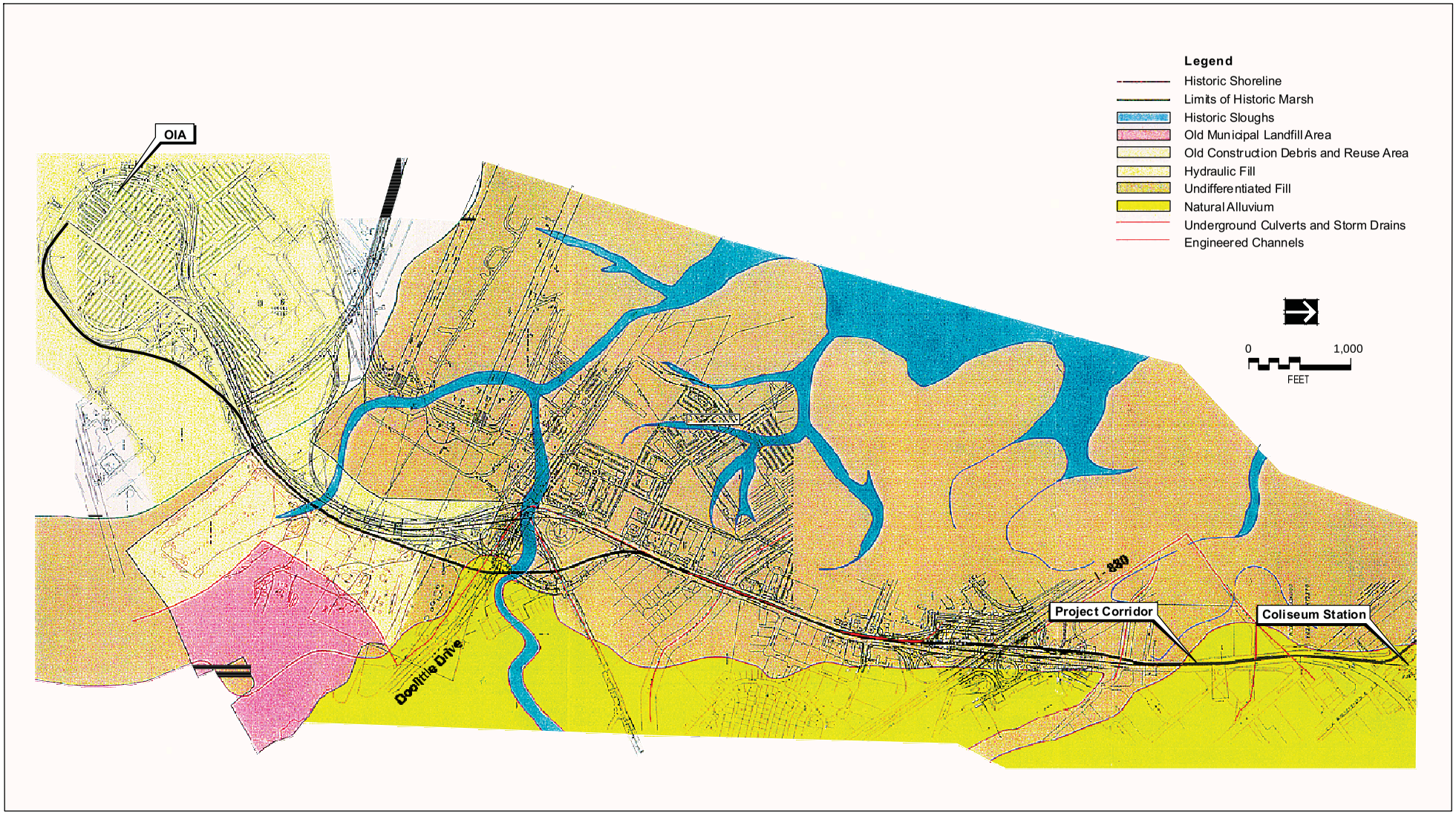


Figure 3.8-3
Local Geologic Map

Table 3.8-1
Geotechnical Constraints of Earthen Materials

	Potential Constraint								
Material Type	***Damage to concrete due to corrosive characteristics***	***Cracks in pavement or foundations due to high shrink/swell potential***	***Excessive foundation settlement due to high compressibility***	***Difficulty in excavating due to oversize materials***	***Unstable during earthquakes due to weak or liquefiable nature***	***Reusability as "engineered" fill***	***Low R-value***	***Unsuitable subgrade for roadways due to yielding***	***Unsuitable for bearing pile-type foundations due to low friction characteristics***
Fill	✓		✓	✓	✓	✓			
Native Soil		✓	✓			✓	✓		
Young Bay Mud	✓	✓	✓		✓	✓	✓	✓	✓
Old Bay Mud	✓	✓				✓	✓	✓	✓
Interfluvial Basin Deposits		✓					✓		

Source: CDM, 2000.

Faulting and Seismicity

The project corridor is not within a currently designated State of California "Special Studies Zone" for active faults (Hart, 1992). No known active or inactive faults or segments occur in the project corridor. The project corridor, however, is within 4 miles of the Hayward Fault. Other known active regional faults are listed in Table 3.8-2.

The San Francisco Bay Region is considered by geologists and seismologists to be a seismically very active region. Earthquakes along major active faults create very strong ground motion that can cause severe damage to structures and de-stabilize ground. Table 3.8-2 summarizes nearby active faults with respect to their closest distance from the project corridor (Jennings, 1992; Hart, 1992; Graymer, 1995), maximum credible earthquake (MCE) magnitude (Borcherdt, 1975; ABAG, 1980; CDMG, 1999), and expected peak ground acceleration based on: 1) MCE of and closest distance to causative fault (deterministic approach; Seed and Idriss, 1982), and 2) likelihood of earthquake occurrence on any regional fault (probabilistic approach using chance of 10 percent exceedance in 50 years, alluvium conditions; CDMG, 1999).

Table 3.8-2
Active Faults in the Region

Fault Name	***Closest Distance from Project Corridor (miles)***	***Maximum Credible Earthquake (Richter Magnitude)[1]***	***Maximum Historic Magnitude***	***Estimated Bedrock Acceleration at Site (g)[2]***	***Probabilistic Bedrock Acceleration at Site (g)[3]***
Hayward	4	7.5	7.0[(4)]	0.55	0.59-0.63
Calaveras	16	7.5	6.6[(5)]	0.30	
San Andreas	15	8.5	8.3[(6)]	0.40	

[1] from Jennings 1992 and Hart, 1992.
[2] from Seed and Idriss, 1982.
[3] from CDMG, 1999, Figure 3.3, 10% Exceedance in 50 Years Peak Ground Acceleration, Alluvium Conditions.
[4] Toppozada, 1981.
[5] Toppozada, 1984.
[6] Richter, 1958.

Potential seismic hazards in the project area include ground rupture (faulting and co-seismic surface displacement), shaking, liquefaction, lurching and lateral spreading.

Fault Rupture

Since no known faults or segments are mapped within the project corridor, the potential for surface rupture due to faulting is low.

Ground Shaking

Collapsed structures, cracked walls or foundations, broken utility lines, cracked pavement and ground loss may occur due to strong ground shaking during a major seismic event. Most earthquake damage is the result of ground shaking and its secondary effects (liquefaction, lurching, lateral spreading and settlement).

The USGS estimates the rates of occurrence of earthquakes and 30-year earthquake probabilities (USGS, 1999). Their study considers a range of magnitudes for earthquakes on the major faults in the region. The CDMG also has an estimate of the range of peak ground accelerations (a measure of the intensity of ground shaking during an earthquake) expected in the vicinity of the project corridor. This range is given in Table 3.8-2 and is as high as 0.63 g (CDMG, 1999). This estimate is based on probabilistic criteria of 10 percent chance of exceedance in 50 years and considers underlying alluvium conditions. Alluvium and soft rock conditions have a tendency to dampen ground motion and decrease peak ground accelerations. However, depending on the direction of wave propagation of the ground motion and the configuration of underlying bedrock surfaces, localized ground amplification effects may cause an increase in peak ground acceleration, particularly in the more damaging vertical direction. This amplification effect was experienced during the Loma Prieta earthquake that occurred on October 17, 1989, where the I-880 Cypress Freeway structure located in Oakland (62 miles from the earthquake's epicenter on the San Andreas fault, and 7 miles from the project corridor)

collapsed due to strong ground motions that were greater than many areas closer to the causative fault.

Liquefaction

Soil liquefaction is the sudden and the total loss of soil strength during earthquake-induced ground motion. Liquefaction occurs in loose, saturated, clean sand where vibration causes settlement of individual sand grains and displacement of groundwater. During liquefaction, the soil transforms into a fluid-like state, allowing displacement of water, and the potential mobilization of sand if not confined. Soil liquefaction potential is governed by the physical properties of the soil, such as sediment grain-size distribution, compaction, cementation, saturation, layer thickness, and depth. Liquefaction is also governed by the degree of ground motion.

According to young work by the California Department of Conservation, Division of Mines and Geology, the entire project corridor is susceptible to liquefaction (CDMG, 2000a and b). Loose, poorly consolidated, saturated sand deposits underlie the area, which are expected to experience strong ground motion during a major seismic event. Induced settlement, sand boils at the surface, foundation failures, and abrupt ground loss can be caused by liquefaction.

Ground Lurching

Ground lurching is the horizontal movement of ground located adjacent to slope faces during strong, earthquake-induced ground motion. The results of ground lurching include longitudinal cracking parallel to the slope face at some distance setback from the top of the slope. Areas along the project corridor particularly susceptible to ground lurching due to fill placement over soft bay mud and slope exposures include those for the Lew F. Galbraith Golf Course, along the east side of Airport Drive. Other fill embankments located within the project corridor may be susceptible to ground lurching. The EIR for the OIA ADP cites potential displacement of riprap due to ground lurching along the bayward face of the perimeter levees and at bridge crossings over stream channels (i.e., at San Leandro Creek) (Port of Oakland, 1997).

Lateral Spreading

Lateral spreading is the horizontal displacement of soil during strong, earthquake-induced ground motion. It occurs in loose, unconfined sedimentary and fill deposits but can also occur in consolidated fills over loose sand or soft mud deposits.

Some potential exists for lateral spreading to occur along levees, but the potential has been significantly reduced by decades of consolidation of the underlying young Bay Mud deposits caused by the placement and weight of the overlying fill deposits (WWC, 1993).

Tsunamis and Earthquake-Induced Flooding

Review of existing data on regional tsunami potential and magnitude, predictions of rates of sea-level rises, and potential settlement rates from similar sites indicates that proposed project corridor surface grades need to take into consideration potential for inundation. This would occur in low elevation areas that are marginal to estuary waters or tidal sloughs.

Portions of the AGT alignment south of Doolittle Drive have existing grades less than an elevation of 11 feet above sea level and may be susceptible to inundation caused by a predicted tsunami and wave run-up. A tsunami with a wave height of 20 feet at the Golden Gate Bridge that is predicted to occur approximately once every 200 years would result in a wave height above 10 feet south of the project corridor along South Airport Drive (Ritter and Dupre, 1972). However, inundation hazards from tsunamis, wave run-up, sea level rise, or settlement are minimal because a dike exists approximately 2,000 feet south of the project corridor that would block the vast majority of effects of a potential tsunami to the extent where only minimal flooding might occur. The minimal amount of potential flooding is acceptable since under the same circumstances the OIA would also be out of service for a short period of time until floodwaters dissipated.

In addition, earthquakes can cause dam failures at reservoirs. If the dam at Lake Chabot, located approximately five miles east of the project corridor, failed during an earthquake, downstream areas along San Leandro Creek could potentially be inundated.

Other Geotechnical Considerations

Other geotechnical considerations include settlement, erosion, landslides and shallow groundwater.

Settlement

Earthen materials underlying the project corridor are prone to long-term settlement due to increased vertical loads caused by historic fill placement. Much of the long-term settlement has already been induced, since most fill placement occurred several decades ago. However, continued settlement can be expected. If additional loads are placed due to construction of the Connector, increases in the rate and amount of settlement can be expected. In addition, as previously discussed under seismic hazards, settlement due to loss of soil strength during a major earthquake (i.e., liquefaction) may occur.

Erosion

In general, soil underlying the project corridor is characterized as having low erosion potential. An exception includes hydraulically-placed sand fill present bayward (southwest) of Doolittle Drive that is prone to wind-blowing. Current vegetative ground cover has mitigated erosion in most of the areas where the hydraulically-placed sand fill is exposed at the surface.

Landslides

Due to the flatland topography encompassing the project corridor, landslides are not present at or within the sphere-of-effect of the project corridor. Slopes for fill embankments at transportation grade separations and creek banks have potential for experiencing small "pop-outs" that could be considered forms of landsliding.

Shallow Groundwater

Groundwater beneath the projected corridor is shallow, less than 10 feet below the ground surface. Geotechnical consequences of shallow groundwater conditions include special

dewatering requirements during excavation/construction, ground instability affecting earthwork activities, and water pressure and infiltration acting upon below-grade structures.

Applicable Policies and Regulations

Federal, state, or local laws, regulations, ordinances or rules related to geologic hazards and the construction and operation of the project include:

- California Building Code
- Public Resources Code
- Seismic Hazards Mapping Act (codified in the Public Resources Code as Division 2, Chapter 7.8, which became operative on April 1, 1991)
- California Division of Mines and Geology, Special Publication 117
- General Permit Requirements for Storm Water Discharges Associated with Construction Activities, SWRCB Water Quality Order 99-08-DWQ
- Federal Aviation Administration's (FAA) Airport Environmental Handbook
- BART Design Criteria

The State's minimum criteria required for project approval within mapped seismic hazard zones requiring investigation are defined in CCR Title 14, Section 3724.

Lead agencies can have other, more stringent criteria for project approval. In addition, Chapter 3 of SP 117 provides a list of topics that should be addressed in site-investigation reports prepared for liquefaction and/or earthquake-induced landslides.

3.8.3 Impact Assessment and Mitigation Measures

Standards of Significance

The California Environmental Quality Act (CEQA) *Guidelines* state that impacts that cause substantial flooding, erosion, or siltation or that expose people or structures to major geologic hazards would normally be considered significant.

The potential for geologic hazards to cause significant impacts during construction and operation of the preferred alternative is generally based on the relationship of site-specific geologic conditions to structural components of the preferred alternative. The Connector project would result in a significant geo-seismic impact if the project design could not achieve acceptable levels of public safety as set forth through geotechnical and seismic safety requirements of applicable building codes, with particular attention to:

- strong seismic ground shaking;
- seismic-related ground failure, including liquefaction;

- lateral spreading, subsidence, and collapse as a result of underlying unstable geologic units; and
- expansive soil.

The Seismic Hazards Mapping Act and related regulations establish a statewide minimum public safety standard for mitigation of earthquake hazards. This means that the minimum level of mitigation for a project should reduce the risk of ground failure during an earthquake to a level that does not cause the collapse of buildings for human occupancy, but in most cases, not to a level of no ground failure at all. However, the Seismic Hazards Mapping Act, the regulations, or SP 117 guidelines do not preclude lead agencies from enacting more stringent requirements, requiring a higher level of performance, or applying these requirements to developments other than those that meet the Act's definition of "project."

Mitigation measures are also required by the Act to reduce potential structural damage impacts resulting from other geologic hazards that in turn cause greater exposure of the public and environment to harm. Other geologic hazards potentially impacting the preferred alternative and requiring site-specific analyses include slope stability, settlement of compressible materials and inundation.

Preferred Alternative Environmental Analysis

Impact GE-1. Effects of fault rupture and landsliding

The Connector project is located 4 miles from the closest known active or potentially active earthquake fault (Hayward fault) and is not located in areas where landsliding could occur. As a result, the preferred alternative would not be exposed to these geo-seismic hazards. (NI)

Median Option. In the event that engineering design refinements require use of the Median Option instead of the preferred alternative alignment for the segment of alignment between Elmhurst Channel and Coliseum Way, the potential seismic impacts discussed above would be present to the same degree in the Median Option segment. Accordingly, substitution of the Median Option for this segment of alignment would have no effect on any of the preceding analyses. (NI)

Impact GE-2. Effects of soil erosion during operations

The project corridor is largely urbanized and contains few areas with exposed soil. U.S. Department of Agriculture Soils Conservation Service would classify soil in the project corridor as Urban Land (non-specific unit of heterogeneous fill) and Xeropsamments (dredged sand fill), both of which have low erosion potential characteristics. Hydraulically-placed sand fill southwest of Doolittle Drive is prone to wind-blowing, but risk of erosion in this area has been curbed by vegetative ground cover. As a result, the risk of excessive, permanent erosion along the project corridor would not occur as a result of the preferred alternative. (NI)

Median Option. In the event that engineering design refinements require use of the Median Option instead of the preferred alternative alignment for the segment of alignment between Elmhurst Channel and Coliseum Way, the potential soil erosion impacts discussed above would

be present to the same degree in the Median Option segment. Accordingly, substitution of the Median Option for this segment of alignment would have no effect on any of the preceding analyses. (NI)

Impact GE-3. Effects of seismically induced ground failure

It can be expected that the preferred alternative and Median Option would be subject to strong ground shaking during its expected life, which could cause structural damage and potential loss of human lives. Lateral spreading and slope lurching could cause ground fissures, differential settlement and displacement of foundations that could cause significant damage to structural elements. Slopes that support structural elements of the Connector could fail under the dynamic stresses caused by ground shaking but would not be considered life-threatening due to the low slope heights and deep foundations associated with the Connector.

Section II.16 of the existing BART design criteria require that all BART-owned structures, including system aerial structures, foundations, earth retaining structures, bored tunnels, cut-and-cover underground structures, and passenger stations and buildings, be designed to withstand ground failures associated with seismic or other events. Section II.16.4 requires that the design of aerial structures comply with the California Department of Transportation Bridge Design Specifications. Section II.16.3 requires that the design of all buildings comply with California Building Code requirements.

BART will require incorporation of these design criteria into contractor plans and specifications for construction of these project components, which will reduce the potential impacts from settlement to a less than significant level for the preferred alternative (LTS).

Median Option. In the event that engineering design refinements require use of the Median Option instead of the preferred alternative alignment for the segment of alignment between Elmhurst Channel and Coliseum Way, the potential seismic impacts discussed above would be present to the same degree in the Median Option segment. Accordingly, substitution of the Median Option for this segment of alignment would have no effect on any of the preceding analyses. (NI)

Impact GE-4. Effects of ground shaking

Horizontal and vertical ground accelerations during seismic events would increase the lateral earth pressures on below-grade structures and subject above-grade structures to lateral stresses. In turn, these forces could cause catastrophic failure of buildings, bridges, and retaining walls and potential loss of human life. During the project's life expectancy, there is a high probability that a major seismic event in the region will subject the project corridor to peak horizontal ground accelerations of up to 0.6g. In addition, uncertainties in ground response along the project corridor could result in higher accelerations due to amplification.

The AGT would require the construction of a maintenance and storage facility for vehicles, construction and operation of transit stations, and construction of an elevated guideway. All of these structures would be susceptible to increased lateral stresses from ground accelerations during seismic events.

The existing BART structural design criteria (Section II.16) require that the seismic design of all BART-owned structures shall be based on the assumption that these structures will be subjected to the ground motion of a hypothetical seismic event with a maximum horizontal ground acceleration of 0.7 g caused by rupture of the Hayward fault.

In March 1997, the California Department of Conservation, Division of Mines and Geology (CDMG) adopted Special Publication 117, Guidelines for Evaluating and Mitigating Seismic Hazards in California (SP-117), which constitutes recent guidelines for meeting the requirements of the Seismic Hazards Mapping Act of 1990 (CDMG, 1997). The BART seismic design criteria recognize the requirements of SP 117.

The requirements of SP 117 would be applicable to the project because the entire project corridor is located within a mapped seismic hazard zone (CDMG, 2000(b)).

BART will require incorporation of these design criteria into contractor plans and specifications for construction of these project components, which will reduce the potential impacts from ground shaking to a less than significant level. (LTS)

Median Option. Substitution of the Median Option for the segment of alignment between Elmhurst Channel and Coliseum Way would have no effect on any of the preceding analyses. (NI)

Impact GE-5. Settlement

Settlement of compressible materials underlying the project corridor of the preferred alternative due to placement of static loads (e.g., buildings, bridge foundations or, fills for raising grade elevations) may cause long-term damage to structural improvements of the project and adversely affect its intended use. The degree of settlement depends on the thickness and compressibility of the underlying material and the amount of load placed on the surface; the amount of settlement increases with an increase of any of these three factors. The majority of the settlement occurs immediately following placement of the loads. Since the entire project corridor has had fill placed on it, settlement is actively occurring. However, the majority of the fill was placed decades ago and the long-term settlement rate has significantly slowed. Dead loads associated with new fills, pavement sections and/or building foundations could re-activate settlement.

Settlement should be expected with construction of the AGT stations, guideway, and maintenance facility. Due to the highly compressible material underlying the airport property, the AGT station at OIA may be subject to potentially significant settlement. Also, the mass of the AGT guideway structure makes the AGT susceptible to settlement impacts.

Existing BART design criteria require the AGT guideway, AGT maintenance facility, and AGT stations to withstand settlement of footings due to consolidation of near-surface artificial fill and underlying soft, compressible, clayey soils. Section 6.2 of the design criteria states that where the bearing stratum at ground surface is underlain by weak and compressible materials, the use of pile foundations should be considered. By supporting the structure on piles, which extend through the clay layer, the impact of settlement due to consolidation of the soft soils

would be reduced. The design criteria in Section 6.3 for pile foundations include provisions for uplift, downward, and lateral loads on piles, and adopt strict installation criteria to limit ground consolidation, building settlement, and disturbance to local residents from the vibratory effects of pile driving. BART will require incorporation of these design criteria into contractor plans and specifications for construction of these project components, which will reduce the potential impacts from settlement for the preferred alternative to a less than significant level.

The BART design criteria provide criteria for design and construction of structural elements that minimize potential adverse effect caused by settlement. Foundations could be designed to specifically avoid settlement by placing the structure's load on piles or caissons that bear on more competent materials beneath the compressible zones. If the settlement is expected to be uniform, mat-type foundations, which are designed to "float" on the compressible materials, should be considered as a more cost-effective mitigation to prevent damage. If warranted, the potential for compressibility of the underlying materials should be reduced through ground improvement techniques to minimize the damage caused by settlement. These techniques can include placing temporary surcharge loads, deep-dynamic compaction, compaction grouting, stone columns, chemical grouting and, mechanical vibration.

By reducing the weight of the static load associated with the structural improvement, the degree of settlement can be reduced thereby minimizing the potential for damage. Weight reduction is achieved through the use of lightweight construction materials (e.g., wood vs. steel and concrete, lightweight concrete and lightweight aggregates). (LTS)

Median Option. In the event that engineering design refinements require use of the Median Option instead of the preferred alternative alignment for the segment of alignment between Elmhurst Channel and Coliseum Way, the potential settlement impacts discussed above would be present to the same degree in the Median Option segment. Accordingly, substitution of the Median Option for this segment of alignment would have no effect on any of the preceding analyses. (NI)

Impact GE-6. Flooding caused by earthquake-induced dam failures

Failure of the dam for Chabot Lake (i.e., caused by an earthquake) could cause flood impact to the channel for San Leandro Creek, a portion of which crosses the project corridor. Based on the assumption that AGT columns are placed on 100-foot increments along the project corridor, but not in San Leandro Creek, there is not a potential for increasing flooding by impeding the flow of floodwaters. Therefore, no impact would occur and no mitigation measures are necessary for the preferred alternative. (NI)

Median Option. In the event that engineering design refinements require use of the Median Option instead of the preferred alternative alignment for the segment of alignment between Elmhurst Channel and Coliseum Way, the potential flooding impacts discussed above would be present to the same degree in the Median Option segment. Accordingly, substitution of the Median Option for this segment of alignment would have no effect on any of the preceding analyses. (NI)

Impact GE-7. Corrosive soil

Corrosive soil may exist along the project corridor that could damage structural improvements. Some soil types are corrosive to concrete and other building materials and can reduce their strength. Impacts could result in the form of failed subsurface drainage piping, weakened building foundations, or failed slabs on grade. Earth grading, building construction, and engineered fill activities would occur for the preferred alternative that could lead to exposure of building materials to corrosive soil.

Existing BART Design Criteria (Section II.6.1) include a requirement that foundation design shall take into account the presence of potentially corrosive substances in soils through the utilization of appropriate protection.

BART will require incorporation of this design criterion into contractor plans and specifications for construction of these project components, which will reduce the potential impacts from corrosive soil to a less than significant level for the preferred alternative. (LTS)

Median Option. In the event that engineering design refinements require use of the Median Option instead of the preferred alternative alignment for the segment of alignment between Elmhurst Channel and Coliseum Way, the potential corrosive soil impacts discussed above would be present to the same degree in the Median Option segment. Accordingly, substitution of the Median Option for this segment of alignment would have no effect on any of the preceding analyses. (NI)

Partial ADP Scenario

Geologic impacts relate to underlying geologic conditions, therefore the Partial ADP scenario would not change the degree of geologic impacts identified for the preferred alternative with the ADP.

Cumulative Analysis

Population and employment growth in the project corridor, as anticipated by the eight projects currently under construction or expected to be occupied by 2005 (see Section 3.0), and as planned for by the City's General Plan and other planning documents, would intensify the amount of development in an area susceptible to strong ground shaking and seismically induced effects, such as liquefaction and settlement. All proposed projects, including the Connector, are relatively large-scale projects that would replace currently underutilized or undeveloped lands. Even though the Connector and other cumulative projects would increase the number of people in the project corridor, each project (including the Corridor) would be subject to the California Building Code and to site-specific geotechnical recommendations to mitigate any geologic, soil, or seismic hazards related to that individual project. Therefore, the cumulative impacts of this growth for the preferred alternative are expected to be less than significant.

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Section 3.9
Hydrology and Water Quality

3.9.1 Introduction

This section discusses existing hydrologic and water quality conditions within the project corridor with emphasis on potential hazards or engineering problems that could occur during construction and operation of the preferred alternative. Specific issues addressed include surface runoff/drainage, storm water flooding, groundwater occurrence, and water quality. Flooding and flood hazards are also discussed in Section 3.8, Geology, Soils, and Seismicity, due to the inter-relationship between geology and flooding caused by earthquakes (e.g., tsunami, high tides, and land subsidence).

3.9.2 Existing Conditions

Climate

The project is situated on the western margin of the East Bay Plain portion of the San Francisco Basin, a sub-watershed of the Central Coast Basin. The East Bay Plain extends from the margin of the San Francisco Bay eastward to the Oakland Hills. Annual normal total precipitation ranges from about 16 to 24 inches per year and depends on local topography. In Oakland, which is representative of the flatland portions of the East Bay Plain that encompass the project corridor, normal total precipitation is 17.93 inches with the majority of precipitation occurring during December through February (USDC, 1970).

Drainage

Drainage channels in the vicinity of the project corridor generally flow westward towards San Francisco Bay. There are five stream channels that cross the project corridor, as shown on Figure 3.9-1. From north to south, they are Arroyo Viejo Creek (the bayward portion of which is also known as Damon Slough), Elmhurst Channel, an unnamed flood channel on the north side of South Coliseum Way, an unnamed channel just north of I-880, and San Leandro Creek, a major perennial stream. All five waterways are improved channels constructed mostly by the Alameda County Flood Control and Water Conservation District (ACFCWCD).

Arroyo Viejo Creek flows southwest in a concrete-lined channel located in the median of Hegenberger Road northeast of the Coliseum BART Station. At the northeast end of the embankment for the Hegenberger Road over-crossing of the BART and UPRR tracks, the creek flows into a concrete box culvert that exits on the west side of Snell Street. Arroyo Viejo Creek then flows under a series of three bridges at San Leandro Street, the southbound Hegenberger Road on-ramp, and the UPRR tracks. From there, the creek flows in an unlined channel northwestward along the UPRR tracks and then westward into Damon Slough located north of

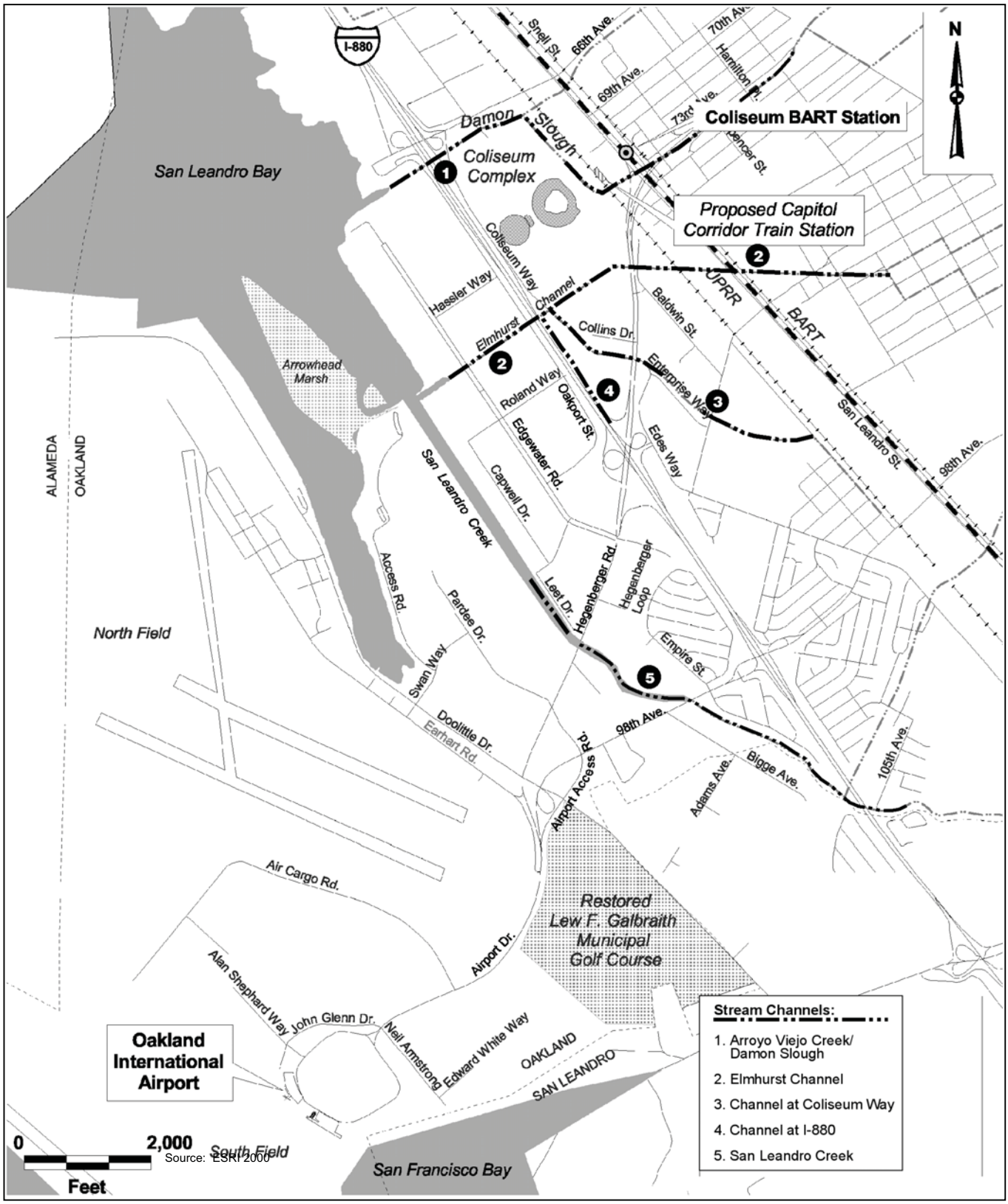

Figure 3.9-1
Stream Channels in the Study Area

the Oakland Coliseum and south of 66th Avenue. San Leandro Creek is a large channel that flows under a bridge at the project corridor crossing located midway between I-880 and Doolittle Drive on Hegenberger Road. San Leandro Creek generally flows in a northwestward direction and is also fed by streams in the Oakland Hills in which two reservoirs, Lake Chabot and San Leandro Reservoir, are located. Elmhurst Channel generally flows southwestward and crosses under Hegenberger Road near Baldwin Street via a bridge. The channels near South Coliseum Way and I-880 join Elmhurst Channel and cross under I-880 to the northwest. All five channels empty into San Leandro Bay, a bay within San Francisco Bay, with Elmhurst Channel merging with San Leandro Creek at the head of San Leandro Bay. All of the drainage channels are tidally-influenced within the project corridor.

The project corridor encompasses flatland topography. Due to the pervious nature of soil underlying a majority of the project corridor, runoff in pervious areas (i.e., landscape areas and bare ground) is minimal. The vast majority of storm water runoff within the project corridor is generated from impervious areas. Runoff from these areas is routed through storm drainpipes that drain into the channels described above. Drainage within the confines of OIA enters detention ponds that are drained to the San Francisco and San Leandro Bays via lift pumps during the rainy season, October-May.

Storm Event Flooding

Early flood prone mapping indicated areas adjacent to the northern edge of the project corridor between I-880 and the Coliseum BART Station as susceptible to flooding during a 100-year storm event (Limerinos, 1973). Updated flood hazard information compiled by the Federal Emergency Management Agency (FEMA) and the Environmental Systems Research Institute, Inc. (ESRI) indicates that 100-year floodplain areas exist along or adjacent to San Leandro Creek, Elmhurst Channel, and Arroyo Viejo Creek. The floodplain next to San Leandro Creek is approximately 125 feet wide and is mapped from San Leandro Bay several miles northeastward to I-580.

Groundwater

The project corridor is located in a groundwater basin first designated by the Department of Water Resources as the Alameda Bay Plain Basin (DWR, 1980). However, the basin encompassing the project corridor has historically and locally also been referred to as the East Bay Plain (DWR, 1994) and recently as the Central and San Leandro Sub-Areas of the San Francisco Basin (Figuers, 1998). Based on these and other recent studies (RWQCB, 1999; Figuers, 1998), hydrostratigraphic[1] correlation between geologic units/formations and locally named aquifers and aquitards[2] is presented in Table 3.9-1. This information is pertinent to the project by providing interpretations of how the project might impact local or regional groundwater characteristics and beneficial uses.

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1 Pertaining to water bearing geologic units (i.e., aquifers) with distinct characteristics that allow for interpretation of age and correlation across large distances.

2 A hydrogeologic unit with low permeability characteristics that impede the vertical flow of groundwater.

Table 3.9-1 Hydrostratigraphic Correlation in the Project Corridor				
Geologic Units Southwest of I-880		**Hydrogeologic Units**	**Geologic Units Northeast of I-880**	
Alameda Formation	Young Bay Mud	Newark Aquitard	(does not exist)	
	San Antonio	Newark Aquifer	Younger Alluvial Fans	Medium-Grained Alluvial Materials
	Yerba Buena Mud	Irvington Aquitard		
	Fine-Grained Material	Centerville Aquifer		
		Mission Aquitard		
		Fremont Aquifer		
		Deeper Aquifers		
Santa Clara Formation		Deeper Aquifers	Santa Clara Formation	

Source: Figuers, 1998

Shallow groundwater conditions exist in the project corridor due to its marginal proximity to the San Francisco Bay. According to a map prepared by the USGS, the groundwater exists at a depth range of 0 to 5 feet below ground surface (bgs) southwest of I-880 and at a depth range of 5 to 10 feet bgs northeast of I-880 in the vicinity of the project corridor (Webster, 1973). According to another map prepared by the USGS, hypothetical wells completed at depth in groundwater-bearing deposits beneath the project corridor have a 68 percent chance that maximum yields will range from 500 to 1,500 gallons per minute (Webster, 1972a). Aquifer conditions of the East Bay Plain have not been subject to substantial change over the last 30 years and are therefore consistent with conditions evaluated in the early 1970s. In general, wells completed in deeper aquifers yield higher flow rates and higher quality water.

Shallow water along the areas marginal to San Francisco Bay is expected to be tidally influenced where tide cycles will govern the groundwater table elevation and slope and the direction of water movement. Tidal influence will have a tendency to cause slight changes in the hydraulic gradient such that, during low tides, the gradient will be towards the Bay and, during high tides, the gradient will be towards the land areas. Overall, the average gradient will be bayward and tidal influences will be localized adjacent to the bay and tidal sloughs.

Water Quality

Surface Water

Surface water in the vicinity of the project corridor originates primarily from urban runoff that is potentially laden with pollutants generated by residential, commercial, industrial, and transportation land uses. San Leandro Creek, which crosses the project corridor, extends into non-urbanized upland areas where protected watersheds exist and pollution potential may be less. Pollutants generated by urban activities may include suspended solids, oil, grease, pesticides, and heavy metals.

During major storm events and certain times of the year, drainage in San Leandro Creek originates from non-urbanized upland areas (e.g., around and above Lake Chabot and San

Leandro Reservoir). Therefore, surface water quality is expected to vary and depends on the time of year, water spills/releases from upstream reservoirs, and urban activities.

Groundwater

Water quality in the groundwater basins encompassing the project corridor varies depending on depth, saline water influences and impacts from surface pollution sources. According to an early map (Webster, 1972b), groundwater in the vicinity of the project corridor is expected to have total dissolved solids (TDS) concentrations of between 500 to 1,000 milligrams per liter (mg/l), which would not meet primary drinking water standards. However, shallow groundwater in areas adjacent to estuary waters may have much higher TDS levels (i.e., greater than 2,000 mg/l) due to high salinity levels from seawater influence. Groundwater with TDS levels in excess of 2,000 mg/l is considered not suitable for industrial or agricultural uses. Inland, seawater intrusion deepens, unless influenced by local pumping.

Section 3.14, Hazardous Materials, discusses the potential for contaminated sites in the vicinity of the project corridor to cause pollution impacts through contact with groundwater.

Applicable Policies and Regulations

Floodplain Management

Executive Order 11988 entitled "Floodplain Management" dated May 24, 1977, requires federal agencies to;

- Evaluate the potential effects of actions it may take in floodplains to avoid adversely impacting floodplains wherever possible;
- Ensure that its planning programs and budget requests reflect consideration of flood hazards and floodplain management, including the restoration and preservation of such land areas as natural undeveloped floodplains; and
- Prescribe procedures to implement the policies and procedures of this Executive Order.

Guidance for implementation of Executive Order 11988 has been provided by the U.S. Water Resources Council in its Floodplain Management Guidelines dated February 10, 1978.

It is the intent of Executive Order 11988 that, wherever possible, federal agencies implement the floodplains requirements through existing procedures, such as those internal procedures established to implement the NEPA and Office of Management and Budget A-95 review procedures. In those instances, where the EIS pursuant to section 102(2)(C) of NEPA, or where programs are not subject to the requirements of NEPA, alternative but equivalent floodplain/wetlands evaluation and notice procedures must be established.

FEMA incorporates floodplain management goals into its planning, regulatory, and decisionmaking processes. It also promotes the preservation and restoration of floodplains so that their natural and beneficial values can be realized. To the extent possible, FEMA shall:

(1) Reduce the hazard and risk of flood loss and wherever it is possible to avoid direct or indirect adverse impact on floodplains;

(2) Where there is no practical alternative to locating in a floodplain, minimize the impact of floods on human safety, health, and welfare, as well as the natural environment;

(3) Restore and preserve natural and beneficial values served by floodplains;

(4) Require the construction of structures and facilities to be in accordance with the standards and criteria, of the regulations promulgated pursuant to the National Flood Insurance Program;

(5) Identify floodplains which require restoration and preservation and recommend management programs necessary to protect these floodplains and to include such considerations as part of on-going planning programs; and

(6) Provide the public with early and continuing information concerning floodplain management and with opportunities for participating in decision making including the (evaluation of) tradeoffs among competing alternatives.

Title 18, Part 725, Subpart A of the Code of Federal Regulations (CFR) defines the applicability of floodplain management regulations in Section 725.3 as follows:

> These regulations apply to all Council actions which have the potential to affect floodplain or wetlands or which would be subject to potential harm if they were located in floodplains or wetlands. The basic test of the potential of an action to affect floodplains or wetlands is the action's potential to result in the long- or short-term adverse impacts associated with:
>
> (a) The occupancy or modification of floodplains, or the direct and indirect support of floodplain development; or
>
> (b) The destruction or modification of wetlands or the direct or indirect support of new construction in wetlands. These procedures apply to Level A and B regional or river basin planning activities carried out by regional planning sponsors including consideration of inclusion of site specific projects in Level A or B regional or river basin plans. These procedures do not apply to site specific Level C planning carried out by individual Federal agencies. Each Federal agency shall use its own procedures promulgated pursuant to these Orders for such Level C planning.

Section 257.3-1 further states that,

> Facilities or practices in floodplains shall not restrict the flow of the base flood, reduce the temporary water storage capacity of the floodplain, or result in washout of solid waste, so as to pose a hazard to human life, wildlife, or land or water resources.

Clean Water Act and NPDES

The prevention of pollutant discharges is regulated under the Federal Water Pollution Control Act (later referred to as the Clean Water Act (CWA)). The CWA was amended 1972 to effectively prohibit point source discharges to waters of the United States, unless the discharge is in compliance with a National Pollutant Discharge Elimination System (NPDES) permit. Amendments to the CWA in 1987 added Section 402(p), which establishes a framework for regulation of municipal and industrial discharges of storm water under the NPDES program. To comply with federal NPDES requirements for storm water regulation, the State of California implemented a general permitting process. This general permitting process required industrial, commercial, and municipal facilities conducting specific activities and listed by their Standard Industrial Classification (SIC) Code by category in 40 CFR Section 122.26(b)(14) (Federal Register, Volume 55 on pages 48065-66) to seek coverage under the State Industrial Storm Water Permit. In addition, they are required to develop a site-specific Storm Water Pollution Prevention Plan (SWPPP) and submit annual reports. The permitting process is administered by the State Water Resources Control Board through the nine Regional Water Quality Control Boards (RWQCBs).

The NPDES storm water permit process includes an assessment by RWQCB regulators of the threat that discharges present to surface water quality objectives. The results of the assessment by the RWQCBs include requiring a full permit, requiring management practices to prevent pollutants from being discharged from facilities, and allowing exemption from permitting requirements. The preferred alternative includes elements, such as transportation maintenance facilities, that would be required to follow the NPDES permitting process.

Federal and state NPDES regulations apply to the Connector project and must be considered in evaluating potential impacts and mitigations. In addition, considerations are given to the following applicable local plans and policies.

- San Francisco Bay Plan
- Flood Safety Element of the Oakland Comprehensive Plan (City of Oakland, 1980)
- Port of Oakland Emergency Operating Procedures (Port of Oakland, 1993)
- BART Extension Program Design Criteria

San Francisco Bay RWQCB Groundwater Policy

Recently, a committee of local groundwater management authorities evaluated potential beneficial uses of groundwater within the San Francisco East Bay Region (RWQCB, 1999). The committee's report recommends that the RWQCB amend the Basin Plan to include division of the East Bay Plain Basin into sub-areas (e.g., the Central and San Leandro Sub-Areas designated by Figuers which encompass the project corridor). The report also recommends establishing three groundwater management zones, one of which would remove shallow, nonpotable groundwater from municipal water supply beneficial uses. Specifically, brackish shallow groundwater in Bay-front artificial fill, Young Bay Mud, and the San Antonio Formation/Merritt Sand could not be used as a groundwater source for municipal drinking

water but may still be used for industrial or agricultural purposes. The RWQCB's report maps the entire project corridor within "Zone A – Significant Drinking Water Resources" where groundwater potentially has significant beneficial uses. Much of the project corridor, however, is likely to have brackish, shallow groundwater that may require special consideration with respect to large dewatering activities.

3.9.3 Impact Assessment and Mitigation Measures

Standards of Significance

Based on CEQA Guidelines, the preferred alternative would result in a significant hydrological impact if the project design, even with implementation of best available mitigation measures, resulted in any of the following:

- Substantial degradation of surface water or groundwater quality,
- Substantial depletion of water resources,
- Violation with adopted environmental plans or goals established for the area where the project is located, or
- Alteration of surface runoff rates and patterns such as to cause substantial flooding, erosion, or siltation.

The potential for hydrological and water quality hazards to cause significant impacts during operation of the preferred alternative is generally based on how site-specific surface water and groundwater conditions might affect or be affected by the preferred alternative.

Preferred Alternative Environmental Analysis

Impact HY-1. Effects of storm water pollution

The Connector project would require maintenance activities that could adversely affect surface water quality via point discharges to storm drains or groundwater via infiltration from the surface. Maintenance activities typically involve the storage and use of chemicals, such as fuels, cleaning solvents or heavy metals that can be exposed to storm water and become entrained in runoff. Misuse or improper storage and handling procedures can result in leaks, spills or other forms of releases to the ground surface where they are potentially exposed to storm water or potentially infiltrate into the ground and reach the water table. Surface water and groundwater quality could be degraded under these conditions.

When compared to the No Action Alternative, the preferred alternative might have a beneficial effect in reducing storm water pollution by reducing the use of personal automobiles and therefore reducing the total amount of oils and other chemicals potentially released during the use, fueling, and maintenance of personal automobiles (including deposition of automobile emissions on the ground) that may enter storm water runoff. (PS)

Median Option. In the event engineering design refinements require the use of the median instead of the preferred alternative alignment for the portion between Elmhurst Channel and

Coliseum Way, incorporation of the Median Option would introduce no additional potential impacts to stormwater pollution. (NI)

Mitigation Measures. The potential effects of storm water pollution resulting from the AGT can be reduced to a less-than-significant effect with the following measure. (LTS)

HY-1(i) *Prepare and Implement Storm Water Pollution Prevention Plan.* BART or its contractor shall obtain an Industrial Storm Water General Permit and prepare a Storm Water Pollution Prevention Plan (SWPPP). The SWPPP is required by the CWA and it must be approved by the RWQCB. The SWPPP shall recommend site-specific Best Management Practices (BMPs) that reduce storm water pollution. BMPs shall include, but not be limited to, housekeeping practices intended to reduce pollutant loading at the maintenance facility, and techniques and equipment to collect and treat storm water pollution. Implementation of the adopted BMPs shall be included as a provision of the contractor.

Impact HY-2. Encroachment into 100-year floodplains

The preferred alternative does not encroach on 100-year floodplain areas since these areas are restricted to existing channels and land immediately adjacent to the channel banks. No maintenance facilities or stations are proposed in these areas. (NI)

Median Option. Substitution of the Median Option for the segment of alignment between Elmhurst Channel and Coliseum Way would have no effect on any of the preceding analyses. (NI)

Impact HY-3. Exposure to uplift forces

Shallow groundwater conditions could result in hydrostatic uplift forces, causing damage to subsurface structures. If this damage is severe, structural failure could result in loss of life. If the groundwater table rises above a critical level such that the weight of water displaced by a structure (e.g., a water-tight tunnel) exceeds the weight of the structure and over-burden materials, the structure will float up. In addition, the weight of the water and soil surrounding the structure will exert pressure on the exterior of the structure. In this instance, damage could occur to the structure if it is not built with sufficient strength. Structural failure due to hydrostatic forces can include sudden collapse of subsurface walls and ceilings.

A tunnel structure is proposed in the vicinity of Doolittle Drive that would likely encounter shallow groundwater. The current conceptual design for the tunnel involves a watertight structure. Because the structure would be below the groundwater table, it could be subject to hydrostatic uplift forces.

Existing BART design criteria require subsurface sections to be designed to withstand hydrostatic uplift forces. Section 9.3.6 of the design criteria requires that underground structures be designed with a minimum factor of safety against flotation. This required minimum is 1.03 of any construction stage and 1.07 when the structure is complete (excluding any benefit from skin friction). Additionally, the design criteria stipulate the use of deep

foundation elements, such as pile foundations, where hydrostatic uplift forces exceed the weight of the structure. BART will require that these design criteria be incorporated into contractor plans and specifications for construction of the tunnel section at Doolittle Drive. Therefore, the potential impacts from hydrostatic uplift forces are considered to be less than significant.

Column and building foundations are constructed of solid concrete that exceed the weight of the water they displace and therefore are not affected by hydrostatic uplift forces. The intermediate stops would not involve structures extended below the groundwater table and, as a result, would not be exposed to hydrostatic uplift forces. (LTS)

Median Option. Substitution of the Median Option for the segment of alignment between Elmhurst Channel and Coliseum Way would have no effect on any of the preceding analyses. (NI)

Partial ADP Scenario

The Partial ADP scenario affects the project corridor only at OIA. The hydrologic impacts and mitigation measures identified in the Preferred Alternative Environmental Analysis for the preferred alternative, above, would not change whether the ADP components were constructed or not.

Cumulative Analysis

Population and employment growth in the project corridor, as anticipated by the eight projects currently under construction or expected to be occupied by 2005, and as planned for by the City's General Plan and other planning documents, would intensify the amount of development in an area susceptible to flooding and storm water pollution. All of the proposed projects, including the Connector, are relatively large-scale projects that would replace currently underutilized or undeveloped lands. As a result, the area available for floodwater storage, infiltration and dissipation is expected to substantially decrease. The cumulative hydrological effect of this growth is expected to be less than significant. This, in part, is due to the fact that each project would be subject to site-specific recommendations to mitigate flooding and water quality degradation hazards. This is accomplished through engineering studies and design of adequate storm water conveyance structures. In addition, each project would likely not encroach on 100-year floodplains since these areas only exist in, and immediately adjacent to, flood control channels that are not practical to build. The preferred alternative would not contribute to hydrological impacts that would be cumulatively considerable.

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Section 3.10
Biological Resources

3.10.1 Introduction

The project corridor is mostly urban but contains a number of areas with biological resources including salt marsh, tidal creek and drainage wetland habitats. This section describes the biological resources in the project corridor, the regulatory setting and the role of federal (U.S. Fish and Wildlife Service, U.S. Army Corps of Engineers) and state (California Department of Fish and Game, California Regional Water Quality Control Board) agencies, and project impacts and mitigation measures.

3.10.2 Existing Conditions

Vegetation Types and Wildlife Habitats

The project corridor is a highly modified urban landform. The most common vegetation types are ruderal upland and landscaping, which are typical non-native urban habitats. One type of native vegetation, coastal salt marsh, is present. The largest extent of coastal salt marsh vegetation is composed of two non-tidal areas. The first area is located within the Lew F. Galbraith Golf Course site; the second area is the fuel farm marsh (also referred to as the Airport Drive Marsh). The reference to fuel farm is based on the cluster of large fuel tanks that exists at the east edge of the wetlands, located east of Airport Drive. Salt marsh vegetation also lines the banks of the creeks and most of the tidal drainage channels within the project corridor. Sensitive vegetation types within the project corridor are shown in Figure 3.10-1. Vegetation types and wildlife habitats are discussed in more detail in Appendix E in the FEIR/FEIS. Plant and wildlife species observed as part of the preparation of this FEIR/FEIS and/or documented by previous studies are listed in Appendix Tables E-1 and E-2, respectively, of the FEIR/FEIS.

As part of the ADP, Airport Drive between Doolittle Drive and the terminal parking area is to be widened. This construction will result in fill of existing wetland areas (mostly drainage ditches) and is mitigated as part of the implementation of the ADP.

Sensitive Plant and Animal Species

Sensitive plant and animal species discussed in this FEIR/FEIS include those species designated by federal, state, or scientific organizations as needing protection due to rarity or threats to their existence. Sensitive species is a general term encompassing species that are listed as rare, endangered, threatened, species of concern, state fully protected, or proposed for, or candidates for, listing by the U.S. Fish and Wildlife Service (USFWS), the California Department of Fish and Game (CDFG), the California Native Plant Society (CNPS), or are considered by experts as unique to Alameda County.

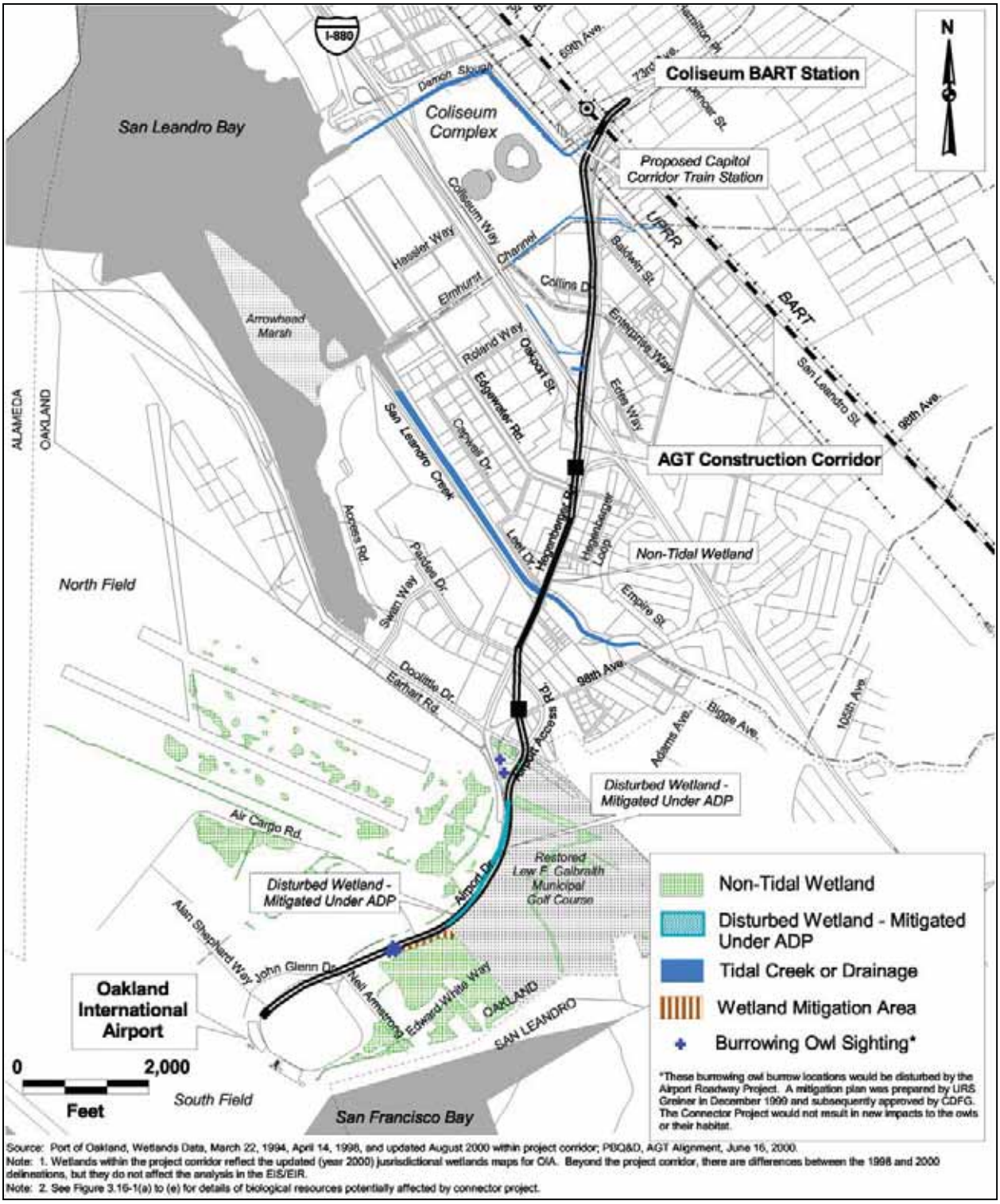
Sources of information used in the preparation of this section include a reconnaissance-level site survey conducted by EIP biologists on February 11, 2000, and searches of the California Department of Fish and Game Natural Diversity Database (CDFG, 2000) and the California Native Plant Society's (CNPS) Electronic Inventory of Rare and Endangered Vascular Plants of California (CNPS, 1999). In addition, the CDFG (Wilson, 2000) and the USFWS (Miller, 2000) were contacted regarding known or potentially occurring sensitive species in the project vicinity. The reports of previous biological studies conducted at OIA were used in preparation of this document, including Airport Roadways Project Biotic Habitats and Wetlands Report (Harvey, 1993), Airport Roadways Project Biological Assessment (Harvey, 1994), the Final EIR/EIS Oakland Harbor Deep-Draft Navigation Improvements (Port of Oakland, U.S. Army Corps of Engineers, 1994), Airport Development Program Final EIR (Port of Oakland, 1997), Airport Roadway Project Draft EIR (Port of Oakland, 1993), the Burrowing Owl Management Plan (Port of Oakland, 1999), as approved by CDFG, and jurisdictional wetland delineations for the Port of Oakland (Port of Oakland, Land Records Management, June 18, 1999 map; Huffman-Chow, 2000), verified by the U.S. Army Corps of Engineers. While most of these reports were reviewed by resource agencies, with few exceptions agency approval was not required. The two exceptions are wetlands delineations verified by the U.S. Army Corps of Engineers and the Burrowing Owl Mitigation Plan (Port of Oakland, 1999) approved by CDFG.

Overall, 17 sensitive plant species and 59 sensitive animal species were considered in this analysis. Appendix Table E-3 of the FEIR/FEIS identifies the sensitive species reported to occur within the vicinity (San Leandro and Oakland East 7.5 minute USGS quadrangles) of the project corridor.

Sensitive Plant Species

Six of the 17 sensitive plant species reported to occur in the vicinity of the project corridor occur in coastal salt marsh habitat which is found in the project corridor: California sea blite, soft bird's beak, Point Reyes bird's beak, Mason's lilaeopsis, hairless popcorn-flower, and marsh gumplant. One of these coastal salt marsh species, marsh gumplant (CNPS List 4 - plants of limited distribution), was observed in the project corridor during the field surveys. Several hundred individuals of marsh gumplant are found along the banks of each of the tidal creeks and drainages between San Leandro Creek and Arroyo Viejo Creek (also identified in this document as Damon Slough). This plant species also occurs in the non-tidal ditch just north of San Leandro Creek on the east side of Hegenberger Road (see Figure 3.10-1). As of the August 2001 CNPS list, marsh gumplant is no longer considered a species of limited distribution. CNPS considered including this species but determined that it was too common. Because of this change, marsh gumplant is not discussed any further in this document.

Three of these six species, soft bird's beak, Pt. Reyes bird's beak, and hairless popcorn-flower, are annuals that bloom in mid- to late-summer and were not in flower during EIP's February 2000 survey. However, because no vegetative material from either of these genera (*Cordylanthus*, *Plagiobothrys*) was observed during EIP's survey, because of the limited extent and quality of the salt marsh vegetation within the project corridor, and because these species were not observed in previous summer surveys of OIA (Harvey, 1994), they are presumed to be absent from the project site. The other two sensitive species known to occur in coastal salt



Source: Port of Oakland, Wetlands Data, March 22, 1994, April 14, 1998, and updated August 2000 within project corridor; PBQ&D, AGT Alignment, June 16, 2000.
Note: 1. Wetlands within the project corridor reflect the updated (year 2000) jurisdictional wetlands maps for OIA. Beyond the project corridor, there are differences between the 1998 and 2000 delineations, but they do not affect the analysis in the EIS/EIR.
Note: 2. See Figure 3.16-1(a) to (e) for details of biological resources potentially affected by connector project.

Figure 3.10-1
Biological Resources Within and Adjacent to the Project Corridor

marsh habitat (California sea blite and Mason's lilaeopsis) are unlikely to occur in the project corridor. The only known extant population of sea blite occurs at Morro Bay; the closest known population of Mason's lilaeopsis is approximately 25 miles away. Neither species was observed during earlier plant surveys undertaken for the Airport Roadway Project (Harvey, 1994).

The other 11 sensitive plant species reported from the vicinity of the project corridor occur in habitat not found in the project corridor and thus are not expected to occur. No other individuals or populations of federal- or state-listed or candidate plant species have been observed in the project corridor.

Sensitive Animal Species

Fifty-seven sensitive animal species are known to occur in the vicinity of the project corridor. Sixteen of these 57 species occur in habitats similar to those found in the project corridor and have a potential to occur within the corridor. Nine of these 16 species have the potential to forage, but not breed, within the project corridor. Either their necessary breeding habitat is absent or the project area is not within their known breeding range. These potential foragers include California brown pelican, tricolored blackbird, American peregrine falcon, ferruginous hawk, Cooper's hawk, northern harrier, American white pelican, black skimmer, and white-tailed kite. California brown pelican, American peregrine falcon, Cooper's hawk, northern harrier, American white pelican, and white-tailed kite were observed on or near the OIA property during 1992 and 1993 bird surveys (Harvey, 1994). The CDFG is primarily concerned with breeding species. Accordingly, these nine bird species are not considered further in this FEIR/FEIS. Furthermore, loss of foraging habitat in the project corridor for these species would not be significant because there is limited existing foraging in the project corridor and extensive foraging habitat exists in the project vicinity.

The seven remaining species do have a potential to breed on the site and are discussed in more detail below. One of these species, the burrowing owl, is known to occur within the project corridor. Two of these species, loggerhead shrike and Alameda song sparrow, are known to occur in the vicinity of the project corridor at the fuel farm marsh. The remaining four species – the salt marsh harvest mouse, salt marsh wandering shrew, California clapper rail, and California black rail – are discussed in more detail below.

The salt-marsh harvest mouse, black rail, and clapper rail, in addition to being listed as state and/or federal endangered and/or threatened species, are also "fully protected" species under the California Fish and Game Code. According to the Fish and Game Code, the Commission may only authorize the collecting of such [bird] species for scientific research (Fish and Game Code Section 3511). The language applicable to the salt-marsh harvest mouse is essentially the same (Fish and Game Code Section 4700). Consequently, the means to confirm their absence (or presence) is restricted and must be made in consultation with the California Department of Fish and Game.

Burrowing Owl

The burrowing owl (*Athene cunicuaria hypugaea*) (federal and state Species of Concern) is a small terrestrial owl that occurs in annual and perennial grasslands, desert, and scrublands with low-growing vegetation. Burrows, which provide protection, shelter, and nest sites for these owls

are an essential component of this species' habitat. Burrowing owls typically use burrows made by burrowing mammals, such as ground squirrels or badgers; however, these owls also use human-made structures such as cement culverts, cement, asphalt, debris or wood piles, or openings beneath cement or asphalt paving.

Burrowing owl burrows have been documented within the project corridor on the east side of Airport Drive just south of the intersection with Air Cargo Road (Port of Oakland, 1997 and 1999). In 1999, one breeding pair, two to three juveniles, and one single adult were observed using five active burrows on the east side of Airport Drive (see Figure 3.10-1). Burrowing owls were also sited south of Doolittle Drive between Airport Drive and Airport Access Road. These burrowing owl sites would be destroyed as part of the Airport Roadway Project Segment 4 Airport Road widening and are mitigated for in the ADP Final EIR. Burrowing owls are not expected to occur elsewhere in the project corridor due to lack of suitable habitat.

Loggerhead Shrike
The loggerhead shrike (*Lanius ludovicianus*) (federal and state Species of Concern) is found from Canada south into Mexico. This species of bird breeds and forages in open fields with scattered trees, open woodland, or scrub. One individual was observed in 1992 at the fuel farm marsh (Harvey, 1994).

Alameda Song Sparrow
The Alameda song sparrow (*Melospiza melodia pusillula*) (federal and state Species of Concern) is one of three endemic subspecies of song sparrows that occur in fresh, brackish, and salt marsh habitats in the San Francisco Bay Area.

Song sparrows that appeared morphologically to belong to this group were observed in the fuel farm marsh (Harvey, 1994). "Races" of song sparrows in the San Francisco Bay Area are known to interbreed in transition areas, such as the brackish habitats found in the vicinity of the project area and genetic information may be necessary to classify resident populations of song sparrows in the region to the sub-species level. However, song sparrows in the fuel farm marsh are assumed to belong to this sub-species (Harvey, 1994).

Salt-Marsh Harvest Mouse and Salt-Marsh Wandering Shrew
Salt-marsh harvest mouse (*Reithrodontomys raviventris*) (federal and state endangered) is found only in saline emergent wetlands of San Francisco Bay and its tributaries. The southern subspecies *Reithrodontomys raviventris raviventris* is restricted to areas of dense pickleweed extending from San Mateo County and Alameda County along both sides of San Francisco Bay south to Santa Clara County.

Salt-marsh wandering shrew (*Sorex vagrans halicoetes*) (federal and state Species of Concern) is restricted to salt marshes in San Francisco Bay. This subspecies occurs in low densities in salt marsh with low, thick cover of pickleweed.

The wetland areas immediately north and west of the Lew F. Galbraith Golf Course site and the fuel farm marsh contain areas of pickleweed that could provide potentially suitable habitat for both species. Trapping was conducted for both species in 1985 at the fuel farm marsh (Harvey,

1985) and in 1989 and 1990 in the central basin of OIA (Port of Oakland, 1997). Neither species was captured in a total of 1,700 trap nights. Dr. Howard Shellhammer (salt-marsh harvest mouse expert permitted by USFWS to handle this species) visited the project corridor adjacent to Lew F. Galbraith Golf Course on April 19, 2000 and concluded that the area is too small and isolated to support either the salt-marsh harvest mouse or the salt-marsh wandering shrew. The USFWS concurred with Dr. Shellhammer that the salt-marsh harvest mouse is not likely to occur in this portion of the project corridor and indicated that further trapping studies would not be required for this species in this area (Hankins, 2000). In contrast, the USFWS did recommend that trapping be conducted at the fuel farm marsh (which would be affected by AGT Option D only) south of the Lew F. Galbraith Golf Course (Hankins, March 2001). Accordingly, a trapping program was designed and implemented by Dr. Shellhammer with assistance of H.T. Harvey and Associates biologists in May and June 2001. The program involved placement of four trapping grids (six rows of 10 traps each for a total of 60 traps per grid) within the pickleweed habitat of fuel farm marsh. Trapping grids were concentrated in the Airport Drive side of the marsh. All four grids were trapped simultaneously, twice for four consecutive nights, for a total of 1,920 trap nights (H.T. Harvey and Associates, 2001). No salt marsh harvest mice nor any other sensitive rodent species were captured during this effort (H.T. Harvey and Associates, 2001). Because of the intense trapping effort conducted without capturing any salt marsh harvest mice, they are presumed absent from the area (H.T. Harvey and Associates, 2001). The results of the trapping survey have been transmitted to the USFWS and CDFG. The USFWS indicated that based on the trapping results, salt marsh harvest mice are not likely to occur in the project area (Hankins, June 2001).

California Clapper Rail and California Black Rail

Rails are secretive marsh birds of the family *Rallidae*. Some species are few in number and restricted to specific habitats, while others, like the American Coot (*Fulica americana*), can be found in a wide variety of habitats, often in large concentrations.

California clapper rail (*Rallus longirostris obsoletus*) (federal and state endangered) is a resident in emergent wetlands of coastal wetlands and brackish marshes (a type of coastal wetland subject to tidal action) in San Francisco, Monterey, and Morro bays, dominated by pickleweed, cordgrass, and bulrush. The clapper rail requires shallow water and mudflats for foraging, with adjacent higher vegetation for cover during high tides.

California black rail (*Laterallus jamaicensis*) (federal Species of Concern, state threatened) occurs in tidal emergent wetlands dominated by pickleweed and in brackish marshes with bulrush and pickleweed. It prefers high wetland zones near the upper limit of tidal flooding, usually along tidal sloughs. The black rail is a resident in California and occurs in the San Francisco Bay area, Sacramento-San Joaquin Delta, Morro Bay, the Salton Sea, and the lower Colorado River area.

Neither of these species was detected during species-specific surveys conducted at the fuel farm marsh and San Leandro Creek in 1992 (Harvey, 1994). The Lew F. Galbraith Golf Course site and the fuel farm marshes are not considered potential breeding habitat for these two species, because they lack a tidal connection and these species prefer tidal habitats. Additionally, the seasonal flooding of the fuel farm marsh creates unsuitable habitat for these species, because no

escape cover remains within the marsh or adjacent upland areas when the marsh is flooded. The tidal creeks and channels between San Leandro Creek and San Leandro Street are also not considered potential breeding habitat for these species because of the limited amount of salt marsh vegetation present. Because neither the California clapper rail nor the California black rail were observed during 1992 surveys and because habitat within the project corridor is generally unsuitable, these species are presumed absent from the project corridor. Concurrence with this conclusion would be required from CDFG and USFWS prior to construction.

Sensitive Habitats

Sensitive habitats and plant communities are those that are considered rare in the region, support sensitive plant or animal species, and/or receive regulatory protection (e.g., wetlands under the U.S. Army Corps of Engineers (Corps) Section 404 permit process and/or the CDFG Streambed Alteration Agreement). Sensitive habitats occurring within the project corridor include four types of potentially jurisdictional wetland and other waters of the United States (see Figure 3.10-1 and Table 3.10-1), as described below.

Table 3.10-1
Acreage of Potential Jurisdictional Wetlands and Waters of the U.S. Within the Construction Corridor

Waterway/Resource	*Acreage*	*Potential Disturbance*	
		by Preferred Alternative	*by Median Option* [1]
Arroyo Viejo Creek (concrete-lined channel)	0.05	0.05	NA
Elmhurst Channel (tidal drainage)	0.03	0.03	0.03
Drainage North of I-880 (tidal drainage)	0.10	0.10	NA
San Leandro Creek (tidal creek)	0.16	No	NA
OIA Non-Tidal Wetlands Airport Drive Drainages[2]	0.0	0.0	NA
Total[3]	0.34	0.18	0.18

Source: EIP Associates, 2001.

Notes:
NA = Not applicable
(1) The Median Option extends between Elmhurst Channel and Coliseum Way and would not affect any waterways besides Elmhurst Channel. Because the remainder of the Connector alignment remains the same, the total area affected by this option is unchanged.
(2) The Port was issued a Corps permit (#21590S) in March 2000 to fill wetlands for the Port's Airport Development Program that included a right-of-way to be eventually used by BART for the Connector. There are no jurisdictional wetlands within the AGT construction corridor that are not already authorized to be filled by Permit #21590S, and the potential to disturb non-tidal wetlands along the Airport Drive drainages does not exist.
(3) Total represents entire AGT alignment.

- **Concrete-lined Portion of Arroyo Viejo Creek** (potential waters of the United States). Arroyo Viejo Creek flows southward in a concrete-lined channel from the median of Hegenberger Road northeast of the Coliseum BART Station to the south end of the embankment of the on-ramp to Hegenberger Road, south of San Leandro Street.

- **Tidal Creeks and Drainages Lined with Salt Marsh Vegetation** (potentially jurisdictional wetland and waters of the United States). Several tidal creeks and drainages occur in the project corridor including Arroyo Viejo Creek, Elmhurst Channel, San Leandro Creek, and two smaller un-named drainages north of I-880 and west of Hegenberger Road.

- **Non-Tidal Wetlands with Salt Marsh Vegetation** (potentially jurisdictional wetland). The largest extent of wetland habitat in the project area is the non-tidal permanent wetlands that occur at the Lew F. Galbraith Golf Course site. Additional areas of non-tidal wetland with salt marsh vegetation include a small drainage channel just north of San Leandro Creek and the portion of the fuel farm marsh that borders the east side of Airport Drive across from Air Cargo Road, and which includes a portion of the Port of Oakland fuel farm mitigation site and upland buffer.

- **Non-Tidal Drainage Ditches**. Non-tidal drainage ditches occur in the project corridor along the east side of Airport Drive from Doolittle Drive to Neil Armstrong Way. These drainage ditches will be filled as part of the Airport Roadway Project Segment 4 widening and are mitigated in the ADP.

Wetland and waters of the United States are rapidly declining throughout California, as they are filled, channelized, or culverted for urban and agricultural development. For this reason, and because wetlands and waters of the United States provide valuable habitat for wildlife, state (CDFG) and federal (Corps) agencies strive to protect and increase these areas through enforcement of "no net loss" regulations. A wetland delineation has been performed for a portion of the wetlands addressed in this document, between Doolittle Drive and the OIA terminal. An OIA-ADP wetlands delineation was verified by the Corps as part of the ADP, and Permit Number 21590S was issued under Section 404 of the Clean Water Act to fill 7.76 acres of wetlands and other waters of the U.S. for landside expansion at OIA (3.32 acres of seasonal wetland, 3.7 acres of drainage channels, 0.72 acre where unauthorized fill was previously placed into wetlands in 1988, and 0.02 acre of tidal creek shaded by the 98th Avenue Bridge for landside expansion at OIA). The fill of wetlands and waters of the U.S. as a result of the ADP would occur in approximately 12 areas on OIA property south of Doolittle Drive and one area along 98th Avenue. Three affected areas are in the vicinity of the proposed AGT alignment; all of these areas are along Airport Drive and the golf course and mitigation sites have been approved by the Corps as part of its issuance of the 404 permit. The 404 permit was for the Port's Airport Development Program, which included a 35-foot easement for use by the Connector project. Since the AGT guideway would be aligned entirely within the project limits of the Airport Development Program in the vicinity of the Airport Drive drainages, the AGT in this segment of the project corridor would not be expected to affect wetlands beyond those already authorized to be filled under Permit Number 21590S. This analysis would be unchanged if the Median Option were selected.

Applicable Policies and Regulations

Federal, state and local statutes provide a regulatory structure that guides the protection of biological resources. The following laws, regulations, and policies are summarized to provide a regulatory setting applicable to biological resources occurring in the Connector project corridor.

Section 404 of the Clean Water Act

Section 404 of the Clean Water Act (33 U.S.C. 1344) prohibits discharges of fill or dredged material into jurisdictional "waters of the United States" without a permit issued by the Corps under a Memorandum of Understanding with the Environmental Protection Agency. "Waters of the United States" are broadly defined in the Corps' regulations (33 CFR 328) to include navigable waterways, their tributaries, and wetlands. Wetlands that are not specifically exempt from Section 404 regulations (such as drainage channels excavated on dry land) are considered to be "jurisdictional wetlands." A Corps permit must be obtained before placing dredged or fill materials in wetlands or other waters of the United States. Specified activities determined to have minimal impacts are covered under existing nationwide permits, some of which do not require notification to the Corps. Individual permits or Letters of Permission are required for all other activities that discharge fill into jurisdictional wetlands. It is possible that placement of fill materials into tidal drainages or adjacent wetlands for this project could meet the conditions for nationwide permit 18 (minor discharges), nationwide permit 25 (structural discharge), or could qualify for a Letter of Permission, depending on the amount of fill and other factors. An individual permit from the Corps would require that an alternatives analysis be prepared pursuant to Section 404(b)(1) of the Clean Water Act. Only the Corps can make the final decision as to which permit mechanism would be applicable.

Before an individual permit may be granted, it must be demonstrated that there are no "practicable alternatives" that are less damaging to aquatic habitats than the proposed project. If project sponsors are able to demonstrate the proposed filling of wetlands is necessary and there are no practicable alternatives to this filling that fulfill project objectives, the project sponsors must prepare a mitigation plan to offset the loss of wetlands. The plan would be reviewed by the USFWS and/or the National Marine Fisheries Service (NMFS) in relation to their mitigation policies.

A condition of Section 404 (33 U.S.C. 1344) requires an applicant for a Corps permit to obtain a Section 401 Water Quality Certification or waiver from the SF Bay Regional Water Quality Control Board (SFBRWQCB). The SFBRWQCB will also review the project for consistency with Waste Discharge Requirements under the state land disposal regulations (Subchapter 15). In reviewing the project, the SFBRWQCB will consider impacts to waters of the state in addition to filling of wetlands.

Federal Endangered Species Act of 1972 (FESA)

Designated endangered and threatened species, as listed through publication of a final rule in the Federal Register, are fully protected from a "take" without a permit administered by the USFWS. A take is defined as the killing, capturing, harming or harassing of a species. Proposed endangered or threatened species are those for which a proposed regulation, but not final rule, has been published in the Federal Register.

State of California-Porter-Cologne Water Quality Control Act

The state Porter-Cologne Act regulates discharges of waste that could affect the waters of the state. The San Francisco Bay Regional Water Quality Control Board, in its Basin Plan, asserts independent authority under the Porter-Cologne Act to regulate discharges of waste to

wetlands, including fill material, that would adversely affect beneficial uses of the wetlands. The State Water Resources Control Board has interpreted the Porter-Cologne Act as regulating the filling of wetlands that are outside federal jurisdiction.

The Migratory Bird Treaty Act of 1918

The Migratory Bird Treaty Act of 1918 makes it unlawful to "take" (kill, harm, harass, etc.) any migratory bird listed in 50 CFR 10, including their nests, eggs, or products.

California Endangered Species Act (CESA)

The California Endangered Species Act declares that listed plant or animal species will be given protection by the state because they are of ecological, educational, historical, recreational, aesthetic, economic, or scientific value to the people of the state. The act established that it is state policy to conserve, protect, restore, and enhance endangered species and their habitats.

Under state law, plant and animal species may be formally designated as rare, threatened, or endangered by official listing by the California Fish and Game Commission. Listed species are generally given greater attention than commonly occurring species during the land use planning process by local governments, public agencies, and landowners than are species that have not been listed.

California Environmental Quality Act - Treatment of Listed Plant and Animal Species

Both the FESA and CESA protect only those species formally listed as threatened or endangered (or rare in the case of the state list). Section 15380 of the California Environmental Quality Act (CEQA), however, independently defines "endangered" species of plants or animals as those whose survival and reproduction in the wild are in immediate jeopardy and "rare" species as those that are in such low numbers that they could become endangered if their environment worsens. The CEQA Guidelines state that a project normally will have a significant effect on the environment if it will "substantially degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, (or) reduce the number or restrict the range of an endangered, rare or threatened species." The significance of impacts to a species under CEQA must be based on analyzing actual rarity and threat of extinction despite legal status or lack thereof.

State of California - Sections 1601-1603 of the Fish and Game Code

Fish and Game Code Sections 1601-1603 require that public agencies and private landowners or project developers obtain a "Streambed Alteration Agreement" from the CDFG for any project that alters streamflows or the bed and bank of a stream, lake, or pond. Conditions of this agreement may include mitigation measures to minimize impacts on fish and wildlife habitat.

State of California - Sections 3503, 3503.5, 3513, 3800 of the Fish and Game Code

There are trees in the project corridor that have been planted in the Hegenberger Road median and along the roadsides as landscaping. Most appear to be non-native, ornamental species, including sycamore, olive, pine, acacia, cypress, and eucalyptus. During windshield surveys of

the project corridor, it was not determined whether any of the trees might have nests. Four sections of the Fish and Game Code prohibit the "take, possession, or destruction of birds, their nests or eggs." Disturbance that causes nest abandonment and/or loss of reproductive effort (killing or abandonment of eggs or young) is considered a "take." Such a take would also violate federal law protecting migratory birds (Migratory Bird Treaty Act).

Fish and Game Code Section 3503 states that it is "unlawful to take, possess, or needlessly destroy the nests or eggs of any bird, except as otherwise provided by this Code or any regulation made pursuant thereto." Starlings and English sparrows are excepted from this rule. Fish and Game Code Section 3503.5 protects all birds of prey (raptors) and their eggs and nests. Sections 3513 and 3800 state that it is unlawful to take or possess any migratory non-game bird as designated in the federal Migratory Bird Treaty Act.

These regulations require that elements of the preferred alternative (in particular tree removals) be reduced or eliminated during critical phases of the nesting cycle (generally from February 1 through August 31 annually), unless it can be demonstrated, subject to approval by the CDFG, that nests will not be disturbed.

State of California – Fully-Protected Species (Sections 3505, 3511, 4700, 5050, and 5515)

Fully protected species may not be taken or possessed. Species afforded protection as fully protected "… may not be taken or possessed at any time and no provision of this code or any other law shall be construed to authorize the issuance of permits or licenses to take any fully protected bird and no such permits or licenses heretofore issued shall have any force or effect for any such purpose …" (Section 3511). The sections pertaining to mammals (4700), reptiles and amphibians (5050), and fish (5515) contain the same wording as presented above for birds. Fully protected species within the project vicinity are presented in Appendix Table E-3 of the FEIR/FEIS.

San Francisco Bay Conservation and Development Commission (BCDC)

The San Francisco Bay Conservation and Development Commission has jurisdiction over San Francisco Bay waters and shorelines, pursuant to the McAteer-Petris Act. The goals and policies of BCDC are contained in its San Francisco Bay Plan. BCDC has jurisdiction over the waters of San Francisco Bay including all tidal sloughs and marshlands. Their shoreline jurisdiction extends 100 feet inland from the elevation of mean high water, estimated at 5.8 feet National Geodetic Vertical Datum (NGVD) within the project area. In tidal wetlands, BCDC's jurisdiction extends 5 feet above mean sea level. Activities that require a BCDC permit include: any placement of fill, dredging, and nearly all work within the 100 foot shoreline band. BCDC defines fill as the placement of solid material within the water, pile supported or cantilevered structures (including bridges and shading of wetlands), disposing of material in the Bay, or the permanent mooring of vessels. Some species of plants are sensitive to the amount of sunlight they receive. A reduction of solar input can result in decreased growth, limited reproduction, or death. Impacts associated with shading could meet the criteria for a potentially significant impact as defined in the Standards of Significance (Section 3.10.3) when the project has a substantial adverse effect on a special status species, sensitive natural community, federally protected wetlands, or when there is a direct loss or measurable degradation of a significant

natural community. For this reason, impacts to sensitive species associated with shading that could result from the proposed project are addressed.

BCDC has permit authority in shoreline areas, in order to insure, among other things, that prime shoreline sites area reserved for priority uses (e.g., ports, water-related recreation, wildlife refuges, airports, etc.), public access is provided, and attractive shoreline development occurs. Areas within the project corridor that may be subject to BCDC jurisdiction include Arroyo Viejo Creek, Elmhurst Channel, and San Leandro Creek.

3.10.3 Impact Assessment and Mitigation Measures

Standards of Significance

For the purpose of this FEIR/FEIS, impacts to biological resources are considered significant if implementation of the preferred alternative could result in one or more of the following specific conditions (following CEQA Section 15065 and CEQA Guidelines, Appendix G):

- substantial adverse effect, either directly or through habitat modifications, on any candidate, sensitive, or special-status species;
- substantial adverse effect on any riparian habitat or other sensitive natural community;
- substantial adverse effect on federal or state protected wetlands;
- substantial interference with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites;
- conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan.

Guidelines developed by federal agencies (USFWS, Corps, U.S. Environmental Protection Agency, etc.) to implement the National Environmental Policy Act (NEPA) generally parallel those of CEQA: an action would be considered to have a significant adverse impact on biological resources if it would directly or indirectly cause:

- the destruction or deterioration of an individual, population, or habitat for special-status species, or a barrier to normal replenishment of a natural community, important plant or animal species, or special-status species
- the direct loss or measurable degradation of a significant natural community (including wetlands)
- a substantial, measurable change in plant or wildlife species or community composition (abundance or diversity) beyond that of normal variation

Impacts in any of these categories would be considered unavoidable significant effects of the Connector project if they could not be eliminated, avoided or minimized by redesign or

relocation of some components of the project; reduced to an acceptable level; or compensated for by replacement of habitat extent and value.

The following analysis was based on the preliminary project design, habitat mapping conducted during site visits, consultation with resource experts, and information collected from a variety of documents. The compilation of the habitat information and proposed alignment allowed the calculation of acreages of habitat affected. The type of habitat affected can be directly correlated to potential impacts to the species that utilize this habitat. The analysis in this section focuses on permanent biological effects. Temporary effects to biological resources are addressed in Section 3.16, Construction Impacts.

Preferred Alternative Environmental Analysis

Impact BR-1. Disturbance to wetlands

Construction of the new Coliseum AGT Station and maintenance and power substation building would not require fill of wetlands. The proposed location of these structures would avoid any impact to the concrete-lined channel between San Leandro Street and the on-ramp to Hegenberger Road at the north end of Arroyo Viejo Creek.

Along the Hegenberger Corridor, between the Arroyo Viejo Creek and the airport, the preferred alignment would pass over Elmhurst Channel, tidal drainages north of I-880, and San Leandro Creek (Figure 3.10-1). One of the design criteria for the AGT has been to avoid sensitive habitats as much as possible, unless there is compelling engineering, cost, logistical, or other reasons. Based on this criterion, BART's general engineering consultant has been able to site the support columns for the aerial AGT guideway to avoid wetlands and waters of the United States.

South of Doolittle Drive, the preferred alternative alignment surfaces to grade east of Airport Drive along the Lew F. Galbraith Golf Course. The at-grade AGT guideway in this segment of the corridor would lie entirely within the area for which the Port has received a permit to fill wetlands. Pursuant to Corps Permit Number 21590S, the Port is authorized to fill wetlands in order to construct the ADP. Since the ADP included right-of-way for the Connector, the AGT would not permanently fill any wetlands that are not already covered by the Corps permit. As a result, there would be no impact to wetlands in this portion of the corridor.

BCDC's jurisdiction is slightly different from that of the Corps in that they consider structures over Bay waters to be fill and subject to the permitting process pursuant to the McAteer-Petris Act. Because the project alignment crosses tidal waters in three locations (Arroyo Viejo Creek, Elmhurst Channel, and San Leandro Creek), it is likely subject to BCDC's jurisdiction. If this is the case, BCDC would consider the aerial guideway to be fill and subject to BCDC's permitting process. Because the structure would be approximately 15.5 feet above grade at all water crossings and no support piles are to be located within any wetlands, there would be a less-than-significant impact to biological resources (primarily from minor increases in shading) from this structure in the long-term. (LTS)

Neither of the two possible AGT intermediate stops is located near a wetland or other water of the U.S.

Median Option. In the event that engineering design refinements require use of the Median Option instead of the preferred alignment, potential permanent impacts to wetlands would be the same as the preferred alternative. (LTS)

Impact BR-2. Loss of trees

Based on a preliminary tree survey conducted in May 2001, the AGT could result in the removal of trees within three segments of the construction corridor. At least two acacias in the segment between Edgewater Road and East Coliseum Way and several multi-trunked olive trees within the Airport parking lot occur within the AGT construction right-of-way and may be displaced. The close planting and the multiple trunks of the olive trees make a precise count difficult, but there do not appear to be more than five trees in this segment. Additionally, four coast redwood trees located at 675 Hegenberger Road are within the construction right-of-way for the AGT. Their removal to construct this portion of the alignment would be considered a significant impact. All of these trees are of sufficient size (nine inches at dbh or greater) such that damage to their roots or their removal would be considered a significant effect. (S)

There are no significant trees within the approximate footprint of the intermediate stations.

Median Option. In the event engineering design refinements require use of the median instead of the preferred alternative alignment for the portion of Hegenberger Road between Elmhurst Channel and Coliseum Way, the four coast redwood trees located at 675 Hegenberger Road would be on the edge of the construction corridor and the potential for these trees to be affected by construction activities would be reduced. Mitigation Measures BR-2(i) and BR-2(ii) would apply to the Median Option if it is selected for this portion of the alignment. (PS)

Mitigation Measures: The preferred alternative and Median Option would result in the removal of trees along the project alignment. While BART is not legally required to comply with local ordinances such as the City of Oakland Tree Ordinance that protects certain native and non-native trees, BART recognizes that the AGT would result in a loss of certain tree resources that would be considered a significant impact. Accordingly, the following mitigation measure would reduce this impact to a less-than-significant level. (LTS)

BR-2(i) *Install Replacement Trees.* For removal of any California or Coast Live Oak with trunk size measuring four inches dbh or larger, or any other tree measuring nine inches dbh or larger (except Eucalyptus and Monterey Pine), BART shall require that replacement trees be planted in the project corridor. Replacement trees will belong to a native tree species (e.g., Coast Redwood, Coast Live Oak, Madrone, California Buckeye, California Bay Laurel, or other appropriate species native to Oakland). At a minimum, each removed tree meeting the above size standards will be replaced either with (i) one replacement tree of twenty four inch box size, or (ii) three replacement trees of fifteen gallon size.

BR-2(ii) Perform Preconstruction Survey for Nesting Birds. BART shall require that a survey be conducted prior to construction to identify potential nesting habitat. If no nests are identified, no further mitigation is necessary. If nests are identified, construction activity shall be restricted. Mitigation Measure C-BR-3(i) defines these restrictions (see Section 3.16, Construction Impacts).

Impact BR-3. Shading of vegetation

Two components of the preferred alternative have the potential to cast shadows: the elevated Coliseum AGT Station and maintenance facility and the aerial guideway. Neither of these components, however, would be constructed close to the ground where the facilities could restrict solar access to underlying plant species for an extended period. The Coliseum AGT Station would be over 40 feet high and the maintenance facility would be below the AGT tracks in the existing BART parking lot. The maintenance facility would be similar in mass and height to a two-story industrial/warehouse building. Ornamental, landscaping trees in the BART parking lot would be shaded by these facilities during the early morning hours. Non-native vegetation and ground cover along the Hegenberger Road overpass and the concrete-lined Arroyo Viejo Creek would be shaded by these facilities in the late afternoon. Because of the limited hours of shade and the absence of sensitive plant species or habitats, these shadow effects on nearby station area vegetation are considered less than significant.

The aerial guideway passes over tidal creeks and drainages (potentially jurisdictional wetland and waters of the United States). These potential wetlands and waters of the United States include Arroyo Viejo Creek, Elmhurst Channel, San Leandro Creek, and two smaller un-named drainages north of I-880 and west of Hegenberger Road. The guideway would be constructed to have a minimum clearance above grade of about 15.5 feet, supported on columns every 60 to 160 feet. Given this height, the maximum 26-foot-width of the guideway, and the column spacing, the shade effects of the aerial segments would be less than significant. The dimensions and shape of the guideway and columns would still permit continuous solar access for most hours of the day. Consequently, underlying or nearby plant species would not be expected to experience impacts from the AGT that would impede their ability to grow and sustain themselves. (LTS)

Median Option. Substitution of the Median Option for the segment of alignment between Elmhurst Channel and Coliseum Way would have the same effect as the preferred alternative. The effects discussed in the preceding analyses would be the same. (LTS)

Impact BR-4. Disturbance to sensitive wildlife species

The project corridor is located in an area with known occurrences of listed rare, endangered, threatened, and other sensitive species. The Martin Luther King Jr. Shoreline Park and San Leandro Bay are considered wildlife refuges by the East Bay Regional Park District (EBRPD), although neither they nor any other nearby areas have had Habitat Conservation Plans prepared to protect the sensitive species and their habitats. Disturbances to habitat and terrestrial and aquatic species at Martin Luther King Jr. Shoreline Park and San Leandro Bay by the Connector would not occur, since these areas are over 0.8 mile to the west of the project corridor.

Burrowing owls have been identified nearby, and loggerhead shrikes and Alameda song sparrows are known to forage nearby at the fuel farm marsh. The preferred alternative would operate within rights-of-way that either exist or would be constructed on or above already disturbed urban landforms. As a result, the preferred alternative would not result in the loss of foraging habitat used by loggerhead shrikes or Alameda song sparrows. The burrowing owls identified near the project corridor will be disturbed by the Airport Roadway Project and mitigation has already been approved by the CDFG for the effects to this Species of Concern. As a result, the preferred alternative would not result in a loss of foraging habitat for the sensitive wildlife species known to occur in the vicinity. (NI)

Median Option. Substitution of the Median Option for the segment of alignment between Elmhurst Channel and Coliseum Way would have no effect on any of the preceding analyses. (NI)

Partial ADP Scenario

In the partial ADP, some of the ADP components (primarily the consolidated and enlarged terminal, the parking garage, and segments of the roadway modifications) would not be implemented. The partial ADP, however, would not change any of the impacts and mitigations discussed above for the preferred alternative. The ADP components that would not be implemented are concentrated in the OIA terminal area, which lacks sensitive biological resources. No additional impacts are anticipated and no additional mitigation measures would be required of the Connector.

Cumulative Analysis

Growth in the project corridor, for the most part, and development of the eight project sites under construction or anticipated to be occupied by 2005 in particular (see Table 3.0-2) would affect rural landscaping or already urbanized sites. As a result, development of the Connector project, in combination with the other projects, would not be expected to have significant cumulative impacts on biological resources.

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Section 3.11
Noise and Vibration

3.11.1 Introduction

This section describes the existing noise and vibration conditions and projected impacts associated with operation of the preferred alternative. "Airborne noise" is transmitted through the air, and "ground-borne vibration" is the transmission of energy through the earth. Noise is defined as unwanted or intrusive sound. Excessive noise in communities can result in widespread annoyance, especially if the noise interferes with sleeping, conversation, or noise-sensitive work. If strong enough to be perceptible, ground-borne vibration can be sensed as a motion of building floors, rattling of windows, or shaking of items on shelves. The low-pitched rumbling noise that can result from ground-borne vibration is called "ground-borne noise."

3.11.2 Existing Conditions

Characterization of Noise and Vibration

The standard unit of sound amplitude measurement is the decibel (dB). The decibel scale is a logarithmic scale that describes the physical intensity of the air pressure vibrations that make up any sound.[1] The pitch of the sound is related to the frequency of the pressure vibration. Since the human ear is not equally sensitive to a given sound level at all frequencies, a special frequency-dependent rating scale is commonly used to relate noise to human sensitivity. The A-weighted decibel scale (dBA) provides the adjustment that most closely matches the sensitivity of the human ear. Table 3.11-1 lists noise levels and common thresholds of response for typical transportation and construction related sources.

Since community noise does not remain static through a typical day, various noise metrics are commonly used to recognize that noise effects on people largely depend on the total acoustical energy of the noise, as well as the time of day when the noise occurs. The equivalent sound level (Leq) is the average acoustic energy content of noise for a stated period of time, typically one hour, Leq(h). Thus, the Leq of a time-varying noise and that of a steady noise are the same if they deliver the same acoustic energy to the ear during exposure. The maximum noise level from an event, such as a vehicle passby, is Lmax. The day-night average noise level (Ldn) is a 24-hour average Leq with an additional 10 dBA "penalty" added to noise that occurs between 10 p.m. and 7 a.m. The effect of the penalty is that an event occurring during nighttime hours, when people are most sensitive, is equivalent to ten similar events occurring in the daytime. The Community Equivalent Noise Level (CNEL) is a 24-hour average noise level similar to the Ldn, with an additional 5 dBA penalty for events occurring between 7 p.m. and 10 p.m.

[1] The logarithmic nature of the decibel scale converts wide ranges of physical values into a scale that is easy to interpret. On the dB scale, changing the physical intensity by a factor of ten, causes a ten dB change on the decibel scale. For example, sound of 60 dB intensity is ten times more intense than a sound of 50 dB.

Table 3.11-1 ***Typical A-Weighted Noise Levels for Sources***		
Response – Source	***Approximate Leq, 50 ft from Source (dBA)***	***Response Threshold (dBA)***
Pain Threshold		130
Arena Concert	110	
Freight Train Locomotive Whistle	105	
Very Loud		100
Pile Driver	100	
Rock Drill	98	
Concrete Mixers	85	
Traffic: 250 heavy trucks per hour, 55 mph	78	
Pumps and Generators	78	
Traffic: 2000 automobiles per hour, 55 mph	72	
City Bus (Idling)	72	
Moderately Loud		70
Traffic: 100 automobiles per hour, 40 mph	65	
Air Conditioner	62	
Quiet		40

Source: FTA, 1995.

Residential areas are nearly always in the range of 50 to 70 Ldn. A very noisy, urban residential area near a freeway or busy arterial is commonly around 70 Ldn (FTA, 1995).

Vibration is an oscillatory motion that can be described in terms of displacement, velocity, or acceleration. The instantaneous peak particle velocity (ppv) is the maximum positive or negative velocity observed. The response of structures to vibration is typically related to the ppv. Thresholds to prevent cosmetic damage to fragile buildings from construction vibration are set at about 0.2 inches per second. Human response to vibration caused by transportation sources or construction activities occurs over a range of frequencies and amplitudes. The root mean square (rms) amplitude of the vibration velocity is a statistical representation of the vibration event. In this report, the rms vibration velocity is taken relative to a reference velocity of one micro-inch per second over a one second time period. The Federal Transit Administration (FTA) uses a unit of measurement in terms of a decibel scale (VdB). In residential areas, background vibration levels are typically below 50 VdB, which is well below the threshold of human perception of about 65 VdB (FTA, 1995). Table 3.11-2 lists ground-borne vibration levels for typical transportation and construction related sources.

Table 3.11-2 *Typical Ground-borne Vibration Levels for Sources*		
Response – Source	***Approximate RMS Vibration Velocity Level, 50 ft from Source (VdB)***	***Response Thresholds (VdB)***
Threshold for Minor Cosmetic Damage (fragile buildings)		100
Blasting from Construction Projects	100	
Pile Driver (Typical)	98	
Bulldozers and Other Heavy Tracked Equipment	92	
Difficulty with Tasks (such as reading computer screen)		90
Commuter Railroad (Upper Range)	85	
Residential Annoyance, Infrequent Events (e.g., fewer than 70 per day)		80
Commuter Railroad (Typical)	75	
Residential Annoyance, Frequent Events (e.g., more than 70 per day)		72
Bus or Truck (Over Bump)	72	
Approximate Threshold for Human Perception		65
Rubber-Tire Transit System (Typical)	65	
Bus or Truck (Typical)	62	
Typical Background Vibration	50	

Source: FTA, 1995.

Ground-borne vibration can be a nuisance to people inside structures. Damage to structures is less common, except during blasting or pile driving that can occur during construction activities. Vibration energy is transferred through the soil and rock strata to the foundation of a structure. Shallow bedrock and stiff clay type soils are the most efficient at transferring vibration energy, and loose soils tend to dampen the effect. If the source energy is strong enough, the various building components within a neighboring structure (including the floors, window housings, walls, and items within the structure) can resonate. The result is that the motion or rattling of the room surfaces can provoke a serious adverse human reaction. Ground-borne noise is the result of wall or floor vibration, creating an audible hum.

Existing Sources of Noise and Vibration

In the study area, the dominating noise sources are transportation related. Motor vehicle noise from cars and trucks along I-880, Hegenberger Road, Airport Drive, and Doolittle Drive affects background noise levels during all times of the day. Approximately 190,000 vehicles per day operate on I-880 near Hegenberger Road, and nearly five percent of that traffic consists of heavy trucks (Caltrans, 2000). Heavy trucks are a large proportion of vehicle traffic on Hegenberger Road and Doolittle Drive near Hegenberger Road because of the nearby industrial uses and distribution-related businesses. At the north end of the project corridor, the existing BART line and UPRR lines are other major sources of noise. Approximately 400 BART trains per day operate along the elevated tracks through the Coliseum BART Station (BART, 2000). Passenger

trains and freight trains operate along the UPRR lines adjacent to the Coliseum Complex. Known as the Capitol Corridor, about eight commuter trains and four long-distance passenger trains run daily on the UPRR line located between the Coliseum Complex and San Leandro Street (Kutrosky, April 2000). About 12 long-distance freight trains run daily on the UPRR line between the Coliseum Complex and San Leandro Street, while limited freight train traffic occurs on the UPRR line between San Leandro Street and Snell Street (Ongerth, June 2000).

Existing truck and rail traffic are notable existing sources of ground-borne vibration. Within about 50 feet of the UPRR lines, vibration effects due to the passing of freight trains can be as high as 80 VdB. Heavy trucks and buses can cause vibration levels around 62 to 72 VdB within 50 feet of the road. The high end of this range corresponds with the effects of heavy traffic on an uneven road.

At the south end of the project corridor, the proximity of OIA makes jet aircraft a major noise source. Takeoffs and landings at the North Field travel over the project corridor, and a variety of noise-generating airport facilities, including the passenger terminals, heavily-traveled airport roadways, rental car facilities, and aircraft maintenance facilities, surround the corridor's southern terminus. More detailed information on existing noise levels is provided below.

In summary, much of the project corridor experiences relatively high levels of ambient noise from these region-serving transportation facilities. Receptors outside of the influence of noise from I-880, the existing BART and rail lines, and the flight paths leading to OIA experience noise from sources more typical of average suburban areas, such as light traffic and children playing.

Sensitive Receptors

Certain types of land uses are considered to be more sensitive than others to elevated noise or ground-borne vibration. Examples of sensitive receptors include residential areas, hospitals, schools, cemeteries, and parks. The residences in the project study area are adjacent to the Coliseum BART Station parking lot. As this is where people normally sleep, the residences would be especially sensitive to changes in day-night noise levels, Ldn. Additionally, there are approximately seven hotels along Hegenberger Road that would also be sensitive to changes in day-night noise. The Martin Luther King Jr. Regional Shoreline Park along the San Leandro Creek Trail at Hegenberger Road and the Lew F. Galbraith Golf Course (under restoration) east of Airport Drive would each be sensitive to changes in daytime noise levels, or changes in Leq, because these are areas with primarily daytime use. Other commercial uses would also be sensitive to changes in daytime noise levels, or changes in Leq, but they are considered to be less sensitive than the residences, hotels, and recreational areas. Because most office buildings, restaurants, and other commercial uses are compatible with higher noise levels, they are not considered by the FTA to be noise-sensitive. There are no known business uses in the project corridor that depend on quiet as an important part of operations (an example of this type of business would be a motion picture or sound recording studio), and there are no noise-sensitive uses at the OIA. The project corridor does not include any historic buildings that would be sensitive to potential damage from vibration.

Measurement Sites and Noise Levels

Ambient noise levels were measured in the project corridor to characterize the existing conditions and to provide a comparison with previous noise surveys conducted in the area. Short-term (15-minute) noise levels at four locations were monitored for traffic noise during weekday peak hour conditions using a Type 1 Sound Level Meter. The locations were selected to be representative of the types of sensitive receptors occurring in the corridor. Locations along Hegenberger Road, Airport Access Road, and Edes Avenue were selected to characterize conditions at hotels in the areas, and a location in the Coliseum BART Station parking lot was selected to be representative of impacts to residences near there. The results of the monitoring program are shown in Table 3.11-3.

The combined influence of the transportation noise sources in the area is shown in Figure 3.11-1. This figure provides a graphical representation of noise levels based on existing traffic conditions, train passby frequency, and information from OIA.

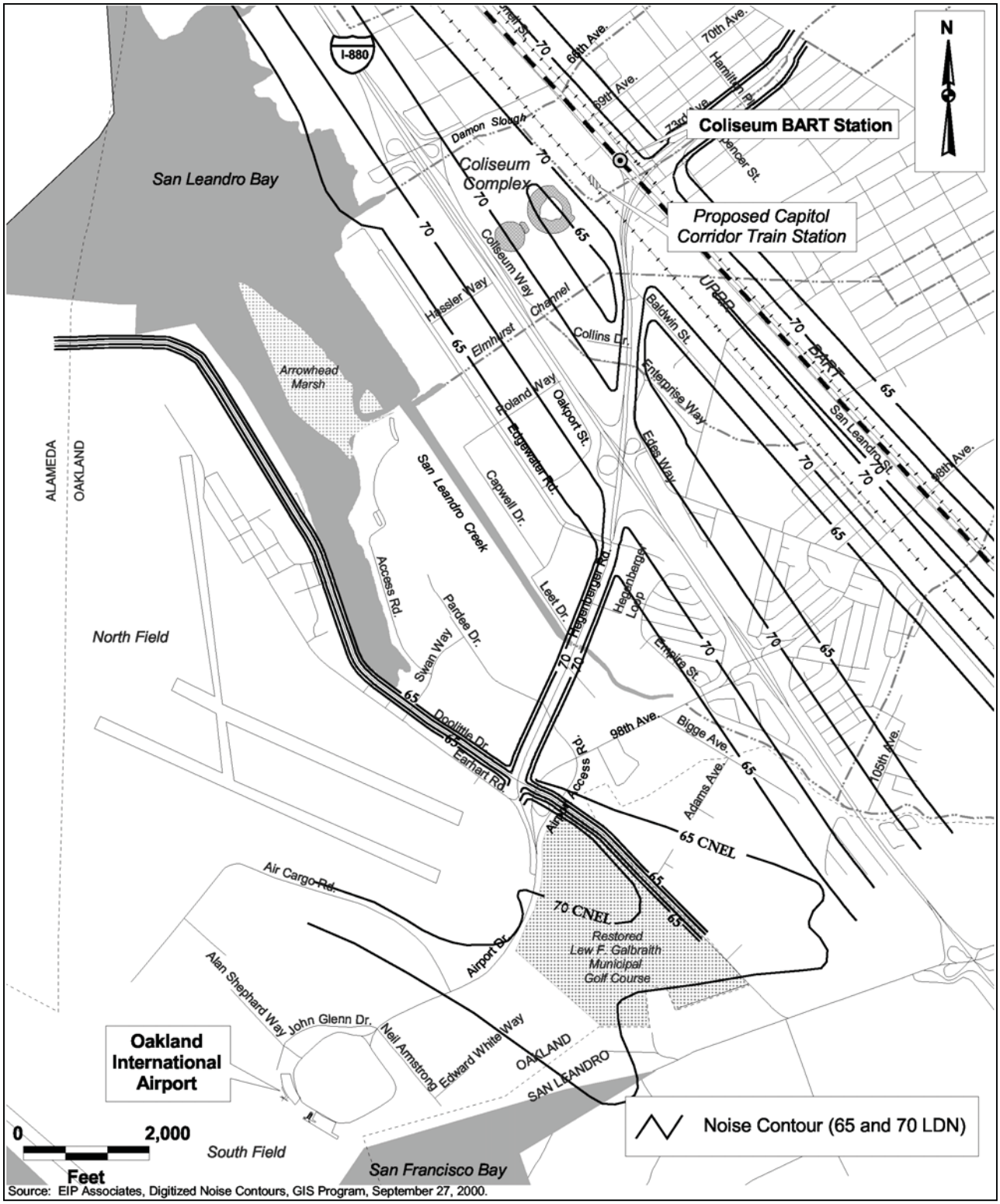
Table 3.11-3
Summary of Short-Term Ambient Noise Measurements

Site	*Description*	*Sensitive Receptors*	*1-hour L_{eq} (dBA)*	*24-hour L_{dn} (dBA)*
R1	Hegenberger Road at San Leandro Creek (85 ft west of Hegenberger Road centerline)	Regional Park or Hotel	67.7	68
R2	Airport Access Road between 98th and Doolittle (55 ft west of Airport Access Road centerline)	Hotel	66.8	69
R3	Edes Avenue between Hegenberger and I-880 (65 ft east of Edes Avenue centerline)	Hotel	72.1	73
R4	Coliseum BART Station Parking Lot (about 350 ft east of BART aerial guideway)	Residences	62.3	67

Source: EIP Associates, February 2000.
Notes: Long-Term (24-hour) measurements were conducted at R1 and R4 to compare with predicted Ldn's. The lowest of the measured and predicted values is presented here.

Highway and Surface Traffic Noise. For locations where there are no intervening buildings obstructing the sound path, the existing traffic along I-880 causes noise levels above 70 Ldn within about 600 feet of the interstate centerline, and noise levels are above 65 Ldn for unobstructed receptors within about 1,200 feet of the interstate centerline. Using Caltrans and Federal Highway Administration modeling methods, Hegenberger Road generates about 65 Ldn at 130 feet and 70 Ldn at 60 feet from the centerline, and noise along Doolittle Drive is between 65 and 70 Ldn for unobstructed locations within about 110 feet of the road centerline (FHWA, 1978 and Caltrans, 1998).

Aircraft Noise. The 1994 existing conditions from the Draft Supplement to the Airport Development Plan EIR (Port of Oakland, 1999) show that the 65 CNEL aircraft noise contour extends north of the airport property to roughly the intersection of 98th Avenue with Airport Drive. Aircraft takeoffs and landings from the OIA North Field cause day-night noise levels to be between 65 and 70 CNEL on most of the golf course property and above 70 CNEL on portions of the course closest to the runways (Figure 3.11-1).



Source: EIP Associates, Digitized Noise Contours, GIS Program, September 27, 2000.

Figure 3.11-1
Existing Noise Contours

Railroad Noise. UPRR freight and passenger trains on the UPRR lines are known to cause peak noise levels of approximately 95 dBA during a single passby. While commuter trains operate during the times of the day when people are less sensitive to noise, the freight trains operating on these lines can occur during any hour of the day or night. Within about 400 feet of the centerline of the tracks south of San Leandro Street, the railroad noise is above 65 Ldn.

Existing BART Operations Noise. Noise from BART trains passing on the aerial tracks at the Coliseum BART Station results from steel wheels on the rails, warning signals as the train enters the station, and electric motors driving the train. Peak noise levels associated with one passby of one train are around 85 dBA within about 100 feet of the tracks. When the trains are far from the stations, day-night noise levels are about 70 Ldn for unobstructed locations within about 600 feet of the centerline of the BART tracks, depending on the speed of the trains and the number of trains per day. Because the trains entering and leaving the project corridor at the Coliseum BART Station are slowing, stopping, and starting, the noise levels tend to be quieter than when trains are traveling between stations. Based on the measurements conducted near the station and tests at other BART locations, the typical weekday noise levels near the station are about 70 Ldn at unobstructed locations within about 300 feet of the centerline of the aerial tracks. On weekends when there is less BART traffic and less activity of patrons in the parking lots, day-night noise levels around the Coliseum BART Station parking lots are closer to 67 Ldn.

Vibration Levels

Existing ground-borne vibration may be perceptible at some locations within the interior of structures immediately adjacent to the existing BART line and UPRR lines due to heavy rail and truck traffic occurring in the project corridor. Characterization of existing ground-borne vibration levels is based on data collected by the FTA for comparable sources. According to FTA guidelines for typical sources, at distances greater than 50 feet, perceptible ground-borne vibration is not common for highway sources, but conditions along the heavy rail lines may result in perceptible ground-borne vibration at distances greater than 50 feet (FTA, 1995). The soils in the study area tend to be low density and are easily compressible. These properties tend to lessen ground-borne vibration. The residences and hotels in the study area that would be sensitive to noise would also be sensitive to vibration. Parking lots and other setbacks commonly separate the buildings in the study area from heavy truck or rail traffic. With the setbacks and the dampening effect of the soil, existing vibration levels at the residential structures and hotels are expected to be under the threshold of perception.

Future Noise Levels

Highway and Surface Traffic Noise. Increased future motor vehicle travel in the project study area is anticipated to cause traffic noise to increase by about 2 dBA between existing conditions and 2005 and 3 dBA between existing conditions and 2020. This change means that for unobstructed locations along Hegenberger Road, noise in 2020 will be above 65 Ldn for locations within 220 feet of the road centerline, and within 100 feet, traffic noise will be above 70 Ldn.

Aircraft Noise. The Draft Supplement to the Airport Development Plan EIR (Port of Oakland, 1999) reports that airport noise in future conditions (2000 and 2010) would not expand

substantially northward along Hegenberger Road, but on much of the Lew F. Galbraith Golf Course, airport noise with the Airport Development Plan in 2010 could increase by as much as 5 CNEL.

Railroad Noise. On the UPRR lines in the corridor, passenger train traffic is anticipated to increase through at least 2005 (BART, 2000). Anticipated growth in commuter rail traffic by 2005 will cause these noise levels to increase by about 1 dBA.

Future BART Operations Noise. Increased future BART service will cause noise levels near the Coliseum BART Station to increase about 1 to 2 dBA by 2010. This increase means that in the future, noise near the Coliseum BART Station will be above 70 Ldn at unobstructed locations within about 400 feet of the centerline of the aerial tracks.

Applicable Plans and Policies

Categorization of Receptors

BART Categorization of Receptors. Based on the existing land uses around a given receptor and the typical noise levels occurring near the receptor, BART assigns the land uses an "area category" that characterizes the sensitivity of the location to its noise and vibration environment (BART, 1992). The five land use categories are listed here, and, based on their surroundings, the sensitive receptors in the project corridor are categorized in Table 3.11-4.

Table 3.11-4
Sensitive Receptors in the Study Corridor

Sensitive Receptor	*Location*	*BART Area Category*	*FTA Noise Category: and Sensitivity*	*FTA Vibration Category: and Sensitivity*
Residences	Homes on 70th and 71st, near BART and Hawley Street	**II**	2 (Ldn)	2 (< 72 VdB)
Residences	Homes on 70th and 69th, near Snell and Hawley Streets	**II**	2 (Ldn)	2 (< 72 VdB)
Medical Office	675 Hegenberger Road	**IV**	3 (Leq)	3 (< 75 VdB)
Restaurant	Denny's: 601 Hegenberger Road	**IV**	None	3 (< 75 VdB)
Restaurant	Sam's Hofbrau: 595 Hegenberger Road	**IV**	None	3 (< 75 VdB)
Hotel	Days Inn: 8350 Edes Ave.	**IV**	2 (Ldn)	2 (< 72 VdB)
Hotel	Holiday Inn: 500 Hegenberger Road	**IV**	2 (Ldn)	2 (< 72 VdB)
Office	Bank of America: 303 Hegenberger Road	**IV**	None	3 (< 75 VdB)
Hotel	Marriott Under Construction: Hegenberger Loop Site	**IV**	2 (Ldn)	2 (< 72 VdB)
Residences	Homes on Empire Road, east of Hegenberger Loop	**II**	2 (Ldn)	2 (< 72 VdB)
Regional Park	San Leandro Creek Trail	**IV**	3 (Leq)	None
Hotel	Park Plaza Hotel: 150 Hegenberger Road	**IV**	2 (Ldn)	2 (< 72 VdB)
Restaurant	Francesco's: 8520 Pardee Drive	**IV**	None	3 (< 75 VdB)
Office	United Labor Bank: 100 Hegenberger Road	**IV**	None	3 (< 75 VdB)
Office	Warehouse Union: 99 Hegenberger Road	**IV**	None	3 (< 75 VdB)
Hotel	Edgewater West: Doolittle Gateway Site	**IV**	2 (Ldn)	2 (< 72 VdB)
Hotel	Hilton Hotel: 1 Hegenberger Road	**IV**	2 (Ldn)	2 (< 72 VdB)
Hotel	Holiday Inn Express: 66 Airport Drive	**IV**	2 (Ldn)	2 (< 72 VdB)
Regional Park	Proposed Bay Trail Extension	**V**	3 (Leq)	None
Golf Course	Lew F. Galbraith Golf Course	**IV**	3 (Leq)	None

Source: EIP, 2001.
Notes: Categorization of receptors according to BART, 1992 and FTA, 1995.

- *Area I: Low Density.* May be urban residential, open space park, suburban residential, or quiet recreation area. No nearby highways or boulevards.

- *Area II: Average.* May be urban residential, quiet apartments and hotels, open space, suburban residential, or occupied outdoor areas near busy streets.

- *Area III: High Density.* May be urban residential, average semi-residential/commercial areas, parks, museum, or non-commercial public building areas.

- *Area IV: Commercial.* May be areas with office buildings, retail stores, etc., primarily daytime occupancy, or Central Business Districts.

- *Area V: Industrial areas or Freeway and Highway Corridors*.

FTA Categorization of Receptors. The FTA has defined several noise and vibration categories to distinguish the sensitivity of different land uses to noise and vibration effects. Table 3.11-4 summarizes the sensitive receptors in the project corridor and identifies their applicable FTA category for noise and vibration effects.

- *Noise Category 1:* Land where quiet is an essential element of the intended purpose. This includes outdoor amphitheaters and landmarks with substantial outdoor use. Most sensitive to changes in Leq.

- *Noise Category 2:* Residences, hotels, hospitals, and other uses where nighttime sensitivity to noise is assumed to be of utmost importance. Most sensitive to changes in day-night Ldn.

- *Noise Category 3:* Institutional land uses with primarily daytime and evening use. This includes medical offices, schools, libraries, and churches. Most sensitive to changes in daytime Leq.

- *Vibration Category 1:* Buildings where low ambient vibration is essential for the operations of the building. Examples include vibration-sensitive research, manufacturing, and hospitals. Facilities operating electron microscopes, operating high resolution lithographic equipment, or manufacturing computer chips can also be considered vibration sensitive. Most sensitive to frequent vibration above 65 VdB.

- *Vibration Category 2:* All residential land uses and any buildings where people sleep, including hotels. Most sensitive to frequent vibration above 72 VdB.

- *Vibration Category 3:* Institutional land uses with primarily daytime use. Schools, churches, and quiet offices. Most sensitive to frequent vibration above 75 VdB.

BART Design Criteria

Criteria for noise and vibration were adopted by BART in its 1992 "Extensions Program System Design Criteria." The criteria specify maximum passby noise and vibration levels and

maximum noise levels from ancillary facilities, which are related directly to the community area categories defined by BART.

Operational Noise Criteria. Table 3.11-5 presents the maximum passby noise levels specified by BART design criteria. The criteria are based on the type of receptor (e.g., single family residence or commercial building) and the area category of the surrounding land use. Some criteria are based solely on the type of receptor, and these are shown in the bottom half of Table 3.11-5.

Table 3.11-5
BART Design Criteria for Operational Noise

	Maximum Passby Noise Levels (dBA)		
BART Area Category	***Single Family Dwellings***	***Multi-Family Dwellings***	***Commercial Buildings***
I Low Density Residential	70	75	80
II Average Residential	75	75	80
III High Density Residential	75	80	85
IV Commercial	80	80	85
V Industrial/Highway	80	85	85
	Maximum Passby Noise Levels (dBA)		
"Quiet" Outdoor Recreation Areas	70		
Concert Halls, Radio, and TV Studios	70		
Churches, Theaters, Schools, Hospitals	75		

Source: BART, 1992.

Separate design criteria are available for maximum noise from ancillary facilities. Transient noise criteria apply to noise from vent shafts during passby of a train, and continuous noise criteria apply to such facilities as traction power substations. When continuous noise has pure tones associated with it, the criteria are reduced. Table 3.11-6 shows the criteria for the maximum noise from ancillary facilities.

Table 3.11-6
BART Design Criteria for Noise from Ancillary Facilities

	Maximum Noise Levels (dBA)	
BART Area Category	***Transient***	***Continuous***
I Low Density Residential	50	40
II Average Residential	55	45
III High Density Residential	60	50
IV Commercial	65	55
V Industrial/Highway	70	65

Source: BART, 1992.
Note: Criteria are reduced by 5 dBA for noises with pure tone components.

Operational Vibration Criteria. Table 3.11-7 presents the BART design criteria for maximum ground-borne vibration levels. The criteria are on the effect of ground-borne vibration of floor surfaces within a building.

Table 3.11-7 ***BART Design Criteria for Operational Ground-borne Vibration***			
	Ground-borne Vibration Maximum Passby Velocity Levels (VdB, µin/sec)		
BART Area Category	***Single Family Dwellings***	***Multi-Family Dwellings***	***Hotels/Motels***
I Low Density Residential	70	70	70
II Average Residential	70	70	75
III High Density Residential	70	75	75
IV Commercial	70	75	75
V Industrial/Highway	75	75	75
	Maximum Passby Velocity Levels (VdB, µin/sec)		
Concert Halls and TV Studios	65		
Churches and Theaters	70-75		
Hospital Sleeping Rooms	70-75		
Courtrooms, Schools, Libraries	75		
Offices	75-80		
Commercial and Industrial Buildings	75-85		
Vibration-Sensitive Industry or Research	60-70		

Source: BART, 1992.
Note: Criteria apply to the vertical vibration of floor surfaces within the buildings.

Federal Transit Administration Guidelines

The FTA, in the 1995 guidance manual titled "Transit Noise and Vibration Impact Assessment," provides methods of impact assessment and characterizes project performance in terms of noise and vibration criteria that are absolute (i.e., defined irrespective of the existing conditions) and relative (i.e., based on the change in exposure caused by a project).

Operational Noise. Operational noise criteria are set forth according to the sensitivity of land uses. Hourly noise levels (Leq(h)) are used where quiet is an essential element of the intended use and in other areas that are used by people for gathering or recreation (Noise Categories 1 and 3, e.g., parks and theaters). Day-night noise levels (Ldn) are used where people normally sleep (Noise Category 2, e.g., residences and hotels).

Existing noise levels are taken into account by the FTA guidelines, and a sliding scale is applied to characterize the project effects relative to the existing conditions. Impacts are characterized by FTA as severe if the project noise would be expected to annoy a significant percentage of people. The FTA criteria for project impacts relative to existing noise levels are shown in Table 3.11-8.

Table 3.11-8 ***FTA Criteria for Operational Noise***						
Existing Noise Exposure	***Project Noise Impact, Leq(h) or Ldn (dBA)***					
	Noise Category 1 or 2			***Noise Category 3***		
Leq(h) or Ldn (dBA)	***No Impact***	***Impact***	***Severe Impact***	***No Impact***	***Impact***	***Severe Impact***
50	< 54	54-59	> 59	< 59	59-64	> 64
55	< 56	56-61	> 61	< 61	61-64	> 66
60	< 58	58-63	> 63	< 63	63-68	> 68
65	< 61	61-66	> 66	< 66	66-71	> 71
70	< 65	65-69	> 69	< 70	70-74	> 74
75	< 66	66-73	> 73	< 71	71-78	> 78

Source: FTA, 1995.
Note: Ldn is used where nighttime sensitivity is a factor, and Leq is used for areas with daytime activities.

Cumulative Operational Noise. Cumulative noise impacts are characterized relative to the existing noise environment. For areas with an existing noise exposure of 60 dBA or less, a 5 dBA increase in cumulative Leq or Ldn could occur without causing a severe impact. This threshold drops to two dBA for areas with existing noise levels of 75 dBA (FTA, 1995). The cumulative noise exposure increase that would cause a severe cumulative impact is shown in Table 3.11-9.

Table 3.11-9 ***FTA Criteria for Cumulative Noise Exposure Increases***		
Existing Noise Exposure Leq(h) or Ldn (dBA)	***Cumulative Impact***	***Severe Cumulative Impact***
50	+ 5	+10
55	+ 3	+ 7
60	+ 2	+ 5
65	+ 1	+ 4
70	+ 1	+ 3
75	+ 0	+ 2

Source: FTA, 1995.
Note: Ldn is used where nighttime sensitivity is a factor, and Leq is used for areas with daytime activities.

Operational Vibration. FTA criteria for ground-borne vibration and ground-borne noise are based on the absolute maximum levels for a single event. There is limited information on how occupants respond to building vibration and ground-borne noise. The FTA criteria for characterizing effects caused by any type of transit system are based on test observations of rapid rail transit systems operating on headways between three to ten minutes with each passby lasting less than ten seconds. Table 3.11-10 summarizes the FTA criteria for ground-borne vibration and noise according to land use category.

Table 3.11-10
FTA Criteria for Ground-Borne Vibration and Noise

Land Use of Receptor [1]	***Ground-Borne Vibration Impact (VdB, µin/sec)***	***Ground-Borne Noise Impact (dB, 20 µPa)***
Vibration Category 1: Extremely Sensitive Buildings	65 [2]	--- [2]
Vibration Category 2: Residences and Hotels	72	35
Vibration Category 3: Institutional or Office Buildings	75	40

Source: FTA, 1995.

Notes: [1] Criteria are applicable inside buildings.

[2] Examples include vibration-sensitive research, manufacturing, and hospitals. Facilities operating electron microscopes, operating high resolution lithographic equipment, or manufacturing computer chips can also be considered vibration sensitive. These facilities are not sensitive to ground-borne noise.

City of Oakland Noise Element

The City of Oakland 1974 Noise Element of the Comprehensive Plan is currently being revised by the City. No quantitative noise level standards are included in the current element. The policies rely on compatibility guidelines recommended by the State Office of Planning and Research. The State Office of Planning and Research defines the compatibility of various land uses as a function of community noise exposure (OPR, 1998). These guidelines indicate that residential land uses are normally compatible with exterior noise environments up to 60 dBA Ldn/CNEL, and lodging land uses are normally compatible with noise levels up to 65 dBA Ldn/CNEL. In much of the study area, the existing noise levels are above those that would be considered "normally acceptable" for these sensitive uses.

City of Oakland Planning Code

The Planning Code regulates nuisance and other short-term noise in the City. Chapter 17.120.050 includes specific performance standards that apply to all activities in the City. Peak noise levels (Lmax) on residential properties are generally limited by the ordinance to 80 dBA during the daytime and 65 dBA during the night (10 p.m. to 7 a.m.). Construction noise standards of the Planning Code and of the City's Health and Safety Code are discussed in Section 3.16 of this document. According to BART's enabling statute, because BART is a special district, BART is not required to comply with certain local ordinances, including noise standards. Nevertheless, BART seeks to adhere to them as much as possible. Consequently, the local ordinances are described, but they do not define the standards by which impacts are determined.

Chapter 17.120.060 of the Planning Code prohibits sources that create perceptible vibration at residential properties; however, it does not apply to ground-borne vibration from trains or temporary construction work. This performance standard would apply to activities at stationary sources or permanent maintenance or operation facilities.

3.11.3 Impact Assessment and Mitigation Measures

Standards of Significance

Project-induced noise and vibration impacts would be considered significant if they would exceed the design criteria adopted by BART in the 1992 "Extensions Program System Design Criteria." Specifically, the preferred alternative would result in a significant impact if:

- Operational noise exceeds the BART criteria shown in Table 3.11-5 or Table 3.11-6.
- Ground-borne vibration from operations exceeds the BART criteria shown in Table 3.11-7.

The cumulative analysis must address noise changes caused by all foreseeable projects affecting the project corridor. Because project effects would contribute to future changes in noise from street and highway traffic and cumulative effects, the cumulative changes in the noise environment are evaluated for consistency with the criteria for cumulative impacts in the FTA guidelines. The preferred alternative would result in a significant cumulative impact if:

- Transit-system operational noise contributes to a cumulative increase in noise levels that would be considered as a severe impact by the FTA criteria shown in Table 3.11-9.

Methodology

Operational noise and vibration is analyzed by focusing on those areas that are sensitive to changes in ambient noise or vibration conditions. If no sensitive land uses (see Table 3.11-4) are present within the vicinity of project influence, then detailed analysis is not necessary. Screening-level analyses are used to identify the areas where impacts would be likely. In the screening procedure, the impact criteria (Tables 3.11-5 through 3.11-7), the sources associated with the project, and the location of sensitive land uses are each considered. If the preferred alternative causes an indirect reduction in noise levels from motor vehicle traffic (e.g., by diverting trips to the Connector), the future traffic noise with the preferred alternative is noted.

For transit vehicle passby noise, operational plans for the year of opening (2005) are used to model the noise caused by the preferred alternative. The No Action Alternative was modeled assuming operation of multiple two-axle urban buses at average speeds of 30 miles per hour; and the AGT was analyzed assuming use of a steel-wheel system on steel rails at 45 miles per hour. The steel-wheel system of the AGT includes further assumptions that take into account aging of the system by anticipating increased wheel noise and vibration from wheel flats and rail corrugation. Preliminary designs of the guideway of the AGT include a sound barrier close to the transit vehicles that would reduce operational noise by about 6 dBA. This set of assumptions is expected to represent the most-intense potential effects of the AGT technologies under consideration, including optional diesel-powered buses operating on the AGT alignment. Noise from power substations for the AGT is analyzed using typical noise levels at similar sources, and for the AGT maintenance facility, a detailed assessment is used (considering simultaneous operation of AGT vehicles, auxiliary equipment, car washes, and the collocated substation). The noise and vibration levels associated with the preferred alternative are then compared to the BART design criteria and standards of significance identified above.

Preferred Alternative Environmental Analysis

Impact NV-1. Noise from vehicle passby

Under the AGT, peak period service would be provided at an average of every 3.5 minutes when the AGT system opens in 2005 (see Table 2.2-2). AGT vehicles could operate on rubber-tires, steel wheels, or some other type of contact with the guideway. Generally, a passby of a steel-wheel system would generate a higher level of noise and vibration than rubber-tire or levitated system. For air or magnetic levitation, there would be little direct contact between the moving vehicle and the guideway, and the system would not likely cause airborne noise or ground-borne vibration during a routine passby. For a conservative analysis, it is assumed that a steel-wheel on steel-rail system would be used and that aging of the system would cause increased passby noise from gradual degradation of components. All preliminary designs of the AGT guideway include a sound barrier that would reduce operational noise by about 6 dBA. The alignment would generally follow Hegenberger Road, and AGT vehicles would pass within 50 feet of some occupied buildings (Employee Development Department, Sam's Hofbrau, United Labor Bank, and Edgewater West) and would parallel the proposed Bay Trail Extension for about 2,000 feet along Airport Drive at the end of the North Field runway.

As with the No Action Alternative, motor vehicle traffic noise increases in the project study area would occur as trips in the area are anticipated to grow. When compared to the No Action Alternative, the AGT would reduce a greater number of motor vehicle trips. For receptors in the vicinity of the highways and the major surface streets, traffic noise increases between existing conditions and 2005 would be approximately 1.8 dBA greater with the preferred alternative (compared to increases of 2 dBA for the No Action Alternative).

Noise-sensitive receptors (see Table 3.11-4) within about 500 feet of the AGT guideway could experience impacts from AGT passby noise. Residences in the study area are further away and would not be affected. Receptors along Hegenberger Road and Airport Drive are currently exposed to either traffic or aircraft noise of at least 68 Ldn and 67 Leq(h) (see Table 3.11-3). Based on the criteria in Table 3.11-5, the AGT would be considered to cause a significant impact to the commercial uses along Hegenberger Road if passby noise from the alternative would exceed 85 dBA Lmax or to recreational uses if the passby noise would exceed 80 dBA Lmax. AGT system passby noise in the year of opening would be about 63 Ldn and 60 Leq(h). According to FTA criteria in Table 3.11-8, these levels would not cause a severe impact. The segment of the alignment between Elmhurst Channel and Coliseum Way would be located along the west side of Hegenberger Road closer to adjacent uses. Therefore, more intense passby noise would occur for commercial receptors on the west side of Hegenberger Road in this segment (e.g., the tenants at 675 Hegenberger Road, the Denny's Restaurant and Sam's Hofbrau would be affected by this change). Table 3.11-11 shows that maximum passby noise from the preferred alternative in this location would be 85.8 dBA Lmax at the nearest receptor (Sam's Hofbrau), which is higher than the BART design criteria for the commercial uses in the corridor resulting in significant impacts at these receptors. (S)

Along Airport Drive, where the proposed Bay Trail Extension would be parallel to the AGT alignment, the BART design criteria for passby noise (80 dba Lmax for recreational uses) would be exceeded. The criteria would not be exceeded on the Lew F. Galbraith Golf Course because it

is 100 feet beyond the alignment. Passby noise impacts at the portions of the recreational uses nearest the alignment would be considered significant. (S)

Table 3.11-11
Passby Noise Impacts on Receptors Under the AGT

			AGT		***Median Option***	
Receptor	***Location***	***Operation Impact Criteria (Lmax)***	***Ldn/Leq (dBA) (Lmax)***	***Level of Impact***	***Ldn/Leq (dBA) (Lmax)***	***Level of Impact***
Residences	Homes on 70th and 71st, near BART and Hawley Street	75	69.0	**LTS**	N/A	N/A
Residences	Homes on 70th and 69th, near Snell and Hawley Streets	75	69.6	**LTS**	N/A	N/A
Medical Office	Building: 675 Hegenberger Road	85	85.6	**S**	82.3	**LTS**
Restaurant	Denny's: 601 Hegenberger Road	85	84.7	**PS**	81.6	**LTS**
Restaurant	Sam's Hofbrau: 595 Hegenberger Road	85	85.8	**S**	84.7	**PS**
Hotel	Days Inn: 8350 Edes Ave.	85	73.1	**LTS**	N/A	N/A
Hotel	Holiday Inn: 500 Hegenberger Road	85	73.8	**LTS**	N/A	N/A
Office	Bank of America: 303 Hegenberger Road	85	78.2	**LTS**	N/A	N/A
Hotel	Marriott Under Construction: Hegenberger Loop Site	85	79.0	**LTS**	N/A	N/A
Residences	Homes on Empire Road, east of Hegenberger Loop	75	70.4	**LTS**	N/A	N/A
Regional Park	San Leandro Creek Trail	80	79.0	**LTS**	N/A	N/A
Hotel	Park Plaza Hotel: 150 Hegenberger Road	85	79.0	**LTS**	N/A	N/A
Restaurant	Francesco's: 8520 Pardee Drive	85	78.5	**LTS**	N/A	N/A
Office	United Labor Bank: 100 Hegenberger Road	85	83.0	**LTS**	N/A	N/A
Office	Warehouse Union: 99 Hegenberger Road	85	77.1	**LTS**	N/A	N/A
Hotel	Edgewater West: Doolittle Gateway Site	85	82.6	**LTS**	N/A	N/A
Hotel	Hilton Hotel: 1 Hegenberger Road	85	73.0	**LTS**	N/A	N/A
Hotel	Holiday Inn Express: 66 Airport Drive	85	77.2	**LTS**	N/A	N/A
Regional Park	Proposed Bay Trail Extension	80	82.5	**S**	N/A	N/A
Golf Course	Lew F. Galbraith Golf Course	80	79.0	**LTS**	N/A	N/A

Source: EIP Associates, 2001.
Notes: Other commercial uses with limited or no noise and vibration sensitivity are not shown.
N/A = significance determination not applicable for non-sensitive uses, or no change for receptor under option.
LTS = Less-than-significant impact, PS = Potentially significant impact, S = Significant impact.

Because the AGT vehicles would operate at reduced speeds near the intermediate stops, passby noise would likely be reduced in these areas. This improvement could be offset by increased passby noise from AGT vehicles accelerating away from the stops. This change in operation would cause no change in noise conditions for receptors in the vicinity of a stop, and no additional noise-sensitive receptors would be affected.

Median Option. In the event engineering design refinements require use of the median instead of the preferred alternative alignment for the portion of Hegenberger Road between Elmhurst Channel and Coliseum Way, noise and vibration impacts to commercial receptors along the west side of Hegenberger Road would still be present but at a reduced level of potential impact. Maximum passby noise from the AGT would be 84.7 dBA Lmax at the nearest receptor (Sam's Hofbrau), which would be equivalent to the BART design criteria for the commercial uses in the corridor (Table 3.11-11). (PS)

Mitigation Measures. Passby noise from the AGT would cause a significant impact to commercial land uses between Elmhurst Channel and Coliseum Way to outdoor recreational uses. Passby noise can be reduced by 10 dBA through the following strategies. The selection of the appropriate technique and mitigation details will be made prior to issuance of a notice to proceed to the contractor. The following mitigation measure would reduce the impacts of the preferred alternative and Median Option to a less-than-significant level. (LTS)

NV-1(i) *Mitigate Passby Noise.* BART shall incorporate into its contract documents a specification that the contractor reduce operational noise to or below the BART design criteria for passby noise. The thresholds can be achieved for diesel-powered equipment by incorporating engine compartment treatments with sound absorbing materials and low-noise engine mufflers, and for rail equipment by incorporating spin-slide wheel traction control, wheel truing, and rail grinding to eliminate wheel flats and rail corrugation.

Impact NV-2. Noise from operation of ancillary facilities

The AGT would include ancillary facilities that would be new stationary sources of noise. The maintenance and central control facility would be located in the southeast corner of the parking lot of the Coliseum BART Station beyond the operational end of the guideway, and three to four power distribution substation rooms would be located along the alignment, under the aerial guideway. At the maintenance facility, vehicle repair and maintenance activities would occur within an enclosed building, and vehicle washing and cleaning could occur outside the building. The propulsion power substations for the AGT would be located at each end of the alignment and at one or two intermediate locations.

Residences on 71st and 70th Street between the BART line and Hawley Street would be most likely to experience noise from maintenance, washing, and repair activities at the maintenance facility. Because the vehicles would be in use during the daytime hours, it is assumed that maintenance operations would occur at night; therefore, it is assumed that nighttime as well as daytime noise would result from operation of the maintenance facility. The residences near the maintenance facility would be sensitive to increases in day-night and peak noise levels. The receptors nearest the maintenance facility are also nearest to the noise from the BART line and associated existing parking lots. As shown in Table 3.11-3, these residences are exposed to between 67 to 70 Ldn, mainly due to the repeated noise from the passing BART trains. Noise from the maintenance facility would be considered significant if it would exceed the 45 dBA Lmax design criteria adopted by BART. The collocated maintenance facility and substation would cause about 63 Ldn at a distance of 300 feet. Because the maintenance facility would be

located about 600 feet away from the existing residences, the day-night noise levels would be acceptable.

Peak noise from operation of equipment at the maintenance facility would occur during vehicle washing. Outdoor car washing would cause peak noise levels of approximately 53 dBA Lmax at the nearest residences. Other noise from activities at the facility would occur within the building and would not exceed the 45 dBA Lmax criteria for the residences near 71st and 70th Street. Because the BART design criteria would be exceeded by vehicle cleaning, a significant impact would occur. (S)

Noise from the substations could disturb sensitive land uses along the remainder of the alignment (i.e., the hotels and outdoor recreational uses as identified in Table 3.11-4). Power substations could be located near the Marriott under construction, the Park Plaza Hotel, the Edgewater West hotel at the Doolittle Gateway Site, or the Holiday Inn Express. Locating a new substation within 250 unobstructed feet of an existing noise-sensitive land use, or within 125 feet if there are intervening structures, would result in a potentially significant noise impact. (PS)

Median Option. Substitution of the Median Option for the segment of alignment between Elmhurst Channel and Coliseum Way would have no effect on the analysis of noise from ancillary facilities. In the event engineering design refinements require use of the Median Option , Mitigation Measures NV-2(i) and NV-2(ii) would apply to any power substations located in this portion of the alignment that are within 250 feet of noise sensitive land uses. (PS)

Mitigation Measures. The AGT would have potentially significant impacts if adequate buffer space is not provided between the ancillary facilities and sensitive receptors. The following mitigation measures would reduce the impacts of the preferred alternative and Median Option to a less-than-significant level. (LTS)

NV-2(i) *Provide Noise Buffer or Sound Barrier between Power Substations and Noise-Sensitive Receptors.* If the site(s) selected for development of AGT power substations is (are) within 250 feet of a commercial or outdoor recreational use, BART shall require that the contractor reduce operational noise to or below the BART design criteria for noise from ancillary facilities. The thresholds can be achieved by incorporating noise barriers, facility enclosures, or other noise reduction features.

NV-2(ii) *Mitigate Noise from Ancillary Vehicle Washing Facility.* BART shall require that the contractor reduce noise from outdoor vehicle washing to or below the BART design criteria for noise from ancillary facilities. The thresholds can be achieved by incorporating noise barriers, facility enclosures, or other noise reduction features such as low-noise washing equipment.

Impact NV-3. Vibration from vehicle passby

AGT vehicles could operate a wide range of technologies including rubber-tires, steel wheels, or some other type of contact with the guideway. Steel-wheel AGT systems would cause the most intrusive vibration effects of these technologies. Because the system is primarily aerial, the

supporting structure would provide insulation for ground-borne vibration at most receptors in the corridor. For the transition areas near the Doolittle Drive tunnel, and under the Doolittle Drive/Airport Drive intersection, the open cut and cut-and-cover tunnel could amplify ground-borne vibration, while AGT vehicle speeds would probably be partially reduced through the transitions. The pinched loop operating configuration would allow crossovers, switches, or other special trackwork at the termini and other locations along the entire length of the guideway. These features would increase the likelihood of wheel-to-rail impacts that could increase vibration. Crossovers, switches, or other special trackwork could cause ground-borne vibration from an AGT passby if located on the aerial structure adjacent to office buildings or restaurants (within about 35 feet of the centerline of the aerial structure), or in the tunnel near hotels (within about 110 feet of the tunnel centerline). Sam's Hofbrau, the building at 675 Hegenberger Road, Denny's Restaurant, and the Edgewater West hotel property at the Doolittle Gateway Site would be properties that would be within these zones of potential impact and could experience a significant vibration impact. (PS)

Median Option. In the event engineering design refinements require use of the median instead of the preferred alternative alignment for the portion of Hegenberger Road between Elmhurst Channel and Coliseum Way, the potential impacts from ground-borne vibration at 675 Hegenberger Road and Denny's Restaurant would be reduced. Under the Median Option, the building at 675 Hegenberger Road and Denny's Restaurant would not be within 35 feet of the aerial structure. Only Sam's Hofbrau would be within 35 feet of the aerial structure for this portion of the alignment. However, since a potentially significant impact remains, Mitigation Measure NV-3(i) would apply to the Median Option if it is selected for this portion of the alignment. (PS)

Mitigation Measures. The following mitigation measures would reduce the impacts of the preferred alternative and Median Option to a less-than-significant level. (LTS)

NV-3(i) *Mitigate Passby Vibration.* BART shall require the following provisions in the contract documents:

a) Vehicle interactions with the guideway and the guidance and running structures and surfaces shall be designed to minimize the transmission of vibration through the guideway structure to the surrounding buildings and terrain during the passage of AGT cars.

b) System-induced vibrations shall be imperceptible at or in surrounding buildings. The threshold of perception shall be as defined by the *Guide to the Evaluation of Human Exposure to Vibration in Buildings*, ANSI Standard S3.29-1983.

Partial ADP Scenario

With the Partial ADP, some of the ADP components would not be implemented. These components occur mostly at the OIA terminal area. No noise- or vibration-sensitive receptors are located in this vicinity of OIA, and the potential noise and vibration effects of the preferred

alternative would be the same as those described above under the Preferred Alternative Environmental Analysis. Noise receptors (mainly airport workers, patrons, and visitors) in the area would benefit from implementation of mitigation measures identified for impacts elsewhere in the study area. The mitigation measures proposed in the Preferred Alternative Environmental Analysis would minimize impacts in the Partial ADP scenario with an effectiveness comparable to the full ADP scenario.

Cumulative Analysis

Residential uses in the vicinity of the Coliseum BART Station are exposed to existing noise conditions of about 67 to 70 Ldn, and at typical building setbacks, the receptors along Hegenberger Road and Airport Drive are currently exposed to either traffic or aircraft noise of at least 68 dBA Ldn and 67 Leq(h) (see Table 3.11-3). According to the FTA significance criteria of Table 3.11-9, a cumulative impact would occur at these receptors if noise levels were to increase by more than 1 dBA, and a significant cumulative impact would occur if noise levels were to increase by more than 3 dBA. For the residential and hotel land uses in the project corridor, existing noise levels are above those that would be considered "normally acceptable" by the City of Oakland Noise Element.

In the future, increased capacity planned for the transbay BART system will cause noise levels for residences in the vicinity of the Coliseum BART Station to increase by 1 to 2 dBA before 2010. Elsewhere in the corridor, growth in motor vehicle activity will cause traffic noise in the vicinity of the Hegenberger Road hotels and outdoor recreation areas to increase about 2 dBA between the existing conditions and 2005. Between existing conditions and 2020, traffic noise would increase approximately 3 dBA. No cumulative ground-borne vibration impacts are anticipated because no cumulative sources of ground-borne vibration have been identified.

Cumulative growth in motor vehicle traffic noise would cause a significant impact to each of the hotels along the Hegenberger Road portion of the project corridor. The resulting noise levels would be above those considered by the City of Oakland Noise Element as "normally acceptable" for lodging uses. The outdoor recreational uses would not be affected by the increased traffic noise, although in the vicinity of aircraft activity at the OIA North Field, the Lew F. Galbraith Golf Course would experience cumulative impacts due to increased aircraft noise. Anticipated increases in BART system noise combined with noise from the preferred alternative would not cause a significant cumulative impact to residences near the Coliseum BART Station.

The preferred alternative , when 2020 operations are considered independent of traffic noise, would have the potential to generate approximately 65 Ldn at the typical setbacks of the Hegenberger Road hotels. With mitigation in this analysis, the preferred alternative would be consistent with the adopted BART Extensions Program System Design Criteria. Traffic noise in the Hegenberger Road portion of the corridor is anticipated to generate 70 to 75 Ldn for these receptors. The preferred alternative would contribute to a significant and unavoidable cumulative noise impact.

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U.S. DOT, Federal Transit Administration, *Transit Noise and Vibration Impact Assessment*, April 1995.

Section 3.12
Air Quality

3.12.1 Introduction

This section describes existing air quality conditions in the Bay Area in the context of federal and state ambient air quality standards. Federal and regional air quality regulations, plans, and policies applicable to the preferred alternative are compared to significance criteria established by the Bay Area Air Quality Management District (BAAQMD) and to conformity criteria established by the Metropolitan Transportation Commission (MTC) and the US Environmental Protection Agency (EPA). These comparisons are made to satisfy the requirements of CEQA and NEPA and to demonstrate project conformity to the State Implementation Plan (SIP), respectively.

3.12.2 Existing Conditions

Applicable Regulations, Plans and Policies

The main federal legislation dealing with air quality is the Clean Air Act (CAA) as enacted in 1970 and amended in 1977 and 1990. The purpose of the CAA is to preserve air quality and to protect public health and welfare. To that end, the EPA has established National Ambient Air Quality Standards (NAAQS) for six "criteria" pollutants:

- Ozone (O_3)
- Carbon Monoxide (CO)
- Nitrogen Dioxide (NO_2)
- Sulfur Oxides (SO_x), measured as Sulfur Dioxide (SO_2)
- Particulate Matter (PM_{10})
- Lead (Pb)

On July 16, 1997, EPA promulgated revised National Ambient Air Quality Standards (NAAQS) for ozone and particulate matter less than 10 microns in diameter (PM_{10}) and new NAAQS for particulate matter less than 2.5 microns in diameter ($PM_{2.5}$). In 1999, the U.S. Court of Appeals for the District of Columbia (D.C.) Circuit invalidated these standards. On February 27, 2001, the U.S. Supreme Court held that EPA did not exceed its delegated authority by promulgating these NAAQS, and that in doing so EPA properly declined to consider costs of implementing the NAAQS. However, the Court remanded the case to the D.C. Circuit to address the timetable for implementing revised ozone standards, and the D.C. Circuit has not yet acted on that remand. In addition, the D.C. Circuit's invalidation of the revised PM_{10} standard was not appealed to the Supreme Court, and EPA has not taken further action on particulate matter. In the meantime, these NAAQS are considered unenforceable and/or are not being implemented. Therefore, the air quality analysis in this document does not address these standards.

The EPA regulations dictate that ambient concentrations of the criteria pollutants in any area of the U.S. may not exceed their respective ambient air quality standards more than once per year for the short-term NAAQS and may never exceed their respective standards for annual NAAQS. The California Air Resources Board (CARB) has established California ambient air quality standards (CAAQS) that are equal to or more stringent than the federal standards. The CAAQS and NAAQS are shown in Table 3.12-1.

Bay Area Attainment

The 1990 CAA amendments established a hierarchy of classifications for nonattainment areas, or areas that have not achieved the NAAQS, for different pollutants. An area designated as a federal nonattainment area for ozone is then further designated by one of the following nonattainment classifications:

Table 3.12-1
State and Federal Ambient Air Quality
Bay Area Attainment Status

Pollutant	*Averaging Time*	*California State Standard (1)*		*Federal Standard (2)*	
		Concentration (3)	*Attainment Status (4)*	*Concentration (3)*	*Attainment Status (4)*
Ozone	1-hour	0.09 ppm	N	0.12 ppm	N
Carbon Monoxide	1-hour	20 ppm	A	35 ppm	A
	8-hour	9.0 ppm	A	9 ppm	A
Nitrogen Dioxide	1-hour	0.25 ppm	A	-	-
	Annual Average	-	-	0.053 ppm	A
Sulfur Dioxide	1-hour	0.25 ppm	A	-	-
	3-hour	-	-	1300 $\mu g/m^3$	A
	24-hour	0.04 ppm	A	365 $\mu g/m^3$	A
	Annual Average	-	-	80 $\mu g/m^3$	A
Particulate Matter (PM_{10})	24-hour	50 $\mu g/m^3$	N	150 $\mu g/m^3$	U
	Annual Geometric Mean	30 $\mu g/m^3$	N	-	-
	Annual Arithmetic Mean	-	-	50 $\mu g/m^3$	A
Sulfates	24-hour	25 $\mu g/m^3$	A	-	-
Lead	30 Day Average	15 $\mu g/m^3$	A	-	-
	Calendar Quarter	-	-	1.5 $\mu g/m^3$	A
Hydrogen Sulfide	1-hour	0.03 ppm	U	-	-

Notes:
1) State standards are not to be exceeded
2) Federal standard for ozone and federal standards based on annual averages or annual arithmetic means are not to be exceeded. All other federal standards are not to be exceeded more than once per year.
3) Concentration units are as follows: ppm = parts per million; $\mu g/m^3$ = micrograms per cubic meter
4) Attainment status is defined as follows: A = attainment; N = nonattainment; and U = unclassified
5) U. S. EPA has adopted ozone and particulate matter standard that are not included in this table, due to legal challenges pending in federal court.

- *Marginal* – Areas having an ozone concentration of 0.121 ppm to 0.138 ppm. These areas have 3 years from the date of classification to reach attainment.
- *Moderate* – Areas having an ozone concentration of 0.138 ppm to 0.160 ppm. These areas have 6 years from the date of classification to reach attainment.

- *Serious* – Areas having an ozone concentration of 0.160 ppm to 0.180 ppm. These areas have 9 years from the date of classification to reach attainment.
- *Severe* – Areas having an ozone concentration of 0.180 ppm to 0.280 ppm. These areas have 15 years from the date of classification to reach attainment.
- *Extreme* – Areas having an ozone concentration of 0.280 ppm and above. These areas have 20 years from the date of classification to reach attainment.

Emissions reductions are required by federal law for nonattainment areas. Requirements differ by the severity of non-attainment area designation.

Ozone. O_3, or smog, is formed in the atmosphere through a set of complex reactions with nitrogen oxides (NO_x), reactive organic gases (ROG), and sunlight. Chronic exposure to high levels of O_3 can cause damage to lung tissue. Ozone is controlled through the regulation of NO_X and ROG emissions, known as ozone precursors.

On July 10, 1998, the EPA redesignated the Bay Area to the nonattainment classification. On July 22, 1999, the Bay Area was classified as being in moderate nonattainment for the 1-hour NAAQS for the purpose of the Congestion Management and Air Quality Improvement Program (CMAQ) only. The Bay Area is also in nonattainment of the CAAQS.

Carbon Monoxide. CO is a colorless, odorless gas is a product of incomplete fuel combustion. Chronic exposure to CO reduces the blood's ability to carry oxygen, limiting the amount of oxygen that reaches major organs such as the brain and heart. Motor vehicles are the primary source of CO.

In April 1998, the Bay Area was redesignated from nonattainment to attainment for the CO NAAQS. Although now in attainment of the CO NAAQS, the Bay Area must implement a maintenance plan intended to assure that it remains in attainment for these standards. The area is in attainment of the more stringent CO CAAQS.

Other Pollutants. NO_2, an O_3 precursor, in high concentrations can lead to both acute and chronic respiratory disease and reduced vision. High concentrations of SO_2 can damage lung tissue and cause acute and chronic respiratory disease. Lead inhalation can cause damage kidneys, liver, nervous system, and other organs. While NO_2 is still a by-product of the combustion process, with the introduction of low sulfur and unleaded fuels, SO_2 and Pb emissions from motor vehicles have significantly reduced.

The Bay Area is in attainment of NO_2, SO_2, and Pb CAAQS and NAAQS. The area is designated as an attainment area for the state sulfates standard. For the federal PM_{10} standard, the Bay Area is unclassified, but is designated as nonattainment for the state PM_{10} standards.

Greenhouse Gases. Four general categories of gases have the potential to contribute to global warming, and are referred to as greenhouse gases (GHG): carbon dioxide (CO_2), methane, nitrous oxide (NO), and chlorinated gases including hydrocarbons. The effects of these gases on global warming potential vary due to their ability to trap heat, referred to their "global

warming potential", or GWP. U.S. CO_2 emissions in 1999 (the latest year that data are available) represented 83 percent of total GHG emissions, at 1,527 million metric tons carbon-equivalent. Nitrous oxide accounts for 6 percent of U.S. GHG emissions, at 103 million metric tons carbon-equivalent.

Transportation sector emissions of CO_2 accounted for one-third of the total energy-related CO_2 emissions in 1999. Almost all (98 percent) of transportation sector CO_2 emissions result from the consumption of petroleum products, particularly motor gasoline (60 percent of transportation sector emissions) and diesel fuel (20 percent). Motor vehicle emissions account for 94 percent of the domestic NO emissions (DOE, 2000).

Plans and Policies

The Bay Area Air Plan. As directed by the CAA and California law, the BAAQMD is the local agency principally responsible for implementing state and federal air quality requirements. EPA approval of the *1982 Bay Area Air Quality Plan* (referred to as the 1982 Plan), which indicates how the BAAQMD will implement federal air quality requirements, incorporated the 1982 Plan into the State Implementation Plan (SIP), and made the 1982 Plan federally enforceable. The BAAQMD updated the 1982 Plan and adopted the Bay Area '91 Clean Air Plan to implement the requirements of the California Clean Air Act of 1988. As required by the California Clean Air Act and subsequent 1992 amendments, the BAAQMD also prepared the *1994 Clean Air Plan Update* and the *Bay Area '97 Clean Air Plan*. As a consequence of the 1998 redesignation of the Bay Area to nonattainment for the federal ozone standard, and under the EPA's direction, the BAAQMD prepared and submitted the Bay Area Ozone Attainment Plan in June 1999 (the 1999 Plan) as a revision to the SIP. The 1999 Plan was disapproved in part by EPA on September 20, 2001. In response, the BAAQMD prepared and revised the San Francisco Bay Area 2001 Ozone Attainment Plan, which has undergone public workshops and was adopted by the BAAQMD Board of Directors, the MTC and the ABAG Administrative Committee on October 26, 2001.

The MTC is responsible for assuring that the Bay Area Regional Transportation Improvement Program (RTIP) and the Regional Transportation Plan (RTP) conform to the SIP. Transportation conformity provisions of the 1990 CAA amendments and subsequent EPA regulations specify the conditions under which transportation plans, programs, and projects will be considered to conform to the SIP and to the federal CAA. The 1990 amendments provided new requirements for reviewing air quality effects of transportation projects. On October 21, 1997, EPA approved the Bay Area's transportation conformity rules, which define the criteria and procedures for transportation conformity actions and consultation for the Bay Area. These procedures specify that MTC must demonstrate, through modeling, that the motor vehicle emissions associated with a project are lower than the approved emission budgets listed in the applicable SIP (or SIP submission) in order for a project to be found in conformity.

EPA Conformity Regulations. The CAA, with the 1990 amendments, provides the current statutory framework for air conformity. The CAA defines conformity to a SIP to mean "conformity to an implementation plan's purpose of eliminating or reducing the severity and number of violations of the national ambient air quality standards and achieving expeditious attainment of such standards…"

Section 176(c) of the CAA specifies that no federal agency may approve, support, or fund an activity that does not conform to the applicable implementation plan.

In November 1993, the EPA promulgated final rules for determining conformity of transportation plans, programs, and projects. EPA has subsequently revised these rules, and they have been further affected by a March 2, 1999 federal court decision. These current rules, which are found in 40 CFR, Part 93, Subpart A, together with the approved regional conformity procedures mentioned above and the EPA and FHWA guidance on implementing the 1999 court decision, govern the conformity assessment for this project. In its September 20, 2001 partial disapproval of the 1999 Bay Area Ozone Attainment Plan, EPA disapproved (without a protective finding) the Plan's attainment assessment and the associated motor vehicle emissions budgets, effective October 22, 2001. On November 30, 2001, CARB submitted the revised 2001 Bay Area Ozone Attainment Plan for EPA approval as a revision to the SIP. The EPA approved the motor vehicle emissions budget in the revised 2001 Bay Area Ozone Attainment Plan on February 14, 2002.

Ambient Air Quality

The BAAQMD operates air quality monitoring stations throughout the region. The San Leandro monitoring station, Oakland monitoring station at Alice Street, and San Francisco monitoring station at Arkansas Street are the stations closest to the project location:

- The San Leandro Station is approximately 4 miles from the Metropolitan Oakland International Airport (OIA)
- The Oakland Station is approximately 7 miles from the OIA
- The San Francisco Station is approximately 9 miles from the OIA (across the Bay)

The data from these three stations are used to describe the existing air quality conditions for this project.

Table 3.12-2 presents a five-year summary of the most recent ambient air quality measurements available from these three monitoring stations. Data for 1999 was not available when this report was prepared. The San Leandro station collects data on O_3 and PM_{10}. The Oakland station at Alice Street collects data on O_3 and CO. The San Francisco station at Arkansas Street collects data on O_3, CO, NO_2, SO_2, PM_{10} and Pb. In the five-year summary table, the values are those from the closest monitoring station that collects data on that criteria pollutant.

Climate and Meteorology

Atmospheric conditions such as wind speed, wind direction, and temperature interact with the physical features of the landscape to determine the movement and dispersal of air pollutants. OIA lies on the eastern shore of San Francisco Bay and normally is exposed to an influx of marine air from the west. Wind measurements taken at the National Weather Service (NWS) San Francisco Surface Monitoring Station (San Francisco Airport) and the NWS Oakland Mixing

Height Monitoring Station[1] (OIA) indicate that the wind blows out of the west, west-northwest, and northwest approximately 55 percent of the time. Light winds are fairly frequent in the area with approximately a third of the readings recording a wind speed of less than 3 miles per hour (mph). Average yearly temperature is approximately 60 degrees Fahrenheit.

Table 3.12-2
Ambient Air Quality Summary - San Leandro, Oakland, and San Francisco Monitoring Stations

Pollutant	Averaging Time	Standard (1) State	Federal	Maximum Concentration (2)					Second Highest Concentration (3)					Number of Days Exceeding California Standard (4)				
				1994	1995	1996	1997	1998	1994	1995	1996	1997	1998	1994	1995	1996	1997	1998
Ozone	1-hour	0.09 ppm	0.12 ppm	0.09	0.15	0.11	0.10	0.11	0.09	0.144	0.10	0.11	0.10	0	6	2	3	2
Carbon Monoxide	1-hour	20 ppm	35 ppm	7.2	4.9	6.9	7.9	6.3	7.2	4.8	5.5	6.0	6.0	0	0	0	0	0
	8-hour	9.0 ppm	9 ppm	5.6	3.8	3.9	3.6	4.6	4.4	3.7	3.8	3.6	4.2	0	0	0	0	0
Nitrogen Dioxide	1-hour	0.25 ppm	-	0.09	0.09	0.08	0.07	0.08	0.088	0.08	0.078	0.067	0.073	0	0	0	0	0
	Annual Average	-	0.053 ppm	0.02	0.02	0.02	0.02	0.02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfur Dioxide	1-hour	0.25 ppm	-	0.017	0.044	0.036	0.026	0.036	0.016	0.034	0.029	0.025	0.020	0	0	0	0	0
	3-hour (5)	-	0.50 ppm	0.009	0.022	0.020	0.022	0.020	0.009	0.021	0.018	0.013	0.012	0	0	0	0	0
	24-hour (5)	0.04 ppm	365 $\mu g/m^3$	0.005	0.007	0.008	0.006	0.006	0.005	0.005	0.007	0.006	0.006	0	0	0	0	0
	Annual Average (5)	-	80 $\mu g/m^3$	0.001	0.001	0.001	0.001	0.001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Particulate Matter (PM_{10})	24-hour	50 $\mu g/m^3$	150 $\mu g/m^3$	62	47	59	65	34	49	42	44	30	26	1	0	1	1	0
	Annual Geometric Mean	30 $\mu g/m^3$	-	18.7	16.9	18.6	15.9	20.1 (6)	NA	NA	NA	NA	NA	0	0	1	1	1
	Annual Arithmetic Mean	-	50 $\mu g/m^3$	21.1	19.4	21.3	17.3	14.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	Calendar Quarter	-	1.5 $\mu g/m^3$	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	NA	NA	NA	NA	NA

Source: Bay Area Air Quality Management District (BAAQMD) (1994 to 1998) and the EPA AIRSData website (http://www.epa.gov/airsdata). Ozone and PM data was collected at the San Leandro monitoring station. Carbon Monoxide data was collected at the Oakland monitoring station on Alice Street. All other data was collected at the San Francisco monitoring station at Arkansas Street.
Notes:
(1) State standards are not to be exceeded. The federal standard for ozone and federal standards based on annual averages are not to be exceeded. All other federal standards are not to be exceeded more than once per year.
(2) Concentration units for a given pollutant are the same as those shown for the corresponding state and federal standards
(3) Concentration units for a given pollutant are the same as those shown for the corresponding state and federal standards. "NA" means not applicable; there is only one annual average concentration
(4) For standards based on annual averages, a value of 1 indicates that the standard was exceeded and a value of 0 indicates it was not exceeded.
(5) Concentration units for these results are in ppm
(6) For 1998, no PM10 data was available from the San Leandro monitoring station. For this year, the PM10 data from the San Francisco monitoring station was used.

Sensitive Receptors

The criteria pollutants, for which NAAQS and CAAQS criteria have been adopted, are recognized to have a variety of potentially adverse health effects to humans. Research shows that exposure to high concentrations of these pollutants can cause respiratory and cardiovascular diseases and ailments. Exposure to these pollutants during strenuous physical activity may cause shortness of breath and chest pains, among other adverse effects.

Several population groups, including, but not limited to, children, the elderly, and the acutely ill (especially those with cardiovascular conditions) are particularly sensitive and are susceptible to the adverse health effects associated with exposure to these pollutants. Locations where a number of people in these population groups are likely to reside or visit are referred to as "sensitive receptors." These locations include residential areas with children and/or the elderly, medical centers, schools, and recreation areas. The CAAQS and NAAQS are "health-

[1] Meteorological data was taken from the EPA Support Center for Regulatory Air Models (SCRAM) website (http://www.epa.gov/ttn/scram/). The Oakland Mixing Height Monitoring Station is the station in closest proximity to the Oakland International Airport that was available. The San Francisco Surface Monitoring Station is the station in closest proximity to the Oakland International Airport that was available.

based" levels that, when attained, do not result in significant adverse health effects in these sensitive populations.

For evaluation of potential local-level impacts, this air quality analysis used model receptors placed in accordance with the "EPA's Guideline for Modeling Carbon Monoxide from Roadway Intersections" (EPA, 1992). No additional model receptors intended to represent the location of sensitive receptors were necessary as the model receptors are located along where the highest impacts from the roadway are expected to be experienced.

3.12.3 Impact Assessment and Mitigation Measures

Standards of Significance

Significance thresholds have been established to help determine if a project has the potential to cause a significant air quality impact. According to the CEQA guidelines, a significant air quality impact is defined as "a substantial or potentially substantial, adverse change in any of the physical conditions within the area affected by the project including…air."

Air quality thresholds of significance are established at the regional level based on attainment status and local air quality issues. As the regional agency responsible for implementing state air quality requirements, the BAAQMD has established guidelines for conducting the air quality analysis required by CEQA. The BAAQMD has defined numerical significance criteria for air quality impacts in *Assessing the Air Quality Impacts of Projects and Plans* (BAAQMD, April 1996). The preferred alternative will be considered to have a significant air quality impact if:

- Project-specific CO vehicle emissions exceed 550 lbs/day, and
- The project's contribution to ambient CO concentration leads to an exceedance of the CAAQS of 9 ppm averaged over 8 hours or 20 ppm averaged over 1 hour, or the NAAQS of 9 ppm averaged over 8 hours or 35 ppm averaged over 1 hour.

In addition to the CO thresholds of significance, ozone precursors, measured as oxides of nitrogen (NO_x) and reactive organic gases (ROG), and particulate matter (PM_{10}) also have individual thresholds of significance. If project-related vehicle emissions of either NO_x, ROG, or PM_{10} exceed 15 tons per year or 80 pounds per day, then the preferred alternative will be considered to have a significant air quality impact.

While the BAAQMD is concerned about all criteria pollutants, the 1996 Guidelines focus on those pollutants for which the region periodically exceeds the CAAQS or NAAQS. Lead (Pb) and SO_2 are not listed as pollutants of concern in the 1996 CEQA Guidelines and are not provided emissions thresholds or any other means of assessing significance. The use of unleaded gasoline has removed concern of lead emissions from vehicles. Gasoline used in vehicles now contains very low levels of sulfur and, therefore, SO_2 emissions from vehicles are also of little concern. For these reasons, Pb and SO_2 will not be considered in this analysis.

Methodology

The methodologies used to determine project-specific impacts, cumulative impacts, and project conformity are described below. For both the project-specific and cumulative impact analyses, regional and local analyses were required. Air quality effects are evaluated in three calendar years: the "base year" 2000, the projected first year of operation 2005, and the horizon year 2020. Impacts were assessed for the AGT for all three years of analysis.

Specific emissions for the diesel-AGT Alternative were not calculated for this analysis. The vehicles for the diesel-AGT would run along the elevated rail, the same as their electric counterparts, and would emit diesel exhaust. The diesel-AGT vehicles would not experience idle time or slowing at intersections and congested roadways. Also, the diesel AGT vehicles would be elevated above the roadways, moving them farther from any sensitive receptor locations located adjacent to the roadway, such as sidewalks. With greater distance to disperse, particulate exposure levels would most likely be lower than that resulting from vehicles traveling at grade. The emissions from the diesel-AGT would be insignificant compared to emissions on the route as a whole.[2]

Preferred Alternative Environmental Analysis

Regional Analysis. Regional air quality impacts are evaluated on the basis of total regional project-related vehicular emissions in the Bay Area. The region includes the 25 airport analysis districts in the nine county Bay Area. The calculation of regional emissions is based on vehicle-miles-traveled (VMT) data for access trips to OIA and on vehicular pollutant emission factors estimated with the EMFAC computer model (included as part of the Motor Vehicle Emission Inventory 7G (MVEI 7G1cJY98) model[3]). VMT calculations are based on the number of vehicles for each traveler type and traveler mode together with the distance from each of 25 airport analysis districts as detailed in Section 3.1, Transportation. Peak-hour and daily VMT data were used together with the EMFAC emission factors to estimate the worst-case regional emissions in pounds per hour (lbs/hr) and tons per year (tons/yr).

The traffic analysis information used to calculate VMT is for the AGT alternative without the intermediate stations. This is because the Alameda CMA model used for the traffic analysis did not include the site-specific land use data around the intermediate stations that would be necessary to include intermediate stations in the analysis. However, it is important to note the

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[2] Vehicle emissions were calculated using the San Francisco Bay Area Vehicle Fleet Characteristics, as listed in BAAQMD CEQA Guidelines URBEMIS7 Model Vehicle Fleet Characteristics for San Francisco Bay area, April 1966 (updated December 1999), which assumes that two percent of the vehicles on the road are diesel buses. AirBART currently operates three buses at any one time, and these three buses are considered part of the two percent estimate of total buses operating in the area. Operation of diesel AGT vehicles would displace the AirBART buses with a projected first-year peak-hour operating fleet of eight vehicles, or a net increase of five vehicles. Even assuming conservatively that emissions from a diesel AGT vehicle would be equivalent to those of an AirBART bus, the air quality analyses conducted in this section cannot quantify an incremental emission load related to five vehicles.

[3] EMFAC 7G, which is included with the MVEI 7G1cJY98, model was the latest EMFAC model available from the CARB website (http://www.arb.ca.gov/msei/mvei/mvei.htm) at the time of analysis and was last updated in February 2000.

addition of the intermediate stations results in an increase in AGT ridership and therefore would increase the amount of the traffic reduction associated with the project. In no case would the preferred alternative create traffic conditions that would be worse than those depicted by this analysis. The air emissions calculations presented in this section, therefore, understate the air quality benefits associated with the preferred alternative compared to the No Action alternative.

The No Action Alternative for all years of analysis reflects the regional forecasted growth, as defined by the Association of Bay Area Governments (ABAG) forecast and explained in Section 3.0 of this analysis. Project-specific, or "net," regional emissions for a given analysis year only reflect the emissions from the project, excluding emissions attributable to the regional forecast. The net regional emissions for a given analysis year are calculated as the regional emissions for the AGT in the given analysis year minus the regional emissions for the No Action Alternative in the given analysis year.

Local Analysis. For the preferred alternative, PM_{10} and CO are the air pollutants of concern on a local scale because vehicular emissions of these pollutants may cause the pertinent air quality standards to be exceeded. Project-specific PM_{10} and CO emissions are produced by associated vehicular traffic at roadway intersections. Local impacts are considered significant if project-specific concentrations, when added to background concentrations, exceed any CAAQS or NAAQS.

- *PM_{10}.* Currently there are no approved models available to calculate local PM_{10} concentrations from motor vehicles. Therefore, a quantitative analysis of local PM_{10} concentrations is not required as part of the CEQA/NEPA analysis or the transportation conformity assessment. Local PM_{10} levels are qualitatively evaluated on the basis of the project-specific regional analysis. A project-specific, or net decrease in regional PM_{10} impacts can reasonably be interpreted to suggest that the project would be unlikely to cause localized exceedances of PM_{10}.

- *CO.* The analysis of local CO impacts is performed for the roadway intersections and the "free-flow" roadway segments links where air quality impacts are expected to be the greatest.

  Roadway intersections where the highest air quality impacts are likely to occur were determined by reviewing the traffic analysis (as presented in Section 3.1, Transportation, of this document), because local CO impacts are a function of motor vehicle traffic. Following EPA guidance, three intersections and three roadway segments were selected for local air quality analysis. The intersections were selected on the basis of vehicle p.m. peak-hour volumes at the intersection and the level of service (LOS) at each intersection. The roadway links were selected on the basis of p.m. peak-hour volume.

  Local CO concentrations were calculated using the CAL3QHC computer model (version 95221). Worst case meteorological conditions were assumed as suggested by the EPA guidance for modeling CO from roadway intersections. CO concentrations were calculated at modeling receptors located at each corner of the intersection and along the intersecting

roadways to determine the highest CO impact at each intersection in accordance with the EPA's guidance.

Project-specific, or "net," CO concentrations were calculated to determine if the preferred alternative alone would cause any exceedances of state or federal ambient CO CAAQS and NAAQS. The net concentrations reflect the impact from the preferred alternative alone and do not include approved and funded projects reflected in the No Action Alternative. The net CO concentrations were calculated as the concentrations for the AGT in a specific year minus the concentrations for the No Action scenario in a specific year, then added to the background concentration. The background concentration was calculated using the highest "second high" concentration from the last five years of air quality data, as presented in Table 3.12-2. For future scenarios, the existing background concentration was multiplied by a concentration factor as suggested in EPA guidelines. The net concentrations are compared against the CO CAAQS and NAAQS for each year of analysis.

Cumulative Impacts

Regional Analysis. Cumulative regional emissions are calculated for the preferred alternative. The cumulative emissions for the preferred alternative reflect emissions from the project as well as the regional forecasted growth, as defined by the Association of Bay Area Governments (ABAG) forecast and explained in Section 3.0 of this analysis. Comparison of the AGT against the No Action Alternative for the same year of analysis provides a measure for determining the effects of the project on the regional air quality.

Local Analysis. As noted before, local PM_{10} impacts are qualitatively evaluated on the basis of project-specific regional emissions. An overall net decrease in regional PM_{10} emissions could reasonably be interpreted to show that the Connector project is unlikely to cause localized exceedances of the PM_{10} CAAQS or NAAQS.

Cumulative CO concentrations are calculated to determine if the project would contribute to future violations of the CO CAAQS or NAAQS. The cumulative No Action Alternative CO concentration includes background CO levels and the contributions from existing traffic as well as forecasted regional traffic growth as described in Section 3.0. Concentrations for the preferred alternative include contributions from existing traffic, background growth, and regional traffic growth, as well as contributions from traffic attributable to the AGT. Cumulative CO concentrations from the AGT for a specific analysis year are compared against the No Action Alternative for the same analysis year as well as the CAAQS and NAAQS.

Conformity Assessment

In order to demonstrate conformity with the federally approved SIP and the Clean Air Act a project must, as required by MTC Resolution No. 3075, come from a transportation plan and program that have been found to conform and, with regard to CO and PM_{10} emissions, the project must not cause or contribute to any new localized pollutant violations or increase the frequency or severity of any existing violations.

The Connector project is included in the 2001 TIP adopted by MTC on September 27, 2000 with conformity findings (MTC Resolution No. 3300) and in the 2001 RTP adopted by MTC on

December 19, 2001 without conformity findings (MTC Resolution Nos. 3425 and 3427). The EPA approved the motor vehicle emissions budget in the revised 2001 Bay Area Ozone Attainment Plan on February 14, 2002. MTC made findings of conformity for the 2001 RTP based on the approved motor vehicle emissions budget in the revised 2001 Bay Area Ozone Attainment Plan on March 15, 2002 (MTC Resolution No. 3432). Therefore, the Connector meets the first criterion for compliance with Clean Air Act conformity requirements for transportation projects.

To address if the Connector meets the second criterion for project specific conformity, the cumulative CO concentrations near roadways and roadway intersections predicted under the AGT, for all years of analysis, are compared with CO CAAQS and NAAQS. To determine if the project alternative meets the conformity criteria of reducing the number and severity of local CO violations, cumulative concentrations estimated for the AGT are compared to estimated for the No Action Alternative. Where no violations are predicted under the No Action Alternative, if there are no new exceedances of the state or federal CO standards, then the project meets this criterion.

Air Toxics

For this project, the primary sources of air toxics are those exhausted from diesel-fueled vehicles. In the past, diesel particulate matter (DPM) has been used to represent diesel exhaust as a whole. While several studies are currently underway as to the effects of diesel fuels on humans, there is little information or modeling resources available for local ambient concentrations of DPM. As the impact of air toxics is primarily based on the exhaust from mobile sources (on-road vehicles) and therefore is directly related to the number of on-road, diesel-fueled, vehicles, a qualitative analysis will be done to demonstrate the impact of air toxics as a function of the number of on-road vehicles.

Greenhouse Gases

There is no current methodology, criterion, or standard of significance from EPA, the Bay Area Air Quality Management District, CEQA Guidelines, or NEPA for evaluating impacts relating to GHG emissions. Accordingly, GHG emissions are not separately quantified as part of the air quality analysis. However, as discussed below, the AGT would generate fewer regional and local emissions of criteria pollutants (e.g., ozone, carbon monoxide, nitrogen dioxide, sulfur oxides) because the project would divert passengers from motor vehicle trips to and/or from the Oakland Airport. Motor vehicle are the primary source of these criteria pollutants. The AGT would result in lower net emissions than the No Action Alternative, as shown in Tables 3.12-4 and 3.12-10. Since regional motor vehicle emissions would decrease with implementation of the Connector project, emissions of GHG from motor vehicles also are expected to decrease. The AGT, therefore, is expected to result in a beneficial air quality impact to GHG emissions compared to the No Action Alternative.

Preferred Alternative Environmental Analysis

CEQA requires a discussion of a project's effects on the existing physical environmental conditions. In the case of the Connector, such an analysis would be hypothetical because the lead time required to design and construct the Connector would preclude the Connector from

affecting existing (2000) air quality conditions. Accordingly, the air quality assessment examines the effects of the Connector in 2005 when it is expected to begin operations.

Impact AQ-1. Regional air quality impacts

Emissions of NO_X, ROG, and PM_{10} under the AGT in all analysis years (2005, 2020) are less than those under the No Action Alternative for each respective year. Projected ridership for the preferred alternative leads to a reduction in the number of vehicles on the road and, therefore, to reduction in VMT. As emissions are directly related to VMT, a reduction in VMT from the No Action alternative to the preferred alternative results in a decrease in emissions from the No Action, or a "negative" emissions impact. Since the project-specific emissions for these pollutants are negative, they are less than the significance criteria of 550 lbs/day of project-specific vehicular emissions.

Table 3.12-4 presents the net emissions for the preferred alternative. The preferred alternative reduces regional air emissions compared to the No Action Alternative in all analysis years. As a result, it would have a beneficial impact on regional air quality. The AGT would result in greater air quality benefits for each of these regional air pollutants. (B)

Table 3.12-3
Cumulative Regional Emission Impacts based on Total VMT for Airport Access Vehicles Calculated by Vehicle Trips from 25 Airport Access Districts

Alternative Year	Daily VMT (veh-mi/day)	Regional Emissions (tons/year)				Peak-hour VMT (veh-mi/hr)	Regional Emissions (lbs/hr)			
		Oxides of Nitrogen	Reactive Organic Gases	Carbon Monoxide	Particulate Matter		Oxides of Nitrogen	Reactive Organic Gases	Carbon Monoxide	Particulate Matter
Existing Conditions										
2000	429,050	268.0	61.7	675.3	7.1	42,157	144.2	33.3	36.5	0.4
No Action Alternative										
2005	576,077	282.6	61.6	729.7	6.0	57,867	155.4	34.0	40.3	0.3
2020	941,101	328.9	49.8	717.6	6.5	99,115	189.7	28.8	41.5	0.4
Automated Guideway Transit										
2005	542,395	266.0	57.7	683.6	5.7	53,880	144.7	31.4	37.3	0.3
2020	881,132	307.8	46.4	668.4	6.1	91,894	175.7	26.5	38.2	0.3

Source: VMT and Speed averages provided by CCS Planning and Engineering

Table 3.12-4
Regional Emission Impacts*

Alternative Year	Change in Daily VMT (veh-mi/day)	Regional Emissions (tons/year)				Peak-hour VMT (veh-mi/hr)	Regional Emissions (lbs/hr)			
		Oxides of Nitrogen	Reactive Organic Gases	Carbon Monoxide	Particulate Matter		Oxides of Nitrogen	Reactive Organic Gases	Carbon Monoxide	Particulate Matter
Automated Guideway Transit										
2005	-33,682	-16.6	-3.9	-46.1	-0.4	-3,987	-10.8	-2.6	-3.0	0.0
2020	-59,969	-21.1	-3.4	-49.1	-0.4	-7,221	-13.9	-2.3	-3.3	0.0

* Regional Emissions (E_{AS}) are defined as the emissions calculated for the preferred alternative (E_B) minus the emissions calculated for the No Action Alternative (E_{NB})

Impact AQ-2. Local PM_{10} impacts

Local PM_{10} levels are qualitatively evaluated on the basis of the project-specific regional analysis. No approved analytical models are available to calculate local PM_{10} concentrations from motor vehicles.

The regional emissions of PM_{10} under the AGT for all analysis years are less than those under existing conditions. This result suggests that the preferred alternative is unlikely to cause localized exceedances of the PM_{10} standard in the future. The preferred alternative is predicted to produce less regional emissions than the No Action Alternative, and therefore, is likely to have a beneficial impact on the local level as well. (B)

Impact AQ-3. Local CO impacts

Net concentrations under the preferred alternative do not exceed the state or federal, 1-hour or 8-hour CO standard at any of the intersections or roadways studied. As a result, the preferred alternative would not result in significant local CO impacts. Tables 3.12-5 and 3.12-6 present the net 1-hour concentrations for the intersections and roadways. The net 8-hour concentrations are presented in Tables 3.12-7 and 3.12-8.

Tables 3.12-5 and 3.12-6 present the net 1-hour concentrations for the intersections and roadways. The net 8-hour concentrations are presented in Tables 3.12-7 and 3.12-8. In both cases, the net concentrations would not exceed the ambient air quality standards. (LTS)

Table 3.12-5
Highest Predicted 1-Hour Net Carbon Monoxide Concentrations in the Vicinity of the Three Most Congested Intersections Based on P.M. Peak Traffic Volumes

Intersection	2005		2020		1-hour CO Standards	
	No Action	AGT	No Action	AGT	CAAQS	NAAQS
Hegenberger Road & Edes Avenue	7.6	7.6	4.5	4.4	20 ppm	35 ppm
Hegenberger Road & Edgewater Drive	7.6	7.6	4.5	3.8	20 ppm	35 ppm
Airport Drive & Doolittle Drive	7.6	7.5	4.5	4.3	20 ppm	35 ppm

1-hour net concentration (Cnet, 1-hr) calculated as the highest predicted 1-hour concentration (without background) under the AGT (C1-hr), minus the highest predicted 1-hour concentration (without background) under the No Action Alternative (CNB, 1-hr), plus the 1-hour background concentration (B1-hr):
$C_{net,\ 1\text{-}hr} = (C_{1\text{-}hr} - C_{NB,\ 1\text{-}hr}) + B_{1\text{-}hr}$

Source: CDM, 2000.

Table 3.12-6
Highest Predicted 1-Hour Net Carbon Monoxide Concentrations in the Vicinity of the Three Most Trafficked Roadways Based on P.M. Peak Traffic Volumes

Intersection	2005		2020		1-hour CO Standards	
	No Action	AGT	No Action	AGT	CAAQS	NAAQS
Between Edgewater and I-880SB Off-ramp	7.6	7.5	4.5	4.1	20 ppm	35 ppm
Between Hegenberger Loop and Edgewater	7.6	7.4	4.5	4.0	20 ppm	35 ppm
Between Pardee and Hegenberger Loop	7.6	7.6	4.5	3.8	20 ppm	35 ppm

1-hour net concentration (Cnet, 1-hr) calculated as the highest predicted 1-hour concentration (without background) under the AGT Alternative (C1-hr), minus the highest predicted 1-hour concentration (without background) under the No Action Alternative (CNB, 1-hr), plus the 1-hour background concentration (B1-hr):
$C_{net,\ 1\text{-}hr} = (C_{1\text{-}hr} - C_{NB,\ 1\text{-}hr}) + B_{1\text{-}hr}$

Source: CDM, 2000.

Table 3.12-7
Highest Predicted 8-Hour Net Carbon Monoxide Concentrations in the Vicinity of the Three Most Congested Intersections
Based on P.M. Peak Traffic Volumes

Intersection	2005			2020			8-hour CO Standards	
	No Action	AGT		No Action	AGT		CAAQS	NAAQS
Hegenberger Road & Edes Avenue	4.7	4.6		2.7	2.7		9 ppm	9 ppm
Hegenberger Road & Edgewater Drive	4.7	4.6		2.7	2.3		9 ppm	9 ppm
Airport Drive & Doolittle Drive	4.7	4.6		2.7	2.6		9 ppm	9 ppm

8-hour net concentration ($C_{net,\ 8\text{-}hr}$) calculated as the highest predicted 8-hour concentration (without background) under the AGT Alternative ($C_{8\text{-}hr}$), minus the highest predicted 8-hour concentration (without background) under the No Action Alternative ($C_{NB,\ 8\text{-}hr}$), multiplied by the persistence factor (PF), plus the 8-hour background concentration ($B_{8\text{-}hr}$):
$C_{net,\ 8\text{-}hr} = (C_{8\text{-}hr} - C_{NB,\ 8\text{-}hr})*PF + B_{8\text{-}hr}$

Source: CDM, 2000.

Table 3.12-8
Highest Predicted 8-Hour Net Carbon Monoxide Concentrations in the Vicinity of the Three Most Trafficked Roadways
Based on P.M. Peak Traffic Volumes

Intersection	2005			2020			8-hour CO Standards	
	No Action	AGT		No Action	AGT		CAAQS	NAAQS
Between Edgewater and I-880SB Off-ramp	4.7	4.6		2.7	2.5		9 ppm	9 ppm
Between Hegenberger Loop and Edgewater	4.7	4.5		2.7	2.4		9 ppm	9 ppm
Between Pardee and Hegenberger Loop	4.7	4.6		2.7	2.3		9 ppm	9 ppm

8-hour net concentration ($C_{net,\ 8\text{-}hr}$) calculated as the highest predicted 8-hour concentration (without background) under the AGT Alternative ($C_{8\text{-}hr}$), minus the highest predicted 8-hour concentration (without background) under the No Action Alternative ($C_{NB,\ 8\text{-}hr}$), multiplied by the persistence factor (PF), plus the 8-hour background concentration ($B_{8\text{-}hr}$):
$C_{net,\ 8\text{-}hr} = (C_{8\text{-}hr} - C_{NB,\ 8\text{-}hr})*PF + B_{8\text{-}hr}$

Source: CDM, 2000.

Impact AQ-4. Secondary emissions from electricity generation

The emissions from power plants that would help supply propulsion electricity for the AGT are considered to be indirect, or secondary, emission sources for this project. As power would be drawn from the local power grid that provides electricity to the Bay Area and surrounding communities in Northern California, it is difficult to pinpoint one location or type of power plant that would be the major source of power for the project.

The South Coast Air Quality Management District (SCAQMD) CEQA Guidelines provide emission rates for electricity use based on the number of kilowatt-hours used by the project. Table 3.12-9 below presents this information.

Table 3.12-9
Estimated Secondary Emissions from the AGT's Use of Electricity

Pollutant	*Emission Factor (lbs./MW-hour)*	*Emissions (lbs./day)*	*Emissions (lbs./hour)*	*Emissions (tons/yr.)*
CO	0.2	6.4	0.3	1.2
ROG	0.0	0.3	0.0	0.1
NOx	1.2	36.8	1.5	6.7
PM_{10}	0.0	1.3	0.1	0.2

Notes:
CO = carbon monoxide; ROG = reactive organic gases; NOx = oxides of nitrogen; PM_{10} = particulate matter (10 micron)
The source of the Emission Factors is Table A9-11-B from the SCAQMD/CEQA Guidelines
Emission calculations are based upon 1 Kilowatt-hour (kWh) = 10,000 British Thermal Units (BTU) of energy; and 32,000 kWh, or 32 megawatt-hours (MWH), are needed for daily operation of the AGT and AGT stations.

Source: CDM, 2000.

The emissions presented in Table 3.12-9 are in addition to project-specific emissions for the AGT. When these emissions are added to the regional project-specific impacts listed in Table 3.12-4, the benefit experienced by the AGT decreases. The project still produces a beneficial effect as compared to the No Action Alternative. Table 3.12-10 presents the impacts that include the secondary emissions estimated for the use of electricity. (B)

Table 3.12-10
Regional Emission Impacts Including Secondary Emissions from Electricity Usage*

Alternative Year	*Change in Daily VMT (veh-mi/day)*	*Regional Emissions (tons/year)*				*Peak-hour VMT (veh-mi/hr)*	*Regional Emissions (lbs./hr)*			
		Oxides of Nitrogen	*Reactive Organic Gases*	*Carbon Monoxide*	*Particulate Matter*		*Oxides of Nitrogen*	*Reactive Organic Gases*	*Carbon Monoxide*	*Particulate Matter*
Automated Guideway Transit										
2005	-33,682	-9.9	-3.8	-44.9	-0.2	-3,987	-9.3	-2.6	-2.7	0.0
2020	-59,969	-14.4	-3.3	-47.9	-0.2	-7,221	-12.4	-2.3	-3.0	0.0

* Regional Emissions (E_{AS}) are defined as the emissions calculated for the preferred alternative (E_B) minus the emissions calculated for the No Action Alternative (E_{NB})

Source: CDM, 2000.

Impact AQ-5. Air Toxic Emissions

The air toxics sources considered for this project are on-road, diesel-fueled, vehicles. Diesel exhaust emissions are usually represented by diesel particulate matter (DPM). Looking at the results presented above, the PM concentrations presented for all vehicles are all expected to be reduced as a result of the implementation of the AGT for all years. The preferred alternative is expected to result in a reduction in the number of all on-road vehicles when compared to the No Action Alternative, as presented in Table 3.12-3. As vehicle emissions are directly related to vehicle volume, a reduction in the vehicle volume for the preferred alternative would result in a reduction of emissions from vehicles, and, therefore, a reduction in diesel emissions as well as emissions from other on-road vehicles.

The regional emissions of PM_{10} under the AGT for all analysis years are less than those under existing conditions, suggesting that DPM would also be less than those under existing conditions. The preferred alternative, therefore, would not cause a significant increase in air toxics emissions. The preferred alternative is predicted to produce less regional emissions than the No Action Alternative, and therefore, is likely to have a beneficial impact on the local level as well. The Diesel AGT would result in higher DPM emissions than the other AGT designs; however, those emissions would be created along an elevated roadway and not along the existing roadways and grade level sensitive receptors. The Diesel AGT design would not result in an increase in PM, and therefore DPM emissions. (LTS)

Median Option. Substitution of the Median Option for the segment of alignment between Elmhurst Channel and Coliseum Way would have no effect on any of the preceding analyses. (NI)

Partial ADP

With the partial ADP, some of the ADP components would not be implemented. These components include the new enlarged and consolidated terminal, the two-level roadway at the terminal, the parking garage and the grade-separated intersection at new Airport Road and Airport Drive.

Consideration of the partial ADP would not change the intersections and roadway segments selected for evaluation of air quality impacts. The absence of these ADP components, however, may affect the LOS for intersection and roadway segments within the OIA complex. The increase in intersection volume and the decrease in traffic speed would, most likely, result in an increase in CO impacts in this area.

Cumulative Analysis

Regional air quality

The regional emissions for the AGT are shown in Table 3.12-3. For all years of analysis, the cumulative emissions of NO_X, ROG, CO and PM_{10} under the AGT are less than those under the No Action Alternative for the year of analysis. Consequently, the preferred alternative would have cumulative beneficial effects on air quality, since it reduces regional air emissions.

Local PM_{10}

The regional emissions of PM_{10} under the AGT for all analysis years are less than those under existing conditions. This result suggests that the preferred alternative is not likely to cause localized exceedances of the PM_{10} standard in the future.

Local CO

Compared to the 1-hour 20ppm CAAQS and the 1-hour 35ppm NAAQS, the AGT would not result in cumulative concentrations exceeding either the NAAQS or CAAQS. The 1-hour CO concentrations predicted for the AGT are lower than those predicted for the No Action Alternative for all years of analysis.

Table 3.12-11
Highest Predicted 1-Hour Cumulative Carbon Monoxide Concentrations (ppm) in the Vicinity of the Three Most Congested Intersections
Based on P.M. Peak Traffic Volumes

Intersection	2000	2005		2020		1-hour CO Standards	
	Existing	No Action	AGT	No Action	AGT	CAAQS	NAAQS
Hegenberger Road & Edes Avenue	11.1	10.7	10.7	6.2	6.1	20 ppm	35 ppm
Hegenberger Road & Edgewater Drive	10.5	11.0	11.0	7.2	6.5	20 ppm	35 ppm
Airport Drive & Doolittle Drive	10.2	10.3	10.2	6.2	6.0	20 ppm	35 ppm

1-hour cumulative concentration ($C_{c,\ 1\text{-}hr}$) calculated as the highest predicted 1-hour concentration (without background) under the No Action Alternative and AGT ($C_{1\text{-}hr}$), plus the 1-hour background concentration ($B_{1\text{-}hr}$):
$C_{net,\ 1\text{-}hr} = C_{1\text{-}hr} + B_{1\text{-}hr}$

Source: CDM, 2000.

Table 3.12-12
Highest Predicted 1-Hour Cumulative Carbon Monoxide Concentrations (ppm) in the Vicinity of the Three Most Trafficked Roadways
Based on P.M. Peak Traffic Volumes

Roadway Segments - Hegenberger Rd	2000	2005		2020		1-hour CO Standards	
	Existing	No Action	AGT	No Action	AGT	CAAQS	NAAQS
Between Edgewater and I-880SB Off-ramp	8.7	9.3	9.2	6.3	5.9	20 ppm	35 ppm
Between Hegenberger Loop and Edgewater	8.6	9.4	9.2	6.4	5.9	20 ppm	35 ppm
Between Pardee and Hegenberger Loop	8.1	8.7	8.7	6.0	5.3	20 ppm	35 ppm

1-hour cumulative concentration ($C_{c,\ 1\text{-}hr}$) calculated as the highest predicted 1-hour concentration (without background) under the No Action Alternative and AGT ($C_{1\text{-}hr}$), plus the 1-hour background concentration ($B_{1\text{-}hr}$):
$C_{net,\ 1\text{-}hr} = C_{1\text{-}hr} + B_{1\text{-}hr}$

Source: CDM, 2000.

Table 3.12-13
Highest Predicted 8-Hour Cumulative Carbon Monoxide Concentrations (ppm) in the Vicinity of the Three Most Congested Intersections
Based on P.M. Peak Traffic Volumes

Intersection	2000	2005		2020		1-hour CO Standards	
	Existing	No Action	AGT	No Action	AGT	CAAQS	NAAQS
Hegenberger Road & Edes Avenue	7.1	6.8	6.8	3.9	3.9	9 ppm	9 ppm
Hegenberger Road & Edgewater Drive	6.7	7.0	7.0	4.6	4.2	9 ppm	9 ppm
Airport Drive & Doolittle Drive	6.5	6.6	6.5	3.9	3.8	9 ppm	9 ppm

8-hour cumulative concentration (Cc, 8-hr) calculated as the highest predicted 8-hour concentration (without background) under the No Action Alternative and AGT (C8-hr), multiplied by the persistence factor (PF), plus the 8-hour background concentration (B8-hr)
$C_{net,\ 8\text{-}hr} = (C_{8\text{-}hr})*PF + B_{8\text{-}hr}$

Source: CDM, 2000.

Table 3.12-14
Highest Predicted 8-Hour Cumulative Carbon Monoxide Concentrations (ppm) in the Vicinity of the Three Most Trafficked Roadways Based on P.M. Peak Traffic Volumes

Roadway Segments - Hegenberger Rd	2000	2005		2020		1-hour CO Standards	
	Existing	No Action	AGT	No Action	AGT	CAAQS	NAAQS
Between Edgewater and I-880SB Off-ramp	6.7	7.1	7.0	4.7	4.5	9 ppm	9 ppm
Between Hegenberger Loop and Edgewater	6.6	7.2	7.0	4.8	4.5	9 ppm	9 ppm
Between Pardee and Hegenberger Loop	6.2	6.7	6.7	4.5	4.1	9 ppm	9 ppm

8-hour cumulative concentration (Cc, 8-hr) calculated as the highest predicted 8-hour concentration (without background) under the No Action Alternative or AGT (C8-hr), multiplied by the persistence factor (PF), plus the 8-hour background concentration (B8-hr)
$C_{net,\ 8\text{-}hr} = (C_{8\text{-}hr})*PF + B_{8\text{-}hr}$

Source: CDM, 2000.

The 8-hour cumulative concentrations under the AGT are also below both the CAAQS and NAAQS. The 8-hour CO concentrations predicted for the AGT are lower than those predicted for the No Action Alternative for all years of analysis.

Air Toxics
Cumulative PM_{10} emissions are projected to decrease (see Table 3.12-3) from existing levels, therefore air toxics, as represented by DPM, are expected to decrease.

The AGT would reduce VMT and would therefore be expected to reduce air toxics emissions associated with vehicular traffic. The diesel-powered AGT would incrementally increase DPM emissions compared to the electric AGT. The change in cumulative DPM levels would be too small to measure or predict and would therefore result in a less than significant cumulative impact. (LTS)

Conformity Assessment

The preferred alternative is in compliance with transportation conformity regulations as defined by 40 CFR Part 93, Subpart A and MTC Resolution No. 3075.

The Connector project is included in the 2001 TIP adopted by MTC on September 27, 2000 with conformity findings (MTC Resolution No. 3300) and in the 2001 RTP adopted by MTC on December 19, 2001 without conformity findings (MTC Resolution Nos. 3425 and 3427). The EPA approved the motor vehicle emissions budget in the revised 2001 Bay Area Ozone Attainment Plan on February 14, 2002. MTC made findings of conformity for the 2001 RTP based on the approved motor vehicle emissions budget in the revised 2001 Bay Area Ozone Attainment Plan on March 15, 2002 (MTC Resolution No. 3432). Therefore, the Connector meets the first criterion for compliance with Clean Air Act conformity requirements for transportation projects.

Tables 3.12-5 through 3.12-8 show the project-specific CO emissions from the AGT are below the No Action Alternative for all years analyzed. The AGT would not increase frequency or severity of any CO violations as the AGT Alternative would result in a decrease from the No

Action concentration for all years of analysis. It has also been shown that the AGT can reasonably be assumed to not cause an increase in PM_{10} emissions both on a local and regional level.

There are no specific PM_{10} control measures required for on-road motor vehicles for this project. To ensure that the project construction does not produce any significant PM_{10} impacts, BART will implement the construction mitigation measures identified in Section 3.16, Construction Impacts, in accordance with BAAQMD/CEQA guidance.

As presented in Tables 3.12-11 through 3.12-14, there are no predicted CO concentrations above either the 1-hour or 8-hour CAAQS or NAAQS for any year analyzed. Since there are no predicted exceedances of the state or federal standards, and since there is no increase in frequency or severity of an existing violation, the AGT meets the second criterion for demonstrating air conformity.

References

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California Air Resources Board (CARB), On-Road Motor Vehicle Emission Inventory Models (Software and Documentation). http://www.arb.ca.gov/msei/mvei/ mvei.htm, July 2000

U.S. Department of Energy, Energy Information Administration, *Emissions of Greenhouse Gases in the United States 1999*, DOE/EIA-0573(99), October 2000

Section 3.13
Energy

3.13.1 Introduction

During operation of the Connector, energy would be required for vehicle propulsion, station operation, and maintenance of vehicles and associated equipment. Different energy sources including electricity, natural gas, gasoline, diesel, methanol, and fuel oil could be used to satisfy operational requirements. While the Connector would consume energy, it would also have the offsetting positive effect of reducing the number of auto trips made to and from OIA. This section compares energy usage associated with the preferred alternative and the Median Option, as well as the changes in regional energy consumption as fewer auto trips are made.

3.13.2 Existing Conditions

Statewide Transportation Energy Demand and Supply

California is the tenth largest consumer of energy in the world. The transportation sector consumes 46 percent of overall energy use in California; the industrial sector, 31 percent; residential, 13 percent; and commercial, 10 percent. Petroleum is used to satisfy 54 percent of California's total energy demand. Natural gas supplies 33 percent and electricity contributes 13 percent (coal is a relatively unimportant fuel in California accounting for less than 1 percent) of total energy use. Within the state, electricity and natural gas consumption are nearly synonymous with stationary energy usage, while petroleum consumption is similarly synonymous with transportation energy usage (CEC, 2000a).

Petroleum (Gasoline and Diesel) Energy

As California's population and economic output continues to grow, the demand for transportation services (and therefore, petroleum/gasoline consumption) will also grow. If current trends continue, on-road gasoline and diesel demand is projected to increase by approximately 40 percent over the next 20 years. Gasoline demand is projected to increase from 13.9 billion gallons in 1999 to 19.9 billion gallons by 2020, and diesel demand is projected to increase from 2.4 billion gallons to 4.8 billion gallons over the same period. The in-state petroleum refining industry is not projected to be able to keep pace with this forecasted growth without major changes in industry operations. This could result in sudden price increases for both gasoline and diesel fuels over sustained time periods (CEC, 2000b).

Public and environmental concerns also shape the transportation fuel market. The combination of strong growth in gasoline demand, phase-out of Methyl tertiary butyl ether (MTBE), greatly expanded use of ethanol necessitated by the federal minimum oxygen requirement, and transition to Phase 3 RFG (Reformulated Gasoline) could substantially affect the balance between supply and demand of transportation fuels in California and impair the ability of refiners to consistently supply volumes of gasoline to meet California demand (CEC, 2000b).

MTBE is a gasoline blending component used as a gasoline oxygenate to help control carbon monoxide emissions. In the fall of 1998, it was found that there are significant risks of water contamination from MTBE and, therefore, the Governor directed that use of MTBE as a gasoline oxygenate is to be phased out by December 31, 2002. Phase 3 RFG prohibits use of MTBE and directs use of only ethanol as oxygenate. Revisions of state and federal regulations to further tighten specifications for diesel fuel are also underway. These revisions will reduce diesel's environmental impact and allow its continued use in engines that are typically more energy efficient than gasoline-fueled engines. All of these factors pose challenges to producing greater volumes of cleaner-burning transportation fuels to meet California's demand.

According to California Energy Commission (CEC) staff, it would be difficult for the state to rely nearly exclusively on petroleum-based fuels in the future, if it desires a stable transportation fuel market (CEC, 2000b).

Natural Gas

California is the second largest consumer of natural gas in the nation. In 1997, the state consumed more than 5.5 billion cubic feet per day (BCF/D). Thirty-six percent of natural gas consumed in California generates electricity. Another 24 percent serve the needs of residential customers. The industrial, mining or resource extraction and commercial sectors consume the remaining 40 percent. The CEC expects that electricity generation needs will lead future growth in California's natural gas demand during the next 20 years. Statewide natural gas consumption, including all market sectors, is expected to increase by 1.3 percent per year, exceeding 7 BCF/D by 2019. Much of this increase can be attributed to electricity generation (CEC, 1999a).

Four producing regions supply California with natural gas. Three of them -- the Southwest US, the Rocky Mountains, and Canada -- provide approximately 85 percent of all gas consumed in the state. The remainder is produced inside California. It is expected that adequate supplies would be available from each of the four regions providing gas to California until 2019. Supplies available to California are expected to increase to 7.8 BCF/D by 2019 (CEC, 1999a).

Electricity

Current State and Regional Energy Use

The CEC tracks statewide electricity consumption and peak electricity demand[1]. According to the CEC, total statewide electricity consumption grew from 166,979 gigawatt hours (GWh) in 1980 to 228,038 GWh in 1990, an annual growth rate of 3.2 percent. There was a slowdown in the growth of energy demand in the 1990s as a result of the economic recession in California from 1990 to 1994. According to the CEC, the total statewide electricity consumption in 1998 was 244,409 GWh, reflecting an annual growth rate of 0.9 percent for the period of 1990-1998. Electric power for the Bay Area is supplied by a number of power generators, including PG&E, and is distributed through PG&E's electric utility grid system. Based on 1998 CEC figures, PG&E used 95,601 GWh, or approximately 43 percent of the statewide total. PG&E is the

[1] Electric energy is measured in watts; 1,000 watts is a kilowatt (kw), 1,000 kilowatts is a megawatt (MW), and 1,000 megawatts is a gigawatt (GW). Electric consumption over time is measured by kilowatt-hours (kwh), megawatt-hours (MWh), and gigawatt-hours (GWh).

primary energy provider and distributor in the Bay Area and northern California. For purposes of this discussion, consumption and peak demand for the PG&E service area are used as measures of regional energy use.

Peak electric demand, expressed in megawatts (MW), measures the largest electric power requirement during a specified period of time, usually integrated over one clock hour. Peak demand is important in evaluating system reliability, determining congestion points on the electric grid, and identifying potential areas where additional transmission, distribution, and generation facilities are needed. California's peak demand typically occurs between the hours of 3 and 5 p.m. on a day in August. High temperatures lead to increased air conditioning use by residential and commercial customers. Increased air conditioning electric loads in combination with industrial loads, commercial lighting and office equipment, and residential refrigerators create the peak electric demand in California (CEC, 2000a).

According to the CEC, the peak electric demand[2] for the state in 1999, including PG&E, Sacramento MUD, Southern California Edison, Los Angeles Division of Power and Water, San Diego Gas and Electric, plus other utilities, was 50,743 MW. The peak demand for the PG&E service area (i.e., the regional demand) in 1999 was 19,417 MW, or approximately 38 percent of peak hour demand. (CEC, June 2000a)

Table 3.13-1 illustrates the annual power consumption and peak electricity demand for the state and the region (as represented by PG&E). The data for power consumption and peak demand represents the most recent data available from the CEC (years 1998 and 1999). Although the years for data vary slightly, they allow a representative comparison of the two systems.

Table 3.13-1
Existing Electricity Consumption And Peak Demand: State and PG&E

	State	***PG&E***
Annual Energy Consumption (GWh)	224,409(1)	95,601(1)
Peak Demand (MW)	50,743(2)	19,417(2)

Source: California Energy Commission
Notes:
(1) CEC 1998 data
(2) CEC 1999 data, end use peak demand
GWh=gigawatt-hours
MW=megawatt

Future Electricity Supply and Demand

The electricity industry has undergone significant market restructuring and divestiture over the past few years. Prior to enactment of Assembly Bill 1890 (AB 1890), local utility companies provided electrical generation, transmission, and distribution. After enactment of AB 1890, California's Investor-Owned Utilities (Pacific Gas & Electric, Southern California Edison, San Diego Gas & Electric) have become local "Utility Distribution Companies" (UDCs). The UDCs

[2] End use peak demand: end use customer demand and does not includes losses, but does include self-generation.

continue to provide regulated distribution service, but no longer control their transmission systems. They have also divested much of their generation capabilities.

The California Independent System Operator (Cal-ISO), regulated by the Federal Energy Regulatory Commission (FERC), is responsible for administering the power grid through which electricity flows throughout the state. Energy service providers either contract directly with the Cal-ISO or through a scheduling coordinator to gain access to the open market power grid operated by the Cal-ISO. The California power grid is a network of long-distance, high-voltage transmission lines and substations that carry bulk electricity to local utilities for distribution to their customers. Investor-Owned Utilities (IOUs) are mandated by AB 1890 to sell all their generated power into and purchase all their generation needs from the newly created Power Exchange (PX) during a four-year transition period that ends March 31, 2002. The PX schedules its deliveries through the ISO (Cal-ISO, 2000a).

During the summer of 1998, the Cal-ISO issued several calls for voluntary reductions in electricity usage. On four occasions, Cal-ISO issued Stage II alerts, which signaled that operating reserves had fallen below 5 percent. Under a Stage II alert, the ISO requests that the UDC curtail their interruptible (nonessential) load customers so that the ISO can maintain an operating reserve of at least 5 percent. A coincidence of high temperatures and high electricity demand over most of the western half of the country during 1998 strained the electricity supply and transmission system to its limits (CEC, 1999b).

A Stage I emergency notice is declared by the Cal-ISO anytime it is clear that the minimum operating reserve capacity is unavailable or, when in real time operations, the operating reserve is forecast to be less than minimum after utilizing available resources. In a Stage II alert, the margin of available capacity over peak demand falls below 5 percent and in a Stage III alert, the available operating reserve is forecast to be less than 1.5 percent (Cal-ISO, 2000b). In 2000, Cal-ISO recorded 56 Stage I alerts, 36 Stage II alerts, and one stage III alert (Cal-ISO, 2000b). When the available reserves become zero, the supply of power to all interruptible load customers can be stopped through rolling blackouts (CEC, 1999b). During January 2001, the frequency of Stage III alerts increased to a level that they were almost a daily occurrence. Although peak energy demands are a summer phenomena, the recent winter (2000-2001) situation indicated that there is a delicate balance of the energy supply and demand throughout the year. This crisis has been exacerbated by a variety of factors including plant shutdowns, high natural gas costs, low rainfall levels, and unusually cold temperatures.

The electricity demand and supply balance will not change until there is increased generating capacity. A significant number of forced outages of old generators have further diminished power supply. Many fossil fuel units have also been closed to comply with more stringent oxides of nitrogen emissions restrictions. Based on information provided by its members, the Western Systems Coordinating Council (WSCC)[3] is of the view that net generation additions over the next five years will not keep pace with forecasted demand growth. However, the CEC staff forecast of new generation capacity is more optimistic and includes many of the plants that

[3] The four reporting regions of the WSCC are the Northwest Power Pool Area, the Rocky Mountain Power Area, the Desert Southwest Area, and the California-Mexico Power Area.

have filed for siting approval from the CEC. There is a high degree of uncertainty surrounding the online dates for many of the new plants in California. The timing of these new additions depends not only on how quickly they proceed through CEC's siting process, but also on the market signals from the PX and the Cal-ISO (CEC, 1999 b). About 22 plants with a total capacity of 16,000 megawatts (MW) of power are either approved or in various stages of planning (2,183 MW by September 2001, and 2,600 MW by December 2002) to begin to meet anticipated demand (SF Chronicle, 2000).

The forecasted peak demand in 2001 for the Cal-ISO Control Area assuming a 1-in-10 year peak temperature condition is 50,068 MW. With a 5 percent operating reserve, there should be sufficient supply to generate 52,278 MW. The total power supply is expected to be at least 55,892 MW including 1,888 MW of new generation and 1,815 MW of emergency resources. Although the future is uncertain, the CEC predicts that the peak electricity demands in 2001 can be satisfied (CEC Electricity Analysis Office, 2000c). By 2010, the projected end use peak demand for electricity is 61,034 MW and the projected annual use is 309,868 GWh. However, the electricity supply beyond 2002 cannot be predicted because the market is so volatile and uncertain.

Although sufficient electricity supply is projected for the state, the Bay Area may still be prone to blackouts because of its constrained transmissions system. In peak times, these transmission systems are susceptible to congestion because there are few lines into the Bay Area and few generation facilities within the Bay Area. On June 14, 2000, the Bay Area experienced blackouts despite the existence of sufficient power sources in other parts of the state. The California Public Utilities Commission (CPUC) has made recommendations to upgrade key transmission infrastructure into the constrained Bay Area region (Lynch and Kahn, 2000).

Current Regional Transportation Energy Demand to OIA

The predominant mode of access to OIA is and will continue to be the private automobile. In 1998, out of a total of 9,216,000 air passengers that traveled to OIA, 85 percent used private automobiles or rental cars. Only 5 percent used public transit; 3 percent used private scheduled bus, hotel shuttle, or other chartered buses; and 7 percent used door-to-door shuttle, taxi or limousine (MTC, 2000). The regional vehicle miles traveled (VMT) in the 25 airport analysis districts evaluated for this study for 1999 equals 429,050 miles (CCS, 2000c). Using the typical regional fleet mix and the energy in British Thermal Units (Btu)[4] consumed per mile by each vehicle type, the total regional transportation energy consumed by vehicles traveling to OIA in 1999 was approximately 3.0 billion Btus per day.

BART is the primary public transit service that currently connects air passengers from the San Francisco Bay Area to OIA . AirBART connects the Coliseum BART Station to OIA, and averaged 1,269 passengers per day in 1999. The average vehicle miles traveled by the AirBART fleet is about 600 miles per day, consuming about 225 to 250 gallons of diesel per day (Peterson, 2000).

[4] A British Thermal Unit (Btu) is a common unit for energy consumption, defined as the quantity of heat required to raise the temperature of one pound of water by one degree Fahrenheit.

Applicable Policies and Regulations

Corporate Average Fuel Economy (CAFE) Standards

The CAFE standards are federal regulations set to reduce energy consumed by on-road motor vehicles by specifying the minimum fuel consumption efficiency standards for manufacturers of new automobiles sold in the United States. The current CAFE standard for passenger cars is 27.5 miles per gallon. The light truck CAFE standard for 1998 was 20.7 miles per gallon (Competitive Enterprise Institute, 1996).

Transportation Equity Act for the 21st Century (TEA-21)

The Transportation Equity Act for the 21st Century (TEA-21) was passed in 1998. This Act strives to protect and enhance communities and the natural environment as development occurs in the transportation sector. TEA-21 builds on the initiatives established in the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA), which was the last major authorizing legislation for surface transportation.

The ISTEA identified planning factors that Metropolitan Planning Organization (MPOs), including the Bay Area's Metropolitan Transportation Commission, are to use in developing transportation plans and programs. One of the planning factors states, "Protect and enhance the environment, promote energy conservation, and improve quality of life." MPOs are also required to consider the consistency of transportation planning with federal, state, and local energy goals.

Title 24, Energy Efficiency Standards

Title 24, part 6, of the California Code of Regulations, Energy Efficiency Standards, ensures efficient energy use in new buildings constructed in California. The standards regulate energy consumed for heating, cooling, ventilation, water heating, and lighting. The building energy efficiency standards are enforced through the local building permit process.

3.13.3 Impact Assessment and Mitigation Measures

Standards of Significance

The goal of conserving energy implies the wise and efficient use of energy. According to Appendix F of the CEQA Guidelines (Guidelines, 1999), the means of achieving this goal include:

1) decreasing overall per capita energy consumption,

2) decreasing reliance on natural gas and oil, and

3) increasing reliance on renewable energy sources.

In order to assure that energy implications are considered in project decisions, CEQA requires that EIRs include a discussion of the potential energy impacts of the proposed project, with particular emphasis on avoiding or reducing inefficient, wasteful, and unnecessary consumption of energy (CEQA, Appendix F, 1999)

According to the CEQA Guidelines, Appendix F, environmental impacts may include the project's energy requirements and energy use efficiencies; effects on local and regional energy supplies and on requirements for additional capacity; effects on peak and base period electricity demand; compliance with existing energy standards; effects on energy resources; and use of efficient transportation alternatives. Implementation of the Connector project would have a significant adverse effect if it would:

- lead to a wasteful, inefficient, and unnecessary usage of energy;
- place a significant demand on regional energy supply or require significant additional capacity;
- significantly increase peak and base period electricity demand.

Implementation of the Connector project would have a significant cumulative adverse effect if it would:

- together with regional growth, contribute to a collectively significant shortage of regional energy supply.

By contrast, if the Connector resulted in energy savings or alleviated demand on energy resources and use of efficient transportation alternatives, it would have a beneficial effect.

Methodology

Energy consumption calculations are based upon actual energy needs of the project and the reductions in energy consumption caused by the shift of passengers from private vehicles to the AGT. Reduced vehicle use is demonstrated by a reduction in VMT. The VMT data presented in this FEIR/FEIS, and the associated energy calculations, are based upon the AGT proposed project presented in the DEIR/DEIS. New VMT data were not calculated for the preferred alternative. VMT estimates associated with the preferred alternative (the 4-station AGT with the alignment west of Hegenberger Road between Elmhurst Channel and Coliseum Way) would be lower than those shown, because the preferred project results in increased ridership and therefore decreased passenger vehicle trips. Energy efficiency benefits associated with the preferred alternative and the Median Option are therefore better than shown in the following data presentations.

Energy consumption by the preferred alternative would increase slightly with an increase in ridership, but the calculated system energy consumption remains relatively constant with increased ridership since the demands on fixed facilities (stations, AGT propulsion) are unchanged. Increased ridership numbers generated for the preferred alternative are included in the energy analyses to show relative energy consumption on a passenger-mile basis.

Preferred Alternative Environmental Analysis

Impact EN-1. Efficient use of energy

CEQA requires a discussion of a project's effects on the existing environmental setting. In the case of the Connector, such an analysis would be hypothetical because the lead-time required to

design and construct the Connector would preclude the Connector from affecting the existing (2001) energy situation. Accordingly, the energy analysis examines the effects of the Connector in 2005 when it is expected to begin operations. The following paragraph provides an analysis of the effects of the preferred alternative on the existing conditions to comply with CEQA requirements.

As discussed in the Existing Conditions section, the 1999/2000 regional VMT to OIA was 429,050 miles. This corresponds to an energy consumption of approximately 3.0 billion Btus per day. The preferred alternative would reduce the regional VMT by diverting air passengers and employees who would have otherwise driven in automobiles. It is estimated that the regional VMT would be reduced to 377,279 with the Project in 1999/2000 (CCS, 2000c). These reduced VMT estimates reduce the associated energy consumption to approximately 2.64 billion BTUs for the AGT. Even after adding the respective energy consumption required to operate the AGT system for year 2005 (see Table 3.13-2), which represent energy consumption calculations based on 2005 Connector ridership projections larger than those for 1999/2000 conditions, the resulting energy consumption estimates are 2.76 billion BTUs per day for the AGT. As a result, the energy consumption attributable to VMT with the AGT in 1999/2000 would be less than under existing conditions, a beneficial effect.

As illustrated in Table 3.13-2, the No Action Alternative (AirBART) would require less total energy resources to operate in 2020 than the AGT. In 2005, the No Action Alternative would require 0.027 billion Btus per day, while the AGT (except for the diesel bus version of the AGT system) would require 0.119 billion Btus per day. The AGT with diesel buses would require 0.110 billion Btus per day in 2005 (see Table 3.13-2).

To analyze the preferred alternative in terms of energy efficiency, it is useful to consider how much energy is consumed per each passenger-mile traveled. The AGT would serve more passengers, and would require substantially greater energy to operate than the No Action Alternative (see Table 3.13-2).

Table 3.13-2
Operational Energy Requirements of Connector Alternatives[1]

	2005			2020		
	No Action	**Preferred Alternative**	**Preferred Alternative with Diesel**	**No Action**	**Preferred Alternative**	**Preferred Alternative with Diesel**
Annual transit vehicle miles traveled	436,104	756,225	756,225	587,792	1,323,394	1,323,394
Annual energy consumption for operation of transit vehicles (in billion Btu) [2]	10.0	[4]	26.1	13.5	[4]	45.6
Annual energy consumption for operation and maintenance of station (in billion Btu)	NA	[4]	13.8 [3]	NA	[4]	15.0 [3]
Average daily energy consumed (in billion Btu)	0.027	0.119 [4]	0.110	0.037	0.185 [4]	0.167
Average daily ridership	1,880	7,380	7,380	3,340	13,545	13,545
Trip length in miles	3.8	3.3	3.3	3.8	3.3	3.3
Total energy consumption in Btu per passenger-mile	3,835	4,885	4,515	2,918	4,139	3,736

Source: EIP Associates.

Notes:

(1) Energy consumption factors - Leigh Stamets, Transportation Energy Planner, California Energy Commission; Annual vehicle miles traveled, mileage factors (miles per gallon), trip length in miles, and energy consumed for AGT preferred alignment and Median Option - Lea+Elliott, Inc., 2000 a, b and c; Coliseum BART Station energy records - Connee Lloyd, Senior Energy Analyst, Bay Area Rapid Transit System; Square footage of Coliseum BART Station - Don Dean, Environmental Coordinator, San Francisco Bay Area Rapid Transit District; Average daily ridership in 2005 - CCS Planning and Engineering, Inc., 2000a

(2) Miles per gallon numbers for diesel buses will vary with type of engine and other bus options, as well as traffic patterns. BART's engineering consultants after consultations with the diesel bus suppliers have arrived at the following estimates: 6 miles per gallon of diesel for a standard AirBART bus and 4 miles per gallon for an articulated AGT diesel bus. A gallon of diesel contains about 138,000 Btu. Therefore, the AirBART would consume about 23,000 Btu per mile and the diesel AGT would consume about 34,500 Btu per mile.

(3) Based on recent energy consumption records, the Coliseum BART Station consumed about 1 million-kilowatt hours (kWh) from April 1999 to March 2000. The Coliseum BART Station occupies 35,400 square feet of area. Based on these factors, the operational energy consumption of a station is estimated at about 28.25 kWh per square foot. The energy consumption factors for the Coliseum BART Station have also been used to calculate the energy required to operate an AGT station. It is assumed that the factor would cover the energy required for maintenance activities. The Coliseum AGT Station occupies about 6,700 square feet of area and the Airport AGT Station occupies 8,800 square feet of area. Each of the two intermediate stations are assumed to be the same size as the average of the two termini stations, for a total station area of 31,000 square feet. The maintenance facility would occupy 17,850 square feet initially (2005), then be expanded to 22,050 square feet (Section 2.2.5). The two stations and maintenance facility would thus consume about 1.38 million kWh of energy, or 13.8 billion Btu/yr in 2005. With the expanded maintenance facility in 2020, the consumption increases to 15.0 billion Btu/yr. Due to the energy losses associated with electricity generation, these calculations assume 1kWh = 10,000 Btu.

(4) Separate estimates of vehicle and station operations were not prepared. However, estimates of total operational energy requirements for the AGT were prepared and are reported in the row, "Average daily energy consumed (in billion BTU)." This value includes the initial energy estimate for operation and maintenance of AGT vehicles, two stations, and maintenance facilities (0.107 billion But/day and 0.170 billion Btu/day for 2005 and 2020, respectively), plus additional estimates for two additional stations (0.012 billion Btu/day both years) and an expanded maintenance facility (0.003 billion Btu/day) in 2020. The AGT is estimated to require 0.119 billion Btu of energy per day in 2005 and 0.185 billion Btu of energy per day in 2020.

While the preferred alternative imposes a demand for energy to operate the vehicles and facilities, they also reduce energy required by autos to the extent that motorists shift to transit. Thus, to provide a comprehensive assessment of energy demand, the overall regional change in energy consumption is examined. In general, transit systems are typically energy efficient compared to private automobiles. For example, as mentioned in Table 3.13-2, each diesel AGT would consume about 34,500 Btu per mile. Assuming a fully loaded diesel AGT with 60 passengers, the energy consumption per passenger per mile traveled would be about 575 Btu. On the other hand, an automobile with an average of 2.8 persons per vehicle would consume

about 1,745 Btu per passenger per mile, almost three times that of the diesel AGT.[5] In the regional context, if the preferred alternative help shifts passengers from automobiles to transit, there would be less total energy consumption in the region.

Table 3.13-3 presents the total regional energy consumption for travel to OIA in 2005 and 2020 under the No Action and preferred alternative. The regional energy demand is based on the vehicle miles traveled for access trips to OIA (CCS Planning and Engineering, Inc., 2000a). As presented in Table 3.13-3, the No Action Alternative would result in a total regional consumption of 4.02 billion Btu of energy per day in 2005, about 3.6 percent greater than the AGT. In the year of opening (2005), the AGT system would result in a reduction of regional transportation energy consumed relative to the No Action conditions of 0.24 billion Btus per day in 2005 and 0.28 billion Btus per day in 2020. The regional transportation energy consumed by the AGT with diesel buses would be slightly lower than the other AGT systems (3.854 billion Btu per day in 2005 and 6.245 billion Btu per day in 2020).

The expansion of the AirBART service under the No Action Alternative would prevent more regional VMT by automobiles than if no additional investment in AirBART were made. The AGT consumes more energy to operate the fleet of transit vehicles than AirBART. This increased demand is offset by the reduction in regional auto travel to OIA and would reduce overall energy demand relative to the No Action Alternative. In summary, the preferred alternative results in energy conservation through the increase in transit usage, which is more energy efficient than individual autos. Thus, the preferred alternative results in overall beneficial energy effects. (B)

[5] An automobile can achieve about 23.4 miles per gallon consumed. One gallon of gasoline consumes 115,000 Btu of energy (Stamets, 2000). Therefore, an automobile consumes 4,916 Btu per mile traveled. Average persons per automobile vary according to the type of car (private or rental), the nature of the trip (business or personal), and the passenger characteristics (visitor, resident, or employee). The most conservative value for persons per vehicle is for a visitor making a personal trip in a private car; the factor being 2.816 persons per vehicle (CCS Planning and Engineering, Inc., 2000b). Therefore, the effective energy consumption would be 1,745 Btu per passenger-mile.

Table 3.13-3
Regional Energy Consumption to OIA [1]

		Energy Consumption Btu per mile	***Energy Consumption in Billion Btus per day***			
			Year 2005		***Year 2020***	
			No Action	***AGT*** [2]	***No Action***	***AGT*** [2]
Regional vehicle miles traveled (VMT)			576,077	542,395[3]	941,101	881,132[3]
Fleet Mix	***Fleet Mix %***					
Private automobiles or rental cars (gasoline)	85	4,915	2.41	2.27	3.93	3.68
Public transit (diesel)	5	28,750	0.83	0.78	1.35	1.27
Private scheduled bus, hotel shuttle, or other chartered buses (diesel)	3	28,750	0.50	0.47	0.81	0.76
Door-to-door shuttle, taxi or limousine (gasoline)	7	6,534	0.26	0.25	0.43	0.40
Regional energy consumption			4.00	3.77	6.52	6.11
Energy consumption (value from Table 3.13-2)			0.027	0.119	0.037	0.185
Total regional transportation energy use (from vehicles traveling to OIA)			4.02	3.89	6.56	6.30

Source: EIP Associates.
Notes:
(1) Fleet mix - MTC, 2000; Energy Consumption Factor - Leigh Stamets, Transportation Energy Planner, California Energy Commission, telephone conversation with EIP Associates, June 21, 2000; Regional Vehicle Miles Traveled - CCS Planning and Engineering, Inc., letter to EIP Associates, July 25, 2000a.
(2) For the AGT with diesel buses, the total regional transportation energy use in 2005 would be 3.89 billion Btus per day (3.77+0.119) and in 2020 would be 6.3 billion Btus per day (6.11+0.185).
(3) VMT numbers for the AGT scenario are based on the two-station AGT alternative presented as the proposed project in the DEIR/DEIS.

Additional energy is required to serve the two intermediate stations. The two stations would be designed to satisfy Title 24 Energy Efficiency Standards requirements.

The total energy consumed by the AGT would be 43.4 billion Btus per year in 2005. This substantial demand in operational energy is due to the number of stations and the ridership, which necessitates operating longer trains (Lea+Elliott, 2000e). In 2020, the total energy consumed for operation of the AGT would be 67.5 billion Btus per year.

Median Option. Substitution of the Median Option for the segment of alignment between Elmhurst Channel and Coliseum Way would have no effect on any of the preceding analyses. (NI)

Impact EN-2. Demand and supply of energy resources
AGT

Petroleum-based Fuel

The AGT (except diesel powered vehicles) would use electric power for propulsion, stations, and maintenance. A number of energy saving features would be incorporated into the AGT system. These would include a composite third rail (better conductivity is more energy efficient) and lightweight vehicles (less energy required for acceleration and deceleration). As presented in EN-1, the AGT would shift a significant number of passengers from automobiles and light duty trucks to the AGT, reducing the overall vehicle miles traveled. Since 85 percent of the vehicles in the region traveling to OIA consist of autos and light duty trucks using gasoline or diesel as fuel, the AGT would have a positive overall effect on the use of petroleum-based fuels. (B)

Electricity

Electric power demand for the AGT (propulsion, stations, and maintenance) would vary depending on the scenario and configuration: number of vehicles, number of stations, etc. The scenario requiring the greatest power demand in the year 2005 would be the 4-station, configuration with 2-vehicle trains, for which annual electric consumption is estimated to be 16.2 GWh (Lea+Elliott, 2001b). This represents approximately 0.02 percent of the regional electricity demand (as represented by the PG&E service area demand). Peak electricity demand (worst case) for the AGT would be approximately 2.8 MW. This represents approximately 0.01 percent of the regional peak electricity demand (as represented by PG&E's end use peak demand in 1999).

As noted in the discussion of supply and demand for electricity in the existing conditions section (Section 3.13-2), the current electric energy situation in California is precarious. The demand for electric energy currently exceeds the supply. Rolling blackouts may be widespread during the months of peak demand (typically summer months). The uncertainty over the region's electric supply will not change until there is increased generating capacity. The Western Systems Coordinating Council is of the view that net generation additions over the next five years will not keep pace with forecasted demand growth. The CEC staff forecast of new generation capacity is more optimistic and includes generating capacity from many of the plants that have filed for siting approval from the CEC. About 22 plants with a total capacity of 16,000 megawatts (MW) of power are either approved or in various stages of planning (2,183 MW by September 2001, and 2,600 MW by December 2002) (SF Chronicle, 2000). Whether these facilities will provide the margin of generating capacity to ensure a stable electric network by 2005 when the AGT could begin revenue service remains to be seen. Due to the uncertainty over the region's future electric supply and transmission system constraints, any increase in electric energy demand from any project or action could potentially have a significant affect on the electric energy supply. Therefore, the AGT may have a significant effect on the electric energy supply. (PS)

AGT with Diesel Buses.

Petroleum-based Fuel

The diesel consumption of the AGT with diesel buses would be less than existing conditions if the Connector project were operational in 1999/2000. Overall, these alternatives would have a beneficial energy effect on the petroleum-based fuel supply.

In 2005, the AGT diesel bus would consume about 190,750 gallons of diesel; in 2020 about 333,800 gallons of diesel. The AGT with diesel bus would consume significantly higher amounts of diesel when compared to the No Action Alternative. However, on a regional basis, the AGT with diesel bus would help shift a significantly higher number of automobiles to transit uses compared to the No Action Alternative. Since 85 percent of the vehicles in the region traveling to OIA consist of autos and light duty trucks using gasoline or diesel as fuel, the AGT with diesel buses would have a positive overall effect on the use of petroleum-based fuels. (B)

Electricity

Operation of the AGT stations and maintenance facility under this option would require about 465,1.38 million kWh of energy annually. Due to the uncertainty over the region's future electric supply and transmission system constraints, any increase in electric energy demand from any project or action may have a significant affect on the electric energy supply. Therefore, maintenance and stations for the AGT with diesel buses could potentially have a significant effect on the electric energy supply (PS)

Median Option. Substitution of the Median Option for the segment of alignment between Elmhurst Channel and Coliseum Way would have no effect on any of the preceding analyses. (NI)

Mitigation Measures.

Petroleum-based Fuel

The AGT (both with and without diesel buses) would have beneficial impacts on the petroleum-based energy supplies. In the event engineering design refinements require use of the median instead of the preferred alternative alignment, consumption of petroleum-based fuel by buses would not differ from the preferred alternative. Therefore, no mitigation measures are required.

Electricity

Unless the electrical energy supply is increased sufficiently to accommodate additional demand in the future, any project or action that requires electric energy will have a significant impact. The AGT (both with and without diesel buses) could potentially have significant impact on the electrical energy supply. In the event engineering design refinements require use of the median instead of the preferred alternative alignment, consumption of electricity would not differ from

the preferred alternative. There are no reasonable mitigation measures other than an increase in the electric energy supply. If the supply of electric energy increases sufficiently before the alternatives begin to demand electricity, the impact would be eliminated. The availability of electric energy in the future is unknown and so the impact is potentially significant and unavoidable.

BART customarily adopts energy conservation techniques such as operation of fewer cars during off-peak hours to reduce the load to be pulled by the engine, low power consuming propulsion systems, and low power consuming light bulbs. However, considering the uncertainty of electricity supplies in the coming years, these conservation measures would not be sufficient to alleviate the impact to a less-than-significant level. Therefore, this impact would remain potentially significant and unavoidable. (PSU)

Partial ADP Scenario

The components of the project that would consume energy (Connector stations and maintenance facilities, and vehicle propulsion) would be the same under either the ADP or the Partial ADP Scenario. Hence, there would be no change in the energy demands of the preferred alternative with the Partial ADP Scenario. As a result, the beneficial and adverse impacts identified under the Preferred Alternative Environmental Analysis are applicable to the Partial ADP Scenario as well.

Cumulative Analysis

The cumulative analysis to study energy conservation is based on regional VMT, which is a function of ABAG's growth forecasts. The regional VMT figures reported in Section 3.1, Transportation, are based on future population, housing, and employment growth in the 25 airport analysis districts evaluated for this study and provide the cumulative scenario for energy cumulative impacts. The total cumulative energy requirement by regional transportation to OIA with the No Action Alternative would be about 6.56 billion Btus per day of energy in 2020 (see Table 3.13-2). The AGT along with other projected growth would reduce cumulative energy requirements by diverting a greater percentage of motorists to transit. The preferred alternative would reduce the regional energy consumption by about 4 percent compared to cumulative conditions with the No Action Alternative (6.28 billion Btu per day). Because the AGT reduces regional energy consumption, it has beneficial cumulative energy effects. (B)

In the future (2020), the No Action Alternative, and the AGT with diesel buses would place a large demand on diesel; 98,000 gallons of diesel by AirBART and 333,800 gallons of diesel by the AGT with diesel buses. These alternatives would shift a significant number of motorists to transit. Because the primary fuel used for transportation is either gasoline or diesel, this shift would result in a smaller demand for petroleum-based fuel supply and would, thus, be a beneficial cumulative impact. (B)

As discussed in the preferred alternative analysis, the exact electricity demand and supply projection is speculative because the electricity market is undergoing a dynamic change. There are current regional electricity transmission and generation issues. Consequently the

cumulative effects on the electricity demand from the preferred alternative together with other projects and growth in the region could potentially exceed electrical generation and transmission capacity and are therefore considered significant and unavoidable. (PSU)

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Section 3.14
Hazardous Materials

3.14.1 Introduction

Exposure to hazardous materials and contaminated soil and groundwater along the project corridor could occur during construction and operation of the preferred alternative. This section of the FEIR/FEIS addresses existing public health hazards along the project corridor and describes the potential impact of exposure to these substances.

Hazardous materials are defined by the State of California as:

> *…any material that, because of its quantity, concentration, or physical or chemical characteristics, poses a significant present or potential hazard to human health and safety or to the environment if released into the workplace or the environment. "Hazardous materials" include, but are not limited to, hazardous substances, hazardous waste, and any material which a handler or the administering agency has a reasonable basis for believing that it would be injurious to the health and safety of persons or harmful to the environment if released into the workplace or the environment. (California Health and Safety Code, Division 20, Chapter 6.95, Section 25501(k).*

Also discussed is the potential impact of electromagnetic fields created by the AGT. Wherever there is a flow of electricity, electric and magnetic fields are created. Electric fields are caused by the voltage in a power line. Magnetic fields result from the current in the line. Collectively, these are known as electromagnetic fields (EMF). Other potential health and safety impacts are addressed in Section 3.6, Community Services.

3.14.2 Existing Conditions

Listed Environmental Sites

The project corridor is located in a heavily urbanized area of Oakland. The large amounts of commercial and industrial activity that have occurred have resulted in soil and groundwater contamination. A number of federal, state, and local agencies maintain lists of sites with known, suspected, or potential contamination. A database search was conducted of sites recorded in a broad range of regulatory agency inventories to identify known or suspected hazardous sites proximate to the project corridor. The search radius was based on American Society of Testing and Materials standard designation E1527-97 recommendations. This list was narrowed to sites within 500 feet west of the project corridor and 1000 feet north, east, and south, based on the possible project construction right-of-way and the direction of groundwater flow patterns from east to west. Based on the database results, 113 sites with known or potential contamination from hazardous materials were identified. No record reviews or site inspections were performed. A complete Phase I Environmental Site Assessment was not performed for the project corridor because such investigations tend to remain valid for only six

months and, as a result, are typically done after selection of the preferred alternative and closer to construction.

Appendix F in this FEIR/FEIS presents complete lists of the databases searched and information concerning the governing agencies, the 113 sites identified in the project corridor vicinity, and a map locating all sites. Although the agency lists are updated regularly, there may be contaminated sites that have not yet been identified and therefore are absent from the databases.[1]

The 113 sites were prioritized into four categories based on their potential to affect public health and safety during construction of the Connector. The basis for the category definitions was the San Francisco Bay Regional Water Quality Control Board's (RWQCB) leaking underground storage tank (LUST) site status classifications. The RWQCB assigns each investigated LUST site a status code based on the progress in identifying, assessing, and remediating the release. These status codes were grouped into four categories in order to provide a general assessment of a site's potential to affect the project. The site categories were numbered I through IV in decreasing order of potential significance to the project. Sites from other environmental databases were assigned to the various categories based on an assessment of the potential level of risk associated with each site.

- **Category I** contains sites that were listed in a regulatory database but that lacked specific information as to the reason the sites were listed or the current status of any remedial activities. Category I also includes sites identified in a LUST database with a leak reported, a leak confirmed with laboratory reporting results, a preliminary site assessment workplan submitted, a preliminary site assessment underway, or contamination boundaries being investigated.

- **Category II** contains LUST sites where remedial activities have been identified, scheduled, are underway, or are undergoing periodic monitoring after completion of remediation. This group also includes sites in the Hazardous Waste Information Systems (HAZNET) database that have disposed of contaminated soil or asbestos. These HAZNET sites are a subset of the general HAZNET list that identifies sites that generated hazardous waste.

- **Category III** is composed of sites on the Resource Conservation and Recovery Information System Small and Large Quantity Generator lists and sites on any of the registered underground storage tank (UST) lists that did not identify a tank release.

- **Category IV** sites include LUST and Comprehensive Environmental Response, Compensation, and Liability Information System sites where the lead agency has determined that no further remedial action is necessary, and HAZNET sites that do not meet the Category II criteria.

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[1] The database search report included a map showing the location of all sites identified within the search radius. Several of these sites were mapped incorrectly. The locations have been correctly identified in this report. The original map is included in the appendix.

Based on this priority system, 43 sites were ranked as Category I sites. These sites have the greatest potential for human exposure to hazardous materials. A listing of these sites, including site name, location, distance from the proposed alignment, and other information, is provided in Table 3.14-1. Following is a list of the databases used to rank sites as Category I, in order of decreasing frequency of identification. Figure 3.14-1 presents the location of these sites.

- **LUST**[2] - sites listed by the State Water Resources Control Board, the Integrated Waste Management Board, and the Department of Toxic Substances Control;
- **Cortese**[3] - sites listed by the State Water Resources Control Board, the Integrated Waste Management Board, and the Department of Toxic Substances Control;
- **Facility Index System/Facility Identification Initiative Program Summary Report (FINDS)** – a compilation of sites listed on multiple databases. These other databases may contain more site contamination details;
- **California Hazardous Material Incident Report System (CHMIRS)** – sites for which an accidental release or spill of hazardous materials was reported;
- **Notify 65** – sites that may have had a release that affected drinking water;
- **CAL-SITES** – sites with a potential or confirmed hazardous material release;
- **HAZNET** – sites that were identified as shipping hazardous waste; and
- **Hazardous Materials Information Reporting System (HMIRS)** – sites where hazardous material spill incidents occurred that were reported to the US Department of Transportation.

Electromagnetic Fields

In recent years, there has been scientific study as well as public debate on the health effects of EMF from utility lines and electrical appliances and facilities. Electric and magnetic field strengths drop off with distance from the source. Electric fields are shielded or weakened by

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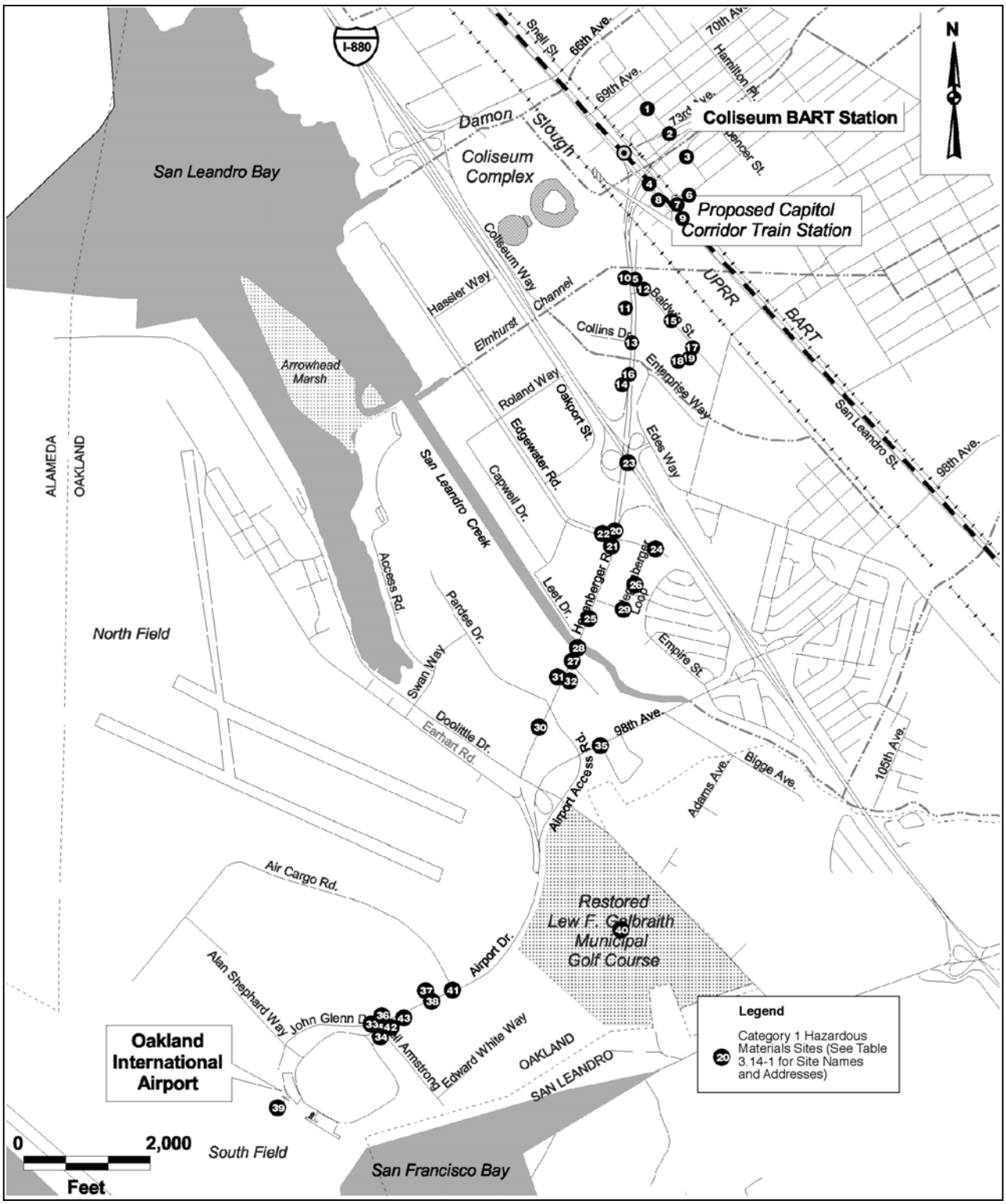
[2] The Leaking Underground Storage Tank (LUST) list is an inventory of reported leaking underground storage tank incidents; maintained by the State Water Resources Control Board.

[3] The Cortese list of hazardous waste sites was established under Cal. Government Code section 65962.5 (referred to as the Cortese Bill). The Cortese list is an inventory of public drinking water wells with detectable levels of contamination; hazardous substance sites selected for remedial action; sites with known toxic material identified through the abandoned site assessment program; sites with USTs having a reportable release; and all solid waste disposal facilities from which there is known migration. This list is maintained by the California Environmental Protection Agency/Office of Emergency Information and is updated annually with sites designated by the State Water Resources Control Board, the Integrated Waste Management Board, and the Department of Toxic Substances Control.

Table 3.14-1
Category I Hazardous Materials Sites

Map ID	*Location Relative to Alignment*	*Distance from Alignment (feet)*	*Site Name*	*Address*	*Basis for Category I Ranking*	*Sites Ranked as Category I Due to Limited Information*
1	North	930	George E Masker Inc.	887 71st Ave.	FINDS	*
2	North	750	George E Masker Inc.	901 73rd Ave.	LUST	*
3	East	790	Damert Co	900 75th Ave.	FINDS	*
4	East	500	Omega Termite Control	807 75th Ave	LUST	
5	--	--	Moose Lodge #324	690 Hegenberger Rd.	LUST	
6	East	860	R&A Trucking/Martinez Trucking	865 77th Ave.	Cortese	*
7	East	570	County Recycling Services Inc.	800 77th Ave	LUST, Cortese	
8	East	500	Chevron Training Center	7616/7617 San Leandro St	LUST, Cortese	
9	East	660	American Brass & Iron	7825 San Leandro St.	LUST	
10	--	--	Environmental Innovations Corp	675 Hegenberger Rd, Suite 110	FINDS	*
11	--	--	Oakland International Trade Center	625-655 Hegenberger Rd	LUST, Cortese	
12	East	500	Golden Gate Truck Center	8200 Baldwin St.	LUST	*
13	--	--	ARCO Products Company	566 Hegenberger Rd	LUST, Cortese	
14	--	--	Caltrans	555 Hegenberger Rd	LUST	
15	East	580	Morris Transportation	8300 Baldwin St.	Notify 65	*
16	--	--	Shell	540 Hegenberger Rd	LUST	
17	East	790	Treescape	660 McClary Ave.	LUST	*
18	East	710	West Coast Wire Rope & Rigging	608 McClary Ave	Notify 65	*
19	East	770	--	616 McClary Ave.	CHMIRS	*
20	--	--	Precision Trucking School	444 Hegenberger Rd	LUST	
21	--	--	Unocal SS #5043	449 Hegenberger Rd	LUST, Cortese	
22	--	--	Chevron SS #91851	451 Hegenberger Rd	LUST	*
23	--	--	--	I880 S/W Hegenberger	CHMIRS	*
24	East	590	Tab Label Co. Inc.	21 Hegenberger Ct.	HAZNET	*
25	--	--	Shell Oil Co.	285 Hegenberger Rd	LUST, Cortese	
26	East	500	Ward Hard Chrome dba Dolsby In	124 Hegenberger Loop	LUST	*
27	--	--	Bldg. K101 Yard	265 Hegenberger Rd	LUST	*
28	--	--	Agricultural Property	250 Hegenberger Rd	LUST	*
29	East	500	W.E.Lyons Construction	50 Hegenberger Loop	LUST	*
30	--	--	TGR Container Sales	20 Hegenberger Rd	FINDS	*
31	--	--	David Property	106/110 Hegenberger Rd.	LUST, Cortese	*
32	--	--	Diablo Cellular	110 Hegenberger Rd	LUST	
33	--	--	Elsinore Aerospace	1 Airport Dr	CHMIRS	*
34	--	--	Hertz Rent-a-Car	1 Airport Dr	LUST, Cortese	
35	East	500	Douglas Airpark	111 98th Ave.	Cortese	*
36	--	--	National Car Rental	100 Airport Drive	LUST	
37	--	--	Port of Oakland, Hangar 6	1100 Airport Dr	LUST, Cortese	*
38	--	--	United Airlines Maintenance	1100 Airport Dr., Hangar 110	LUST, FINDS	
39	--	--	Oakland International Airport	Doolittle & Airport	Cal-Sites	*
40	East	870	Former Lew Galbraith Golf Course	10505 Doolittle Dr.	LUST	*
41	--	--	Federal Express Corp.	1 Sally Ride Way	HMIRS	*
42	--	--	Chevron	1 Neil Armstrong	LUST	
43	--	--	Shell	1 Neil Armstrong	LUST	

Source: EDR, 1999.



Source: EDR. 1999.

Figure 3.14-1
Category 1 Hazardous Material Sites

materials that conduct electricity, including trees, buildings, and human skin. Magnetic fields, on the other hand, pass through most materials and are therefore more difficult to shield. As a result, recent studies have focused on the possible health effects associated with magnetic fields. Studies have been conducted to prove or disprove the relationship between EMF exposure and numerous forms of cancer, birth defects, mental disorders, and other adverse health conditions, but no direct link has been established. The California Public Utilities Commission (PUC) and the California Department of Health Services have not concluded that exposure to magnetic fields from utility electric facilities is a health hazard. Federal and state agencies have agreed that more research is needed (PG&E, 1999).

Existing potential sources of EMF include background levels in nature, high voltage electric power lines, and high voltage transformers. Section 3.7, Utilities, presents a summary of electric transmission lines and facilities located within the study area.

Applicable Policies and Regulations

Hazardous Materials

Hazardous materials users are required to comply with numerous safeguards established by local, state and federal laws and regulations. These provisions include the following:

- Reporting and planning requirements in accordance with the Emergency Planning and Community Right-To-Know Act of 1986.
- Emergency response planning provisions, including the development of a business emergency plan (BEP) in accordance with the Waters Bill (California). For the Connector, the local administering agency for BEPs is the Oakland Fire Services Agency (OFSA). The OFSA refers to the BEP as a Hazardous Materials Business Plan (HMBP).
- Compliance with worker safety and health standards established under the federal Occupational Safety and Health Act of 1970 and the California Occupational Safety and Health Act.
- Tracking and record keeping provisions pertaining to the generation, transportation, treatment, storage and disposal of hazardous waste in accordance with the federal Resource Conservation and Recovery Act (RCRA), the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, and the California Hazardous Waste Control Law (HWCL). The City of Oakland regulates BART's local hazardous waste generation.
- Compliance with all UST regulations, including the national UST regulatory program, commonly referred to as Subtitle I of RCRA, and a state program, the State UST Law. The City of Oakland is responsible for enforcement of UST regulations in the Connector study area. The Alameda County Department of Environmental Health Services oversees LUST sites once they are transferred to the Local Oversight Program by the City of Oakland.

BART has developed emergency procedures for dealing with system failures in its regular operations (BART, 2001). The Connector operations will be required to comply with and follow the procedures identified in this system-wide plan.

BART operates a quarterly hazardous waste disposal program through the Environmental Compliance Division in the System Safety Department. Hazardous and non-hazardous wastes at every BART service location are packaged according to US Environmental Protection Agency guidelines and disposed of by a licensed contractor at approved disposal facilities. Copies of the hazardous waste manifests are kept on file at BART. The Environmental Compliance Division also manages BART's Storm Water Pollution Prevention Plan program, prepares HMBPs for every station, and conducts an annual environmental compliance audit program. The HMBPs include a complete inventory of all hazardous materials used and stored at the site, hazardous waste generated and any treatment systems present, USTs or aboveground storage tanks at the site, emergency response plans and procedures, and a program of employee training for hazardous materials releases. BART currently implements a waste minimization and waste recycling program, thereby reducing the amount of waste generated and transported to disposal facilities. BART complies with aboveground storage tank and UST regulations regarding permitting, secondary containment, and monitoring systems. The roles of these BART departments could vary for the Connector. The operator of the Connector will be required to comply with the above regulations.

Electromagnetic Fields

There are no health-based standards for long-term human exposure to EMF in the United States. Federal and state agencies have reviewed past studies to determine if exposure to EMF triggers adverse health effects, and have found no basis for setting health standards to date (PG&E, 1999). Some states and local authorities have passed laws and ordinances limiting EMF exposure by establishing minimum distances between development and electrical systems of specific voltage. The distances and voltages varied by jurisdiction (FTA, 1996). In 1993, the PUC issued Decision 93-11-013 that established certain steps to address EMF. After an investigation to determine the Commission's role in mitigating health effects, if any, of EMF created by electric utility power lines and by cellular radiotelephone facilities, the PUC developed the measures to reduce EMF levels, develop design guidelines, create EMF measurement programs, facilitate stakeholder and public involvement, and begin educational and research programs (PUC, 1993).

3.14.3 Impact Assessment and Mitigation Measures

Standards of Significance

According to CEQA standards (Appendix G), a project would be considered to have a significant adverse impact on the environment if it would:

- Create a potential public or environmental health hazard through the routine transport, use, or disposal of hazardous materials;
- Emit hazardous emissions, or handle hazardous materials or waste within one-quarter mile of an existing or proposed school;
- Present an undue potential risk for health-related accidents;

- Result in a safety hazard for people residing or working in the project area;
- Be located on a site which is included on a list of hazardous materials sites and, as a result, create a significant hazard to the public or the environment.

The scientific community has not reached consensus on the potential health effects from exposure to EMF. Therefore, it is inappropriate to determine criteria for evaluating the significance of the potential impact from EMF to this project. In Section 15145, the CEQA Guidelines indicate that if an impact is too speculative for evaluation, the agency should note its findings and conclude discussion of the impact.

Preferred Alternative Environmental Analysis

Impact HM-1. Exposure to hazardous materials from operational activities

Operation of the preferred alternative would not involve transport, use or disposal of hazardous materials that would create a potentially significant hazard to the public or the environment. The AGT maintenance facility would potentially use, store, and handle hazardous materials and hazardous waste, including the loading, storage, and handling of diesel fuel for a diesel-powered AGT system. Wastes that may typically be generated at these service locations would include tires (for the diesel and possibly other AGT systems), batteries, oil-containing liquids or solids (such as oil and fuel filters), and solvents. Assuming that the AGT would use a similar vehicle washing system as the existing BART system, exterior vehicle cleaning would not generate hazardous waste. Currently, BART's cleaning compound is a non-regulated monosodium phosphate cleaner with surfactants (BART, 2000).

Overall, some of the materials described above are potentially hazardous, but do not pose a significant public health and safety risk because of the limited volumes and concentrations required and because BART will require the Connector operator to meet all legal requirements for handling and disposal practices. (LTS)

Median Option. Substitution of the Median Option for the segment of alignment between Elmhurst Channel and Coliseum Way would have no effect on any of the preceding analyses. (NI)

Please see Section 3.16, Construction Impacts, for a discussion of the impacts from exposure to contamination during construction activities.

Partial ADP Scenario

Under the Partial ADP scenario, hazardous materials effects of the Connector would be the same as described above under the Preferred Alternative Environmental Analysis. The difference between these two scenarios primarily concerns the consolidation and enlargement of the terminals, the construction of a parking garage, and roadway improvements. The construction of any of those elements has no effect on the Connector's impacts regarding hazardous materials. In other segments of the Connector route, the ADP and Partial ADP scenarios are identical, so that hazardous material effects in these areas are identical.

Consequently, the effects of the preferred alternative are the same under the Partial ADP as they are under the full ADP.

Cumulative Analysis

Many aspects of hazardous materials use and hazardous waste generation are site-specific in nature and are not subject to cumulative effects, including exposure of construction workers to contaminated substances, in the work place or during construction. Potential effects that may be exacerbated due to cumulative conditions include hazardous materials transportation and hazardous waste generation. However, the Connector system would generate waste proportional to the increase from regular BART operations.

Cumulative development in the vicinity of the project planning area, including the development of the eight project sites under construction or anticipated to be occupied by 2005, would result in increased use of hazardous materials such as solvents and waste oils. This would result in increased transportation of hazardous materials and hazardous wastes on public roadways. The likelihood of an accident involving hazardous materials or wastes would also increase, resulting in a greater likelihood that people and the environment would be exposed to these substances. Compliance with regulations regarding proper packaging and handling, coupled with employee training and emergency response, will reduce potential Connector impacts associated with increased ground transport of hazardous materials/wastes to a level that does not contribute to cumulatively considerable impacts.

Cumulative increases in the use of hazardous materials may add to the generation of hazardous wastes, therefore increasing the burden on off-site treatment, recycling, and disposal facilities. However, businesses that use hazardous materials are subject to requirements to minimize their use and the generation of hazardous waste. All the businesses planned for operation by 2005 that would produce hazardous waste during their operations will be subject to these regulations. On a cumulative basis, compliance with these regulations will result in less hazardous waste produced by these facilities. Potential cumulative impacts associated with increased hazardous waste generation would thus be less than significant for the preferred alternative.

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Section 3.15
Environmental Justice

3.15.1 Introduction

This section addresses Executive Order No.12898 of February 11, 1994, ("Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations"). The order provides, in pertinent part:

> To the greatest extent practicable and permitted by law ...each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies and activities on minority populations and low-income populations.... (Subsection 1-101).
>
> Each Federal agency shall conduct its programs, policies, and activities that substantially affect human health or the environment, in a manner that ensures that such programs, policies, and activities do not have the effect of excluding persons (including populations) from participation in, denying persons (including populations) the benefits of, or subjecting persons (including populations) to discrimination under, such programs, policies, and activities, because of their race, color, or national origin. (Subsection 2-2).
>
> Each Federal agency shall work to ensure that public documents, notices, and hearings relating to human health or the environment are concise, understandable, and readily accessible to the public. [Subsection 5-5(c)].

A Presidential Memorandum that accompanied the executive order emphasized that the order was "intended to promote nondiscrimination in Federal programs substantially affecting human health and the environment, and to provide minority communities and low-income communities access to public information on, and an opportunity for public participation in, matters relating to human health or the environment." (Weekly Compilation of Presidential Documents at 279, February 11, 1994). It also underscored the application of certain provisions of existing law, such as NEPA. Specifically, the memorandum notes that a NEPA analysis must include "effects on minority communities and low-income communities." and that mitigation measures "should address significant and adverse environmental effects of proposed Federal actions on minority communities and low-income communities." (Subsection 5-5c). In addition, "[e]ach Federal agency shall provide opportunities for community input in the NEPA process, including identifying potential effects and mitigation measures in consultation with affected communities and improving the accessibility of meetings, crucial documents and notices." (Subsection 5-5c).

Thus, the memorandum encourages wherever possible the use of existing requirements and procedures to accomplish the goals of the executive order. Accordingly, this section uses the NEPA/CEQA framework to assess whether the preferred alternative meets the goals and requirements of the order and memorandum. This section first discusses whether the preferred alternative meets community participation goals and then analyzes impacts on minority and low-income communities.

Community Participation

A public scoping meeting was held in November 1999 for this FEIR/FEIS to solicit recent public ideas about the scope of the environmental analysis. The open house and scoping meeting were publicized through a mailer sent to over 400 property owners, residents, business owners, special interest groups, public agencies, and other interested parties, inviting them to attend the meeting. The study area includes minority and low-income communities such as the residential area north of the Coliseum BART Station. A press release was sent to five area newspapers, including the Oakland Tribune, the Valley Times (Pleasanton), the Tri-Valley Herald (Pleasanton), the Argus (Fremont), and the San Francisco Chronicle. Two of these newspapers are readily available in minority and low-income communities near the project area.

Thirty-four people attended the meeting. Written comments were accepted throughout the meeting. The open house was followed by a more formal comment forum that was facilitated by a moderator. A court reporter was provided to record verbal comments during the comment forum. A Public Scoping Open House Summary Report was prepared which included all verbal and written comments received. All written and verbal comments were addressed as the scope of the environmental analysis was established.

In addition, written comments on the DEIR/DEIS were accepted during the 45-day public comment period. Thirty-one agencies, organization, and individuals submitted written comments on the DEIR/DEIS. A public hearing was also held during the comment period. A court reporter was provided to record verbal comments during the public hearing. Six people testified. The responses to all of the comments received on the DEIR/DEIS are provided in Volume II of this FEIR/FEIS.

3.15.2 Environmental Conditions

As discussed in Section 3.2, Land Use, and Section 3.3, Socioeconomics, there are no residential neighborhoods along the project corridor[1]. There are only two residential neighborhoods within the project study area[2]: the residential neighborhood north of the Coliseum BART station (hereafter referred to as North of BART) and the Columbian Garden residential neighborhood east of Hegenberger Loop (see Figure 3.2-1). As a result, the Environmental Justice analysis focuses on these neighborhoods. A description of the ethnicity and income levels of the residents of these two neighborhoods is presented below. Census Tracts are the smallest geographic unit for which population data is available for ethnicity and income levels. For the North of BART neighborhood, the data provided is a combination of Census Tracts 4088

[1] The project corridor runs from the Coliseum BART Station along San Leandro Street, then south along Hegenberger Road, and finally along Airport Drive to the OIA.

[2] The project study area is within ½ mile of the project corridor.

and 4089, as the neighborhood lies within both tracts. The Columbian Garden neighborhood lies entirely within Census Tract 4090.

Ethnicity

Based on ethnicity data presented in Table 3.15-1, the residents of the North of BART and Columbian Gardens neighborhoods would be considered Environmental Justice populations. Minority persons make up more than 50 percent of the population of these neighborhoods. The percentage of minority persons within these neighborhoods is also more than 10 percentage points higher than the minority population of both the City of Oakland and Alameda County.

Table 3.15-1
Ethnicity

	Alameda County	***City of Oakland***	***North of BART neighborhood***	***Columbian Gardens neighborhood***
Population	1,279,182	372,242	7,561	3,114
Race				
White (%)	580,010 (45.3)	105,203 (28.3)	151 (2.0)	95 (3.1)
Black (%)	229,249 (17.9)	159,465 (42.8)	5,521 (73.0)	2,687 (86.3)
Hispanic (%)	181,805 (14.2)	51,711 (13.9)	1,156 (15.3)	237 (7.6)
Asian/Pacific Islander (%)	192,554 (15.1)	53,025 (14.2)	721 (9.5)	80 (2.6)
American Indian, Eskimo, Aleut (%)	8,894 (0.7)	1,807 (0.5)	9 (0.1)	10 (0.3)
Other (%)	86,670 (6.8)	1,031 (0.3)	23 (0.3)	5 (0.2)

Source: 1990 US Census Information

Income Levels

Based on a comparison of income levels, the residents of the North of BART and Columbian Gardens neighborhoods would be considered Environmental Justice populations. While the percentage of persons living in poverty within these neighborhoods is less than 50 percent (33.6% in North of BART and 25.1% in Columbia Gardens), the percentages are more than 10 points higher than for Alameda County, which is 10.3%. For the North of BART neighborhood, the percentage of persons living in poverty is also more than 10 points higher than for the City of Oakland (18.8%), while the Columbia Gardens neighborhood is approximately 8% higher than the City of Oakland. Table 3.15-2 presents poverty information from 1990.

Table 3.15-2
Income Level

	Alameda County	***City of Oakland***	***North of BART neighborhood***	***Columbian Gardens neighborhood***
Population	1,279,182	372,242	7,561	3,114
Percentage of persons below poverty level	10.3%	18.8%	33.6 %	25.1%

Source: 1990 US Census Information

Mean household income from 1990 to 2020 is projected to grow at a similar rate in both the neighborhoods within the study area, and the City of Oakland and Alameda County. As a

result, the existing disparity in income will continue such that in 2020 the mean household income in the neighborhoods within the study area is expected to still be less than 50 percent of Alameda County's and 60 percent of the City of Oakland's. Table 3.15-3 presents mean household income projections.

Table 3.15-3
Estimated Income Levels, 1990-2020

	1990 Mean Household Income (1995$)	***2000 (% increase since 1990)***	***2010 (% increase since 1990)***	***2020 (% increase since 1990)***
Alameda County	$57,200	$66,800 (16.8%)	$76,400 (33.6%)	$82,300 (43.9%)
City of Oakland	$46,100	$54,000 (17.1%)	$62,300 (35.1%)	$67,100 (45.6%)
North of BART neighborhood	$24,102	$27,134 (12.6%)	$31,799 (31.9%)	$33,678 (39.7%)
Columbian Gardens neighborhood	$31,623	$32,600 (3.1%)	$37,000 (17.0%)	$40,400 (27.8%)

Source: ABAG Projections 2000.

3.15.3 Impact Assessment and Mitigation Measures

Approach, Methodology, and Standards of Significance

The methodology used in this FEIR/FEIS for the analysis of Environmental Justice impacts is based on guidance provided by the EPA, CEQ and FHWA [3]. These agencies have developed guidance documents for conducting Environmental Justice analysis as part of the NEPA compliance process. The guidance documents also provide definitions of minority and low-income populations as well as general methods for evaluating whether disproportionately high and adverse environmental effects would occur on these populations.

To determine if the preferred alternative would result in impacts on racial minorities and low-income populations, a five-step method was used. Steps 1-4 determine the characteristics of the affected population. Step 5 determines the significance criteria utilized to determine if the affected populations would be disproportionately affected. The five steps are as follows:

1) *Identify Potential Effects* – As required by NEPA and CEQA, a broad range of project-related potential environmental and human health effects have been evaluated. These include effects on transportation, land use, socioeconomics, visual quality, cultural resources,

[3]

- U.S. Environmental Protection Agency, "Interim Final Guidance for Incorporating Environmental Justice Concerns in EPA's NEPA Compliance Analysis, Office of Federal Activities," September 30, 1997.
- Federal Highway Administration, "Interim Guidance: Addressing Environmental Justice in the Environmental Assessment (EA)/Environmental Impact Statement (EIS)" March 2, 1999.
- Council on Environmental Quality Environmental Justice, Guidance under the National Environmental Policy Act, December 1997

community services, utilities, geology, soils, seismicity, hydrology and water quality, biological resources, noise and vibration, air quality, energy, and hazardous materials. The discussion of potential impacts to these topic areas is discussion in Sections 3.1 through 3.14 of this document.

2) *Determine the Affected Geographic Area* – For most environmental topic areas, the geographic area affected by the project includes those uses directly along the project corridor. For land use and socioeconomics, the geographic area affected by the project includes those uses within one-half mile of the project corridor. The potential for the project to affect the surrounding residential communities is discussed in Sections 3.1 through 3.14 of this document.

3) *Determine the Demographic Characteristics of the Affected Geographic Area* – For the affected geographic areas, the demographic characteristics were determined. These demographic characteristics include:

   - Total population
   - Percent of racial minority status[4] in the affected area[5]
   - Percent of population of low-income status[6] in the affected area
   - Percent of population of racial minority status in the City of Oakland and Alameda County
   - Percent of population of low-income status in the City of Oakland and Alameda County

   The discussion of demographic characteristics of potentially affected demographic areas is discussed in the Environmental Setting portion of this Section.

4) *Determine if the Affected Populations Include Environmental Justice Communities* – The affected populations are those populations within the affected geographic area. The following criteria were utilized to determine if the affected community is an environmental justice community:

   - At least one-half of the population is of racial minority status

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[4] For this project, a racial minority person is defined as someone who is Black (non-Hispanic), Hispanic, Asian/Pacific Islander, American Indian/Eskimo/Aleut, or other non-White persons.

[5] This analysis utilizes combined data for the census tracts that encompass the project corridor (4088, 4089, and 4090). Data for the census tract (4090) is specifically called out, as it encompasses over 90 percent of the project corridor.

[6] For this project, low-income is defined as a person whose household income is below U.S. Department of Health and Human Services poverty guidelines. Poverty thresholds vary by family size. In 1989 the poverty income threshold in the United States was $12,674 for a family of four. Although more recent guidelines have been issued, the 1990 census provides the most recent statistical information of income in the project area. The U.S. Bureau of the Census will issue new data following the 2000 census.

- At least one-half the population is of low-income status
- The percentage of the population that is of racial minority status is at least 10 percentage points higher than for the City of Oakland or Alameda County.
- The percentage of the population that is of low-income status is at least 10 percentage points higher than for the City of Oakland or Alameda County.

Meeting any of the criteria listed above would qualify the community as an Environmental Justice community. As discussed in the Environmental Conditions portion of this Section, the two residential communities in the vicinity of the project corridor are Environmental Justice Communities.

5) *Determine Whether the Significant Unavoidable Effects of the Project Would Disproportionately Affect Environmental Justice Communities* – A significant impact would occur if a project-related impact would have a disproportionate effect on Environmental Justice populations. A disproportionate effect is defined as an effect that is predominantly borne, more severe, or of a greater magnitude in areas with environmental justice populations than in other areas.

Preferred Alternative Environmental Analysis

Impact EJ-1. Environmental justice

Operation of the preferred alternative would not affect either the North of BART or Columbian Gardens residential areas. Both of these communities are physically separated from the corridor in which both alternatives would operate. Intervening land uses between the North of BART and Columbian Gardens communities, mostly commercial and industrial uses, would act as effective buffers between the Connector operations and residents of these communities. The intervening land uses would provide an effective shield from potential operational effects such as increased noise, visual disruption, or any other operations-related effect. As a result, neither the North of BART nor Columbian Gardens communities would experience an adverse effect from operation of the preferred alternative. (NI)

Median Option. Substitution of the Median Option for the segment of alignment between Elmhurst Channel and Coliseum Way would have no effect on any of the preceding analyses. (NI)

Partial ADP

The ADP affects the OIA and roadways serving the OIA. The proposed ADP improvements do not encroach upon, sever, or create significant adverse impacts for either of the environmental justice communities in the project study area, the North of BART and the Columbian Gardens residential areas. Likewise, the Partial ADP Scenario which eliminates some of the proposed ADP improvements would have no effect on these environmental justice communities.

Cumulative Analysis

Since the preferred alternative would not have any affect on environmental justice communities, they would not contribute to potential cumulative effects resulting from other

foreseeable development projects in the Connector project corridor. As a result, there would be no cumulative effects with the preferred alternative relative to environmental justice.

Section 3.16
Construction Impacts

3.16.1 Introduction

This section provides a discussion of various aspects of the construction process for the preferred alternative and the Median Option. Following the presentation of the construction techniques, schedules, and activities, this section assesses potential construction-related impacts and identifies mitigation measures as necessary. The construction impacts are organized into the same topics and presented in the same order as the preceding Sections 3.1 through 3.15.

3.16.2 Construction Scenarios

Proposed Alignment

The alignment for the AGT includes aerial, tunnel, at-grade, and below-grade segments along the 3.3-mile route. Table 3.16-1 presents the estimated lengths of the various segments.

Table 3.16-1
Estimated AGT Guideway Lengths and Construction Corridor Widths

Alignment Segment	*Length (feet)*	*Construction Corridor Width (feet)*
Aerial	13,820	50 – 75(1)
Tunnel	430	35
Retained Open Cut (below grade)	850	60
At-grade	2,300	65
Total Alignment length	17,400 feet (approx. 3.3 miles)	

Source: Lea+Elliott, 2000
Notes:
(1) Construction Corridor width is 50 feet for aerial segments within the Hegenberger median and 75 feet for the segments outside of the median.

Aerial Guideway Construction

For the purposes of this environmental analysis, it has been assumed that the aerial segments of the guideway would be constructed of precast concrete (or possibly steel[1]) girders placed on cast-in-place concrete columns. The concept for guideway construction is to place guideway support columns at 60, 100, or 160-foot intervals to the maximum extent possible. This technique would allow most precast girders to be manufactured to uniform lengths and thus promote construction efficiency. Some special length girders would be necessary given the existing infrastructure and utilities in the project corridor. Guideway construction would take

[1] The project will be a Design-Build project. To foster cost competitiveness, Connector specifications will allow bidders flexibility to provide final design of the guideway and vehicles. The final construction details may vary from this construction scenario. However, for purposes of evaluating environmental impacts, worst-case assumptions are used in this analysis.

place in four phases: 1) construct column foundations, 2) construct poured-in-place columns, 3) lift and connect horizontal guideway sections into place atop the columns, and 4) form and pour top deck.

Each vertical support column would be supported by a reinforced concrete foundation shaft approximately 10 feet in diameter and 60 to 80 feet deep, depending on guideway characteristics and geotechnical conditions. Using cast-in-drilled-hole (CIDH) technology, a circumferential ring of cement-improved soil with an outside diameter of approximately 14 feet would be constructed to the full depth of the foundation. The interior soil would then be removed by auger boring or with a water-jet boring machine, which would create a slurry mix that could be pumped from the hole. Each foundation would yield approximately 650 cubic yards of spoils, which would have to be trucked away and disposed of. Due to the mix of commercial and industrial uses along the Hegenberger Road Corridor, the excavated material at some of the foundation locations may be contaminated with hazardous materials. Thus, testing of excavated materials would be required, and remediation may be necessary. Using water-jet foundation technology could be more effective if hazardous materials are encountered, because water jetted soil is converted into a slurry in situ that is pumped directly into tank trucks and disposed off site. Therefore, there would be no human exposure to raw soil that could be spilled during loading, or converted to wind-born dust.

Guideway support columns would be approximately 5 to 7 feet in diameter, 15.5 to 20 feet tall, and constructed of cast-in-place concrete. The horizontal guideway spans would consist of dual precast concrete box girders approximately 26 feet in overall width. The depth of the span would vary, but would be approximately 4.5 feet. Horizontal guideway sections would be fabricated at an off-site location and transported to the alignment by truck. The length and width of precast concrete spans would meet Caltrans and City of Oakland parameters for highway transportation using standard permits. Once on site, the guideway sections would be hoisted by crane from the transport trucks into place atop the columns and connected.

Pile Driving. Pile driving would be avoided wherever possible, and is not anticipated in alignment segments between the Coliseum BART Station and Doolittle Drive. Due to the occurrence of hydraulically placed sand fill south of Doolittle Drive, pile driving would be required for the elevated guideway between Doolittle Drive and the airport terminal. These soil conditions create the potential for liquefaction during an earthquake. An approximate 32-foot square excavation would be required to create a reinforced concrete pile cap at each column location. Approximately 300 cubic yards of excavation and off-site haul would be required per pile cap. Although CIDH technology is the preferred construction method north of Doolittle Drive, unanticipated soil conditions or other circumstances may require pile driving between Doolittle Drive and the Coliseum BART station.

Restricted Airspace. The restricted airspace that protects the North Field runways from obstacles to air navigation would require pile driving techniques that do not extend vertically into the obstacle free zone prescribed by Federal Aviation Regulations, Part 77. The obstacle free zone is determined by the flight path of aircraft using the North Field runways, and restricts the height of construction in the vicinity of the runways. Use of segmented piles would provide a lower vertical clearance but would increase the duration of construction.

Technologically advanced alternatives to traditional driven piles, such as screw piles, also may be applicable. It may be necessary to coordinate with the FAA and the OIA for a temporary closure of the North Field runways (during periods of low aviation activity) during portions of construction.

Union Pacific Railroad Tracks. Construction around and over the Union Pacific Railroad right-of-way would require coordination with daily railroad operations. Compliance with Union Pacific Railroad criteria and applicable California Public Utilities Commission regulations would be necessary.

Interstate 880. Currently, the AGT Connector alignment assumes that Caltrans would allow a guideway support column in the median immediately west of the Hegenberger Road bridge over I-880. Guideway spans of 160 feet over I-880 connecting to a median column appear to be technically feasible. No special construction techniques would be required. No pile driving would be required, and conventional augering or water jet excavation could be used to construct a reinforced concrete shaft foundation.

Wetlands. The preferred alternative would entail construction of the AGT guideway over a portion of potentially jurisdictional wetlands (tidal creeks and drainages) located along Arroyo Viejo Creek, Elmhurst Channel, San Leandro Creek, and two unnamed drainages immediately north of I-880. Current column placement design allows these creeks and drainages to be spanned by the aerial guideway with no disturbance by columns. Within the OIA property, all jurisdictional wetlands that could be temporarily disturbed by the AGT construction corridor are already covered by the Corps permit issued to the Port of Oakland for its ADP. Accordingly, the Connector construction would not be expected to affect wetlands at OIA.

Construction Corridor. Construction of columns and guideway in the median of Hegenberger Road could be accomplished by closing the lanes immediately adjacent to the median (two centermost lanes, one in each direction). These lanes would be closed for approximately 2,800 feet between Pardee Drive and Edgewater Drive. Active coordination with utility providers would be undertaken during preliminary engineering, design and construction to ensure safety in all aspects of the AGT design, construction and operation. Some street reconstruction and utility rerouting would be necessary and would be done with minimal disruption to traffic and commercial activities in accordance with City of Oakland standards. Lane closures for the portion of the alignment along the west side of Hegenberger Road from the Hegenberger Road/San Leandro Street on-ramp to South Coliseum Way would not be necessary to the same degree as median construction, and median reconstruction at left turn lanes would not be required. In aerial segments where space is not at a premium, as it is in the roadway, a wider construction area of 75 feet would be desirable.

Equipment Required. Equipment required for the aerial construction would include drilling rigs, possibly specialized water jet excavators, trucks to remove the excavated soil, transit mix concrete trucks and concrete pumps, specialized truck trailers to deliver the guideway precast concrete spans, cranes, trucks to deliver forms, reinforcing steel, pavement saws, backhoes for utility relocation, precast concrete post tensioning jacks and related equipment, and miscellaneous power hand tools. During installation of AGT operating system equipment,

cranes and materials delivery trucks would be used along the guideway, and some brief roadway lane closures would be required. Most work would take place on top of the aerial guideway. Small tools and construction equipment would move along the guideway as installation took place.

Tunnel Construction
The alignment would follow the median of Hegenberger Road, cross over 98th Avenue (which is partially below grade) on an aerial guideway, and under Doolittle Drive in a tunnel.

The actual tunnel would be under the Doolittle Drive/Airport Drive intersection and would be approximately 430 feet long: 215 feet of cut-and-cover construction and 215 feet of tunneling construction. Cut-and-cover construction would approach Doolittle Drive from both sides. Then pits would be excavated on both sides adjacent to Doolittle Drive, and headers would be driven horizontally beneath Doolittle Drive from both sides of the street to support the roadway. Vertical supports would be installed and the below-grade portion of the alignment tunneled. The tunnel would require approximately 12,000 cubic yards of excavation. No piles or deep foundations would be needed. Tunneling would require coordination with the Port of Oakland, Caltrans and with the appropriate utility providers to minimize disruption to utility services in the area. Duration of the below-grade construction would be approximately six months. By tunneling beneath Doolittle Drive, roadway detours are not anticipated, and traffic impacts should be minimal.

Construction Corridor. To maintain a minimal construction corridor, temporary sheet piles could be driven to form a perimeter around the retained cut transitions at each end of the tunnel and excavation/construction kept within a 35-foot wide corridor. This 35-foot corridor would encroach into the Lew F. Galbraith Golf Course to the east and Airport Drive to the west. Coordination with the City of Oakland, OIA, and golf course operator is necessary to ensure golf course operation is not affected. In addition, coordination with the OIA would be necessary to minimize impacts to traffic traveling to and from OIA. In order to comply with BART's construction noise specifications, sheet pile driving would be restricted to daylight hours given the proximity of sensitive noise receptors.

Equipment. In addition to the equipment for guideway placement discussed above, construction at the Doolittle interchange would require sheet pile drivers, specialized horizontal header drivers and jacks, excavators including backhoes and front end loaders, and additional trucks to remove spoils and deliver concrete.

At-Grade Construction
From south of the retained cut segment to approximately 400 feet north of Air Cargo Road, the Connector guideway would be constructed at-grade. The at-grade guideway would be slab-on-grade (cast-in-place reinforced concrete) construction, supported by piles at approximate 30-foot intervals. Cement-modified soil improvement also may be required along this segment of the alignment to provide sufficient support or possibly may be used in lieu of piles.

Construction Corridor. At-grade construction would require a 35-foot-wide corridor, plus an additional construction easement approximately 30 feet in width, for a total of 65 feet.

Equipment. All the equipment necessary for elevated guideway construction except foundation drilling rigs also would be necessary for at-grade construction. In addition, bulldozers or graders would be required for subgrade preparation below the guideway slab.

Station Construction

Coliseum AGT Station. The AGT station at the Coliseum BART Station would be located on the south side of San Leandro Street adjacent to the west side of Hegenberger Road and would span San Leandro Street to connect to the east end of the existing BART platform. The AGT station structure would be of steel or concrete frame construction. The building footprint would be approximately 55 feet by 160 feet. The span over San Leandro Street would be approximately 64 feet long by 55 feet wide. Drilling would be required for cast-in-place reinforced concrete foundations, but no significant excavation is planned. Prefabricated spans would be hoisted into place over San Leandro Street and would require a one-time, temporary closure of the street, which could most likely be done at night when traffic impacts would be minimal. Construction of the stairs, escalator and elevator between the AGT platform and the BART platform would be closely coordinated with BART operations to ensure safety and minimum passenger service inconvenience. Construction contract documents would specify working conditions and constraints to achieve these objectives.

Maintenance Facility. A maintenance and central control facility for the AGT would be constructed in the parking lot at the Coliseum BART Station. This 105-foot-wide by 210-foot-long structure would be three stories high and supported by a reinforced concrete frame or steel structure. CIDH pile foundations would be constructed to support the structure. A traction power distribution substation and freight elevator would be located on the ground floor of the maintenance facility. A primary power feeder conduit duct bank serving the substation would be located in an excavated trench. Underground water, sewer, and communications connections would be constructed. A pit for elevator equipment may be required as well. No other significant excavation is planned. Construction would require removal of some existing parking spaces and establishing a temporary work zone around the building footprint. The maintenance facility would require the permanent removal of approximately 75 parking spaces, and the construction staging area around the facility would require the temporary removal of approximately 90 additional parking spaces.

Intermediate Stops. Intermediate AGT stations would be located west of Hegenberger Road at Edgewater Drive and on the parcel bounded by Hegenberger Road, Airport Access Road, and 98th Avenue. Intermediate stations have not been designed, but a station footprint would be assumed to be approximately 55 feet wide by 245 feet long. Construction impacts generally would be confined to the station site itself and a contiguous construction easement and would not require construction within the roadway.

The intermediate stops would lengthen the construction phase somewhat, if the stations were constructed simultaneously with other portions of the AGT system; or as a design option, the stations could be constructed at a later date.

Airport AGT Station. The AGT alignment in the airport area would approach the terminal on an elevated guideway. The guideway would connect to an elevated AGT station in the parking

structure next to the moving walkway connecting the parking structure to the terminal entrance. Ideally, construction of the AGT station would take place in conjunction with the Port of Oakland's ADP. It is possible, however, that the terminal area improvements would be constructed earlier or later around the AGT guideway and station. The AGT station footprint would be approximately 55 feet wide feet by 230 feet long. It would be supported by its own steel or reinforced concrete frame structure that would be seismically isolated from the parking structure and frontage roadways.

Staging Areas. Three areas for construction staging and one off-site area for guideway fabrication are planned. The first construction staging area could be located under the roadway bridge at Hegenberger Road/San Leandro Street. This approximately 0.75-acre site would serve both the Coliseum AGT Station and northern portions of the alignment. The second staging area would be in the vicinity of Doolittle Drive and would serve the southern portion of the alignment. It could possibly be the parcel bounded by Hegenberger Road, Airport Drive, and 98th Avenue (and is also a potential intermediate station site). A third location, a minimum of 2 acres in size, would be required near, but not necessarily along, the AGT alignment. This larger site would include contractor and BART field offices located in temporary, portable buildings as well as space for equipment and materials storage. These staging locations would be used only during construction and would be available for other uses following completion of construction.

Construction Sequence and Duration

Construction would most likely begin at the Coliseum station and proceed toward the airport terminal. Construction of foundations and columns would be sequential as follows: augering and possibly water jet excavation for foundations, placement of steel reinforced concrete shafts, forming columns and placing reinforcing steel cages, and pouring concrete for the columns. There could be several weeks between these steps of construction. Construction of columns would take place intermittently over the course of one year as specialized construction crews moved along the alignment (excavation crews, ironworkers, form setters, concrete placers).

The activities following column construction would include lifting prefabricated guideway spans into place; post tensioning, and other connection activities; forming, placing reinforcing steel, and pouring the concrete top deck of the guideway; and installing parapet walls. Once these activities occur, almost all remaining construction would take place atop the guideway and not at ground level. Installation of the AGT guideway equipment, electric power distribution, and train control would follow behind the construction of the columns and guideway. The intensity of construction activities would decrease over the period of construction, as construction activity moved from street level to the guideway level.

The overall duration of construction would depend on the number of crews working on the project. Crews could work simultaneously along the elevated, at-grade, and tunnel portions of the alignment. Actual ground level construction probably would take approximately two years followed by a third year of operating system equipment installation and test and acceptance activities.

Other Considerations

Utility Relocation

Any utilities located in the alignment that interfere with column placement would have to be relocated prior to construction of the proposed project. Relocation would be conducted as part of the median expansion and reconstruction.

Maintaining Access to Businesses

Access would be maintained to businesses along the chosen alignment during business hours; although temporary changes to access may be required for certain parcels. Any driveway closures would take place during non-business hours.

3.16.3 Construction Analysis

Short-term impacts related to construction of the preferred alternative are presented below. Unless otherwise noted, the standards of significance identified in Sections 3.1 through 3.14 for operational impacts of the preferred alternative also apply for the construction period.

Transportation

Standards of Significance

For the purposes of this analysis, the preferred alternative would be considered to have significant transportation impacts during the construction period, if it were to create traffic hazards or create traffic congestion that would stop general traffic flow in the project corridor by more than 40 seconds (equivalent to an intersection Level of Service E), or eliminate vehicular, pedestrian, or bicycle access to adjoining areas.

Impact C-TR-1. Temporary effects on traffic operations

The vehicular traffic associated with the construction (construction vehicles and trips by construction workers) of the AGT would affect the traffic operations at intersections and on street segments where the construction occurs.

As stated in Section 3.16.2, "Construction Scenario" for the AGT, construction of the Coliseum AGT Station would involve hoisting prefabricated spans over San Leandro Street that would require temporary street closure and traffic re-routing. Depending on the time of day of those street closures, the disruption to local traffic circulation could potentially be significant. The AGT station connection to the BART station platform may be able to be constructed at nighttime while BART is not in service. If this were not possible, construction of the AGT station connection to the BART station platform across one set of BART tracks could interfere with BART operations and delay service, as a temporary closure of one set of the tracks may be necessary when structural elements are being placed above the BART tracks. BART has the ability to operate service around this area using a single track, which is often done on evenings and weekends.

Construction of the guideway across I-880 would require temporary nighttime closures of portions of I-880, but by confining the closures to the nighttime hours, the effects on traffic conditions would be less than significant. In addition, some median lane closures would be

necessary to construct the columns to support the guideway in the freeway median. BART would coordinate with Caltrans to ensure that the effects of nighttime lane closures are minimized.

Closure of portions of the two inside lanes along the Hegenberger Road median would be required during construction of the AGT guideway columns. The lane closures could cause significant congestion if the construction activity occurs during peak traffic periods. Where the guideway transitions from the median of Hegenberger to the west side of the roadway the southbound lanes of Hegenberger Road would need to be closed when the overhead guideway is put in place. This closure would be limited to the period of time, which should be 12 hours or less, during which the overhead structural elements of the guideway are lifted into place over the southbound lanes. The median lane closures and the reconstruction of the median to accommodate the guideway columns on Hegenberger Road could interfere with left-turn movements to and from the businesses that front either side of the street.

In addition, construction along the west side of Hegenberger Road between Coliseum Way and Elmhurst Channel could temporarily interfere with access to businesses. The median of the street would not need to be reconstructed in this area, so temporary lane closures in the median would not be necessary, but portions of the shoulder, which is used as a refuge for disabled vehicles, and the curb traffic lane along the west side of the street may need to be closed temporarily. Since this is a no parking zone, no parking spaces would be lost. Closure of the curb/breakdown lane would require the closure of portions of one traffic lane on Hegenberger Road compared to two traffic lanes when construction is in the median. However, the temporary closure of portions of the traffic lane on the west side of the street would substantially interfere with local traffic circulation during peak hours. Depending on the duration of the traffic lane closure and the extent of the closure, the disruption to local traffic circulation could be significant.

The tunnel portion of the alignment planned under Doolittle Drive would be constructed using a technique that would not require closure of the roadway during construction.

The AGT station at the OIA would be constructed as part of the parking structure and terminal projects, which is part of the overall ADP. Construction of the AGT station and guideway at OIA would likely require temporary traffic lane closures. Depending on the duration of the traffic lane closures, the extent of those lane closures, and whether the construction at OIA could occur simultaneously with construction activities related to the ADP, the disruption to local traffic circulation could potentially be significant.

Construction of intermediate stops along the route would have minimal temporary effects on traffic operations. Construction would be confined to the station sites and would not require construction in the roadway. Construction of the intermediate stops may occur at a later date than the remainder of the AGT system. However, if the intermediate stations were constructed simultaneously with the remainder of the AGT system, the construction of the intermediate stations would generate more construction-related traffic (construction vehicles and trips by construction workers) than the AGT. Therefore, the intermediate stops would have a slightly greater effect on traffic operations at intersections and on street segments where the

construction occurs. However, the incremental increase in construction traffic associated with the intermediate stops would be minimal, and the effect on traffic conditions would be less than significant. (PS)

Median Option. In the event engineering design refinements require use of the median instead of the preferred alternative alignment for the portion of Hegenberger Road between Elmhurst Channel and Coliseum Way, the potential temporary effect on traffic conditions between Elmhurst Channel and I-880 would be greater since closure of two lanes of traffic would be required compared to one lane of traffic when construction is on the west of Hegenberger. As with the preferred alternative, depending on the duration of the traffic lane closure and the extent of the closure, the disruption to local traffic circulation could be significant. Mitigation Measures C-TR-1(i), C-TR-1(ii), and C-TR-1(iii) would apply to the Median Option if it is selected for this portion of the alignment. (PS)

Mitigation Measures. The preferred alternative and Median Option could interfere with traffic operations and thus require mitigation measures. The measures below would reduce potentially significant traffic impacts to a less-than-significant level. (LTS)

C-TR-1(i) *Restripe Hegenberger Road.* BART shall restripe Hegenberger Road where the portions of the two inside lanes along the Hegenberger Road median would be closed in order to facilitate construction of the AGT guideway columns to shift the travel lanes outward (toward the curb) and maintain the current number of travel lanes in each direction along Hegenberger Road. Although this measure would mitigate the traffic impacts associated with closing the two travel lanes on either side of the median, it would require the removal of 123 on-street parking along Hegenberger Road, and an additional 25 on-street parking spaces associated with incorporation of the Median Option. The permanent removal of these spaces is discussed in Section 3.1, *TR-4 Parking Impacts.*

C-TR-1(ii) *Develop and Implement a Construction Traffic Management Plan.* BART shall direct the contractor to prepare and implement a construction phasing plan and traffic management plan that defines how traffic operations would be managed and maintained during each phase of construction. The plan shall be developed with the direct participation of BART, the City of Oakland, the Airport, AC Transit, and Caltrans. In addition, the property owners of all businesses adjacent to the construction areas shall be consulted. To the maximum practical extent, the plan shall:

- Plan, schedule, and coordinate construction activities to reduce impacts on AC Transit bus lines and dead-heading times, so that additional buses are not required on any route to maintain on-time performance, and so that larger buses are not required on any route to maintain on-time performance.

- Detail how access will be maintained to individual businesses where construction activities may interfere with ingress and egress. Any driveway closures shall take place during non-business hours.

- Specify predetermined haul routes from staging areas to construction sites and to disposal areas by agreement with the City prior to construction. The routes shall follow streets and highways that provide the safest route and have the least impact on traffic.

- During construction, require the contractor to provide information to the public using signs, press releases, and other media tools of traffic closures, detours or temporary displacement of left-turn lanes.

- Identify a single phone number that property owners and businesses can call for construction scheduling, phasing, and duration information, as well as for complaints. A BART Connector website will contain similar information, and BART will coordinate with the Port so that all construction information will be available to the Port.

- Identify construction activities that must take place during off-peak traffic hours or result in temporary road closures due to concerns regarding traffic safety or traffic congestion. Any road closures will be done at night under ordinary circumstances. If unforeseen circumstances require road closing during the day, the City of Oakland will be consulted.

C-TR-1(iii) *Coordinate with ADP Construction Management Plans for Vehicular Circulation.* BART shall coordinate with the OIA to assure that the traffic management plans coordinate construction of the Airport AGT station with the overall construction of the ADP. If the construction of the ADP does not occur concurrently with the AGT station, then the Construction Traffic Management Plan, prepared under Mitigation Measure C-TR-1(ii), shall also include measures to address construction-related impacts on traffic at OIA.

Impact C-TR-2. Temporary effects on pedestrian and bicycle conditions

Construction of the Coliseum AGT Station may require temporary sidewalk closures on the north side of San Leandro Street in order to allow AGT station construction to occur. The construction may also interfere with pedestrian movements along the south side of San Leandro Street, although there is no sidewalk in this area. A construction staging area is also proposed on the south side of San Leandro Street under the Hegenberger Road overpass. This temporary use may inhibit pedestrian movement on the south side of the street.

Guideway construction in the median of Hegenberger Road may interfere with pedestrian movement across Hegenberger Road through construction zones. These construction activities may also temporarily interfere with bicycle operations in the area. Construction activities at San Leandro Creek may temporarily affect bicycle and pedestrian conditions along San Leandro Creek Trail, as described in Section 5, Section 4(f) Evaluation. If the planned pedestrian/bicycle trail near the golf course is constructed before the AGT guideway, the construction zone for the AGT guideway along the east side of Airport Drive adjacent to the golf course may affect the planned multipurpose pedestrian/bicycle trail in this area.

In addition, guideway construction along the west side of Hegenberger Road between I-880 and Elmhurst Channel would temporarily disrupt pedestrian movement since the sidewalk on this stretch of Hegenberger Road would be closed during construction. Pedestrian access to businesses along the west side of Hegenberger Road could be affected. Pedestrian activity in this area is light, and the businesses that would be affected are community commercial or highway-oriented businesses that depend on vehicular access rather than pedestrian activity. Therefore, the temporary effect on pedestrian access to these businesses would not be considered a significant impact. Bicycle operations in the area could also be impacted due to the temporary closure of the roadway shoulder area and the sidewalk. However, bicycle activity in this area is light, and these effects on bicycle operations would not be considered a significant impact.

Construction of intermediate stops along the route would not significantly affect pedestrian or bicycle operations. Construction would be confined to the station sites, although the sidewalk may be closed during construction. The intermediate stops would not result in any additional construction-related impacts to pedestrian or bicycle activity.

In addition, construction of the Airport station and surrounding facilities could interfere with pedestrian movement in the OIA terminal area. (PS)

Median Option. In the event engineering design refinements require use of the median instead of the preferred alternative alignment for the portion of Hegenberger Road between Elmhurst Channel and Coliseum Way, the potential temporary effect on pedestrian and bicycle conditions between Elmhurst Channel and I-880 would be less than the preferred alternative since construction would be in the median instead over the sidewalk and breakdown lane on the west side of Hegenberger. However, guideway construction in the median of Hegenberger Road may interfere with pedestrian movement across Hegenberger Road through construction zones and may also temporarily interfere with bicycle operation sin the area. These effects are considered to be potentially significant. Mitigation Measures C-TR-2(i) and C-TR-2(ii) would apply to the Median Option if it is selected for this portion of the alignment. (PS)

Mitigation Measures. The preferred alternative and Median Option could interfere with pedestrian and bicycle circulation and thus require mitigation measures. The measures below would reduce potentially significant pedestrian/bicycle impacts to a less-than-significant level. (LTS)

C-TR-2(i) *Construct Temporary Walkways*. Where an existing sidewalk or pedestrian/bicycle path would be closed during construction, BART shall require the contractor to provide a temporary walkway or a clearly marked detour with appropriate markings, barriers, and signs to safely separate pedestrians from vehicular traffic. At no time shall the temporary walkway or detour be located on the west side of Airport Drive. If access to pedestrian/bicycle trails or the continuity of the trails is impacted, a properly signed and marked detour shall be provided.

C-TR-2(ii) *Coordinate with ADP Construction Management Plans for Pedestrian Circulation*. BART shall coordinate with the OIA to ensure that the pedestrian management

plans for the construction of the Airport AGT station is coordinated with the overall construction of the ADP. If the construction of the ADP does not occur concurrently with the AGT station, then BART shall require the Contractor to provide the temporary walkways recommended under Mitigation Measure C-TR-2(i) in consultation with OIA.

Impact C-TR-3. Temporary effects on parking conditions

The AGT station at OIA would be constructed as part of the parking structure and terminal projects, which are components of the overall ADP. Construction of the AGT station and guideway at OIA would temporarily reduce the available parking supply, especially if the AGT were constructed prior to implementation of the ADP.

The construction of the AGT would require the temporary use of private off-street parking from several businesses along the project corridor. These businesses include the Edgewater West Motel property, the General Motors property, and the Chevron Station property. (See the "Socioeconomics" section, below, for further details regarding these properties.) In addition, the temporary use of some off-street private parking areas immediately west of Hegenberger Road would be required for the portion of guideway constructed on the west side of Hegenberger. The temporary removal of this off-street parking could reduce the parking supply below that which is necessary to accommodate the estimated demand.

Based on the expected location of the maintenance facility within the BART parking lot, the maintenance facility would require the permanent removal of approximately 75 BART parking spaces, and the construction staging area around the facility would require the temporary removal of approximately 90 additional parking spaces. The Coliseum BART parking lot is currently about 64 percent occupied on a typical weekday, with more than 360 available spaces. Therefore, the displacement of 165 parking spaces for the construction of the AGT maintenance facility would not reduce the available parking supply below demand. The occupancy of the Coliseum Station parking lot would not likely increase to a level such that the removal of 165 spaces (75 spaces permanently and 90 additional spaces temporarily) would reduce the parking supply below the parking demand prior to completion of construction.

Mitigation measure C-TR-1(i) would require the removal of 123 parking spaces along Hegenberger Road. These spaces would be removed permanently by the AGT as described in Section 3.1, *TR-4 Parking Impacts*. The permanent removal of these spaces was determined to be less than significant, as the small number of vehicles displaced from Hegenberger Road could be accommodated on other nearby streets. The displaced vehicles could also be accommodated on other nearby streets during construction of the AGT system, and therefore the temporary effect on on-street parking conditions would be less than significant. In addition, the construction of the AGT guideway on the west side of Hegenberger Road would be constructed in the shoulder[1], and would not require the removal of any on-street parking. Construction of the intermediate stops would be confined to the station sites themselves. Because on-street parking is not permitted in the immediate vicinity of the proposed station sites, construction of

[1] On-street parking is not permitted on the west side of Hegenberger Road in this area. The space between the outside edge of the travel lane and the curb serves as a shoulder or refuge area.

the stations would not require the temporary removal of any on-street or off-street parking spaces.

In summary, the construction-related parking impacts would be less-than-significant, except at OIA and some private businesses within the project corridor. The temporary displacement due to the construction of the AGT station at OIA could result in a temporary parking deficit if the AGT system were constructed prior to the implementation of the ADP, and the temporary removal of off-street private parking for businesses in the project corridor could affect parking conditions for those businesses. (PS)

Median Option. In the event engineering design refinements require use of the median instead of the preferred alternative alignment for the portion of Hegenberger Road between Elmhurst Channel and Coliseum Way, the potential temporary effect on parking conditions between Elmhurst Channel and I-880 would be the same or greater than the preferred alternative since construction in the median would entail enlarging the median and moving the existing lanes outward, likely taking the street parking on the east side of Hegenberger Road. Mitigation Measures C-TR-3(i) and C-TR-3(ii) would apply to the Median Option if it is selected for this portion of the alignment. (PS)

Mitigation Measures. The preferred alternative and Median Option could temporarily affect parking conditions within the project corridor and would require mitigation measures. The measures below would reduce potentially significant construction-related parking impacts to a less-than-significant level. (LTS)

C-TR-3(i) *Provide Temporary Replacement Parking for Affected Businesses.* BART shall provide on-site or off-site replacement parking facilities on a one space-for-one space basis for properties whose parking supply is reduced below demand by construction. If on-site or off-site replacement parking facilities cannot be identified, BART shall financially compensate the property owners for the use of the parking spaces during the period that construction activities affect on-site parking.

C-TR-3(ii) *Coordinate with ADP Construction Management Plans for Parking Conditions.* BART shall coordinate with the OIA to assure that the parking management plans coordinate the construction of the Airport AGT station with the overall construction of the ADP. Even if the ADP and the Connector facilities are not constructed concurrently, a parking plan shall be developed with the direct participation of BART and the Port and is intended to maintain parking supply equivalent to the on-airport parking supply at the time of construction, similar to the mitigation measure identified in the *ADP EIR*, which identified four locations where replacement parking spaces could be accommodated: the Air Cargo Road Lot, the Neil Armstrong Way Lot, the Swan Way Lot, and the New Inside Terminal Loop Lot. To provide these spaces, other temporary parking locations may need to be identified. These could include locations on Airport property that can be used temporarily for parking, off-site locations, arrangements with existing commercial parking lots, or use of the Coliseum BART Station lot. Any

temporary off-airport parking will require shuttle service. BART shall pay for any shuttle service needed beyond those already necessary for the ADP construction.

Land Use

A land use impact due to construction activity is a function of the intensity and duration of construction work, the sensitivity of the land uses adjacent to the construction areas, and distance of these land uses to the construction sites. Construction-related effects that can result in land use conflicts are mostly associated with traffic and circulation issues, increase in noise, increase in dust levels and other air pollutants, and decrease in safety. These effects overlap with those evaluated elsewhere in this section. The reader is referred to these other sections for the discussion of impacts in the project corridor during the construction period.

Socioeconomics

Standards of Significance

A significant socioeconomic construction impact would occur if construction activities related to the preferred alternative substantially diminished access to, or parking at, a business thereby reducing the ability of customers to patronize the business; created new employment opportunities; physically divided a community; or introduced new development that is not consistent with the existing community or general plan.

Impact C-SE-1. Loss of access or use of property during construction

Construction of the preferred alternative would be designed to ensure that access to businesses along the corridor would be maintained at all times. If, at any point, construction requires blocking the existing access, alternative access would be provided.

Guideway construction along the west side of Hegenberger Road would necessitate a construction corridor of approximately 75 feet, of which approximately 26 feet would be the permanent project corridor. It is not clear at this time what portion of the remaining 49 feet of construction corridor would be to the east of the permanent corridor (into Hegenberger Road), and what portion would be to the west (onto the properties abutting Hegenberger Road). This analysis conservatively assumes that the construction corridor would be fully to the west of the permanent corridor, thereby having the greatest impact on the off-street parking on the properties abutting Hegenberger Road. Based on this assumption, temporary use of private off-street parking by the AGT could occur at the following businesses along the corridor:

- Edgewater West Motel at 10 Hegenberger Road (APN 044-5020-004-01) (the easterly portion of the back parking lot would be affected);
- Caltrans (leased by GM Trucks) property at 8099 Coliseum Way (APN 042-4328-008-01) (a strip of paved land currently used to park large trucks would be affected); and
- Chevron Station property at 455 Oakport Street (APN 042-4425-010-00) (two parking stalls would be affected).

- Home Base property at 633 Hegenberger Road (APN 042-4328-001-16) (Up to 32 parking spaces could be removed during construction); and
- Building at 675 Hegenberger Road property (APN 042-4328-001-20) (Several parking spaces in proximity to the existing curb could be removed during construction).

The removal of this parking has the potential to affect the economic viability of these businesses. (PS)

The intermediate stop at Edgewater Drive and Doolittle Drive would not require the temporary use of parking spaces for construction. (NI)

Median Option. In the event engineering design refinements require use of the median instead of the preferred alternative alignment for the portion of Hegenberger Road between Elmhurst Channel and Coliseum Way, off-street parking for the properties between Elmhurst Channel and Coliseum Way would not be affected. (NI)

Mitigation Measures. The following mitigation measure would reduce the temporary impacts associated with construction of the AGT to a less-than-significant level. (LTS)

C-SE-1(i) Provide Replacement Parking. During construction, BART shall provide on-site replacement parking facilities (including fencing, as appropriate) for any off-street parking that is displaced as required for construction, in an amount equivalent to the parking affected. If on-site replacement parking facilities cannot be identified, BART would compensate the property owners for the use of the parking spaces during the construction period.

Impact C-SE-2. Creation of construction-related jobs

Construction of the 2-station AGT configuration would create an average of 273 construction jobs over the estimated 31-month construction period, resulting in a beneficial economic impact. The preferred alternative, with the addition of two intermediate stations, would require additional labor working over a longer construction schedule, thereby increasing the beneficial impact to construction-related jobs in the area. (B)

Median Option. Substitution of the Median Option for the segment of alignment between Elmhurst Channel and Coliseum Way would have no effect on any of the preceding analyses. (NI)

Impact C-SE-3. Physically divide the community during construction

The project study area contains residential neighborhoods on either side of the project corridor, although not directly along the project corridor. These neighborhoods are communities unto themselves and these neighborhoods are not considered part of a single, larger community, due to the distance and various land uses between them, and the physical barrier of Hegenberger Road, a major regional arterial. Therefore, the construction of the preferred alternative would not physically divide a residential community.

Numerous businesses line the project corridor along Hegenberger Road. These businesses generally do not provide services for local residences, but provide commercial services of a regional nature. These businesses are separated by a heavily traveled, six-to-eight lane major regional arterial. Therefore, the construction of the preferred alternative would not physically divide an existing business community. (LTS)

Median Option. Substitution of the Median Option for the segment of alignment between Elmhurst Channel and Coliseum Way would have no effect on any of the preceding analyses. (NI)

Impact C-SE-4. Induce substantial growth during construction not in accordance with existing community or city plans

The preferred alternative would require the expenditure of approximately $230 million to construct the new system -- $26 million more than the $204 million estimated for construction of the 2-station AGT without intermediate stops (the proposed project in the DEIR/DEIS). The capital investment for the 2-station AGT system would result in 416 indirect jobs. These indirect jobs would be created as a result of the need for goods and services not only for the AGT construction, but for the construction employees positions directly created by the preferred alternative. To calculate the indirect employment that would be generated by the capital expenditure for construction of the AGT, the APTA *Employment Impacts of Transit Capital Investment and Operating Expenditures* model was used. This model calculates the indirect job growth that would result from transit-related capital expenditures. Based on the APTA model, the capital expenditure for the AGT (original estimate for two-station design) is estimated to indirectly generate approximately 416 jobs. This indirect growth in jobs resulting from construction of the AGT is considered a beneficial effect on the local and regional economy.

The preferred alternative, with its larger capital cost, would generate additional indirect jobs in the local and regional economy, thereby increasing the beneficial impact.

Both the Oakland General Plan and the Gateway Development Study assume the construction of a fixed-route link from the Coliseum BART to the OIA. The Oakland General Plan was subject to an EIR, completed in 1998, that stated that the construction of a fixed route line between the BART Coliseum station and OIA is accounted for in the EIR and would not cause significant impacts related to growth. Therefore, the construction of the preferred alternative would not induce substantial growth. (LTS)

Median Option. Substitution of the Median Option for the segment of alignment between Elmhurst Channel and Coliseum Way would have no effect on any of the preceding analyses. (NI)

Visual Quality

Standards of Significance

A significant visual construction impact would occur if construction activities related to the preferred alternative or Median Option substantially altered the visual character of the corridor;

the relationship among the corridor's building scale, landscaping, building intensity, or massing; or the intensity of light so as to adversely affect day or nighttime views.

Impact C-VQ-1. Construction effects on visual character of the project corridor

Construction of the preferred alternative and Median Option would introduce views of construction equipment and crews, unfinished building forms, and construction-related and safety signs. The degree of visual impact is primarily related to the duration of construction and the sensitivity of the receptors in the vicinity of the construction area.

The construction materials, equipment, unfinished work, and freshly cut earth would alter the visual setting in the surrounding area. Because the streetscape of Hegenberger Road Corridor lacks visual coherence and the construction of the preferred alternative and Median Option would not be substantially different than other larger scale construction projects along the project corridor (see Table 3.0-2), the visual effects are not expected to cause a demonstrable and negative change in the visual setting.

The construction activities at the Coliseum BART Station area, which include the construction of the AGT Station, maintenance facility and guideway, and a construction staging area would be about 600 feet from the residential area north of Snell Street at the closest point. However, views from these residences toward the construction area would be partially screened by trees along the perimeter of the BART parking lot. The staging area would be further screened by the BART station itself.

The Doolittle Intermediate Station site for the second staging area is currently witnessing considerable construction activity with extension of 98th Avenue and alteration of road configuration. Because there is a mix of uses in this area, including hotels, long term parking, light industrial, businesses, etc., that do not define a coherent visual setting, the staging area would not substantially contrast with the visual setting. Therefore, this would be a less-than-significant visual impact. The construction of the intermediate stops would alter the visual setting of the surrounding area. The visual receptors in the vicinity of the proposed intermediate stop at the intersection of Edgewater Drive and Hegenberger Road are not sensitive. Consequently, the visual effects at this location would not be significant. The guests at the hotel near the intermediate stop are considered highly sensitive. However, the construction work would not significantly contrast with the heavy traffic in the project corridor nor would many guests be affected because the hotel has a circular shape and a limited number of rooms would face the staging area. Therefore, it is expected that the guests would not be significantly affected by temporary alterations to the visual setting. (LTS)

Median Option. In the event engineering design refinements require use of the median instead of the preferred alternative alignment for the portion between Elmhurst Channel and Coliseum Way, potential construction-related visual quality impacts would remain at a less-than significant level. The Median Option would not increase or diminish these potential effects. (LTS)

Impact C-VQ-2. Construction light and glare effects

Construction lighting can cause light and glare that could potentially disturb residences or lead to safety issues on the road.

The lighting used for construction work during night hours could cause light and glare effects in the surrounding areas and roads. The lighting used for construction work of the intermediate stops during the night hours could cause light and glare effects in the surrounding areas and roads. FAA's 7640 permit process would mitigate potential light and glare effects in and around the OIA area. Nonetheless, these effects remain a potentially significant temporary problem along the project corridor north of OIA. (PS)

Median Option. In the event engineering design refinements require use of the median instead of the preferred alternative alignment for the portion of Hegenberger Road between Elmhurst Channel and Coliseum Way, the potential temporary effect of construction light and glare effects would still occur. Mitigation Measure C-VQ-2(i) would apply to the Median Option if it is selected for this portion of the alignment. (PS)

Mitigation Measures. The preferred alternative and Median Option would have potentially significant light and glare effects. The following mitigation measures would reduce the impact to a less-than-significant level. (LTS)

C-VQ-2(i) *Adopt Measures to Reduce Light and Glare During Construction.* BART shall specify maximum lighting standards for staging areas and construction sites. The lighting shall focus illumination downward to restrict light from extending beyond the construction boundaries. To achieve this, the light fixtures shall be fitted with lenses, hoods, and reflectors to minimize spillover light and glare. This measure shall be incorporated into the construction bid documents to ensure that the contractors conform to these lighting specifications.

Cultural Resources

Standards of Significance

A significant cultural construction impact would occur if construction activities related to the preferred alternative demolished or materially altered a significant historical, archaeological, or paleontological resource.

Impact C-CR-1. Disturbance to significant paleontological resources

The major strata that underlie the Area of Potential Effect (APE) for construction are not fossil bearing. There are, however, interfluvial basin deposits that contain common gastropods (e.g., snails) and pelecypods (i.e., clams). No significant, rare, or unusual paleontological resources are known to exist. Therefore, the preferred alternative would not affect significant paleontological resources. In the event engineering design refinements require use of the median instead of the preferred alternative alignment, there would be no construction impacts to significant paleontological resources. No impact would occur, and no mitigation would be required. (NI)

Median Option. Substitution of the Median Option for the segment of alignment between Elmhurst Channel and Coliseum Way would have no effect on any of the preceding analyses. (NI)

Impact C-CR-2. Disturbance to significant archaeological resources
Three prehistoric sites (the Nelson sites), believed to be shell middens, lie within or adjacent to the APE for the proposed project. Although Site N-321 is located outside the APE and would not be affected, the potential still exists for encountering intact components of Sites N-322 and N-323 during ground-disturbing activities, such as trenching or asphalt removal. Little is known of these sites, other than approximate dates of discovery and general characterizations by Nelson, because no Primary Site Records are known to exist for any of them. For the purpose of this FEIR/FEIS, these sites are considered potentially significant. SHPO concurrence with the APE and the determination of potentially significant impacts was received in their September 17, 2001 letter to FTA. A copy of the letter is included in Volume II, Section 3, of this FEIR/FEIS.

Additionally, the known existence of these three sites (two within the preferred alternative APE), and the lack of ground visibility during William Self and Associates' field survey, may indicate the possible existence of other, previously unidentified archaeological sites.

Although the Nelson sites generally lie on the eastern side of the APE, and the AGT involves construction along the west side of Hegenberger Road, the potential still exists, depending upon the size of the archaeological deposits in Sites N-322 and N-323, for the preferred alternative to adversely affect these sites during ground-disturbing activities, and to adversely affect previously unidentified sites. There is also the possibility of other, previously unidentified sites that could be affected during construction. (PS)

Median Option. In the event engineering design refinements require use of the median instead of the preferred alternative alignment, there would be the same potential construction impacts to significant archeological resources as the preferred alternative. Mitigation Measures C-CR-2(i) and C-CR-2(ii) would apply to the Median Option if it is selected for this portion of the alignment. (PS)

Mitigation Measures. The following mitigation measures would avoid or minimize potential impacts to archaeological resources resulting from implementation of the preferred alternative and Median Option. (LTS)

C-CR-2(i) *Conduct Subsurface Archaeological Testing/Exploration*. If the guideway columns are sited within 500 feet of the known locations of the Nelson sites, BART shall retain a qualified archaeologist to conduct subsurface testing to characterize the subsurface archaeological deposits. The methods of archaeological testing shall be approved by the State Historic Preservation Office, and the testing shall be performed prior to construction.

Should potentially significant archaeological resources be found during testing or exploration, BART shall retain a qualified archaeologist to prepare a cultural

resources management plan for submittal to and approval by the State Historic Preservation Office. This plan shall address the recovery of important data from the sites prior to and during construction, and shall describe the research design, data recovery and analysis methodology, curation procedures, technical reporting requirements, and any other information deemed necessary by the State Historic Preservation Office. The plan shall also include a Native American Coordination Plan to be executed in the event of the recovery of human remains during the course of the work.

C-CR-2(ii) *Conduct Spot-Checks for Archaeological Resources During Construction Activities*. BART shall retain a qualified archaeologist to conduct spot-checks during ground-disturbing activities in the project corridor. The archaeologist shall have the authority to halt all construction activities in the vicinity upon the discovery of archaeological remains, pending an evaluation of the nature and significance of the materials found. If any materials found are determined to be potentially significant, the provisions of Mitigation Measure C-CR-2(i) regarding preparation of a cultural resources management plan shall apply.

Impact C-CR-3. Effects on significant historic structures

The ADP EIR analyzed potential footprint and operational effects of the Connector as a related project. In a letter of February 21, 1997, the State Historic Preservation Office concluded that none of the structures identified within the ADP APE are of the quality or character to be considered historic properties. Further, the revised project APE for the Connector does not include any portion of North Field.

None of the potentially historic structures that were analyzed by JRP Historical Consulting Services within the area of potential effect along the project corridor is considered to be eligible for the NRHP, or otherwise significant under Sections 5024.1 and/or 15064.5(a)(3)(A-C) of the California Public Resources Code. Therefore, the preferred alternative would not affect any significant historic resources. (NI)

Median Option. In the event engineering design refinements require use of the median instead of the preferred alternative alignment, there would be no construction impacts to significant historic resources. No impact would occur, and no mitigation would be required. (NI)

Community Services

Standards of Significance

A significant community service construction impact would occur if construction activities related to the preferred alternative or Median Option triggered the need for new police or fire department facilities and construction of those facilities were to cause significant physical, environmental effects.

Impact C-CS-1. Increased need for fire protection and emergency response during construction phase

According to the City of Oakland Fire Department, construction of the AGT would not substantially increase the demand for Fire Department services (Wittmer, July 14, 2000). The City of Oakland Fire Department would provide fire protection and emergency response services to the project corridor during construction. Construction activities for the preferred alternative would not directly require new Fire Department personnel. (NI)

Median Option. Substitution of the Median Option for the segment of alignment between Elmhurst Channel and Coliseum Way would have no effect on any of the preceding analyses. (NI)

Impact C-CS-2. Increased need for police services during construction phase

Construction of the preferred alternative would not require additional BART or City of Oakland police officers to patrol construction sites (Dunbar, 2000; White, 2000). (NI)

Median Option. Substitution of the Median Option for the segment of alignment between Elmhurst Channel and Coliseum Way would have no effect on any of the preceding analyses. (NI)

Utilities

The CEQA Guidelines for Utilities and Service Systems do not directly address construction-related impacts associated with relocation and service disruption. For the purposes of this section and based upon professional opinion, construction-related utility impacts would be considered significant if, through the excavation and relocation of underground utilities:

- Daytime power, natural gas, or communications service was disrupted for more than a few minutes;
- Daytime drinking water supplies were disrupted for more than a few hours;
- Wastewater transport was disrupted, at any time, for more than a few minutes; or
- The ability to transport stormwater was disrupted during and after precipitation events.

Impact C-UT-1. Relocation of utility lines

Existing service pipeline locations could be affected along the entire alignment due to the possible need to relocate gravity drainage piping for wastewater and stormwater service. As shown in Tables 3.7-1 and 3.7-2 (Section 3.7), there are drinking water pipelines along Hegenberger Road ranging in size from 6″ to 20″ in diameter; wastewater and stormwater lines in the vicinity of the alignment range in size from 6″ to 66″ in diameter. The AGT has not been developed in enough detail to determine if and where any construction activities would potentially interfere with pipeline alignments. For a conservative assessment (i.e., greater impacts), it has been assumed that construction of the AGT could result in utility service interruption. Utility service disruptions would occur with the AGT, if utility lines must be severed and reconnected to relocated pipelines. (PS)

Median Option. In the event engineering design refinements require use of the median instead of the preferred alternative alignment for the portion between Elmhurst Channel and Coliseum Way, potential construction-related impacts to utilities would be the same as the preferred alternative. The Median Option would not increase or diminish these potential effects. Mitigation Measure C-UT-1(i) would apply to the Median Option if it is selected for this portion of the alignment. (PS)

Mitigation Measures. The following mitigation measure would reduce the potential impacts of utility relocation associated with the preferred alternative and Median Option to a less-than-significant level. (LTS)

C-UT-1(i) *Minimize Interruption of Utility Services.* BART shall require construction contractor to install all re-routed utility lines (drinking water, wastewater, stormwater, telephone, natural gas, electricity), and conduct tie-in activities during off-peak service periods approved by the affected utility purveyor. No stormwater piping relocation tie-ins shall be conducted during or within 24 hours of a rain event. All relocations of wastewater piping shall utilize pumps and diverted flows to maintain full service capabilities.

Geology, Soils, and Seismicity

Standards of Significance
A significant geologic, soils, or seismicity construction impact would occur if construction activities related to the preferred alternative could not achieve acceptable levels of public safety, particularly for excavations and ground settlement, as set forth in applicable building codes.

Impact C-GE-1. Excavation instability caused by shallow groundwater
The AGT could require significant temporary cut slopes to construct the tunnel segment that could encounter shallow groundwater that could create instability. The instability is caused by groundwater seeping into the excavation, or upward force from artesian water pressure, both of which weaken the excavation slopes. Construction workers in the excavations could be susceptible to harm by entrapment or being engulfed. People in buildings adjacent to excavations that encounter shallow groundwater could also be harmed if the excavation slopes fail to the extent to cause structural failure to the nearby buildings. (PS)

Median Option. The Median Option would not experience excavation instabilities since the column foundation construction technique described in Section 3.16.2 does not require temporary cut slopes. Accordingly, substitution of the Median Option for this portion of the alignment would have no effect on the preceding analyses. . (NI)

Mitigation Measures. The preferred alternative would require the following measures, or their equivalent, to reduce the potentially significant groundwater seepage effect to less than significant. (LTS)

C-GE-1(i) *Dewatering and Groundwater Control in Excavations. Best Management Practices.* BART shall require the contractor to design and implement a temporary dewatering system during excavation and construction of structures that

interface with the groundwater table. In addition, the extracted groundwater may be sediment-laden or contaminated and would require mitigation under measures *C-HM-1(i), and C-HM-1(ii)*.

Impact C-GE-2. Settlement due to construction-related activities

Construction of the preferred alternative could cause settlement in the following ways:

- Lowering the groundwater table by dewatering can lessen the bearing capacity of dewatered soils by removal of pore pressure or densification of particles, thereby causing settlement and damage to overlying structures.
- Excavations can cause ground deformation in areas behind the excavation by removal of lateral support.
- Vibration from heavy equipment traffic or pile driving can cause settlement by "shakedown" of saturated, loose, sand layers and, to a lesser extent, unsaturated, loose sand layers. (PS)

Median Option. In the event engineering design refinements require use of the median instead of the preferred alternative alignment for the portion between Elmhurst Channel and Coliseum Way, potential settlement due to construction-related activities as listed above would be the same as the preferred alternative. The Median Option would not increase or diminish these potential effects. Mitigation Measures C-GE-2(i), C-GE-2(ii), and C-GE-2(iii) would apply to Median Option if it is selected for this portion of the alignment. (PS)

Mitigation Measures. The preferred alternative and Median Option would require the following measures, or their equivalent, to reduce the potentially significant settlement effect to less than significant. (LTS)

C-GE-2(i) *Monitor Settlement During Construction.* BART shall require the contractor to implement a settlement monitoring program to detect potential construction-induced settlement at an early stage. If settlement is detected, additional support measures would be required to strengthen the affected adjacent structures. These additional measures could include shoring or grouting of affected underlying soil or strengthening of affected foundations.

C-GE-2(ii) *Control Groundwater During Dewatering.* Settlement potentially caused by dewatering shall be controlled by installation of a cut-off wall between the area needing dewatering and potentially affected structures. The cut-off wall can be sheet piling, a grout curtain, or an injection well array that would limit the amount of dewatering that takes place beneath structures adjacent to the construction corridor.

C-GE-2(iii) *Limit Vibration.* In areas of loose sand layers underlying adjacent structures, alternative construction methods shall be used that do not create significant vibration. For example, if pile-type foundations are selected, pre-construction design investigations will determine if loose sand layers are present beneath structures in close enough proximity to the construction corridor such that

settlement could be induced by vibration from pile driving equipment. If loose sand layers are present, an alternative foundation design (e.g., drilled piers) shall be used. By another example, movement of heavy equipment can cause significant vibration and cause settlement. In this case, the equipment traveling speed shall be reduced to limit vibration.

Hydrology and Water Quality

Standards of Significance
A significant hydrological construction impact would occur if construction activities related to the preferred alternative substantially affected surface water or groundwater quality or altered surface runoff rates thereby contributing to flooding or erosion hazards.

Impact C-HY-1. Stormwater erosion

The AGT could require significant temporary cut slopes to construct the tunnel segment that could lead to erosion, sedimentation, or stormwater pollution. For the intermediate stops, drilling would be required for cast-in-place reinforced concrete foundations in the same manner as the Coliseum AGT Station, and would therefore not be a significant source of erosion. Excavations for utilities on embankments under the AGT could erode during storms. Temporary cut slopes for excavations would be susceptible to erosion during storm events. The resultant high suspended solids content of the stormwater and the subsequent sedimentation when it enters a receiving waterway could impact the environment and aquatic fauna. Points where runoff enters waterways are areas of greatest potential for impact. Sediment could also be released if entrained in dewatering activities. (PS)

Median Option. In the event engineering design refinements require use of the median instead of the preferred alternative alignment for the portion between Elmhurst Channel and Coliseum Way, construction-related activities may require additional utility relocation and therefore may cause greater potential for stormwater-related erosion. Mitigation Measure C-HY-1(i) would apply to the Median Option if it is selected for this portion of the alignment. (PS)

Mitigation Measures. The preferred alternative and Median Option would require the following measures, or their equivalent, to reduce the potentially significant erosion effect to less than significant. (LTS)

C-HY-1(i) *Implement Stormwater Best Management Practices.* BART will be required by the State to implement best management practices (BMPs) under General Permit Requirements for Storm Water Discharges Associated with Construction Activities, SWRCB Water Quality Order 99-08-DWQ. BART shall require the contractor to comply with these requirements and develop an acceptable Stormwater Pollution Prevention Plan. The plan shall contain BMPs that have demonstrated effectiveness at reducing stormwater pollution. Examples of BMPs that reduce erosion include, but are not limited to, precluding grading operations during the rainy season, hydro-mulching bare ground, installing silt fences, and placing hay bales to stop entrained sediments from reaching waterways.

Impact C-HY-2. Discharge of construction water

Excavation activities would likely occur for the AGT that would require removal of groundwater from excavations during construction. These activities may include excavations for the tunnel segment, pile caps, caissons, utilities, and ground stability improvement activities (e.g., soil removal and replacement activities). Dewatering activities for excavations below the water table could result in wastewater treatment plant upset if unsuitable and untreated water is discharged directly to the sanitary sewer system. Due to the potential of discharging pollutants (primarily by entraining silt and clay but also from encountering chemicals and other contaminants) through release of construction water directly to the environment, construction water is typically discharged to the sanitary sewer. If temporary excavations require dewatering and discharge of high salinity groundwater to receiving sanitary sewer treatment plants, the treatment plant's ability to purify water could be upset resulting in exceeding discharge limitations and pollution. (PS)

Median Option. In the event engineering design refinements require use of the median instead of the preferred alternative alignment for the portion between Elmhurst Channel and Coliseum Way, potential impacts from discharge of construction water would be the same as the preferred alternative. The Median Option would not increase or diminish these potential effects. Mitigation Measures C-HY-2(i) through C-HY-2(iv) would apply to the Median Option if it is selected for this portion of the alignment. (PS)

Mitigation Measures. If construction of the preferred alternative and Median Option require discharge of groundwater to the sanitary sewer system, the contractor must notify the East Bay Municipal Utility District (EBMUD) and gain prior approval with the possibility of water discharge requirements being issued by EBMUD. The contractor would be required to test construction water for the type and concentration of water quality constituents. Based on the findings, construction water may be discharged to the sanitary sewer. If high salinity (in general, having a chloride concentration greater than 2,000 mg/l) is identified upon testing the excavation water, then implementation of one of the appropriate following mitigations would reduce the potential impact to a less-than-significant effect. (LTS)

C-HY-2(i) *Notify Treatment Plant.* BART shall require the contractor to coordinate and schedule discharges to the sanitary sewer with the treatment authority to prevent plant upsets.

C-HY-2(ii) *Control Discharges to Sanitary Sewer.* At the direction of the treatment plant personnel, coordination efforts would involve limiting the flow rate or total volume of groundwater discharged or allowing discharges only at times when total plant flows are large and adequate dilution of high salinity water can occur.

C-HY-2(iii) *Treatment Prior to Discharge.* If required to meet influent standards imposed by the treatment plant, BART shall require the contractor to pre-treat and test the construction water as necessary. This mitigation measure is an alternative to C-*HY-2(ii).*

C-HY-2(iv) *Discharge to Waterways with RWQCB Authorization*. Discharges can be routed to alternative areas or back into saline water bodies to prevent discharges to the sanitary sewer. For construction of subsurface excavations adjacent to saline water bodies, direct discharge back to the water body shall be arranged only under special allowances from the RWQCB. In this case, the discharger is required to demonstrate to the satisfaction of the RWQCB that the discharge is not causing pollution or otherwise impacting the environment. Alternatively, groundwater could be routed to temporary percolation basins on OIA property subject to prior authorization from the Port of Oakland. Further discussion of potential impacts related to water discharges to water bodies is presented in Mitigation Measure C-BR-1(iii).

Biological Resources

Standards of Significance
A significant biological construction impact would occur if construction activities related to the preferred alternative substantially affected sensitive species or habitats, including natural communities and federally protected wetlands.

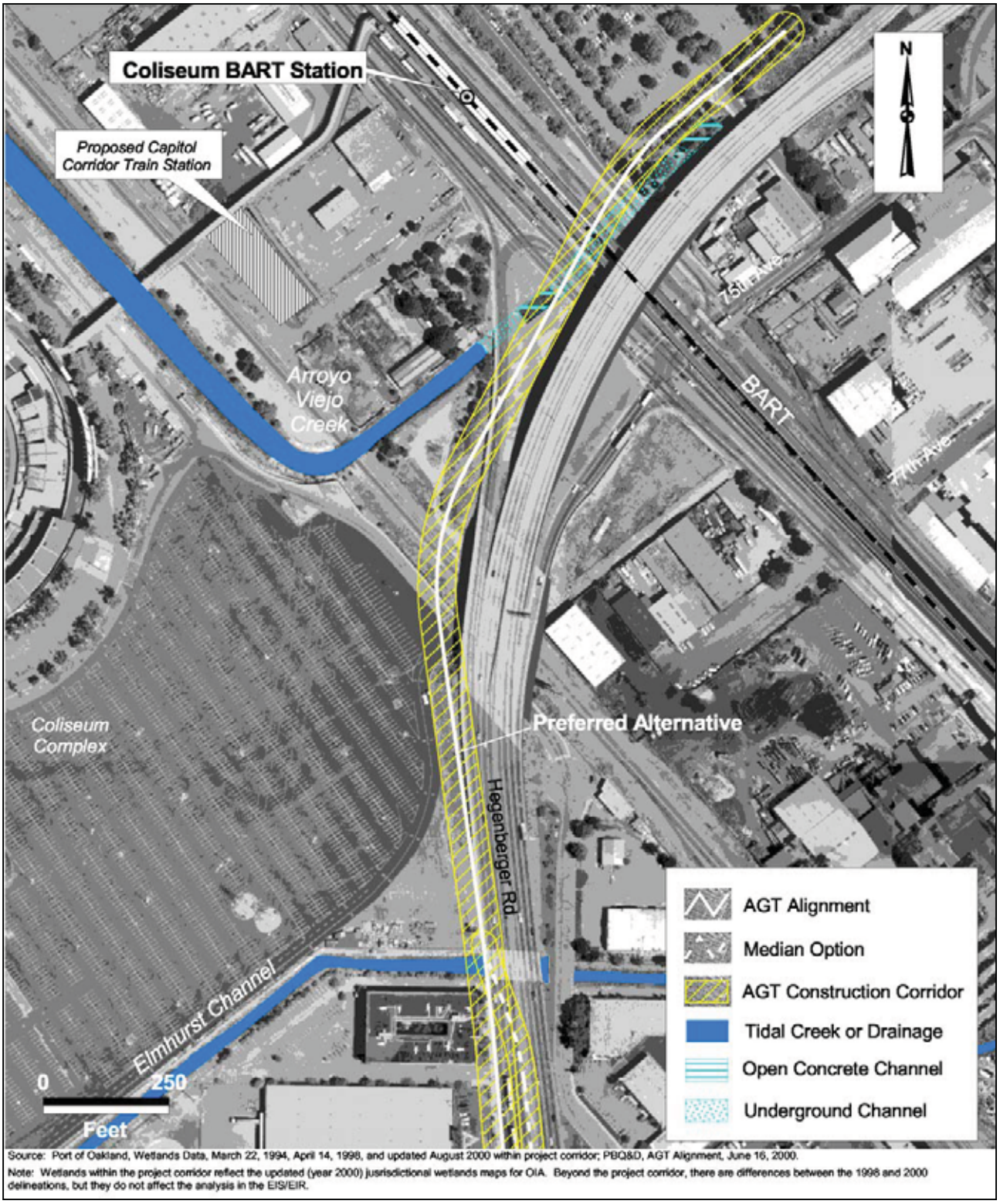
Potential impacts to biological resources would occur during the construction phase of the preferred alternative. Figures 3.16-1(a) through (e) illustrate the locations and types of biological resources that would be encountered during project construction.

Impact C-BR-1. Wetlands impacts

Construction of the new Coliseum AGT Station and maintenance and power substation building would not affect wetlands. These structures would avoid any impact to the concrete-lined channel between San Leandro Street and the on-ramp to Hegenberger Road at the north end of Arroyo Viejo Creek.

Construction of the aerial guideway for the AGT could potentially affect wetlands. The aerial construction right-of–way is anticipated to be 50 feet wide in the Hegenberger Road median and 75 feet elsewhere. While no portion of this right-of-way will encroach on existing wetlands, there is the possibility of construction impacts on wetlands at tidal creek crossings and drainage areas adjacent to the construction corridor. As a worst-case scenario, if all tidal wetlands and other waters of the United States within the construction right-of-way were assumed to be affected, about 0.18 acre would be disturbed (see Figure 3.16-1 and Table 3.10-1).

Construction of the tunnel under Doolittle Drive and the at-grade guideway between Doolittle Drive and Air Cargo Road would not affect wetlands. The anticipated 65-foot-wide construction right-of-way lies adjacent to wetlands at the Lew F. Galbraith Golf Course. The revised jurisdictional delineation was verified by the Corps in August 2000 and indicates that the AGT construction corridor would not affect wetlands that were not already authorized to be filled by the Corps, pursuant to Permit Number 21590S issued to the Port for its ADP.



Source: Port of Oakland, Wetlands Data, March 22, 1994, April 14, 1998, and updated August 2000 within project corridor; PBQ&D, AGT Alignment, June 16, 2000.

Note: Wetlands within the project corridor reflect the updated (year 2000) jusrisdictional wetlands maps for OIA. Beyond the project corridor, there are differences between the 1998 and 2000 delineations, but they do not affect the analysis in the EIS/EIR.

Figure 3.16-1(a)
Affected Biological Resources within the AGT Construction Corridor

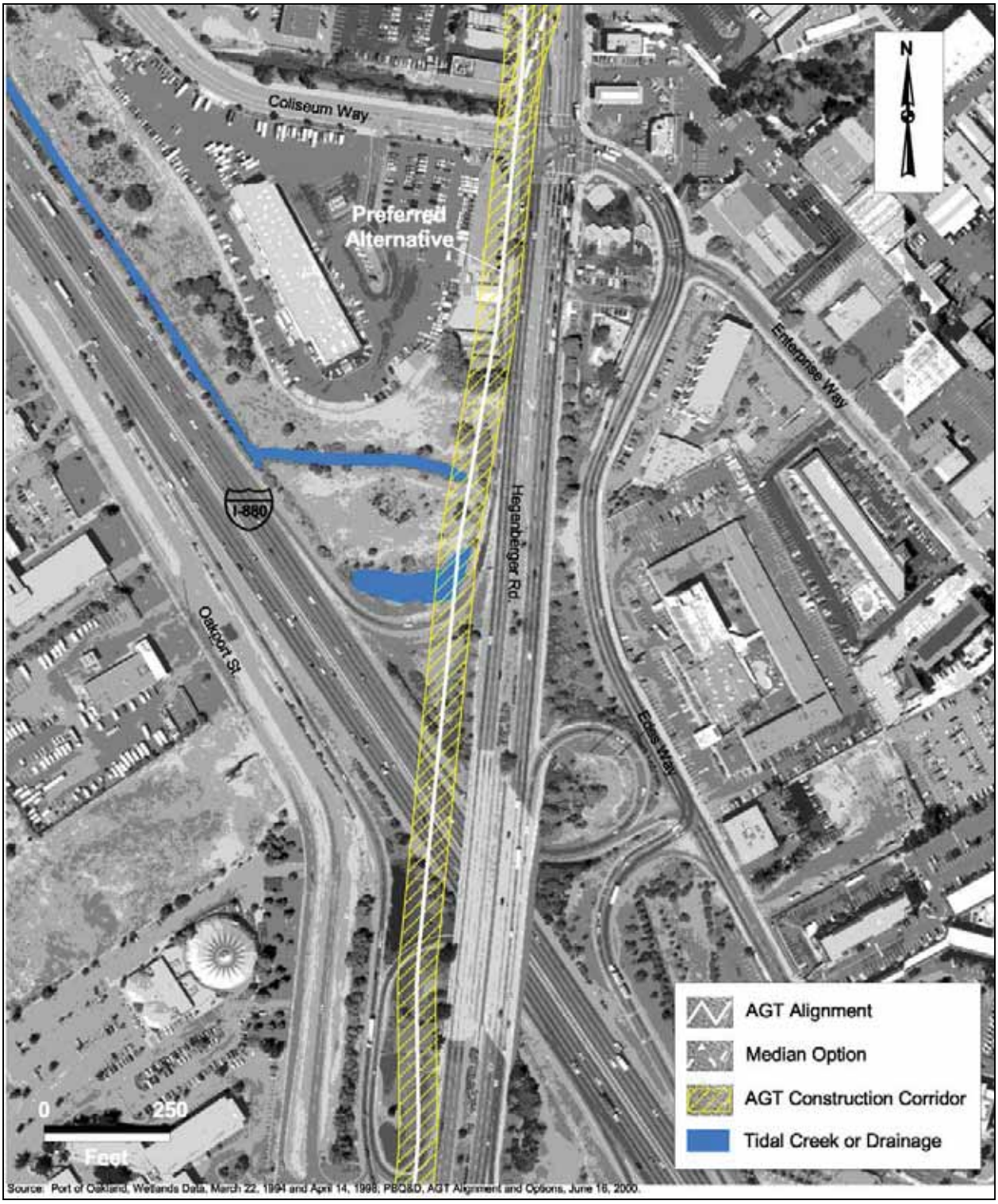


Figure 3.16-1(b)
Affected Biological Resources within the AGT Construction Corridor

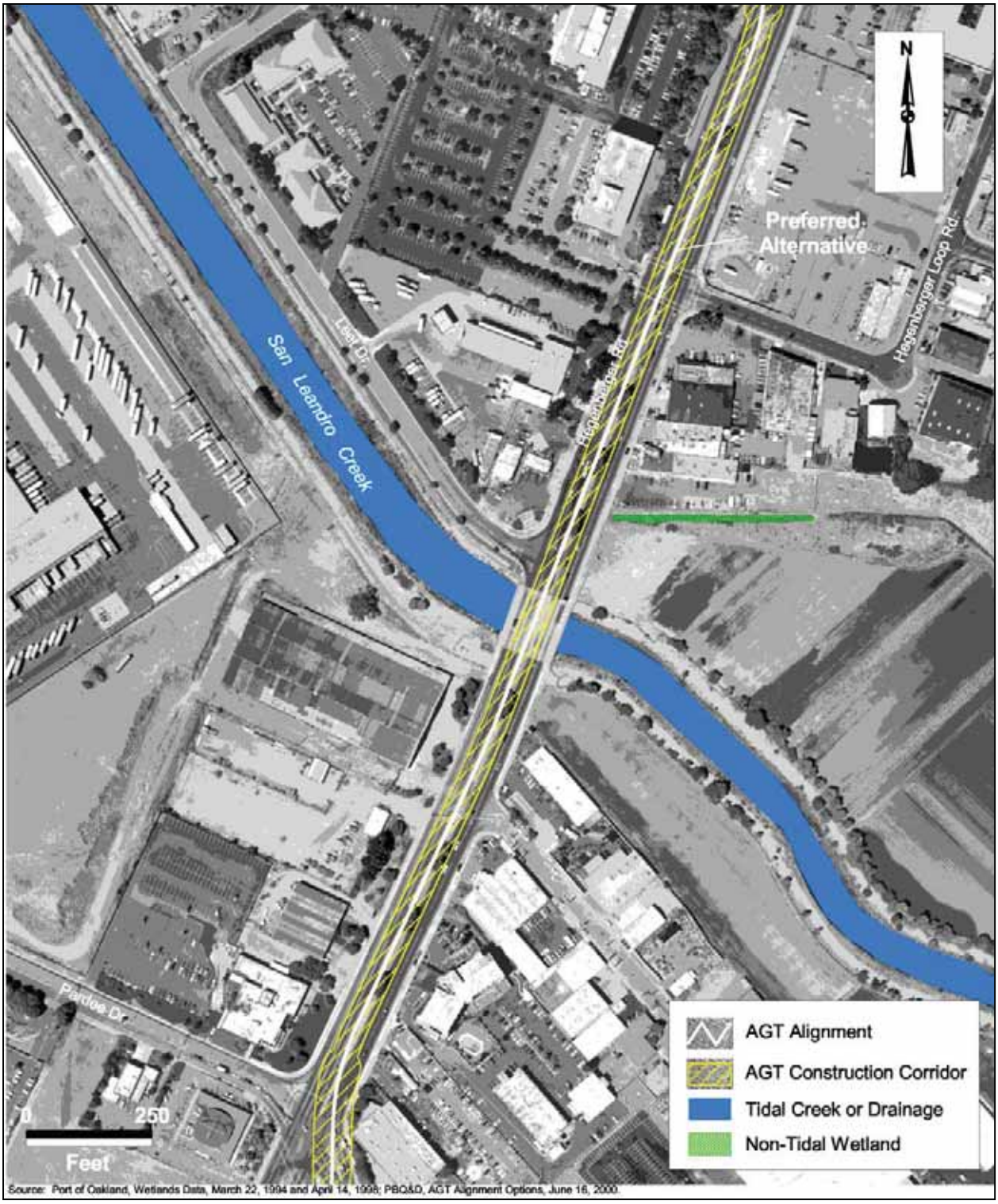


Figure 3.16-1(c)
Affected Biological Resources within the AGT Construction Corridor

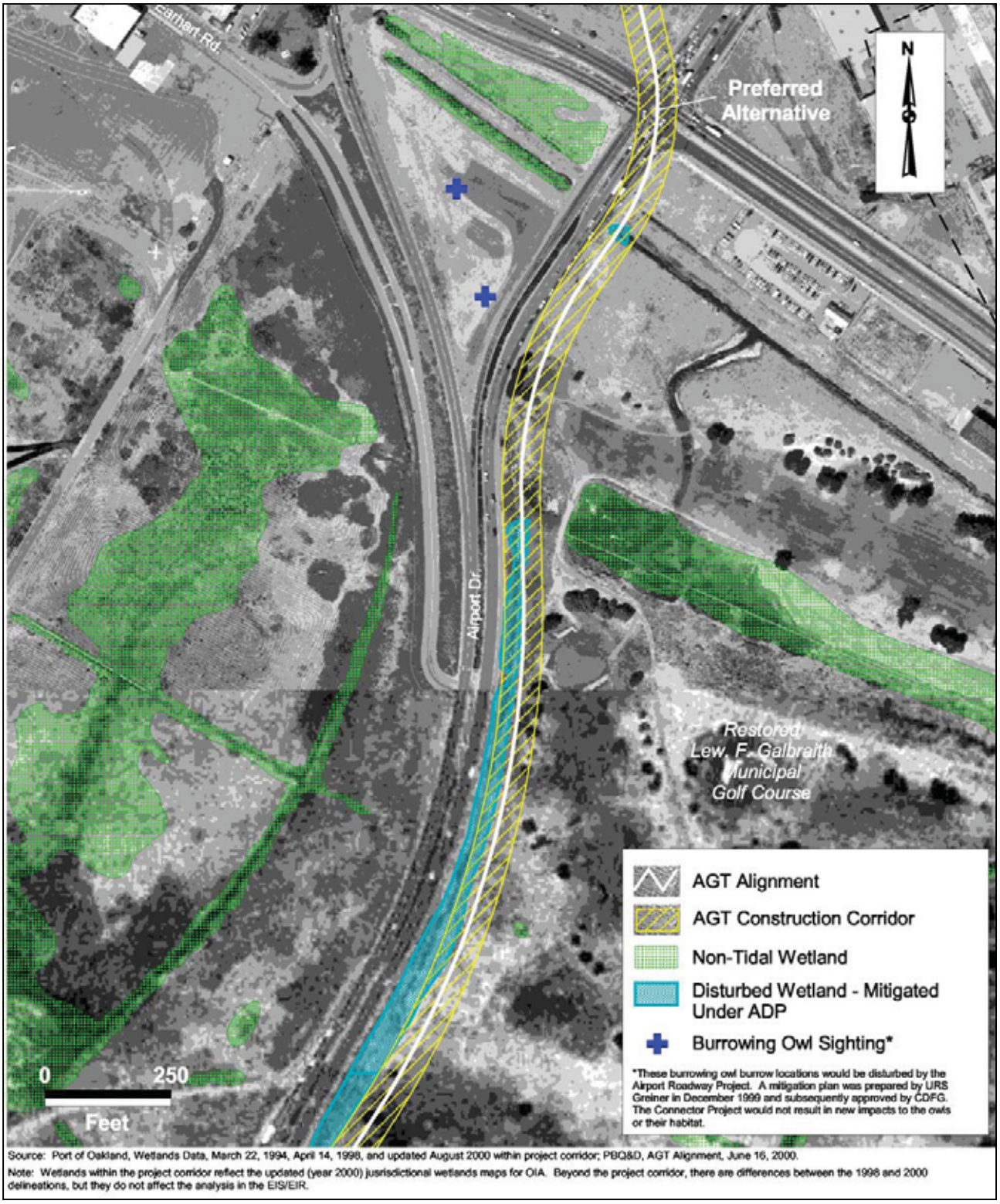
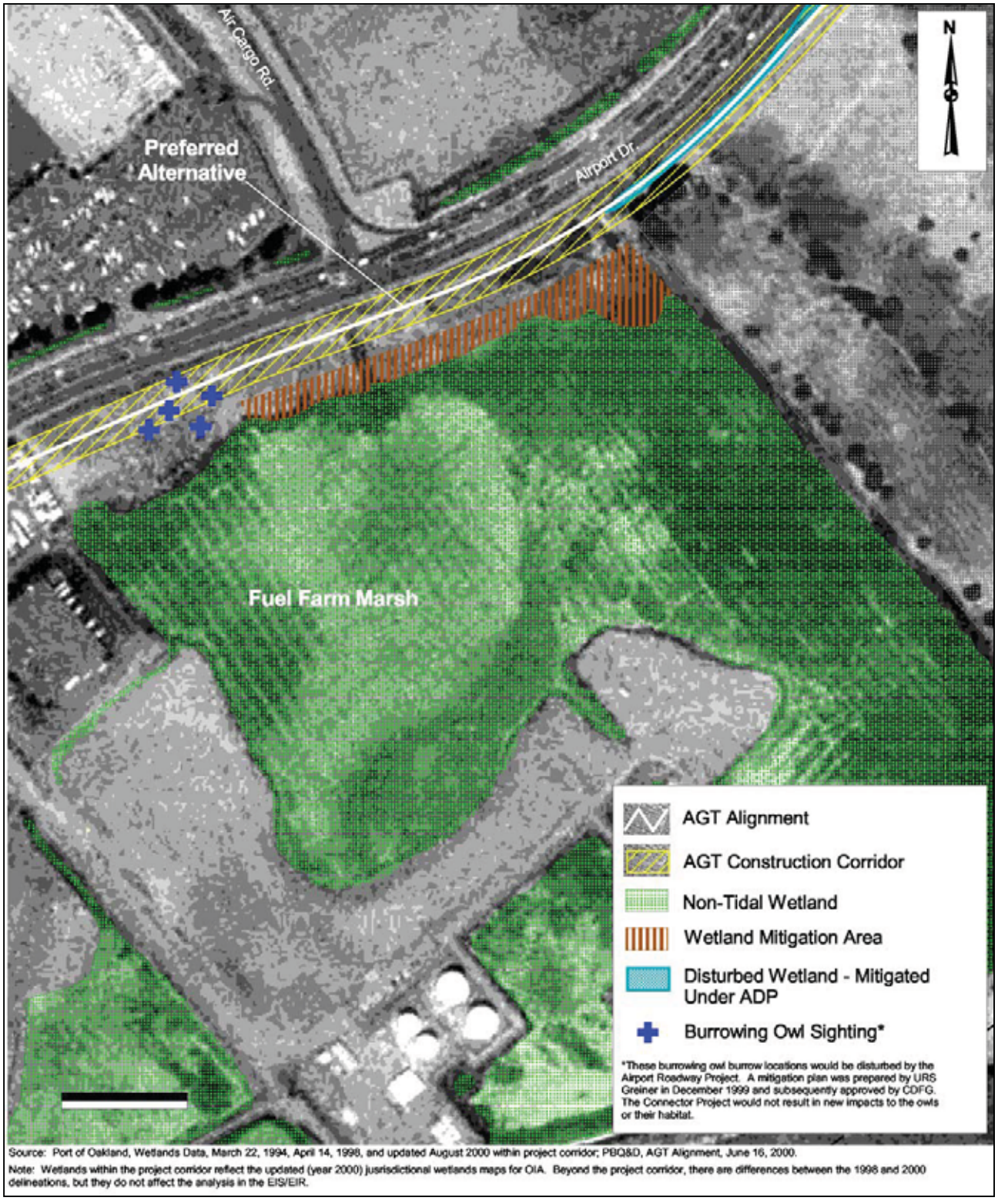


Figure 3.16-1(d)
Affected Biological Resources within the AGT Construction Corridor



Source: Port of Oakland, Wetlands Data, March 22, 1994, April 14, 1998, and updated August 2000 within project corridor; PBQ&D, AGT Alignment, June 16, 2000.

Note: Wetlands within the project corridor reflect the updated (year 2000) jusrisdictional wetlands maps for OIA. Beyond the project corridor, there are differences between the 1998 and 2000 delineations, but they do not affect the analysis in the EIS/EIR.

Figure 3.16-1(e)
Affected Biological Resources within the AGT Construction Corridor

Accordingly, in this segment of the project corridor, AGT construction would not disturb jurisdictional wetlands.

Dewatering of the tunnel segment would be required during construction. Dewatering activities could potentially discharge salts, silts and clays into the adjacent wetland area at the golf course. Dewatering activities could potentially alter adjacent hydrologic conditions, possibly affecting the adjacent wetland area at the golf course. This would be a potentially significant impact of the AGT.

Construction of the intermediate stops and the new Airport AGT Station near the existing terminal and surface parking area would not disturb wetlands, because none exists within the proposed construction areas.

Summarizing, the AGT could involve potential temporary impacts to adjacent wetlands. (PS)

Construction of the intermediate stations would not affect wetlands because none exist within or adjacent to these areas. (NI)

Median Option. In the event engineering design refinements require use of the median alignment instead of the preferred alternative alignment in the area of Elmhurst Channel, potential construction impacts to adjacent wetlands would still be present. Mitigation Measures C-BR-1(i) through C-BR-1(ii) would apply to the Median Option if it is selected for this portion of the alignment. (PS)

Mitigation Measures. The following mitigation measures would reduce the wetland impacts of the AGT to a less-than-significant level. Compliance with the following mitigation measures would reduce the wetland impacts of the AGT Alternative and alignment options to a less-than-significant level. (LTS)

C-BR-1(i) *Protect and Reduce Construction Corridor to Avoid Wetland Disturbance*. In the areas where the construction rights-of-way are adjacent to tidal creeks, drainages or non-tidal wetlands, BART shall require that the construction right-of-way be narrowed to the extent possible to avoid temporary construction impacts. The jurisdictional wetlands shall be staked by a qualified biologist, and the construction corridor shall be no closer than 5 feet from the staked wetland. To ensure that equipment and personnel do not enter the wetland, a solid fence a minimum of 4-feet tall shall be constructed a minimum of 5 feet from the edge of the wetland. The fence can be built with metal t-stakes and plywood. This fence would have the added effect of limiting intrusion by animals into the work area. In addition, a qualified biologist shall be retained by BART to monitor the site during construction to ensure implementation of Best Management Practices (see Mitigation Measure C-BR-1(ii)). This measure may involve temporary closure or narrowing lanes of Airport Drive to allow access for construction equipment and activities from the roadway side. Temporary closure or narrowing of lanes shall be coordinated with the Port of Oakland. Access to and from OIA shall be maintained at all times.

C-BR-1 (ii) *Adhere to Sound General Construction Practices in Areas Adjacent to Wetlands.* BART shall require that construction contractors implement Best Management Practices to reduce construction-related impacts from sedimentation and contamination. Best Management Practices shall include, but not be limited to, the flagging of all wetland areas adjacent to construction activities and the installation of silt fencing between wetland areas and all construction activities prior to the commencement of construction activities.

C-BR-1(iii) *Mitigate Discharge of Excess Water from Tunnel Construction under Doolittle Drive.* If dewatering into surface drainages is necessary, BART shall require that construction contractors use sediment basins or settling tanks located in upland habitats (avoiding all designated wetlands) immediately adjacent to the dewatered construction site but also within the designated construction right-of-way. All waters pumped from the site would first be discharged into these sediment basins/tanks, for settling of silts and sediments. Only after treatment would this cleaner surface water be discharged into surface drainages with approval of the RWQCB.

Further discussion of mitigation measures related to treatment and control of construction water is presented in the prior discussion on Hydrology and Water Quality.

Impact C-BR-2. Impacts to burrowing owls and habitat

Burrowing owl burrows have been documented within the Connector project corridor on the east side of Airport Drive just south of the intersection with Air Cargo Road and south of Doolittle Drive between Airport Drive and Airport Access Road (Port of Oakland, 1997, 1999). These burrowing owl sites have been destroyed as part of the Airport Roadway Project Segment 4 Airport Road widening and have been mitigated as required in the ADP FEIR. The Burrowing Owl Management Plan (Port of Oakland, 1999) contains specific measures to mitigate construction-period effects. This plan was approved by the CDFG. Burrowing owls are not known to occur elsewhere in the Connector project corridor due to lack of suitable habitat. The preferred alternative would not impact new burrowing owls or their habitat. (NI)

Median Option. Substitution of the Median Option for the segment of alignment between Elmhurst Channel and Coliseum Way would have no effect on any of the preceding analyses. (NI)

Impact C-BR-3. Impacts to nesting birds

Development of the AGT system would require removal of ornamental street trees, primarily those to be installed by the City of Oakland in the Hegenberger Road median south of I-880 as part of the Gateway landscaping project, and along the west side of Hegenberger Road between Elmhurst Channel and Interstate 880. These removals could result in the direct or indirect loss of bird nests, eggs, or nestlings, a violation of California Department of Fish and Game Code Section 3503. Only European starlings and English sparrows are exempted from this statute. This activity would also result in a violation of Section 703 of the Migratory Bird Treaty Act,

depending on the species involved. If nests occupy the trees to be removed, their disturbance would be a significant effect of project construction. (PS)

Median Option. Incorporation of the Median Option would avoid the removal of the four coast redwood trees at 675 Hegenberger Road. Potential impacts to nesting birds would still be present but at a less than significant level since the trees would not be removed. (LTS)

Mitigation Measures. The following mitigation measures would reduce the potential impact of the preferred alternative to a less-than-significant level. (LTS)

C-BR-3(i) *Perform Preconstruction Survey for Nesting Birds.* If construction or tree removal is conducted outside the breeding season, generally February 1 to August 31, no action is necessary. It is not necessary to replace potential nesting habitat of common birds occurring on site because they are well adapted to nesting in developed areas.

If tree removal is required during the breeding season (February 1 to August 31), a preconstruction survey shall be conducted to identify the presence, or lack thereof, of nesting bird species. Surveys shall be performed by a qualified wildlife biologist no more than two weeks prior to the start of construction. If no nests are identified in trees to be removed during the preconstruction surveys, no further mitigation is necessary. If nests are identified, all construction activity, including pile driving, within 150 feet of the active nest shall be postponed until the nest is vacated and juveniles have fledged (typically 3 to 4 weeks).

Impact C-BR-4. Effect of construction noise and activity on wildlife

Noise, grading, activities, and dust resulting from construction of the Connector project could have adverse affects on wildlife species occurring in the project corridor. Noise associated with construction would be a temporary impact occurring over a short period of time. Wildlife species and individuals display varying levels of sensitivity and habituation to noise. Those species most sensitive to noise would be expected to leave the site. Less sensitive "urban-adapted" species, such as robins, jays, towhees, blackbirds, finches, and sparrows, would be expected to return to suitable remaining or developing habitat in the project corridor after construction is completed.

Grading for construction of the preferred alternative would result in short-term wildlife impacts during the construction period, including direct mortality of less mobile or small burrowing mammals. Direct mortality of small burrowing mammals, and indirect stress-related impacts to more mobile medium- to large-size mammals attempting to relocate to nearby, already occupied sites, would be unavoidable. Dust could cover plant surfaces upon which insects providing food for birds forage, or interfere with insect respiration and reproduction, thereby reducing the food supply for insectivores. However, because these species are common in the vicinity of the project area, impacts would be considered less than significant, and no mitigation would be required. Construction of the preferred alternative and intermediate stations would have a less than significant impact on sensitive wildlife species. (LTS)

Median Option. Substitution of the Median Option for the segment of alignment between Elmhurst Channel and Coliseum Way would have no effect on any of the preceding analyses. (LTS)

Noise and Vibration

Applicable Plans and Policies

Construction Noise. The criteria for noise and vibration from construction activities are absolute (i.e., defined irrespective of the existing conditions). Of the policies and regulations published by the FTA, BART, and the City of Oakland regarding construction noise, the most-restrictive construction noise standards are specified by BART in the *Standard Specifications for Construction Contracts* (BART, 2000).

BART maintains requirements for construction contractors to minimize noise and minimize the disturbance to people in the vicinity of the construction activities (BART, 2000). The maximum allowable noise levels defined in the BART *Standard Specifications for Construction Contracts* (Table 3.16-2) are more-restrictive than those specified by the FTA, and are identical to the criteria in the 1992 BART "Extensions Program System Design Criteria" document.

Table 3.16-2
BART Specifications for Construction Noise

Land Use of Receptor	*Maximum Daytime Intermittent Noise Level (dBA)*	*Maximum Nighttime Intermittent Noise Level (dBA)*	*Maximum Continuous Noise Level (dBA)*
Single Family Residential	75	60	60
Commercial Areas (including hotels)	80	70	70
Commercial Areas (without hotels)	85	85	70

Source: BART, 2000.
Note: Maximum noise levels (L_{MAX}) for intermittent activities apply to non-repetitive, short-term noises not lasting more than a few hours. Maximum continuous noise levels (L_{MAX}) apply to repetitive or long-term noise lasting more than a few hours. Outdoor recreational areas in the project corridor are designated with the criteria for "Commercial Areas (including hotels)".

Chapter 8.18.010 of the City of Oakland Health and Safety Code generally prohibits excessive and annoying noise that disturbs the peace of a community. Construction activities are considered to be a nuisance if the following measures are not implemented (Chapter 8.18.020):

- all construction equipment powered by internal combustion engines shall be properly muffled and maintained;
- unnecessary idling of internal combustion engines is prohibited;
- all stationary, noise-generating construction equipment, such as air compressors, are to be located as far as practical from existing residences;
- quiet construction equipment, particularly air compressors, are to be selected whenever possible; and

- use of pile drivers and jack hammers shall be prohibited on Sundays and holidays except for emergencies and as approved in advance by the City's Building Official.

The maximum allowable noise levels specified by the City of Oakland in Chapter 17.120.050(H) of the City Planning Code require intermittent construction activities to be below 80 dBA at residential land uses, and below 85 dBA at commercial land uses, if the activity occurs in the daytime (7 a.m. to 7 p.m.). Longer-term construction activities are required to be less than 65 dBA at residential uses, and less than 70 dBA at commercial uses. Compliance with the BART specifications (in Table 3.16-2, above) would ensure compliance with the City Planning Code standards.

Construction Vibration. The City of Oakland does not have an ordinance that limits ground-borne vibration from construction. The criteria specified by the FTA aim to protect buildings from damage and provide consideration for nearby vibration sensitive activities. The FTA damage threshold for fragile buildings is 0.20 inches per second ppv, or for extremely fragile buildings, 0.12 inches per second ppv (FTA, 1995). The criteria specified in the 1992 BART "Extensions Program Design Criteria" document characterize construction vibration in terms of the duration of the impact at the nearest affected building. Sustained construction vibration (more than one hour per day) is limited to 0.01 inches per second ppv (80 VdB); transient vibration (less than one hour per day) is limited to 0.03 inches per second ppv (90 VdB); and peak transient vibration (less than 10 minutes per day) is limited to 0.10 inches per second ppv (100 VdB).

Standards of Significance

Construction activities related to the preferred alternative would result in a significant impact if:

- construction noise exceeds the BART criteria shown in Table 3.16-2.

- ground-borne vibration from construction activities exceeds the BART criteria of 80 VdB (more than one hour per day), 90 VdB (less than one hour per day), or 100 VdB (less than 10 minutes per day), or the damage threshold of 0.20 inches per second ppv for fragile buildings or structures.

Methodology

Construction noise and vibration vary widely depending on the process underway, the type and condition of the equipment used, the layout of the construction site and staging areas, and the day-by-day schedule of activities. BART *Standard Specifications for Construction Contracts* would be included in construction documents as they are developed. Because the contractor would have some discretion over many of the construction activities and methods, it is difficult to accurately estimate levels of construction noise. This analysis follows a method of general assessment prescribed by the FTA guidance documents. The combined noise levels of the noisiest equipment are considered on a "worst-hour" basis and compared to the short-term (intermittent) significance thresholds of Table 3.16-2 and the vibration thresholds identified above.

The noise and vibration level predictions and effectiveness of potential mitigation are sufficiently accurate for the purposes of an environmental analysis. The estimations for the radius of impact are based on worst-case assumptions of combined activities and unobstructed receptor exposure. However, final noise and vibration predictions and specific details of mitigation measures (e.g., specific height and locations of sound barriers, or specific types of vibration mitigation) should be determined before issuance of a notice to proceed to the project's contractors. In particular, further refinements of ground-borne vibration levels may include field measurements of the characteristics of the soils and geologic strata in the project corridor. Although the measures recommended are intended to achieve compliance with the noise and vibration criteria, other measures may eventually be identified and implemented to achieve equivalent mitigation.

Impact C-NV-1. Effects of construction-related noise

Construction for the foundations of the facilities would generate the most intense noise impacts of all construction activities. Foundation columns would be placed using cast-in-drilled-hole (CIDH) techniques or pile driving. Simultaneous operation of rock drilling rigs and possibly water-jet excavators or equipment for installation of shoring and grouting with other equipment would be expected for installation of the foundation and pile system and for excavation. Typical equipment, without pile-driving, could cause intermittent one-hour Leq noise levels above 85 dBA for receptors within approximately 220 feet, and intermittent noise levels could be above 80 dBA for receptors within approximately 400 feet. Pile driving could widen the range of the impacts. Construction of the basic foundation or excavated areas with pile driving techniques could cause intermittent noise levels to be above 85 dBA for receptors within approximately 360 feet and above 80 dBA within 650 feet. For any receptor within 1,200 feet of the alignment, pile driving phases could cause intermittent noise levels up to 75 dBA. Activities related to lifting and connecting guideway sections, constructing the top deck, installing guideway equipment, or erecting ancillary structures would require continued (longer-term) use of heavy equipment, but not at the intense levels expected during the foundation phases. Excavation for foundations and placement of concrete columns could require crews to work at each column location along the alignment for several weeks at a time. Intermittent construction activity at each location over a total of two years would be required to complete on-the-ground construction activities.

Noise-sensitive land uses (see Table 3.11-4) could be affected by the construction work. In the vicinity of San Leandro Street and the Coliseum BART Station, construction of the guideway and maintenance facility would be approximately 600 feet southeast of the nearest residential areas. Other residential areas in the study area are no closer than about 700 to 800 feet from AGT alignment. Hotels are as near as approximately 100 feet from the alignment. Portions of recreational facilities adjacent the alignment could also be affected by construction noise. Recreational uses are considered to be sensitive to construction noise during the daytime only. The impacts would vary month-by-month, but they would be most intense during the earliest phases of construction, especially during the weeks of construction of the foundation or excavation when rock drilling, water-jet excavation, or pile driving could be necessary. Residential areas within approximately 1,200 feet of the foundation or excavation work, and

hotels within approximately 650 feet, would experience short-term and intermittent significant noise impacts during pile driving phases.

Commercial uses (including office buildings and restaurants) and industrial uses are more commonly located closer to the alignment than the residential and hotel uses identified above; however, they are also more tolerant of noise increases. For example, between Elmhurst Channel and Coliseum Way, the construction right-of-way for the area of the alignment would be within 60 feet of three to four commercial properties west of Hegenberger Road. As with the effects that could occur at noise-sensitive residences and hotels, the intensity of construction noise at commercial uses would vary month-by-month, but they would be most intense during the earliest phases of construction, especially during the weeks of construction of the foundation or excavation. Short-term construction-related noise levels that would occur at office buildings and restaurants in the corridor are compared with the applicable BART specifications from Table 3.16-2 in Table 3.16-3. Although construction activities could at times exceed the noise levels for commercial areas in the BART specifications, contract documents would include the BART *Standard Specifications for Construction Contracts*, and adherence to these standards would be enforced by the construction management team. Office buildings, restaurants, other commercial uses, and industrial uses are not considered to be noise sensitive by FTA guidance. No noise-sensitive receptors are located at OIA.

Staging areas under consideration are two small (less than one acre) lots under the Hegenberger Road overpass along San Leandro Street and in the vicinity of the Doolittle Drive and 98th Avenue and a larger site (at least two acres) for material storage and temporary offices, which would need to be identified. Although the staging areas would not be located adjacent to the residences of the study area, they could be located near the San Leandro Creek Trail or one of the hotels near Doolittle Drive (the Edgewater West or the Holiday Inn Express). If the staging area is within 160 feet of either hotel, intermittent noise levels at the receptor could exceed 80 dBA, which would cause a significant noise impact. Additionally, the construction right-of-way could occupy a portion of the proposed Bay Trail Extension, which would cause a significant impact.

The construction of the intermediate stops would result in temporary increased construction noise impacts on the neighboring land uses. Offices near the Edgewater Drive intermediate stop would not be substantially affected by the increased construction activity because they are separated from the construction by the width of Hegenberger Road. Hotels and other commercial uses near the proposed site for the intermediate stop in the vicinity of 98th Avenue and Airport Drive would be disturbed by an extended duration of construction noise.

In summary, the construction noise impacts caused by the AGT for construction of the guideway, stations, and ancillary facilities would be expected, at times, to exceed the thresholds of Table 3.16-2 and would be considered significant for noise-sensitive receptors in the vicinity of the alignment. (S)

Median Option. In the event engineering design refinements require use of the median instead of the preferred alternative alignment for the portion of Hegenberger Road between Elmhurst Channel and Coliseum Way, three to four commercial properties would have fewer noise

impacts. For commercial properties east of Hegenberger Road, the impacts would be increased. For the properties west of Hegenberger Road, the noise impacts related to construction of the guideway would decrease noticeably (by about 3 to 7 dBA, to a level of 101 to 108.1 dBA) compared to the preferred alternative. Mitigation Measures C-NV-1(i), C-NV-1(ii), and C-NV-1(iii) would apply to the Median Option if it is selected for this portion of the alignment. (PS)

Table 3.16-3
Construction-Related Noise Impacts on Receptors for Preferred Alternative

			AGT Alternative		***Median Option***	
Receptor	***Location***	***Construction Impact Criteria (Leq)***	***Maximum Leq (dBA). (Leq)***	***Level of Impact***	***Maximum Leq (dBA) (Leq)***	***Level of Impact***
Residences	Homes on 70th and 71st, near BART and Hawley Street	75	76.7	**S**	N/A	N/A
Residences	Homes on 70th and 69th, near Snell and Hawley Streets	75	78.0	**S**	N/A	N/A
Medical Office	Building at 675 Hegenberger Road	85	109.9	**S**	103.3	**S**
Restaurant	Denny's: 601 Hegenberger Road	85	108.1	**S**	101.9	**S**
Restaurant	Sam's Hofbrau: 595 Hegenberger Road	85	110.3	**S**	108.1	**S**
Hotel	Days Inn: 8350 Edes Ave.	80	84.9	**S**	N/A	N/A
Hotel	Holiday Inn: 500 Hegenberger Road	80	86.4	**S**	N/A	N/A
Office	Bank of America: 303 Hegenberger Road	85	95.2	**S**	N/A	N/A
Hotel	Marriott Under Construction: Hegenberger Loop Site	80	96.7	**S**	N/A	N/A
Residences	Homes on Empire Road, east of Hegenberger Loop	75	79.6	**S**	N/A	N/A
Regional Park	San Leandro Creek Trail	80	96.7	**S**	N/A	N/A
Hotel	Park Plaza Hotel: 150 Hegenberger Road	80	96.7	**S**	N/A	N/A
Restaurant	Francesco's: 8520 Pardee Drive	85	95.8	**S**	N/A	N/A
Office	United Labor Bank: 100 Hegenberger Road	85	104.7	**S**	N/A	N/A
Office	Warehouse Union: 99 Hegenberger Road	85	93.0	**S**	N/A	N/A
Hotel	Edgewater West: Doolittle Gateway Site	75	103.9	S	N/A	N/A
Hotel	Hilton Hotel: 1 Hegenberger Road	75	84.7	**S**	N/A	N/A
Hotel	Holiday Inn Express: 66 Airport Drive	75	93.2	**S**	N/A	N/A
Regional Park	Proposed Bay Trail Extension	80	103.7	**S**	N/A	N/A
Golf Course	Lew F. Galbraith Golf Course	80	96.7	**S**	N/A	N/A

Source: EIP Associates, 2001.
Notes: Other commercial uses with limited or no noise and vibration sensitivity are not shown.
Construction noise Leq assumes impact pile driving would be necessary.
N/A = significance determination not applicable for non-sensitive uses, or no change for receptor under option.
LTS = Less-than-significant impact, PS = Potentially significant impact, S = Significant impact.

Mitigation Measures. The following best management practices for noise control, if implemented, would be likely to provide a noise reduction of at least 5 dBA; this would be the minimum improvement resulting from installation of a temporary barrier, enclosure, or shield close to a loud piece of equipment. The noise reductions provided by the following mitigation measures would be sufficient to reduce project impacts to residential areas to a less-than-significant level, but impacts to hotels, outdoor recreational areas, and other commercial uses would remain significant and unavoidable. (SU)

C-NV-1(i) *Implement Best Management Practices to Reduce Construction Noise.* BART shall incorporate the following practices into the construction documents to be implemented by the contractor:

a. Maximize the physical separation between noise generators and noise receptors. Such separation includes, but is not limited to, the following measures:

- provide enclosures for stationary equipment and barriers around particularly noisy areas on the site or around the entire site;
- use shields, impervious fences, or other physical sound barriers, to inhibit transmission of noise to sensitive receptors; and
- locate stationary equipment to minimize noise impacts on the community;

b. Schedule construction activity that produces higher noise levels during less noise-sensitive hours (normally 7 a.m. to 7 p.m.). Minimize noise intrusive impacts during the most noise-sensitive hours (normally 7 p.m. to 7 a.m.) by planning noisier operations during times of highest ambient noise levels. Sheet pile driving will be restricted to daylight hours under ordinary circumstances. Should unforeseen circumstances require sheet pile driving at night, BART will advise the immediate neighbors.

c. Select haul routes for removal of excavation materials in conjunction with the City of Oakland such that noise-sensitive areas, including residences, hotels, and outdoor recreation areas, are avoided as much as possible.

C-NV-1(ii) *Provide Noise Buffer or Sound Barrier between Construction Activities and Noise-Sensitive Receptors.* If the construction right-of-way is within 700 feet of a residential area, 400 feet of a hotel, or 220 feet of another commercial use, BART shall require that the contractor reduce construction noise to or below BART's construction noise thresholds. The thresholds can be achieved by enclosing noisy equipment or constructing temporary noise barriers to the appropriate height(s) (approximately 8 to 12 feet).

C-NV-1(iii) *Reduce Noise from Pile Driving.* If pile driving is planned within 1,200 feet of residences, or within 650 feet of hotels or in-use outdoor recreation areas, the following technologies shall be used as an alternative to meet BART's noise and vibration criteria: cast-in-drilled-hole (CIDH) piles, pre-drilled piles, soil-mix wall technology, shielded pile drivers, or vibratory pile drivers. This measure will either eliminate the need to drive piles, or reduce the force and duration necessary to install piles. Shielded pile drivers or vibratory pile drivers shall be used only where geotechnical conditions allow.

Impact C-NV-2. Construction-related vibration annoyance
Construction of the guideway would require short-term use of drilling rigs, possibly specialized water-jet excavators or equipment for installation of shoring and grouting, trucks to remove excavated material and deliver structural concrete, cranes, backhoes, and other miscellaneous equipment. The foundation columns and piles would be placed using CIDH techniques or pile driving.

Should typical pile driving be used, depending upon the characteristics of the soils and geologic strata surrounding the impact location, ground-borne vibration levels above 80 VdB could radiate outward for distances up to 400 feet during impacts. Occupants of office buildings and hotels, and patrons of restaurants, within about 125 feet of the pile driving could experience significant effects over the 90 VdB threshold for transient effects. During all other periods of construction, other heavy equipment could cause sustained ground-borne vibration levels to be as high as 80 VdB within 60 feet of the activity. At any location along the alignment, pile driving would not be expected to occur for longer than several weeks. Buildings closest to the Doolittle Drive tunnel portion of the alignment would be most likely to experience the adverse impacts because sheet pile driving would be necessary to maintain a construction corridor to the tunnel and horizontal headers would need to be driven to support the roadway overhead.

Other construction activities, such as use of drilling rigs or other general use of heavy equipment would cause longer-term ground-borne vibration. Within the construction right-of-way, haul trucks passing with material loads, or movement of bulldozers and cranes, would be routine and cause longer-term effects due to the duration of activity. These routine activities would cause significant annoyance effects at hotels, office buildings, and restaurants within about 60 feet of the right-of-way. United Labor Bank and the Edgewater West hotel at the Doolittle Gateway site could experience significant, sustained vibration impacts from routine construction activity. The segment of the alignment west of Hegenberger Road between Elmhurst Channel and Coliseum Way would cause the intensity of significant impacts to increase for the Employment Development Department, Denny's, and Sam's Hofbrau.

The construction of the intermediate stops would result in temporarily increased vibration impacts on the neighboring land uses. Offices near the Edgewater Drive intermediate stop would not be substantially affected by the increased construction activity because they are distanced by the width of Hegenberger Road. Offices and hotels near the proposed site for the intermediate stop in the vicinity of 98th Avenue and Airport Drive would be disturbed by an extended duration of construction activity.

In summary, the short-term ground-borne vibration impacts from pile driving associated with construction of the AGT guideway, stations, and ancillary facilities would be considered potentially significant for occupants of office buildings and hotels, and patrons of restaurants, within 400 feet of the activity; however, ground-borne vibration from longer-term construction activities would cause significant impacts, especially to hotels and other vibration-sensitive uses within 60 feet of the right-of-way. (S)

Median Option. In the event engineering design refinements require use of the median instead of the preferred alternative alignment for the portion of Hegenberger Road between Elmhurst

Channel and Coliseum Way, the construction of the AGT would not expose fewer vibration-sensitive receptors to significant effects; however, the intensity of impacts considered significant under the preferred alternative would decrease for Sam's Hofbrau, Denny's restaurant, and the Employment Development Department building, but would still be present at a reduced level of impact. Mitigation Measure C-NV-2(i) would apply to the Median Option if it is selected for this portion of the alignment. (PS)

Mitigation Measures. Implementation of Mitigation Measure C-NV-1(i), i.e., implement best management practices to reduce construction noise, would also reduce ground-borne vibration. To further reduce this impact, the following additional measure is identified. Although implementation of this measure would minimize the effects of construction-related vibration on building occupants, the impact would remain significant and unavoidable. (SU)

C-NV-2(i). *Mitigate Construction Vibration Effects on Occupants of Nearby Land Uses.* If pile driving is planned within 400 feet of hotels, office buildings, or restaurants, the following technologies shall be used as an alternative to meet BART's noise and vibration criteria: cast-in-drilled-hole (CIDH) piles, pre-drilled piles, soil-mix wall technology, shielded pile drivers, or vibratory pile drivers.

Impact C-NV-3. Construction-related vibration structural damage

The threshold for human perception of vibration is much lower than the damage threshold for structures, which means that annoyance impacts are more likely than structural effects. The project corridor does not include any extremely fragile historic buildings that would be sensitive to potential damage from vibration. Vibration from routine construction activities would not be expected to cause damage to neighboring structures. However, pile driving could occur intermittently at locations in the corridor and, within approximately 50 feet of typical pile driving activities, ground-borne vibration can exceed 0.20 inches per second ppv during impacts. This means that fragile buildings or structures within 50 feet of typical pile driving activities could experience ground-borne vibration over the damage threshold. Construction of the intermediate stops would increase the length of pile driving time. Properties within this radius of impact include offices (Employment Development Department and United Labor Bank), restaurants (Sam's Hofbrau and Denny's), the Edgewater West hotel, and other infrastructure, including, but not limited to, roadway support structures, utility lines, or the OIA airport instrumentation lighting system. Table 3.16-4 includes the receptors that could experience potentially significant impacts. (PS)

Table 3.16-4
Construction-Related Vibration Impacts on Structures Under the Preferred Alternative

		Level of Impact	
Receptor	***Location***	***AGT***	***Median Option***
Residences	Homes on 70th and 71st, near BART and Hawley Street	**LTS**	N/A
Residences	Homes on 70th and 69th, near Snell and Hawley Streets	**LTS**	N/A
Medical Office	Building at 675 Hegenberger Road	**PS**	**PS**
Restaurant	Denny's: 601 Hegenberger Road	**PS**	**LTS**
Restaurant	Sam's Hofbrau: 595 Hegenberger Road	**PS**	**PS**
Hotel	Days Inn: 8350 Edes Ave.	**LTS**	N/A
Hotel	Holiday Inn: 500 Hegenberger Road	**LTS**	N/A
Office	Bank of America: 303 Hegenberger Road	**LTS**	N/A
Hotel	Marriott Under Construction: Hegenberger Loop Site	**LTS**	N/A
Residences	Homes on Empire Road, east of Hegenberger Loop	**LTS**	N/A
Regional Park	San Leandro Creek Trail	N/A	N/A
Hotel	Park Plaza Hotel: 150 Hegenberger Road	**LTS**	N/A
Restaurant	Francesco's: 8520 Pardee Drive	**LTS**	N/A
Office	United Labor Bank: 100 Hegenberger Road	**PS**	N/A
Office	Warehouse Union: 99 Hegenberger Road	**LTS**	N/A
Hotel	Edgewater West: Doolittle Gateway Site	**PS**	N/A
Hotel	Hilton Hotel: 1 Hegenberger Road	**LTS**	N/A
Hotel	Holiday Inn Express: 66 Airport Drive	**LTS**	N/A
Regional Park	Proposed Bay Trail Extension	N/A	N/A
Golf Course	Lew F. Galbraith Golf Course	N/A	N/A

Source: EIP Associates, 2000.
Notes: Other commercial uses with limited or no noise and vibration sensitivity are not shown.
N/A = significance determination not applicable for non-sensitive uses, or no change for receptor under option.
LTS = Less-than-significant impact, PS = Potentially significant impact, S = Significant impact.

Median Option. In the event engineering design refinements require use of the median instead of the preferred alternative alignment for the portion of Hegenberger Road between Elmhurst Channel and Coliseum Way, one less restaurant use (Denny's) would be affected by construction-related vibration compared to the preferred alternative. Mitigation Measure C-NV-3(i) would apply to the Median Option if it is selected for this portion of the alignment. (PS)

Mitigation Measures. Implementation of Mitigation Measure C-NV-1(i), i.e., implement best management practices to reduce construction noise, and C-NV-2(i), i.e., mitigate construction vibration effects on occupants of nearby land uses, would also reduce the vibration effects of this impact. To further reduce the impacts, the following additional measure is identified. Although implementation of this measure would minimize the effects of construction-related vibration on structures in the project corridor, the impact would remain significant. (SU)

C-NV-3(i) *Reduce Construction Vibration Effects on Structures.* BART shall conduct a pre-construction survey of existing conditions. The survey shall include buildings and other infrastructure, including, but not limited to, roadway support structures, utility lines, or the OIA airport instrumentation lighting system. If recommended by the geotechnical engineer, for structures or facilities within 50 feet of pile driving, BART shall require ground-borne vibration monitoring of vibration-intensive activities.

Air Quality

Standards of Significance

A significant air quality construction impact would occur if construction-related best management practices for construction activities, as recommended by the Bay Area Air Quality Management District, were not implemented.

Impact C-AQ-1. Temporary air emissions

Quantitative construction impacts are not required by BAAQMD for the purpose of demonstrating conformity or identifying potential impacts. Instead, a qualitative analysis is presented detailing those measures that should be implemented to ensure a less-than-significant impact during the construction of the preferred alternative. If these measures are implemented, ensuring that the construction would result in a less-than-significant impact, then the preferred alternative is considered to have shown conformity.

During construction, local PM_{10} emissions are of concern. Mobile construction equipment, such as bulldozers, scrapers, graders and haul trucks, as well as vehicle travel on paved and unpaved surfaces, cause the majority of fugitive dust emissions while construction is underway. Exhausts from construction vehicles add to the total PM_{10} emissions. The tunneling and construction needed for the AGT would result in fugitive PM_{10} emissions from drilling, earth moving and hauling equipment.

Though construction of the AGT is expected to last up to two years, construction would be done in segments, so no one receptor would experience continuous construction impacts the entire two years. However, the project corridor is a populated, urban area and construction activities associated with the AGT may become a significant source of PM_{10}. To ensure the construction phase for the preferred alternative does not become a significant source of PM, mitigation measures would be necessary. (PS)

Median Option. In the event engineering design refinements require use of the median instead of the preferred alternative alignment for the portion of Hegenberger Road between Elmhurst Channel and Coliseum Way, impacts from temporary air emissions would be the same as the preferred alternative. The Median Option would not increase or diminish these potential effects. Mitigation Measure C-AQ-1(i) would apply to the Median Option if it is selected for this portion of the alignment. (PS)

Mitigation Measures. The following mitigation measures are appropriate for small construction sites (4 acres and under), are in accordance with the BAAQMD/CEQA guidelines, and would reduce PM_{10} and dust emissions to a less-than significant level. (LTS)

C-AQ-1(i) *Implement Best Management Practices to Reduce Construction-Related Air Emissions.* BART shall require that its contractor implement the following practices during the construction of the Connector and related facilities.

- Watering all active construction areas twice daily.
- Covering all trucks hauling soil, sand, and other loose materials or requiring all trucks to maintain at least two feet of freeboard
- Applying water three times daily to paved or applying non-toxic soil stabilizers on all unpaved access roads, parking areas, and staging areas at the construction site.
- Sweeping all paved access roads, parking areas, and staging areas, at construction sites, daily with water sweepers.
- Sweep adjacent public streets daily with water sweepers if visible soil material is carried onto them.

The Port requires the following measures be included within the plans and specifications for construction projects at the Airport. These additional mitigation measures will further ensure that PM_{10} impacts remain less than significant at construction sites.

- Enclose, cover, water twice daily or apply (non-toxic) soil binders to exposed stockpiles.
- Install hay bales, sandbags, or other erosion control measures to prevent silt runoff to public roadways and wetlands.
- Require that the construction contractor use California regulated diesel fuel for all diesel powered equipment.
- Require that the construction contractor use construction equipment that is properly tuned and maintained in accordance with manufacturer specifications.

Energy

Standards of Significance

A significant energy construction impact would occur if construction activities related to the preferred alternative or Median Option consumed nonrenewable energy resources in a wasteful, inefficient, or unnecessary manner.

Impact C-EN-1. Consumption of energy

Table 3.16-5 presents energy consumption factors for construction of guideways and stations. Energy consumption for the construction of the two intermediate stations is assumed to be equivalent to the Coliseum and the Airport AGT Stations, on a square foot basis. The total energy budget for construction of the preferred alternative is estimated at 740 billion Btu.

Table 3.16-5 Energy Requirement for AGT Alternative Construction (billion Btu)		
AGT Component	**Energy Consumption Factor (billion Btu)**	**Energy Used (billion Btu)**
Coliseum AGT Station (8,033 sq. ft.)	0.009/sq. ft.	72
Airport AGT Station (10,565 sq. ft.)	0.009/sq. ft.	95
Maintenance Facility (15,406 + 6,460 sq. ft. for future expansion)	0.009/sq. ft.	197
Aerial guideway (2.8 mile)	55.63/guideway mile	155
Tunnel alignment (0.08 mile)	328.33/guideway mile	26
Retained cut (0.16 mile)	163.11/guideway mile	26
At-grade guideway (0.18 mile)	19.11/guideway mile	3
Intermediate Stops (2 at 9,300 sq. ft.)	0.009/sq. ft.	166
Total energy		740

Source: BART, 1995; VBN Architects, August 11, 2000.

Because the preferred alternative has only been conceptually designed, details regarding energy conservation practices have not been specified. It is expected that BART would require contractors to employ good construction practices and energy management techniques for its construction projects. However, in the absence of clear energy conservation guidelines for the proposed project construction, it is conservatively assumed that there could be potential inefficient energy use during construction of the AGT. For example, unplanned and inefficient delivery of materials to the AGT stations could increase the number of truck trips, resulting in wasteful use of energy. If the construction equipment and machinery were not in good condition, they could result in the wasteful consumption of energy. Equipment and vehicles left idling could also result in unnecessary use of energy.

A conservative assumption is made that the AGT construction process could have a potential to result in a wasteful, inefficient, and unnecessary use of energy, which would be considered a potentially significant effect. (PS)

Median Option. In the event engineering design refinements require use of the median instead of the preferred alternative alignment for the portion of Hegenberger Road between Elmhurst Channel and Coliseum Way, potential energy impacts would be the same as the preferred alternative. The Median Option would not increase or diminish these potential effects. Mitigation Measure C-EN-1(i) would apply to the Median Option if it is selected for this portion of the alignment. (PS)

Mitigation Measures. Based on conservative assumptions, construction of the preferred alternative and the Median Option could result in potentially significant energy impacts. The following measure would reduce wasteful energy consumption during the construction phase to a less-than-significant level. (LTS)

C-EN-1(i) *Develop and Implement Construction Energy Conservation Plan.* BART shall require the contractors to adopt the construction energy conservation measures including, but not limited to, those listed below:

- use energy-efficient equipment and incorporate energy-saving techniques in the construction of the Connector;
- avoid unnecessary idling of construction equipment;
- consolidate material delivery as much as possible in order to ensure efficient vehicle utilization;
- schedule delivery of materials during non-rush hours to maximize vehicle fuel efficiency;
- encourage car-pooling by construction workers; and
- maintain equipment and machinery, especially those using gasoline and diesel, in good working condition.

Hazardous Materials

Standards of Significance
A significant hazardous materials construction impact would occur if construction activities related to the preferred alternative created a potential public or environmental health hazard; an undue potential risk for health-related accidents; or resulted in a safety hazard for people residing or working in the project area.

Impact C-HM-1. Exposure to known contaminated sites or to accidental releases of hazardous materials

The health and safety of construction workers and the general public under the AGT could be adversely affected by exposure to hazardous materials along the project corridor. Soil removal for the AGT alignment could expose workers to contaminated soil, if excavation encounters contaminants released from nearby known or suspected hazardous waste sites (see Figure 3.14-1). Additionally, exposure could occur if previously unknown contamination is encountered. There may be potentially contaminated sites that have yet to be identified at OIA facilities and elsewhere in the project corridor. Extensive dewatering of construction areas could cause groundwater inflow to the area causing migration of "off-site" contaminants to soil and groundwater within the construction right-of-way. Unintended releases of hazardous materials could occur from a tank rupture during removal or spills of materials used in construction. Typical hazardous materials that may be used during construction activities include motor oils, fuel, solvents, cleaning fluids, and lubricants**.** There is a potential for dermal contact and inhalation of contaminants from these exposures. (PS)

The alignment for the preferred alternative would require the construction on properties currently listed on the state regulatory database lists. Specific properties listed in Table 3.14-1 within the proposed AGT alignment include:

- Environmental Innovations Corp. at 675 Hegenberger Road (Table 3.14-1 map ID #10);
- CALTRANS at 555 Hegenberger Road (map ID #14);
- Chevron service station at 451 Hegenberger Road (map ID #22);
- UNOCAL (Circle K) station at 449 Hegenberger Road/Edgewater (Map ID #21 on Table 3.14-1).
- Oakland International Trade Center at 625-655 Hegenberger Road (map ID #11).

Median Option. In the event engineering design refinements require use of the median instead of the preferred alternative alignment for the portion of Hegenberger Road between Elmhurst Channel and Coliseum Way, the potential exposure to contaminated sites would be less because the Oakland International Trade Center would not be within the alignment. However, Mitigation Measures C-HM-1(i), C-HM-1(ii), and C-HM-1(iii) would apply to the Median Option if it is selected for this portion of the alignment. (PS)

Mitigation Measures. Adherence to all of the following mitigation measures would satisfy the regulatory requirements regarding hazard identification and would mitigate this potentially significant impact to a less-than-significant level. (LTS)

C-HM-1 (i) *Conduct a Phase I Environmental Site Assessment.* BART shall require that a Phase I Environmental Site Assessment be prepared for the selected alignment and station locations, according to established ASTM guidelines. As necessary, BART will require the development and implementation of a soil and groundwater characterization program at all excavation locations in proximity to listed hazardous waste sites identified in the Phase I Site Assessment.

The soil and groundwater characterization program shall identify those excavation areas that will require development and implementation of appropriate remediation measures. The mitigation measures described below apply only to areas where contact with contaminated soil or groundwater is suspected.

C-HM-1 (ii) *Prepare and Implement a Worker Health and Safety Plan Prior to Start of Construction Activities.* The Health and Safety Plan shall, at a minimum, identify:

- all contaminants that could be encountered during excavation activities;
- all appropriate worker, public health, and environmental protection equipment and procedures;
- emergency response procedures;
- the most direct route to a hospital; and

- the site Safety Officer.

The plan shall require documentation that all workers have reviewed and signed the plan. The plan shall be prepared by the contractor.

C-HM-1 (iii) *Prepare and Implement a Soil Management Plan.* The Soil Management Plan shall identify the soil sampling and handling procedures necessary to avoid or minimize worker and public exposure and to avoid or minimize the potential for off-site migration of contaminants. The Soil Management Plan shall also identify the range of pre-determined soil disposition options (reuse, landfill disposal, etc.) according to the concentrations of contaminants in the excavated soil. The Soil Management Plan shall also identify the construction procedures to be implemented that will minimize the excavation and excess handling of contaminated soil. The Soil Management Plan shall be prepared by the contractor for submittal, review, and approval by the RWQCB.

C-HM-1 (iv) *Prepare and Implement an Excavation Water Treatment and Handling Plan.* The Water Treatment and Handling Plan shall present an engineering design for an on-site excavation water treatment system, designed to reduce contaminant concentrations in excavation water to levels acceptable for permitted discharge. The treated water can be discharged to either the stormwater system or the sanitary sewer system, as long as all the appropriate permits are obtained by the contractor. The Water Treatment and Handling Plan shall be prepared by the contractor for submittal, review, and approval by either the RWQCB (for stormwater discharge) or by EBMUD (for sanitary sewer discharge).

Environmental Justice

Standards of Significance
A significant environmental justice construction impact would occur if construction activities related to the preferred alternative or Median Option created a significant unavoidable impact for an environmental justice community.

Impact C-EJ-1. Impact of Construction Activities on Environmental Justice communities

Construction of the preferred alternative would not affect either the North of BART or Columbian Gardens residential areas. Both of these communities are physically separated from any construction activities associated with the preferred alternative. Intervening land uses between the North of BART and Columbian Gardens communities, mostly commercial and industrial uses, would act as effective buffers between the construction activities associated with the preferred alternative and residents of these communities. The intervening land uses would provide an effective shield from potential construction-period effects such as increased noise, dust, visual disruption, or any other construction-related effect. As a result, neither the North of BART or Columbian Gardens communities would experience an adverse effect from construction activities associated with the preferred alternative. (NI)

Cumulative Analysis

The construction of the eight development projects in the project corridor expected to be occupied by 2005 along with the Connector project could result in cumulative construction effects. These projects include about 730 hotel rooms, nearly 2 million square feet of office, research and development, and distribution space, and a transit system running the length of the Hegenberger Road Corridor.

Cumulative Construction Traffic and Construction Noise

The AGT would require construction of AGT stations at the Coliseum BART Station and OIA, intermediate stations, the AGT guideway, and an AGT maintenance facility. It is estimated that the actual ground-level construction would take approximately two years followed by a third year of operating system equipment installation and test and acceptance activities. However, the construction of the AGT guideway would be implemented in stages (segment by segment) and concurrent construction activities throughout the whole project corridor at any given time would be remote. The preferred alternative and Median Option would also require staging areas during the period of construction.

Construction of the eight projects may not coincide geographically or in time with the Connector project. Nevertheless, given the number of development projects and their magnitude and the length of construction for the AGT system, it is reasonable to assume that some of the projects would occur within the same time frame and would affect the Hegenberger Road Corridor. Potentially significant cumulative construction impacts could include:

- increased congestion and delays due to construction vehicles,
- diminished access for businesses,
- boarded up construction zones that visually alter streetscape,
- diminished emergency responsiveness because of congestion and lane closures,
- increased erosion and sedimentation due to disturbance at multiple construction zones,
- potential impacts on adjacent wetlands and other sensitive biological habitats,
- increased noise levels from construction vehicles and equipment,
- increased air emissions from fugitive dust and construction equipment exhaust at multiple construction zones,
- increased energy consumption, and
- increased change of accidental releases of hazardous materials.

These combined effects from cumulative projects are expected to occur throughout the construction period of the Connector project. Land use and visual effects would be considered inconveniences but would not be expected to significantly detract from the regional commercial

nature of the corridor. Erosion, sedimentation, and accidental releases of hazardous materials are considered site-specific impacts and relatively straightforward to control or mitigate at the construction site, so that cumulative effects are not expected to be significant.

Cumulative biological resources, noise, air quality, and transportation impacts would be considered significant. Mitigation Measures C-BR-l(ii) and C-BR-3(i) for biological resources require sound general construction practices in areas adjacent to wetlands and preconstruction surveys for nesting birds would mitigate significant cumulative impacts on wetlands and other sensitive biological habitat in the project corridor. Mitigation Measures C-NV-l(i) (noise), C-EN-1(i) (energy), and C-AQ-l(i) (air quality) requiring implementation of Best Management Practices and energy conservation measures to reduce construction related noise impacts, energy consumption, and air emission respectively, would mitigate significant cumulative noise, energy, and air quality effects. Nevertheless, noise impacts from the use of heavy construction equipment and the size and duration of construction related to the cumulative projects along the Hegenberger Corridor would likely remain significant and unavoidable.

Construction management plans and specific contractor practices would be needed to reduce cumulative construction impacts. These plans will be filed with the City of Oakland as part of the individual development applications and enable the City to coordinate traffic movement, detours, and emergency response. Mitigation Measure C- TR-l (ii), requiring a construction traffic management plan, defines the type of issues and measures to be adopted on an individual project and that can be coordinated by the City to address cumulative traffic effects. However, given the proximity and scale of the development projects currently proposed or under construction along the Hegenberger Corridor in conjunction with construction traffic related to the AGT, it is reasonable to expect that vehicle access and local vehicle circulation along Hegenberger Road, as well as transit, pedestrian, and bicycle movements, would be significantly disrupted. Truck trips, the arrival and departure of construction crews, and materials hauling and delivery would impede traffic flow, result in additional delays, and make access to local businesses more circuitous. Additionally, on-street parking spaces would be displaced. While the disruption in front on any particular business would be relatively short term and mitigated by individual construction transportation management plans filed with the City of Oakland, the overall congestion and delays along the Hegenberger Corridor from cumulative construction activities, though temporary, would remain significant and unavoidable.

Implementation of mitigation measures (including construction management plans and specific contractor practices) provided in this construction analysis would reduce all cumulative construction impacts, except transportation-related and noise impacts, to a less-than-significant level. Cumulative construction-related transportation and noise impacts would remain significant and unavoidable for the preferred alternative.

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