

INTRODUCTION TO THE ADAPTING TO RISING TIDES EXISTING CONDITIONS AND STRESSORS REPORT

The Adapting to Rising Tides (ART) project evaluated the current condition of shoreline and community assets, and the stressors affecting them, because understanding existing conditions and stressors can inform an understanding of individual asset resilience (or lack thereof) to projected climate impacts, including sea level rise and storm events. Stressors can also provide information on current and future trends and how those trends may affect resilience. The existing conditions and stressors were analyzed and summarized for each asset category included in the ART project assessment. This analysis served as a foundation for the ART vulnerability and risk assessment, which examined asset exposure to five potential climate impacts, sensitivity of assets to these impacts, and the ability of assets to accommodate or adjust to these impacts with little financial or structural intervention.

The following Existing Conditions and Stressors report chapter includes:

- a definition of the asset category;
- a synthesis of information about current conditions and stressors; and
- discussion of these conditions through the lenses of sustainability organized by society and equity, environment, economy and governance.

The complete ART Existing Conditions and Stressors Report is available at the ART Portfolio website.

AIRPORT

I. Definition

Oakland International Airport (OAK) is located in the City of Oakland, about 6.5 miles southeast of downtown Oakland in Alameda County along San Francisco Bay (see Figure 1). OAK encompasses 2,600 acres and is owned and operated by the Port of Oakland, an independent department of the City of Oakland. The Port of Oakland was created in 1927 as an autonomous department of the City of Oakland under the exclusive direction of the Board of Port Commissioners by an amendment to the City’s Charter. The Port manages property stretching along 20 miles of the eastern shore of San Francisco Bay. OAK’s property is divided into North Field and South Field, and its facilities include terminal, airfield, parking, air cargo, general aviation, and maintenance facilities. Passenger terminal facilities, commercial airline service, and air cargo operations are concentrated at South Field while general aviation operations are concentrated at North Field.

II. Location and Facilities

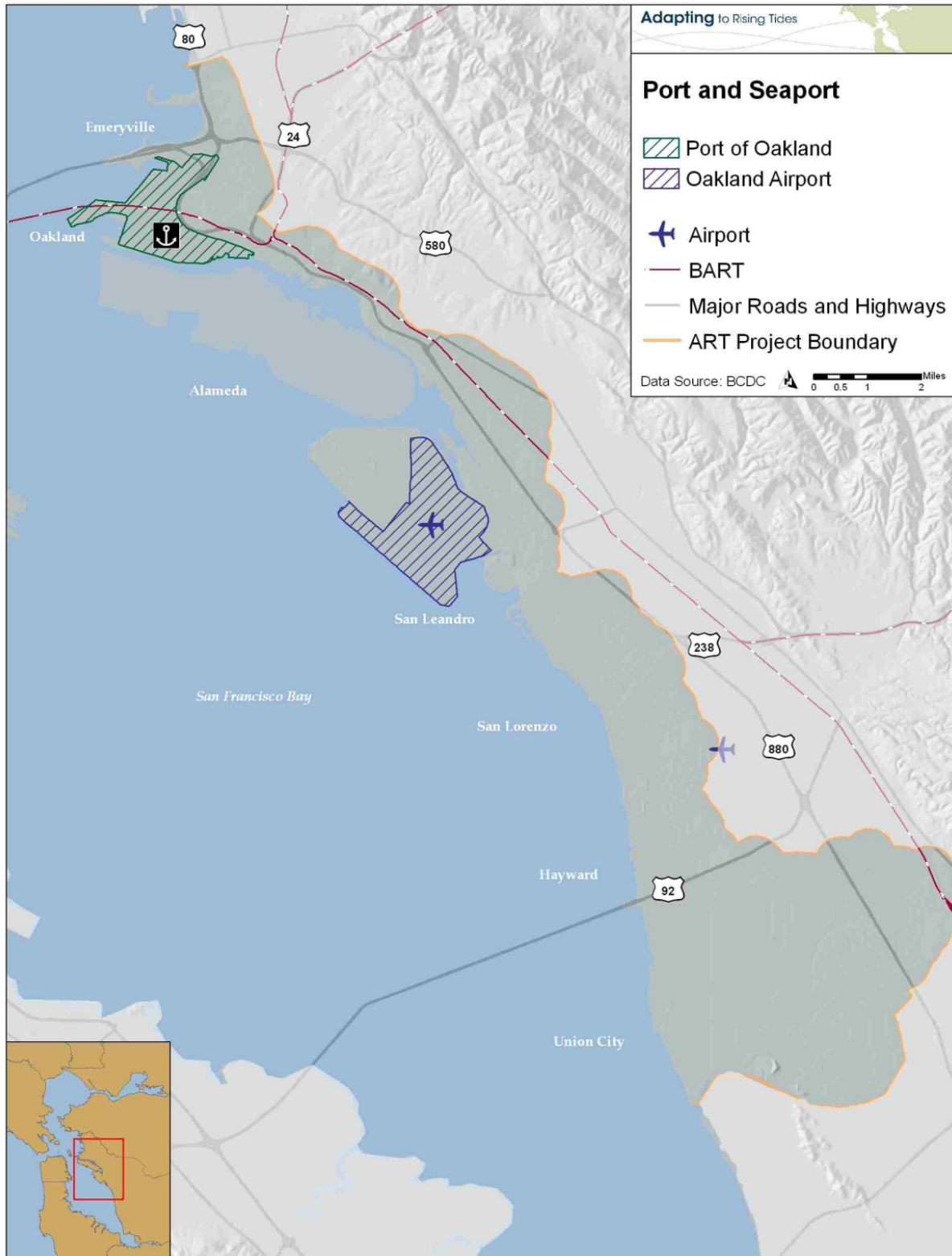
South Field has OAK’s primary air carrier runway (Runway 11/29) and North Field has three runways (Runway 9R/27L, Runway 9L/27R, and Runway 15/33). South Field’s Runway 11/29 provides service to larger commercial aircraft, including turbo-jet and turbo-fan aircraft, four-engine reciprocating powered aircraft, and turbo-props over 17,000 pounds. North Field’s three runways provide service to smaller aircraft, including general aviation and some air cargo. As Table 1 summarizes, the elevations of these critical runway facilities range from a low of only 1.8 feet above mean sea level to a high of only 8.7 feet.

Table 1. Oakland International Airport Runway Facilities

Runway	Length (ft)	Width (ft)	Surface Type	Runway end / Elevation (ft, MSL)	Runway end / Elevation (ft, MSL)
09L/ 27R	5,454	150	Asphalt	09L = 5.6	27R = 5.8
09R/ 27L	6,213	150	Asphalt	09R = 8.1	27L = 8.2
11/ 29	10,000	150	Asphalt	11 = 7.8	29 = 8.7
15/ 33	3,372	75	Asphalt	15 = 1.6	33 = 4.0

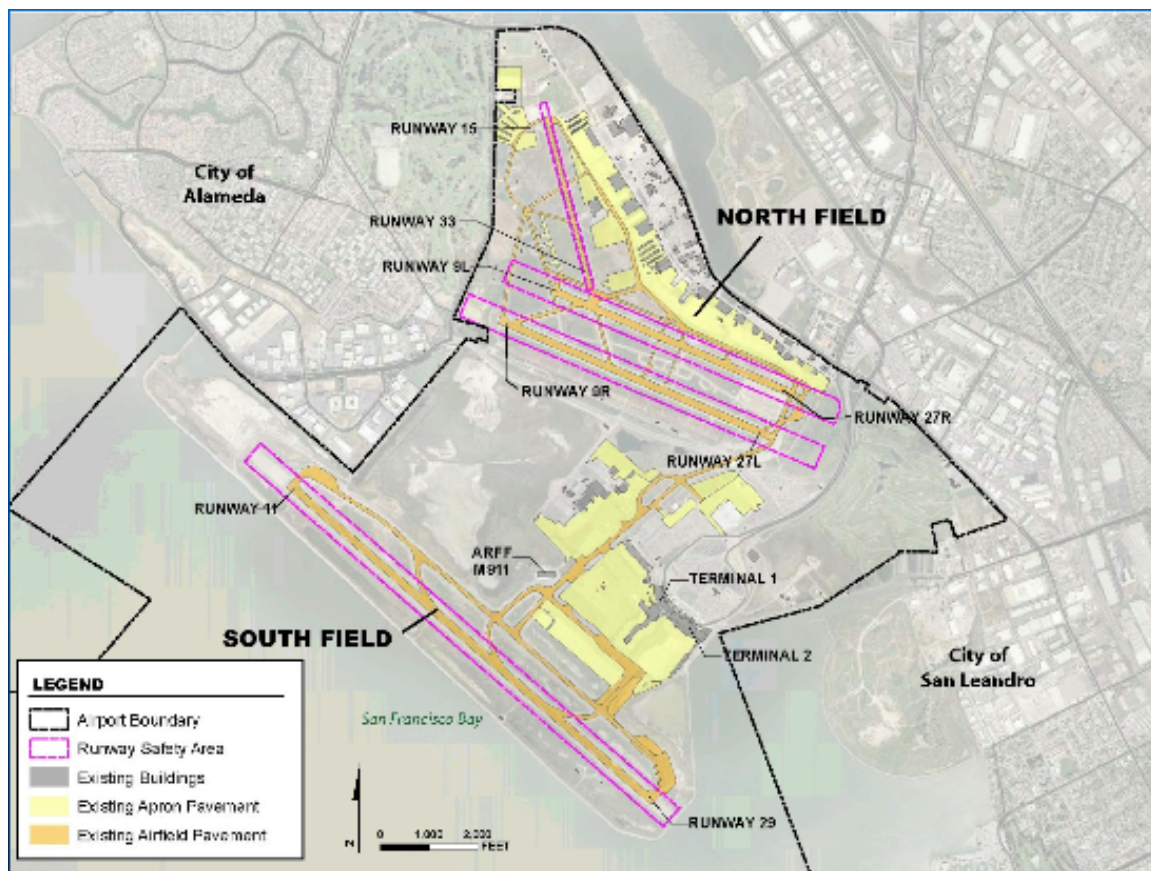
Source: FAA Form 5010 Summary.

Figure 1. Map of Port of Oakland Facilities, Airport and Seaport



Runways constitute the largest aviation land use at OAK at approximately 1,078 acres (Oakland Airport Master Plan, 2006) (See Figure 2). South Field, which is defined as the airport area south of Ron Cowan Parkway, contains 208 acres of passenger facilities, which include Terminals 1 and 2. Additionally, South Field holds 104 acres of air cargo facilities, the largest of which is the FedEx Metroplex (their West Coast hub operation). North Field (the airport area north of Ron Cowan Parkway) contains a variety of aviation land uses, the largest of which is general aviation (approximately 85 acres), including aircraft hangars, ramps, and three fixed base operators, KaiserAir, Business Jet Center, and Landmark Aviation. North Field also accommodates some air cargo facilities (approximately 30 acres), including Ameriflight, a small package carrier. South Field currently has 29 aircraft gates at two terminals: Terminal 1 with 16 aircraft gates and Terminal 2 with 13 aircraft gates.

Figure 2. Oakland International Airport Layout



Source: Oakland International Airport Master Plan.

III. Existing Plans and Future Capacity

Based on forecasts of the number of passengers and flights through the airport, the 2006 Airport Master Plan estimated a need for 46 to 50 total aircraft gates to efficiently handle demand between 2010 and 2012. Currently, the airport has a total of 29 gates. The Master Plan Forecasts assumed a 2010 passenger demand of 18 million passengers per year, based on the 2005 FAA Terminal Area Forecast (TAF) and similar forecasts made in the 2000 Regional Airport System

Plan (RASP). However, due to several factors—the national economic recession, airline competition, the steep and sudden increase in jet fuel prices, and several airline bankruptcies—the 2010 passenger projections were not met. Reflecting such changes in airport demand, new projections were evaluated in 2010 as part of the update to the RASP. The RASP's Baseline and Delay Report predicts a decline in passenger and aircraft operations at OAK until 2020, followed by a surge in activity. The 2020 aviation forecast predicts 300,600 annual aircraft operations, which includes all commercial, general, and cargo aviation activity, followed by a steady annual increase to 354,000 by 2035.

Airfield capacity at OAK is affected by its runway configuration and use patterns. The single air carrier runway on the South Field, Runway 11/29, is used by nearly all commercial flights. The three runways on the North Field have restrictions on turbojet operations due to noise ordinances and are used almost exclusively by general aviation and some charter and cargo flights. FAA regulations and airport policies dictate what type of planes can land on which runways. Aircraft with experimental or limited certification having over 1,000 horsepower or 4,000 pounds are restricted to Runway 11/29. It is preferred that aircraft landing at the North Field arrive on Runway 27L and depart on 9R or 27R. However, if these runways are unusable based on air traffic control instruction, then Runway 11/29 must be used. OAK has a 24-hour noise abatement procedure which prohibits turbojet- and turbofan-powered aircraft, turboprops over 17,000 pounds, four-engine reciprocating powered aircraft, and surplus military aircraft over 12,500 pounds from departing on Runways 27L and 27R or landing on Runways 9R and 9L (FAA Airport Master Record, 2011). However, these noise prohibitions can be waived in emergencies or whenever Runway 11/29 is closed due to maintenance, safety issues, high wind, or weather.

According to the 2011 Regional Airport System Plan Update forecast for OAK, traffic growth is not projected to be a significant issue in the future. Accommodating the 2035 growth in activity with today's airfield facilities is feasible at only a four-minute average aircraft delay, which is well below the FAA standard metric of 15 minutes as the point at which delays must be reported (Regional Airport System Plan Update, 2011). The practical annual capacity of OAK (including North Field and South Field operations) is estimated to be between 400,000 and 450,000 annual operations. With actual operations at fewer than 220,000 in 2010, airfield capacity is not expected to be reached until after 2035.

IV. Existing Stressors

Earthquakes are a major hazard throughout the Bay Area, and OAK's location on top of bay fill makes it particularly susceptible to liquefaction and shaking. As such, airport operations were affected by the 1989 Loma Prieta earthquake, in spite of its location over 40 miles from the epicenter. Runway 11/29, the airport's main 10,000-foot runway, built on hydraulic fill over Bay mud, was severely damaged by liquefaction; 3,000 feet of the runway sustained cracks, some of which were a foot wide and a foot deep (USGS, 1998). Spreading of the adjacent unpaved ground resulted in cracks up to 3 feet wide. Large sand boils appeared on the runway and adjacent taxiway, a few as wide as 40 feet (see Figure 3).

Figure 3. OAK's Main Runway after Loma Prieta Earthquake, with sand boils and cracks (above) and a close up of a sand boil on the main runway (below)



Sources: U.S. Geological Survey, Photo from 10/18/1989.

As a result, OAK was immediately shut down to evaluate runway damage. North Field's general aviation Runway 9R/27L was used to accommodate diverted air traffic for several hours before the main runway was reopened with a usable length of only 7,000 feet. This shorter runway length impacted cargo loads during takeoff. Over the 30 days following the earthquake, 1,500 feet of the 3,000-foot damaged section of the runway was repaired. An adjacent taxiway was also damaged by liquefaction. Repairs of this taxiway segment and the

final 1,500 feet of the main runway were completed six months later, with repair costs totaling approximately \$6.8 million, including \$3.5 million for runway repairs, \$2.2 million for taxiway repairs, and \$1.1 million for repair of other (non-liquefaction-related) damage. FAA funded approximately \$5.5 million of the repairs, with the remainder funded by OAK. Neither San Francisco International Airport nor San Jose International Airport was affected by liquefaction in the Loma Prieta earthquake.

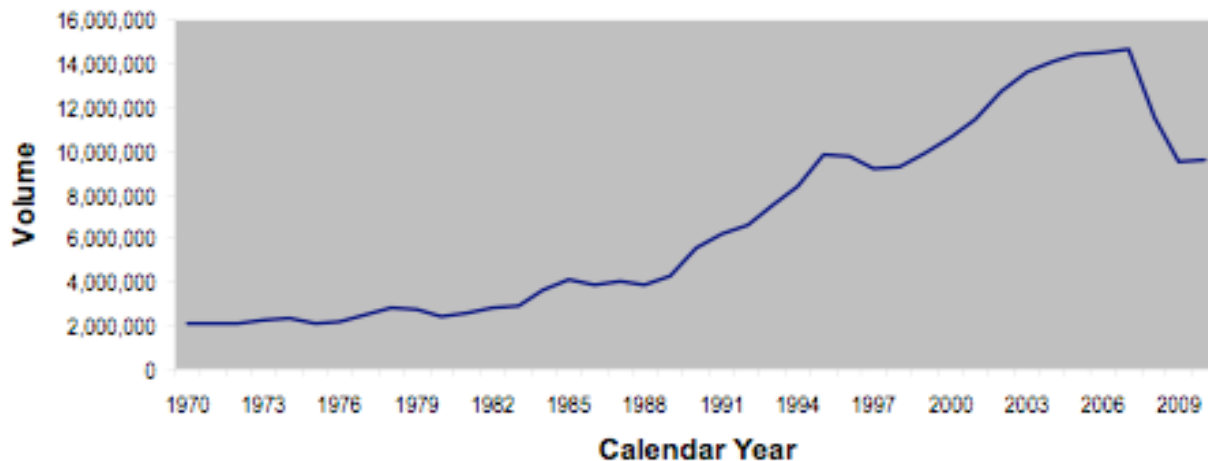
A perimeter dike forms the southwestern shoreline of the airport property and protects the South Airport from flooding by waters of San Francisco Bay. The dike was constructed in three phases during the 1950's, '60s, and '70s, mainly from materials dredged from the Bay, for the purpose of "reclaiming" land on which to develop and expand OAK's facilities. Dredged materials (mainly sand) were used to fill the area behind the dike. Portions of the dike currently do not meet FEMA 100-year flood standards, and portions are susceptible to liquefaction in a major seismic event. The Port of Oakland plans to construct improvements to the perimeter dike to correct these deficiencies, enabling the dike to withstand severe storms and seismic events, protect the Airport from potential flooding, and meet FEMA certification standards. In addition, the planned improvements would help mitigate the effects of potential sea level rise due to global warming. The project is currently in the environmental review phase.

V. Economics/Jobs

Twelve scheduled passenger airlines currently serve OAK. Southwest Airlines dominates market share, serving nearly 74% of all OAK passengers in 2010 (Port of Oakland, 2011), followed by Alaska/Horizon Air and JetBlue at 6.7% and 6.5%, respectively. OAK is currently the largest operating hub in California for Southwest. The airport is also the North American West Coast hub for FedEx, the largest air cargo operator at OAK, which performs intermodal sort and distribution of freight and overnight packages from around the world from its OAK facilities. FedEx averaged 15 flights a day, handling 907 million pounds of cargo in 2010 (Port of Oakland, 2011). UPS also has a large cargo presence at Oakland, averaging four cargo flights per day in 2010, transporting a total of 174 million pounds of goods. Ameriflight and West Air also operate air cargo transportation services out of OAK.

In 2010, OAK carried 9,857,845 passengers, making it the 33rd busiest airport in the United States in terms of total passengers, according to Airports Council International-North America (see Figure 4). This number is down from a 2007 all-time high of 14,613,489 passengers, reflecting both the downturn in the economy as well as a shift in travel to San Francisco International Airport from key domestic markets (Port of Oakland, 2011).

Figure 4. Annual Passengers at OAK



Source: Port of Oakland, 2011.

In 2010 the airport handled 510,947 metric tons of cargo and had 219,652 total aircraft movements (landings and takeoffs), ranking 12th in the country by metric tons and 34th by total aircraft movements. The 2010 figures represent a 4% increase from 2009 levels in metric tons of cargo, but a 6% decrease in total aircraft movements.

In the Bay Area alone in 2010, aviation activity from OAK yielded 7,680 direct, 5,578 induced, and 1,408 indirect jobs, for a total of 14,466 (Martin Associates 2011). An additional 24,428 hospitality industry jobs are dependent upon OAK, and nationwide, over 383,000 jobs are estimated to be in some way related to aviation activity at OAK. These jobs generated \$4.2 billion in business revenue and \$1.9 billion in personal income. OAK also generated \$197 million in state and local taxes. Direct payments to the City of Oakland totaled \$3.2 million.

VI. Equity/Environment

OAK has a long history of working with its adjacent communities to develop programs that improve environmental quality and reduce the airport's negative impacts. For example, to reduce noise impacts on adjacent communities, the airport spent \$34 million to insulate 760 houses and five schools in the cities of Alameda and San Leandro, reducing the average interior sound level by five to seven decibels. To help improve air quality, OAK has a compressed natural gas fueling station that is open to the public and helps fuel taxis, parking shuttles, and door-to-door vans. The station pumps the equivalent of 35,000 gallons of gasoline per month (Port of Oakland, 2011). To protect water quality, the airport organizes workshops, conducts pollution prevention training, collects and analyzes stormwater samples, and inspects approximately 40 Port and tenant facilities annually in compliance with the State Water Resources Control Board's industrial stormwater permit. The airport also reviews stormwater regulations with contractors and assists them in the development of stormwater pollution prevention plans.

OAK, as a department of the Port of Oakland, strives to work collaboratively and inclusively with its surrounding communities to ensure that its plans and projects yield benefits for the

local community. The Maritime and Aviation Project Labor Agreement (MAPLA) was adopted by the Board of Port Commissioners in March 2000 (for more information see www.portofoakland.com/business/contract.asp). MAPLA is intended to ensure that 50% of the total hours worked on most Port projects are by residents within the Port Local Impact Area, which consists of the Cities of Oakland, Emeryville, San Leandro, and Alameda. Additionally, all workers covered by MAPLA are to be paid prevailing wages, as determined by the State of California. MAPLA projects include non-federally-funded on-site construction, modifications, alterations, repair, and demolition of Port projects in the Maritime and Aviation areas that are over \$50,000 and Tenant Improvements in Maritime and Airport North Field over \$150,000 and over \$50,000 in the Airport area. In addition to MAPLA, the Port's Living Wage Program applies to all businesses with more than 20 employees working on Port-related contracts.

References

- 2010 North American (ACI_NA) Final Rankings: Airports Council International-North America.
<http://aci-na.org/content/airport-traffic-reports>.
- Airport Perimeter Dike Improvement Environmental Assessment and Initial Study Public Scoping Workshop: Oakland International Airport, 2011.
- Economic Impacts of the Port of Oakland CY 2010. Martin Associates, 4/2011.
- East Bay Economic Outlook. East Bay Economic Development Alliance, 4/2011.
- Federal Aviation Administration, Airport Master Records and Report Form 5010.
<http://www.gcr1.com/5010web/airport.cfm?Site=OAK>.
- The Loma Prieta, California, Earthquake of October 17, 1989—Liquefaction. United States Geological Survey, 1998.
- Oakland International Airport Master Plan. Port of Oakland, March 2006.
- Port of Oakland Refunding Revenue Bonds Report of the Independent Consultants. Ricondo & Associates, 2011.
- Regional Airport System Planning Analysis 2011 Update.
http://www.mtc.ca.gov/planning/air_plan/.