Feasibility Study for a Federal Inspection Service Facility at Long Beach Airport

City of Long Beach

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September 30, 2016

AP1035-04

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Introduction

Long Beach Airport (LGB) is owned and operated by the City of Long Beach (City). As sponsor for LGB, the City has a statutory obligation to manage the airport in the most financially self-sustaining manner possible. This requires full, thoughtful consideration of requests from all stakeholders that may produce financial benefits to LGB, the City, and the region while also considering environmental, social, economic, and legal impacts.

A principal consideration in LGB's operation is the limit enforced in regards to cumulative aircraft noise. The City's Airport Noise Compatibility Ordinance (Noise Ordinance) was maintained as a local action as part of the Federal Airport Noise and Capacity Act of 1990. The Noise Ordinance was codified as Long Beach Municipal Code Chapter (LBMCC) 16.43 in 1995[1]. Since that time, the City Council has consistently reaffirmed the City's support for the Noise Ordinance and the restrictions therein, through the adoption of not less than six resolutions.

The Noise Ordinance balances the environmental, social, economic, and legal concerns of the community and the Federal regulatory requirement for a safe, efficient, and financially sustainable national plan of integrated airport systems. The City gives protection of the Noise Ordinance the highest priority, factored into consideration of every airport issue. The Noise Ordinance is among the most stringent in the United States and has been emulated by airports worldwide, positioning the City as an industry leader in airport noise mitigation.

The Noise Ordinance does not restrict the destination of flights departing from LGB, nor does it restrict the origin of flights arriving at LGB. The Noise Ordinance limits noise rather than flight activity. The annual limit of 65 decibels (dB) Community Noise Equivalent Level (CNEL) is based on established State and Federal standards. Based on these standards, the City set limits on the number of daily commercial flight operations and maximum Single Event Noise Exposure Levels (SENEL) to ensure that total cumulative noise exposure remains at or below 65 CNEL. Cumulative noise levels are managed via five airport user categories based on noise levels and flight activities that occurred in the baseline noise year from November 1, 1989 to October 31, 1990. This provides assurance to the surrounding communities that cumulative noise levels will not increase above 65 CNEL.

The Noise Ordinance contains reasonable and non-arbitrary provisions for the number of daily air carrier operations (minimum of 41 plus 9 supplemental flight slots), commuter carrier flight slots (minimum of 25), as well as cumulative noise budgets and maximum SENEL limits for Charter, Industrial, and General Aviation (GA) operations. Under the Noise Ordinance, if the cumulative noise budgets for the air carrier and commuter operators are below the cumulative noise limits established for these categories as determined during the baseline noise year 1989-1990, the number of flight slots available to air carrier and commuter operators must be increased. As a result, LGB must determine annually, as specified in LBMCC 16.43 whether additional flights must be allocated based on the cumulative noise generated by air carrier and commuter operations during the prior 12 month period.

Based on an analysis and review of noise data for October 1, 2014 through September 30, 2015[2], the Airport Director determined that LGB was operating below the noise budget for air carriers. LGB reported the need to add nine supplemental flight slots at the December 8, 2015 City Council meeting to remain in compliance with the Noise Ordinance. Presently, LGB permits 50 air carrier slots.

[1] Long Beach, City of. Municipal Code Chapter 16.43 Airport Noise Compatibility Ordinance. 1995.
[2] Acoustical Analysis Associates, Incorporated. *Analysis of Long Beach Municipal Airport Noise Monitoring Data to Determine CNEL Contributions for the Third Quarter 2015 – AAAI Report 1474.* November 2015.

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The vast majority of flight slots are currently allocated to four passenger airlines offering service to major cities along the West Coast and multiple destinations throughout the US. JetBlue Airways (JetBlue) currently holds 35 of the 50 air carrier slots, American Airlines (American) holds five, Delta Air Lines (Delta) holds four, and Southwest Airlines (Southwest) holds four. In addition, UPS Airlines (UPS) and FedEx Express (FedEx) each hold one air carrier slot for air cargo operations. Delta holds 3 of the 25 commuter slots; with 22 commuter slots remaining unallocated.

In February 2015, JetBlue requested LGB apply to the U.S. Department of Homeland Security, U.S. Customs and Border Protection (CBP) for a User Fee Airport (UFA) designation and seek approval to establish customs facilities. City Council approval is required to pursue the development of a Federal Inspection Service (FIS) Facility at LGB.

A FIS Facility is a single processing complex that evolved from the consolidation and integration of U.S. customs, immigration, and agriculture operations, offices, and support functions. The FIS Facility unifies both passenger processing and baggage/cargo processing for safe and efficient flow of passengers and goods into and out of the United States. The FIS Facility would have a CBP security area to accommodate international air commerce designated for processing passengers, crew, baggage and effects arriving from, or departing to, foreign countries, as well as aircraft deplaning, ramp areas, and other restricted areas designated by the local CBP port director.

The FIS Facility would function similarly to the passenger security screening and baggage security screening areas within the existing terminal area. The existing security screening areas focus on departing passengers and baggage while the security screening areas within the FIS would focus on arriving passengers and baggage. The FIS Facility would contain a sterile corridor connecting arrival aircraft parking positions to the inspection facility, primary processing, secondary processing, international baggage claim, administrative, and storage areas. The FIS Facility would also include support functions such as mechanical, electrical, janitorial, and maintenance areas.

City Council authorized the City Manager to proceed with the work necessary to determine the feasibility, financial or otherwise, of a FIS Facility on July 7, 2015. On January 19, 2016, the City commissioned Jacobs to conduct a Feasibility Study for a FIS Facility at LGB (the Study).

Evaluation Process

To provide a comprehensive feasibility study for a potential FIS Facility at LGB, the consultant examined the following items:

1. Market Demand
2. Environmental Compliance
3. Economic Impact
4. Facility Concepts
5. LGB Scope and Capability
6. Financial Feasibility
7. Security Risk

Jacobs assembled the material required to verify the market, scope and capability of LGB as well as an assessment of the required environmental clearance processes in compliance with the California Environmental Quality Act (CEQA), and the National Environmental Policy Act (NEPA). Jacobs developed three siting concepts to provide Rough Order Magnitude (ROM) cost estimates necessary to evaluate the financial feasibility of a

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potential FIS Facility. The ROM cost estimates were also used to quantify a portion of the economic impact to the City and surrounding communities.

The progressive evaluation process used by the consultant of assessing feasibility of a potential FIS Facility at LGB included the following steps:

1. Present the scope of the Study to community stakeholders and receive public comments.
2. Analyze the air traffic market to determine demand for international flights to/from LGB.
3. Determine generic space requirements for CBP based on the forecast demand.
4. Assess environmental compliance in accordance with CEQA, NEPA, and previous City Council actions.
5. Analyze the economic impact of LGB and a potential FIS Facility on the local and regional economy.
6. Evaluate potential FIS Facility siting alternatives.
7. Analyze the Scope and Capability of LGB.
8. Analyze financial feasibility of a potential FIS Facility and various siting alternatives.
9. Analyze the security risk of a potential FIS Facility.
10. Prepare a summary of findings and final Feasibility Study.

Community Outreach

At the start of the Study, Jacobs and the City hosted two community events to inform Long Beach residents on components of the Study and receive comments.

Community Meeting One was held on Wednesday, March 30, 2016 at Long Beach Gas and Oil Auditorium, 2400 East Spring Street, Long Beach, CA at 6PM. 108 community members attended.

Community Meeting Two was held on Wednesday, April 20, 2016 at Long Beach Gas and Oil Auditorium, 2400 East Spring Street, Long Beach, CA at 6PM. 152 community members attended.

At both Community Meetings, comment cards were distributed throughout the event for community members to submit questions, thoughts, opinions, and concerns. The comments and responses received were individually evaluated and categorized into the following sections:

- Market Analysis
- Airport Scope & Capability
- Financial Feasibility
- Economic Impact
- Environmental Assessment
- Security Assessment
- Noise Ordinance
- Other

An online email account was set up for anyone to provide feedback electronically at any time during the course of the Study. As of September 29, 2016, 21 emails were received. Individual comments and responses to frequently asked questions are included in Appendix H.

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To assist the Economic Impact Analysis, an online survey was sent to tenants of LGB and neighboring businesses to attain the most comprehensive understanding of the impact LGB has on the economy. The initial survey was administered the week of June 26, 2016 with follow-up telephone contacts beginning the week of July 11, 2016 and continuing through the last week of August 2016. Survey invitations were sent to LGB tenants, local government agencies, LGB-dependent business, and aircraft owners for economic data. The data inputs collected in the survey (material, budgets, capital spending, etc.) were converted into outputs of the Economic Impact Analysis. All information was kept strictly confidential. The survey consisted of 21 questions and was transmitted to 159 contacts at these organizations. A total of 44 organizations provided useable responses. The response rate of 28% is consistent with online response rates for similar surveys.

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1. Market Analysis

The Market Analysis[3] evaluated domestic and international market conditions, forecasted commercial airline activity and market demands, and assessed potential General Aviation (GA) activity. The analysis documented past and current domestic and international flight activities of LGB, as well as other airports in California and comparable airports in the nation. The Market Analysis also forecasted potential flight activities and market demand of international flights to/from LGB.

The Market Analysis is organized in two sections: Benchmark Studies and Data Analysis. A full copy of the Market Analysis has been attached as Appendix A.

The Benchmark Studies section focused on the following:

- Flight activities at LGB, similar size US airports, and California airports
- LGB air carrier and GA community interviews
- Current aircraft types and capabilities analysis
- U.S. Customs and Border Protection designation analysis
- Airline industry practices and trends analysis

LGB is served by four U.S. passenger airlines providing nonstop flights to 13 destinations (including seasonal service to Anchorage) that include American, Delta, JetBlue, and Southwest hubs/focus cities.

The air carriers and the fleet types currently deployed at LGB are capable of serving markets within a range of approximately 3,200 miles[4]. Interviews with air carriers identified a desire to increase service to current markets, with JetBlue indicating a desire to initiate international service to profitable destinations within their existing network. The remaining air carriers indicated they do not have a desire for international service to/from LGB at this time. The findings in the Benchmark Studies section identified a market demand for domestic and international growth potential in Southern California.

The Data Analysis section focused on the following:

- Market sizes and forecast statistics for LGB
- Future international flight activity projection (commercial and GA)
- Potential and probable international markets
- Airline network analysis

In 2015, the U.S. Department of Transportation reported that the Southern California aviation market grew at a rate of 6%, versus 4.7% nationally. From June 2015 to April 2016, the international segment has grown 11% at Los Angeles International Airport (LAX) versus 6.5% growth in domestic traffic[5]. The U.S. and Mexico modernized their bilateral air services agreement, effective January 1, 2016[6]. Historically, modernizing bilateral air services agreements have generated growth, new services, and benefits to both countries.

LGB is a slot controlled airport. Over the last ten years (2006-2015) the air carriers have averaged a slot utilization rate of 79% or 32.5 flights per day. During 2015, the average air carrier slot utilization rate was 74% or 30.4 flights per day. Based on a recent review of the Noise Ordinance budget, the City issued nine supplemental slots for 2016. The Market Analysis assumed a maximum of 50 air carrier slots, equal to the 41

[3] LaCosta Consulting Group. *Market Analysis For Long Beach Airport.* August 2016.
[4] Airbus Industries. *Aircraft Range Capability and Engine Noise.* March 2016.
[5] Los Angeles World Airports (LAWA). *LAWA Air Traffic Report*. March 2016.
[6] U.S. Department of Transportation – Mexico Aviation Bilateral. November 2014.

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minimum daily air carrier flights plus the nine current supplemental slots provided by LBMCC 16.43[1]. International operations are forecast to be incremental to domestic operations within the current slot allocation.

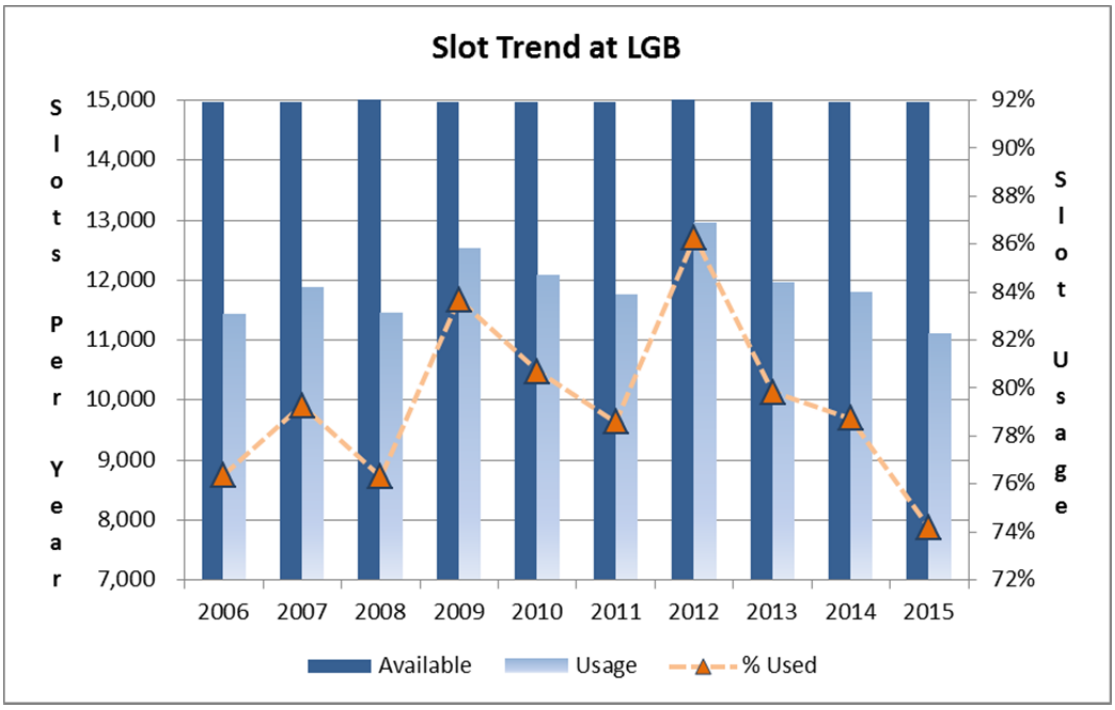

Figure 1 Slot Trend and Usage

Current Markets			Top Markets by Enplanements		
1	AUS	Austin, TX	1	SLC	Salt Lake City, UT
2	BOS	Boston, MA	2	LAS	Las Vegas, NV
3	JFK	New York, NY	3	SFO	San Francisco, CA
4	LAS	Las Vegas, NV	4	OAK	Oakland, CA
5	MEM	Memphis, TN*	5	SEA	Seattle, WA
6	OAK	Oakland, CA	6	PDX	Portland, OR
7	PDX	Portland, OR	7	PHX	Phoenix, AZ
8	PHX	Phoenix, AZ	8	JFK	New York, NY
9	RNO	Reno, NV	9	SMF	Sacramento, CA
10	SDF	Louisville, KY*	10	AUS	Austin, TX
11	SEA	Seattle, WA			
12	SFO	San Francisco, CA			
13	SLC	Salt Lake City, UT			
14	SMF	Sacramento, CA			
15	ANC	Anchorage, AK (Seasonal)			*For cargo only

Table 1 Current Markets and Top Markets at LGB[7]

[7] U.S. Department of Transportation. *Bureau of Transportation Statistics.* April 2016.

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1.1 Air Carrier Interviews

The Market Analysis included interviews with all four current LGB air carriers to capture an understanding of industry needs for a potential FIS Facility. The interviews with LGB air carriers were conducted to assess current and future plans for international flight activities. Meetings and conference calls were conducted with current market planning managers. American, Delta, and Southwest have significant levels of operations and large capital investments at LAX. Their stated strategies are to continue focusing their international investment in LAX where they can leverage their larger networks.

American Airlines

To review the feasibility project a conference call was held with Mike Britman, American's Managing Director of Network and Route Planning. American's growth strategies in Southern California are focused completely at LAX. They see LGB fitting into their network through services to their Phoenix hub and will monitor demand and look to respond with aircraft gauge or frequency adjustments. American does not have any interest in commencing international service at LGB at this time as their international focus is at LAX.

American's focus for international service at its LAX hub is based on the following factors: greater volume and frequency of operations, greater connectivity to their overall network, previous capital investment into Terminal 4, planned future investment in Terminal 5, and the recently opened T4 Connector provides a linkage between Terminal 4 and American's international partners in the Tom Bradley International Terminal.

Delta Air Lines

To review the feasibility project a conference call was held with Scott Springer, Delta's General Manager of Network and Domestic Planning. Similar to American for international flights, Delta sees LAX as the natural growth engine for their brand in Southern California. Delta sees serving all Southern California airports important to strengthen their Delta network with flights from LGB flowing through their Salt Lake City hub. Long term, Delta sees capacity at LGB as proportional to the demand for Delta services and synergistic to its LAX strategy.

Delta's focus for international service at its LAX hub is similar to American and is based on the following factors: greater volume and frequency of operations, greater connectivity to their overall network, planned multi-billion dollar investment at Terminal 2 and Terminal 3, and future plans for a T3 Connector between Terminal 3 and the Tom Bradley International Terminal to provide a linkage with their international partners.

JetBlue Airways

Meetings with JetBlue's Sr. VP Government Affairs, Robert Land, and Sr. VP of Network Planning, Scott Laurence, were conducted. The meeting with JetBlue confirmed their intention to operate international flights at LGB, JetBlue's only west coast focus city, should a potential FIS Facility be developed. An overview of the feasibility study being conducted was presented and JetBlue offered their opinion. JetBlue has analyzed potential international traffic and have identified significant passenger demand at many airports in their network.

Southwest Airlines

Southwest's Network and Revenue Team has committed to expanding in Southern California. Recent statements by Southwest indicate commitment at LAX for international service. Southwest does not have any interest in commencing international service at LGB at this time. They will monitor new services as the market develops.

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Similar to Delta and American, Southwest's commitment at LAX for international service is based on the following factors: greater volume and frequency of operations, greater connectivity to their overall network, recently completed and ongoing improvements to Terminal 1, and planned future development of Concourse Zero.

1.2 Air Traffic Analysis

Southern California has experienced robust international demand growth over the last five years following recovery from the 2008 financial crisis. Both LAX and John Wayne Airport (SNA) have experienced international traffic growth. Between the years 2010-2015 international traffic in the Southern California has grown 30%[8].

For LGB, the forecast data was used to determine potential and probable international airports served if LGB were to have a FIS Facility. Market forecast for passenger demand is supported by assessment and analysis of historical trends in traffic demand, projected economic growth, and other relevant factors that may affect growth in the local aviation market.

The Market Analysis assumes that the 2016 noise budget and the number of commercial slots at LGB are the bases for all future flight operations. The Airbus A320 (A320) used by JetBlue was the aircraft type used in the Market Analysis. The aircraft that have been ordered by the air carriers operating at LGB are anticipated to generate equal or less noise in the future; however, it is not known at this time the exact aircraft mix or timing of when these aircraft would be scheduled at LGB. Therefore, inclusion of reduced noise benefits was not considered in the Market Analysis. The Market Analysis acknowledges that the Noise Ordinance is indifferent to whether there are domestic or international operations.

The Boeing 757-300 (B757) is the largest aircraft that can be accommodated at the airport terminal and the Boeing 767-300 (B767) is the critical aircraft for airfield design as indicated on the Airport Layout Plan[9]. Neither aircraft is currently used at LGB for commercial passenger service; however, UPS uses the B767 for air cargo operations. The B757 life cycle is nearing completion with 30% of all B757 retired as of July 2015.

The A320 family is the most common commercial aircraft operating at LGB and is the aircraft most likely to be used for future operations. With the addition of Southwest at LGB the new generation Boeing 737 MAX will eventually populate the schedule. The Boeing 737 MAX has a noise envelope lower than the current A320 so little in the forecast would change with that adjustment in aircraft mix. The segmentation and mix will change with a likely average of eight daily international departures when projected three to five years beyond commencement of international service.

1.3 Potential Destinations

International service is independent of the number of air carrier flight slots. The minimum number of air carrier flight slots is 41 per day, and this minimum number is sufficient to provide the departure capacity for sustained international service. The recent allocation of nine supplemental flight slots enhances this capacity but is not essential to international service. Allocation of 35 commercial slots to JetBlue provides the opportunity to complement existing domestic routes with international service. Development of a FIS Facility and small search rooms at the departure gates would provide the terminal capacity for international service.

The Market Analysis was performed to identify the greatest potential destinations based on size of cities, market trends, networks of current air carriers and current air traffic flows. During the airline interview with JetBlue, they indicated a list of destinations under consideration. The following list was developed from an analysis of

[8] Airport Council International (ACI). *North American Airport Traffic Summary – Top Enplanement Traffic Growth Report.* August 2015.
[9] Long Beach Airport. *Airport Layout Plan*. September 2016.

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destinations in JetBlue's network and those markets that have been identified from the Market Analysis. Most of these potential destinations have existing service to the Southern California region.

Country	Airport Code	City	Country	Airport Code	City
Mexico	SJD	Los Cabos	Mexico	MLM	Morelia
	PVR	Puerto Vallarta		BJX	León
	MTY	Monterrey	El Salvador	SAL	San Salvador
	MEX	México City	Costa Rica	SJO	San José
	GDL	Guadalajara		LIR	Liberia
	ACA	Acapulco	Guatemala	GUA	Guatemala City
	CUN	Cancún	Panama	PTY	Panamá City
	ZCL	Zacatecas	Canada	YVR	Vancouver

Table 2 List of Potential International Destinations[10]

Figure 2 Map of Potential International Destinations

[10] CBP has a preclearance facility in Vancouver. YVR traffic does not require CBP facilities at LGB.

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1.4 Probable Destinations

Of the carriers interviewed, JetBlue is the only carrier that expressed a desire to operate international routes to/from LGB. Based on the Market Analysis, international routes identified during the JetBlue interview, and current level of available slots, the most probable international destinations are listed in Table 3. The most probable international destinations are in alignment with JetBlue's current network. It is estimated that six to eight of these 11 markets would be considered as part of JetBlue's West Coast strategy.

Country	Airport Code	City
Mexico	SJD	Los Cabos
	PVR	Puerto Vallarta
	MTY	Monterrey
	MEX	México City
	GDL	Guadalajara
	CUN	Cancún
Costa Rica	SJO	San José
	LIR	Liberia
Guatemala	GUA	Guatemala City
Panama	PTY	Panamá City
El Salvador	SAL	San Salvador

Table 3 Most Probable International Destinations

The Market Analysis included a network evaluation of current commercial carriers serving LGB, select carriers not currently active at LGB, and international carriers that may look to LGB as a gateway. Based on the JetBlue international network and potential air traffic demand, it is expected they would pursue markets in Mexico and Central America. Many of these markets are currently served from JetBlue east coast focus cities such as John F. Kennedy International Airport and Fort Lauderdale – Hollywood International Airport. Based on LGB's competitive position in Southern California, observed historic demand, and econometric indicators, it is reasonable to assume continued international growth in the Southern California market. A potential FIS Facility would provide opportunity for a share of the international market within the constraints of the Noise Ordinance.

Figure 3 indicates a simulated international flight schedule based on the *Most Probable International Destinations* list produced by the network and forecast evaluations. International origins and destinations labeled XXX are potential destinations that may be added four to five years beyond commencement of international service. Departure and arrival times are included for illustrative purposes only. Flight schedules must conform to operating hours permitted under the Noise Ordinance and would be subject to service schedules approved by CBP.

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Probable International Arrivals				
Airline	Equipment	Origin	Departure	Arrival
JetBlue	A320	GDL	0700	0835
JetBlue	A320	LIR	0835	1340
JetBlue	A320	XXX	tbd	1430
JetBlue	A320	PVR	1400	1500
JetBlue	A320	MEX	1430	1645
JetBlue	A320	XXX	tbd	1730
JetBlue	A320	SJD	1810	1940
JetBlue	A320	CUN	1650	2015

Probable International Departures				
Airline	Equipment	Destination	Departure	Arrival
JetBlue	A320	PVR	0805	1305
JetBlue	A320	MEX	0805	1340
JetBlue	A320	CUN	0920	1610
JetBlue	A320	XXX	0945	tbd
JetBlue	A320	SJD	1425	1714
JetBlue	A320	XXX	1520	tbd
JetBlue	A320	LIR	1545	2155
JetBlue	A320	GDL	1730	2230

Figure 3 Simulated Long Beach International Flight Schedule Activity

1.5 Forecast – International Market Demand at LGB

Based on statistics from the Bureau of Transportation, Table 4 shows the historic distribution of passenger enplanements for domestic and international travel. In general, the distribution of passenger enplanements is 80% domestic and 20% international. This trend applied to LGB would suggest that of the current 50 flight slots approximately 10 daily flights could become international.

Year	DOMESTIC		INTERNATIONAL		TOTAL
2002	551,899,643	82%	118,704,850	18%	670,604,493
2003	583,293,766	83%	117,569,855	17%	700,863,621
2004	629,769,616	82%	133,940,075	18%	763,709,691
2005	657,261,487	82%	143,588,422	18%	800,849,909
2006	658,362,620	81%	149,740,591	19%	808,103,211
2007	679,185,450	81%	156,324,972	19%	835,510,422
2008	651,710,182	80%	158,111,711	20%	809,821,893
2009	618,067,255	80%	149,749,333	20%	767,816,588
2010	629,537,593	80%	157,940,463	20%	787,478,056
2011	638,247,667	80%	163,887,126	20%	802,134,793
2012	642,289,482	79%	170,838,576	21%	813,128,058
2013	645,677,554	78%	179,290,049	22%	824,967,603
2014	662,826,955	78%	188,690,254	22%	851,517,209
2015	696,016,894	78%	200,491,818	22%	896,508,712
2016	286,808,375	78%	78,858,882	22%	365,667,257
TOTAL	9,230,954,539	80%	2,267,726,977	20%	11,498,681,516

Table 4 Historical Passengers Statistics: All Carriers - All Airports (All U.S. and Foreign Carriers)[11]

The Market Analysis has forecasted a startup of six international routes the first year after initiating international service, increasing to eight routes by the fourth year. This level of service represents 12% of the currently allocated flight slots (17% of JetBlue slots) the first year increasing to 16% of the currently allocated flight slots (23% of JetBlue slots) by the fourth year. The Market Analysis estimates a steady state of eight international

[11] United States Department of Transportation, Bureau of Transportation Statistics, *T-100 Market data* 2002 through May 2016.

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routes in Years Five and beyond. International operations are forecast to be incremental to domestic operations.

Table 5 provides the forecast operational statistics for a five year period following initiation of international service. The Market Analysis forecast assumes a cap of 50 commercial slots with a steady state level occurring in Years Four and Five. Based on the passenger and network evaluations, it is estimated that the most likely schedules would produce six frequencies in Year one followed by two more flights in Years Four and Five producing an arrival peak of two A320 operations at the potential FIS. The forecast reflected in Table 5 is based on an 85% load factor using 150-seat A320 aircraft. The passenger mix used in the forecast is 93% origin/destination (beginning or concluding travel) and 7% connecting (transfer) from another domestic flight. There are also some charters and ad hoc schedule flights included (made available by the cancellation of day of week schedules). See Table 6 for specific international service spool up and steady state assumptions.

Year	1	2	3	4	5
Seats	246,375	333,975	336,713	446,213	446,213
Enplanements	209,419	283,879	286,206	379,281	379,281
Departures	1,643	2,227	2,245	2,975	2,975

Table 5 Forecast Operations for Years 1-5 following International Service Initiation

Year	Assumption
1	Three daily departures for the first six months followed by six daily departures for the second six months.
2	Six daily departures for 12 months with an escalator of 10% (37 annual flights) added for charters and ad hoc frequencies. All charter or ad hoc departures are assumed to be made available from cancellations of other scheduled flights.
3	Six daily departures for 12 months with an escalator of 10% (37 annual flights) added for charters and ad hoc frequencies. All charter or ad hoc departures are assumed to be made available from cancellations of other scheduled flights.
4	Eight daily departures for 12 months with an escalator of 15% (55 annual flights) added for charters and ad hoc frequencies. All charter or ad hoc departures are assumed to be made available from cancellations of other scheduled flights.
5	Eight daily departures for 12 months with an escalator of 15% (55 annual flights) added for charters and ad hoc frequencies. All charter or ad hoc departures are assumed to be made available from cancellations of other scheduled flights.

Table 6 International Service Spool up and Steady State Assumptions

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1.6 Current General Aviation Activity

As part of the Market Analysis, interviews were conducted with GA tenants and operators to gauge interest for international clearance at LGB and gather information on current trends in the Southern California market. Members of the GA Community interviewed included the Aeroplex / Aerolease Group (Aeroplex), Long Beach Airport Association (LBAA); Signature Flight Support (Signature); AirFlite, and Gulfstream Aerospace Corporation (Gulfstream). All parties acknowledged previous CBP clearance procedures at LGB, which remained until 2006 (and briefly as a gateway city for the 2010 Winter Olympics in Vancouver, BC). The GA Community has expressed interest and support for reinstating CBP clearance procedures at LGB.

The most recent addition of CBP clearance procedures for GA operations within the Southern California market was the opening of the FIS facility at Van Nuys Airport (VNY) on 23 MAY 2015, which averages 50 FIS clearance activities per month after one year of service.

According to LGB records[12], 65% of the GA Noise Budget was used during Noise Year[13] 2015 (NY15). Based on noise averages from Q3 NY15, the unused portion of the GA Noise Budget represents approximately 31 flights per day.

Many of the jet aircraft based at LGB return from international flights with a CBP clearance stop at other airports and reposition to LGB. In this scenario, a minimal number of new operations would be produced as a result of a potential FIS Facility, and those flights would land directly at LGB reducing the cost and environmental impacts of repositioning flights. There are also aircraft maintenance and safety benefits to the owners and operators of jet aircraft gained from reducing takeoff and landing operations. A potential FIS Facility and international capabilities (within the constraints of the Noise Ordinance) could also serve as a tool to support business development for the City including supporting local businesses expanding to international markets, creating greater efficiencies for business travel, providing greater access for foreign executives, and attract new businesses that can leverage quick access to international locations.

The following topics were brought up most often during interviews with current GA operators:

- LGB had custom clearance until 2006 when the CBP reduced funding due to budget cuts. During that time, the annual GA Noise Budget was not exceeded.
- Current GA operations are 35% below the noise budget and no change in aircraft mix is expected if international operations were to be reinstated.
- The GA community estimates demand for international flights of approximately two per day.
- There are possible environmental and economic benefits from potential CBP clearance at LGB as international flights currently destined for LGB must clear at another airport first and then reposition the aircraft to LGB. Flights to reposition aircraft create an extra operations, additional fuel burn, and financial impact to customers.

GA departure annual growth rates of 1-2% are expected over the next five years if CBP clearance procedures are reinstated at LGB. This would have GA operating below the Noise Budget. Based on the international capabilities of the current GA aircraft fleet mix, there are no expected changes to the type of aircraft operating at LGB.

[12] Landrum & Brown. Airport Noise Budget Analysis Report. November 2015.
[13] Each Noise Year begins November 1st and ends October 31st.

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1.7 Potential General Aviation Activity Evaluation

Currently GA departures are down 26% from the peak in 2007. As previously stated, about 65% of the GA Noise Budget was used in 2015. Based on the most recent annual noise reporting period (NY15), average noise levels for departure and arrival operations, 31 additional daily GA flights could be accommodated within the GA Noise Budget. Based on feedback from interviews with the GA community, an estimate of two flights per day would potentially use the services of CBP for international clearance.

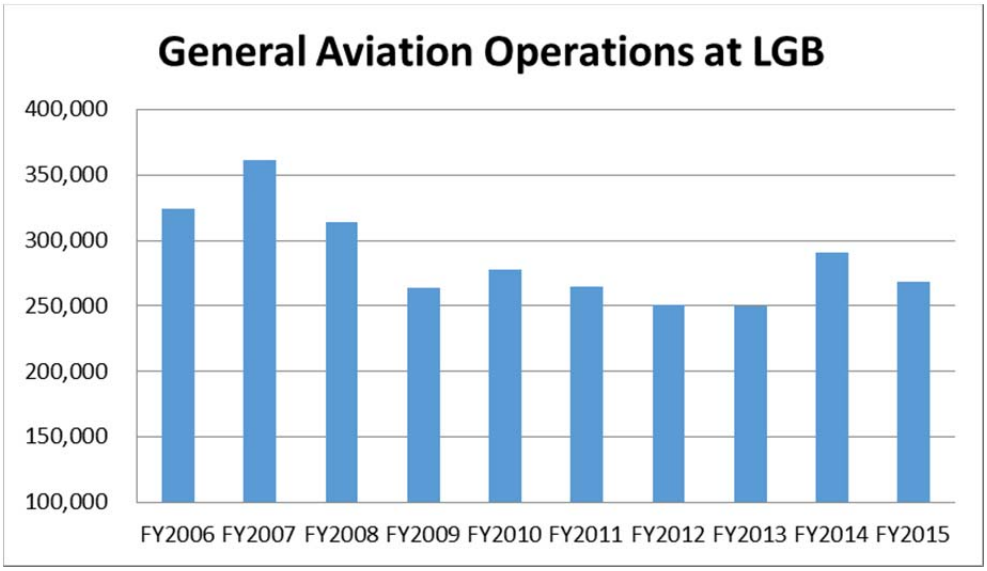

Figure 4 General Aviation Operations – Long Beach Airport

LGB's proximity to downtown Los Angeles and Orange County make it an attractive arrival and departure point for business and personal GA flights. The GA community identified the reinstatement of CBP clearance procedures at LGB as an ideal departure point for locals and as an attractive destination for leisure and business travelers. The primary GA use of a potential FIS Facility would be corporate and personal.

At VNY, a dedicated 1,528 square foot FIS facility officially opened on May 23, 2015 under the Federal User Fee Airport Program. CBP returned to VNY after ceasing operations at all airports in the Southern California market, except for LAX, in 2006. Prior to 2006, CBP inspectors were on call, on demand, and no fee. VNY reported 50 flights per month after a one year spool up. There are no empirical data relating VNY international clearances to operations; however, it is estimated by VNY that 40 of those flights (80/%) were pre-clearing at other airports before repositioning to VNY. VNY estimates that there may be intermittent clearing of aircraft occasionally that are not home based aircraft. They conclude there are few new flights into VNY as a result of CBP services. The impact is actually a gain in efficiencies since over 600 flights per year (or 50 flights per month average) were clearing at LAX and repositioning to their home base at VNY.

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2. Environmental Compliance Assessment

A Feasibility Study, in and of itself, is statutorily exempt per the California Environmental Quality Act (CEQA). Specifically, Section 15262, Feasibility and Planning Studies, of the State CEQA Guidelines states the following:

> *A project involving only feasibility or planning studies for possible future actions which the agency, board, or commission has not approved, adopted, or funded does not require the preparation of an EIR or Negative Declaration but does require consideration of environmental factors. This section does not apply to the adoption of a plan that will have a legally binding effect on later activities.*

Therefore, as a Feasibility Study, the purpose of this evaluation is not to provide the City with a CEQA document; rather it is intended to give the City an understanding of the types of technical studies and environmental compliance documents that may be required should the City decide to move forward with the subsequent project-level evaluation of the FIS Facility. However, to aid in the evaluation, the questions from the CEQA Environmental Checklist[14] were used as a baseline to assess potential environmental effects of a potential FIS Facility.

In conducting this evaluation, consideration was also given regarding whether the potential FIS Facility could be accommodated within the impact envelope evaluated in the 2006 Long Beach Airport Terminal Area Improvement Project Final Environmental Impact Report No. 37-03[15] (State Clearinghouse No. 2003091112) (hereinafter referred to as "FEIR 37-03") and approved by the Long Beach City Council on June 20, 2006, with the adoption of Resolution No. Res-06-0056.

It should be noted that, at this phase of the process, only very general siting concepts are available. Therefore, the Environmental Compliance Assessment[16] is not intended to provide consideration of specific design elements. It is assumed that, should the potential FIS Facility proceed to the subsequent phase of evaluation, all facilities would be designed in compliance with CBP Airport Technical Design Standards (ATDS). As such, applicable Department of Homeland Security requirements would be complied with.

2.1 Previous CEQA Documentation

The Project evaluated in FEIR 37-03 consisted of improvements to the existing Airport Terminal Building and related facilities in order to accommodate increases in flight activity at LGB consistent with operational limitations of Noise Ordinance and the 1995 Settlement Agreement. The 1995 Settlement Agreement included a "grandfather" provision under the Airport Noise and Capacity Act (ANCA) that allowed for continued City of Long Beach enforcement of flight and noise restrictions. The Project included construction of, or alteration to, the 13 areas listed below:

- Holdrooms
- Concession Area
- Passenger Security Screening
- Baggage Security Screening
- Baggage Claim Devices
- Baggage Service Office
- Restrooms
- Office Space
- Ticketing Facilities
- Airline Gates
- Aircraft Parking Positions
- Vehicular Parking
- Traffic and Pedestrian Circulation

[14] California Code of Regulations, Title 14, Chapter 3, Sections 15000, et seq., *Appendix G: Environmental Checklist Form*. 2016
[15] BonTerra Consulting. *Long Beach Airport Terminal Area Improvement Project EIR*. November 2005.
[16] Psomas. *Environmental Compliance Assessment.* August 2016.

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The study area for the Terminal Area Improvements included the area surrounding the existing Airport Terminal Building. The FEIR evaluated the construction of improvements between the Gulfstream building and the Million Air lease site at LGB. Uses in this area include the Airport Terminal Building, a permanent holdroom, temporary holdrooms, security screening of passengers and baggage, a baggage claim area, a parking structure, and surface parking facilities. On the airfield side, uses include aircraft parking positions for the commercial and commuter carriers and a general aviation tie-down area on the Million Air lease site.

Further detail regarding the approved square footage program for the Terminal Area Improvements and a summary of implementation of the Terminal Area Improvements can be found in Appendix B.

2.2 Environmental Evaluation

The purpose of the environmental evaluation is to provide a baseline assessment of the potential environmental effects that could occur with implementation of the potential FIS Facility. The purpose is to provide the City with an understanding of potential issues and possible future studies that may be needed to comply with CEQA. Additionally, if implemented, the potential FIS Facility would require modifications to the airfield layout plan, which would require Federal Aviation Administration (FAA) approval. Therefore, environmental compliance pursuant to NEPA would also be required.

Consideration was also given regarding whether the potential FIS Facility could be accommodated within the impact envelope evaluated in FEIR 37-03. CEQA Guidelines encourage public agencies to reduce delay and paperwork through a variety of strategies. Using a previous EIR when it adequately addresses a proposed project is one of these strategies. When there is phased implementation of a project, if the agency finds that no new effects could occur or no new mitigation measures would be required pursuant to Section 15162 of the CEQA Guidelines, the agency can approve the activity as being within the scope of the project covered by the program EIR and no new environmental document would be required. Therefore, the discussion below provides a preliminary assessment of the adequacy of FEIR 37-03 for addressing the potential FIS Facility should the City elect to proceed to the subsequent phase of evaluation. Further detail can be found in Appendix B.

As indicated in Appendix B, the FEIR evaluated larger terminal area improvements than were ultimately approved. Should the City Council elect to do so, if it is determined that the FEIR fully addresses the impacts associated with the potential FIS Facility, the full 102,850 square feet of terminal area improvements and up to 14 aircraft parking positions addressed in the FEIR could be implemented without further documentation. It should be noted that the Program FEIR and approving resolutions identified the interior square footage for the buildings (i.e., net square feet). The siting concept plans for the potential FIS Facility identify the outside footprint of the building (i.e., gross square feet) because these values are being used to estimate the rough order magnitude cost of the potential FIS Facility. As such, the square footage of the potential FIS Facility being assessed in this Study and the square footage of the facilities evaluated in FEIR 37-03 represent slightly different dimensions; however, they provide a basis for general comparison at this level of evaluation. If the potential FIS Facility is recommended for further evaluation, a more precise comparison of actual conceptual design plans would be evaluated to make definitive recommendations on the type of CEQA documentation that would be required.

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2.3 CEQA Environmental Checklist Topics

The potential FIS Facility siting options, as described in Section 4 and Appendix D, were reviewed using the following CEQA Environmental Checklist Topics:

- Aesthetics
- Agricultural and Forest Resources
- Air Quality
- Biological Resources
- Cultural Resources
- Geology and Soils
- Greenhouse Gas Emissions
- Hazards and Hazardous Material
- Hydrology and Water Quality
- Land Use and Planning
- Mineral Resources
- Noise
- Population and Housing
- Public Services
- Recreation
- Transportation/Traffic
- Utilities and Service Systems

Appendix B contains further detail regarding CEQA checklist questions, conceptual assessment of a potential FIS Facility, consistency assessment with FEIR 37-03, and recommended further evaluation for each CEQA checklist topic.

2.4 Air Quality

The introduction of commercial international flights would not alter the type of aircraft or operational procedures at LGB. Therefore, commercial aircraft emissions would not be expected to change. The introduction of CBP facilities would have the potential to incrementally reduce regional air emissions as it relates to general aviation operations. Currently, general aviation and charter aircraft traveling to LGB from international destination are required to be cleared at an airport with CBP facilities. The Noise Ordinance defines general aviation as aviation activity other than operations by Air Carriers, Commuter Carriers, Industrial operators, Charter operators, and government aircraft. As a result, for general aviation aircraft an additional stop is required. The additional take-off and landing would result in incrementally greater emissions. Though this would not change the local emissions at LGB, the additional flights do contribute to the regional emissions. Counterbalancing this, there is the potential that some general aviation and charter aircraft will utilize LGB as a stopping point for CBP services though Long Beach is not the final destination. On a regional scale these additional takeoffs and landings would not have an effect on regional air quality. It should be noted, based on the Market Analysis[3], expected increases in general aviation would be nominal and would not have a substantial increase on the localized air quality.

There would be four areas that may contribute to incremental increases in air emissions: (1) construction activities; (2) utility usage associated with expanded facilities (i.e., heating and cooling requirements); (3) additional employees that would be serving LGB (i.e., CBP employees); and (4) special handling of international trash from the flights. Similarly, the additional air emissions associated with operational activities (items 2 through 4 listed above) are also expected to be nominal and below the thresholds of significance established by the South Coast Air Quality Management District (SCAQMD). Because the flights would not increase and the

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operational procedures would be the same, the introduction of the FIS Facility would not require any modifications to the Air Quality Management Plan for the South Coast Air Basin, nor would it result in the creation of objectionable odors. Though there are sensitive receptors living near LGB, the incremental increase in the overall level of air emissions would not result in an increase of substantial pollutant concentrations.

2.5 Noise

The Noise Ordinance is the controlling mechanism for aircraft noise. The potential FIS Facility would not change the number of flights at LGB. What would change is the destination of a portion of the flights. As shown in the Market Analysis[3], the international cities that would likely be served are Vancouver, Canada and multiple cities in Mexico and Central America. These international destinations would be within the cap of 50 daily commercial carrier flights, which would not be modified unless the overall noise levels associated with the commercial carrier flights is reduced to less than noise budget allocated for commercial carriers per the Noise Ordinance.

There is the potential that international flights would travel greater distances than domestic flights. In these instances, it is reasonably assumed the aircraft would have to carry additional fuel and luggage weight could be greater. As a heavier aircraft, the noise characteristics of the international flights may be slightly greater than if the same type of aircraft travels to a closer destination. It is speculative as to whether this incremental noise increase would be sufficient to influence the Community Noise Equivalent Level (CNEL) contours. However, the Noise Ordinance would address this issue because if the CNEL contours were to increase beyond what is allowed in the Noise Ordinance, then the total number of flights would be reduced accordingly.

Similarly, if the potential FIS Facility is available at LGB there could be an incremental increase in general aviation and charter aircraft utilizing LGB. Currently, aircraft with international origins are required to stop at an airfield with CBP facilities, such as Brown Field in San Diego County, before proceeding to their ultimate destination. As previously indicated, based on the Market Analysis, increases in general aviation activity is projected to be minimal. However, if the increase in general aviation and charter activity were enough to result in substantial noise increases that exceed the noise budget for their respective categories, the provisions of the Noise Ordinance would apply and the corrective actions would be implemented. Section 16.43.060A of the Noise Ordinance specifically pertains to general aviation compliance with the noise budgets and Section 16.43.060C pertains to charter operations. Operation of the potential FIS Facility would not increase the number of sensitive receptors exposed to noise levels in excess of State or federal standards. Therefore, operation of the potential FIS Facility would not result in any long-term noise impacts.

During construction of the FIS Facility there would be construction noise. The closest sensitive receptor to the potential FIS Facility would be the homes west of Clark Avenue. These homes are more than 3,500 feet from either the northern or southern siting alternatives. As a result, the construction noise levels would be less than significant. Once constructed, the noise levels associated with use of the FIS Facility would not be substantially different from the existing conditions in the terminal area.

2.6 CEQA Conclusion

The preliminary evaluation of the potential FIS Facility does not identify any significant impacts that were not previously addressed in FEIR 37-03. This analysis has been conducted without the benefit of detailed concept plans. Based on the preliminary assessment, it would appear the potential FIS Facility would be consistent with the Terminal Area Improvements Project evaluated in FEIR 37-03. The scale of the facility appears to be within the parameters of the facilities addressed in FEIR 37-03. As previously indicated, FEIR 37-03 and approving resolutions identified the interior square footage for the buildings (i.e., net square feet), whereas the potential FIS Facility siting alternatives identify outside footprint of the building (i.e., gross square feet). As such, the square footage of the potential FIS Facility being assessed in this Study and the square footage of the facilities

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evaluated in FEIR 37-03 are presented slightly differently. Further definition of a conceptual plan would be required prior to making a complete CEQA determination.

Once conceptual plans (with net square footage) are available, it is possible that the size of the potential FIS Facility would be consistent with the April 2007 City Council direction pertaining to the size of the terminal area improvements and number of aircraft parking positions (i.e., 12 parking positions). However, as indicated above, FEIR 37-03 fully addresses the impacts associated with 102,850 square feet terminal area improvements and 14 aircraft parking positions. Therefore, should the City Council elect to do so, if it is determined that the potential FIS Facility fits within the parameters of the 102,850 square feet addressed in FEIR 37-03, it could be implemented without further documentation because the type of facilities proposed for the potential FIS Facility are generally consistent with the project description in FEIR 37-03.

CEQA evaluation is required to address environmental impacts of proposed actions. The environmental impacts associated with the construction of the potential FIS Facility would not be substantially different from the impacts associated with the construction of terminal facilities to accommodate domestic flights. Pursuant to Section 15162(a) of the State CEQA Guidelines, a subsequent EIR or Negative Declaration is only required when:

(1) Substantial changes are proposed in the project which will require major revisions of the previous EIR or negative declaration due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified significant effects;

(2) Substantial changes occur with respect to the circumstances under which the project is undertaken which will require major revisions of the previous EIR or Negative Declaration due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified significant effects; or

(3) New information of substantial importance, which was not known and could not have been known with the exercise of reasonable diligence at the time the previous EIR was certified as complete or the Negative Declaration was adopted, shows any of the following:

   (A) The project will have one or more significant effects not discussed in the previous EIR or negative declaration;

   (B) Significant effects previously examined will be substantially more severe than shown in the previous EIR;

   (C) Mitigation measures or alternatives previously found not to be feasible would in fact be feasible, and would substantially reduce one or more significant effects of the project, but the project proponents decline to adopt the mitigation measure or alternative;

   (D) Mitigation measures or alternatives which are considerably different from those analyzed in the previous EIR would substantially reduce one or more significant effects on the environment, but the project proponents decline to adopt the mitigation measure or alternative.

Notwithstanding the reliance on FEIR 37-03, design of the potential FIS Facility would need to be reviewed by the Cultural Heritage Commission for compatibility with the historic terminal building. Additionally, FEIR 37-03 assumed the Terminal Area Improvements would be designed consistent with LEED requirements. Though no reduction in impacts was assumed based on LEED consistency, this provision was identified as a Project Design Feature and should be incorporated into the design of the potential FIS Facility.

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Provided the potential FIS Facility can be accommodated within the square footage allocation addressed in FEIR 37-03 and no new significant impacts are identified, it would be reasonable to rely on the previous EIR as the CEQA documentation for the potential FIS Facility.

2.7 NEPA Compliance Requirements

NEPA compliance would be required for any federal actions or approvals. A potential FIS Facility may require federal approvals by both CBP and the FAA. All three siting options, as described in Section 4 and Appendix D, would require approval by CBP. CBP follows guidance provided by the Council on Environmental Quality (CEQ) for the implementation of NEPA. A provision of the *Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act* allows for the processing of a Categorical exclusion for "actions which do not individually or cumulatively have a significant effect on the human environment…" (40 CFR 1508.4). Given the context of the potential FIS Facility (i.e., development of a limited amount of additional new terminal area in a disturbed area of LGB, which would not directly influence the number of allowed commercial carrier flights), it is reasonable to assume a Categorical Exclusion would be appropriate documentation pursuant to NEPA. Coordination with CBP on the type of NEPA documentation would be required as part of the project development process.

As indicated above, FAA approval would also be required for the potential FIS Facility. For siting Option 1 (the northern location) FAA approval would be required for modifications to the airfield due to the relocation of one aircraft parking position and the addition of a new aircraft parking position. Coordination with the FAA would be required to determine the type of environmental document that would be required. However, given the limited improvements/modifications to a disturbed area of the airfield, a Categorical Exclusion would be anticipated. It should be noted that these improvements would also require a modified Airport Layout Plan, which is identified in FAA Order 1050.1E, CHG 1 as an action where a Categorical Exclusion is frequently processed. If the potential FIS Facility would be funded with the use of a Passenger Facility Charge, FAA approval would also be required.

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3. Economic Impact Analysis

The Economic Impact Analysis[17] (EIA) was commissioned by the City as part of the Study. The EIA was produced to quantify the economic impact of LGB, aviation dependent activity associated with LGB and the additional impact of building and operating the potential FIS Facility at LGB. The EIA offers a quantitative method to estimate the financial and employment benefits of LGB to the region. Using the results of a 2016 tenant survey, business list analysis, interviews, LGB expenditures and forecast data analyzed with the IMPLAN model's latest database the EIA identifies the economic impacts of LGB and the potential contribution of a FIS Facility.

Economic impact analysis using the IMPLAN modeling software provides a quantitative method to estimate the benefits of economic activity and investment projects in a region. Business activity analyzed via IMPLAN is expressed in terms of the level of investment with the model then estimating the jobs, earnings and the value of output generated by that activity. The EIA focused on the contribution made by LGB and adjacent air transport business activities to the regional economy. The regional economy for purposes of the EIA is defined to include Los Angeles and Orange Counties. LGB is the 80th largest airport in the U.S. based on enplaned passengers. The EIA has two specific objectives: estimate the economic activity generated by LGB and estimate the additional impact of three potential citing options for the construction and operations of a FIS Facility at LGB.

A self-supporting enterprise of the City, LGB does not receive financial support through the City's general fund. LGB generates revenues through a variety of tenant, passenger and aviation activity user fees and charges. Total revenue for the last full calendar year (2015) was $34.1 million while serving 2.4 million total passengers. Approximately 33% of these revenues are used to purchase services from the City including police, fire, public works, fleet services, city attorney and other services. The level of operations at LGB is dependent on noise budgets as specified in the Noise Ordinance. The Noise Ordinance specifies five airport user categories, with noise budgets for each category reviewed annually. As aircraft are constrained by this budget, this report measures the economic activity at a moment in time and does not attempt to measure activity in unconstrained conditions outside of the Noise Ordinance.

As with all large infrastructure enterprises managing capital improvement programs (CIP) that support projects, LGB must respond to increasing demand, fulfilling federal mandates and passenger expectations. In 2010 LGB funded a major CIP for the construction of the award winning passenger concourse, an on-site parking structure, as well as the modernization and rehabilitation of the iconic and historic streamline moderne terminal. As the facility supporting passenger activity has been addressed, the bulk of the CIP over the next several years will be allocated to airfield related improvements, customer experience and rental car programs projected for fiscal years 2017 - 2019. The projection is for these expenditures to exceed $42 million over the next three years.

LGB has a number of unique characteristics including the size and makeup of the businesses on and around the property. The business composition includes not just commercial, cargo and general aviation but manufacturing, business and passenger services, multiple business parks, warehousing and hospitality. This diversity creates significant economic activity directly and indirectly throughout Long Beach stimulating economic activity throughout the region.

[17] LaCosta Consulting Group. *The Economic Impact of Long Beach Airport (Federal Inspection Service Facility).* September 2016.

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There are four primary categories that make up the employment base and economic output at LGB:

- **On-Airport Activity** – This category includes airport tenants, such as air carriers, rental car agencies, general aviation, fix based operators, flight schools, concessionaires, support businesses and governmental agencies. Support businesses at LGB include flight operations, manufacturing facilities, business services and business parks. Flight operations consist of commercial, cargo, general, corporate and supporting aviation services as well as flight schools. Governmental agencies include the Transportation Security Administration (TSA), police, fire and rescue, air traffic controllers, other Federal Aviation Administration (FAA) lines of business, as well as various other state and federal agencies.

- **Capital Improvement Programs (CIP)** – Capital improvements, such as runway rehabilitation or terminal improvements are ongoing activities. In addition, businesses and other agencies undertake capital improvement projects. These projects employ people in jobs such as construction, architecture, engineering, and consulting.

- **Commercial Service Visitors** – This category includes estimated non-local passengers (business and leisure visitors) arriving via commercial air carriers. The direct output of this group includes spending on hotel, food and beverage, transportation, convention, retail and entertainment expenses during their trip. This spending supports jobs primarily in the hospitality industry.

- **Tenants –** LGB manages significant property and administers the collection of rents and fees to a diverse set of tenants.

The IMPLAN economic model provides estimates of the direct, indirect and induced impacts for each of these categories. The definitions of these categories are:

- **Direct impacts** result from expenditures to suppliers, employees associated with LGB and the businesses at LGB and transportation related businesses in the area

- **Indirect impacts** result from the suppliers purchasing goods and services and hiring workers to meet demand

- **Induced impacts** results from the employees of LGB purchasing goods and services at a household level.

The EIA tabulated quantifiable elements of adding the potential FIS Facility to LGB identifying and modeling additional economic impacts for employment and total value. The qualitative analysis collected in the surveys with local business partners indicated an international facility would have multiple economic benefits. Their insights included supporting local businesses expanding their markets to international locations, creating greater efficiencies for current business travel, giving greater access for foreign executives and a tool to attract new businesses that can leverage quick access to international locations. For example, the GA community now must stop at other airports to clear customs and then reposition to LGB, creating a negative environmental and economic impact because of the extra flight. The cruise and port business could benefit from having nonstop flights return directly to LGB from Mexico and Central America. The hospitality industry values the incremental business the FIS Facility would bring to their current business mix. During interviews with the GA community, real estate holding groups, hospitality industry and business partners noted that the potential FIS Facility would be a value added asset to LGB at this time and long term. Based on these interviews, the potential FIS Facility would create an asset of strategic relevance for multiple enterprises in the City.

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The output of the analysis yields the following findings of LGB:

- The annual economic contribution of LGB and their tenants is approximately 45,000 jobs and $10.3 billion in output
- Direct business and government employment of approximately 9,000 individuals representing 6.4% of the employment in the City
- 28% of current employment in the tenant survey are residents of the City
- The annual economic contribution to the region of LGB's expenditures produces approximately 170 jobs and almost $50 million of annual output in the region
- $130 million in additional economic output is generated by LGB's capital investment plan over the five year period 2015-2019 generating 771 jobs
- Employment by LGB, air carriers, government and businesses supporting the operation of the international flights and the FIS Facility would have a total economic impact of more than 350 employees and over $36.4 million of additional output in the region annually
- The potential additional economic expenditures from the international travelers over the first five years ranges from $57 million to $104 million
- Business and tourist travel impacts are estimated to result in an increase of approximately 1,400 jobs with a total economic value of $185.6 million by Year Five following the opening of a potential FIS Facility
- The construction of the FIS facility would generate financial output valued between $31 million and $38 million depending on the option chosen generating between 203 and 253 jobs
- The tax impacts from existing operations by LGB and their tenants are estimated at approximately $360 million in state and local revenues and $790 million in federal tax revenues
- LGB is a key determinate for businesses' weighing a decision to consolidate facilities or relocate to the City, and international utility would add to that amenity
- LGB revenue base to expand by $4.3 million annum by year four after opening the FIS Facility

The economic impact of an airport is the sum of primary impacts – both direct and indirect – and induced economic activity that occurs because of the additional income generated by the workers at the facilities, tenant businesses, aviation and transport services. As reported above, LGB and its tenants generate over $10 billion and 45,000 jobs in total economic activity with an additional $1.1 billion in tax revenues at the federal, state and local levels.

As no date has been determined for opening a potential FIS Facility, the Economic Impact Analysis quantified the economic benefits from domestic flights based on historical operational averages. International operations are forecast to be incremental to domestic operations; therefore the economic benefit from international flights will also be incremental to the economic benefit from domestic flights.

If the FIS Facility were to be built, it would enhance this contribution to economic activity ranging between $31 - $39 million and 203 – 253 jobs, depending on the option chosen. Once the FIS Facility becomes operational, there would be additional economic contributions due to the visitors to the region as reported in the Economic Impact Analysis. The magnitude of this contribution begins at $102 million growing to $185 million by Years 4 and 5. There is also the potential to generate additional business activity in the area of LGB given the increased access to international markets due to the FIS Facility. However, it is not possible to estimate this impact given the existing data constraints.

Additional information and further detail can be found in Appendix C.

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4. FIS Facility Siting Alternatives

Building upon the findings contained in the Market Analysis and validation of demand for international service at LGB and within the Southern California market, defining the FIS Facility is the next step in evaluating feasibility. Definition of the FIS Facility is based in large part on the requirements contained in the CBP Airport Technical Design Standard (ATDS)[18]. This Study[19] evaluates the requirements for a FIS Facility to process up to 400 passengers per hour.

Each FIS Facility is a single processing complex that evolved from the consolidation and integration of US customs, immigration, and agriculture operations, offices, and support functions. The FIS Facility unifies both passenger processing and baggage/cargo processing for safe and efficient flow of passengers and goods into and out of the United States. The FIS Facility would also have a CBP security area to accommodate international air commerce designated for processing passengers, crew, baggage and effects arriving from, or departing to, foreign countries, as well as aircraft deplaning, ramp areas, and other restricted areas designated by the port director.

The FIS Facility functions similarly to the passenger security screening and baggage security screening areas within the existing terminal area. The existing security screening areas focus on departing passengers and baggage while the security screening areas within the FIS Facility would focus on arriving passengers and baggage. The FIS Facility would contain a sterile corridor connecting arrival aircraft parking positions to the inspection facility, primary processing, secondary processing, international baggage claim, administrative, and storage areas. It would also include support functions such as mechanical, electrical, janitorial, and maintenance areas.

4.1 CBP Requirements

Should the City decide to proceed with the development of a FIS Facility at LGB, the ATDS must be followed. CBP approval is required at each stage of the development process.

There are multiple types of CBP passenger processing facilities at airports. Two of the main designations of CBP passenger processing facilities are Ports of Entry (POE) and User Fee Airport (UFA).

A POE is a place where one may lawfully enter a country. It typically staffed with agents who review passports and visas and inspect luggage to ensure that contraband is not imported. Cargo operations at international airports, as well as road and rail crossings on a land border, are usually served by POE facilities. Some international airport passenger inspection facilities also have POE status.

According to the U.S. Department of Homeland Security and CBP, the following are considered the minimum criteria for establishing a POE[20]. The requesting community must:

- Prepare a report that shows how the benefits to be derived justify the Federal Government expense,
- Be serviced by at least one major mode of transportation,
- Have a minimum population of 300,000 within the immediate service area (approximately a 70 mile radius).

[18] U.S. Customs and Border Protection. *Airport Technical Design Standard. Signature Version.* June 2012.
[19] Jacobs. *FIS Development Alternatives.* August 2016.
[20] U.S. Customs and Border Protection. *Ports of Entry and User Fee Airports.* March 2016.

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Also, the actual workload in the area must be one or a combination of the following:

- 15,000 international air passengers (airport) and 2,000 scheduled international arrivals (airport),
- 2,500 consumption entries (imported goods) each valued over $2,000, with not more than half being attributed to any one party (airport, seaport, land border port),
- 350 vessels (seaport),
- 150,000 vehicles (land border port).

A POE is the processing point for various agencies for enforcement of U.S. laws and regulations. POE processing services, however, are normally furnished by the government at no cost to the airport operator.

On the other hand, a UFA is a facility that reimburses CBP for all costs associated with providing customs services at the airport. The major differences between a UFA and a POE are the workload criteria and financial responsibility for services. Airports may request UFA designation when they do not meet the criteria for becoming a POE or they do not receive POE designation by CBP.

An airport operator that desires CBP services at its airport but does not meet the workload requirements for a POE may still receive the services with a UFA designation by meeting the following three criteria:

- The volume or value of business at the airport is insufficient to justify the availability of CBP service at such airport on a non-reimbursable basis,
- The Governor of the State in which such airport is located approved such designation in writing to the Commissioner of CBP,
- The community (or airport authority) agrees to reimburse CBP for all costs associated with the services, including all expenses of staffing a minimum of one full-time officer.

UFAs do not receive CBP services until they 1) establish and equip a FIS Facility and appropriate office space that meet the ATDS, and 2) have entered into a memorandum of agreement with CBP.

4.2 Port Of Entry / User Fee Airport Designation

Based on the flight activity forecast in the *Traffic Analysis* section in the Market Analysis, LGB's market demand for international passengers has been identified as sufficient in workload and volume of business to justify User Fee Airport designation for startup. When service and passenger volumes meet qualifying levels of POE designation, then LGB may apply for POE designation.

For the purpose of assessing probability for designations, the Study has identified two California airports currently applying for POE status[21]. Fresno Yosemite International Airport and John Wayne Airport have international service and passenger levels that are above the minimum requirement for POE designation. To date, neither airport has been successful in receiving POE designation; both operate as UFAs. John Wayne Airport is the most recent California airport to apply for POE status. Although it received UFA designation in 2012, it has yet to be successful in receiving POE designation after satisfying all requirements as outlined above. John Wayne Airport has had the political support at the state, congressional, and local levels of government and still has been unsuccessful at receiving POE designation.

Therefore the probability for LGB receiving the UFA designation is high. POE designation cannot be assessed until specific levels workload and volumes are met; however, based on current findings as outlined above, it would be unlikely in the near term.

[21] U.S. Customs and Border Protection. *Lis of Airports Where CBP Inspection Services are Normally Available.* https://www.cbp.gov/. March 2014.

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Airports that request UFA designation must begin the application process by contacting the nearest POE or the servicing Field Office and request an initial site visit to review existing infrastructure, if any, and to discuss projected workload and required services. See Appendix D for nearest CBP point of contact.

The airport operator must then arrange for the current governor to submit a letter to the CBP Commissioner supporting the airport operator requested to be designated a UFA. If CBP determines that it can support the request, the Commissioner will provide provisional approval in the response to the governor contingent upon the airport providing ATDS-compliant facilities.

4.3 FIS Development Process

Project approval, including all design work approval and notice to proceed on any work within the scope of the project, must be obtained from an assigned Project Manager (PM). No other CBP entity has the authority to approve work requested by the airport operator. The development of a CBP airport passenger processing facility project follows a seven step process. Further detail regarding the FIS development process can be found in Appendix D.

4.4 Description of FIS Facility at LGB

A FIS Facility at LGB would be developed in accordance with CBP design standards and security requirements as well as have processing areas that are designed for and sized for the predicted number of arriving international passengers. In addition to meeting CBP standards, such a FIS Facility should have a suitable location, comply with environmental requirements, provide the least disruption to existing operations, and fit within overall future terminal development plan.

The FIS Facility should include the following components:

- Aircraft Arrival Area
- Sterile Corridor System (SCS)
- CBP Primary Processing Area (PPA)
- CBP Secondary Processing Area
- CBP Administrative Area and Support Functions
- International Baggage Claim

Further definition of FIS Facility components can be found in Appendix D.

4.5 North FIS Facility Siting Alternative

One potential location for the FIS Facility is north of the terminal area, as shown in Figures 5 and 6. The north FIS alternative is referred to as Option 1. This location would be accessible for inbound international flights from Taxiway K to aircraft parking positions 11 and 12. These parking positions do not exist and would need to be constructed. Passengers would exit the aircraft, transit the sterile corridor to the CBP Primary Processing Area and retrieve their baggage from the international baggage claim. As passengers exit the FIS Facility, they would proceed through an exit corridor to the curbside north of the terminal for pickup or continue to other modes of ground transportation.

Option 1 would require approximately 35,051 square feet of new construction with corridors to both enter and exit the FIS Facility. The sterile entry corridor would be approximately 6,353 square feet and the exit corridor would be approximately 3,144 square feet. Option 1 preserves area for terminal operations. The exit corridor is necessary to safely lead passengers to the curbside, but may be viewed as a passenger inconvenience. Approximately 5,772 square feet would be dedicated to international baggage claim area with approximately 70

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linear feet of claim unit frontage on the airline loading side and approximately 140 linear feet on the passenger side.

NOTE: The North FIS Facility siting alternative is conceptual, presented for illustrative purposes only.

Figure 5 Option 1 NE View

New aircraft parking positions 11 and 12 will be the primary parking positions for international flights arriving to LGB if the FIS Facility were to be located on the north side. These parking positions do not exist and would need to be constructed north of the FIS Facility requiring 91,500 square feet of new aircraft pavement. Due to airport vehicles using the area between the potential north FIS Facility and the north concourse to conduct terminal operations, traffic control measures (i.e. flagger, traffic signal, grade separation, etc.) would be necessary if flight schedules require three simultaneous international arrivals. Terminal operations between the potential north FIS Facility and the north concourse would prohibit boarding at aircraft parking positions 11 and 12 without traffic control measures. This restriction would require aircraft to be repositioned between deplaning and boarding. Repositioning aircraft creates additional work for airline personnel and would require towing operations prior to each departure.

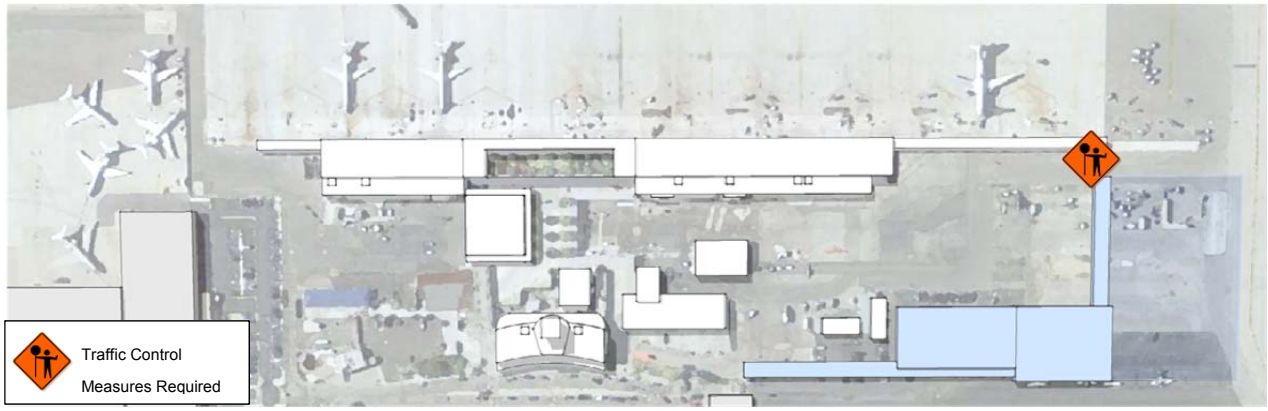

Figure 6 Option 1 Plan View

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4.6 South FIS Facility Siting Alternatives

Another potential location for the FIS Facility is south of the terminal area, as shown in Figures 7 – 10. Compared to the north site, the site south of the terminal is more constrained, having less available space to construct the FIS Facility. In reviewing potential options for constructability of the facility, two south options were evaluated and are referred to as Options 2 and 3. Options 2 and 3 are similar, with Option 3 taking advantage of repurposing the existing Security Screening Checkpoint (SSCP) to reduce the impact of new construction south of the terminal area. The south FIS location would be accessible for inbound international flights from Taxiway C to existing aircraft parking positions 1 and 2. Similar to the north FIS, passengers would exit the aircraft, transit the sterile corridor to the CBP Primary Processing Area and retrieve their baggage from the international baggage claim. As passengers exit the FIS Facility, they would proceed to a courtyard adjacent to the curbside south of the terminal for pickup or continue to other modes of ground transportation. Positioning arriving passengers south of the terminal in a single level roadway configuration would reduce traffic congestion on the north side for vehicles coming into the terminal area.

NOTE: The South FIS Facility siting alternatives are conceptual, presented for illustrative purposes only.

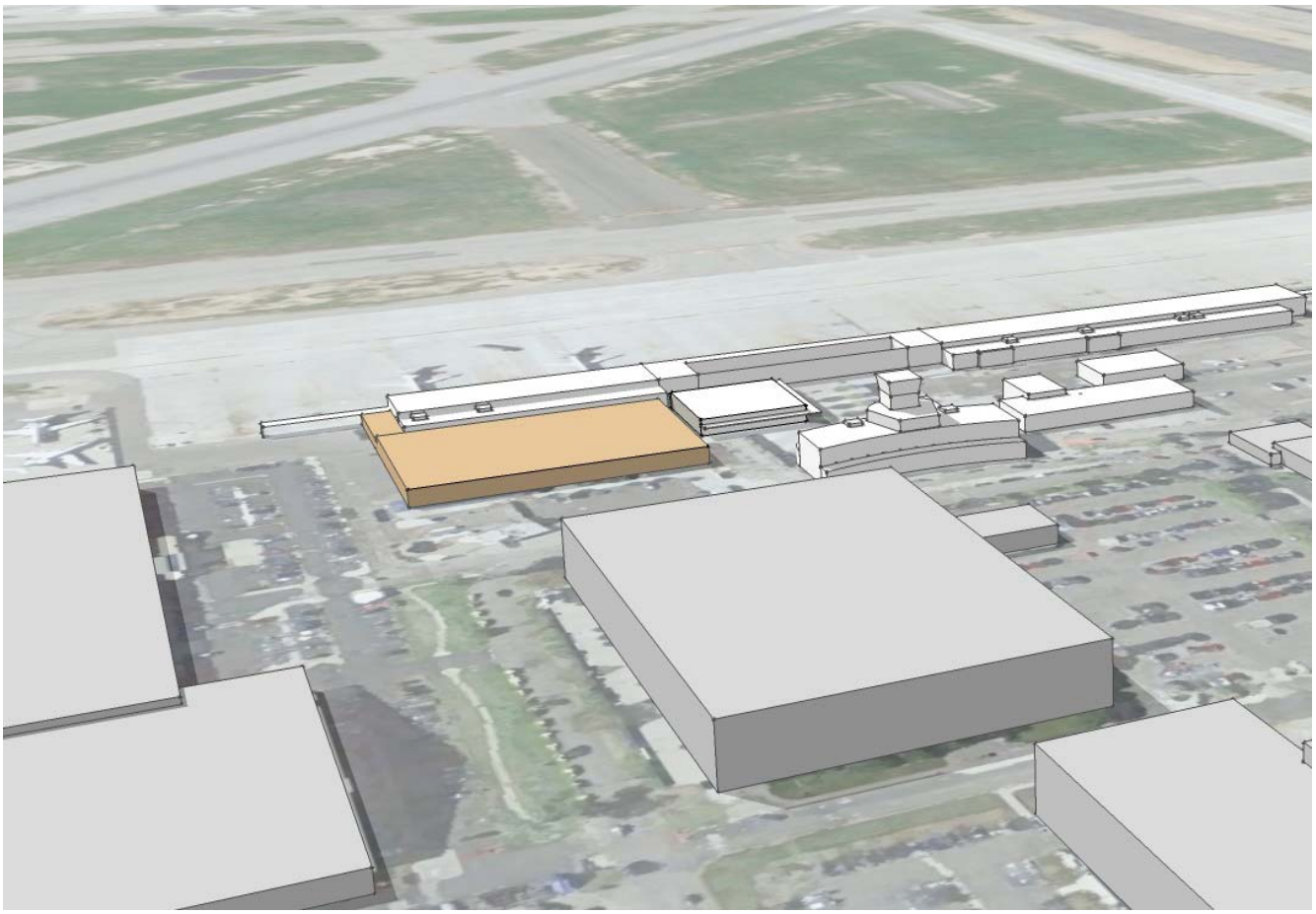

Figure 7 Option 2 SE View

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Option 2 would require approximately 30,672 square feet of new construction immediately to the east of the south concourse and immediately south of the existing SSCP with a shorter entry corridor than the entry corridor of Option 1 and will not require an exit corridor. The sterile entry corridor would be approximately 1,815 square feet. The footprint of Option 2 would impact storage of ground service equipment but would eliminate the need for an exit corridor due to the close proximity to the curbside south of the terminal. Approximately 9,075 square feet would be dedicated to baggage claim area with approximately 210 linear feet of claim unit frontage on the airline loading side and 420 linear feet on the passenger side split amongst three baggage claim units. Two of the baggage claim units would be for domestic arrivals with the third unit configured to operate as a "swing" baggage claim that can be used for either domestic or international arriving passengers. Option 2 will require demolition of 312 linear feet of existing claim unit frontage on the airline loading side and 346 linear feet on the passenger side.

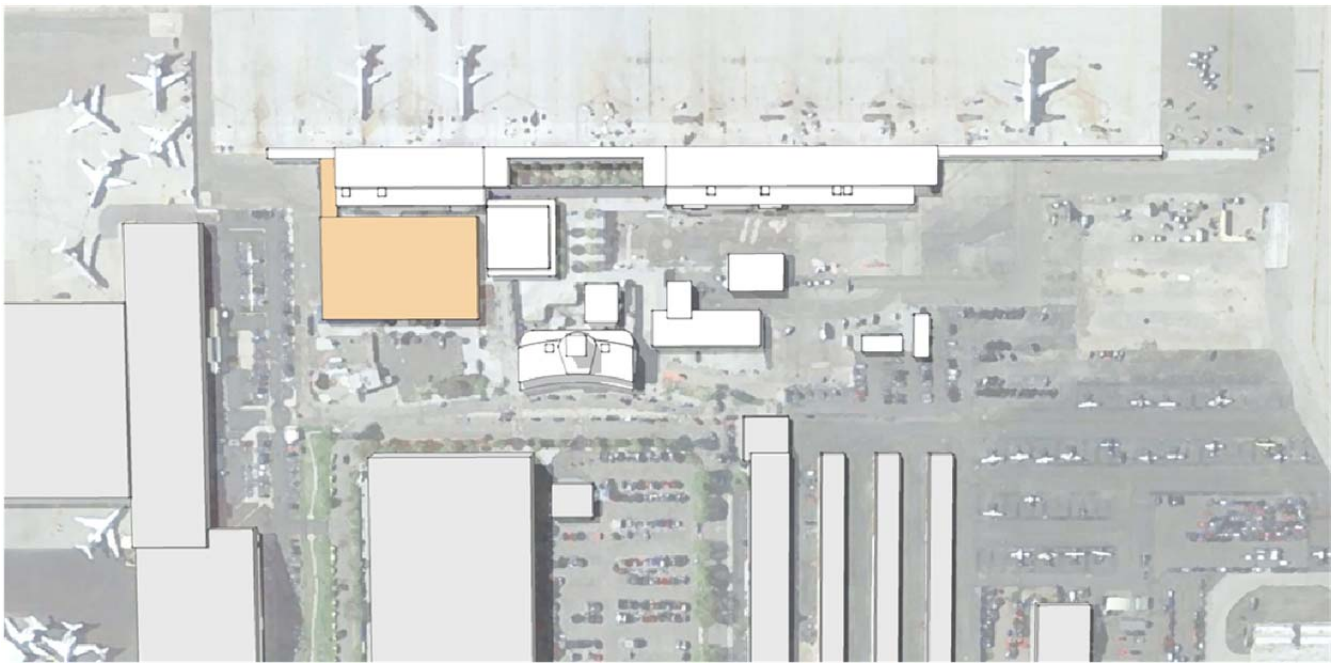

Figure 8 Option 2 Plan View

Option 3 would integrate and repurpose the existing SSCP into the FIS Facility. Option 3 would require approximately 21,656 square feet of new construction immediately to the east of the south concourse and immediately south of the existing SSCP with a shorter entry corridor than the entry corridor of Option 1 and will not require an exit corridor. The sterile entry corridor would be approximately 1,815 square feet. Approximately 6,750 square feet of the existing SSCP would be repurposed for the FIS Facility. Repurposing the existing SSCP would require construction of a new SSCP, shown in green in Figures 9 and 10, located north of the "meeter-greeter" plaza. The new SSCP would be approximately 8,100 square feet and would be a direct replacement for the existing SSCP. The reduced size of new construction south of the terminal would preserve area for storage of ground service equipment. Approximately 5,772 square feet within the new construction would be dedicated to international baggage claim area with approximately 70 linear feet of baggage claim unit frontage on the airline loading side and approximately 140 linear feet on the passenger side configured as a "swing" baggage claim unit. Option 3 would require demolition of 312 linear feet of existing claim unit frontage on the airline loading side and demolition of 346 linear feet on the passenger side. Option 3 would replace baggage claim units 1 and 2 with two new baggage claim units with a total of 140 linear feet of claim unit frontage on the airline loading side and 280 linear feet on the passenger side.

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Figure 9 Option 3 SE View

Figure 10 Option 3 Plan View

Aircraft parking positions 1 and 2 will be the primary parking positions should the FIS Facility be located on the south. Boarding operations at aircraft parking position 1 would not be allowed to commence until deplaning operations at aircraft parking position 2 are complete. Utilization of aircraft parking positions 1 and 2 does not require new pavement construction. Options 2 and 3 allow for three simultaneous operations without the need for traffic control measures, as the entrance to the sterile corridor would be accessible from existing aircraft parking positions 1, 2, or 3.

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4.7 LGB FIS Facility Program

The size of the FIS Facility is determined by the number of arriving aircraft and passengers processed during the peak hour of operation. Based on the simulated international flight activity in the Market Analysis, the potential frequency of arriving international passengers is 255 passengers during the peak hour. LGB would be categorized as a small airport by ATDS definition.

Providing a FIS Facility that meets CBP guidelines would require approximately 35,051 square feet for Option 1; 30,672 square feet for Option 2; and 28,406 square feet for Option 3.

The overall FIS Facility area square footage would be allocated among the various uses and is described below in more detail in the Table 7.

		OPTION 1 (NORTH)	OPTION 2 (SOUTH)	OPTION 3 (SOUTH-ALT)	
FLOOR AREA SUMMARY	**NET AREA[22]**	**GROSS FLOOR AREA[23]**	**GROSS FLOOR AREA[23]**	**GROSS FLOOR AREA[23]**	**REMODELED AREA**
ENTRY CORRIDOR		**6,353**	**1,815**	**1,815**	**0**
GENERAL AREAS	**Net SF**	**GFA SF**	**GFA SF**	**GFA SF**	**GFA SF**
BAGGAGE CLAIM	4,770	5,772	9,075	5,772	
CIRCULATION	2,640	3,196	3,196	1,888	
COUNTER TERRORISM RESPONSE	475	575	575	575	
RESTROOM	696	842	842	842	
QUEUING	2,732	3,308	3,308	3,308	
PASSENGER PROCESSING	1,476	1,786	1,786	1,786	
ADDITIONAL SUPPORT AREAS[24]	5,704	6,909	6,909	2,504	6,750
SUBTOTAL GENERAL AREAS	**18,493**	**22,388**	**25,691**	**16,675**	**6,750**
CORRIDOR BET. ENTRY/EXIT		3,144	0	0	0
INTERNAL CORRIDOR		1,008	1,008	1,008	0
SECONDARY AREA		2,158	2,158	2,158	0
SUBTOTAL ADDITIONAL AREAS		**6,310**	**3,166**	**3,166**	**0**
TOTAL FLOOR AREA		**35,051**	**30,672**	**21,656**	**6,750**
BAGGAGE CLAIM – AIRLINE LOADING SIDE (LF)		70	210	210	0
BAGGAGE CLAIM – PASSENGER SIDE (LF)		140	420	420	0
BAGGAGE CLAIM–AIRLINE LOADING SIDE DEMO (LF)		0	312	312	0
BAGGAGE CLAIM–PASSENDER SIDE DEMO (LF)		0	346	346	0
AIRCRAFT PAVEMENT–15" PCC / 6" CTB / 8" CTS (SF)		91,500	0	0	0

Table 7 FIS Facility Program Summary

[22] Net Area calculations do not include wall thickness.
[23] Gross floor area (GFA) is the total floor area inside the building envelope including external walls and excluding the roof.
[24] Additional Support Areas are further defined in Appendix D.

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5. LGB Airport Scope and Capability Analysis

Building upon the Market Analysis and Facility Definition, the Study[25] analyzed the airside and landside capability of LGB to meet the forecasted demand as a result of adding a FIS Facility. This Study also provides recommendations for improvements to the scope and capability of LGB.

5.1 LGB Airfield Infrastructure Review

LGB reported 300,164 annual aircraft operations in FY2015[26]. Aircraft operations included scheduled passenger air carriers, air freight, general aviation, fixed wing and rotorcraft training, government/military flight operations, and other uses. LGB has three active runways, ten supporting taxiways, and various aircraft parking aprons. LGB recently decommissioned two runways (16R-34L and 16L-34R). LGB serves as the west coast focus city for JetBlue, has significant based and transient GA activity, and is home to Gulfstream Aerospace finishing, delivery, and maintenance facilities.

Tables 8 and 9 provide data on the three active runways and ten taxiways[27].

RUNWAY DATA							
		RUNWAY 12-30		RUNWAY 7L-25R		RUNWAY 7R-25L	
		EXISTING	FUTURE	EXISTING	FUTURE	EXISTING	FUTURE
AIRPORT REFERENCE CODE		D-IV	No Change	D-III	No Change	B-II	No Change
CRITICAL AIRCRAFT	AIRCRAFT	767-300ER	No Change	737-800W	No Change	Cessna Citation II	Beechcraft King Air 200
	WINGSPAN (ft.)	156.2	No Change	112.5	No Change	51.7	54.5
	UNDERCARRIAGE (ft.)	30.50	No Change	18.8	No Change	15	16.25
	APPROACH SPEED (kts.)	145	No Change	142	No Change	108	103
	MAX. TAKEOFF WT. (lbs.)	412,000	No Change	174,200	No Change	13,300	12,500
PHYSICAL LENGTH AND WIDTH		10,000' x 200'	No Change	6,192' x 150'	No Change	5,423' x 150'	3918' x 100'
RUNWAY HIGH POINT (Above Mean Sea Level)		60'	No Change	58'	No Change	53'	No Change
RUNWAY LOW POINT (Above Mean Sea Level)		26'	No Change	38'	No Change	31'	35'
VERTICAL LINE OF SIGHT PROVIDED		Yes	No Change	Yes	No Change	Yes	No Change
EFFECTIVE GRADIENT (%)		0.35	No Change	0.32	No Change	0.39	0.47
MAXIMUM GRADIENT (%)		0.35	No Change	0.32	No Change	0.39	0.47
RUNWAY SURFACE		Asphalt	No Change	Asphalt	No Change	Asphalt	No Change
PAVEMENT STRENGTH (1,000#) - S/D/DT		30/200/300	No Change	30/200/300	No Change	30/75/-	12.5/-/-
RUNWAY EDGE LIGHTING		HIRL/Centerline/TDZ	No Change	HIRL	No Change	HIRL	No Change

Table 8 LGB Runway Data

TAXIWAY DATA														
TAXIWAY	AIRPLANE DESIGN		TAXIWAY DESIGN		WIDTH		SURFACE TYPE		RWY CL TO TWY CL		TAXIWAY SAFETY		TAXIWAY OBJECT	
	EXISTING	FUTURE	EXISTING	FUTURE	EXISTING	FUTURE	EXISTING	FUTURE	EXISTING	FUTURE	EXISTING	FUTURE	EXISTING	FUTURE
A	IV	No Change	5	No Change	75'	No Change	Asphalt	No Change	N/A	No Change	171'	No Change	259'	No Change
B	IV	No Change	5	No Change	65'	No Change	Asphalt	No Change	460'	No Change	79'	No Change	131'	No Change
C	IV	No Change	5	No Change	75'	No Change	PCC	No Change	300'	No Change	171'	No Change	259'	No Change
D	IV	No Change	5	No Change	75'	No Change	Asphalt	No Change	350'	No Change	171'	No Change	259'	No Change
E	II	N/A	3	N/A	50'	N/A	Asphalt	No Change	N/A	N/A	49'	N/A	90'	N/A
F	IV	II / III / IV	5	2 / 3 / 5	100'	35' / 50' / 75'	Asphalt	No Change	275'	No Change	79'	No Change	131'	No Change
G	IV	No Change	5	No Change	75'	No Change	Asphalt	No Change	N/A	No Change	171'	No Change	259'	No Change
J	III	No Change	3	No Change	75'	No Change	Asphalt	No Change	400'	No Change	49'	No Change	100'	No Change
K	IV	No Change	5	No Change	75'	No Change	PCC	No Change	400'	400'	<171'	171'	<259'	259'
L	IV	No Change	5	No Change	75'	No Change	Asphalt	No Change	400'	No Change	171'	No Change	259'	No Change

Table 9 LGB Taxiway Data

[25] Jacobs. *LGB Airport Scope and Capability Analysis.* August 2016.
[26] Federal Aviation Administration (FAA). *Enplanements at All Commercial Service Airports.* March 2016.
[27] Long Beach Airport. *Airport Layout Plan*. September 2016.

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5.2 Airside Scope and Capability

Currently, LGB is served by a combination of narrow-body aircraft for commercial flights. As of July 2016, the fleet mix included those in the Airbus A320 family, Boeing 737 family, and the Bombardier CRJ700 and CRJ900. UPS flies the Boeing 767-300F and FedEx flies the Airbus A300F for air cargo operations. From the Market Analysis, JetBlue will continue to utilize its A320 fleet to operate potential international flights. All gates and aircraft parking positions at the LGB terminal can accommodate and service the entire A320 family, including the Airbus A321-200, which is the largest variant in the series. All terminal gates are able to accommodate up to Airplane Design Group III, which includes Boeing 737 and Airbus A320. Aircraft parking positions 1, 2, and 10 are wider and can also accommodate Boeing 757-300, which is classified as Airplane Design Group IV.

Manufacturer	Aircraft	AAC[28]	ADG[29]	TDG[30]
Airbus	A300F	C	IV	5
Airbus	A319	C	III	3
Airbus	A320	C	III	3
Airbus	A321	C	III	3
Boeing	737-700W	C	III	3
Boeing	737-800W	D	III	3
Boeing	737-900W	D	III	3
Boeing	757-300W	D	IV	4
Boeing	767-300F	D	IV	5
Bombardier	CRJ700	C	II	3
Bombardier	CRJ900	C	III	3

Table 10 LGB Commercial Aircraft Fleet Mix

LGB has the infrastructure to support the next generation of aircraft. Over the last 50 years, the aviation industry has cut fuel consumption, CO_2 emissions by more than 80%, NOx emissions by 90%, and noise by 75%. The technology pipeline of products in development mirrors these improvement trends. The next generation A320neo, the aircraft that will most affect LGB in the future, will reduce emissions and noise while meeting market demands. The A320neo family includes sharklet wingtip devices and engine improvements that will improve its noise footprint by 15 decibels.

There are also many types of aircraft flown by the GA community that are capable of flying to international markets. These include, but are not limited to, the family of Gulfstream Aerospace jets, Cessna Citation jets, and Boeing Business jets.

Inside the terminal, the holdroom level of service was evaluated using International Air Transport Association (IATA) Airport Development Reference Manual, 10th Edition. The key factors used in the IATA approach are:

- Holdroom area.
- Number of aircraft seats.
- Number of passengers based on an assumed load factor.
- Ratio of seated to standing passengers.
- Loss of available seats due to passengers putting personal belongings on an adjacent seat.

[28] Aircraft Approach Category (AAC). A grouping of aircraft based on a reference landing speed (V_{REF}), if specified, or if V_{REF} is not specified, 1.3 times stall speed (V_{SO}) at the maximum certificated landing weight. V_{REF}, V_{SO}, and the maximum certificated landing weight are those values as established for the aircraft by the certification authority of the country of registry.

[29] Airplane Design Group (ADG). A classification of aircraft based on wingspan and tail height.

[30] Taxiway Design Group (TDG). A classification of airplanes based on outer to outer Main Gear Width (MGW) and Cockpit to Main Gear distance (CMG).

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- Potential to use seating in an adjacent holdroom.
- Space per seated passenger.
- Space per standing passenger.

The holdroom level of service guideline developed by IATA is based on the available square feet per passenger. IATA defines three levels of service for holdroom size:

- Over Design (>15.6 square feet per passenger).
- Optimum (12.9 to 15.6 square feet per passenger).
- Suboptimum (<12.9 square feet per passenger).

Due to ongoing airline and aircraft scheduling changes, the IATA level of service approach for designing new airport terminals is based on the largest aircraft that can fit on a gate. The results of this analysis are show in Table 11.

HOLDROOM LOS BASED ON EXISTING GATE STRIPING							
Gate No.	Actual Area SF	Design Aircraft	Seats	IATA Calc Area SF	IATA LOS SF/PAX		Airline
1	1,825	B757-300	243	2,985	8.8	Suboptimum	--
2	2,345	B757-300	243	2,985	11.4	Suboptimum	--
3	2,356	B737-900W	189	2,389	14.7	Optimum	--
4	1,805	B737-900W	189	2,389	11.2	Suboptimum	--
5	1,807	B737-900W	189	2,389	11.2	Suboptimum	--
6	2,938	B737-900W	189	2,389	18.3	Over Design	--
7	2,944	B737-900W	189	2,389	18.3	Over Design	--
8	2,939	B737-900W	189	2,389	18.3	Over Design	--
9	2,552	B737-900W	189	2,389	15.9	Over Design	--
10-11	2,214	B757-300 & B737-900	432	5,074	6.0	Suboptimum	--

Table 11 Holdroom Level of Service on Existing Gate Striping

A useful analysis for evaluating existing terminal holdrooms is to adapt the IATA approach based on the scheduled aircraft using each gate. The results of this analysis for the existing flight schedule are shown in Table 12. Based on IATA standards, holdroom size is "Optimum" or better in all cases. The results indicate that the holdrooms have the capacity and flexibility to accommodate typical airline operational changes to meet market demand, such as additional flights and larger aircraft.

HOLDROOM LOS BASED ON EXISTING FLIGHT SCHEDULE							
Gate No.	Actual Area SF	Design Aircraft	Seats	IATA Calc Area SF	IATA LOS SF/PAX		Airline
1	1,825	B737-700	148	1,936	14.5	Optimum	Southwest
2	2,345	CRJ9	90	1,295	30.7	Over Design	Delta
3	2,356	CRJ9	90	1,295	30.8	Over Design	American
4	1,805	--	--	--	--		Unassigned
5	1,807	A320	150	1,958	14.2	Optimum	JetBlue
6	2,938	A320	150	1,958	23.0	Over Design	JetBlue
7	2,944	A320	150	1,958	23.1	Over Design	JetBlue
8	2,939	A320	150	1,958	23.1	Over Design	JetBlue
9	2,552	--	--	--	--		Unassigned
10-11	2,214	--	--	--	--		Unassigned

Table 12 Holdroom Level of Service on Existing Flight Schedule

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The holdrooms were also analyzed with the potential additional of international flights for both a South and North FIS Options in in Tables 13 and 14. The results indicate that based on IATA standards, the holdroom size is "Optimum" or better in all cases.

HOLDROOM LOS BASED ON FUTURE FLIGHT SCHEDULE (SOUTH FIS)							
Gate No.	Actual Area SF	Design Aircraft	Seats	IATA Calc Area SF	IATA LOS SF/PAX		Airline
1	1,825	A320	150	1,958	14.3	Optimum	JetBlue
2	2,345	A320	150	1,958	18.4	Over Design	JetBlue
3	2,356	A320	150	1,958	18.5	Over Design	JetBlue
4	1,805	A320	150	1,958	14.2	Optimum	JetBlue
5	1,807	A320	150	1,958	14.2	Optimum	JetBlue
6	2,938	A320	150	1,958	23.0	Over Design	JetBlue
7	2,944	A320	150	1,958	23.1	Over Design	JetBlue
8	2,939	CRJ9	90	1,295	38.4	Over Design	American
9	2,552	CRJ9	90	1,295	33.4	Over Design	Delta
10-11	2,214	B737-700	148	1,936	17.6	Over Design	Southwest

Table 13 Holdroom Level of Service Based on Future Flight Schedule for South FIS Facility Option

HOLDROOM LOS BASED ON FUTURE FLIGHT SCHEDULE (NORTH FIS)							
Holdroom Gate No.	Actual Area SF	Design Aircraft	Seats	IATA Calc Area SF	IATA LOS SF/PAX		Airline
1	1,825	B737-700	148	1,936	14.5	Optimum	Southwest
2	2,345	CRJ9	90	1,295	30.7	Over Design	Delta
3	2,356	CRJ9	90	1,295	30.8	Over Design	American
4	1,805	A320	150	1,958	14.2	Optimum	JetBlue
5	1,807	A320	150	1,958	14.2	Optimum	JetBlue
6	2,938	A320	150	1,958	23.0	Over Design	JetBlue
7	2,944	A320	150	1,958	23.1	Over Design	JetBlue
8	2,939	A320	150	1,958	23.1	Over Design	JetBlue
9	2,552	A320	150	1,958	20.0	Over Design	JetBlue
10-11	2,214	A320	150	1,958	17.4	Over Design	JetBlue

Table 14 Holdroom Level of Service on Future Flight Schedule for North FIS Facility Option

Figure 11 shows all arriving international passengers based on time using the Market Analysis simulated international flight schedule. Peak time periods for arrivals would be in the early afternoon in the 1:40PM to 2:30PM time range, around 4:45PM, and around 7:40PM.

<u>NOTE:</u> Specific service periods for potential FIS clearance activities are subject to agreement by CBP and would also require compliance with the LGB Noise Ordinance restrictions.

Figure 12 shows domestic passenger flow using the existing flight schedule. The combined number of passengers is below 1,000 per rolling 60 minutes.

Figure 13 shows domestic and international passenger flow using the Market Analysis simulated international flight schedule. There are peak periods on the afternoon where the combined number of passengers is above 1,000 per rolling 60 minutes.

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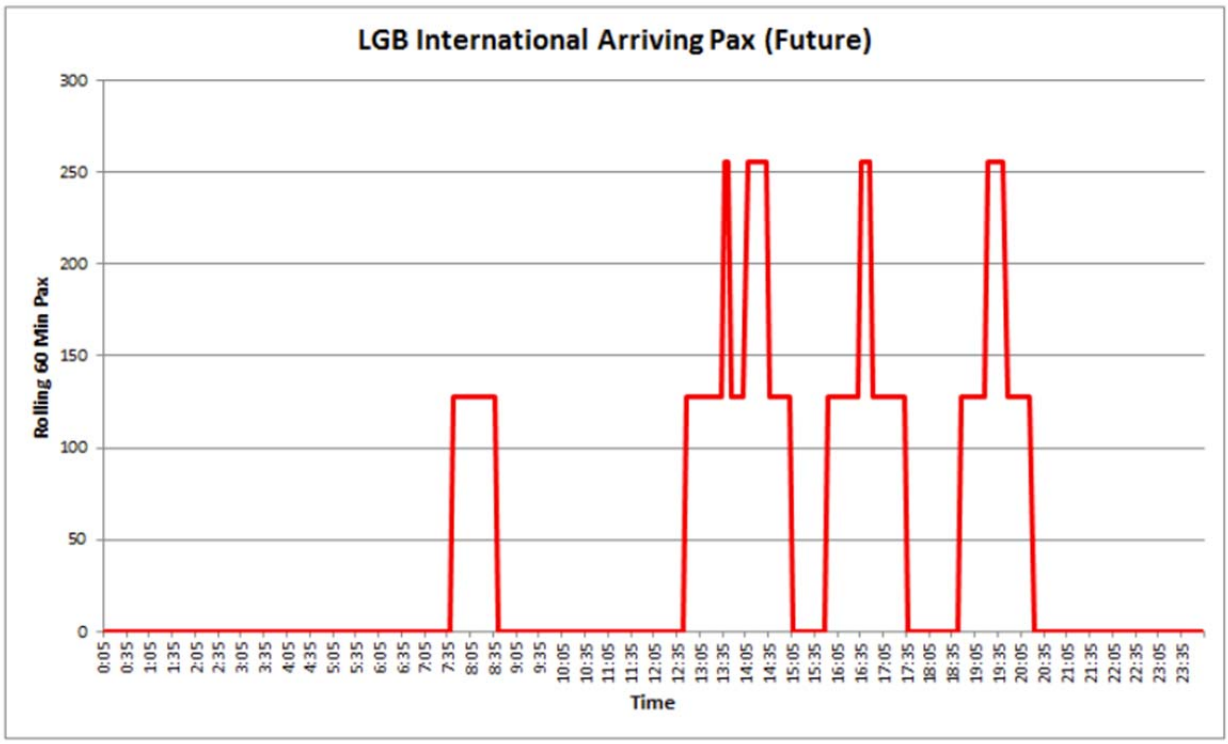

Figure 11 International Arriving Passenger Flow Based on Future Flight Schedule

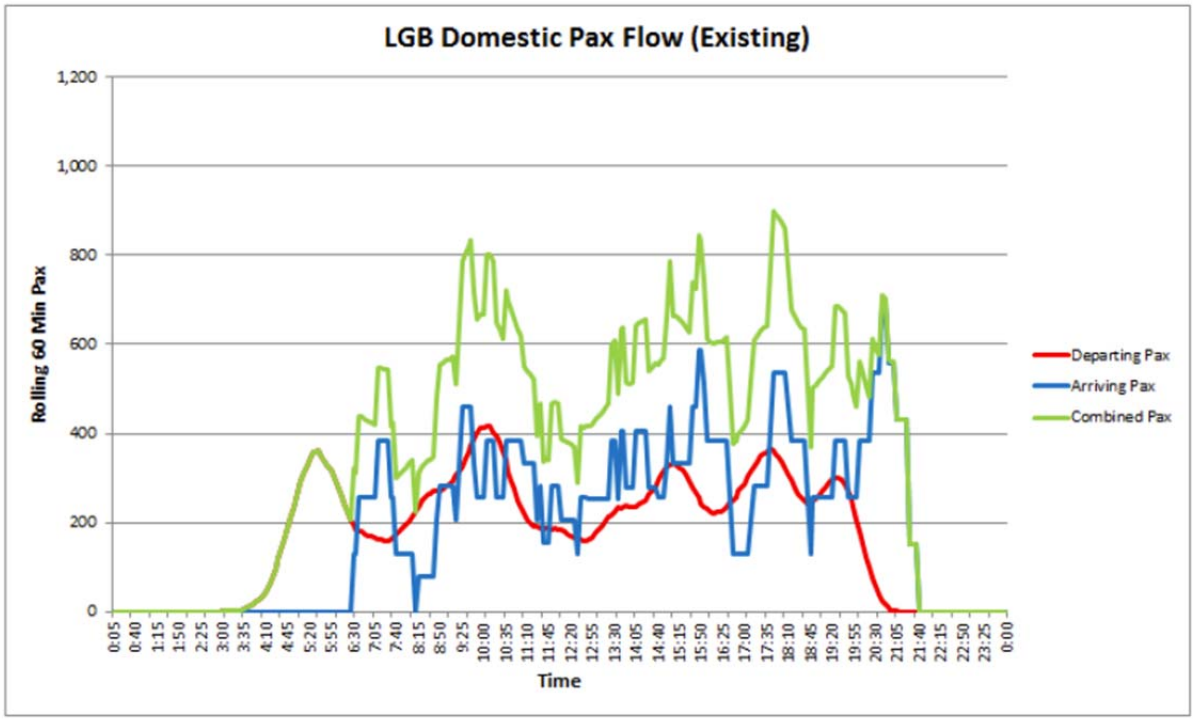

Figure 12 Domestic Passenger Flow Based on Existing Flight Schedule

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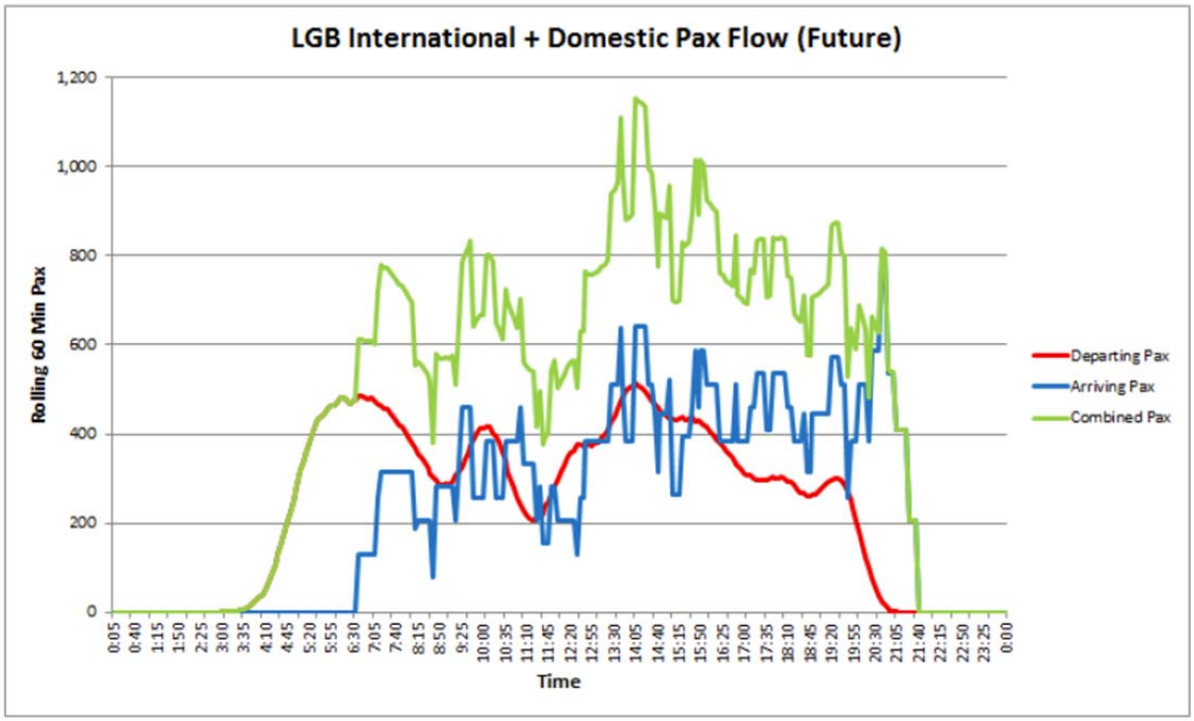

Figure 13 Domestic and International Passenger Flow Based on Future Flight Schedule

5.3 Critical Airside Components

The critical airside component of an airport is the runway and taxiway system. The primary runway for air carrier operation is Runway 12-30. The secondary runway for air carrier operation is Runway 7L-25R. The primary taxiways between the air carrier runways and the terminal are Taxiways C, K, and L.

Airside Component	AAC[28]	ADG[29]	TDG[30]
Runway 12-30	D	IV	
Runway 7L-25R	D	III	
Taxiway C		IV	5
Taxiway K		IV	5
Taxiway L		IV	5

Table 15 Critical Airfield Components

Other critical components are aircraft parking positons and gates. To support international flight service, LGB will need to have the appropriate amount of aircraft parking positions. As noted in *FIS Development Alternatives*, there are three potential options – one north FIS alternative and two south FIS alternatives.

The south concourse has four aircraft gates and is supported by aircraft parking positions 1 – 4. The north concourse has seven aircraft gates and is supported by aircraft parking positions 5 – 11. In Option 1, the current aircraft parking position 11 would be decommissioned, and new parking positions 11 and 12 would need to be constructed. New aircraft parking positions 11 and 12 would be the primary parking positions for Option 1.

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For Options 2 and 3 aircraft parking positions 1 and 2 would be the primary aircraft parking positions; no new aircraft parking construction is needed.

Table 16 provides information regarding aircraft parking capabilities at each of the existing aircraft parking positions within the Terminal Area.

	Aircraft Parking Positions										
	1	2	3	4	5	6	7	8	9	10	11
A320	✈	✈	✈	✈	✈	✈	✈	✈	✈	✈	✈
A321-100	✈	✈	✈	✈	✈	✈	✈	✈	✈	✈	✈
B737-700W	✈	✈	✈	✈	✈	✈	✈	✈	✈	✈	✈
B737-900W	✈	✈	✈	✈	✈	✈	✈	✈	✈	✈	✈
B757-300	✈	✈								✈	
B757-200W	✈	✈								✈	
CRJ700	✈	✈	✈	✈	✈	✈	✈	✈	✈	✈	✈
CRJ900	✈	✈	✈	✈	✈	✈	✈	✈	✈	✈	✈

Table 16 Existing Aircraft Parking Positions

5.4 Recommendation for Airside Infrastructure Improvements

Option 1 would require two aircraft parking positions to be constructed. Aircraft parking position 11 would be decommissioned, and new parking positions 11 and 12 would need to be constructed. The new aircraft parking positions 11 and 12 would be the primary positions for Option 1.

Options 2 and 3 require no new parking positions to be constructed. For Option 3, the current SSCP located on the south side will need to be repurposed as part of the FIS Facility and a new SSCP would be constructed on the north side.

Within the existing concourse, Outbound Search Rooms (OSR) will need to be constructed per CBP ATDS requirements. One OSR will be needed for each two gates serving international departures. Option 1 would require one OSR in the north concourse; Options 2 and 3 would require one OSR in the south concourse.

5.5 LGB Landside Infrastructure Review

LGB is situated on approximately 1,166 acres in central Long Beach on Donald Douglas Drive, located just north of Interstate-405 (I-405), bounded by Cherry Avenue to the west, City of Lakewood and Douglas Park to the north, and North Lakewood Boulevard to the east.

Vehicular access to LGB is provided at North Lakewood Boulevard at Donald Douglas Drive/East Wardlow Road. Donald Douglas Drive loops into LGB providing access to the terminal as well as the short term parking structure (Lot A), long term parking structure (Lot B), car rental lot, and office spaces. Also present is an extension of the south side of the Donald Douglas Drive to exit onto North Lakewood Boulevard, with southbound North Lakewood Boulevard access (right turn) only.

In November 2005, an Environmental Impact Report (EIR) was conducted for the Long Beach Airport Terminal Area Improvement Project. The EIR evaluated the potential impacts associated with additional commercial carrier flights and full utilization of the 25 minimum commuter flights provided for in the Noise Ordinance. The full utilization of 25 commuter flights and a total of 52 commercial carrier flights are identified as the Optimized Flights scenario in the EIR[15].

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With the Optimized Flights scenario, the EIR evaluated traffic impact for future Year 2020 and concluded that the full utilization of commuter and commercial flights are not causally related[15].

The Optimized Flights scenario is the maximum reasonable flight level that could potentially occur with optimized operational procedures and aircraft and still be within the noise budgets permitted by the Noise Ordinance[15].

Currently, all passenger access to LGB is via Donald Douglas Drive and North Lakewood Boulevard.

Lakewood Boulevard runs north-south and is classified as a regional roadway in the City of Long Beach's General Plan. There are four lanes in each direction within the study area, a raised median, and a 45 MPH speed limit. In 2014, the daily traffic volume measured by the City of Long Beach Public Works Department was approximately 44,300 vehicles per day.

Donald Douglas Drive serves as the entrance road to the Long Beach Airport as well as a limited amount of office space, Million Air, a franchised GA services company, Gulfstream aircraft manufacturing, and other aviation businesses. Donald Douglas Drive forms a one-way, two-lane loop through the terminal area. The roadway is two lanes in each direction between the loop and North Lakewood Boulevard. In 2016, the daily traffic volume was approximately 13,000 vehicles per day.

The street opposite Donald Douglas Drive at Lakewood Boulevard, East Wardlow Road, is a four-lane roadway with a 35 mile per hour speed limit. The daily traffic volume in 2014 measured by the City of Long Beach Public Works Department was approximately 10,500 vehicles per day.

Parking capacity was analyzed using the following data obtained from Long Beach Airport staff:

- Daily overnight night volumes from 2015.
- Monthly enplaned passenger activity from 2015.
- Annual enplaned passenger activity from 2015.
- Number of existing parking stalls in Lots A and B.
- Existing and future planning day flight schedules.

There are a total of 3,007 parking stalls in Lots A and B (1,018 parking stalls in Lot A and 1,989 parking stalls in Lot B). July was the busiest month of the year for passenger activity in 2015. During that month, the greatest number of overnight parked vehicles was 1,401. This represents a parking demand level that is approximately 47% of total parking capacity.

The future planning day flight schedule has a 22.5% increase in the number seats compared to the existing flight schedule. Assuming the same parking patterns, an increase of 22.5% in passenger activity would result in an overnight demand in July for 1,716 parking stalls, or 57% of capacity.

There appears to be ample parking capacity to meet demand into the future for many scenarios:

- Growth from the increased passenger activity of new international flights.
- Variations in overnight parking demand during months where there may fewer passengers but length of stay increases (e.g. seasonal business versus leisure traffic).
- Annual year over year growth.

LGB is currently served by four Long Beach Transit routes with connections to major locations in Los Angeles County and Orange County. Long Beach Transit Route #111 runs between Downtown Long Beach and Lakewood Center Mall. From the Downtown Long Beach Transit Mall, the route travels through Long Beach

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along Broadway, crossing Cherry Avenue, Redondo Avenue; then along Ximeno Avenue to North Lakewood Boulevard. It then proceeds north along North Lakewood Boulevard, then through LGB, then continues north towards the Lakewood Mall and South Street where it then continues south back to Downtown Long Beach. Route #111 operates daily and starts operation at about 5:00 AM and runs until 12:30AM.

Long Beach Transit Routes #102 and #104 both serve the same route but different days of operations. The route starts at Carson Street and Norwalk Boulevard, travels south along Norwalk Boulevard, then west along East Wardlow Road, then south along Studebaker Road, then west along Spring Street into LGB, and then continuing down North Lakewood Boulevard and traveling west on Willow Street towards Santa Fe Ave. Route #102 operates only on weekdays from around 5:30 AM until 9:00 PM. Route #104 operates daily with weekday service beginning at 6:00 AM until 7:00 PM and weekend service from 6:45 AM until 6:40 PM.

Long Beach Transit Route #176 provides transit between Technology Place on PCH and Lakewood Mall. The route starts at Technology Place and runs east along PCH before continuing north on Lakewood Boulevard, stopping at LGB, and then continuing north again along North Lakewood Boulevard, east on Carson Street, and then north along Clark Ave to Lakewood Mall . Route #176 operates only on weekdays from around 6:45 AM until 6:15 PM.

5.6 Critical Landside Components

The critical components of an airport are the areas in front of the terminal for passenger drop off and pickup, passenger and employee parking, and pre-security infrastructure. Most passengers will enter the airport through some mode of transportation such as personal cars, public transportation, taxis, etc.

5.7 Recommendation for Landside Infrastructure Improvement

Based on analysis of the traffic study data and results of the traffic flow model[31], removing the island curb in front of the Terminal will ease vehicle congestion and improve the level of service for LGB. Removing the island curb will allow for the construction of two drop off/pickup lanes and two through-traffic lanes. Level of service is estimated to increase from E (poor) to B (good) for the simulated LGB schedule activity with international flights. This improvement is recommended regardless of development of the FIS Facility as it will also improve level of service from C (fair) to B (good) for the existing LGB schedule activity. Additional reduction of vehicle congestion in front of the Terminal can be realized through the relocation of the entrance to the Gulfstream leasehold to the intersection of Barbara London Drive and Donald Douglas Drive.

[31] Traffic Flow Model methodology and data are provided in Appendix E.

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6. Financial Feasibility

Frasca & Associates, LLC ("FRASCA") evaluated the financial feasibility of the potential New FIS Facility for Long Beach Airport[32]. For purposes of the analysis, FRASCA relied upon information provided by other members of the Jacobs consulting team related to projected capital and operating costs of a new FIS Facility (see Appendix G) and forecasted international passenger demand (see Appendix A). FRASCA also utilized historical financial information from LGB.

The FIS Facility Siting Alternatives[19] provided three options for the potential FIS Facility, with capital costs ranging from $17.3 million to $21.6 million. The major cost components of each option are summarized in Table 17. Additional information and further detail can be found in Appendix F.

Item Description	North FIS Facility - Option 1 Summary	South FIS Facility - Option 2 Summary	South FIS Facility - Option 3 Summary
Design & Administrative Costs	$1,636,000	$1,316,000	$1,545,000
Construction Costs	$16,357,000	$13,152,000	$15,442,000
Utility Coordination Allowance	$655,000	$527,000	$618,000
Construction Management, Testing & Inspection	$2,209,000	$1,776,000	$2,085,000
Plan Check & Permit	$409,000	$329,000	$387,000
PW/FM Overhead	$292,000	$235,000	$276,000
TOTAL Project Costs	**$21,558,000**	**$17,335,000**	**$20,353,000**

Table 17 FIS Facility - Options Comparison

The potential FIS Facility provides only facilities required by Customs and Border Protection to process international arriving passengers; all international flights would use existing terminal facilities. The Market Analysis[3] forecasted demand for international flights, under LGB's existing slot regime, would result in 379,281 annual FIS arriving passengers in Year Four following a three year ramp up period. These passengers would be new activity for LGB, not displacing existing domestic activity. Annual expense projections for operating costs, major maintenance, and CBP costs were also factored into the Financial Feasibility Report[32].

Based upon these inputs, FRASCA developed a financial feasibility model to evaluate the affordability of the potential FIS Facility. For purposes of this analysis, FRASCA reviewed the LGB funding capacity, including outstanding airport revenue bonds that successfully financed the new terminal concourse and parking garage and the LGB Passenger Facility Charge (PFC) program. Further, FRASCA assessed the projected demand for the potential FIS Facility, noting that it is driven by JetBlue's strategic plans to serve Mexico and Latin America. Based upon these factors, FRASCA developed a financing plan that included $3 million of LGB PFC funding with the balance of the capital costs funded directly by JetBlue, as the primary user of the facility[33]. FRASCA also assessed the incremental concession and ground transportation revenues that would be generated from the international passenger activity. Consistent with the LGB existing "modified residual" airline rate methodology, FRASCA assumed that these revenues would be used to offset a portion of the FIS Facility operating expenses.

The resulting effective "FIS Charge", reflecting the net capital and operating expenses for the potential FIS Facility, is projected to be approximately $13 per FIS arriving passenger in Year One (reflecting start-up costs and the initial ramp-up of international activity) and then approximately $6 per FIS arriving passenger over the

[32] Frasca & Associates, LLC. *Feasibility Study for a Potential FIS Facility for Long Beach Airport: Financial Feasibility Report*. August 2016.
[33] This preliminary financing plan assumes that JetBlue would have the right to recover a portion of its capital investment from other airlines that utilize the FIS Facility via the FIS Charge, which would be paid by the other airlines on a per arriving passenger basis.

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next ten years. The effective fee includes both the recovery of JetBlue's assumed capital investment and the ongoing net operating expenses of LGB in the facility. This fee level is in the range of FIS charges at other comparable California airports as summarized in Table 18.

Airport	Current FIS Fees[34]
SNA	Effective fee of $6.80 (2016) per FIS arriving passenger based upon allocated costs and FIS square footage
SAN	$2.00 per arriving international seat
OAK	$10.00 per arriving international passenger
FAT	$12.00 per deplaned passenger using the FIS facility
PHX	Fee per FIS arriving passenger: $1.30 (2016); $2.55 (2017) & $4.00 (2018) Fee per aircraft turn: $430 (2016); $562.70 (2017) & $662 (2018)

Table 18 Current FIS Fees

As noted in the Financial Feasibility Report, FRASCA developed a financing plan that included $3 million of Airport PFC funding with the balance of the capital costs funded directly by JetBlue, as the primary user of the facility. The resulting FIS Capital Charge, required based upon the net capital investment, would range from **$3.52 to $4.65 per FIS arriving passenger**, after the ramp-up in projected FIS activity. This capital charge reflects the amortization JetBlue's capital investment in the facility[35]. Under federal PFC regulations, PFC Assurance #8, the PFC funding of a capital project is not allowed to be included in the airline rate base. As such, LGB's PFC funding of a portion of the potential FIS Facility would not be recovered from JetBlue or other users of the facility, rather from enplaned passengers.

FRASCA also reviewed forecasted operating expenses and major maintenance expense projections prepared by for the potential FIS Facility. Major maintenance expenses, for purposes of the projections, were assumed to be funded over time (Year Ten expenditures were assumed to be funded in level amounts over the prior five years and the combined Year 15 and 20 expenditures were funded in level payments over Years 11 to 20).

Third, CBP costs, were developed assuming LGB received the UFA designation as noted above, were included. Actual CBP staffing level and costs would be negotiated between CBP and the City based upon actual flight activity and included in a Memorandum of Understanding. Based upon the estimates provided in Appendix F, CBP costs would be $3.7 million in Year One, $3.5 million in Year Two, $3.6 million in Year Three and increased for annual cost of living inflationary adjustments thereafter.

Under LGB's existing "modified residual" airline rate methodology, LGB utilizes non-airline revenues in excess of required financial targets to offset airline rates. For the potential FIS Facility, FRASCA analyzed the incremental revenues to LGB from terminal concessions (restaurants and retail shops in the terminal), parking and rental cars based upon the forecasted international passenger activity. The incremental revenues per enplaned passenger, based upon current passenger spending rates using year-to-date FY 2016 data, are assumed to be:

- Terminal Concessions[36]: $1.75 per enplaned passenger
- Parking: $6.00 per enplaned passenger
- Rental Car: $2.10 per enplaned passenger

[34] Source: Airport reports and records.
[35] For purposes of this analysis, JetBlue's direct capital investment is assumed to be amortized at 5.0% over 20 years, with the first three years being interest only. JetBlue may elect to fund this investment with cash, debt or other funds it has available.
[36] For purposes of this analysis, FRASCA did not adjust the current spending and concessions rental revenue per passenger that is currently generated at LGB. Depending upon the profile of the international passengers, additional revenues from duty free sales may be possible.

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Based upon projected international traffic, these non-airline revenues are forecasted to be $2.2 million in Year One, $3.0 million in Year Two, $3.0 million in Year Three and $4.1 million in Year Four, with inflationary increases thereafter.

Figures 14 through 16 reflect the projected FIS Charges per Arriving FIS Passenger for each of the facility options.

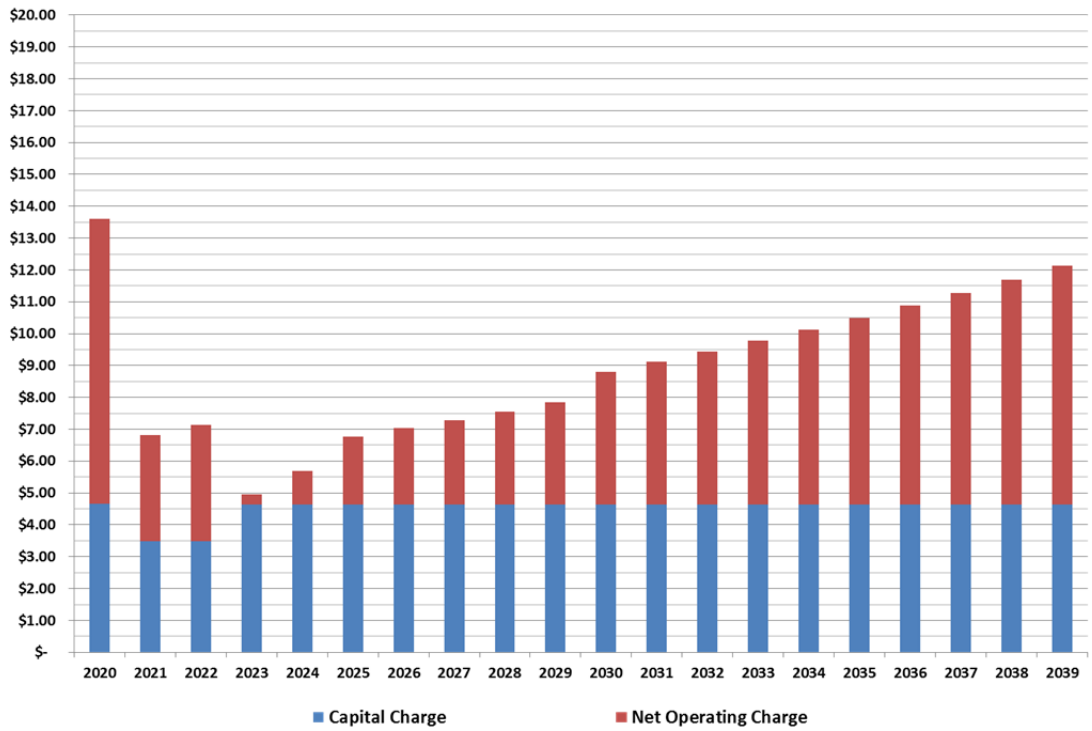

Figure 14 FIS Charges per Arriving Passenger - Option 1

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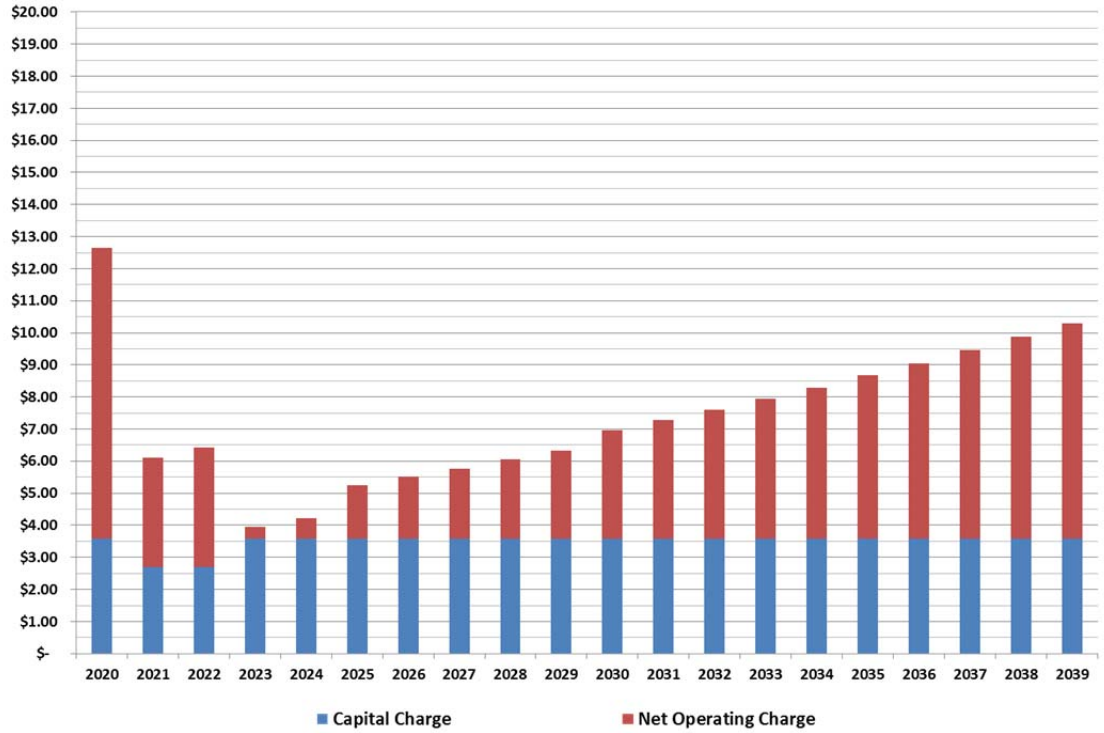

Figure 15 FIS Charges per Arriving FIS Passenger - Option 2

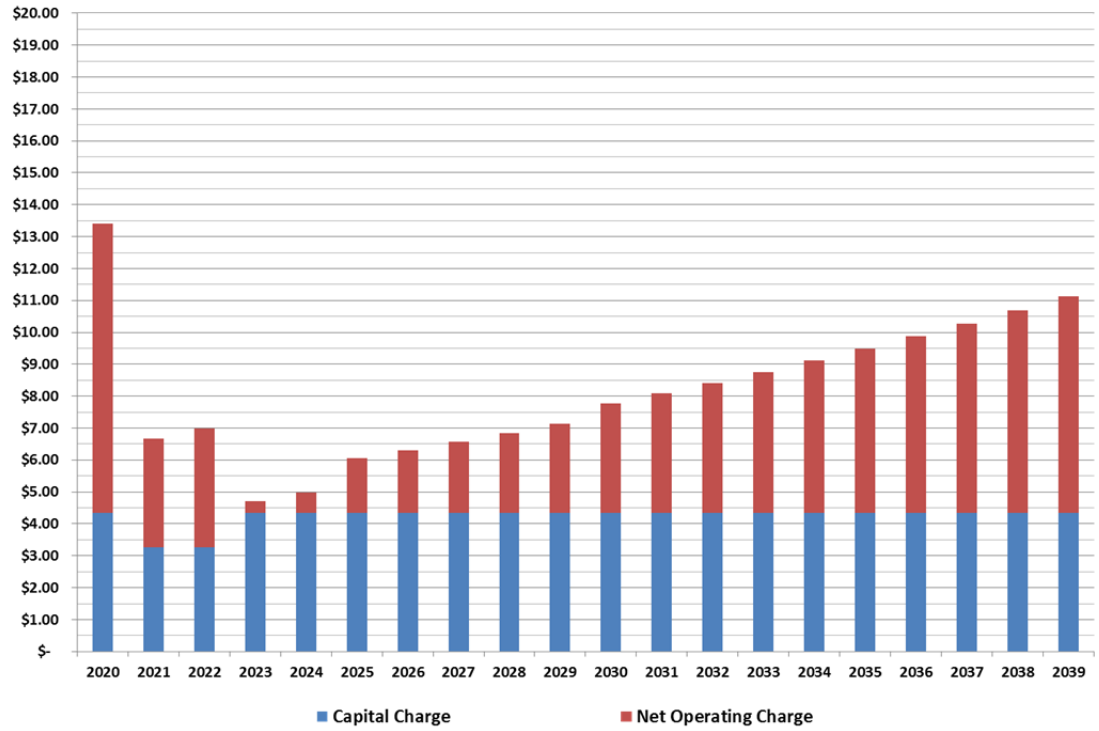

Figure 16 FIS Charges per Arriving FIS Passenger - Option 3

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	JetBlue	Other Potential Carriers
Capital Charge *(blue bars)*	Imputed charge reflecting amortization of JetBlue's capital investment in the facility	Charge paid by other potential users of the facility to JetBlue to reimburse a pro-rata share of its capital investment
Net Operating Charge *(red bars)*	Fees paid to LGB to recover the ongoing net operating costs of the facility	Fees paid to LGB to recover the ongoing net operating costs of the facility

Table 19 Projected FIS Charge Summary

Other than the initial year FIS Charges, which reflect start-up CBP expenses and ramp-up of international passenger activity, the FIS Charges in each of the three options are approximately $6 per arriving FIS passenger over the first ten years of the forecast period.

Based upon these analyses, as detailed in Appendix G, the potential FIS Facility would be financially feasible. Additional information and further detail can be found in Appendix G.

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7. Security Risk Assessment

The Security Risk Assessment[37] prepared by Applied Research Associates, Inc. (ARA) focused on incremental risk to the Long Beach Airport and the Long Beach community from international arrivals and departures. The comprehensive risk assessment has been classified under 49 C.F.R. Parts 15 and 1520 as sensitive security information not available for public distribution. The following information was requested by the City to be included in the Study as a publicly releasable (non-sensitive security information) executive summary of the comprehensive security risk assessment.

To understand the potential security risks of locating a U.S. Customs and Border Protection FIS Facility at LGB, ARA was contracted to compare the security risk to LGB and the Long Beach community of currently proposed and probable future LGB international flights to the risks arising from land border proximity, the international seaport, and nearby international airports.

ARA traveled to Long Beach to review the latest security assessment report developed for LGB and to speak with airport security personnel and the Long Beach Police Department. In addition to the information ARA obtained onsite, security related information was gathered from other open source data and combined with ARA personnel's knowledge of security risks to the aviation sector.

7.1 Facility and Area Description

LGB is located in the northern section of the Long Beach, CA municipal area three miles northeast of downtown Long Beach. In addition to Long Beach, the closest adjacent community to LGB is Lakewood, which shares a boundary with the airport. LGB covers an area of 1,166 acres. It has three runways and six helipads. The commercial carriers and the fleet types deployed at LGB are capable of serving international markets within a range of approximately 3,200 miles; however, the range of general aviation aircraft can be significantly higher. LGB is one of the busiest general aviation airports in the world, with approximately 87% of the 329,808 aircraft movements (takeoffs and landings) in 2010 being general aviation according to the FAA. LGB has approximately 1.4 million passengers per year. To compare, Los Angeles International Airport (LAX) has over 34 million passengers per year and over 600,000 aircraft movements.

Additional organizations which use LGB include FedEx, UPS, Boeing, Gulfstream, U.S. Coast Guard, and law enforcement.

Long Beach is located in Los Angeles County and is the seventh-largest city in California. According to the 2010 census, the population was 462,257. Other nearby communities include Cypress, Cerritos, Lakewood, Compton, and Carson. Los Angeles County has a population of 9,818,605 according to the 2010 census. The greater Los Angeles area population is estimated to be approximately 18 million people, which means Long Beach constitutes approximately 2.6% of the area's population.

In addition to LGB and LAX, three other sizable airports serve the Los Angeles area: John Wayne Airport (SNA), Ontario International Airport (ONT), and Bob Hope Airport (BUR); listed in order of passenger traffic. Ontario and Bob Hope have slighter larger passenger counts than LGB, while John Wayne has twice as many passengers. LAX, Ontario, and John Wayne all service international flights and operate FIS facilities. Also noteworthy is prior to 2006 international flights were allowed to land at LGB by appointment with CBP inspectors meeting the flights.

[37] Applied Research Associates, Inc. *Security Risk Assessment for Proposed International Flights.* August 2016.

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The Port of Los Angeles and the Port of Long Beach, located adjacent to one another, are the two busiest container ports in the United States, respectively. These ports occupy several thousand acres, deliver a couple hundred million metric tons of cargo, and generate several hundred billion dollars in trade annually. The facilities are world famous due to their size and shipping volume.

The City of Long Beach is approximately one hundred miles from three Land Ports of Entry from Mexico. The ports of entry are in and around San Diego, CA. One port, the San Ysidro Port of Entry, is the busiest land border crossing in the world. According to the U.S. Department of Transportation, this single port of entry processes approximately 5.9 million personal vehicle passengers and 1.6 million pedestrians annually. While a significant amount of this traffic can be attributed to daily commuters between San Diego and Tijuana, a large percentage of these numbers entering the U.S. are destined for the Los Angeles area.

7.2 Existing LGB Security

Existing security at LGB is comparable to similar airports. LGB has its own Special Service Officers (SSOs) with jurisdiction on LGB property. SSOs are supervised by security managers in the LGB Safety and Security Division (SSD). SSO personnel are augmented by the Long Beach Police Department (LBPD) who also patrol LGB property and stand posts alongside LGB SSOs. Additional security personnel include Transportation Security Administration (TSA) officers who screen travelers entering the secure passenger area. LGB has electronic access control and key locks on authorized personnel only areas, plus CCTV monitoring of public and restricted areas. Fencing around the airport perimeter discourages trespassing on the Airport Operations Area (AOA) or airside, as it is commonly called. Vehicle traffic in the AOA is restricted to cleared personnel. LGB also has an emergency notification system.

7.3 Risks

Based on the obtained information, ARA applied a security risk assessment process to determine security related risks to LGB and the surrounding community with the addition of international flight arrivals and departures at LGB compared to the current risks from the surrounding area.

The addition of international flights at LGB would also prompt the construction of a FIS Facility which would be designed to mitigate the potential risks of new threats arriving from outside the country. The threats and relative risks would remain basically the same as these threats are already present in the area. Essentially, by adding international flights and constructing a FIS Facility, LGB would be maintaining the status quo. LGB would also benefit from the presence of US Customs and Border Protection, which would operate the FIS Facility. A federal law enforcement agency presence provides an additional deterrent to potential adversaries.

Smuggling of narcotics, weapons, and people are an issue regardless of arrival by air, sea, or land; however, air travel to a security controlled airport like LGB makes it much more difficult to smuggle large quantities. The cargo capacity of two large nearby seaports and their inability to screen every container arriving in the ports makes it much easier for a smuggler to transport items. The US/Mexico border is also a much more porous avenue for transporting contraband. While LGB will continue to deal with small quantities of contraband hidden on or inside a person or their luggage, the risks of large quantities arriving via airport is much lower.

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7.4 Security-Related Costs

LGB must consider the following cost considerations when evaluating the construction of a FIS Facility. The CBP requires the following security measures and support for a FIS Facility:

- Perimeter security – For a FIS Facility located on an airport, LGB is responsible for all access control and security around the facility and at the facility entrances. The perimeter doors of the facility must be integrated with LGB's access control system, and CBP personnel will be issued access control credentials from LGB for entry to the airside and entry into the FIS Facility.

- FIS interior security – The interior of the FIS is controlled and monitored by CBP. This includes a security control room, a Closed Circuit Television (CCTV) system, and an access control system for segmenting the FIS space.

- Holding rooms and police transport – The FIS must be equipped with access controlled holding rooms with handcuff benches for detaining suspects. Local law enforcement is not required in FIS Facility space except for transfer of custody of individuals suspected in violation of local laws not superseded by a federal crime for which CBP would maintain custody.

7.5 Conclusions

The addition of international flights and construction of a FIS Facility does not negatively impact the risks to LGB and the Long Beach community compared with current risks from other Ports of Entry in the area. The complete elimination of risk is seldom possible, and LGB currently commits significant resources to provide a reasonable level of protection for the public. Regardless of the addition of international service or not, the risks to LGB should continue to be managed with a robust security operation.

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8. Summary of Findings

Analysis and Findings

The baseline assumption for the Study was the slot control associated with the City's Airport Noise Compatibility Ordinance, which provides 41 minimum daily air carrier slots and 25 minimum daily commuter slots. The Noise Ordinance provides limits for single event noise exposure levels and cumulative noise exposure levels for aircraft operating to/from LGB. The Noise Ordinance does not provide limits for origination or destination airport for aircraft operating to/from LGB.

In 2015, LGB air carriers utilized 74% of the available air carrier slots. Based on analysis and review of noise data for October 1, 2014 through September 30, 2015, the Airport Director determined LGB was operating below the noise budget for air carrier flights. During the December 8, 2015 City Council Meeting LGB announced the addition of nine supplemental slots, which were necessary to remain in compliance with the Noise Ordinance. The Study assumed an activity level of 50 daily air carrier flights. The Study acknowledges that the Noise Ordinance is indifferent to whether there are domestic or international operations.

The Study examined seven key areas:

- Market Demand – Based on LGB's competitive position in Southern California, as well as observed historic demand and econometric indicators, it is reasonable to assume continued international growth of the Southern California market, and a FIS Facility at LGB would provide opportunity for a share of the markets offered within the constraints of the Noise Ordinance. The Study concludes it is not predicted that having a FIS Facility will reduce domestic flight activity. The Market Analysis forecasted that demand for international flights, under the Airport's existing slot regime, would result in approximately 379,281 annual FIS arriving passengers in Year Four following a three year ramp up period. International service would account for 12% or 6 of 50 flights in the first year and increasing to 16% or 8 of 50 flights by Year Four. These passengers would be new activity for LGB.

- Environmental Compliance Assessment – The purpose of the assessment is to provide the City with an understanding of the types of technical studies and environmental compliance documents that may be required should the City decide to move forward with development of the FIS Facility. The assessment concluded that the FIS Facility could be accommodated within the impact envelope contemplated in the 2006 Terminal Area Improvement Project Final Environmental Impact Report No. 37-03 (State Clearinghouse No. 2003091112).

- Economic Impact of Long Beach Airport – The Economic Impact Analysis used results from a 2016 tenant survey, business list analysis, interviews, LGB expenditures and forecast data within the IMPLAN database. The analysis identified the economic impacts of LGB and the potential contribution of a FIS Facility. The annual economic contribution of LGB and their tenants is approximately 45,000 jobs and $10.3 billion in output.

  The potential annual economic contribution of a FIS Facility is approximately 350 jobs and $36.4 million of additional output. The potential additional economic expenditures from international travelers is estimated to range between $57 million to $104 million during the five year establishment period following initiation of international service. The international business and tourist travel impacts are estimated to generate approximately 1,400 jobs and $185.6 million annually following the establishment period. Construction of the FIS facility would generate financial output valued between $31 million and $38 million depending on the selected option generating between 203 and 253 jobs.

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- Facility Concepts – A FIS Facility is a single processing complex that evolved from the consolidation and integration of US customs, immigration, and agriculture operations, offices, and support functions. The FIS Facility unifies both passenger processing and baggage/cargo processing for safe and efficient flow of passengers and goods into and out of the United States. A FIS Facility includes a CBP security area to accommodate international air commerce designated for processing passengers, crew, baggage and effects arriving from, or departing to, foreign countries, as well as aircraft deplaning, ramp areas, and other restricted areas.

- Airport Scope and Capability – Critical components of airside and landside infrastructure at LGB have been identified to support potential international flights. The runway and taxiway systems can support the probable fleet mix to fly to international destinations determined in the Market Analysis. LGB may have to construct new aircraft parking positions should LGB proceed with FIS Facility Option 1. In terms of landside infrastructure, removal of the island curb and reconfiguration of the lanes in front of the terminal for pickup and drop off will reduce congestion and allow for better vehicular flow.

- Financial Feasibility – By reviewing LGB's funding capacity and the projected demand for the potential FIS Facility, a financing plan was developed that included $3 million of Airport Passenger Facility Charge funding with the balance of the capital costs funded directly by JetBlue Airways as the primary user of the facility. The resulting FIS Facility charge required to cover the amortization of the net capital investment would be approximately $13 per FIS arriving passenger in 2020 (reflecting start-up costs) and then approximately $6 per FIS arriving passenger for the next ten years. The potential FIS Facility would be financially feasible as this fee level is in the range of FIS charges at comparable California airports.

- Security Risk Assessment – The addition of international flights and construction of a FIS Facility does not negatively impact the risks to LGB and the Long Beach community compared with current risks from other Ports of Entry in the area. The complete elimination of risk is seldom possible, and LGB currently commits significant resources to provide a reasonable level of protection for the public. Regardless of the addition of international service, the risks to LGB should continue to be managed with a robust security operation.

- Community Outreach –Jacobs and LGB hosted two community meetings to inform residents on components of the Study and to receive comments from the community. Both community meetings were held at the Long Beach Gas and Oil Auditorium 108 and 152 community members attended meetings #1 and #2, respectively. Community comments were recorded on comment cards distributed at the community meetings. In addition, an email account was set up to collect responses electronically throughout the duration of the Study. All comments have been attached in Appendix H.

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Next Steps

The following provides an outline of the next steps in the process:

- Public review of the Study. A minimum 15 day review period will be provided for the public to review prior to any public meeting to discuss the report per City Council Direction.

- Presentation of the Study to the Long Beach Airport Advisory Commission, City of Long Beach Economic Development Commission, and to the Mayor and City Council.

- City Council decision whether or not to proceed with development of the FIS Facility in Long Beach.

- Should City Council decide to vote no, the City may be required to provide a report to the Secretary of Transportation that:

    1. Describes the request;
    2. Provides an explanation as to why the request could not be accommodated; and
    3. Provides a time frame within which, if any, the airport will be able to accommodate the request.

    The requirement for providing a report to the Secretary of Transportation stems from FAA Airport Improvement Program (AIP) Grant Assurance Number 39, *Competitive Access*. Although Grant Assurance #39 is written explicitly for operators of medium and large hub airports, it is possible for an air carrier to petition the Department of Transportation for an explanation if a small hub airport, such as LGB, is unable to accommodate one or more requests by an air carrier for access to gates or other facilities to allow the air carrier to provide service or expand service to the airport.

- Should City Council decide to vote yes, the following provides a summary of the CBP application process:

    1. Contact the nearest CBP Port of Entry (POE) or servicing Field Office and request an initial site visit to review existing infrastructure and to discuss projected workload and required services.
    2. LGB must then arrange for the current governor to submit a letter to the CBP Commissioner supporting the request.
    3. Following CBP approval, LGB must submit request to design and construct the FIS Facility.
    4. Facility Programming and Design – LGB must work with CBP to develop floor plans and other design documents to ensure all spaces and components required to support CBP operations are included. LGB must prepare construction bid documents for CBP approval prior to soliciting construction bids.
    5. Facility Construction – upon receiving a Notice To Proceed and kick-off meeting, the construction team can begin. Construction must be performed with close coordination with CBP.
    6. CBP Acceptance, Occupancy, and Commissioning – CBP will inspect the FIS Facility, provide final punch list, and move in furniture and equipment to set up the facility.

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Appendix A. Market Analysis for Long Beach Airport

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La Costa Consulting Group

Market Analysis

For Long Beach Airport

Federal Inspection Service Facility Feasibility Study

Prepared by LaCosta Consulting Group

9/26/2016

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Forecast methods used in this report are consistent with those approved by the Federal Aviation Administration Office of Aviation Policy and Plans Statistics and Forecast Branch.

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This is intended to be used as the deliverable to Jacobs for support of Long Beach Airports RFQ AP-15-203.

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Executive Summary

The analysis contained herein is provided in response to Section 3.1 Market Analysis of City of Long Beach (City) Request for Qualifications (RFQ) Number AP15-203, Feasibility Study for a Federal Inspection Service (FIS) Facility (Study) at Long Beach Airport (LGB). The Market Analysis is organized in two sections, Benchmark Studies and Traffic Analysis.

The Benchmark Studies section focuses on the following:

- Flight activities at Long Beach Airport, similar size US airports, and California airports
- Long Beach airlines and General Aviation (GA) community interviews
- Current aircraft types and capabilities analysis
- US Customs and Border Protection designation analysis
- Airline industry practices and trends analysis

LGB is owned and operated by the City of Long Beach with four US passenger airlines providing nonstop flights to thirteen destinations (with seasonal service to Anchorage), including hubs/focus cities for American Airlines, Delta Air Lines, JetBlue Airways (JetBlue) and Southwest Airlines. This analysis investigates potential international service to/from LGB using market forecast and airline network analysis.

The airline carriers and the fleet types currently deployed at LGB are capable of serving domestic and international markets within a range of approximately 3,200 miles. Interviews with airline carriers identify a desire to increase service to current markets with JetBlue indicating a desire to initiate international service to profitable destinations to complement their existing network. The findings in the Benchmark Studies section identify potential passenger demand for domestic and international growth in Southern California and nationally.

The Traffic Analysis section focuses on the following:

- Market sizes and forecast statistics for LGB
- Future international flight activity projection (commercial and GA)
- Potential and probable international markets
- Airline carrier network analysis

2015 US DOT data reported that the Southern California aviation market grew at a rate of 6%, versus 4.7% nationally. Over the past ten months (fiscal year to date April 2016) the international segment at Los Angeles International Airport (LAX) has grown 11% versus the 6.5% domestic traffic (LAX traffic comparison report TCOM). The US and Mexico modernized the bilateral air services agreement, effective January 1, 2016. Historically, modernizing bilateral air services agreements have generated growth, new services, and benefits to both countries. LGB is a slot controlled airport with airlines using 74% of the available slots in 2015 and based on a recent review of its noise budget, the airport issued nine supplemental slots for 2016. The underutilized slots offer air capacity for potential domestic and international operations. This analysis assumed a maximum of 50 air carrier slots (the most recent year's budget), equal to the 41 minimum daily air carrier flights provided by Long Beach Municipal Code Chapter (LBMCC) 16.43 plus nine supplemental slots. This analysis identifies potential international markets for air carriers at LGB.

Benchmarks Studies

Past and Current Flight Activities

This section documents past and current flight activities at Long Beach Airport, other Southern California airports and select airports in the US that are comparable to LGB. LGB operates under LBMCC16.43 which requires the Airport to operate under a budgeted noise level each year producing a specific number of slots that can be operated. For 2016 the budget allows for an average of 50 slots per day, and that is the slot availability assumed in this analysis. Noise budgets are reviewed each year to ensure compliance with specific levels.

This analysis is based on the assumption that the nine slot increase for 2016 will be included in the long term noise budget and the addition of another carrier (Southwest Airlines) that has been awarded slots. Long Beach Airport flight activities have remained relatively constant over the last ten years (2006-2015). During the 2015 period, air carriers operated an average of 30.4 of the 41 daily flights that were allocated. The 30.4 flights per day equates to a 74% utilization rate of the slot budget. This is below the long-term average utilization rate of 79% or 32.5 flights per day (Table 1). Per the Noise Ordinance, air carriers could have operated an additional 10.6 flights per day to achieve 100%utilization (41 flights). In November 2015, using reasonable and conservative assumptions, Landrum & Brown produced a review and concluded that using a 95% utilization rate of current slot allocation, the noise budget could be raised 24% making an additional nine departure slots available with the current mix of aircraft.

Air Carrier Slot Usage by Landings

	Available	Usage	% Used
2006	14,965	11,430	76%
2007	14,965	11,864	79%
2008	15,006	11,450	76%
2009	14,965	12,525	84%
2010	14,965	12,076	81%
2011	14,965	11,761	79%
2012	15,006	12,945	86%
2013	14,965	11,946	80%
2014	14,965	11,784	79%
2015	14,965	11,102	74%
Average	**14,965**	**11,888**	**79%**

Table 1 Percent of Slots Used Per Year Source: Long Beach Airport

Over the long term adding a new carrier and potential international flights should materially change the annual usage. The impact of additional slots and long term averages will be addressed further in the Traffic Analysis section of this report. Figure 1 below charts the ten year trend of slot usage at LGB.

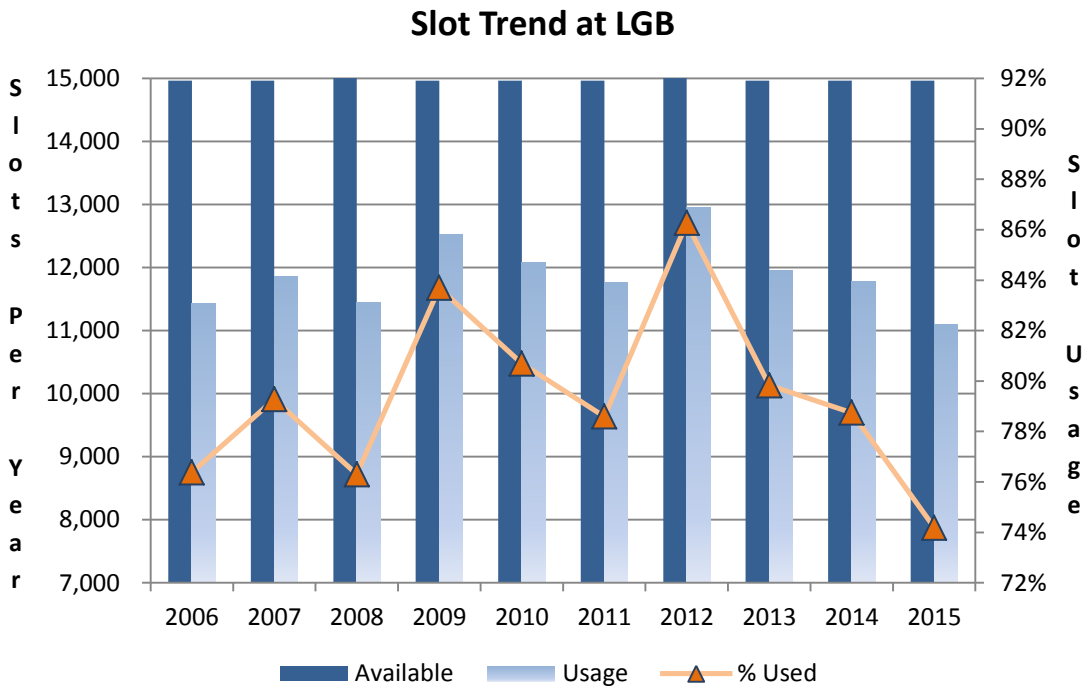

Figure 1 Annual Slot Trend and Usage

Current and Top Markets at LGB

Current Markets		Top Markets by Enplanements	
1 AUS	Austin, TX	1 SLC	Salt Lake City, UT
2 BOS	Boston, MA	2 LAS	Las Vegas, NV
3 JFK	New York, NY	3 SFO	San Francisco, CA
4 LAS	Las Vegas, NV	4 OAK	Oakland, CA
5 MEM	Memphis, TN*	5 SEA	Seattle, WA
6 OAK	Oakland, CA	6 PDX	Portland, OR
7 PDX	Portland, OR	7 PHX	Phoenix, AZ
8 PHX	Phoenix, AZ	8 JFK	New York, NY
9 RNO	Reno, NV	9 SMF	Sacramento, CA
10 SDF	Louisville, KY*	10 AUS	Austin, TX
11 SEA	Seattle, WA		
12 SFO	San Francisco, CA		
13 SLC	Salt Lake City, UT		
14 SMF	Sacramento, CA		
15 ANC	Anchorage, AK (Seasonal)		
	*Cargo Only Flights		

Table 2 Current and Top 10 Markets at LGB Source Long Beach Airport

Air Carrier Activity at Long Beach Airport

Arriving Flights

City	Time		Airline	Flight #	Aircraft	
ANC	7:23	AM	JetBlue	501	A320	
OAK	7:29	AM	JetBlue	247	A320	
AUS	7:54	AM	JetBlue	217	A320	
PHX	9:06	AM	American	5663	CRJ9	
PDX	9:36	AM	JetBlue	407	A320	
SLC	9:43	AM	Delta	4644	CRJ9	
OAK	10:00	AM	Southwest	972	B737	
SEA	10:13	AM	JetBlue	1207	A320	
OAK	10:18	AM	JetBlue	147	A320	
SFO	11:00	AM	JetBlue	735	A320	
LAS	11:19	AM	JetBlue	211	A320	
PHX	11:57	AM	American	5661	CRJ9	
SLC	12:25	PM	Delta	4589	CRJ9	Ex Sa
SLC	12:44	PM	JetBlue	231	A320	
SFO	1:27	PM	JetBlue	1435	A320	
OAK	1:45	PM	Southwest	1024	B737	
JFK	2:20	PM	JetBlue	213	A320	Ex Tu We Sa
LAS	2:32	PM	JetBlue	877	A320	
SMF	2:39	PM	JetBlue	265	A320	
SEA	2:58	PM	JetBlue	1007	A320	
JFK	3:42	PM	JetBlue	213	A320	Tu We Sa
PHX	3:49	PM	American	5619	CRJ9	
AUS	4:05	PM	JetBlue	1417	A320	
SLC	4:12	PM	Delta	4723	CRJ9	Sa
PDX	4:17	PM	JetBlue	1521	A320	
OAK	4:30	PM	Southwest	18	B737	
LAS	5:31	PM	JetBlue	379	A320	
SDF	5:35	PM	UPS	2908	B763F	Mo - Fr
SEA	5:40	PM	JetBlue	407	A320	
MEM	5:47	PM	FedEx	1351	A300F	Mo - Fr
SLC	6:04	PM	Delta	4723	CRJ7	Ex Sa
PHX	6:07	PM	American	5668	CRJ9	
SMF	6:33	PM	JetBlue	365	A320	
SLC	6:37	PM	JetBlue	531	A320	
LAS	6:53	PM	JetBlue	879	A320	Mo Fr Su
OAK	7:00	PM	Southwest	5654	B737	Sa
SFO	7:43	PM	JetBlue	1635	A320	
OAK	8:18	PM	JetBlue	404	A320	
PDX	8:41	PM	JetBlue	1621	A320	
OAK	9:00	PM	Southwest	2785	B737	
SLC	9:17	PM	Delta	4645	CRJ7	
PHX	9:17	PM	American	5755	CRJ9	
BOS	9:18	PM	JetBlue	405	A320	
JFK	9:35	PM	JetBlue	1013	A320	

Departing Flights

City	Time		Airline	Flight #	Aircraft	
PHX	6:45	AM	American	5652	CRJ9	
OAK	7:00	AM	JetBlue	148	A320	
OAK	7:00	AM	Southwest	756	B737	
SFO	7:20	AM	JetBlue	736	A320	
SLC	7:20	AM	Delta	4643	CRJ7	
AUS	8:25	AM	JetBlue	1416	A320	
SLC	8:35	AM	JetBlue	232	A320	
SEA	9:00	AM	JetBlue	406	A320	
PHX	10:00	AM	American	5712	CRJ9	
SLC	10:18	AM	Delta	4644	CRJ9	
LAS	10:25	AM	JetBlue	880	A320	Ex Sa
OAK	10:30	AM	Southwest	1853	B737	
PDX	10:59	AM	JetBlue	1522	A320	
SMF	11:15	AM	JetBlue	266	A320	Tu We Sa
SEA	11:40	AM	JetBlue	1006	A320	Ex Tu We Sa
SFO	11:49	AM	JetBlue	1636	A320	
SMF	12:05	PM	JetBlue	266	A320	Ex Tu We Sa
SEA	12:25	PM	JetBlue	1006	A320	Tu We Sa
PHX	12:30	PM	American	5687	CRJ9	
SLC	1:05	PM	Delta	4589	CRJ9	
LAS	1:25	PM	JetBlue	1780	A320	
JFK	1:35	PM	JetBlue	514	A320	
OAK	2:15	PM	Southwest	2867	B737	
SLC	2:25	PM	JetBlue	532	A320	
SMF	3:11	PM	JetBlue	1166	A320	Ex Tu We Sa
PDX	3:20	PM	JetBlue	1622	A320	
OAK	3:20	PM	Southwest	3945	B737	Sa
LAS	3:24	PM	JetBlue	380	A320	
SMF	3:25	PM	JetBlue	236	A320	Tu We Sa
SFO	4:18	PM	JetBlue	1436	A320	
PHX	4:35	PM	American	5710	CRJ9	
SLC	4:48	PM	Delta	4723	CRJ9	Sa
OAK	5:00	PM	Southwest	1788	B737	Ex Sa
OAK	5:05	PM	JetBlue	348	A320	
PDX	5:40	PM	JetBlue	1822	A320	
LAS	6:19	PM	JetBlue	1980	A320	
SEA	6:26	PM	JetBlue	206	A320	
SLC	6:40	PM	Delta	4723	CRJ7	Ex Sa
MEM	7:02	PM	FedEx	1351	A300F	Mo - Fr
OAK	7:19	PM	JetBlue	448	A320	
PHX	7:25	PM	American	5616	CRJ9	
ANC	7:30	PM	JetBlue	600	A320	
SDF	7:34	PM	UPS	905	B763F	Mo - Fr
LAS	7:55	PM	JetBlue	1780	A320	
AUS	8:30	PM	JetBlue	216	A320	
BOS	9:10	PM	JetBlue	404	A320	
JFK	9:32	PM	JetBlue	14	A320	

Figure 2 July 2016 schedule at LGB Source OAG

Figure 2 above shows the arrival and departure flight activity by airline during July, historically the peak month of the year. As with most airports it is not unusual to see flights pre-cancelled certain days of the week as airline try to maximize utilization and profitability.

LGB Enplanement Trend by Carrier

	Alaska	JetBlue	Delta	American	all other	Total
FY2006	114,084	1,102,186	29,936	102,162	64,268	1,412,636
FY2007	144,551	1,142,177	57,301	102,091	-	1,446,120
FY2008	113,310	1,101,602	71,865	105,467	47,354	1,439,598
FY2009	125,468	1,150,629	83,710	90,622	16,070	1,466,499
FY2010	7,283	1,178,409	87,972	87,764	98,613	1,460,041
FY2011	30,400	1,207,147	83,693	101,868	109,334	1,532,442
FY2012	82,342	1,335,263	94,099	120,858	10,821	1,643,383
FY2013	83,976	1,196,052	95,015	122,460	-	1,497,503
FY2014	69,003	1,147,101	84,968	130,132	2,069	1,433,273
FY2015	12,181	1,062,506	85,241	115,475	1,276	1,276,679
Total	782,598	11,623,072	773,800	1,078,899	349,805	14,608,174
% of Total	5%	80%	5%	7%	2%	100%

Table 3 Enplanement Trend

Comparison - Similar Size US Airports

LGB is a unique airport in that there are no airports with comparable noise restrictions in a major air service area. However the following chart lists airports with passenger enplanement level similar to LGB from the last two years (FAA audited) and where CBP inspections services are normally available.

US Rank	State	Airport Code	City	Airport Name	CY 14 Enplanements	CY 13 Enplanements	% Change	International Facility
71	WA	GEG	Spokane	Spokane International	1,445,572	1,417,731	1.96%	Y
72	GU	GUM	Tamuning	Guam International	1,436,726	1,562,165	-8.03%	Y
73	HI	KOA	Kailua Kona	Kona International at Keahole	1,403,559	1,376,641	1.96%	Y
74	TX	ELP	El Paso	El Paso International	1,395,363	1,363,102	2.37%	Y
75	ID	BOI	Boise	Boise Air Terminal	1,378,352	1,313,741	4.92%	Y
76	OK	TUL	Tulsa	Tulsa International	1,371,613	1,323,377	3.64%	Y
77	CA	LGB	Long Beach	Daugherty Field	1,368,923	1,438,756	-4.85%	N
78	HI	LIH	Lihue	Lihue	1,340,014	1,315,141	1.89%	Y
79	AL	BHM	Birmingham	Birmingham-Shuttlesworth	1,299,214	1,334,177	-2.62%	Y
80	NY	ALB	Albany	Albany International	1,210,825	1,196,532	1.19%	Y
81	MI	GRR	Grand	Gerald R Ford International	1,174,821	1,123,257	4.59%	N
82	NY	ROC	Rochester	Greater Rochester International	1,173,933	1,209,245	-2.92%	Y
83	IA	DSM	Des Moines	Des Moines International	1,141,172	1,078,496	5.81%	Y
84	OH	DAY	Dayton	James M Cox Dayton	1,120,842	1,244,841	-9.96%	Y
85	FL	SFB	Sanford	Orlando Sanford International	1,064,133	971,522	9.53%	Y

Source: FAA Enplanement at commercial airports - data and CBP inspection availability http://www.cbp.gov

Table 4 Comparable Airports with LGB Ranked By Enplanements

California Airports

The Southern California region has a very healthy air traffic demand profile led by LAX, the third largest US airport in terms of passengers, experiencing 6% enplanement traffic growth over the last two years. San Diego enplanements grew 6.5% during the same period. Between 2012-2015 John Wayne Airport, California's fifth largest airport has grown 15% with international flights contributing to 25% of its growth since opening a FIS Facility in 2012. For the first eight months of their fiscal year July 2015-February 2016 international enplanements at LAX has reported growth of 11.6%. The Los Angeles Basin total international growth for 2015 was 4.2%, almost double that of the US. (ACI, DOT T-100 Data Bank and Airports Web/Statistics)

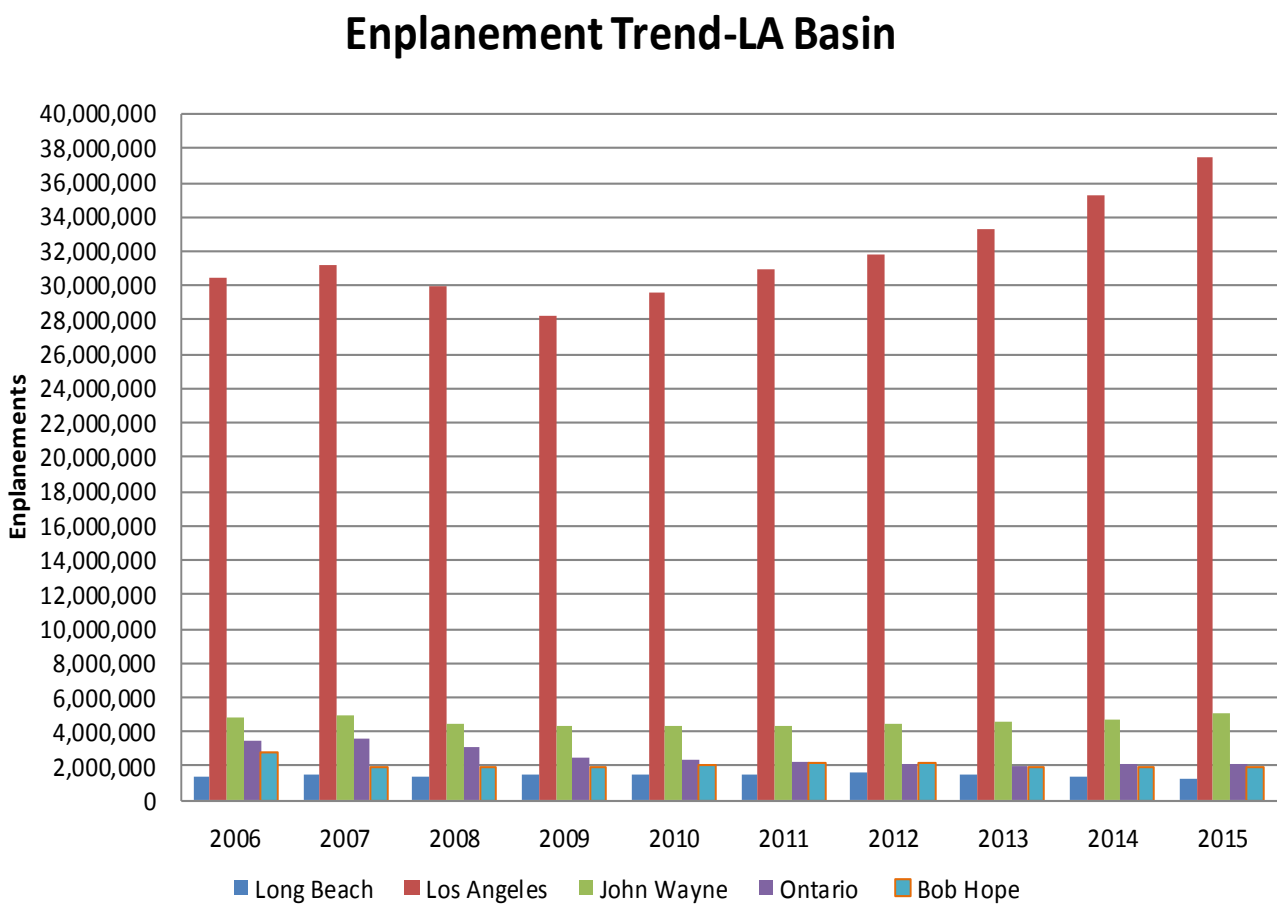

Figure 3 LA Basin Passenger Trend - Source T-100 and Airport Reporting

These growth numbers are considerable suggesting more international growth going forward. It should be noted that even with LGB slot restrictions the airport's enplanement performance has maintained greater consistency than the enplanement performance of Ontario International Airport.

Figure 4 below lists the top fifteen California airports ranked by enplaned passengers. LGB is the tenth largest airport serving California and fifth ranked in the LA area. Airports such as those in Fresno, Bakersfield, Oakland, Palm Springs, Sacramento and others, some smaller than LGB with noise mitigation measures, have US Customs clearance services. During interviews with the GA community, it was reported that until 2006, on demand international access from CBP was provided at LGB. The GA community sees the potential FIS Facility as a benefit to the Long Beach Airport.

Top Fifteen Airports in California

Rank	City served	Airport name	Enplaned Passengers	CBP Services
1	Los Angeles	Los Angeles International	36,351,272	Y
2	San Francisco	San Francisco International	24,190,560	Y
3	San Diego	San Diego International	9,985,763	Y
4	Oakland	Metropolitan Oakland International	5,506,687	Y
5	Santa Ana	John Wayne Airport-Orange County	4,945,209	Y
6	San Jose	Norman Y Mineta San Jose International	4,822,480	Y
7	Sacramento	Sacramento International	4,714,729	Y
8	Ontario	Ontario International	2,089,801	Y
9	Burbank	Bob Hope	1,973,897	N
10	Long Beach	Long Beach /Daugherty Field/	1,220,937	N
11	Palm Springs	Palm Springs International	947,728	Y
12	Fresno	Fresno Yosemite International	695,008	Y
13	Santa Barbara	Santa Barbara Municipal	316,511	N
14	Monterey	Monterey Regional	180,605	Y
15	San Luis Obispc	San Luis County Regional	144,324	Y

Figure 4 California Airports Ranked by enplaned passengers Source: FAA 2015 Totals

Airline Interviews

To ensure the greatest understanding of industry needs in a FIS Facility at LGB, interviews with LGB airlines were conducted to assess current and future plans for international flight activities. Meetings and conference calls were made with current market planning managers. All the airlines except JetBlue have significant levels of operations at LAX. Their stated strategies are to continue focusing their international investment in LAX where they can leverage their larger network. The following are the results of those meetings.

American Airlines

To review the feasibility project a conference call with Mike Britman, the Managing Director of Network and Route Planning at American Airlines was held. American Airlines growth strategies in the LA Basin are focused completely at LAX. They see LGB fitting into their network through services to Phoenix and will monitor demand and look to respond with aircraft gauge or frequency adjustments. American does not have any interest in commencing international service at LGB at this time as their international focus is at LAX.

Delta Air Lines

To review the feasibility project a conference call with Scott Springer, General Manager of Network and Domestic Planning at Delta Air Lines (Delta), was held. Like American for international flights, Delta sees LAX as the natural growth engine for their brand in Los Angeles. Delta sees serving all LA airports important to strengthen their Delta network with flights from LGB flowing through their Salt Lake City hub. Long term, they see Delta's capacity at LGB as being proportional to the demand for Delta services and synergistic to its LA strategy.

JetBlue Airways

Meetings with JetBlue's Sr. VP Government Affairs, Robert Land, and Sr. VP of Network Planning, Scott Laurence, were conducted. The meeting with JetBlue confirmed their intention to operate international flights at LGB should it have a FIS Facility. An overview of the feasibility study being conducted was presented and JetBlue offered their opinion. JetBlue has analyzed potential international traffic and have identified significant passenger demand at many airports in their network.

Southwest Airlines

Southwest Airlines (Southwest) Network and Revenue Team has committed to expanding in Los Angeles. Reference to recent press releases indicate commitment at LAX for international service. Southwest does not have any interest in commencing international service at this time. They will monitor the new services as the market develops.

General Aviation Community Interviews

Meetings with the GA community were held to gather interest for international clearance at LGB and current trends in the Los Angeles Basin. Those interviewed were: Curt Castagna, C.M. President, Aeroplex/Aerolease Group and President of the Long Beach Airport Association; Eric Hill, Signature Flight Support; John Tary, AirFlite and Paul Giczewski, Gulfstream. All parties identified LGB as having customs clearance until 2006, and reinstating these procedures is of interest to the General Aviation community. The most notable increase to international access/clearance in the LA area is the opening of an FIS facility at Van Nuys Airport on 23 MAY 2015, which increased their activity approximately 33 flights a month.

GA used 65% of its noise budget through 2015 (LGB records). Many of the based jet aircraft at LGB fly international flights clear at other airports today and ferry to LGB; so in that scenario there are no new operations produced, as those flights would land directly at LGB reducing ferry or repositioning flights. The best example of this today is Toyota that lands and clears it's international flights at another airport and then flies to LGB. The other advantage to international capabilities is it would support business development for the City of Long Beach as well as offering direct access to foreign executives.

Airline Industry Practices and Trends

Competition is high among airline companies. Trends in the airline industry are highly seasonal, affected by traffic demand, fluctuations in energy prices and events such as geopolitical or economic downturns. Events like September 11 attacks (9/11) and the 2008 financial crisis negatively affected the demand for air travel across the US. At the same time, rising fuel prices continued to put upward pressure on airfares. As a result, commercial airline carriers have responded with measures to increase revenues and control costs. These measures have been capacity reductions, assessment of various service fees, and increases in fares. These events and the airlines' responses produced significant historical trends, financial losses and volatility. These trends have buckled during a decade long consolidation phase coupled with improving economy, reduced fuel expenditures and growing demand. All have taken hold of the aviation sector. There have been noteworthy changes over the last ten years as the historic boom and bust cycles of the US aviation industry have subsided and the aforementioned consolidation phase has led the US airline industry to post record profits of $23.2 billion for 2015.

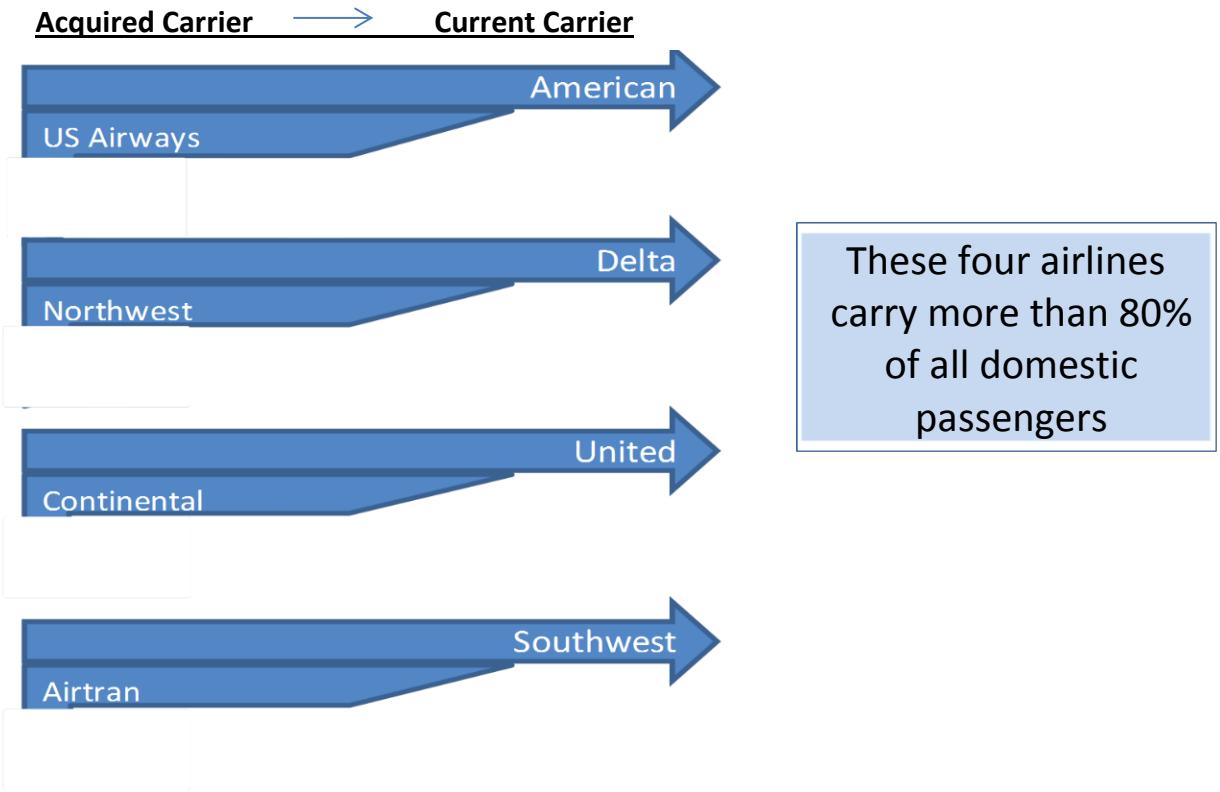

Figure 5 Consolidation- Mapping the Mergers of the US Airline Industry over the Last 10 Years

The backdrop leading up to this consolidation phase were the geopolitical impacts following 9/11, oversized networks, bloated unit cost, a hyper run up in the cost of jet fuel (up 155% between 2004-2008) and the financial crisis of 2008-09 leading to record losses. Post-recession, airfares have increased, in both nominal and real terms, and are now above pre-recession peak levels seen from 2004 through 2008. Fuel costs, the single largest cost input, have fallen to $47 per barrel in the most recent reporting period accelerating the current profit cycle, year ending 2015.

The chart below highlights the industries' primary cost and demand metrics.

	2005	2015
Load Factor	77%	85%
Fuel Per Barrel	$101	$53
Profits	-$28.5 Billion	$23 billion

Figure 6 Key Turn Around Perfomance Metrics

Domestic flights averaged 85% seats filled for 2015, a record high. Figures 7 and 8 track passenger demand and Figure 9 shows load factor trends. Figure 7 charts the continuous enplanement growth in the US aviation system (37% over the last 20 years). The FAA forecast enplanements to reach approximately 1 billion passengers by 2027.

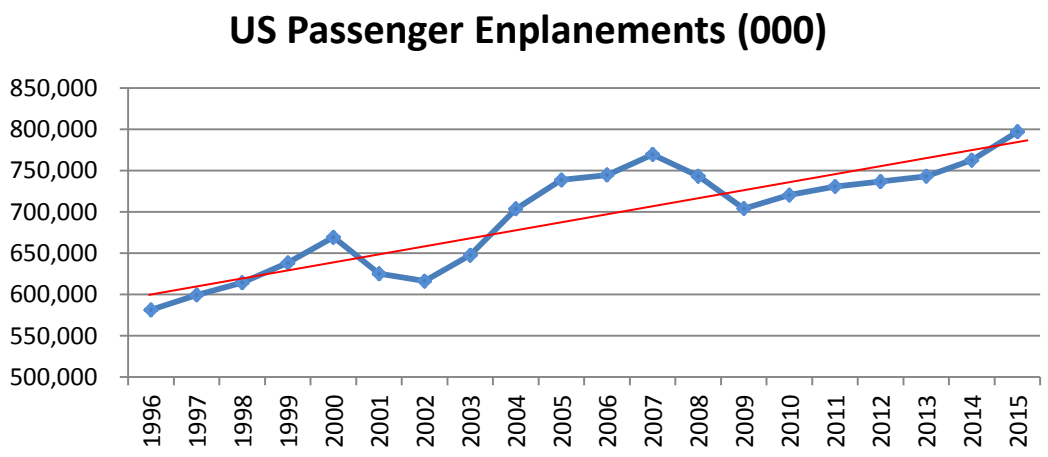

Figure 7 Twenty Year Trend - US Enplanements DOT T-100

System Passenger - Passenger Enplanements (000)

	2014	2015	Change %
Domestic	662,831	696,186	5.0%
International	99,879	102,200	2.3%
System	762,709	798,386	4.7%

Figure 8 US Airlines Composition Source: Bureau of Transportation Statistics

As noted, a trend changing event during this period was US carrier consolidation. This has drastically changed the industry fundamentals both operationally and financially. After a period of capacity contraction, carriers are growing again. This growth has accompanied greater capacity utilization with load factors rising five points since the 2008 financial crisis and fifteen points over the last 20 years (Figure 9). System load factor and trip length continued to edge slightly upwards over the past couple years, even as seats per aircraft mile increased. The domestic load factor reached a record-breaking 85%, up 0.4 points

from 2014, while passenger trip length increased 2.4 miles to 1,131 miles. Seats per aircraft mile increased to 145.2 seats (up 2.3 seats per aircraft mile), the highest level since 1999 (DOT-BTS). International capacity growth expanded 6% (19% since 2012) while maintaining an 82.6% load factor (DOT T-100).

Airline profitability is at record breaking levels as industry strategies used to counter past industry conditions included: capacity discipline, leveraging international alliances, restructured fuel efficient fleets, and a focus on financial metrics to create high valued assets. Operating practices for the major carriers includes reducing hubs considered to be redundant, restructuring of hubs and networks, restructuring of fleets, restructuring major labor contracts, unbundling pricing structures all while expanding international flying and alliance integration. For 2015 international demand grew 2.3% (US DOT Data Bank). Industry operating practices have created a system of measured growth, in line with long term US GDP expansion.

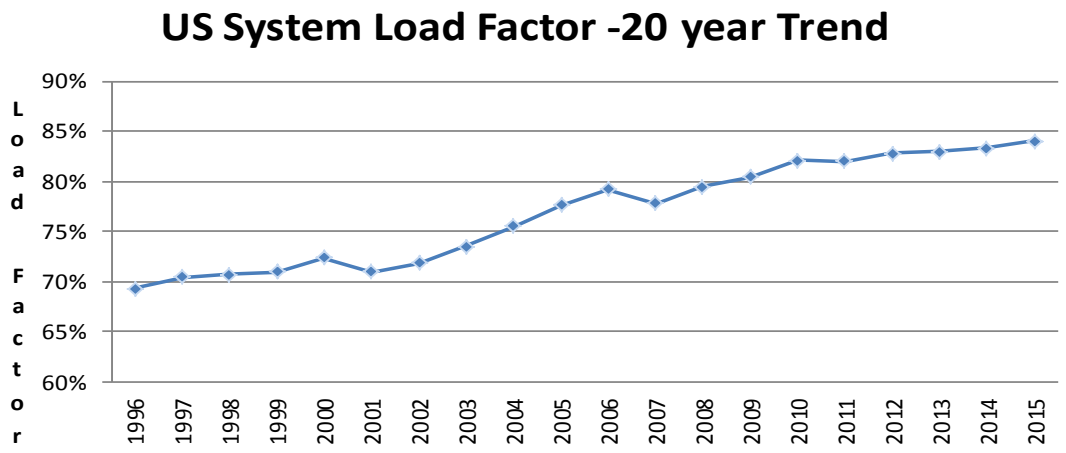

Figure 9 US Load Factors Source Bureau of Transportation Statistics

Another trend during this period of consolidation was the reduction of hubs. Cities that lost hub status include Memphis, St. Louis, Las Vegas, Cincinnati, and Cleveland. Airports at Oakland and Ontario lost up to 38% of their flights at their lowest point of contraction. Airlines' strategy with regards to fleet plans, specifically regional jets (RJ), has also changed in two ways. Labor contracts were renegotiated to allow for the larger 70 and 90 seat aircraft substituting for the 50 seat regional carriers. This increased the average seats per departure in the US from 50 to 58, reducing the departures using RJ aircraft by 23% over the last 10 years. By the end of 2015, 50 seat RJ made up 36% of regional aircraft versus 52% of all regional aircraft flown in the US in 2010. This reduction in departures was an important lever in reducing cost. For the customer, services trends have changed with a divergence of products being offered. Airline products can be purchased as unbundled and semi-bundled products by consumers.

With US airlines restraining capacity and growth targets at approximately 2%, load factors should maintain historical high. Even through 9/11 and the 2008 financial crisis, the industry load factors bounced back the following year (Figure 9) displaying airlines' ability and wellness to make course corrections as they see necessary even though it took years for actual passenger enplanements to bounce back.

The operational trends have all translated positively to airline balance sheets. On the trailing twelve months basis, airline industry's cash and cash equivalent grew by 3.01% in 4th Quarter 2015 sequentially, faster than current liabilities, thus creating a more sustainable industry. The Bureau of Economic Analysis reported 2015 travel and tourism spending grew 4.4% after increasing 3.1% in 2014. These improvements point to a positive trajectory moving forward in the airline industry. Airlines for America, the US industry advocate group, reports that the economic impact for the industry is $807 billion or approximately 5.1% of GDP, a significant positive economic force for communities.

Current Aircraft Types and Capabilities Analysis

Over the last 50 years, the aviation industry has cut fuel consumption, CO2 emissions by more than 80%, NOx emissions by 90% and noise by 75%. The technology pipeline of products in development mirrors these improvement trends. The next generation A320neo, the aircraft that will most affect Long Beach Airport in the future, will reduce emissions and noise while meeting market needs. Innovation and technology are vital to building next generation aircraft that generate fewer emissions and less noise while carrying a maximum payload over the missions range. To maintain its position as the most advanced and fuel-efficient single-aisle aircraft family innovation, the A320 family will include the Sharklet wingtip devices and engine improvements on the A320neo, improving its noise footprint by producing 15 decibels below the current standard (Airbus Industries). The colored shaded circles on the following map (Figure 10) plot the maximum achievable range based on manufacturer performance tables for the specific aircraft identified in the circles. This figure is based on commonality of the current airline fleets operating at LGB. There are also many types of aircraft flown by the General Aviation community capable of flying to international markets.

Figure 10 Current Non Stop Destinations and Current Range Capabilities of Aircraft Serving LGB

Port of Entry / User Fee Designation Evaluation

There are two possible avenues for acquiring designation as an international service provider: gaining status as a Port of Entry (POE) or status as a User Fee Airport (UFA). US Customs and Border Protection (CBP) Ports of Entry are places (seaports, airports, or land border ports) designated by the Secretary of the Treasury where CBP officers or employees are assigned to accept entries of merchandise, clear passengers, collect duties, and enforce the various provisions of CBP and related laws. In general, a Port of Entry is a place where one may lawfully enter a country. It typically has a staff of people who checks passports and visas and inspects luggage to ensure that contraband is not imported. International airports are usually Ports of Entry, as well as road and rail crossings on a land border. The following is information taken from the official website of the Department of Homeland Security.

1. The following are considered the minimum criteria for establishing a Port of Entry. The requesting community must:

- Prepare a report that shows how the benefits to be derived justify the Federal Government expense,
- Be serviced by at least one major mode of transportation,
- Have a minimum population of 300,000 within the immediate service area (approximately a 70 mile radius).
- The actual workload in the area must be one or a combination of the following:
    - 15,000 international air passengers (airport), 2,000 scheduled international arrivals (airport),
    - 2,500 consumption entries (each valued over $2,000), with no more than half being attributed to any one party (airport, seaport, land border port),
    - 350 vessels (seaport),
    - 150,000 vehicles (land border port).

2. Facilities provided without cost to the federal government must include:

- Warehousing space for the secure storage of imported cargo pending final CBP inspection and release,
- The commitment of optimal use of electronic data input equipment and software to permit integration with any CBP system for electronic processing of commercial entries,
- Administrative office space,
- Cargo inspection areas,
- Primary and secondary inspection rooms,
- And storage areas and any other space necessary for regular CBP operations.

It is CBP's responsibility to ensure that the facility requirements of all Federal agencies are met. The requesting community must notify the other Federal inspection agencies of its request to establish a Port of Entry and obtain the concurrence of these agencies on this issue.

Designated User Fee Airports are functionally equivalent to Ports of Entry. The major differences between the two are workload criteria and financial responsibility for services. Communities who desire CBP services at their airports but do not meet the workload requirements for a Port of Entry may still receive the services if they meet the following three criteria:

- The volume or value of business at the airport is insufficient to justify the availability of CBP service at such airport on a non-reimbursable basis,

- The Governor of the State in which such airport is located approved such designation in writing to the Commissioner of Customs and Border Protection,
- The Community (or airport authority) agrees to reimburse Customs and Border Protection for all costs associated with the services, including all expenses of staffing a minimum of one full-time officer.

In all cases regarding new services request for POE and UFA designation, Customs and Border Protection must have the available manpower or the authorization and appropriations to hire additional personnel prior to approving requests.

Port of Entry / User Fee Designation Recommendation

Based on the flight activity forecast in the Traffic Analysis Section of this report, Long Beach Airport's market demand for international passengers has been identified as sufficient in workload and volumes of business to justify User Fee Airport designation for startup.

Therefore if Long Beach Airport decides to build a FIS Facility and commits to accommodate all requirements outlined in #2 above, it is recommended to pursue a User Fee Airport designation to initiate services. When service and passenger volumes meet qualifying levels for Port of Entry designation it is recommended that Long Beach apply for the Port of Entry designation. Contacts and processes are outlined in the Outline of Optimal Process below.

Probability of Receiving Designation Assessment

For the purpose of assessing probability for designations this report has identified two California airports, Fresno Yosemite International Airport and John Wayne Airport, currently applying for Port of Entry status. Both airports have international service and passenger levels that are above the minimum requirement for Port of Entry designation. To date, neither airport has been successful in receiving Port of Entry designation. Both operate as User Fee designation airports. John Wayne Airport is the most recent California airport to apply for Port of Entry status. While it has been successful at receiving User Fee designation to start up international services in 2012, it has yet to be successful in receiving Port of Entry designation after satisfying all requirements as outlined above. John Wayne Airport has had the political support at the state, congressional, and local levels of government and still has been unsuccessful at receiving Port of Entry designation.

Therefore the probability for Long Beach Airport receiving the User Fee Airport designation is high. Port of Entry designation cannot be assessed until specific levels in workload and volumes are met; however based on current findings as outlined above it would be unlikely in the near term.

Outline of Optimal Process

Once a FIS Facility is approved it is recommended to move forward with an application to CBP for a User Fee Airport designation. Long Beach Airport's application process for User Fee Airport designation to CBP should include the following activities using the approximate timeline.

Once authorization to proceed is made, the City of Long Beach Mayor, or designee, should:

- Submit a letter of application to CBP regional director that includes a timeline of the facility construction, date of opening as well as an anticipated commencement date of service.
- Contact the Governor of California office with notification of the decision to build a FIS Facility with studies administered for supporting that decision.

- Request letters of support from local congressmen and businesses to be sent to CBP Director.

One year before opening:

- Submit a letter to the Governor requesting a letter of application in support of LGB as a User Fee Airport
- Have the letter from the California Governor's office sent to the Port Director of Los Angeles officially requesting LGB be designated a User Fee Airport.

Once the minimum criteria are reached and reviewed, CBP will process the request and notify the airport for further procedures.

It remains at the discretion of CBP whether User Fee Airport designation or Port of Entry designation at an airport meets the criteria and if status is granted. For questions, the CBP website recommends contacting the Passenger Programs Division at (202) 344-1220 for the current filing process. The two key processes to move forward are submitting a notification letter to CBP with a timeline showing the facility open date and anticipated commencement of service date and obtaining a letter of support from the governor.

Traffic Analysis

This section projects future flight activity and forecast passengers for international demand. The forecast uses a network and passenger demand analysis providing lists for both potential international markets and a lower bound or more probable list of international airports served if LGB had a FIS Facility. The analysis identified passenger demand for international services at LGB and market fit within JetBlue's network in addition to demand from ongoing domestic services.

Southern California has experienced robust international demand growth over the last five years following recovery from the 2008 financial crisis. LAX and John Wayne Airport (SNA) international traffic are growing. SNA's international facility opened in 2012. Between the years 2010-2015 international traffic in the LA region has grown 30%.

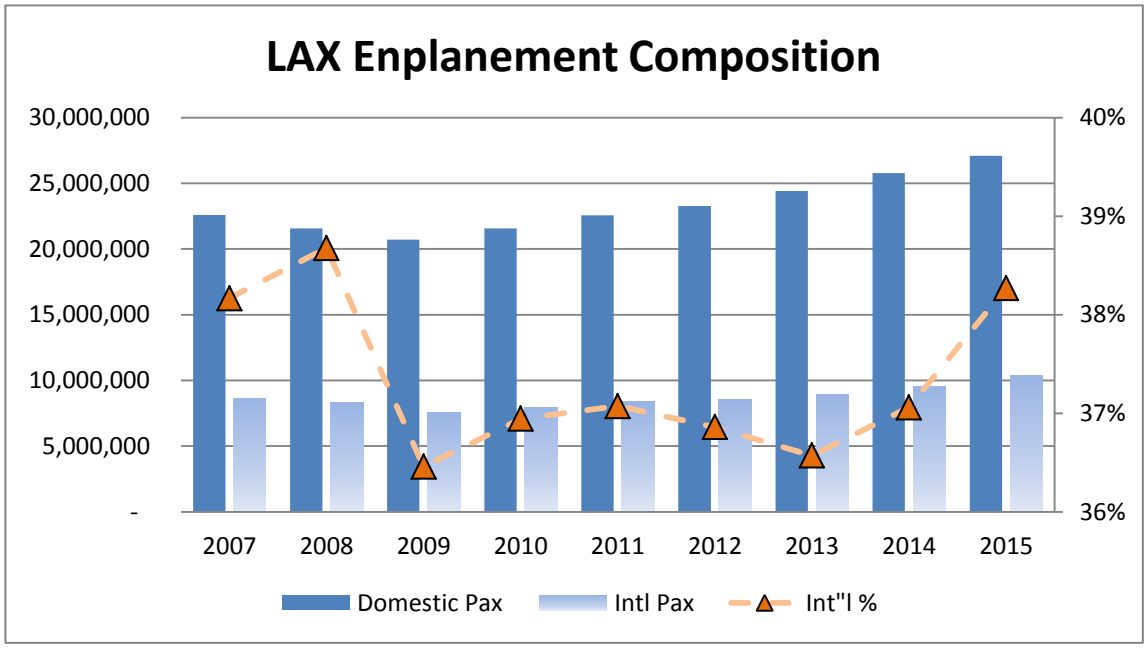

Figure 11. LAX Passenger Segmentation

Market forecast for passenger demand is supported by careful assessment and analysis of historical trends in traffic demand, projected economic growth, and many other relevant factors (see Forecast Market Demand in this section) that may affect growth in the local aviation market. One methodology often used assumes that an airport's historic traffic can be used to assess future traffic patterns. Because there are no historic international traffic patterns at LGB an alternative method recommended by the FAA is used. That method assigns a share of a larger traffic volume, such as that of a statewide or regional aviation system (FAA Methodology: Forecasting Aviation Activity). For this report the broader international travel patterns for the Los Angeles Basin was used. In this study, passenger share is assigned to LGB based on a catchment area and most likely airline network capacity solution by LGB primary carrier, JetBlue. To assess the international market size and the number of potential flights, an assumption regarding the aircraft types that may be operated (see Analysis of Aircraft Type section) is fundamental to the forecast as aircraft noise is the driver of specific slots levels available at LGB. The engine technology currently deployed has reduced noise allowing for 50 slots to be available for 2016 . Engine manufacturers forecast that future technology under development will reduce noise another 15% over current aircraft at similar weights. The A320 used by JetBlue will be the aircraft type used in the market analysis. This forecast considers this non-passenger demand related criteria to influence market share and number of probable destinations.

Projection of Future Flight Activities

Given the slot regime at LGB, the development of an FIS facilities forecast is not just based on traffic levels, local demographics or air service area characteristics but the slot limitations. This report assumes that the 2016 noise budget and the number of commercial slots at LGB are the base for all future flight operations. The aircraft that have been ordered by the airlines operating at Long Beach Airport will produce less noise in the future, however it is not known at this time the exact aircraft mix or the timing of when these aircraft would be scheduled at LGB. Therefore, no inclusion of those benefits is considered in this report. Because aircraft arrival and departure flight procedures, performance and noise characteristics differ by specific aircraft, the number of available slots varies for arrivals and departures within the aircraft types. These factors constrain the market analysis to 2016 levels. The report also acknowledges that the noise budget is indifferent to whether there are domestic or international operations.

The B757-300 is the largest aircraft that can be accommodated at the airport terminal and the B767-300 is the critical aircraft for Airfield design and neither aircraft are currently used at LGB for passenger service. These aircraft's life cycle are nearing their end and is not likely the choice for airlines flying at LGB. Thirty percent of the 757s manufactured have already been retired as of July 2015 (World Airliner Census). The A320 family is the most common commercial aircraft operating at Long Beach Airport and is the aircraft most likely to be used in the future for ongoing operations. With the addition of Southwest at LGB the new generation 737 will eventually populate the schedule. The Southwest 737 MAX has a noise envelope lower than the current A320 so little in the forecast would change with that adjustment in aircraft mix.

As stated above, no increase in total flight activities beyond the current noise budget are used to estimated international flights. A key assessment in this report looks at the slot usage patterns at the airport over time. Historically underperforming domestic flights were cancelled or airlines exchanged aircraft types, replacing commercial jets with smaller commuters. The slot usage reflects flight schedules changes with new markets opening and others being cancelled. LGB has also experienced airlines exiting the market, discontinuing all services at LGB. Airlines are constantly looking to optimize their networks profitability and at LGB this meant leaving commercial slots dormant. It is not anticipated that this pattern will change in the long term. This supply and demand imbalance has fluctuated over the years and in 2015 slot usage fell to 74% (79% is the 10 year average-Table 1). In the most current month, July 2016, usage was also 74%. For 2016 slot usage is anticipated to rise vs. 2015 during the second half of the year but the long term trend outlined in the Past and Current Flight Activities section suggests there is room in the current noise budget for the international flights forecasted. If an FIS is built, the segmentation and destination mix will change based on current market drivers at that time. No date has been determined for the potential opening of an FIS facility therefore the international forecast assumes slot usage of domestic flight operations at historical averages.

Given the cyclical nature of the aviation industry, over the long term, diversity of a broader product mix would provide the benefit of greater stability for the airport, tenants, vendors and business partners. The historically underutilized slots, recent awarding of new slots, plus a FIS Facility will provide both the departure capacity and terminal capacity for international service. The forecast presented in this section estimates 6 international flights in the startup year going to 8 by year four. Of the 50 slots that level of flying would equal 12 and16 percent respectively.

Potential Destinations

A market analysis was performed to identify the largest potential destinations based on size of cities, market trends, networks of current airlines and current traffic flows. JetBlue has requested the FIS and was interviewed as a task in the scope of the report. At that time, they provided a list of destinations under consideration and markets that they had analyzed. This following list was developed from an analysis of

destinations in JetBlue's network and those markets that have been identified from the market analysis performed for this report (Table 5). Most of these destinations have some service to the Los Angeles region.

Potential International Destinations

Country	Airport Code	City	Airport
Mexico	SJD	Los Cabos	(Los Cabos International Airport)
	PVR	Puerto Vallarta	(Gustavo Díaz Ordaz International Airport)
	MTY	Monterrey	(General Mariano Escobedo International)
	MEX	México City	(Aeropuerto International Benito Juárez)
	GDL	Guadalajara	(Miguel Hidalgo y Costilla International Airport)
	ACA	Acapulco	(General Juan N. Álvarez International)
	CUN	Cancun	(Cancún International)
	ZCL	Zacatecas	(General Leobardo C. Ruiz International)
	BJX	Leon	(Aeropuerto International de Guanajuato)
	MLM	Morella	(General Francisco J. Mujica International)
Costa Rica	SJO	San Jose	(Juan Santamaría International Airport)
	LIR	Liberia	(Daniel Oduber Quirós International)
Guatemala	GUA	Guatemala City	(La Aurora International Airport)
Panama	PTY	Panama City	(Tocumen International Airport)
El Salvador	SAL	San Salvador	(Monseñor Óscar Arnulfo Romero International Airport)
Canada	YVR	Vancouver	(Vancouver International) * Pre Cleared

*Vancouver would not require CBP facilities as CBP pre clears passenger in YVR

Table 5 List of Potential International Destinations at LGB

Figure 12 Map of Potential International Destinations

Probable Destinations

Of the carriers interviewed JetBlue is the only carrier that has shown a desire to operate international destinations from LGB. Based on the market and network analysis in this report, the markets identified during the JetBlue interview and current level of available slots, the most probable markets to be served are listed in Table 6. The Most Probable List also has alignment with JetBlue's current international network. It is estimated that six to eight of these 11 markets would be considered competitively feasible.

Most Probable Markets Forecasted

Country	Airport Code	City	Airport
Mexico	SJD	Los Cabos	(Los Cabos International Airport)
	PVR	Puerto Vallarta	(Gustavo Díaz Ordaz International Airport)
	MTY	Monterrey	(General Mariano Escobedo International)
	MEX	México City	(Aeropuerto International Benito Juárez)
	GDL	Guadalajara	(Miguel Hidalgo y Costilla International Airport)
	CUN	Cancun	(Cancún International)
Costa Rica	SJO	San Jose	(Juan Santamaría International Airport)
	LIR	Liberia	(Daniel Oduber Quirós International)
Guatemala	GUA	Guatemala City	(La Aurora International Airport)
Panama	PTY	Panama City	(Tocumen International Airport)
El Salvador	SAL	San Salvador	(Monseñor Óscar Arnulfo Romero International Airport)

Table 6 List of JetBlue's Most Probable Destinations

Figure 13 Map of Probable Destinations

Forecast - Market Demand at LGB

For planning purposes the forecast calls for a startup of six international markets the first year and then going to eight by Year 4. This forecast stays within a cap of 50 commercial slots as some international flights may be substituted for domestic flights. However the long term trend does not indicate any substitution should be required as noted in the Projection of Future Flight Activities section. Market and population share methods include using a proportional market share of origin and destination passengers in the LA Basin for the forecast base discounted for a frequency share deficit to LAX.

Listed below are relevant factors and drivers of passenger demand analyzed used in the traffic forecast for a potential FIS at LGB:

- Markets – large historic traffic totals
- US-Mexico bilateral agreement
- Price elasticity and new capacity
- Business in Long Beach metro area
- Community of Interest
    - Friends and Family
    - US ex-patriots
- Vacation destinations
- Port business
- General Aviation business
- Geographic attributes

Operations and Traffic Statistics

Table 7 represents the operational statistics for a five year period. As previously stated the forecast assumes a cap of 50 commercial operating slots with a steady state level occurring Year 4. Based on the passenger and network evaluations, it is estimated that the most likely schedules would produce six frequencies in Year 1 followed by two more flights in Years 4-5 producing an arrival peak of two A320 operations at the FIS. The forecast reflected in Table 7 is based on an 85% load factor using 150-seat A320 aircraft. The passenger composition on the aircraft in the forecast is 93% local and 7% connecting from another domestic flight. There are also some charter and ad hoc schedule flights included (funded by the cancellation of day of week schedules as noted in Figure 2). See Table 8 in the last section for specific assumptions.

Year	1	2	3	4	5
Seats	246,375	333,975	336,713	446,213	446,213
Enplanements	209,419	283,879	286,206	379,281	379,281
Departures	1,643	2,227	2,245	2,975	2,975

Table 7 Years 1-5 Forecast Operations from Launch of Service and Traffic Statistics for International FIS

Potential International Destinations Analysis

Using traffic analysis of international demand (US DOT) for the Los Angeles area as a baseline, the growth rate for the last three years has been 12%. JetBlue pricing and capacity has stimulated passenger growth between 12 and 125% in other international markets they have entered.

Furthermore JetBlue's desire to operate international markets at LGB with current mission capable aircraft and capacity created by a FIS facility would stimulate passenger demand and offer the community the utility of an additional asset.

LGB Flight Activity Evaluation

This study included a network evaluation of current commercial carriers serving LGB and international carriers that may look to LGB as a gateway. Based on JetBlue's, international network and potential traffic demand, it is expected that they would pursue markets in Mexico and Central America at are part of their current network. Many of these markets are currently served from their East Coast hubs. A station activity report in Figure 15 simulates LGB's July 2016 schedule and overlays potential international markets.

Based on LGB's competitive position in Southern California, as well as observed historic demand and econometric indicators, it is reasonable to assume continued international growth to the LA Basin and that a FIS Facility at LGB would command fair share of the markets offered within the slot constraints.

Figure 14 below uses the JetBlue July 2016 schedule at LGB and inserts a simulated international schedule based on markets from the most probable list produced from the network and forecast evaluations.

Simulated JetBlue Station Activity Report Including International Flights

Equip	Flt#	Inb Sta	Dept TO	Arvl LGB	Total Departures	Dept FROM	Arvl LGB	Outb Sta	Flt#	Equip
					1	700	815	OAK	148	320
					2	720	847	SFO	736	320
320	247	OAK	608	727	3	805	1305	PVR		320
320	2135	SFO	615	735	4	805	1340	MEX		320
320	217	AUS	710	804						
					5	814	929	OAK	248	320
					6	825	1318	AUS	1416	320
					7	830	1108	SLC	232	320
320		GDL	700	835						
					8	900	1135	SEA	406	320
320	1121	PDX	715	936	9	920	1610	CUN		320
						945		XXX		320
320	1207	SEA	735	1013						
320	147	OAK	900	1018	10	1025	1133	LAS	880	320
320	735	SFO	930	1100						
					11	1110	1321	PDX	1522	320
320	211	LAS	1015	1119						
					12	1128	1401	SEA	1006	320
320	447	OAK	1010	1129						
					13	1149	1314	SFO	1636	320
					14	1205	1326	SMF	266	320
					15	1215	1330	RNO	42	320
320	231	SLC	1154	1244						
320	1435	SFO	1159	1327						
320		LIR	835	1340	16	1335	2157	JFK	514	320
320	213	JFK	1132	1420	17	1425	1714	SJD		320
320		XXX		1430	18	1425	1705	SLC	532	320
320	877	LAS	1324	1432						
320	1007	SEA	1220	1458						
320		PVR	1400	1500	19	1511	1629	SMF	1166	320
					20	1520	1732	PDX	1622	320
320	265	SMF	1410	1531		1520		XXX		320
320	43	RNO	1415	1540	21	1545	2155	LIR		320
					22	1545	1652	LAS	380	320
320	1417	AUS	1520	1615						
					23	1618	1738	SFO	1436	320
					24	1630	1737	LAS	280	320
320	1521	PDX	1410	1631						
320		MEX	1430	1645	25	1730	1843	OAK	348	320
320	379	LAS	1625	1731						
320	407	SEA	1500	1740	26	1740	1953	PDX	1822	320
320		XXX		1730	27	1730	2230	GDL		320
					28	1820	1926	LAS	1980	320
					29	1826	2102	SEA	206	320
320	365	SMF	1713	1833						
320	531	SLC	1750	1837						
320	879	LAS	1735	1838						
320		SJD	1810	1940	30	1919	2033	OAK	448	320
320		CUN	1650	2015						
320	1179	LAS	1835	1938						
320	1635	SFO	1820	1943						
					31	1955	2101	LAS	1780	320
					32	2030	122	AUS	216	320
320	1621	PDX	1823	2041						
320	404	OAK	1925	2044						
					33	2110	536	BOS	404	320
320	405	BOS	1800	2118						
					34	2130	2249	SFO	2136	320
					35	2132	549	JFK	14	320
320	1013	JFK	1825	2135						

Note: Peak JetBlue Schedule for first year of operations. International destinations are identified in red with XXX indicating new markets Years 3-5.

This simulation assumes a 35 flight level for JetBlue and the current 50 jet departure cap for all carriers.

All flights in this activity report are assigned daily frequencies. Any additional international or seasonal JetBlue flights would come from cancellation of other frequencies. The network analysis finds it is not unusual for airlines to optimize flight schedules with specific day of week flying, specifically leisure international destinations.

Departure and arrival times are included for illustrative purposes only. Flight schedules must conform to operating hours permitted under the Noise Ordinance and would be subject to service schedules approved by CBP.

Figure 14 Potential JetBlue Startup Schedule Based on Summer 2016 Schedules

Simulated International and Domestic Activity with All Carriers

Airline	Equip	Flt #	Inb Sta	Dept	Arvl	Total Departures	Dept	Arvl	Outb Sta	Flt#	Equip	Airline
				TO	**LGB**		**FROM**	**LGB**				
JetBlue	320	247	OAK	608	727	1	640	809	PHX	5662	CRJ9	American
JetBlue	320	2135	SFO	615	735	2	700	820	OAK	756	737	Southwest
JetBlue	320	217	AUS	710	804	3	700	815	OAK	148	320	JetBlue
JetBlue	320		GDL	700	835	4	720	110	SLC	4643	CRJ9	Delta
American	CRJ9	5663	PHX	745	909	5	720	847	SFO	736	320	JetBlue
JetBlue	320	1121	PDX	715	936	6	805	1305	PVR		320	JetBlue
Delta	CRJ7	4644	SLC	832	938	7	805	1340	MEX		320	JetBlue
Southwest	737	972	OAK	835	1000	8	814	929	OAK	248	320	JetBlue
JetBlue	320	1207	SEA	735	1013	9	825	1318	AUS	1416	320	JetBlue
JetBlue	320	147	OAK	900	1018	10	830	1108	SLC	232	320	JetBlue
JetBlue	320	735	SFO	930	1100	11	900	1135	SEA	406	320	JetBlue
JetBlue	320	211	LAS	1015	1119	12	920	1610	CUN		320	JetBlue
JetBlue	320	447	OAK	1010	1129		945		XXX		320	JetBlue
American	CRJ9	5661	PHX	1035	1155	13	1000	1120	PHX	5854	CRJ9	American
Delta	CRJ9	4589	SLC	1125	1225	14	1018	1305	SLC	4644	CRJ7	Delta
JetBlue	320	231	SLC	1154	1244	15	1025	1133	LAS	880	320	JetBlue
JetBlue	320	1435	SFO	1159	1327	16	1030	1150	OAK	1853	737	Southwest
JetBlue	320		LIR	835	1340	17	1110	1321	PDX	1522	320	JetBlue
Southwest	737	1024	OAK	1220	1345	18	1128	1401	SEA	1006	320	JetBlue
JetBlue	320	213	JFK	1132	1420	19	1149	1314	SFO	1636	320	JetBlue
JetBlue	320		XXX		1430	20	1205	1326	SMF	266	320	JetBlue
JetBlue	320	877	LAS	1324	1432	21	1215	1330	RNO	42	320	JetBlue
JetBlue	320	1007	SEA	1220	1458	22	1230	1357	PHX	5685	CRJ9	American
JetBlue	320		PVR	1400	1500	23	1305	1552	SLC	4589	CRJ9	Delta
JetBlue	320	265	SMF	1410	1531	24	1335	2157	JFK	514	320	JetBlue
JetBlue	320	43	RNO	1415	1540	25	1415	1535	OAK	1863	737	Southwest
American	CRJ9	5619	PHX	1435	1555	26	1425	1714	SJD		320	JetBlue
JetBlue	320	1417	AUS	1520	1615	27	1425	1705	SLC	532	320	JetBlue
Southwest	737	18	OAK	1505	1630	28	1511	1629	SMF	1166	320	JetBlue
JetBlue	320	1521	PDX	1410	1631	29	1520	1732	PDX	1622	320	JetBlue
JetBlue	320		MEX	1430	1645		1520		XXX		320	JetBlue
JetBlue	320		XXX		1730	30	1545	2155	LIR		320	JetBlue
JetBlue	320	379	LAS	1625	1731	31	1545	1652	LAS	380	320	JetBlue
UPS	B763F	2908	SDF	1610	1735	32	1618	1738	SFO	1436	320	JetBlue
JetBlue	320	407	SEA	1500	1740	33	1630	1737	LAS	280	320	JetBlue
FedEx	A300F	1351	MEM	1600	1747	34	1635	1800	PHX	5698	CRJ9	American
Delta	CRJ7	4723	SLC	1700	1804	35	1700	1820	OAK	1788	737	Southwest
American	CRJ9	5668	PHX	1643	1815	36	1730	1843	OAK	348	320	JetBlue
JetBlue	320	365	SMF	1713	1833	37	1730	2230	GDL		320	JetBlue
JetBlue	320	531	SLC	1750	1837	38	1740	1953	PDX	1822	320	JetBlue
JetBlue	320	879	LAS	1735	1838	39	1820	1926	LAS	1980	320	JetBlue
JetBlue	320	1179	LAS	1835	1938	40	1832	2115	SLC	4723	CRJ7	Delta
JetBlue	320		SJD	1810	1940	41	1826	2102	SEA	206	320	JetBlue
JetBlue	320	1635	SFO	1820	1943	42	1902	1225	MEM	1351	A300F	FedEx
JetBlue	320		CUN	1650	2015	43	1919	2033	OAK	448	320	JetBlue
JetBlue	320	1621	PDX	1823	2041	44	1925	2046	PHX	5616	CRJ9	American
JetBlue	320	404	OAK	1925	2044	45	1934	209	SDF	905	767	UPS
Southwest	737	2785	OAK	1935	2100	46	1955	2101	LAS	1780	320	JetBlue
Delta	CRJ9	4639	SLC	2015	2117	47	2030	122	AUS	216	320	JetBlue
JetBlue	320	405	BOS	1800	2118	48	2110	536	BOS	404	320	JetBlue
American	CRJ9	5870	PHX	2000	2131	49	2130	2249	SFO	2136	320	JetBlue
JetBlue	320	1013	JFK	1825	2135	50	2132	549	JFK	14	320	JetBlue

Figure 15 Simulated Long Beach July Schedule Activity with International Flights

Aircraft Analysis Potential Changes

As part of the network evaluation of carriers serving LGB, their fleet and mission capability were analyzed (see Figure 10). The current aircraft types flown at LGB are capable of conducting international flights. Using Airbus A320 aircraft, JetBlue serves 32 international airports with similar distances as the probable destinations shown in Table 6. Using Airbus' range tables, the A320 aircraft are capable of the international destinations identified. Additionally mileage comparisons to other markets that are flying the A320 aircraft were made. No changes are foreseen at this time to pursue that mission should LGB open a FIS Facility.

General Aviation

This report identified potential GA demand for international arrivals capability. Working with LGB staff, an analysis was performed to review GA use of the most recent noise budget. That analysis produced a GA noise budget usage rate of 65% for 2015. If fully utilized the remaining allowance that the noise budget could accommodate would equal 31 more GA flights a day. This is based on noise averages in the 3rd Quarter of 2015.

Current General Aviation Activity – International Flights Impact Assessment

The following topics were brought up most often during interviews with current GA operators:

- LGB had custom clearance until 2006 when the CBP cut back funding due to budget cuts. At that time no noise issues with the annual noise budget were observed.
- Current GA operations are 35% below the noise budget and minimal change in aircraft mix is expected if international operations were to start up again.
- The GA community estimates demand for international flights of approximately two per day
- There are environmental benefits to clearance at LGB as international flights currently destined for LGB must clear at another airport first and then ferry the airplane to LGB. This creates an extra flight adding to more fuel burn and financial impact to customers.

GA total departure growth rates of 1-2% are expected over the next five years. This would have GA operating well below the noise budget. There are no fleet changes foreseen from today's activity due to international capabilities of current fleet.

Potential General Aviation Activity Evaluation

Based on the most recent annual reporting period, year ending October 2015, GA uses about 65% of its noise budget. Using the average noise levels for departure and arrival operations, 31 additional daily GA flights could be accommodated within the General Aviation Noise Budget. Based on feedback from the GA interviews, an estimate of two flights per day would use the services of CBP. Currently GA departures are down 26% since its peak in 2007.

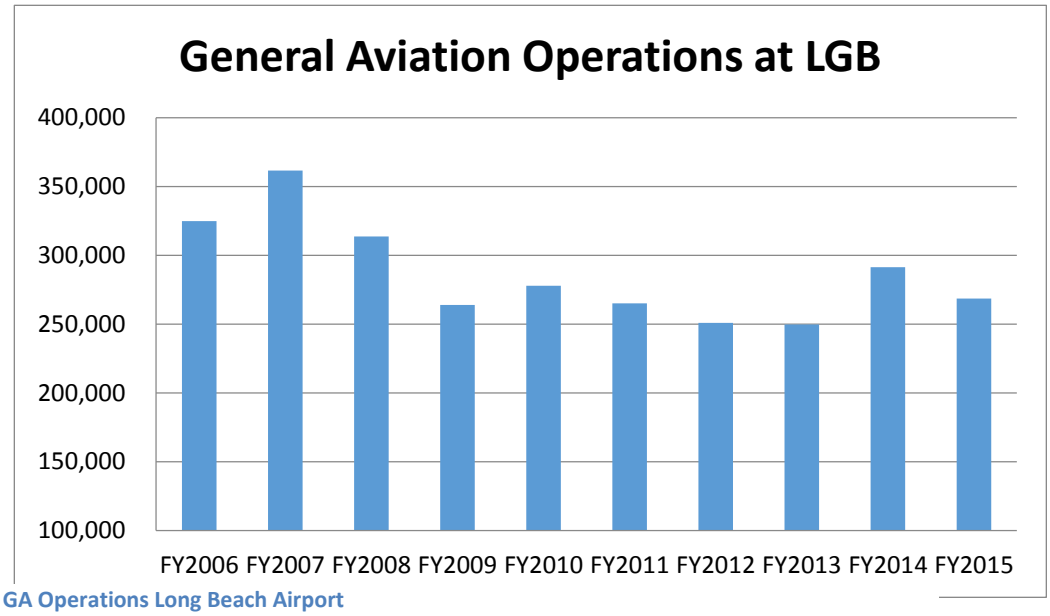

Figure 16 GA Operations Long Beach Airport

LGB's proximity to downtown Los Angeles and Orange County makes it an attractive arrival point for business and personal GA flights. The GA community identified the addition of CBP services as an ideal departure point for locals and as a destination for leisure and business travelers. The primary use of the FIS Facility by GA would be corporate and personal.

At Van Nuys Airport (VNY) a dedicated 1,528 square-foot clearance facility officially opened on May 23, 2015 under the Federal User Fee Airport Program. CBP returned to VNY after the CBP had ceased operations at all airports in the LA region except for LAX in 2006. Prior to 2006, CBP were on call, on demand, and no fee. Van Nuys reports an average of 50 FIS clearances per month after one year of service. There are no empirical data relating VNY international clearances to operations; however it is estimated by the airport that 40 of those flights were pre-clearing at other airports before ferrying to Van Nuys. VNY estimates that there may be a one off clearing of aircraft occasionally that are not home based aircraft. They conclude there are few new flights into VNY relating to CBP services. The impact is actually a gain in efficiencies since over 600 (or 50 per month average) were clearing annually at LAX and relocating back to their home base at VNY.

List of Airports Where CBP Inspection Services are Normally Available in California

Meadows Field Airport (KBFL), Bakersfield, California

Calexico International Airport (KCXL), Calexico, California

Eureka Municipal Airport (KAVC), Eureka, California

Murray Field (KEKA), Eureka, California

Fresno Air Terminal (KFAT), Fresno, California

Los Angeles International Airport (KLAX), Los Angeles, California

Arcata-Eureka Airport (KACV), McKinleyville, California

Monterey Peninsula Airport (KMRY), Monterey, California

Moffett Federal Airfield (KNUQ), Mountain View, California

Oakland International Airport (KOAK), Oakland, California

Palm Springs Regional Airport (KPSP), Palm Springs, California

Beale Air Force Base (KBAB), Sacramento, California

Sacramento International Airport (KSMF), Sacramento, California

Brown Field Municipal (KSDM), San Diego California McClellan-Palomar Airport (KCRQ) San Diego, California

San Diego International Airport -Lindbergh Field (KSAN), San Diego, California

San Francisco International Airport (KSFO), San Francisco, California

Norman Y. Mineta San Jose International Airport (KSJC), San Jose, California

Approach and Methodology

This study chose a technique that makes the best use of available data. As there is no historic international traffic data at LGB, the approach uses current international traffic demand in the LA Basin for the demand set which includes LAX, SNA and ONT, using a range of JetBlue's traffic growth from price, service stimulation, the bilateral stimulation, most likely aircraft type, constrained slot levels and approximating share distribution based on departure capacity and geographical location.

Forecast Departure Assumptions –Spool Up and Steady State

The operating assumption: the noise budget in all years is capped at 50 commercial departures per day.

Year	1	2	3	4	5
	3 daily departures for the first 6 months 6 daily departures for second six months	6 daily departures for 12 months with an escalator of 10% (37 annual flights) added for charters and ad hoc frequencies. All weekend or ad hoc departures are assumed to be funded from cancellations of other scheduled flights	6 daily departures for 12 months with an escalator of 10% (37 annual flights) added for charters and ad hoc frequencies. All weekend or ad hoc departures are assumed to be funded from cancellations of other scheduled flights	8 daily departures for 12 months with an escalator of 15% (55 annual flights) added for charters and ad hoc frequencies. All weekend or ad hoc departures are assumed to be funded from cancellations of other scheduled flights	8 daily departures for 12 months with an escalator of 15% (55 annual flights) added for charters and ad hoc frequencies. All weekend or ad hoc departures are assumed to be funded from cancellations of other scheduled flights

Table 8 Phasing of Projected Operations at FIS

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Appendix B. Environmental Compliance Assessment

PLEASE NOTE: The information, analysis, assessments and opinions contained in this document are intended for general evaluation purposes only. This document is intended for use only by its specified client and is NOT intended for use, reliance or in making financial/investment decisions by outside parties.

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Feasibility Study for a Federal Inspection Service Facility at Long Beach Airport

Environmental Compliance Assessment

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Introduction

This Environmental Compliance Assessment is part of the larger Feasibility Study being prepared to assess the Federal Inspection Service (FIS) Facility at Long Beach Airport (LGB or the Airport). A FIS Facility is a single processing complex that evolved from the consolidation and integration of U.S. customs, immigration, and agriculture operations with offices and support functions.

A Feasibility Study is statutorily exempt per the California Environmental Quality Act (CEQA). Specifically, Section 15262, Feasibility and Planning Studies, of the State CEQA Guidelines states the following:

> A project involving only feasibility or planning studies for possible future actions which the agency, board, or commission has not approved, adopted, or funded does not require the preparation of an EIR or Negative Declaration but does require consideration of environmental factors. This section does not apply to the adoption of a plan that will have a legally binding effect on later activities.

Therefore, as a Feasibility Study, the purpose of this evaluation is not to provide the City with a CEQA document; rather it is intended to give the City an understanding of the types of technical studies and environmental compliance documents that may be required should it decide to move forward with the subsequent project-level evaluation of the FIS Facility. However, to aid in the evaluation, the questions from the CEQA Environmental Checklist from Appendix G of the CEQA Guidelines (California Code of Regulations, Title 14, Chapter 3, Sections 15000, et seq.) are used as a baseline to assess potential environmental effects of the FIS Facility.

In conducting this evaluation, consideration was also given regarding whether the FIS Facility could be accommodated within the impact envelope that was evaluated in the 2006 Long Beach Airport Terminal Area Improvement Project Final Environmental Impact Report No. 37-03 (State Clearinghouse No. 2003091112) (hereinafter referred to as "FEIR 37-03") and approved by the Long Beach City Council on June 20, 2006, with the adoption of Resolution No. Res-06-0056.

At this conceptual level, three options have been identified—Option 1 would be located north of the terminal area and Options 2 and 3 would be located south of the terminal area. Section 3 of the Study provides a description of the improvements associated with each option. Figures 4 through 9 provide graphic depictions of the required for an FIS Facility. For comparison purposes, Option 1 would require approximately 35,051 square feet of new construction; Option 2 would require 30,672 square feet of new construction; and Option 3 would require 21,656 square feet of new construction and approximately 6,750 square feet of the Security Screening Checkpoint (SSCP) would be repurposed and would require the construction of a new SSCP. In addition, it should be noted, that Option 1 would require aircraft parking position 11 be reconstructed to be to be on the north side of the FIS Facility and a new parking position (position 12) would be constructed.

It should be noted that, at this phase of the process, only very general concepts are available. Therefore, this evaluation is not intended to provide consideration of specific design elements. It is assumed that, should the FIS Facility proceed to the subsequent phase of evaluation, all facilities would be designed in compliance with the Customs and Border Protection (CBP)

Airport Technical Design Standards (ATDS). As such, applicable Department of Homeland Security requirements would be complied with.

Previous California Environmental Quality Act Documentation

Long Beach Airport Terminal Area Improvement Project EIR

The Project evaluated in FEIR 37-03 consisted of improvements to the existing Airport Terminal Building and related facilities in order to accommodate increases in flight activity at LGB consistent with operational limitations of the Airport Noise Compatibility Ordinance and the 1995 Settlement Agreement. The 1995 Settlement Agreement included a "grandfather" provision under the Airport Noise and Capacity Act (ANCA) that allowed for continued City of Long Beach enforcement of flight and noise restrictions. The Project included construction of, or alteration to, the 13 areas listed below:

- Holdrooms
- Concession Area
- Passenger Security Screening
- Baggage Security Screening
- Baggage Claim Devices
- Baggage Service Office
- Restrooms
- Office Space
- Ticketing Facilities
- Airline Gates
- Aircraft Parking Positions
- Vehicular Parking
- Traffic and Pedestrian Circulation

The study area for the Terminal Area Improvements included the area surrounding the existing Airport Terminal Building. The FEIR evaluated the construction of improvements between the Gulfstream building and the Million Air lease site on the Airport. Uses in this area include the Airport Terminal Building, a permanent holdroom, temporary holdrooms, security screening of passengers and baggage, a baggage claim area, a parking structure, and surface parking facilities. On the airfield side, uses include aircraft parking position for the commercial and commuter carriers and a general aviation tie-down area on the Million Air site.

Though the FEIR evaluated 102,850 square feet of terminal facilities and up to 14 aircraft parking positions, when certifying FEIR 37-03 on June 20, 2006, the City Council, through Resolution No. Res-06-0056, approved 97,545 square feet of terminal improvements with a maximum of 12 aircraft parking positions together with a 4,000-space parking structure (City of Long Beach 2006a, 2006c). The FEIR identified only one significant, unavoidable impact, for which the City Council adopted Findings of Fact and a Statement of Overriding Considerations. The impact was associated short-term air quality impacts during construction, specifically, NO_X and VOC emissions would exceed established standard. It should be noted that the reduction of

5,305 square feet of terminal area improvements was not required to reduce potential significant impacts, but instead was approved due to the intense public interest[1] in the proposed terminal improvements and related facilities.

Implementation of Terminal Area Improvements

On April 17, 2007, a workshop was conducted with the City Council to review the results of a detailed space needs analysis completed by the City's architectural consultant for the Airport Terminal Improvement Project. Based on the direction provided at this workshop, staff reported back to the City Council on April 24, 2007 and received authorization to prepare final plans, specifications, cost estimates and a financing plan for the construction of a terminal improvement project of 89,995 square feet.

FEIR 37-03 identified that the Terminal Area Improvements would be phased based on service priorities and funding availability. To date, only the first phase of improvements have been implemented. Phase I included the construction of an additional parking structure with an adjoining surface lot; a new passenger concourse with consolidated passenger screening; and a new aircraft parking ramp. The concourse opened to the public on December 12, 2012. While additional improvements have been proposed, there is no timing on the implementation of any additional improvements.

Table 1 provides a summary of the improvements evaluated in FEIR 37-03; the improvement program approved by the City Council on April 24, 2007; the size of the terminal area facilities with the implementation of the Phase I improvements; and the amount of terminal area improvements allocated for future construction pursuant to the City Council direction. For informational purposes only, the amount of additional terminal area improvement that has approved CEQA documentation pursuant to FEIR 37-03 is also provided (i.e., the delta between what was environmentally cleared in FEIR 37-03 and what has been constructed). However, this allocation exceeds the April 24, 2007 directive, which reduced the size of the terminal area improvements from what was evaluated in FEIR 37-03 and the June 20, 2006 initial approvals.

[1] An extensive public outreach program was conducted in conjunction with the preparation of FEIR 37-03. There were two public scoping meetings in 2003 as part of the Notice of Preparation (NOP) process, with 100 and 200 people in attendance. The City received 251 responses to the NOP. Fifteen meetings, which were open to the public, were conducted with the Airport Advisory Commission to determine the scope of the EIR. The City Council considered the scope recommendations at two council meetings in 2005. An updated NOP was circulated in 2005, and two additional public meetings were conducted. The EIR was circulated for an 84-day public review period. A series of public meetings were held during the public review period and included an overview of the findings of the Draft EIR; there was also a joint workshop with the Long Beach Planning Commission and the Long Beach Cultural Heritage Commission. During the public review period, a total of 215 written comments were received (a combination of letters, comment cards, and emails) on the Draft EIR.

TABLE 1
LONG BEACH AIRPORT
TERMINAL AREA IMPROVEMENTS PROGRAM SPACE ALLOCATION

Function	Terminal Improvements Facilities Evaluated in FEIR 37-03	Terminal Improvements Program Approved by City Council April 24, 2007	Terminal Improvements Post Phase I Improvements[a]	Terminal Improvements Future Construction per April 24,2007 Authorization	Remaining Terminal Improvements Under FEIR 37-03
Total Square Footage[b]	102,850 sf	89,995 sf	73,769 sf[c]	24,826 sf[d]	37,681 sf[e]
Airline Gates	11	11	11	0	0
Aircraft Parking Positions	12 to 14	12	11	0	1
Total Parking Spaces	6,286	5,586[f]	3,836	1,750[e]	2,450

lf=linear feet
sf= square feet

NOTES:
a. Phase I Constructed Areas listed provided by Architect of Record D. Holloway from HOK on February 11, 2014.
b. Exterior covered space or terminal support functions such as mechanical, electrical, kitchen equipment and food prep, janitorial and maintenance are exempt from Total Area.
c. Total reflects the demolition of 23,850 square feet resulting in a net of 73,769 square feet of terminal area.
d. Assumes the removal of 3,600 square feet of existing TSA space and 5,000 square feet of existing baggage security screening areas that have been identified for renovation. Additionally, the 1,975 square feet of improvements that have been identified but not constructed are provided for in this total.
e. Reliance on FEIR 37-03 for construction up to 102,850 square feet would require action by the City Council, which restricted terminal area improvements to 89,995 square feet. However, from a CEQA compliance perspective, the FEIR addressed the impacts associated with 102,850. This would allow up to an additional 12,855 square feet of terminal area improvements beyond what was authorized on April 24, 2007.
f. Rental Car Parking relocated from Lot A or Lot B Parking Structures to Million Air Leasehold during 5/06/2008 City Council Site Plan Review Approval.

Environmental Evaluation

It should be noted that this evaluation is not intended to serve as a CEQA compliance document. At this phase of the process, only very general concepts are available; therefore, consideration of specific design elements is not possible. It is assumed that, should the FIS Facility proceed to the subsequent phase of evaluation, all facilities would be designed in compliance with the CBP Airport Technical Design Standards (ATDS). As such, applicable Department of Homeland Security requirements would be complied with.

As described above, the purpose of this environmental evaluation is to provide a baseline assessment of the potential environmental effects that could occur with implementation of the FIS Facility. The purpose is to provide the City with an understanding of potential issues and possible future studies that may be needed to comply with CEQA.[2]

An assumption of the analysis is that there would be no modifications to the City's Airport Noise Ordinance, which was enacted as Chapter 16.43 of the Municipal Code.[3] The Noise Ordinance contains reasonable and non-arbitrary provisions for the number of daily air carrier operations (minimum of 41 plus 9 supplemental flight slots)[4], commuter carrier flight slots (minimum of 25), as well as cumulative noise budgets and maximum Single Event Noise Exposure Level (SENEL) limits for Charter, Industrial and General Aviation (GA) operations. Under the Noise Ordinance, if the cumulative noise budgets for the air carrier and commuter operators are below the cumulative noise limits established for these categories as determined during the baseline year 1989-1990, the number of flight slots available to air carrier and commuter operators must be increased. As a result, LGB must determine annually as specified in Chapter 16.43 of the Municipal Code, whether additional flights must be allocated based on the cumulative noise generated by air carrier and commuter operations during the prior 12 month period.

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2 If implemented, the FIS Facility would require modifications to the airfield side of LGB, which would require Federal Aviation Administration (FAA) approval. Therefore, environmental compliance pursuant to the National Environmental Policy Act (NEPA) would also be required.

3 At the public meetings held for the FIS Facility, some members of the community raised a concern about whether introducing international flights would lead to a repeal of the City's Airport Noise Ordinance. However, the FIS Facility would not introduce any components that would jeopardize or nullify the City's Airport Noise Ordinance. In 1990, while the litigation between the City and the carriers was pending, Congress passed the *Airport Noise and Capacity Act* (ANCA), which limited an Airport operator's right to control Stage 3 aircraft. Included within the ANCA legislation is a "grandfather" provision which permits Long Beach Airport to continue to enforce the flight and noise restrictions that are contained in the Airport Noise Compatibility Ordinance (Chapter 16.43). In May 2003, when the Terminal Area Improvements Project was being processed, the FAA reaffirmed the "grandfather" status of the Ordinance under ANCA.

4 For commercial aircraft, the Airport Noise Ordinance had provisions for a minimum of 41 flights per day. In order for the number of flights to be increased and still comply with the Airport Noise Compatibility Ordinance, the airlines had to adjust their flight operations to reduce the noise footprint. This was done through the use of quieter aircraft and reducing the number of late night operations. This was achieved and, in late 2015, additional flights were allocated. The flights were initiated in 2016. It should be noted that, if the noise budgets are exceeded, the number of flights would be reduced to ensure compliance with the City's Airport Noise Ordinance.

The assessment also assumes that international flights would use the current fleet mix operating at LGB.[5] As a result, the noise characteristic and passenger levels served at the Airport would not be substantially changed from what is currently provided for with the current flight allocations. When assessing the impact on the environment, the origin or destination of the flight does not substantially change the effect of the flight. However, it does change the type of facilities required to service the flights in order to meet CBP requirements. For the most part, this involves internal design requirements (e.g., providing the necessary sterile corridors to ensure all incoming international travelers proceed through CBP checkpoints). Consideration was also given regarding whether the FIS Facility could be accommodated within the impact envelope that was evaluated in FEIR 37-03. The State CEQA Guidelines encourage public agencies to reduce delay and paperwork through a variety of strategies. Using a previous EIR when it adequately addresses a proposed project is one of these strategies. When there is phased implementation of a project, if the agency finds that no new effects could occur or no new mitigation measures would be required pursuant to Section 15162 of the State CEQA Guidelines, the agency can approve the activity as being within the scope of the project covered by the program EIR and no new environmental document would be required. Therefore, the discussion below provides a preliminary assessment of the adequacy of FEIR 37-03 for addressing the FIS Facility should further evaluation be recommended.

As indicated above, the FEIR evaluated larger terminal area improvements than were ultimately authorized. Should the City Council elect to do so, if it is determined that the FEIR fully addresses the impacts associated with the FIS Facility, the full 102,850 square feet of terminal area improvements and up to 14 aircraft parking positions addressed in the FEIR could be implemented without further documentation. It should be noted that the Program FEIR and approving resolutions identified the interior square footage for the buildings (i.e., net square feet). The concept plans used for this Feasibility Study identifies outside footprint of the building (i.e., gross square feet) because these values are being used to estimate cost of the facilities. As such, the square footage of the FIS Facility being assessed in this study and the square footage of the facilities evaluated in FEIR 37-03 represent slightly different things; however, they provide a basis for general comparison at this level of evaluation. If the FIS Facility is recommended for further evaluation, a more precise comparison of actual conceptual design plans would be evaluated to make definitive recommendations on the type of CEQA documentation that would be required.

CEQA Environmental Checklist Topics

Though the FIS Facility is being considered as part of a feasibility study, the intent is to provide the City with a preliminary assessment of the environmental considerations that may be associated with implementation of the facility. As indicated above, to aid in the evaluation, the questions from the CEQA Environmental Checklist are being used. The CEQA Environmental Checklist has been developed as part of the State CEQA Guidelines as a tool for assessing areas of potential environmental impacts. The checklist addresses 17 different topical areas and

[5] Over the upcoming years, it is reasonable to assume the fleet mix at the Airport may change as Stage 4 aircraft are in more wide spread used. However, this transition in fleet mix would not be in response to the FIS Facility and it would be speculative to estimate what a future fleet mix would be. The Stage 4 aircraft are quieter and reduce air emissions compared to the current fleet mix. Therefore, the impacts associated with introduction of new aircraft is expected to reduce environmental impacts.

includes 86 questions. The CEQA Environmental Checklist is generally used when preparing an Initial Study to determine the type of environmental document for a project or as the basis for a Negative Declaration or Mitigated Negative Declaration.[6] The following discussion does not provide the level of detail generally associated with an Initial Study because of the preliminary nature of the design plans. While all the CEQA checklist questions are provided, the evaluation is provided at a topical level rather than a question-by-question assessment. For each topical area the following sections are provided:

- **CEQA Checklist Questions.** This section lists the questions from the CEQA Environmental Checklist included in Appendix G of the State CEQA Guidelines, only modified to focus on the FIS Facility, rather than state "the project" (as a feasibility study, the FIS Facility does not represent a "project" under CEQA).
- **Conceptual Assessment of the FIS Facility.** This section provides a preliminary assessment of the nature of the environmental impacts for the topical issue. This assessment is based on the very conceptual plans used for this Feasibility Study (see Section 3).
- **Consistency Assessment with FEIR 37-03.** As indicated above, a comprehensive EIR was prepared that assessed the environmental impacts associated with implementation of the terminal area improvements. The improvements were identified as being phased. The full square footage of the improvements evaluated in FEIR 37-03 have not been completed. Therefore, there is an assessment to determine whether the design of the FIS Facility is able to fit within the parameters of the improvements evaluated in FEIR 37-03 and whether the FIS Facility is anticipated to create new or more severe impacts or other changes in conditions that would require the certified EIR to be updated.
- **Recommended Further Evaluation.** This section identifies recommended further studies or evaluations that would be required if the FIS Facility is recommended for further evaluation and is subject to CEQA evaluation. The section states whether further analysis is required even if FEIR 37-03 is being relied upon as the CEQA compliance document or if the studies are only required if it is determined that an additional CEQA document is required.

Aesthetics

CEQA Checklist Questions

a) Would the FIS Facility have a substantial adverse effect on a scenic vista?

b) Would the FIS Facility substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?

c) Would the FIS Facility substantially degrade the existing visual character or quality of the site and its surroundings?

[6] A Negative Declaration is prepared for projects where there would not be a significant effect on the environment. A Mitigated Negative Declaration is prepared for a project when the a potentially significant effects on the environment has been identified but measures have been incorporated prior to releasing the Initial Study for public review would avoid the effects or mitigate the effects to a point where no significant effect on the environment would occur. An EIR is the most involved CEQA document and is prepared when significant effects that cannot be mitigated to a level of less than significant have been identified.

d) Would the FIS Facility create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?

Conceptual Assessment of the FIS Facility

At this time, only very conceptual building size and placement information is known about the FIS Facility (see Exhibits 1 through 3). Under all three Options, the buildings would be located in the area adjacent to the existing commercial terminal and airfield (i.e., international commercial passenger facilities would not be expanded to any other portion of the Airport). Based on preliminary information available, the placement and size of the buildings would serve to minimize aesthetic impacts because the overall visual character and visual quality of the site would not be substantially altered. Presuming the design of the buildings are consistent with the architectural character of the surrounding uses, the FIS Facility would become part of a visually cohesive terminal area. Neither the southern nor northern options offer any visual features that contribute to the aesthetic character of Airport.

The Airport is not located in the viewshed of a designated scenic vista or state scenic highway. Views of the FIS Facility would be limited to the area surrounding the existing Airport terminal and would have minimal effect outside the immediate area. This portion of the Airport site does not have trees or rock outcroppings that would be affected by the FIS Facility. Though not located along a State scenic highway, the terminal building is a notable local historic landmark to the residents of the City of Long Beach. Protection of the views of the terminal building was a point of concern during the preparation of FEIR 37-03. As part of the design considerations of the expanded terminal improvements, views of the historic terminal building were preserved on Donald Douglas Drive. With both the southern and northern options, views of the historic terminal building would not be impeded. (Historic resources is further discussed below under Cultural Resources.)

The FIS Facility would result in a greater amount of light emanating from the buildings; however, facilities would be located in the terminal area, which has been developed with similar uses. Design would be required to comply with applicable regulations associated with light and glare, as set forth in the zoning ordinance and FAA regulations. Lighting from the facilities would not extend beyond the terminal area.

Based on a review of the other CEQA Environmental Checklist questions, no significant impacts would be anticipated. However, before a definitive determination can be made, a review of the design plans would be required as part of the design phase.

Consistency Assessment with FEIR 37-03

FEIR 37-03 identified that the Terminal Area Improvements Project would (1) alter views of the project site during construction activities, potentially resulting in short-term aesthetic impacts and (2) result in light and glare impacts associated with security lighting and light emanating from the proposed improvements. However, impacts would be reduced to a level considered less than significant with implementation of the Mitigation Program identified in the FEIR.

The Mitigation Program in FEIR 37-03 included a Project Design Feature (PDF) and three Standard Conditions and Requirements associated with the preservation of the historic

character of the original terminal building. Additionally, four Mitigation Measures were adopted that dealt with lighting and building design requirements (City of Long Beach 2006b).

Assuming the size and scale of the buildings are found to be consistent with the assessment provided in FEIR 37-03 and that the Mitigation Program is implemented, the FEIR would adequately address the aesthetic impacts associated with the FIS Facility.

Recommended Further Evaluation

As part of the CEQA review process, the design of the FIS Facility would need to be evaluated for compatibility with the design of both the original terminal building and recent terminal area improvements to ensure the visual elements are compatible. If it is determined that FEIR 37-03 addresses the impacts of the FIS Facility, the design would have to incorporate the measures pertaining to aesthetics in the Mitigation Program adopted by the City Council. However, most of the measures were directed at a terminal expansion design concept that would be connected to the original historic terminal building, as well as construction associated with Parcel O located at the southwest portion of the Airport. These measures would not be applicable to the FIS Facility. There would be measures pertaining to lighting and amounts of reflective glass used in the building design that would apply. As discussed below under Cultural Resources, the design concepts would also be presented to the Cultural Heritage Commission.

Agricultural and Forest Resources

CEQA Checklist Questions

a) Would the FIS Facility convert Prime Farmland, Unique Farmland, or Farmland of Statewide importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?

b) Would the FIS Facility conflict with existing zoning for agricultural use, or a Williamson Act contract?

c) Would the FIS Facility conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220[g]), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104[g])?

d) Would the FIS Facility result in the loss of forest land or conversion of forest land to non-forest use?

e) Would the FIS Facility involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to nonagricultural use or conversion of forest land to non-forest use?

Conceptual Assessment of the FIS Facility

The FIS Facility would not result in any impacts to farmlands listed as “Prime”, “Unique”, or of “Statewide Importance” based on the 2014 Los Angeles County Important Farmland Map prepared by the Department of Conservation. Due to lack of resources, none of the Airport is

under a Williamson Act Contract. Additionally, there are no forestland or timberland resources in the vicinity of the Airport; therefore, there would be no direct or indirect (i.e., pressure for conversion) impacts on these resources.

Consistency Assessment with FEIR 37-03

Impacts to agricultural resources were focused out of FEIR 37-03 based on the 2002 Los Angeles County Important Farmland Map prepared by the Department of Conservation. The study area was generally designated as "Urban and Built-Up Land". Additionally, there would be no conflict with Williamson Act Contracts, and implementing the Terminal Area Improvements Project would not create pressure to convert farmland to other uses. At the time FEIR 37-03 was prepared, Forest Resources were not an issue requiring evaluation. The FIS Facility would be located in the terminal area and would not conflict with these findings.

Recommended Further Evaluation

No further evaluation of agricultural and forest resources is required.

Air Quality

CEQA Checklist Questions

a) Would the FIS Facility conflict with or obstruct implementation of the applicable air quality plan?

b) Would the FIS Facility violate any air quality standard or contribute substantially to an existing or projected air quality violation?

c) Would the FIS Facility result in a cumulatively considerable net increase of any criteria pollutant for which the region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?

d) Would the FIS Facility expose sensitive receptors to substantial pollutant concentrations?

e) Would the FIS Facility create objectionable odors affecting a substantial number of people?

Conceptual Assessment of the FIS Facility

The introduction of commercial international flights would not alter the type of aircraft or operational procedures at LGB. Therefore, commercial aircraft emissions would not be expected to change. The introduction of CBP facilities would have the potential to incrementally reduce regional air emissions as it relates to general aviation operations. Currently, general aviation and charter aircraft traveling to LGB from international destination are required to be cleared at an airport with CBP facilities.[7] As a result, for these aircraft an additional stop is required. The additional take-off and landing would result in incrementally greater emissions. Though this would not change the local emissions at LGB, the additional flights do contribute to the regional emissions. Counterbalancing this, there is the potential that some general aviation and charter aircraft will utilize LGB as a stopping point for CBP services

[7] The Airport Noise Ordinance defines general aviation as aviation activity other than operations by Air Carriers, Commuter Carriers, Industrial operators, Charter operators, and public aircraft.

though Long Beach is not the final destination. On a regional scale these additional take off and lands would not have an effect on regional air quality. It should be noted, based on the Market Analysis (Appendix A), expected increases in general aviation would be nominal and would not have a substantial increase on the localized air quality.[8]

There would be four areas that may contribute to incremental increases in air emissions: (1) construction activities; (2) utility usage associated with expanded facilities (i.e., heating and cooling requirements); (3) additional employees that would be serving the Airport (i.e., CBP employees); and (4) special handling of international trash from the flights. Due to the differences in the amount of new building space being provided in each Option, the construction emissions would vary depending on the Option selected. However, the amount of additional space by any of the Options is not substantial. Similarly, the additional air emissions associated with operational activities (items 2 through 4 listed above) are also expected to be nominal and below the thresholds of significance established by the South Coast Air Quality Management District (SCAQMD). Because the flights would not increase and the operational procedures would be the same, the introduction of the FIS Facility would not require any modifications to the Air Quality Management Plan for the South Coast Air Basin, nor would it result in the creation of objectionable odors. Though there are sensitive receptors living near the Airport, the incremental increase in the overall level of air emissions would not result in an increase of substantial pollutant concentrations.

Consistency Assessment with FEIR 37-03

FEIR 37-03 identified that the Terminal Area Improvements Project would result in a significant short-term construction-related air quality impact for nitrogen oxides (NOx) and volatile organic compounds (VOC). The Mitigation Program in FEIR 37-03 would reduce the impact; however, the impact would remain significant even after implementation of the Mitigation Program. If the FIS Facility is evaluated as a standalone project, the construction impacts would reasonably be less than significant because of the small scale of the facility.

Provided an Option is selected that can be accommodated within the size parameters of the facilities evaluated in FEIR 37-03, the air quality evaluation prepared for the FEIR would reasonably address the impacts associated with the FIS Facility. As noted above, the introduction of international flights would not alter the type of aircraft or operational procedures at LGB; therefore, the flight characteristics would be consistent with the existing conditions and the assumptions of the FEIR. In terms of an incremental increase in air emissions associated with utility usage, these impacts would have been accounted for in the previous air quality study because the analysis was based on the size of the facilities. Similarly, construction emissions would have been included in the overall impacts associated with construction of the terminal improvements.

Recommended Further Evaluation

If it is determined that the FIS Facility is within the parameters of the improvements addressed in FEIR 37-03, the design would have to incorporate the applicable measures pertaining to air

[8] The Market Analysis cites the most recent addition of CBP clearance procedures for general aviation operations within the Southern California market was the opening of the FIS facility at Van Nuys Airport (VNY) on May 23, 2015, which has increased general aviation flight activity by approximately 33 flights per month or roughly 1 flight per day.

quality, as listed in the Mitigation Program adopted by the City Council. Several of these provisions pertain to design requirements (e.g., lighting requirements, buildings that are certified by the Leadership in Energy and Environmental Design [LEED]). Additionally, Standard Conditions to reduce construction emissions would be applicable.

If the FIS Facility is beyond the parameters of the provisions of FEIR 37-03, an air quality analysis would need to be prepared. However, because the magnitude of the improvements is limited, rather than a full standalone technical report, the evaluation could be directly incorporated into the CEQA document with just the modeling results included in the appendices. Impacts would be expected to be below SCAQMD significance thresholds.

Biological Resources

CEQA Checklist Questions

a) Would the FIS Facility have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?

b) Would the FIS Facility have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?

c) Would the FIS Facility have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?

d) Would the FIS Facility interfere substantially 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?

e) Would the FIS Facility conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinances?

f) Would the FIS Facility conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?

Conceptual Assessment of the FIS Facility

All options for the FIS Facility are located on portions of the Airport that are paved. They do not support sensitive habitat or impact any sensitive species. No impacts are anticipated.

Consistency Assessment with FEIR 37-03

Impacts to biological resources were focused out of FEIR 37-03 because the portion of the Airport evaluated for improvements was developed/paved to support airport-associated activities. The improvements would not have any direct impact on biological resources because it would not result in the removal of any sensitive habitat or impact any sensitive species. The terminal area improvements would not change the type of operations or operational

procedures at the Airport; therefore, the project addressed in FEIR 37-03 would not result in substantial interference with the movement of wildlife or migration of birds.

Recommended Further Evaluation

No further analysis would be required.

Cultural Resources

CEQA Checklist Questions

a) Would the FIS Facility cause a substantial adverse change in the significance of a historical resource as defined in §15064.5?

b) Would the FIS Facility cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5?

c) Would the FIS Facility directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?

d) Would the FIS Facility disturb any human remains, including those interred outside of formal cemeteries?

Conceptual Assessment of the FIS Facility

None of the Options for the FIS Facility would directly impact the historic terminal building because there would be no direct connection to the historic building. Based on placement of the buildings, it would be unlikely that any of the FIS Facility Options would have an indirect impact because of the physical separation of the facility from the historic terminal. The degree of separation and intervening non-historic buildings and features would not substantially change the setting or context of the historic terminal building. Any improvements would need to abide by the May 7, 1990 Memorandum of Understanding (MOU) adopted by the Cultural Heritage Commission and the City Council pertaining to new construction adjacent to or attached to the Terminal Building that recommends the Secretary of the Interior's Rehabilitation Standards be followed. Impacts to historic terminal building would not occur with compliance with these standards. If the FIS Facility is recommended for further study, design plans would need to be evaluated by an architectural historian and the plans reviewed by the Cultural Heritage Commission.

Based on the disturbed nature of the site and the limited grading that would be expected for the FIS Facility, further evaluation of archaeological and paleontological resources is not anticipated.

Consistency Assessment with FEIR 37-03

FEIR 37-03 identified that the Terminal Area Improvements Project would result in alterations to the original terminal building, a designated historical landmark. This was identified as a significant impact; however, implementation of the Mitigation Program would reduce the potentially significant impacts to a level considered less than significant. It should be noted that, as part of the design, the building concept for the Terminal Area Improvements was modified to avoid direct impacts on the historic terminal building. As indicated above, it is

unlikely that any of the Options for the FIS Facility would have a direct or indirect impact on the historic terminal building. However, this would need to be verified by a qualified architectural historian at the time design plans are prepared.

The results of the record search indicate that there are no previously recorded archeological sites within a one-mile radius of the project site. The potential for archaeological resources or human remains to be present on the project site is very low because of the disturbed nature of the site. Similarly, based on the literature and records search conducted by the Vertebrate Paleontology Section of the Natural History Museum of Los Angeles County, there are no recorded vertebrate fossil localities within the Terminal Area Improvements Project's boundaries. The study area is situated on younger Quaternary alluvium, which would probably not yield fossils in the uppermost layers of soil.

Recommended Further Evaluation

Regardless of the whether the FIS Facility relies on FEIR 37-03 as the appropriate CEQA documentation or if additional CEQA documentation is prepared, design plans would need to be evaluated by an architectural historian and the plans reviewed by the Cultural Heritage Commission.

If FEIR 37-03 is relied on as the appropriate CEQA documentation, the Mitigation Program would apply. However, it should be noted that a number of the mitigation measures were identified because the analysis in the FEIR assumed a direct connection of the Terminal Area Improvements with the historic terminal building. Since the FIS Facility would not have this direct connection, some of the measures would not be applicable (e.g., the measure pertaining to the replicating the original style of fenestration if window replacement for the historic terminal building is required).

Geology and Soils

CEQA Checklist Questions

a) Would the FIS Facility expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:

   i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.

   ii) Strong seismic ground shaking?

   iii) Seismic-related ground failure, including liquefaction?

   iv) Landslides?

b) Would the FIS Facility result in substantial soil erosion or the loss of topsoil?

c) Would the FIS Facility be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the FIS Facility, and potentially result in on or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?

d) Would the FIS Facility be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?

e) Would the FIS Facility have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?

Conceptual Assessment of the FIS Facility

The area being evaluated for the FIS Facility is relatively flat covered by an impervious surface. Construction activities would expose the underlying soils; however, the overall area exposed would be limited and would be covered once the improvements were implemented. The FIS Facility site would not be prone to geotechnical constraints such as slope instability or landslides because the site is relatively flat. Though all of Southern California is exposed to seismic hazards, the Long Beach Seismic Safety Element of the General Plan indicates the site would have a low potential for liquefaction. Additionally, a geotechnical survey conducted by the City of Long Beach for the parking structure at the Airport concluded that the potential for the site to be significantly impacted by earthquakes, seismic ground shaking, liquefaction, landslides, substantial soil erosion, or unstable or expansive soil is limited (City of Long Beach 2006a). Implementation of Standard Conditions and Requirements, such as compliance with the 2016 California Building Code, would reduce the risks to a level considered less than significant. Septic tanks would not be required to serve the FIS Facility.

Consistency Assessment with FEIR 37-03

The evaluation of Geology and Soils was focused out of FEIR 37-03 for the reasons stated above. It was determined compliance with existing regulations would provide a sufficient safeguard to public safety and avoid or minimize environmental impacts.

Recommended Further Evaluation

No further evaluation of Geology and Soils should be required. The lack of constraints and compliance with existing building regulations would sufficiently avoid or minimize impacts on the environment.

Greenhouse Gas Emissions

CEQA Checklist Questions

a) Would the FIS Facility generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?

b) Would the FIS Facility conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?

Conceptual Assessment of the FIS Facility

For small projects, the SCAQMD has identified a screening value or bright line value for the evaluation of Greenhouse Gas (GHG) emissions. For industrial projects, the SCAQMD has adopted a threshold of 10,000 metric tons of carbon dioxide (CO_2) equivalent per year ($MTCO_2e/yr$). Since there is not a threshold or draft threshold specific to airport use, it is

anticipated that the industrial threshold would apply. Given the small scale of the FIS Facility, it is reasonable to assume that the GHG emissions would be below this bright line threshold and no impacts would be anticipated.

Consistency Assessment with FEIR 37-03

GHG emissions were not addressed in FEIR 37-03. It should be noted, however, that the courts have found that GHG emissions and global climate change is not "new information" since these effects have been generally known for quite some time. Therefore, reliance on a previous document that did not evaluate GHG emissions would not be an issue. GHG emissions would not be considered new information under Section 21166 of CEQA.

Recommended Further Evaluation

If FEIR 37-03 is the CEQA compliance document for the FIS Facility, no further evaluation is required. Should documentation be required, the GHG emissions associated with the FIS Facility should be quantified to demonstrate that the emissions associated with the improvements are below the bright line threshold established by the SCAQMD.

Hazards and Hazardous Materials

CEQA Checklist Questions

a) Would the FIS Facility create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?

b) Would the FIS Facility create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?

c) Would the FIS Facility emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?

d) Would the FIS Facility be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?

e) Would the FIS Facility result in a safety hazard for people residing or working in an area within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport?

f) Would the FIS Facility result in a safety hazard for people residing or working in an area that is within the vicinity of a private airstrip?

g) Would the FIS Facility impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?

h) Would the FIS Facility expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?

Conceptual Assessment of the FIS Facility

Given the industrial nature of the Airport and the ongoing use and storage of hazardous materials at the site, there is the potential that sites considered for the FIS Facility may have been exposed to past hazardous materials. To the extent that the FIS Facility would disturb the soil, there could be a potential limited risk during construction. However, this is a relatively low risk given that both the northern and southern locations are completely impervious and have been covered for well over a decade.

The southern options would integrate the south Security Check Point into the overall design of the FIS Facility. This structure was constructed as part of the Terminal Area Improvements and, based on when the southern security checkpoint was constructed, lead based paint or asbestos-containing materials would not have been used.

Standard construction practices would sufficiently address the handling of hazardous materials required for construction. Permits and licenses from health and regulatory agencies to operate and properly manifest all hazardous or California regulated materials are standard conditions for contractors transporting or handling hazardous materials and/or wastes.

The FIS Facility would not result in a significant hazard from the transport of hazardous materials. Materials used for construction that are classified as "hazardous" would be handled consistent with federal, State, and LGB practices regarding the handling of hazardous materials. The FIS Facility would not alter the Airport's fueling or other maintenance or operational procedures.

The FIS Facility would not change the number of flights, the flight patterns, or the operational procedures at the Airport in a manner that would result in increased safety hazards on site or off site. Flight operations would be under the purview of the FAA and would be required to abide by applicable safety regulations. The FIS Facility would be required to comply with the Department of Homeland Security/CBP requirements. Transportation Security Administration (TSA) safety screening would be applied to all outgoing international flights.

The FIS Facility would not alter or interfere with an adopted emergency response plan or emergency evacuation plan. Access to the Airport is off Lakewood Boulevard, which is not designated as an evacuation route. The Airport is not within ¼ mile of any existing schools; therefore, there would be no risk associated with emitting hazardous emissions or handling hazardous or acutely hazardous materials, substances, or waste near a school.

The Airport site is not located in an area subject to wildland fires. The area surrounding the Airport is urbanized and the conditions for wildland fires do not exist in close proximity.

Based on overall site conditions, existing regulations, and nature of the FIS Facility, no safety impacts or constraints associated with hazardous materials are anticipated.

Consistency Assessment with FEIR 37-03

FEIR 37-03 identified potential risks associated with modification of the historic terminal building, predominantly from lead based paint and asbestos. These impacts would not be applicable to the FIS Facility because no demolition or modification to older buildings would be necessary.

FEIR 37-03 also identified risks associated with aerially deposited lead from Interstate (I) 405 and possible trace amounts of dichloro-diphenyl-trichloroethane (DDT) being released into the environment during soil removal and disturbance on Parcel O. This impact would not be applicable to the FIS Facility, which would not utilize Parcel O. As indicated above, sites being considered for the FIS Facility are completely paved over and are not in close proximity to I-405 or grassy infield areas.

The FEIR also evaluated potential risks associated with the use of hazardous materials during construction. Implementation of standard regulations and conditions controlling these substances would reduce the risk to a level considered less than significant. These standard regulations and conditions include the applicable State and federal regulations on the handling and storage of these materials and the Storm Water Pollution Prevention Plan (SWPPP) for the Airport's existing Industrial Permit and for future Construction Activity Permits. This evaluation and associated conditions would be applicable to the FIS Facility and no further impacts would be anticipated.

The evaluation of impacts associated with transport of hazardous materials, releases in proximity to schools, and wildland fires were focused out of FEIR 37-03 for the reasons cited above.

Recommended Further Evaluation

If further evaluation of the FIS Facility is recommended, an updated search of federal, State, and local databases is recommended to clearly identify any outstanding hazardous materials constraints in the terminal area vicinity. Based on the results of the database search, additional actions such as coring for soil samples may be recommended; however, this would likely not be done until final design.

If FEIR 37-03 is relied upon as the CEQA compliance document, the Mitigation Program would apply. As indicated above, some of the measures would not be applicable because no modifications to the historic terminal building would be required. However, the Mitigation Program would require the FIS Facility to be constructed as a LEED-certified building. No other outstanding issues have been identified.

Hydrology and Water Quality

CEQA Checklist Questions

a) Would the FIS Facility violate any water quality standards or waste discharge requirements?

b) Would the FIS Facility substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?

c) Would the FIS Facility substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?

d) Would the FIS Facility substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?

e) Would the FIS Facility create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?

f) Would the FIS Facility otherwise substantially degrade water quality?

g) Would the FIS Facility place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?

h) Would the FIS Facility place within a 100-year flood hazard area structures which would impede or redirect flood flows?

i) Would the FIS Facility expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?

Conceptual Assessment of the FIS Facility

For all Options, the area being evaluated for the FIS Facility is currently paved. As a result, the facility would not result in an increase in impervious soil or result in increased runoff. This facility would not alter the existing drainage pattern of the site or affect the quality or quantity of the groundwater table.

The FIS Facility would be required to comply with the Municipal Storm Water permit issued to the City of Long Beach, as well as the City-developed Long Beach Storm Water Management Program.

The FIS Facility would not be located within a 100-year flood hazard area, nor would it alter the flood zone. Therefore, it would not place housing or any structures that would impede or redirect flood flows within a 100-year flood hazard area, as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map.

Consistency Assessment with FEIR 37-03

For the reasons stated above, Hydrology and Water Quality was focused out of FEIR 37-03.

Recommended Further Evaluation

No further evaluation is required. If the FIS Facility is recommended for further evaluation, the design would be required to comply with the Municipal Storm Water permit and Long Beach Storm Water Management Program.

Land Use and Planning

CEQA Checklist Questions

a) Would the FIS Facility physically divide an established community?

b) Would the FIS Facility conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?

c) Would the FIS Facility conflict with any applicable habitat conservation plan or natural community conservation plan?

Conceptual Assessment of the FIS Facility

The FIS Facility would be limited to improvements on the Airport property and would not be expected to have direct or indirect impacts on the surrounding land uses. It would not physically divide an established community. The potential for indirect impact associated with noise is addressed below under Noise. The Airport is not located in a habitat conservation plan area.

The FIS Facility Options would require new construction at the Airport; however, substantial land use impacts are not anticipated. The improvements associated with the Proposed Project would be consistent with the City's General Plan Land Use Districts and Zoning Districts. The FIS Facility would not conflict with land use planning programs because it would not change the nature of the uses at the Airport. These land use policies do not specify the specific uses allowed in the terminal area. The FIS Facility Options are not designated on the Airport Layout Plan.[9] As discussed below, two of the options would displace existing uses; however, there are opportunities to replace the uses without significant land use impacts. If implemented, the FIS Facility would require a modification to the Airport Layout Plan. However, this action is not part of the CEQA or NEPA process.

Two of the Options would require modification to existing land uses at the Airport. Option 1 (North FIS Facility) would require the relocation of aircraft parking position 11 from its current location to serve the FIS Facility. Option 3 would integrate the South Security Checkpoint into the FIS Facility, which would require replacement. However, as shown in Exhibit 3, there is physical space available to construct a new security checkpoint without resulting in land use impacts on the Airport. Both the southern FIS options (Options 2 and 3) would use the area currently utilized as parking for airport service vehicles; however, this area is not specifically designated for this use. Relocation options are available at the Airport. .

Consistency Assessment with FEIR 37-03

FEIR 37-03 evaluated the impacts of 102,850 square feet of terminal area facilities. The impacts associated with this amount of development in the terminal area would be consistent with the potential impacts associated with the FIS Facility. As discussed above, the FIS Facility is not

[9] An Airport Layout Plan, which serves as a planning tool, typically shows both existing facilities and planned development for an airport.

expected to result in direct or indirect impacts on surrounding land uses. No new impacts are anticipated.

Recommended Further Evaluation

No further evaluation is required. If the FIS Facility is ultimately recommended for implementation, the Airport Layout Plan would need to be revised to show the changes to the Airport.

Mineral Resources

CEQA Checklist Questions

a) Would the FIS Facility result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?

b) Would the FIS Facility result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?

Conceptual Assessment of the FIS Facility

The California Division of Mines and Geology (CDMG) is the State agency with the responsibility to oversee the management of mineral resources in California. The CDMG considers a site to be significant in regard to mineral commodities if it can be mined commercially and there must be enough of the resource to be economically viable. There are no such resources on site.

Consistency Assessment with FEIR 37-03

Mineral Resources was focused out of FEIR 37-03 for the reason stated above.

Recommended Further Evaluation

No evaluation of this topical area is required.

Noise

CEQA Checklist Questions

a) Would the FIS Facility expose persons to or generate noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?

b) Would the FIS Facility expose persons to or generate excessive groundborne vibration or groundborne noise levels?

c) Would the FIS Facility cause a substantial permanent increase in ambient noise levels in the vicinity above levels existing without it?

d) Would the FIS Facility cause a substantial temporary or periodic increase in ambient noise levels in the vicinity above levels existing without it?

e) Would the FIS Facility expose people residing or working within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport to excessive noise levels?

f) Would the FIS Facility expose people residing or working in the vicinity of a private airstrip to excessive noise levels?

Conceptual Assessment of the FIS Facility

The City's Airport Noise Ordinance is the controlling mechanism for aircraft noise. The FIS Facility would not change the number of flights at the Airport. What would change is the destination of a portion of the flights. As shown in the Market Analysis prepared for this Feasibility Study (Appendix A), the international cities that would likely be served are Vancouver, Canada and multiple cities in Mexico and Central America. These international destinations would be substituted for domestic destinations because the cap of an average of 50 average daily commercial carrier flights would not be modified unless the overall noise levels associated with the commercial carrier flights is reduced to less than noise budget allocated for commercial carriers per the Airport Noise Ordinance. There is the potential that the international flights would travel greater distances than the domestic flights they are replacing. In these instances, it is reasonably assumed the aircraft would have to carry additional fuel and luggage weight could be greater. As a heavier aircraft, the noise characteristics of the international flights may be slightly greater than if the same type of aircraft travels to a closer locale. It is speculative as to whether this incremental noise increase would be sufficient to influence the Community Noise Equivalent Level (CNEL) contours. However, the City's Airport Noise Ordinance would address this issue because if the CNEL contours were to increase beyond what is allowed in the Airport Noise Ordinance, then the total number of flights would be reduced accordingly. Similarly, if the FIS Facility is available at LGB there could be an incremental increase in general aviation and charter aircraft utilizing the Airport. Currently, aircraft with international origins are required to stop at an airfield with CBP facilities, such as Brown Field in San Diego County, before proceeding to their ultimate destination. As previously indicated, based on the Market Analysis, increases in general aviation activity is projected to be minimal. However, if the increase in general aviation and charter activity were enough to result substantial noise increases that exceeds the noise budget for their respective categories, the provisions of the Airport Noise Ordinance apply and the corrective actions would be implemented. Section 16.43.060A of the Airport Noise Ordinance specifically pertains to general aviation compliance with the noise budgets and Section 16.43.060C pertains to charter operations. The operation of the FIS Facility would not increase the number of sensitive receptors exposed to noise levels in excess of State or federal standards. Therefore, the operation of the FIS Facility would not result in any long-term noise impacts.

During construction of the FIS Facility there would be construction noise. The closest sensitive receptor to the FIS Facility locations would be the homes west of Clark Avenue. These homes are more than 3,500 feet from either the northern or southern locations. As a result, the construction noise levels would be less than significant. Once constructed, the noise levels associated with use of the FIS Facility would not be substantially different from the existing conditions in the terminal area.

Consistency Assessment with FEIR 37-03

The analysis presented in FEIR 37-03 is consistent with the analysis presented above. FEIR 37-03 did not identify any significant noise impacts associated with 102,850 square feet of terminal area facilities. Similarly, the construction noise impacts associated with improvements in the terminal area were quantified and found to be less than significant. The impacts associated the FIS Facility would be consistent with the findings of FEIR 37-03.

Recommended Further Evaluation

No further noise analysis would be required because the FIS Facility would not require or result in any modifications to the City's Airport Noise Ordinance, which is the controlling mechanism for aircraft noise.

Population and Housing

a) Would the FIS Facility induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?

b) Would the FIS Facility displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?

c) Would the FIS Facility displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?

Conceptual Assessment of the FIS Facility

The FIS Facility would not result in substantial growth-inducing impacts or result in changes in population projections for the City of Long Beach or the vicinity of the Airport. The FIS Facility would not result in increased flight levels or displace existing housing. Therefore, there would be no need for construction of replacement housing. Additionally, the project would not change the noise budget for LGB resulting in potential displacement of housing to achieve noise/land use compatibility. There are no indications that FIS Facility would have any effect on the "grandfather" status of LGB as it pertains to ANCA.[10] The FIS Facility would result in an incremental increase of employees at the Airport because CBP staff would serve the facility. However, the overall number of employees would be nominal, especially when considered in light of the metropolitan setting. This small increase in employees would not result in the demand for additional housing beyond the current and planned housing stock, nor would it result in a substantial change in the population of the region.

Consistency Assessment with FEIR 37-03

Population and Housing was focused out of FEIR 37-03 for the reason stated above.

[10] As part of process for FEIR 37-03, the City coordinated with FAA as it pertains to noise and flight restrictions. Mr. James W. Whitlow, Deputy Chief Counsel for the FAA, confirmed in a letter dated April 30, 2003 to Mr. Chris Kunze, the Airport Manager, that FAA acknowledges the "grandfather" status of LGB. This was reconfirmed in a letter from Ms. Patricia A. McNall, Deputy Chief Counsel for the FAA, to Robert C. Land, Senior Vice President JetBlue Airways, dated May 27, 2015.

Recommended Further Evaluation

No further evaluation of Population and Housing would be required for the FIS Facility.

Public Services

CEQA Checklist Questions

a) Would the FIS Facility result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:

   Fire protection?

   Police protection?

   Schools?

   Parks?

   Other public facilities?

Conceptual Assessment of the FIS Facility

The FIS Facility would result in an incremental increase in the square footage of terminal improvements. The public services potentially affected would be fire and police protection. However, the incremental increase in the building square footage would not result in the need for new or physically altered government facilities, the construction of which could cause significant environmental impacts. The Airport has dedicated services located at the Airport that would provide the necessary response. The FIS Facility would result in the need for CBP staff to be at the Airport to serve international flights. The size of the FIS Facility addresses this need. No environmental impacts beyond the construction of these facilities would be expected.

As shown in Exhibits 1 through 3, all the design options are located either to the north or the south of the terminal area. Therefore, there would be minimal interference due to construction activities. Additionally, during construction, the Airport's construction safety plan, titled *Safety and Security Requirements During Construction*, defines standards and procedures for meeting Federal Aviation Regulations requirements (as stated in the *Code of Federal Regulations* [CFR], Title 14, Part 139) and local rules and regulations governing operational safety on airports during construction. With implementation of these provisions, there would not be substantial impacts on emergency responders due to construction activities.

No impact on parks, schools, or library services would result from the FIS Facilities because it would not generate new population that would create the need for these services.

Consistency Assessment with FEIR 37-03

The purpose of the proposed terminal area improvements evaluated in FEIR 37-03 was to implement facilities improvements to better serve the passengers who currently use the Airport. Since staffing levels are generally based on the number of passengers and flights at the

Airport, based on input from the fire and police departments, the new facilities would not result in a substantial increase in demand for fire or police service at Long Beach Airport. The FIS Facility would be consistent with the nature of the improvements evaluated in FEIR 37-03. The Standard Conditions and Regulations outlined in the Mitigation Program incorporated requirements that would reduce potential conflict during construction. These requirements would be applicable to the FIS Facilities.

Recommended Further Evaluation

Once concept designs are available, coordination with the fire and police departments should be conducted to verify that the design meets the applicable requirements. However, based on the threshold of whether new or physically altered governmental facilities could cause significant environmental impacts, it is anticipated that there would be either no impacts or less than significant impacts on public services.

Recreation

CEQA Checklist Questions

a) Would the FIS Facility increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?

b) Does the FIS Facility include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?

Conceptual Assessment of the FIS Facility

The FIS Facility would not generate any increase in population or provide development that would result in increased usage of existing neighborhood and regional parks. There would not be any physical deterioration to existing recreational facilities due to the FIS Facility.

Consistency Assessment with FEIR 37-03

Recreation was focused out of FEIR 37-03 for the reason stated above.

Recommended Further Evaluation

No further evaluation of recreation would be required for the FIS Facility.

Transportation/Traffic

CEQA Checklist Questions

a) Would the FIS Facility conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?

b) Would the FIS Facility conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways?

c) Would the FIS Facility result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?

d) Would the FIS Facility substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?

e) Would the FIS Facility result in inadequate emergency access?

f) Would the FIS Facility conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities?

Conceptual Assessment of the FIS Facility

As discussed above, the City's Airport Noise Ordinance controls the number of commercial carrier flights that are allocated to the airlines. If the FIS Facility is implemented, international flights would be substituted for domestic flights because the cap of an average of 50 average daily commercial carrier flights would not be modified. As a result, the number of trips associated with the commercial carriers would be the same with or without the FIS Facility. There would be an incremental increase in vehicle trips associated with the CBP staff and possibly an increase in TSA staff serving the Airport. However, the overall number of trips would be limited and would not be expected to substantially alter the overall trip generation rate used for the Airport. The potential impact on the surrounding circulation network would be dependent on the time of the international flights because that would influence if the additional employee trips would occur at peak hour.

The FIS Facility would not alter the alternative modes of transportation currently serving the Airport (e.g., shuttles and transit). There would be no element of the FIS Facility that would result in hazardous design features or incompatible use. The public circulation system at the Airport would not be altered and internal (airfield side) circulation would be regulated by applicable FAA and Airport requirements.

Consistency Assessment with FEIR 37-03

The additional square footage of terminal area improvements associated with the FIS Facility would be consistent with the facility assumptions in FEIR 37-03. The traffic generation factor used for the traffic assessment in the FEIR evaluated passenger trips and factored in employee trips and delivery trips serving the Airport. The FEIR considered the trips associated with the commercial carriers, as well as an assumption of 25 commuter flights, which is minimum levels provided by the Airport Noise Compatibility Ordinance. This overstates the historical and current traffic generated by the Airport because the full 25 commuter flights have never been allocated due to lack of demand.

The construction traffic associated with the FIS Facility would either be comparable to or less than the levels evaluated in FEIR 37-03 because the FEIR evaluated the traffic generated for the construction of the full 102,850 square feet of terminal improvements and the estimated 4,000

space parking garage. This equated to approximately 50 peak hour trips during the most active construction period. Given the limited scale of the FIS Facility, this number of trips would overstate the construction related impacts.

Recommended Further Evaluation

No further analysis pertaining to traffic would be required for the FIS Facility.

Utilities and Service Systems

CEQA Checklist Questions

a) Would the FIS Facility exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?

b) Would the FIS Facility require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?

c) Would the FIS Facility require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?

d) Would the FIS Facility have sufficient water supplies available from existing entitlements and resources, or are new or expanded entitlements needed?

e) Would the FIS Facility result in a determination by the wastewater treatment provider which serves or may serve it that it has adequate capacity to serve the FIS Facility's projected demand in addition to the provider's existing commitments?

f) Would the FIS Facility be served by a landfill with sufficient permitted capacity to accommodate its solid waste disposal needs?

g) Would the FIS Facility comply with federal, state, and local statutes and regulations related to solid waste?

Conceptual Assessment of the FIS Facility

The FIS Facility would not create substantial demand on water, wastewater, or solid waste disposal. Water and wastewater service is provided by the Long Beach Water Department. Though there would be an incremental increase in water demand because there would be additional facilities, including new restroom facilities, at the Airport. However, the total number of passengers served would not increase because that is a factor of the number of flights, which would not change due to the FIS Facility. The FIS Facility may result in slightly increased peak flow rates, though the overall increase would not be substantial enough to require expansion of existing facilities. The FIS Facility would not require a water supply assessment pursuant to Senate Bill (SB) 610 because the size of the improvements is well below the thresholds used in SB 610 or the State Water Code.

The total amount of solid waste generated at the FIS Facility would be comparable to the quantity associated with domestic flights. However, international generated garbage may be handled differently than garbage generated on domestic flights, if it is defined as "regulated garbage". Not all garbage generated onboard is defined as "regulated garbage". Regulated

garbage generally includes food scraps, table refuse, galley refuse, food wrappers or packaging materials, and other waste material from stores and food preparation areas. However, pursuant to 7 CFR 330.400 and 9 CFR 94.5 there are exemptions for aircraft provided certain conditions are met. These requirements pertain to the air carriers conducting the international flights rather than the FIS Facility. The air carriers would be responsible for entering into Agricultural Compliance Agreement (ACA) for handling international garbage.

Consistency Assessment with FEIR 37-03

The discussion of utilities was focused out of FEIR 37-03 because it was determined that the incremental increased demand on water, wastewater, and solid waste would not result in any impacts on services or exceed capacity of the existing systems. The demand associated with the 102,850 square feet of terminal area facilities would address the incremental increased demand associated with the FIS Facility. The one element of the FIS Facility that is unique as it pertains to utilities, is the solid waste disposal from international flights. As indicated above, the air carriers are responsible for entering into an Agricultural Compliance Agreement for handling international garbage.

Recommended Further Evaluation

From a CEQA perspective, no further evaluation of utilities would be required for the FIS Facility.

CEQA Conclusion

The preliminary evaluation of the FIS Facility does not identify any significant impacts that were not previously addressed in FEIR 37-03. This analysis has been conducted without the benefit of detailed concept plans. Based on the preliminary assessment, it would appear the FIS Facility would be consistent with the Terminal Area Improvements Project evaluated in FEIR 37-03. The scale of the facility appears to be within the parameters of the facilities addressed in the FEIR. As previously indicated, FEIR 37-03 and approving resolutions identified the interior square footage for the buildings (i.e., net square feet), whereas this Feasibility Study identifies outside footprint of the building (i.e., gross square feet). As such, the square footage of the FIS Facility being assessed in this study and the square footage of the facilities evaluated in FEIR 37-03 are presented slightly differently. The more detailed conceptual plan would be required prior to making a complete CEQA determination.

Once conceptual plans (with net square footage) are available, it is possible that size of the FIS Facility would be consistent with the April 2007 City Council direction pertaining to the size of the terminal area improvements and number of aircraft parking positions (i.e., 12 parking positions). However, as indicated above, the FEIR fully addresses the impacts associated with 102,850 square feet terminal area improvements and 14 parking positions. Therefore, should the City Council elect to do so, if it is determined that FIS Facility fits within the parameters of the 102,850 square feet addressed in the FEIR, it could be implemented without further documentation because the type of facilities proposed for the FIS Facility are generally consistent with the project description in FEIR 37-03.

CEQA is required to address environmental impacts of proposed actions. The environmental impacts associated with the construction of the FIS Facility would not be substantially different

from the impacts associated with the construction of terminal facilities to accommodate domestic flights. Pursuant to Section 15162(a) of the State CEQA Guidelines, a subsequent EIR or Negative Declaration is only required when:

(1) Substantial changes are proposed in the project which will require major revisions of the previous EIR or negative declaration due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified significant effects;

(2) Substantial changes occur with respect to the circumstances under which the project is undertaken which will require major revisions of the previous EIR or Negative Declaration due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified significant effects; or

(3) New information of substantial importance, which was not known and could not have been known with the exercise of reasonable diligence at the time the previous EIR was certified as complete or the Negative Declaration was adopted, shows any of the following:

(A) The project will have one or more significant effects not discussed in the previous EIR or negative declaration;

(B) Significant effects previously examined will be substantially more severe than shown in the previous EIR;

(C) Mitigation measures or alternatives previously found not to be feasible would in fact be feasible, and would substantially reduce one or more significant effects of the project, but the project proponents decline to adopt the mitigation measure or alternative;

(D) Mitigation measures or alternatives which are considerably different from those analyzed in the previous EIR would substantially reduce one or more significant effects on the environment, but the project proponents decline to adopt the mitigation measure or alternative.

Notwithstanding the reliance on FEIR 37-03, the design of the FIS Facility would need to be reviewed by the Cultural Heritage Commission for compatibility with the historic terminal building. Additionally, FEIR 37-03 assumed the Terminal Area Improvements would be designed consistent with LEED requirements. Though no reduction in impacts was assumed based on LEED consistency, this provision was identified as a Project Design Feature and should be incorporated into the design of the FIS Facility.

Provided the FIS Facility can be accommodated within the square footage allocation addressed in FEIR 37-03 and no new significant impacts are identified, it would be reasonable to rely on the previous EIR as the CEQA documentation for the FIS Facility.

NEPA Compliance Requirements

NEPA compliance would be required for any federal actions or approvals. The FIS Facility may require federal approvals by both the CBP and FAA. All three options would require approval by CBP. CBP follows guidance provided by the Council on Environmental Quality's (CEQ's) for

the implementation of NEPA. A provision of the *Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act* allows for the processing of a Categorical exclusion for "actions which do not individually or cumulatively have a significant effect on the human environment. . ." (40 CFR 1508.4). Given the context of the FIS Facility (i.e., development a limited amount of additional new terminal area in a disturbed area of the Airport, which would not directly influence the number of allowed commercial carrier flights), it is reasonable to assume a Categorical Exclusion would be appropriate documentation pursuant to NEPA. Coordination with CBP on the type of NEPA documentation would be required as part of the project development process.

As indicated above, FAA approval would also be required for the FIS. For Option 1 (the northern location) FAA approval of the airfield would require modifications to the airfield due to the relocation of one aircraft parking position and the addition of a new aircraft parking position. Coordination with the FAA would be required to determine the type of environmental document that would be required. However, given the limited improvements/modifications to the airfield, a Categorical Exclusion would be anticipated. It should be noted that these improvements would also require a modified Airport Layout Plan, which is identified in FAA Order 1050.1E CHG 1 as an action where a Categorical Exclusion is frequently processed. If the FIS Facility would be funded with the use of a Passenger Facility Charge, FAA approval would also be required.

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APPENDIX G:
ENVIRONMENTAL CHECKLIST FORM

NOTE: The following is a sample form and may be tailored to satisfy individual agencies' needs and project circumstances. It may be used to meet the requirements for an initial study when the criteria set forth in CEQA Guidelines have been met. Substantial evidence of potential impacts that are not listed on this form must also be considered. The sample questions in this form are intended to encourage thoughtful assessment of impacts, and do not necessarily represent thresholds of significance.

1. Project title: _____
2. Lead agency name and address:
   _____
   _____
   _____
3. Contact person and phone number: _____
4. Project location: _____
5. Project sponsor's name and address:
   _____
   _____
   _____
6. General plan designation: _____ 7. Zoning: _____
8. Description of project: (Describe the whole action involved, including but not limited to later phases of the project, and any secondary, support, or off-site features necessary for its implementation. Attach additional sheets if necessary.)
   _____
   _____
   _____
   _____
9. Surrounding land uses and setting: Briefly describe the project's surroundings:
   _____
   _____
   _____
   _____
10. Other public agencies whose approval is required (e.g., permits, financing approval, or participation agreement.)
    _____
    _____
    _____
    _____

ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED:

The environmental factors checked below would be potentially affected by this project, involving at least one impact that is a "Potentially Significant Impact" as indicated by the checklist on the following pages.

☐ Aesthetics	☐ Agriculture and Forestry Resources	☐ Air Quality
☐ Biological Resources	☐ Cultural Resources	☐ Geology /Soils
☐ Greenhouse Gas Emissions	☐ Hazards & Hazardous Materials	☐ Hydrology / Water Quality
☐ Land Use / Planning	☐ Mineral Resources	☐ Noise
☐ Population / Housing	☐ Public Services	☐ Recreation
☐ Transportation/Traffic	☐ Utilities / Service Systems	☐ Mandatory Findings of Significance

DETERMINATION: (To be completed by the Lead Agency)

On the basis of this initial evaluation:

☐ I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.

☐ I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.

☐ I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

☐ I find that the proposed project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.

☐ I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

_____ _____
Signature Date

_____ _____
Signature Date

EVALUATION OF ENVIRONMENTAL IMPACTS:

1) A brief explanation is required for all answers except "No Impact" answers that are adequately supported by the information sources a lead agency cites in the parentheses following each question. A "No Impact" answer is adequately supported if the referenced information sources show that the impact simply does not apply to projects like the one involved (e.g., the project falls outside a fault rupture zone). A "No Impact" answer should be explained where it is based on project-specific factors as well as general standards (e.g., the project will not expose sensitive receptors to pollutants, based on a project-specific screening analysis).

2) All answers must take account of the whole action involved, including off-site as well as on-site, cumulative as well as project-level, indirect as well as direct, and construction as well as operational impacts.

3) Once the lead agency has determined that a particular physical impact may occur, then the checklist answers must indicate whether the impact is potentially significant, less than significant with mitigation, or less than significant. "Potentially Significant Impact" is appropriate if there is substantial evidence that an effect may be significant. If there are one or more "Potentially Significant Impact" entries when the determination is made, an EIR is required.

4) "Negative Declaration: Less Than Significant With Mitigation Incorporated" applies where the incorporation of mitigation measures has reduced an effect from "Potentially Significant Impact" to a "Less Than Significant Impact." The lead agency must describe the mitigation measures, and briefly explain how they reduce the effect to a less than significant level (mitigation measures from "Earlier Analyses," as described in (5) below, may be cross-referenced).

5) Earlier analyses may be used where, pursuant to the tiering, program EIR, or other CEQA process, an effect has been adequately analyzed in an earlier EIR or negative declaration. Section 15063(c)(3)(D). In this case, a brief discussion should identify the following:

   a) Earlier Analysis Used. Identify and state where they are available for review.

   b) Impacts Adequately Addressed. Identify which effects from the above checklist were within the scope of and adequately analyzed in an earlier document pursuant to applicable legal standards, and state whether such effects were addressed by mitigation measures based on the earlier analysis.

   c) Mitigation Measures. For effects that are "Less than Significant with Mitigation Measures Incorporated," describe the mitigation measures which were incorporated or refined from the earlier document and the extent to which they address site-specific conditions for the project.

6) Lead agencies are encouraged to incorporate into the checklist references to information sources for potential impacts (e.g., general plans, zoning ordinances). Reference to a previously prepared or outside document should, where appropriate, include a reference to the page or pages where the statement is substantiated.

7) Supporting Information Sources: A source list should be attached, and other sources used or individuals contacted should be cited in the discussion.

8) This is only a suggested form, and lead agencies are free to use different formats; however, lead agencies should normally address the questions from this checklist that are relevant to a project's environmental effects in whatever format is selected.

9) The explanation of each issue should identify:

a) the significance criteria or threshold, if any, used to evaluate each question; and

b) the mitigation measure identified, if any, to reduce the impact to less than significance

SAMPLE QUESTION

Issues:

	Potentially Significant Impact	**Less Than Significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
I. AESTHETICS. Would the project:				
a) Have a substantial adverse effect on a scenic vista?	☐	☐	☐	☐
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	☐	☐	☐	☐
c) Substantially degrade the existing visual character or quality of the site and its surroundings?	☐	☐	☐	☐
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	☐	☐	☐	☐
II. AGRICULTURE AND FORESTRY RESOURCES. In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Dept. of Conservation as an optional model to use in assessing impacts on agriculture and farmland. In determining whether impacts to forest resources, including timberland, are significant environmental effects, lead agencies may refer to information compiled by the California Department of Forestry and Fire Protection regarding the state's inventory of forest land, including the Forest and Range Assessment Project and the Forest Legacy Assessment project; and forest carbon measurement methodology provided in Forest Protocols adopted by the California Air Resources Board. Would the project:				

	Potentially Significant Impact	**Less Than Significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☐	☐	☐
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?	☐	☐	☐	☐
c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?	☐	☐	☐	☐
d) Result in the loss of forest land or conversion of forest land to non-forest use?	☐	☐	☐	☐
e) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use?	☐	☐	☐	☐
III. AIR QUALITY. Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. Would the project:				
a) Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☐	☐
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	☐	☐	☐	☐
c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?	☐	☐	☐	☐

	Potentially Significant Impact	**Less Than Significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
d) Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	☐	☐
e) Create objectionable odors affecting a substantial number of people?	☐	☐	☐	☐
<u>IV. BIOLOGICAL RESOURCES:</u> Would the project:				
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☐	☐	☐	☐
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or US Fish and Wildlife Service?	☐	☐	☐	☐
c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☐	☐	☐
d) Interfere substantially 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?	☐	☐	☐	☐
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☐	☐
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	☐	☐	☐	☐

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
V. CULTURAL RESOURCES. Would the project:				
a) Cause a substantial adverse change in the significance of a historical resource as defined in § 15064.5?	☐	☐	☐	☐
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to § 15064.5?	☐	☐	☐	☐
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☐	☐	☐
d) Disturb any human remains, including those interred outside of formal cemeteries?	☐	☐	☐	☐
VI. GEOLOGY AND SOILS. Would the project:				
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:	☐	☐	☐	☐
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.	☐	☐	☐	☐
ii) Strong seismic ground shaking?	☐	☐	☐	☐
iii) Seismic-related ground failure, including liquefaction?	☐	☐	☐	☐
iv) Landslides?	☐	☐	☐	☐
b) Result in substantial soil erosion or the loss of topsoil?	☐	☐	☐	☐
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?	☐	☐	☐	☐

	Potentially Significant Impact	**Less Than Significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?	☐	☐	☐	☐
e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?	☐	☐	☐	☐
VII. GREENHOUSE GAS EMISSIONS. Would the project:				
a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	☐	☐	☐	☐
b) Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?	☐	☐	☐	☐
VIII. HAZARDS AND HAZARDOUS MATERIALS. Would the project:				
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☐	☐	☐
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☐	☐	☐
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☐	☐	☐
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☐	☐	☐

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☐
f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☐
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	☐
h) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	☐	☐	☐	☐
IX. HYDROLOGY AND WATER QUALITY. Would the project:				
a) Violate any water quality standards or waste discharge requirements?	☐	☐	☐	☐
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?	☐	☐	☐	☐
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?	☐	☐	☐	☐

	Potentially Significant Impact	**Less Than Significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?	☐	☐	☐	☐
e) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	☐	☐	☐	☐
f) Otherwise substantially degrade water quality?	☐	☐	☐	☐
g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	☐	☐	☐	☐
h) Place within a 100-year flood hazard area structures which would impede or redirect flood flows?	☐	☐	☐	☐
i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?	☐	☐	☐	☐
j) Inundation by seiche, tsunami, or mudflow?	☐	☐	☐	☐
X. LAND USE AND PLANNING. Would the project:				
a) Physically divide an established community?	☐	☐	☐	☐
b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☐	☐

	Potentially Significant Impact	**Less Than Significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
c) Conflict with any applicable habitat conservation plan or natural community conservation plan?	☐	☐	☐	☐
XI. MINERAL RESOURCES. Would the project:				
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☐	☐	☐
b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?	☐	☐	☐	☐
XII. NOISE -- Would the project result in:				
a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☐	☐	☐	☐
b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?	☐	☐	☐	☐
c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☐	☐
d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☐	☐
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☐
f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☐

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
XIII. POPULATION AND HOUSING. Would the project:				
a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	☐	☐	☐	☐
b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☐
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☐
XIV. PUBLIC SERVICES.				
a) Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:	☐	☐	☐	☐
Fire protection?	☐	☐	☐	☐
Police protection?	☐	☐	☐	☐
Schools?	☐	☐	☐	☐
Parks?	☐	☐	☐	☐
Other public facilities?	☐	☐	☐	☐
XV. RECREATION.				
a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☐	☐

	Potentially Significant Impact	**Less Than Significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?	☐	☐	☐	☐
<u>XVI. TRANSPORTATION/TRAFFIC.</u> Would the project:				
a) Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?	☐	☐	☐	☐
b) Conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways?	☐	☐	☐	☐
c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?	☐	☐	☐	☐
d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☐	☐	☐
e) Result in inadequate emergency access?	☐	☐	☐	☐
f) Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities?	☐	☐	☐	☐

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
XVII. UTILITIES AND SERVICE SYSTEMS. Would the project:				
a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	☐	☐	☐	☐
b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☐
c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☐
d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?	☐	☐	☐	☐
e) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☐	☐	☐	☐
f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☐	☐	☐
g) Comply with federal, state, and local statutes and regulations related to solid waste?	☐	☐	☐	☐
XVIII. MANDATORY FINDINGS OF SIGNIFICANCE.				
a) Does the project have the potential to 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, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	☐	☐	☐	☐

	Potentially Significant Impact	**Less Than Significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?	☐	☐	☐	☐
c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☐	☐	☐

Note: Authority cited: Sections 21083 and 21083.05, Public Resources Code. Reference: Section 65088.4, Gov. Code; Sections 21080(c), 21080.1, 21080.3, 21083, 21083.05, 21083.3, 21093, 21094, 21095, and 21151, Public Resources Code; *Sundstrom v. County of Mendocino*,(1988) 202 Cal.App.3d 296; *Leonoff v. Monterey Board of Supervisors,* (1990) 222 Cal.App.3d 1337; *Eureka Citizens for Responsible Govt. v. City of Eureka* (2007) 147 Cal.App.4th 357; *Protect the Historic Amador Waterways v. Amador Water Agency* (2004) 116 Cal.App.4th at 1109; *San Franciscans Upholding the Downtown Plan v. City and County of San Francisco* (2002) 102 Cal.App.4th 656.

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Appendix C. The Economic Impact of Long Beach Airport (Federal Inspection Service Facility)

PLEASE NOTE: The information, analysis, assessments and opinions contained in this document are intended for general evaluation purposes only. This document is intended for use only by its specified client and is NOT intended for use, reliance or in making financial/investment decisions by outside parties.

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JACOBS

The Economic Impact of Long Beach Airport

Federal Inspection Service Facility

Feasibility Study
9/26/2016

This study provides estimates of the economic impact of Long Beach Airport and a proposed Federal Inspection Service Facility upon the City of Long Beach. Total output of Long Beach Airport is 45,000 jobs and an output valued in excess of $10.3 billion.

Prepared by LaCosta Consulting Group, Inc.

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Executive Summary

The Long Beach Airport (LGB) is an expansive asset of 1,166 acres established in 1923 and is located in the center of the City of Long Beach (City) supporting air services for residents and businesses. Adjacent to Interstate 405, LGB offers ease of access to both Los Angeles and Orange County. The businesses at LGB include flight operations, manufacturing facilities, business services and business parks. Flight operations consist of commercial, cargo, general, corporate and supporting aviation services as well as flight schools.

This Economic Impact Analysis (EIA) report was commissioned by the City as part of a Federal Inspection Service (FIS) Facility Feasibility Study at LGB. The EIA is produced to quantify the economic impact of LGB, aviation dependent activity associated with LGB and the additional impact of building and operating a Federal Inspection Service Facility at LGB. The EIA offers a quantitative method to estimate the financial and employment benefits of LGB to the region. Using the results of a 2016 tenant survey, business list analysis, interviews, LGB expenditures and forecast data analyzed with the IMPLAN[1] model's latest database this EIA identifies the economic impacts of LGB and the potential contribution of a FIS Facility.

The output of the analysis yields the following findings for LGB:

- The annual economic contribution of LGB and their tenants is approximately 45,000 jobs and $10.3 billion in output
- Direct business and government employment of approximately 9,000 individuals representing 6.4% of the employment in the City
- 28% of current employment in the tenant survey are residents of the City
- The annual economic contribution to the region of LGB's expenditures produces approximately 170 jobs and almost $50 million of annual output in the region
- $130 million in additional economic output is generated by LGB's capital investment plan over the five year period 2015-2019 generating 771 jobs
- Employment by LGB, airlines, government and businesses supporting the operation of the international flights and the FIS Facility would have a total economic impact of more than 350 employees and over $36.4 million of additional output in the region annually
- The potential additional economic expenditures from the international travelers over the first five years ranges from $57 million to $104 million
- Business and tourist travel impacts are estimated to result in an increase of approximately 1,400 jobs with a total economic value of $185.6 million by year five following the opening of a potential FIS Facility
- The construction of the FIS facility would generate financial output valued between $31 million and $38 million depending on the option chosen generating between 203 and 253 jobs
- The tax impacts from existing operations by LGB and their tenants are approximately $360 million in state and local revenues and $790 million in federal tax revenues
- LGB is a key determinate for businesses' weighing a decision to consolidate facilities or relocate to the City, and international utility would add to that amenity
- LGB revenue base to expand by $4.3 million annum by year four after opening the FIS Facility

[1] IMPLAN Pro4 Economic Modeling Software, IMPLAN MIG, Huntersville, NC

Introduction

The Economic Impact Analysis using the IMPLAN modeling software provides a quantitative method to estimate the benefits of economic activity and investment projects in a region. That business activity being analyzed is expressed in terms of the level of investment with the model then estimating the jobs, earnings and the value of output generated by that activity. The EIA considered here focuses on the contribution made by LGB and adjacent air transport business activities to the regional economy. The regional economy, for the purposes of this study, is defined more broadly to include the counties of Los Angeles and Orange. LGB is the 80th largest airport in the U.S. based on enplaned passengers. This report has two specific objectives: estimate the economic activity generated by LGB and estimate the additional impact of three potential citing options produced by Jacobs for the construction and operations of a FIS Facility at LGB.

A self-supporting enterprise of the City, LGB does not receive financial support through the City's general fund. LGB generates revenues through a variety of tenant, passenger and aviation activity user fees and charges. Total revenue for the last full calendar year (2015) was $34.1 million while serving 2.4 million total passengers. Approximately 33% of these revenues are used to purchase services from the City including police, fire, public works, fleet services, city attorney and other services. The level of operations at LGB is dependent on noise budgets as specified in Long Beach Municipal Code Chapter 16.43 *Long Beach Airport Noise Compatibility Ordinance* (Noise Ordinance). The Noise Ordinance specifies five airport user categories. Noise budgets for each of these categories are reviewed annually. As aircraft are constrained by this budget, this report measures the economic activity at a moment in time and does not attempt to measure activity in unconstrained conditions outside of the Noise Ordinance.

As with all large infrastructure enterprises managing capital improvement programs (CIP) that support projects, it is essential to respond to increasing demand, fulfilling federal mandates and passenger expectations at LGB. In 2010 LGB funded a major CIP for the construction of the award winning passenger concourse, an on-site parking structure, as well as the modernization and rehabilitation of its iconic and historic streamline modern terminal. As the facility supporting the passenger activity has been addressed the bulk of the CIP over the next several years will be allocated to airfield related improvements, customer experience and rental car programs projected for fiscal years 2017 - 2019. The projection is for these expenditures to exceed $42 million over the next three years.

LGB has a number of unique characteristics including the size and makeup of the businesses on and around the property. The business composition includes not just commercial, cargo and general aviation but manufacturing, business and passenger services, multiple business parks, warehousing and hospitality. This diversity creates significant economic activity directly and indirectly throughout Long Beach stimulating economic activity throughout the region.

There are four primary categories that make up the employment base and economic output at LGB.

- **On-Airport Activity** – This category includes airport tenants, such as airlines, rental car agencies, general aviation, fix based operators, flight schools, concessionaires, support businesses and governmental agencies. Governmental agencies include the Transportation Security Administration (TSA), police, fire and rescue, air traffic controllers, other Federal Aviation Administration (FAA) lines of business, as well as various other state and federal agencies.
- **Capital Improvement Programs** – Capital improvements, such as runway rehabilitation or terminal improvements are ongoing activities. In addition, businesses and other agencies

undertake capital improvement projects. These projects employ people in jobs such as construction, architecture, engineering, and consulting.

- **Commercial Service Visitors** – This category includes estimated non-local passengers (business and leisure visitors) arriving via commercial airlines. The direct output of this group includes spending on hotel, parking fees, food and beverage, transportation, convention, retail and entertainment expenses during their trip. This spending supports jobs primarily in the hospitality industry.
- **Tenants –** LGB manages significant property and administers the collection of rents and fees to a diverse set of tenants.

The IMPLAN economic model provides estimates of the direct, indirect and induced impacts for each of these categories. The definitions of these categories are:

- **Direct impacts** result from expenditures to suppliers, employees associated with LGB and the businesses at LGB, and transportation related businesses in the area
- **Indirect impacts** result from the suppliers purchasing goods and services and hiring workers to meet demand
- **Induced impacts** results from the employees of LGB purchasing goods and services at a household level.

LGB is a large geographical area (Figure 1) north of Interstate 405 and south of Carson Street. The methodology used to capture this economic activity included surveys, phone banks, business lists, government data and the IMPLAN model which is specifically built for calculating economic impacts. The full methodology used in this analysis is discussed in more detail in the following section.

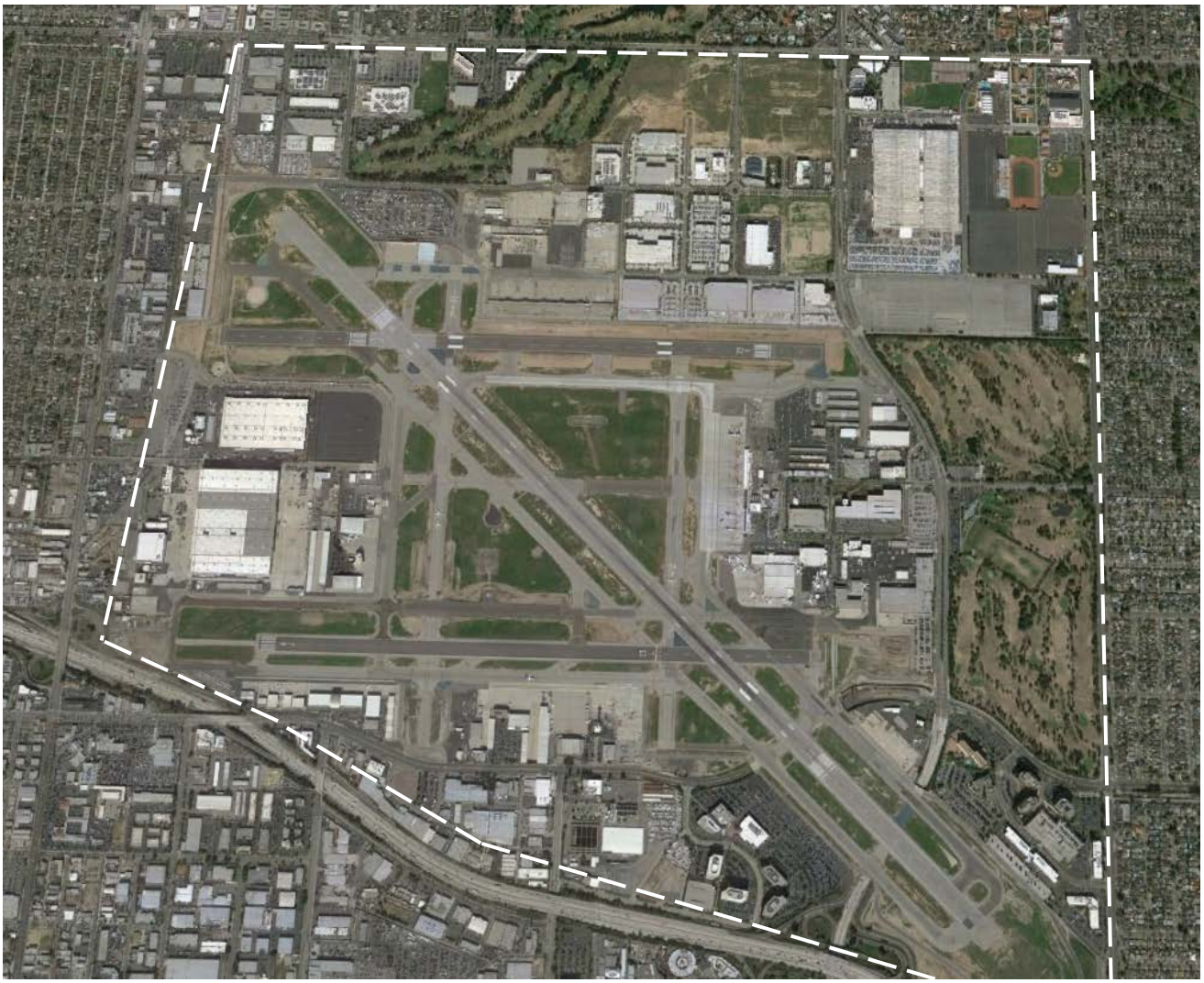

Figure 1 Aerial View of LGB, Google Earth February 2014

Approach and Methodology of Economic Impact Study

The EIA provides a structured approach that is built on a system that measures the economic implications at a particular point in time for a particular region. The economic variables of interest such as the value of output generated, the "value-added" created, and the employment impacts of a particular project are determined for a given economic project such as establishing a FIS Facility at LGB. Economic impact analysis provides a quantitative method to estimate the economic benefits that a particular industry or project brings to a city's economy and surrounding communities where the specific industry is located. In this EIA the industry is the transportation systems that make up LGB and an associate project, the feasibility study of constructing and operating a FIS Facility. The FIS Facility would house international customs and immigration inspection allowing for international flights to operate at LGB.

Economic impact studies use financial and economic data to generate estimates of output, employment, and labor income and tax revenues associated with changes in the level of economic activity resulting

from the project or industry being analyzed. This EIA provides a robust analysis to inform the decision making process on the matter of constructing a FIS Facility at LGB.

Methodology & Data

Conducting an economic impact analysis requires an accurate assessment of the financial and employment data associated with the activity considered. The EIA focuses on the contribution made by LGB, commercial, manufacturing, general aviation and support services to the regional economy. For the purposes of this EIA the regional economy is defined by the counties of Los Angeles and Orange. The justification of limiting the analysis to these two counties is it's consistency with a past study [2] that estimated that 95% of the activity at LGB is captured within these two counties. This analysis focuses on the impact of business and government expenditures that are directly related to airport dependent activities. Once those enterprises are identified a survey was developed to collect employment, wage, expenditures, description of business and qualitative elements to add insights to the analysis.

The EIA required the identification of relevant data from businesses and government sectors at and around the airport, relying on multiple sources for data and inputs to identify the target population of enterprises associated in airport-dependent economic activity. The primary sources are: LGB tenant list; City business licenses in the area of LGB (see Figure 1); a commercially available business list InfoUSA captured from the 2011 study; interviews with LGB, regional developers and community business partners. Considering information from all sources facilitated the identification of the target data for impact analysis.

LGB's most relevant and current source of data for creating a survey distribution list is the 2013 LGB tenant list. This was the core source used to distribute an online survey to all tenants. The survey list used identifies 162 businesses and government agencies that are operating or leasing space at LGB. This list also included government agencies at LGB, an input missing from the last impact study, making for a more comprehensive analysis in identifying the enterprise systems actively engaged in airport-dependent activities. LGB is also a landlord for much of the property that surrounds LGB itself. However, the tenant list has limitation when considering an economic impact analysis as not all tenants are engaged in aviation or airport-dependent business; Sky Links Golf Course would be an example. As the tenant list's last update is 2013 some of the enterprises are no longer at LGB and new ones have entered the space. It also does not include all sub-leased space.

To supplement for these limitations other sources where acquired to identify businesses located at and around LGB including the City's Business License list. Interviews with community business partners and LGB leaders offered additional inputs. According to the City Business License list, there are 517 businesses licensed to operate within the boundaries identified in Figure 1.

The approach used for this analysis begins with the tenant list from LGB as the foundation for a survey list and associated economic analysis. The other two sources of business lists were then used to help calibrate and enrich the tenant list provided by LGB. First, the Business License list obtained from the City was compared to the tenant list provided by LGB. Next, the current tenant list from LGB was compared to a 2011 InfoUSA list of businesses as provided. Overall, that comparison resulted in approximately a 30% overlap between the lists. The firms that were on the tenant list but not included

[2] Grobar and Magaddino. *The Economic Impact of the Long Beach Airport*. 2011

in the other two lists were evaluated to determine whether or not they were airport-dependent and should remain in the list to be surveyed and coded appropriately for IMPLAN modeling.

To provide an accurate measure of the economic impact a survey was created and emailed to the organizations on the list for their input. The survey was designed to obtain quantitative information about the employment, financial and grow plans of business and government categorized as airport-dependent enterprises. The results of the analysis provided a lower bound or conservative estimate of the economic impact versus previous studies. The impact of organizations not included in the survey population will be discussed qualitatively to provide a better understanding of the data limitations of the analysis.

Survey

A survey was administered to the expanded tenant list as discussed above and introduced to the enterprises via email with a link to an online survey. A phone bank was set up to conduct the survey via phone if an email address was unavailable, to follow up on incomplete responses to the survey or for contacts at businesses that were acquired late in the process. The survey instrument focused on determining the measureable economic data for each firm. The primary data collected centered around gross sales, part-time/full-time employment, total wage bill, business expectations for their respective firm over the next two years, as well as data on employees of sub-tenants. The survey was designed to be completed by a respondent that is familiar with business planning as well as data on employees and the total wage bill, including benefits.

The initial survey was emailed to 200 contacts at organizations the week of June 26, 2016 with follow-up telephone contacts beginning the week of July 11 and continuing through the last week of August. A total of 45 organizations provided useable responses for a response rate of 28%. This response rate is consistent with online response rates for similar surveys.

Measurements of Economic Activity at Long Beach Airport

Economic impact analysis using IMPLAN is based upon supply and demand relationships. To estimate the economic impact of LGB dependent activities, the modeling software IMPLAN was used. IMPLAN is a regional economic input-output model that provides results on employment, labor income, value added, and the value of output. Each of these categories will be reported as direct, indirect and induced impacts using multipliers to determine the total impacts. The strength of this type of analysis is that it considers the entire supply-chain effects of an economic activity by considering the direct and indirect effects as well as estimating the induced effects resulting from additional employment.

The economy of Long Beach is a diverse economy that supports employment in all sectors. Table 1 provides aggregate employment for the City for March 2016.

Employment by Industry Sector

Sector	Long Beach	YOY (%)
Health Care	24,450	1.9
Leisure and Hospitality	20,225	2.6
Government	14,175	3
Transport/Warehouse	13,675	3.6
Retail Trade	13,275	0.6
Professional, Science, Technical	11,675	5.6
Local	10,100	3.6
Admin Support	8,625	-1
Manufacturing	7,825	1.6
Other Services	6,550	1.6
Construction	6,100	0.7
Wholesale Trade	5,800	0.5
State and Federal	4,075	1.6
Real Estate	3,500	4.4
Finance and Insurance	3,175	-2.3
Information	1,525	-3
Educational Services	1,125	0.4
Total All Industries	141,725	2

Table 1 Long Beach Employment by Sector (March 2016) Source: EDD and Beacon Economics

Determining the sector distribution of employment for the LGB Impact Area is not possible due to data confidentiality at the California Employment Development Department (EDD) to protect firm identity. However, comparisons can be made regarding total contribution of the LGB Impact Area to the Long Beach economy using the results of the tenant survey discussed above. Extrapolating from the survey results to the target population, total employment is approximately 9,000 resulting in a contribution of approximately 6.4% of the total jobs in Long Beach. This result is similar to the findings of Grobar and Magaddino (2012) who found that the LGB complex, more broadly defined using the InfoUSA data, to be approximately 9%.

Economic Activity at Long Beach Airport

This EIA provides a quantitative method to estimate the economic benefits that a particular industry and project brings to the regional economy where the specific project is located. The scope of this EIA is to measure the economic impact of the transportation systems that make up LGB and the impact of construction and operation of a FIS Facility. This FIS Facility would house international customs and immigration inspection permitting for international flights to operate at LGB.

This EIA uses financial and economic data to generate estimates of output, employment and tax revenues associated with changes in the level of economic activity at the airport complex and the addition of the FIS. This EIA provides a robust analysis to aid in the decision making process for

determining economic benefits to the City and the regional economy from the construction of a potential FIS Facility.

Using information provided by LGB, the economic impact on the regional economy from direct operations of LGB was estimated. The economic impact of LGB and the tenant survey results are then estimated using IMPLAN. These results include both the direct operations of LGB as well as the tenants on the regional economy.

Tables 2 and 3 provide data on the impact of expenditures by LGB only, not including the impact of the complete list of firms from the LGB tenant list. Table 2 provides a summary of the economic impact of Non Capital expenditures by LGB for the calendar year 2015. Airport expenditures generated approximately 65 direct jobs and 54 indirect jobs. These jobs resulted in another 52 induced jobs for the regional economy from those employees spending their paychecks. The overall economic contribution of LGB as measured by the value of the output generated is almost $50 million.

Impact Type	Employment	Labor Income	Output
Direct Effect	64.4	$6,336,095	$26,804,876
Indirect Effect	54.3	$4,085,192	$14,323,459
Induced Effect	52.4	$2,819,099	$8,253,272
Total Effect	171.1	$13,240,386	$49,381,607

Table 2 Economic Impacts of LGB Expenditures (2015) Non Capital Expenditures

Table 3 provides estimates of the regional economic impacts from the planned capital expenditures by LGB starting with the actual levels in 2015 and estimated levels for 2016 through 2019.

Year	Expenditures	Total Employment	Labor Income	Value of Output
2015	$16,914,460	184	$10,873,743	$ 30,894,450
2016	$11,100,994	121	$7,136,459	$ 20,276,089
2017	$11,207,563	122	$7,204,969	$ 20,470,739
2018	$23,582,479	256	$15,160,390	$ 43,073,661
2019	$8,059,329	88	$5,181,074	$ 14,720,454
Total Expenditures	$70,864,825	771	$45,556,635	$ 129,435,393

Table 3 Economic Impact of Capital Expenditures over Time

The following Tables expand the analysis to include the data collected from the survey from LGB and tenants. One important finding in this analysis is the difference between the average wage levels measured at the airport enterprises versus Los Angeles County average annual wage level. Table 4

shows that the average wage for the LGB tenant list is approximately $9,000 more per year than the average wage of Los Angeles County.

Location	Average Wages
LGB & LGB Tenants	$67,590
Los Angeles County *	$58,565

* Source: Los Angeles County data from the Employment Development Department, State of California

Table 4 Average Wage Comparison

Table 5 provides the results of the IMPLAN model for total economic impacts using the survey results. Based upon the economic activity reported by the firms that responded to the survey the impact to the regional economy indicates that over 45,000 jobs are generated by LGB and the firms and government operations of the tenants located near LGB. The results reported in Table 5 include the impact of LGB expenditures as reported in Table 2 as well as the capital expenditures for 2015.

	Direct	Indirect	Induced	Total
Employment	19,144	12,548	13,435	45,127
Labor Income	$1,761,215,496	$909,858,169	$723,221,193	$3,367,294,857
Output	$5,810,861,129	$2,413,089,155	$2,117,491,398	$10,341,441,683

Table 5 Total Economic Impact of LGB and LGB Tenant List Businesses

In addition to the quantifiable findings supported from the survey results and modeled in IMPLAN, other significant insights from the survey and interviews were gathered. There is a large area surrounding LGB that is under significant development at this time. While quantifiable details are not attainable in this EIA, interview responses clearly identified LGB as a key reason for business relocation, consolidation and expansion in this area. Some of the businesses have been relocated here as they are directly associated with aviation while others are attracted by the first class facilities being created as part of the redevelopment. Douglas Park is one such development; it is a highly desirable location adjacent to LGB as well as the freeway and the Ports of Long Beach and Los Angeles. Sares-Regis, the developer of Douglas Park, referred to LGB as the key amenity for those companies looking for Class A facilities offered at Douglas Park. While Mercedes-Benz needs were expansive space, their requirement for access to affordable nonstop air service to support training for their 14 western states is also paramount to their firm.

Other expansion more directly associated with LGB but not captured in this EIA are the expansion and construction of new hotel rooms. The Hilton brand has two new hotels under development, a Hampton Inn and a Homewood Suites at the southeast corner of Cover Street and Lakewood Boulevard. Holiday Inn is in the middle of a three year remodeling and expansion including an all-new 125 room executive suites Staybridge Hotel at their current location.

Proposed FIS Facility

The definition of the FIS Facility is based in large part on the requirements contained in the U.S. Customs and Border Protection Airport Technical Design Standard. A FIS Facility is a single processing complex that evolved from the consolidation and integration of US customs, immigration, and agriculture operations, offices, and support functions. The FIS Facility unifies both passenger processing and baggage/cargo processing for safe and efficient flow of passengers and goods into and out of the United States. Based on the findings (Table 17) contained in the Market Analysis section of the Feasibility Study for a Federal Inspection Service Facility three alternative locations were evaluated for the FIS Facility. All three options have unique qualities, attributes, and come with different cost of construction. As such three options were modeled to estimate the economic impacts for each option. The finding in the Market Analysis estimates eight flights a day using the facility. The facility options are designed to accommodate two flights simultaneously using two gate positions. Following the analysis of the three construction options, ongoing economic impacts benefiting the region from additional employment and visitor spending are analyzed.

Impact of the Federal Inspection Service Facility

There are currently three options being considered for the FIS Facility. Table 6 provides the construction estimates for each option Jacobs produced.

Option	Estimate
North FIS Facility – Option 1	$21,558,000
South FIS Facility – Option 2	$17,335,000
South FIS Facility – Option 3	$20,353,000

Table 6 Total Construction cost for Feasibility Options

The resulting output from the IMPLAN model for each option is presented in Tables 7 through 12. As Table 7 shows the total employment impact of Option 1 indicates that over 250 jobs and almost $39 million in added output would be created with the construction of the facility. The top ten industries impacted by the project are shown in Table 8.

Impact Type	Employment	Labor Income	Output
Direct Effect	154.4	$10,199,615	$21,558,001
Indirect Effect	34.8	$2,489,892	$7,244,388
Induced Effect	63.7	$3,429,152	$10,038,055
Total Effect	252.9	$16,118,658	$38,840,444

Table 7 Total Impacts for North FIS Option 1

Industry sector impacts from the North FIS Option, as presented in Table 8, will have the greatest influence on the construction, administrative and architectural services sectors (direct impacts). These

expenditures will then further support economic activity related to the purchase of inputs into the construction of the facility and the support services as employees spend their income in the local economy (indirect impacts) and the income that those businesses receive is spent (induced effects) will also contribute to the regional economy.

Sector	Total Employment	Total Labor Income	Total Output
Construction-commercial structure	113.5	$6,731,776	$17,012,001
Office administrative services	33	$2,537,993	$3,050,131
Architectural and engineering	11.7	$1,344,457	$2,135,812
Wholesale trade	6.3	$531,184	$1,586,688
Real estate	4.3	$151,192	$1,080,316
Full-service restaurants	4.3	$116,598	$216,635
Limited-service restaurants	3.4	$79,884	$313,151
Employment services	3.2	$120,567	$219,986
Hospitals	2.7	$245,234	$470,740
Individual and family services	2.4	$41,238	$68,015

Table 8 Top Ten Sector Impacts from the North FIS Option 1

Similar results for the other two options are provided in Tables 9 through 12.

Impact Type	Employment	Labor Income	Output
Direct Effect	124.2	$8,201,752	$17,335,000
Indirect Effect	28	$2,002,182	$5,825,311
Induced Effect	51.2	$2,757,463	$8,071,839
Total Effect	203.4	$12,961,397	$31,232,151

Table 9 Total Impacts from South FIS Option 2

Sector	Total Employment	Total Labor Income	Total Output
Construction-commercial structure	91.3	$5,412,883	$13,679,001
Office administrative services	26.6	$2,040,915	$2,452,748
Architectural and engineering	9.4	$1,081,356	$1,717,849
Wholesale trade	5	$427,124	$1,275,851
Real estate	3.5	$121,578	$868,713
Full-service restaurants	3.5	$93,761	$174,204
Limited-service restaurants	2.7	$64,237	$251,814
Employment services	2.5	$96,958	$176,909
Hospitals	2.2	$197,198	$378,533
Individual and family services	1.9	$33,161	$54,693

Table 10 Top Ten Sector Impacts from South FIS Option 2

Impact Type	Employment	Labor Income	Output
Direct Effect	145.8	$9,629,806	$20,353,001
Indirect Effect	32.8	$2,350,791	$6,839,510
Induced Effect	60.2	$3,237,580	$9,477,272
Total Effect	238.8	$15,218,177	$36,669,782

Table 11 Total Impact of South FIS Option 3

Sector	Total Employment	Total Labor Income	Total Output
Construction-commercial structure	107.2	$6,355,063	$16,060,001
Office administrative services	31.2	$2,396,338	$2,879,891
Architectural and engineering	11	$1,269,860	$2,017,307
Wholesale trade	5.9	$501,479	$1,497,955
Real estate	4.1	$142,747	$1,019,974
Full-service restaurants	4.1	$110,087	$204,538
Limited-service restaurants	3.2	$75,422	$295,661
Employment services	3	$113,846	$207,723
Hospitals	2.6	$231,534	$444,442
Individual and family services	2.3	$38,934	$64,216

Table 12 Top Ten Sectors Impacts from South FIS Option 3

Ongoing Economic Impacts

The results reported above capture the economic impacts of constructing the three FIS Facilities options but not the impacts of ongoing operation and maintenance (O&M). The total impact from ongoing O&M costs will be approximately $435,000 per year for the next 20 years, as shown in Tables 13 through 15.

Impact Type	Employment	Labor Income	Output
Direct Effect	2.3	$190,796	$434,339
Indirect Effect	1.3	$85,628	$213,974
Induced Effect	1.4	$74,753	$218,840
Total Effect	5	$351,176	$867,153

Table 13 Economic Impacts for Ongoing O&M for FIS-Option1

Impact Type	Employment	Labor Income	Output
Direct Effect	2	$164,217	$373,833
Indirect Effect	1.1	$73,699	$184,167
Induced Effect	1.2	$64,339	$188,354
Total Effect	4.3	$302,255	$746,354

Table 14 Economic Impacts for Ongoing O&M for FIS-Option2

Impact Type	Employment	Labor Income	Output
Direct Effect	2	$166,666	$379,410
Indirect Effect	1.2	$74,799	$186,914
Induced Effect	1.2	$65,299	$191,164
Total Effect	4.4	$306,764	$757,488

Table 15 Economic Impacts for Ongoing O&M FIS-Option3

Regardless of the construction option chosen, additional ongoing economic impacts will occur from operations at the FIS Facility. These will include additional staffing expenditures to the airlines for operations and government agencies to staff the facility. Table 16 provides the details of the additional employee requirements for the international flights and the estimated total wage bill for both the airlines and government to operate the facility.

	Employment	Labor Income
Airline Operations	154	$ 6,468,000
Government Operation	48	$ 5,062,400
Total	202	$ 11,530,400

Table 16 Employment Impacts of FIS Operations

The economic impact generated by the additional flights adds 72.2 workers by suppliers (direct effect) as shown in Table 17.

Impact Type	Employment	Labor Income	Value of Output
Direct Effect	72.2	$3,234,062	$11,740,400
Indirect Effect	47.4	$2,970,295	$7,487,780
Induced Effect	31.1	$1,672,810	$4,895,479
Total Effect	150.6	$7,877,167	$24,123,659

Table 17 Economic Impacts of FIS Operations

Secondary Economic Impacts

If LGB begins offering international flights there will be additional economic impacts from increases in international visitors to the region. Table 18 is the international forecast from the Market Analysis. The Market Analysis estimated that 30% of the annual international passengers are visitors that originate outside the U.S. The economic impact of additional international visitors is estimated based upon average expenditure per visitor[3] to the region.

International Forecast

Year	1	2	3	4	5
Seats	246,375	333,975	333,975	446,213	446,213
Enplanements	209,419	283,879	283,879	379,281	379,281
Departures	1,643	2,227	2,227	2,975	2,975

Table 18 International Forecast Flight Operations per Year After the Facility is Opened

[3] LA Tourism & Convention Bureau 2013

Table 19 provides the estimated economic impact from additional international visitors to the region. Of the international passengers to the region, 70% of those remain in the area for leisure reasons and 30% for business. Leisure visitors have an average expenditure per visit of $900. The contribution to the regional economy for the business travelers is based upon the estimated expenditures of $949 per trip.

Estimate of Visitor Spending

Year	1	2	3	4	5
Enplanements	209,419	283,879	283,879	379,281	379,281
Leisure	43,978	59,615	59,615	79,649	79,649
Business	18,848	25,549	25,549	34,135	34,135
Leisure Expenditures	$39,580,200	$53,653,131	$53,653,131	$71,684,109	$71,684,109
Business Expenditures	$17,886,752	$24,246,105	$24,246,105	$32,394,390	$32,394,390
Total Expenditures	$57,466,952	$77,899,236	$77,899,236	$104,078,499	$104,078,499

Table 19 Regional Economic Impact of International Tourist Year per Year After the Facility is Opened

Therefore, the combined expenditures of the passengers remaining in the region will generate additional economic activity for the leisure and hospitality sector of the economy. The multiplier effect is reported in Table 20.

Year	Expenditures	Total Employment*	Labor Income*	Value of Output*
1	$57,466,952	771	$37,055,151	$102,484,840
2	$77,899,236	1045	$50,230,052	$138,923,163
3	$77,899,236	1045	$50,230,052	$138,923,163
4	$104,078,499	1396	$67,110,651	$185,610,476
5	$104,078,499	1396	$67,110,651	$185,610,476

*Includes direct, indirect and induced effects

Table 20 Regional Economic Impact Multiplier Effects per Year After the Facility is Opened

This section tabulated quantifiable elements of adding a FIS Facility to LGB identifying and modeling additional economic impacts for employment and total value. The qualitative analysis collected in the surveys with local business partners indicated an international facility would have multiple economic benefits. Their insights included supporting local businesses expanding their markets to international locations, creating greater efficiencies for current business travel, giving greater access for foreign executives and a tool to attract new businesses that can leverage quick access to international locations. For example, the General Aviation (GA) community now must stop at other airports to clear customs and then reposition to LGB, creating a negative environmental and economic impact because of the extra flight. The cruise and port business could benefit from having nonstop flights return directly to LGB from Mexico and Central America. The hospitality industry values the incremental business the FIS Facility would bring to their current business mix. During interviews with the GA community, real estate holding groups, hospitality industry and business partners noted that a FIS Facility would be a value added asset to LGB at this time and long term. Based on these interviews, a FIS Facility would create an asset of strategic relevance for multiple enterprises in the City.

The Business of LGB

In today's interconnected, interdependent economies, access to vital commercial pathways and the other hallmarks of connectivity are core to regional and local economic wellbeing. Aviation is a critical part of that activity and the U.S. economy with the U.S. Airline Industry driving $1.5 trillion in economic activity creating 11 million jobs[4]. Long Beach Airport is part of the most extensive airport system in the world (19,299 U.S. airports) linking passengers and businesses in the Long Beach area and the rest of the world. Managing a range of services, airports link airlines to families and businesses fostering economic activities by supporting tourism, domestic and international commerce generating employment. Airports are also a vital national asset supporting disaster relief, emergency services and the military as well as state and national needs.

LGB's primary business is managing the infrastructure to support commercial, general aviation, cargo, charter, flight schools and military aviation. But its business influence is much broader than that as these core operations spawn numerous aviation service businesses. Covering 1,166 acres, LGB has evolved into a highly diversified aviation complex with more than 150 business at or adjacent to LGB that are directly related to or support the aviation activity at LGB. LGB manages a real estate and a tenant enterprise portfolio as well as the administration of government services.

LGB balances the demands of diverse business activities ensuring economic vitality and responsible governance ensuring quality of life standards. In 1995 the Federal District Court approved a noise ordinance settlement at LGB. This settlement is known as the Airport Noise Compatibility Ordinance governing the operational levels at LGB through the administration of a cumulative noise budget using slots. Today LGB still operates under that decision. Noise levels are continuously monitored and reviewed annually to allocate daily levels of operations for the following year. This governance of noise is allocated into annual noise budget levels that regulate the commercial, commuter, industrial, charter and general aviation slot for usage. Military and government operations are monitored but are not part of the annual noise budget. GA's noise budget is not allocated to any specific company. GA is currently operating at approximately 63% of the allotted noise budget. As of July 2016 Long Beach Airport allocated 50 air carrier flight slots. During this period there were approximately 37 average daily commercial departures recorded.

Passenger and Cargo Slots at LGB

Commercial	Slots
JetBlue	35
American	5
Delta	4
Southwest	4
FedEx	1
UPS	1

Commuter	Slots
Delta	3

Table 21 Slot Allocation by Carrier-Note FedEx and UPS are Cargo Operations

[4] Airlines For America http://airlines.org/industry/

Commercial Aviation

As a commercial airport, activity for most of LGB's history was limited prior to JetBlue (now the largest carrier) initiating service in 2001. For the decade prior to JetBlue service, commercial traffic totals averaged less than one million total passengers. However with Long Beach Airport's attractive location for commercial aviation passengers, LGB has grown to over 2.4 million total passengers (YE 2015) and reached over three million as recently as 2012 (Table 22).

Total Commercial Passengers (000) at LGB

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Arriving	1,324	1,399	1,405	1,398	1,430	1,504	1,544	1,430	1,357	1,216
Departing	1,340	1,409	1,408	1,398	1,435	1,508	1,552	1,435	1,365	1,218
Total Passengers	2,664	2,808	2,813	2,796	2,865	3,012	3,096	2,865	2,722	2,434

Table 22 Annual Passenger Levels for the Last Ten Years

Although passenger demand was down in the most recent year LGB still exhibits capacity demand opportunity for both domestic and international growth. In October 2015 during the annual noise budget review, additional slots were identified. That capacity was requested by multiple airlines including a new operator Southwest Airlines (Southwest). Southwest requested access to nine slots, and was awarded four; it commenced service to Oakland in July 2016 with planned service to Las Vegas in the fall of 2016. JetBlue has announced new domestic services to Reno and San Jose. Additionally international passenger demand has also been identified. This is based on the flight activity forecast in the *Traffic Analysis* section in the Market Analysis. While the number of flights at LGB is restricted, the Market Analysis identified pent up demand for many international markets to LGB. The international forecast was constrained to estimate potential markets within the 50 commercial slots available. Table 18 in the *Proposed FIS Facility* section are the estimates for international enplanements from the Market Analysis forecast over the first five years of operations based on the current level of slots allocated by the noise budget.

Passenger enplanements contribute to the economics of LGB in a variety of ways. Point of Origin (POO) demand on flights at LGB is balanced with 53% of the passengers originating in the Long Beach region and 47% of the passengers originating their itinerary at the other airports and arriving on inbound flights. POO traffic has different economic impacts at an airport. Inbound POO traffic is a high generator of economic activity in a region as it drives spending for hotels, car rentals, meals, entertainment and other incidentals into the local economy. A good example of the economic impact of inbound POO traffic can be seen in Tables 19 and 20 in the *Proposed FIS Facility* section. Parking, the largest non-aeronautical revenue contributor to LGB, is driven by POO traffic at LGB making up approximately 27% of LGB's revenue base.

Employment growth associated with enplanement growth is most evident at JetBlue. Since initiating service in 2001 JetBlue's domicile at LGB has grown to 700 people, the second largest employer at LGB.

General Aviation

Another large and important source of economic activity at LGB is General Aviation (GA). LGB is one of the largest GA airports in the US consistently operating in the top 15 in the country as measured by operations. While the long term historic trend is in decline, as of June 2016 GA operations were up 4.5% YTD compare to 2015. Over the last five years, GA level of operations have performed in a narrow range. John Wayne Airport, another Southern California regional airport, is down 2% since 2010 similar to LGB. The FAA classifies GA flights into separate use types - personal, business or other (instruction, aerial application etc.). The GA business composition at LGB is extensive with many types of aircraft flying a variety of missions.

GA Aircraft Operations

2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
324,747	361,513	313,750	264,041	277,871	265,018	250,830	249,820	291,327	268,500

Table 23 GA -Operations Trend at LGB

Air Cargo

The demand for air cargo movement has historically been correlated with economic growth, but is also influenced by the types of consignment to be moved and the logistics needs of the associated supply-chain of the enterprises in the area. FedEx and UPS, the world's largest and third largest global cargo carriers respectively, support this local demand with both providing nonstop wide-body aircraft service from LGB. Since the 2008 financial crisis total landing weights are down as landings have been reduced by 74% since its peak in 2008 (Table 24). Cargo landing weights have shown to be stable the last four years.

Cargo at Long Beach Airport

YEAR	LANDINGS	LANDING WEIGHTS (lbs)
2006	1,822	332,026,800
2007	1,875	308,728,570
2008	2,070	307,989,740
2009	1,857	264,064,440
2010	1,750	187,513,620
2011	1,548	181,386,340
2012	746	154,539,360
2013	524	163,013,400
2014	525	159,820,629
2015	532	168,216,540

Table 24 Cargo Landing Weights Trend

Fiscal Impacts

Long Beach Airport operates without support from the City's General Fund. LGB contributes to the City's revenue requirements by generating taxes and fees which are collected by the City or the LGB Enterprise Fund. Additionally, LGB pays approximately 30 % of its $33 million annual budget to the City for public services received. The economic activity generated by LGB and the tenants of LGB as reported in Table 5 above results in a significant contribution to the local tax base. The tax results reported in Table 25 are based upon current economic activity as reported in Table 5. These estimates are based upon the tax structure as it existed in 2014, the most current year for the IMPLAN data.

Tax Impacts From LGB & Tenants

State & Local Taxes	
State & Local Taxes	
Employee Compensation	$8,605,429
Production & Imports	$208,662,735
Households	$124,922,515
Corporations	$16,366,068
Total State & Local	$358,556,747

Federal Taxes	
Employee Compensation	$369,255,769
Proprietor Income	$11,524,604
Production & Imports	$35,207,173
Households	$283,133,555
Corporations	$93,567,239
Total Federal	$792,688,340

Table 25 Federal, State and Local Tax Impacts

The addition of the FIS Facility would further enhance the tax revenues generated from the increased business opportunities and the spending of international visitors to the region. The increased tax base for Los Angeles and Orange Counties will help to strengthen local institutions.

As reported in the Market Analysis, FIS capabilities increase the airports annual passenger enplanement by 379,000 by year four (Table 18). The associated concession and Passenger Facility Charge (PFC) per enplanement would increase LGB's revenue base by approximately $4.3 million annually by year four.

According to the seventh annual Airport Affordability Index (2016) published by Cheapflights.com, LGB has been awarded the most affordable airport in the U.S., a positive financial impact to the City. John Wayne Airport (SNA) in Orange County and Los Angeles International Airport (LAX) are ranked 31 and32 respectively.

Conclusions

The economic impact of an airport is the sum of primary impacts – both direct and indirect – and induced economic activity that occurs because of the additional income generated by the workers at the facilities, tenant businesses, aviation and transport services. As reported above, LGB and its tenants

generate over $10 billion and 45,000 jobs in total economic activity with an additional $1.1 billion in tax revenues at the federal, state and local levels.

If the FIS Facility were to be built, it would enhance this contribution to economic activity ranging between $31 - $39 million and 203 – 253 jobs, depending on the option chosen. Once the FIS Facility becomes operational, there would be additional economic contributions due to the visitors to the region as reported in Table 20. The magnitude of this contribution begins at $102 million growing to $185 million by Years 4 and 5. There is also the potential to generate additional business activity in the area of LGB given the increased access to international markets due to the FIS Facility. However, it is not possible to estimate this impact given the existing data constraints.

Other Business in the Long Beach Airport Complex

Now approaching its centennial, Long Beach Airport was established in 1923 as the first municipal airport to serve Southern California. It has become a high output generator of jobs and services for the residents and businesses in the City. LGB resides in a larger complex of business enterprises. While many of these businesses are not dependent on aviation assets (runways or terminals) or related transportation services, LGB's presence produces economic activity to a multitude of businesses including restaurants, storage companies, services and other commercial entities. LGB and its location create a magnet for current and future business that supports Long Beach's economy. This report measured the impact of 162 dependent businesses at LGB that are part of the 517 business in the geographical footprint (Figure 1) making this an ideal economic complex for future economic growth.

This EIA shows the multiple award winning Long Beach Airport as a source of substantial economic activity and employment, as well as a leader in maintaining sustainable, environmentally responsible operations.

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www.jacobs.com

June 24, 2016

Subject: Long Beach Airport Economic Impact Analysis

Dear Long Beach Airport Tenants and Surrounding Businesses:

On January 19, 2016, the City of Long Beach (City) commissioned Jacobs to conduct a Feasibility Study (Study) for a Federal Inspection Services (FIS) Facility at the Long Beach Airport (Airport). The scope of work for the Study includes an Economic Impact Analysis of the Airport on the local and surrounding region through employment, wages, and other benefits.

The Jacobs team is coordinating with Airport staff to attain the most comprehensive understanding of the impact that the airport has on the economy. Specifically, the analysis will survey the airport, airport tenants, government agencies, airport-dependent businesses, and aircraft owners for economic data and analyze passenger traffic related spending to determine the impact.

Jacobs is forwarding an online survey to all tenants and surrounding business in the Airport area. Your assistance completing the questionnaire is critical for this analysis. The data inputs collected in the survey (data, material, budgets, capital spending, etc.) will be converted into outputs of the Economic Impact of Long Beach Airport. All information will be kept strictly confidential. The survey consists of 21 questions and needs to be completed by July 1, 2016.

Please visit http://www.surveygizmo.com/s3/2839900/Economic-Impact-Study-for-Long-Beach-Airport to complete the survey.

Should you have any questions please email us at lgbfiscomments@gmail.com. Should you want a call back please call (214) 361-6474.

Thank you,

Steven Peters, RA, LEED AP BD+C
Project Manager

Economic Impact Study for Long Beach Airport

Survey

*Responses to this survey will be treated as confidential. Responses from individual businesses will be combined with information from other respondents to preserve confidentiality. No survey data will be released without written permission of tenant, **only aggregate information will be reported.** Attachments with a greater explanation are welcome.*

Copy of **Survey**

*Responses to this survey will be treated as confidential. Responses from individual businesses will be combined with information from other respondents to preserve confidentiality. No survey data will be released without written permission of tenant, **only aggregate information will be reported.** Attachments with a greater explanation are welcome.*

1. Establishment Name

2. Years at airport or current location

3. Date of response

4. Name

5. Description of products or services your firm produces:

6. Sales (most recent full fiscal year) in $

7. Market Composition (% of sales):

	% of Total	Expected % Two Years from Now
Industry Markets		
Household Markets		
Governments - Local or State		
Government - Federal		
Enter another option		

8. Market Trends - How do you see your lines of business changing over the next two years?

	% Increase	% Decrease	No Change
Corporate			
General Aviation			
Cargo			
Flight School			
Other if not in Aviation --			

9. How many employees do you have that are:

Full Time

Part Time

10. What was your total level of employee compensation (in $) in your most recent full fiscal year? (e.g. wages & salaries as well as fringe benefits)

11. Please estimate what % of employees working at your firm live in the City of Long Beach.

12. Do you have tenants or subtenants?

- ☐ Yes
- ☐ No

13. If yes, what are the names of the companies?

14. How many people do those companies employ?

- ☐ 0-5
- ☐ 6-10
- ☐ 11-20
- ☐ 21-50
- ☐ Greater than 50

15. Has your 2016 Capital Expenditures budget at the airport changed from the beginning of this year?

- ☐ No Change
- ☐ Has Decreased
- ☐ Has Increased

16. If your Capital Expenditures has changed, by what %? Why has this change occurred?

17. What are the most important issues facing your business activity at Long Beach Airport over the next several years?

18. Are there actions that Long Beach Airport could take that would help your business deal with issues identified in Question 17?

- ☐ Yes
- ☐ No

19. If the answer is yes, please describe these actions.

20. The Long Beach Airport is currently conducting a feasibility study of a potential Federal Inspection Service (FIS) Facility. Would the availability of international flights at Long Beach Airport affect your business?

- ☐ Yes
- ☐ No

21. If so, how will the availability of international flights at Long Beach Airport affect your business?

Submit

0%

Survey Software powered by SurveyGizmo

Appendix D. FIS Facility Siting Alternatives

PLEASE NOTE: The information, analysis, assessments and opinions contained in this document are intended for general evaluation purposes only. This document is intended for use only by its specified client and is NOT intended for use, reliance or in making financial/investment decisions by outside parties.

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Feasibility Study for a Federal Inspection Service Facility at Long Beach Airport

Federal Inspection Service Facility Siting Alternatives

W9Y17400-1

September 30, 2016

Feasibility Study for a Federal Inspection Service Facility at Long Beach Airport

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Introduction

Building upon the findings contained in the Market Analysis[1] and validation of the demand for international service at Long Beach Airport (LGB) and within the Southern California market, defining the Federal Inspection Service (FIS) Facility is the next step in evaluating feasibility. Definition of the FIS Facility is based in large part on the requirements contained in the U.S. Customs and Border Protection (CBP) Airport Technical Design Standard (ATDS)[2]. This Study evaluates the requirements for a FIS Facility to process up to 400 passengers per hour.

Each FIS Facility is a single processing complex that evolved from the consolidation and integration of US customs, immigration, and agriculture operations, offices, and support functions. The FIS Facility unifies both passenger processing and baggage/cargo processing for safe and efficient flow of passengers and goods into and out of the United States. The FIS Facility would also have a CBP security area to accommodate international air commerce designated for processing passengers, crew, baggage and effects arriving from, or departing to, foreign countries, as well as aircraft deplaning, ramp areas, and other restricted areas designated by the port director.

The FIS Facility functions similarly to the passenger security screening and baggage security screening areas within the existing terminal area. The existing security screening areas focus on departing passengers and baggage while the security screening areas within the FIS Facility would focus on arriving passengers and baggage. The FIS Facility would contain a sterile corridor, primary processing, secondary processing, international baggage claim, administrative, and storage areas. It would also include support functions such as mechanical, electrical, janitorial, and maintenance areas.

[1] LaCosta Consulting Group. *Market Analysis For Long Beach Airport*. August 2016.
[2] U.S. Customs and Border Protection. *Airport Technical Design Standard. Signature Version.* June 2012.

1. CBP Requirements

Should the City of Long Beach (City) decide to proceed with the development of a FIS Facility at LGB, the ATDS must be followed. CBP approval is required at each stage of the development process.

There are multiple types of CBP passenger processing facilities at airports. Two of the main designations of CBP passenger processing facilities are Ports of Entry (POE) and User Fee Airport (UFA).

A POE is a place where one may lawfully enter a country. It is typically staffed with agents who review passports and visas and inspect luggage to ensure that contraband is not imported. International airports, as well as road and rail crossings on a land border, are usually POE.

According to the U.S. Department of Homeland Security and CBP, the following are considered the minimum criteria for establishing a POE[3]. The requesting community must:

- Prepare a report that shows how the benefits to be derived justify the Federal Government expense,
- Be serviced by at least one major mode of transportation,
- Have a minimum population of 300,000 within the immediate service area (approximately a 70 mile radius).

Also, the actual workload in the area must be one or a combination of the following:

- 15,000 international air passengers (airport) and 2,000 scheduled international arrivals (airport),
- 2,500 consumption entries (each valued over $2,000), with not more than half being attributed to any one party (airport, seaport, land border port),
- 350 vessels (seaport),
- 150,000 vehicles (land border port).

A POE is the processing point for various agencies for enforcement of U.S. laws and regulations. POE processing services, however, are normally furnished by the government at no cost to the airport.

On the other hand, a UFA is a facility that reimburses CBP for all costs associated with providing customs services at the airport. The major differences between a UFA and a POE are the workload criteria and financial responsibility for services. Airports may request UFA designation when they do not meet the criteria for becoming a POE or they do not receive POE designation by CBP.

A community that desires CBP services at its airport but does not meet the workload requirements for a POE may still receive the services with a UFA designation by meeting the following three criteria:

- The volume or value of business at the airport is insufficient to justify the availability of CBP service at such airport on a non-reimbursable basis,
- The Governor of the State in which such airport is located approved such designation in writing to the Commissioner of CBP,
- The community (or airport authority) agrees to reimburse CBP for all costs associated with the services, including all expenses of staffing a minimum of one full-time officer.

UFAs do not receive CBP services until they 1) establish and equip a FIS Facility and appropriate office space that meet the ATDS, and 2) have entered into a memorandum of agreement with CBP.

[3] U.S. Customs and Border Protection. *Ports of Entry and User Fee Airports.* March 2016.

2. Port Of Entry / User Fee Airport Designation

Based on the flight activity forecast in the *Traffic Analysis* section in the Market Analysis[1], LGB's market demand for international passengers has been identified as sufficient in workload and volume of business to justify UFA designation for startup. When service and passenger volumes meet qualifying levels of POE designation, then LGB may apply for POE designation.

For the purpose of assessing probability for designations, this Study has identified two California airports currently applying for POE status[4]. Fresno Yosemite International Airport and John Wayne Airport have international service and passenger levels that are above the minimum requirement for POE designation. To date, neither airport has been successful in receiving POE designation; both operate as UFAs. John Wayne Airport is the most recent California airport to apply for POE status. Although it received UFA designation in 2012, it has yet to be successful in receiving POE designation after satisfying all requirements as outlined above. John Wayne Airport has had the political support at the state, congressional, and local levels of government and still has been unsuccessful at receiving POE designation.

Therefore the probability for LGB receiving the UFA designation is high. POE designation cannot be assessed until specific levels workload and volumes are met; however, based on current findings as outlined above, it would be unlikely in the near term.

Airports that request UFA designation must begin the application process by contacting the nearest POE or the servicing Field Office and request an initial site visit to review existing infrastructure, if any, and to discuss projected workload and required services.

Port of Entry:
Scott Jackson
Assistant Port Director, Tactical & Trade
U.S. Customs and Border Protection
Los Angeles International Airport
11099 S La Cienega Blvd
Los Angeles, CA 90045
(310) 215-2618

The airport sponsor must then arrange for the current governor to submit a letter to the CBP Commissioner which supports the airport sponsor request to be designated a UFA. If CBP determines that it can support the request, the Commissioner will provide provisional approval in the response to the governor contingent upon the airport providing ATDS-compliant facilities.

[4] U.S. Customs and Border Protection. *Lis of Airports Where CBP Inspection Services are Normally Available.* https://www.cbp.gov/. March 2014.

3. FIS Development Process

Project approval, including all design work approval and notice to proceed on any work within the scope of the project, must be obtained from an assigned Project Manager (PM). No other CBP entity has the authority to approve work requested by the airport operator. The development of a CBP airport passenger processing facility project includes the following seven steps in the design process and is coordinated between the airport operator and/or their agent(s) and CBP.

- CBP Project Approval and Airport Designation – airport operator/carrier submits request to construct/renovate a CBP Passenger Processing Facility to CBP
- Pre-Design and Programming - CBP provides the airport operator with oversight review to ensure the design provides all of the spaces and build-out required to support CBP processing operations
- Schematic Design Phase Design Development Phase – architect/engineer provides designs incorporating floor plans/sections, elevations, reflected ceiling plans, site plan, outline specifications, finish schedule, single-line diagrams for all building systems, layout, security systems, building sections, walls sections, and special construction requirements
- Construction Document Phase – architect/engineer provides complete construction document submission
- Construction Phase – upon receiving a Notice To Proceed and having a kick-off meeting, construction team can begin construction with close coordination between CBP and representatives
- Acceptance, Occupancy, and Commissioning – CBP will move-in with specific furniture and equipment to set up the facility while airport operator provides as-built documents

4. Description of FIS Facility at LGB

The FIS Facility will be developed in accordance with CBP design standards and security requirements as well as have processing areas that are designed for and sized for the number of arriving international passengers. In addition to meeting CBP standards the FIS Facility should have a suitable location, comply with environmental requirements, provide the least disruption to existing operations, and fit within overall future terminal development plan.

The FIS Facility should include the following components:

- Aircraft Arrival Area
- Sterile Corridor System (SCS)
- CBP Primary Processing Area (PPA)
- CBP Secondary Processing Area
- CBP Administrative Area and Support Functions
- International Baggage Claim

A typical sterile corridor, as defined by the ATDS, consists of a walkway with walls to establish a sterile environment that leads passengers and crew members to the CBP Primary Processing Area and assure that no one has physical contact with other types of passengers, the general public, or transportation line and port employees not authorized by CBP.

Upon deplaning, passengers move from the aircraft to the sterile corridor that leads to the CBP Primary Processing Area. A Primary Processing Area is the first point of examination of passengers by a CBP Officer.

At the conclusion of processing, admissible passengers enter the international baggage claim area, retrieve baggage and proceed to an exit control officer at the head of the main facility exit lanes to surrender their CBP declarations. Most passengers are instructed by exit control officers to exit the facility. If a passenger has been identified for additional processing at primary, or by any CBP Officer while in the CBP sterile area, the passenger will be directed to proceed to the CBP Secondary Area for further processing.

A Secondary Processing Area is the secondary point of inspection for those passengers referred after Primary Processing. This process includes a more thorough inspection of passengers and baggage.

The passenger processing area must be separated physically and visually from the domestic “meeter-greeter” area, domestic passenger operations, and other outside areas. This separation includes a wall structure that establishes a sterile environment. Any deviation must be submitted for approval by the Office of Administration (OA) and Program Management (PM). The FIS Area must be designed so that arriving passengers or crewmembers cannot bypass the processing area or interact with the public prior to CBP processing.

The CBP administrative offices and administration support spaces are located within the sterile perimeter adjacent to and readily accessible from the Primary Processing Area and the Secondary Processing Area. All of the CBP staffed facilities may include a public reception room and an adjacent Entrance and Clearance office. The office is required to be accessible to the CBP officers from within the secured facility and include a public reception area, which shall be accessible to the general public from the domestic side of the terminal.

5. North FIS Alternative

A potential location for the FIS Facility is north of the terminal area, as shown in Figure 1. The north FIS alternative is referred to as Option 1. This location would be accessible for inbound international flights from Taxiway K to aircraft parking positions 11 and 12. These parking positions do not exist and would need to be constructed. Passengers would exit the aircraft, transit the sterile corridor to the CBP Primary Processing Area and retrieve their baggage from the international baggage claim. As passengers exit the FIS Facility, they would proceed through an exit corridor to the curbside north of the terminal for pickup or continue to other modes of ground transportation.

Option 1 would require approximately 35,051 square feet of new construction with corridors to both enter and exit the FIS Facility. The sterile entry corridor would be approximately 6,353 square feet and the exit corridor would be approximately 3,144 square feet. Option 1 preserves area for terminal operations and future development. The exit corridor is necessary to safely lead passengers to the curbside, but may be viewed as a passenger inconvenience. Approximately 5,772 square feet would be dedicated to international baggage claim area with approximately 70 linear feet of claim unit frontage on the airline loading side and approximately 140 linear feet on the passenger side.

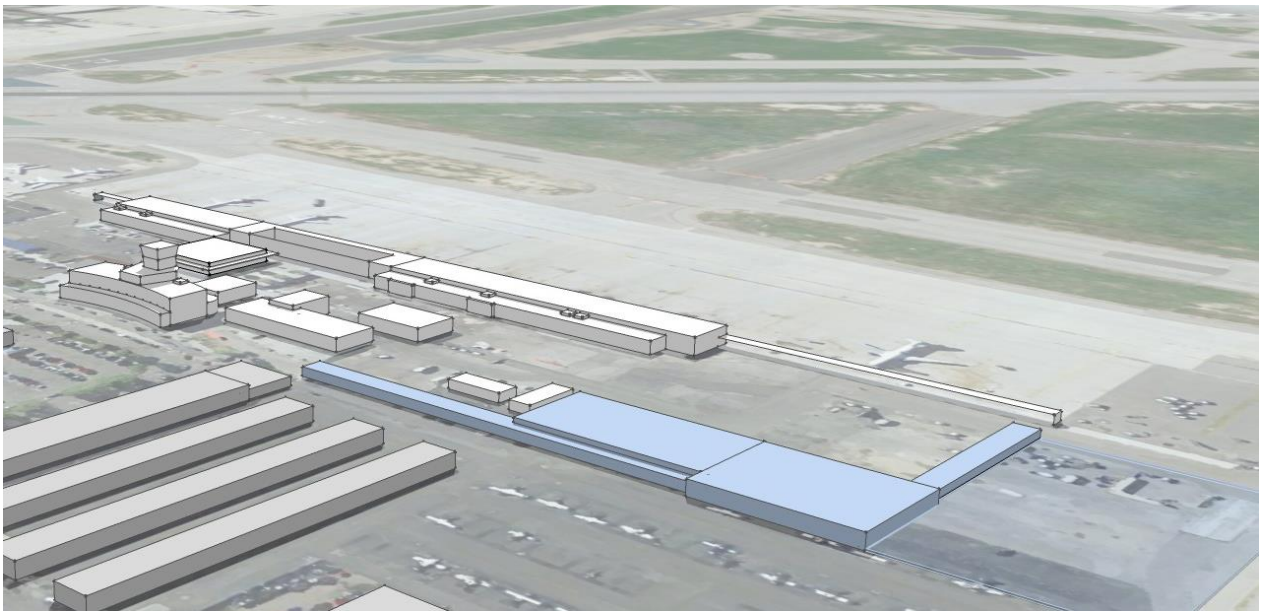

Figure 1 Option 1 NE View

New aircraft parking positions 11 and 12 will be the primary parking positions for international flights arriving to LGB if the FIS Facility were to be located on the north side. These parking positions do not exist and would need to be constructed north of the FIS Facility requiring 91,500 square feet of new aircraft pavement. Due to airport vehicles using the area between the potential north FIS Facility and the north concourse to conduct terminal operations, traffic control measures (i.e. flagger, traffic signal, grade separation, etc.) would be necessary if flight schedules require three simultaneous international arrivals. Terminal operations between the potential north FIS Facility and the north concourse would prohibit boarding at aircraft parking positions 11 and 12 without traffic control measures. This restriction would require aircraft to be repositioned between deplaning and boarding. Repositioning aircraft creates additional work for airline personnel and would require towing operations prior to each departure.

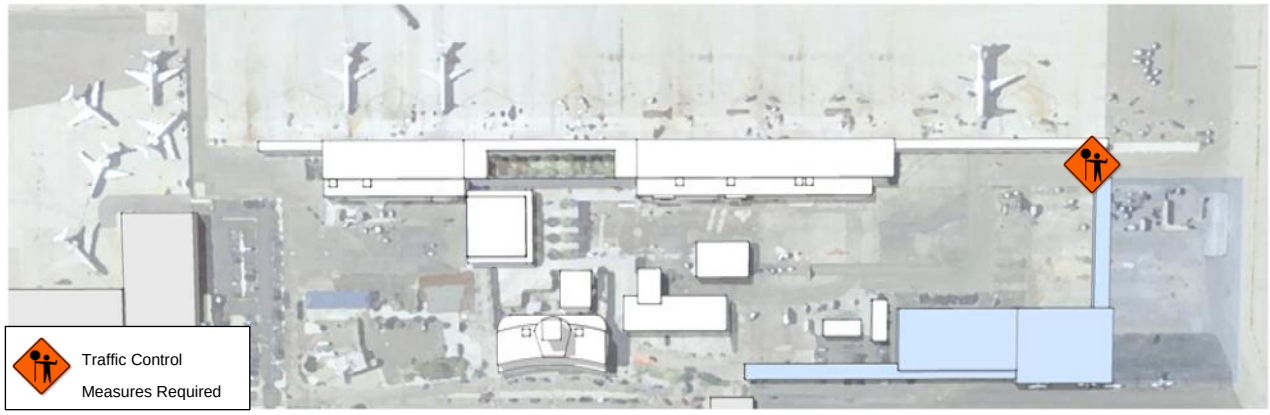

Figure 2 Option 1 Plan View

6. South FIS Alternatives

Another potential location for the FIS Facility is south of the terminal area, as shown in Figures 3 –6. Compared to the north site, the site south of the terminal is more constrained with less available space to construct the FIS Facility. In reviewing potential options for constructability of the facility, two south options were evaluated and are referred to as Options 2 and 3. Options 2 and 3 are similar, with Option 3 taking advantage of repurposing the existing Security Screening Checkpoint (SSCP) to reduce the impact of new construction south of the terminal area. The south FIS location would be accessible for inbound international flights from Taxiway C to existing aircraft parking positions 1 and 2. Similar to the north FIS, passengers would exit the aircraft, transit the sterile corridor to the CBP Primary Processing Area and retrieve their baggage from the international baggage claim. As passengers exit the FIS Facility, they would proceed to a courtyard adjacent to the curbside south of the terminal for pickup or continue to other modes of ground transportation. Positioning arriving passengers south of the terminal in a single level roadway configuration would reduce traffic congestion on the north side for vehicles coming into the terminal area.

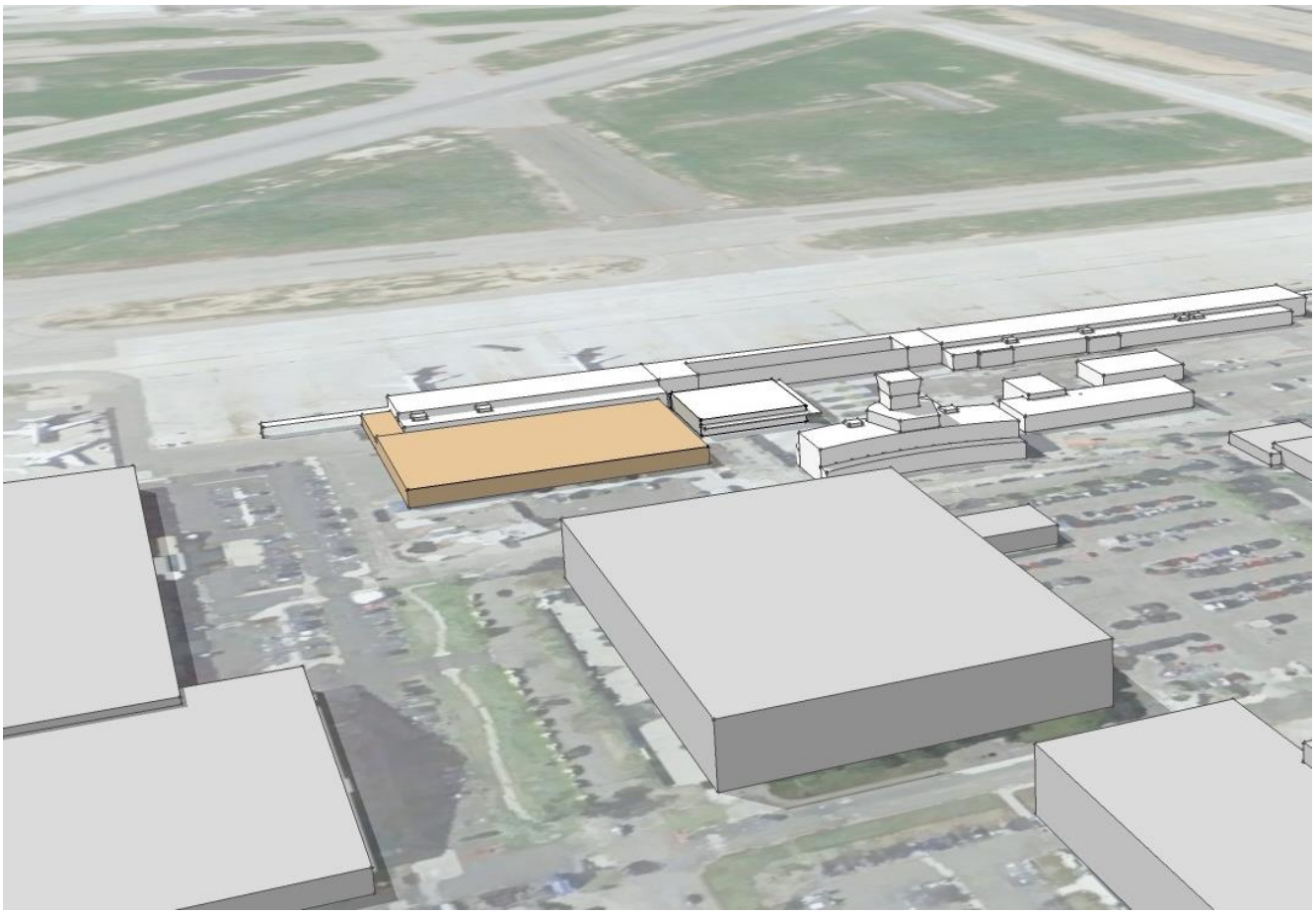

Figure 3 Option 2 SE View

Option 2 would require approximately 30,672 square feet of new construction immediately to the east of the south concourse and immediately south of the existing SSCP with a shorter entry corridor than the entry corridor of Option 1 and will not require an exit corridor. The sterile entry corridor would be approximately 1,815 square feet. The footprint of Option 2 would impact storage of ground service equipment but would eliminate the need for an exit corridor due to the close proximity to the curbside south of the terminal. Approximately 9,075 square feet would be dedicated to baggage claim area with approximately 210 linear feet of claim unit frontage on the airline loading side and 420 linear feet on the passenger side split amongst three baggage claim units. Two of the baggage claim units would be for domestic arrivals with the third unit configured to operate as a “swing” baggage claim that can be used for either domestic or international arriving passengers. Option 2 will require demolition of 312 linear feet of existing claim unit frontage on the airline loading side and 346 linear feet on the passenger side.

Figure 4 Option 2 Plan View

Option 3 would integrate and repurpose the existing SSCP into the FIS Facility. Option 3 would require approximately 21,656 square feet of new construction immediately to the east of the south concourse and immediately south of the existing SSCP with a shorter entry corridor than the entry corridor of Option 1 and will not require an exit corridor. The sterile entry corridor would be approximately 1,815 square feet. Approximately 6,750 square feet of the existing SSCP would be repurposed for the FIS Facility. Repurposing the existing SSCP would require construction of a new SSCP, shown in green in Figures 5 and 6, located north of the “meeter-greeter” plaza. The new SSCP would be approximately 8,100 square feet and would be a direct replacement for the existing SSCP. The reduced size of new construction south of the terminal would preserve area for storage of ground service equipment. Approximately 5,772 square feet within the new construction would be dedicated to international baggage claim area with approximately 70 linear feet of baggage claim unit frontage on the airline loading side and approximately 140 linear feet on the passenger side configured as a “swing” baggage claim unit. Option 3 would require demolition of 312 linear feet of existing claim unit frontage on the airline loading side and demolition of 346 linear feet on the passenger side. Option 3 would replace baggage claim units 1 and 2 with two new baggage claim units with a total of 140 linear feet of claim unit frontage on the airline loading side and 280 linear feet on the passenger side.

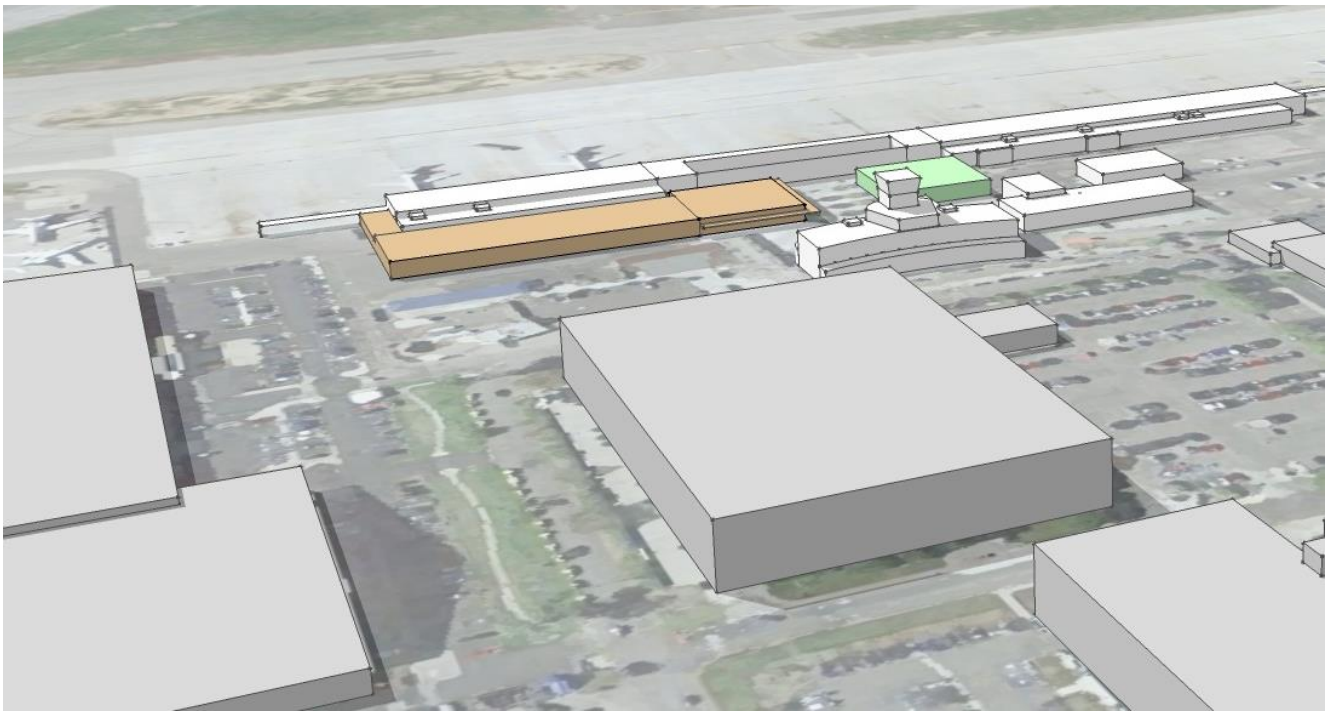

Figure 5 Option 3 SE View

Figure 6 Option 3 Plan View

Aircraft parking positions 1 and 2 will be the primary parking positions should the FIS Facility be located on the south. Boarding operations at aircraft parking position 1 would not be allowed to commence until deplaning operations at aircraft parking position 2 are complete. Utilization of aircraft parking positions 1 and 2 does not require new pavement construction. Options 2 and 3 allow for three simultaneous operations without the need for traffic control measures, as the entrance to the sterile corridor would be accessible from existing aircraft parking positions 1, 2, or 3.

7. LGB FIS Facility Program

The size of the FIS Facility is determined by the number of arriving aircraft and passengers processed during the peak hour of operation. Based on the simulated international flight activity in the Market Analysis, the potential frequency of arriving international passengers is 255 passengers during the peak hour. LGB would be categorized as a small airport by ATDS definition.

Providing a FIS Facility that meets CBP guidelines would require approximately 35,051 square feet for Option 1; 30,672 square feet for Option 2; and 28,406 square feet for Option 3.

The overall FIS Facility area square footage would be allocated among the various uses and is described below in more detail in the Table below:

		OPTION 1 (NORTH)	OPTION 2 (SOUTH)	OPTION 3 (SOUTH-ALT)	
FLOOR AREA SUMMARY	**NET SF AREA**	**GROSSED UP AREA**	**GROSSED UP AREA**	**GROSSED UP AREA**	**REMODELED AREA**
ENTRY CORRIDOR		**6,353**	**1,815**	**1,815**	**0**
GENERAL AREAS	**Net SF**	**Gross SF**	**Gross SF**	**Gross SF**	**Gross SF**
BAGGAGE CLAIM	4,770	5,772	9,075	5,772	
CIRCULATION	2,640	3,196	3,196	1,888	
COUNTER TERRORISM RESPONSE	475	575	575	575	
RESTROOM	696	842	842	842	
QUEUING	2,732	3,308	3,308	3,308	
PASSENGER PROCESSING	1,476	1,786	1,786	1,786	
COMMAND & CONTROL CENTER	225	272	272		272
WIRING/IDF	116	140	140		140
LAN/TELCO	180	218	218		218
RADIO/TEL ROOM	60	73	73		73
LACTATION ROOM	80	97	97		97
STAFF BREAK ROOM	200	242	242		242
GYM	200	242	242		242
LOCKERS	164	199	199		199
MALE HOLD ROOM	115	139	139		139
FEMALE HOLD ROOM	115	139	139		139
JUVENILE HOLD ROOM	115	139	139		139
INTERVIEW ROOM	80	97	97		97
SEARCH ROOM	80	97	97		97
DETAINEE BAGGAGE STORAGE	50	61	61	61	
AGRI LAB	150	182	182	182	
AGRI DISPOSAL	150	182	182	182	
ICE OFFICE	150	182	182	182	
MEN'S TOILET	63	76	76	76	
WOMEN'S TOILET	63	76	76	76	
WAITING	250	303	303	303	
GENERAL STORAGE	150	182	182		182

		OPTION 1 (NORTH)	OPTION 2 (SOUTH)	OPTION 3 (SOUTH-ALT)	
FLOOR AREA SUMMARY	**NET SF AREA**	**GROSSED UP AREA**	**GROSSED UP AREA**	**GROSSED UP AREA**	**REMODELED AREA**
SUPERVISOR'S OFFICE	150	182	182		182
PORT DIRECTOR'S OFFICE	225	272	272	272	
CHIEF OFFICER'S OFFICE	200	242	242	242	
ADIT	150	182	182	182	
GENERAL OFFICES	256	310	310	310	
WASHER/DRYER	60	73	73		73
DRY FOOD STORAGE	75	91	91		91
K9 KENNEL	123	149	149		149
K9 PROCESSING	150	182	182		182
K9 FOOD PREP	150	182	182		182
K9 GENERAL STORAGE	50	61	61		61
K9 TRAINING AID STORAGE	64	77	77		77
K9 TRAINING AID STORAGE	64	77	77		77
K9 WORK AREA	64	77	77		77
TEMP SEIZED PROPERTY	60	73	73		73
SECURE STORAGE	100	121	121		121
PPE STORAGE	65	79	79		79
WEAPONS CLEANING	80	97	97		97
WEAPONS STORAGE	100	121	121		121
SHIPS OFFICE	402	487	487		487
TRIAGE PODIUM	180	218	218	218	
EXIT PODIUM	180	218	218	218	
SUBTOTAL GENERAL AREAS	**18,493**	**22,388**	**25,691**	**16,675**	**6,750**
CORRIDOR BET. ENTRY/EXIT		3,144	0	0	0
INTERNAL CORRIDOR		1,008	1,008	1,008	0
SECONDARY AREA		2,158	2,158	2,158	0
SUBTOTAL ADDITIONAL AREAS		**6,310**	**3,166**	**3,166**	**0**
TOTAL FLOOR AREA		**35,051**	**30,672**	**21,656**	**6,750**
BAGGAGE CLAIM – AIRLINE LOADING SIDE (LF)		70	210	210	0
BAGGAGE CLAIM – PASSENGER SIDE (LF)		140	420	420	0
BAGGAGE CLAIM–AIRLINE LOADING SIDE DEMO (LF)		0	312	312	0
BAGGAGE CLAIM–PASSENDER SIDE DEMO (LF)		0	346	346	0
AIRCRAFT PAVEMENT–15" PCC / 6" CTB / 8" CTS (SF)		91,500	0	0	0

Table 1 FIS Facility Program Summary

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Appendix E. LGB Airport Scope and Capability Analysis

PLEASE NOTE: The information, analysis, assessments and opinions contained in this document are intended for general evaluation purposes only. This document is intended for use only by its specified client and is NOT intended for use, reliance or in making financial/investment decisions by outside parties.

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Feasibility Study for a Federal Inspection Service Facility at Long Beach Airport

LGB Airport Scope and Capability

W9Y17400-1

September 30, 2016

Feasibility Study for a Federal Inspection Service Facility at Long Beach Airport

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7. Critical Landside Components 18
8. Recommendation for Landside Infrastructure Improvement 19

1. LGB Airfield Infrastructure Review

Long Beach Airport (LGB) reported 300,164 annual aircraft operations in FY2015[1]. Aircraft operations included scheduled passenger air carriers, air freight, general aviation, fixed wing and rotorcraft training, government/military flight operations, and other uses. LGB has three active runways, ten supporting taxiways, and various aircraft parking aprons. LGB recently decommissioned two runways (16R-34L and 16L-34R). LGB serves as the west coast focus city for JetBlue Airways (JetBlue), has significant based and transient General Aviation (GA) activity, and is home to Gulfstream Aerospace finishing, delivery, and maintenance facilities.

The tables below provide data on the three active runways and ten taxiways[2].

RUNWAY DATA							
		RUNWAY 12-30		RUNWAY 7L-25R		RUNWAY 7R-25L	
		EXISTING	FUTURE	EXISTING	FUTURE	EXISTING	FUTURE
AIRPORT REFERENCE CODE		D-IV	No Change	D-III	No Change	B-II	No Change
CRITICAL AIRCRAFT	AIRCRAFT	767-300ER	No Change	737-800W	No Change	Cessna Citation II	Beechcraft King Air 200
	WINGSPAN (ft.)	156.2	No Change	112.5	No Change	51.7	54.5
	UNDERCARRIAGE (ft.)	30.50	No Change	18.8	No Change	15	16.25
	APPROACH SPEED (kts.)	145	No Change	142	No Change	108	103
	MAX. TAKEOFF WT. (lbs.)	412,000	No Change	174,200	No Change	13,300	12,500
PHYSICAL LENGTH AND WIDTH		10,000' x 200'	No Change	6,192' x 150'	No Change	5,423' x 150'	3918' x 100'
RUNWAY HIGH POINT (Above Mean Sea Level)		60'	No Change	58'	No Change	53'	No Change
RUNWAY LOW POINT (Above Mean Sea Level)		26'	No Change	38'	No Change	31'	35'
VERTICAL LINE OF SIGHT PROVIDED		Yes	No Change	Yes	No Change	Yes	No Change
EFFECTIVE GRADIENT (%)		0.35	No Change	0.32	No Change	0.39	0.47
MAXIMUM GRADIENT (%)		0.35	No Change	0.32	No Change	0.39	0.47
RUNWAY SURFACE		Asphalt	No Change	Asphalt	No Change	Asphalt	No Change
PAVEMENT STRENGTH (1,000#) - S/D/DT		30/200/300	No Change	30/200/300	No Change	30/75/-	12.5/-/-
RUNWAY EDGE LIGHTING		HIRL/Centerline/TDZ	No Change	HIRL	No Change	HIRL	No Change

Table 1 LGB Runway Data

[1] Federal Aviation Administration (FAA). *Enplanements at All Commercial Service Airports.* March 2016.
[2] Long Beach Airport. *Airport Layout Plan*. September 2016.

RUNWAY END DATA								
APPROACH END OF RUNWAY		Existing	12	30	7L	25R	7R	25L
		Future	No Change	No Change	8L	26R	8R	26L
RUNWAY END COORDINATES	LATITUDE	Existing	33° 49' 34.331" N	33° 48' 24.720" N	33° 49' 21.937" N	33° 49' 21.716" N	33° 48' 49.784" N	33° 48' 49.827" N
		Future	No Change	No Change	No Change	No Change	33° 48' 50.031" N	33° 48' 50.063" N
	LONGITUDE	Existing	118° 09' 41.525" W	118° 08' 17.317" W	118° 09' 48.688" W	118° 08' 35.294" W	118° 09' 40.688" W	118° 08' 36.414" W
		Future	No Change	No Change	No Change	No Change	No Change	118° 08' 54.254" W
RUNWAY END ELEVATIONS (Above Mean Sea Level)		Existing	60.4'	25.7'	58.1'	38.1'	52.8'	31.3'
		Future	No Change	No Change	No Change	No Change	No Change	34.6'
RUNWAY MARKINGS		Existing	Precision	Precision	Non-Precision	Non-Precision	Non-Precision	Non-Precision
		Future	No Change	No Change	No Change	No Change	Visual	Visual
DISPLACED THRESHOLD		Existing	1,350'	2,000'	1,305'	532'	None	1,505'
		Future	No Change	No Change	No Change	No Change	None	None
RUNWAY TOUCH DOWN ZONE ELEVATION (MSL)		Existing	52.9'	38.4'	52.8'	47.6'	58.1'	45.8'
		Future	No Change	No Change	No Change	No Change	No Change	No Change
NAGIVATION AIDS		Existing	PAPI, REIL, GPS	MALSR, PAPI, ILS, GPS, VOR	None	PAPI, REIL, GPS	None	PAPI, REIL
		Future	No Change	No Change	None	No Change	None	No Change
APPROACH VISIBILITY (Minimums)		Existing	1 1/8 mile	1/2 mile	Visual	1 mile	Visual	Visual
		Future	No Change	No Change	No Change	No Change	No Change	No Change
APPROACH SLOPE		Existing	34:1	50:1/40:1	20:1	34:1	20:1	20:1
		Future	No Change	No Change	No Change	34:01:00	No Change	No Change
RUNWAY SAFETY AREA (Width)		Existing	500'		500'		150'	
		Future	No Change		No Change		No Change	
RUNWAY SAFETY AREA (Length Beyond Runway End)		Existing	1000'	414'	219'	240'	300'	300'
		Future	No Change	No Change	No Change	No Change	No Change	No Change
OBSTACLE FREE ZONE (Width)		Existing	400'		400'		400'	
		Future	No Change		No Change		250'	
OBSTACLE FREE ZONE (Length Beyond Runway End)		Existing	200'	200'	163'	200'	200'	200'
		Future	No Change	No Change	No Change	No Change	No Change	No Change
OBJECT FREE AREA (Width)		Existing	800'		800'		500'	
		Future	No Change		No Change		No Change	
OBJECT FREE AREA (Length Beyond Runway End)		Existing	414'	1000'	170'	340'	300'	300'
		Future	No Change	No Change	No Change	No Change	No Change	No Change
DISTANCE FROM RUNWAY CENTERLINE TO HOLD BARS		Existing	244'		239'		148'	
		Future	No Change		125'		200'	

Table 2 LGB Runway End Data

TAXIWAY DATA														
TAXIWAY	AIRPLANE DESIGN		TAXIWAY DESIGN		WIDTH		SURFACE TYPE		RWY CL TO TWY CL		TAXIWAY SAFETY		TAXIWAY OBJECT	
	EXISTING	FUTURE	EXISTING	FUTURE	EXISTING	FUTURE	EXISTING	FUTURE	EXISTING	FUTURE	EXISTING	FUTURE	EXISTING	FUTURE
A	IV	No Change	5	No Change	75'	No Change	Asphalt	No Change	N/A	No Change	171'	No Change	259'	No Change
B	IV	No Change	5	No Change	65'	No Change	Asphalt	No Change	460'	No Change	79'	No Change	131'	No Change
C	IV	No Change	5	No Change	75'	No Change	PCC	No Change	300'	No Change	171'	No Change	259'	No Change
D	IV	No Change	5	No Change	75'	No Change	Asphalt	No Change	350'	No Change	171'	No Change	259'	No Change
E	II	N/A	3	N/A	50'	N/A	Asphalt	No Change	N/A	N/A	49'	N/A	90'	N/A
F	IV	II / III / IV	5	2 / 3 / 5	100'	35' / 50' / 75'	Asphalt	No Change	275'	No Change	79'	No Change	131'	No Change
G	IV	No Change	5	No Change	75'	No Change	Asphalt	No Change	N/A	No Change	171'	No Change	259'	No Change
J	III	No Change	3	No Change	75'	No Change	Asphalt	No Change	400'	No Change	49'	No Change	100'	No Change
K	IV	No Change	5	No Change	75'	No Change	PCC	No Change	400'	400'	<171'	171'	<259'	259'
L	IV	No Change	5	No Change	75'	No Change	Asphalt	No Change	400'	No Change	171'	No Change	259'	No Change

Table 3 LGB Taxiway Data

2. Airside Scope and Capability

Currently, LGB is served by a combination of narrow-body aircraft for commercial flights. As of July 2016, the fleet mix included those in the Airbus A320 family, Boeing 737 family, and the Bombardier CRJ700 and CRJ900. UPS flies the Boeing 767-300F and FedEx flies the Airbus A300F for air cargo operations. From the Market Analysis[3], JetBlue will continue to utilize its A320 fleet to operate potential international flights. All gates and aircraft parking positions at the LGB terminal can accommodate and service the entire A320 family, including the Airbus A321-200, which is the largest variant in the series. All terminal gates are able to accommodate up to Airplane Design Group III, which includes Boeing 737 and Airbus A320. Aircraft parking positions 1, 2, and 10 are wider and can also accommodate Boeing 757-300, which is classified as Airplane Design Group IV.

Manufacturer	Aircraft	AAC[4]	ADG[5]	TDG[6]
Airbus	A300F	C	IV	5
Airbus	A319	C	III	3
Airbus	A320	C	III	3
Airbus	A321	C	III	3
Boeing	737-700W	C	III	3
Boeing	737-800W	D	III	3
Boeing	737-900W	D	III	3
Boeing	757-300W	D	IV	4
Boeing	767-300F	D	IV	5
Bombardier	CRJ700	C	II	3
Bombardier	CRJ900	C	III	3

Table 4 LGB Aircraft Fleet Mix

LGB has the infrastructure to support the next generation of aircraft. Over the last 50 years, the aviation industry has cut fuel consumption, CO_2 emissions by more than 80%, NOx emissions by 90%, and noise by 75%. The technology pipeline of products in development mirrors these improvement trends. The next generation A320neo, the aircraft that will most affect LGB in the future, will reduce emissions and noise while meeting market demands. The A320neo family includes sharklet wingtip devices and engine improvements that will improve its noise footprint by 15 decibels.

There are also many types of aircraft flown by the GA community that are capable of flying to international markets. These include, but are not limited to, the family of Gulfstream Aerospace jets, Cessna Citation jets, and Boeing Business jets.

[3] LaCosta Consulting Group. *Market Analysis For Long Beach Airport.* August 2016.
[4] Aircraft Approach Category (AAC). A grouping of aircraft based on a reference landing speed (V_{REF}), if specified, or if V_{REF} is not specified, 1.3 times stall speed (V_{SO}) at the maximum certificated landing weight. V_{REF}, V_{SO}, and the maximum certificated landing weight are those values as established for the aircraft by the certification authority of the country of registry.
[5] Airplane Design Group (ADG). A classification of aircraft based on wingspan and tail height.
[6] Taxiway Design Group (TDG). A classification of airplanes based on outer to outer Main Gear Width (MGW) and Cockpit to Main Gear distance (CMG).

Inside the terminal, the holdroom level of service was evaluated using International Air Transport Association (IATA) Airport Development Reference Manual, 10th Edition. The key factors used in the IATA approach are:

- Holdroom area.
- Number of aircraft seats.
- Number of passengers based on an assumed load factor.
- Ratio of seated to standing passengers.
- Loss of available seats due to passengers putting personal belongings on an adjacent seat.
- Potential to use seating in an adjacent holdroom.
- Space per seated passenger.
- Space per standing passenger.

The holdroom level of service guideline developed by IATA is based on the available square feet per passenger. IATA defines three levels of service for holdroom size:

- Over Design (>15.6 square feet per passenger).
- Optimum (12.9 to 15.6 square feet per passenger).
- Suboptimum (<12.9 square feet per passenger).

Due to ongoing airline and aircraft scheduling changes, the IATA level of service approach for designing new airport terminals is based on the largest aircraft that can fit on a gate. The results of this analysis are show in Table 5 below.

HOLDROOM LOS BASED ON EXISTING GATE STRIPING							
Gate No.	Actual Area SF	Design Aircraft	Seats	IATA Calc Area SF	IATA LOS SF/PAX		Airline
1	1,825	B757-300	243	2,985	8.8	Suboptimum	--
2	2,345	B757-300	243	2,985	11.4	Suboptimum	--
3	2,356	B737-900W	189	2,389	14.7	Optimum	--
4	1,805	B737-900W	189	2,389	11.2	Suboptimum	--
5	1,807	B737-900W	189	2,389	11.2	Suboptimum	--
6	2,938	B737-900W	189	2,389	18.3	Over Design	--
7	2,944	B737-900W	189	2,389	18.3	Over Design	--
8	2,939	B737-900W	189	2,389	18.3	Over Design	--
9	2,552	B737-900W	189	2,389	15.9	Over Design	--
10-11	2,214	B757-300 & B737-900	432	5,074	6.0	Suboptimum	--

Table 5 Holdroom Level of Service on Existing Gate Striping

A useful analysis for evaluating existing terminal holdrooms is to adapt the IATA approach based on the scheduled aircraft using each gate. The results of this analysis for the existing flight schedule are shown in Table 6 below. Based on IATA standards, holdroom size is “Optimum” or better in all cases. The results indicate that the holdrooms have the capacity and flexibility to accommodate typical airline operational changes to meet market demand, such as additional flights and larger aircraft.

HOLDROOM LOS BASED ON EXISTING FLIGHT SCHEDULE							
Gate No.	Actual Area SF	Design Aircraft	Seats	IATA Calc Area SF	IATA LOS SF/PAX		Airline
1	1,825	B737-700	148	1,936	14.5	Optimum	Southwest
2	2,345	CRJ9	90	1,295	30.7	Over Design	Delta
3	2,356	CRJ9	90	1,295	30.8	Over Design	American
4	1,805	--	--	--	--		Unassigned
5	1,807	A320	150	1,958	14.2	Optimum	JetBlue
6	2,938	A320	150	1,958	23.0	Over Design	JetBlue
7	2,944	A320	150	1,958	23.1	Over Design	JetBlue
8	2,939	A320	150	1,958	23.1	Over Design	JetBlue
9	2,552	--	--	--	--		Unassigned
10-11	2,214	--	--	--	--		Unassigned

Table 6 Holdroom Level of Service on Existing Flight Schedule

The holdrooms were also analyzed with the potential additional of international flights for both a South and North FIS Options in in Tables 7 and 8 below. The results indicate that based on IATA standards, the holdroom size is "Optimum" or better in all cases.

HOLDROOM LOS BASED ON FUTURE FLIGHT SCHEDULE (SOUTH FIS)							
Gate No.	Actual Area SF	Design Aircraft	Seats	IATA Calc Area SF	IATA LOS SF/PAX		Airline
1	1,825	A320	150	1,958	14.3	Optimum	JetBlue
2	2,345	A320	150	1,958	18.4	Over Design	JetBlue
3	2,356	A320	150	1,958	18.5	Over Design	JetBlue
4	1,805	A320	150	1,958	14.2	Optimum	JetBlue
5	1,807	A320	150	1,958	14.2	Optimum	JetBlue
6	2,938	A320	150	1,958	23.0	Over Design	JetBlue
7	2,944	A320	150	1,958	23.1	Over Design	JetBlue
8	2,939	CRJ9	90	1,295	38.4	Over Design	American
9	2,552	CRJ9	90	1,295	33.4	Over Design	Delta
10-11	2,214	B737-700	148	1,936	17.6	Over Design	Southwest

Table 7 Holdroom Level of Service Based on Future Flight Schedule for South FIS Facility Option

HOLDROOM LOS BASED ON FUTURE FLIGHT SCHEDULE (NORTH FIS)							
Holdroom Gate No.	Actual Area SF	Design Aircraft	Seats	IATA Calc Area SF	IATA LOS SF/PAX		Airline
1	1,825	B737-700	148	1,936	14.5	Optimum	Southwest
2	2,345	CRJ9	90	1,295	30.7	Over Design	Delta
3	2,356	CRJ9	90	1,295	30.8	Over Design	American
4	1,805	A320	150	1,958	14.2	Optimum	JetBlue
5	1,807	A320	150	1,958	14.2	Optimum	JetBlue
6	2,938	A320	150	1,958	23.0	Over Design	JetBlue
7	2,944	A320	150	1,958	23.1	Over Design	JetBlue
8	2,939	A320	150	1,958	23.1	Over Design	JetBlue
9	2,552	A320	150	1,958	20.0	Over Design	JetBlue
10-11	2,214	A320	150	1,958	17.4	Over Design	JetBlue

Table 8 Holdroom Level of Service on Future Flight Schedule for North FIS Facility Option

Figure 1 shows all arriving international passengers based on time using the Market Analysis simulated international flight schedule. Peak time periods for arrivals would be in the early afternoon in the 1:40PM to 2:30PM time range, around 4:45PM, and around 7:40PM.

Figure 2 shows domestic passenger flow using the existing flight schedule. The combined number of passengers is below 1,000 per rolling 60 minutes.

Figure 3 shows domestic and international passenger flow using the Market Analysis simulated international flight schedule. There are peak periods on the afternoon where the combined number of passengers is above 1,000 per rolling 60 minutes.

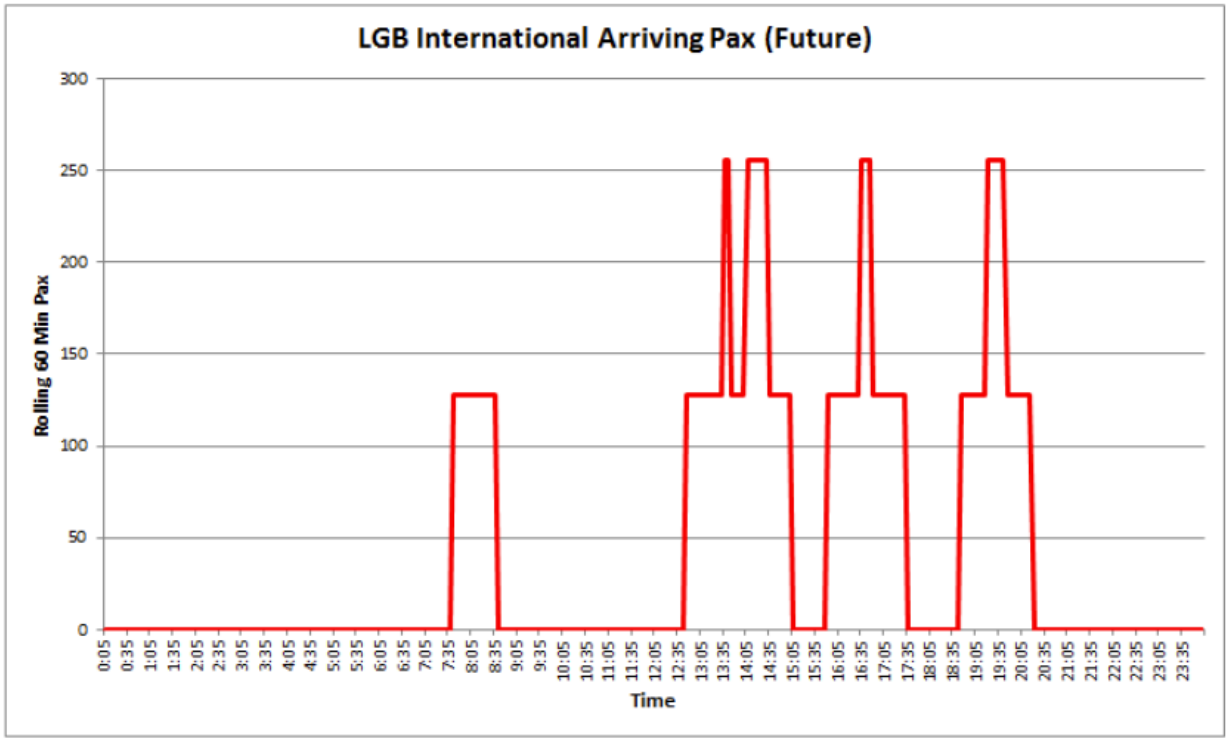


Figure 1 International Arriving Passenger Flow Based on Future Flight Schedule

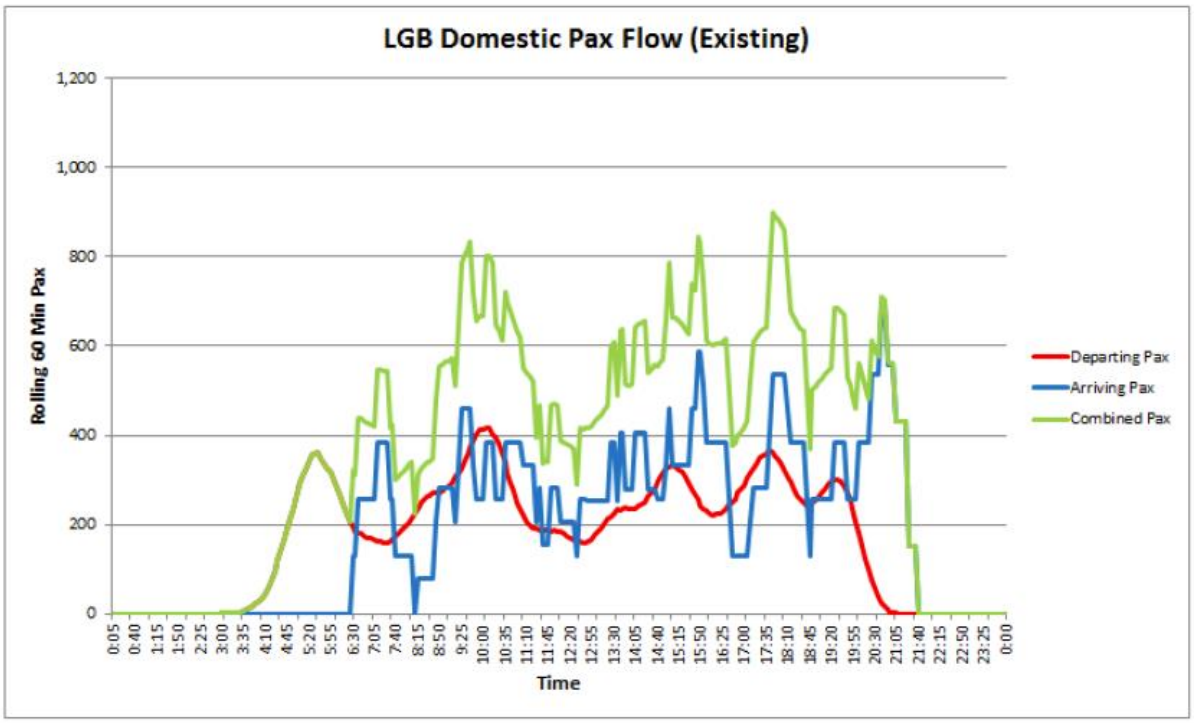


Figure 2 Domestic Passenger Flow Based on Existing Flight Schedule

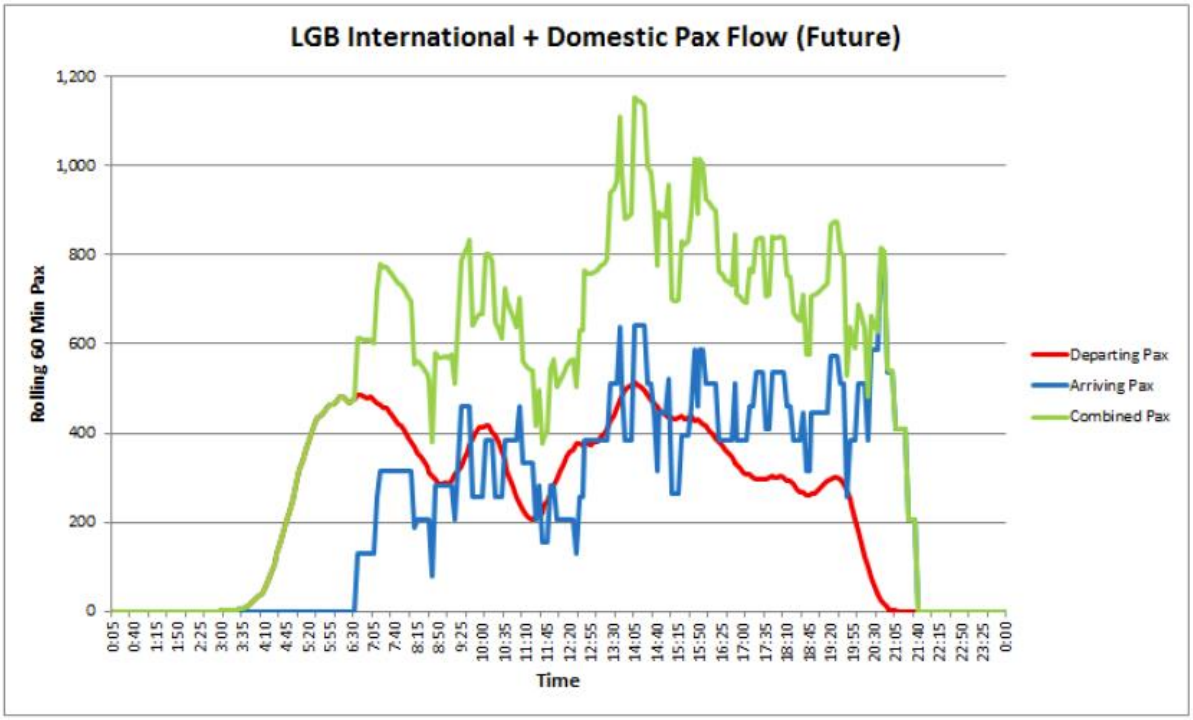


Figure 3 Domestic and International Passenger Flow Based on Future Flight Schedule

3. Critical Airside Components

The critical airside component of an airport is the runway and taxiway system. The primary runway for air carrier operation is Runway 12-30. The secondary runway for air carrier operation is Runway 7L-25R. The primary taxiways between the air carrier runways and the terminal are Taxiways C, K, and L.

Airside Component	AAC[4]	ADG[5]	TDG[6]
Runway 12-30	D	IV	
Runway 7L-25R	D	III	
Taxiway C		IV	5
Taxiway K		IV	5
Taxiway L		IV	5

Table 4 Critical Airfield Components

Other critical components are aircraft parking positons and gates. To support international flight service, LGB will need to have the appropriate amount of aircraft parking positions. As noted in *Federal Inspection Service Facility Development Alternatives*[7], there are three potential options – a north FIS alternative and two south FIS alternatives.

The south concourse has four aircraft gates and is supported by aircraft parking positions 1 – 4. The north concourse has seven aircraft gates and is supported by aircraft parking positions 5 – 11. In Option 1, the current aircraft parking position 11 would be decommissioned, and new parking positions 11 and 12 would need to be constructed. The new aircraft parking positions 11 and 12 would be the primary parking positions for Option 1.

For Options 2 and 3 aircraft parking positions 1 and 2 would be the primary aircraft parking positions; no new aircraft parking construction is needed.

The following table provides information regarding aircraft parking capabilities at each of the existing aircraft parking positions within the Terminal Area.

	Aircraft Parking Positions										
	1	2	3	4	5	6	7	8	9	10	11
A320	✈	✈	✈	✈	✈	✈	✈	✈	✈	✈	✈
A321-100	✈	✈	✈	✈	✈	✈	✈	✈	✈	✈	✈
B737-700W	✈	✈	✈	✈	✈	✈	✈	✈	✈	✈	✈
B737-900W	✈	✈	✈	✈	✈	✈	✈	✈	✈	✈	✈
B757-300	✈	✈								✈	
B757-200W	✈	✈								✈	
CRJ700	✈	✈	✈	✈	✈	✈	✈	✈	✈	✈	✈
CRJ900	✈	✈	✈	✈	✈	✈	✈	✈	✈	✈	✈

Table 5 Existing Aircraft Parking Positions

[7] Jacobs. *Federal Inspection Service Facility Development Alternatives.* August 2016.

4. Recommendation for Airside Infrastructure Improvements

Option 1 would require two aircraft parking positions to be constructed. Aircraft parking position 11 would be decommissioned, and new parking positions 11 and 12 would need to be constructed. The new aircraft parking positions 11 and 12 would be the primary positions for Option 1.

Options 2 and 3 require no new parking positions to be constructed. For Option 3, the current Security Screening Checkpoint (SSCP) located on the south side will need to be repurposed as part of the FIS Facility and a new SSCP would be constructed on the north side.

Within the existing concourse, Outbound Search Rooms (OSR) will need to be constructed per U.S. Customs and Border Protection (CBP) Airport Technical Design Standard (ATDS) requirements[8]. One OSR will be needed for each two gates serving international departures. Option 1 would require one OSR in the north concourse; Options 2 and 3 would require one OSR in the south concourse.

[8] U.S. Customs and Border Protection. *Airport Technical Design Standard. Signature Version.* June 2012.

5. LGB Landside Infrastructure Review

LGB is situated on approximately 1,166 acres in central Long Beach on Donald Douglas Drive and is located just north of Interstate-405 (I-405) and bound by Cherry Avenue to the west, City of Lakewood and Douglas Park to the north, and North Lakewood Boulevard to the east.

Vehicular access to LGB is provided at North Lakewood Boulevard at Donald Douglas Drive/East Wardlow Road. Donald Douglas Drive loops into LGB providing access to the terminal as well as the short term parking structure (Lot A), long term parking structure (Lot B), car rental lot, and office spaces. Also present is an extension of the south side of the Donald Douglas Drive to exit onto North Lakewood Boulevard, with southbound North Lakewood Boulevard access (right turn) only.

In November 2005, an Environmental Impact Report (EIR) was conducted for the Long Beach Airport Terminal Area Improvement Project[9]. The EIR evaluated the potential impacts associated with additional commercial carrier flights and full utilization of the 25 minimum commuter flights provided for in the Airport Noise Compatibility Ordinance. The full utilization of 25 commuter flights and a total of 52 commercial carrier flights are identified as the Optimized Flights scenario in the EIR.

With the Optimized Flights scenario, the EIR evaluated traffic impact for future Year 2020 and concluded that the full utilization of commuter and commercial flights are not causally related[9].

The Optimized Flights scenario is the maximum reasonable flight level that could potentially occur with optimized operational procedures and aircraft and still be within the noise budgets permitted by the Airport Noise Compatibility Ordinance[9].

Currently, all passenger access to LGB is via Donald Douglas Drive and North Lakewood Boulevard.

Lakewood Boulevard runs north-south and is classified as a regional roadway in the City of Long Beach's General Plan. There are four lanes in each direction within the study area, a raised median, and a 45 MPH speed limit. In 2014, the daily traffic volume was approximately 44,300 vehicles per day.

Donald Douglas Drive serves as the entrance road to the Long Beach Airport as well as a limited amount of office space; Million Air, a franchised GA services company; Gulfstream aircraft manufacturing; and other aviation businesses. Donald Douglas Drive forms a one-way, two-lane loop through the terminal area. The roadway is two lanes in each direction between the loop and North Lakewood Boulevard. In 2016, the daily traffic volume was approximately 13,000 vehicles per day.

The street opposite of Donald Douglas Drive at Lakewood Boulevard, East Wardlow Road, is a four-lane roadway with a 35 mile per hour speed limit. The daily traffic volume in 2014 was approximately 10,500 vehicles per day.

Parking capacity was analyzed using the following data obtained from Long Beach Airport staff:

- Daily overnight night volumes from 2015.
- Monthly enplaned passenger activity from 2015.
- Annual enplaned passenger activity from 2015.
- Number of existing parking stalls in Lots A and B.
- Existing and future planning day flight schedules.

There are a total of 3,007 parking stalls in Lots A and B (1,018 parking stalls in Lot A and 1,989 parking stalls in Lot B). July was the busiest month of the year for passenger activity in 2015. During that month, the greatest

[9] BonTerra Consulting. *Long Beach Airport Terminal Area Improvement Project EIR.* November 2005.

number of overnight parked vehicles was 1,401. This represents a parking demand level that is approximately 47% of total parking capacity.

The future planning day flight schedule has a 22.5% increase in the number seats compared to the existing flight schedule. Assuming the same parking patterns, an increase of 22.5% in passenger activity would result in an overnight demand in July for 1,716 parking stalls, or 57% of capacity.

There appears to be ample parking capacity to meet demand into the future for many scenarios:

- Growth from the increased passenger activity of new international flights.
- Variations in overnight parking demand during months where there may fewer passengers but length of stay increases (e.g. seasonal business versus leisure traffic).
- Annual year over year growth.

LGB is currently served by four Long Beach Transit routes with connections to major locations in Los Angeles County and Orange County. Long Beach Transit Route #111 runs between Downtown Long Beach and Lakewood Center Mall. From the Downtown Long Beach Transit Mall, the route travels through Long Beach along Broadway, crossing Cherry Avenue, Redondo Avenue; then along Ximeno Avenue to North Lakewood Boulevard. It then proceeds north along North Lakewood Boulevard, then through LGB, then continues north towards the Lakewood Mall and South Street where it then continues south back to Downtown Long Beach. Route #111 operates daily and starts operation at about 5:00 AM and runs until 12:30AM.

Long Beach Transit Routes #102 and #104 both serve the same route but different days of operations. The route starts at Carson Street and Norwalk Boulevard, travels south along Norwalk Boulevard, then west along East Wardlow Road, then south along Studebaker Road, then west along Spring Street into LGB, and then continuing down North Lakewood Boulevard and traveling west on Willow Street towards Santa Fe Ave. Route #102 operates only on weekdays from around 5:30 AM until 9:00 PM. Route #104 operates daily with weekday service beginning at 6:00 AM until 7:00 PM and weekend service from 6:45 AM until 6:40 PM.

Long Beach Transit Route #176 provides transit between Technology Place on PCH and Lakewood Mall. The route starts at Technology Place and runs east along PCH before continuing north on Lakewood Boulevard, stopping at LGB, and then continuing north again along North Lakewood Boulevard, east on Carson Street, and then north along Clark Ave to Lakewood Mall . Route #176 operates only on weekdays from around 6:45 AM until 6:15 PM.

6. Traffic Flow Model

To assess current traffic conditions at Long Beach Airport, a traffic study was conducted in May 2016 to analyze key points such as the entrance and exit of LGB and various locations along Donald Douglas Drive. The intersection of Lakewood Boulevard and Donald Douglas Drive/East Wardlow Road was set up with cameras to record all movements for three peak hour periods on May 17, 2016: 7-9AM, 4-6PM, and 9-11PM. A similar camera set up was established at the Donald Douglas Drive exit onto North Lakewood Boulevard. One-way tube counts were set up all along Donald Douglas Drive and connecting roads at 14 strategic locations to count the number of vehicles driving over these points over a 24 hour period on May 17, 2016. Two-way tube counts were set up a few feet in from the main entrance into LGB as well as a few feet before the south side exit to capture the number of vehicles coming into and out of the Airport for a full one week period.

The video-based data collection set up at the intersection and exit of the Airport allows for recording of turning movements to accurately count all vehicles and pedestrians activity at these busy locations. The light weight and inconspicuous camera systems were installed by a single Field Technician in less than ten minutes. The small, neutral-colored enclosures were mounted on existing infrastructure, in this case the traffic light poles, well above the average individual's sightline. In this way, the camera systems do not impact the public's behavior.

After the video is recorded, the data is reviewed in the field and also at a local operations office before being sent to a Video Reduction Center (VRC) where it is processed to produce highly accurate data. At the VRC, video quality and accuracy of paperwork is verified before the video is backed-up to the consultant's secure server. Trained technicians then reduce the digital video footage into usable data, typically at speeds faster than real-time. This allows for more efficient collection of traffic data, and significantly increases efficiency when counting slow-moving traffic such as pedestrians and cyclists.

For less complex study locations where vehicles are typically driving straight, the tube count system was used to capture vehicle data. The system consists of small black rubber hoses placed perpendicular to the flow of traffic and away from curves, driveways, and turn lanes to measure the number of cars traveling a particular stretch of roadway over a 24 hour period. The tubes cannot be placed in areas where vehicles will stop or park on them. To understand where vehicles are going (i.e. main terminal, parking structure, offices, car rental, etc.), tubes were set up before and after connecting roads (Barbara London Drive) where vehicles may turn into. The black rubber tubes are closed on one end and are held down by ropes tied to nails on the ground. The other end is plugged into a device called a counter. Gorilla tape was used to keep the tubes from excessively moving. When the wheel of a car hits the tube, the pressure creates a pneumatic (air) pulse, which is measured by the counter. The counter records each individual hit with a timestamp. This information was used to create reports about the number of vehicles using a particular stretch of roadway.

The figure below shows the locations of where the traffic study was conducted. The red pins represent the turn movement counts with the camera system for peak hour periods in one day; the blue pins represent the one-way tube counts for a full 24 hour period; the purple pins represent the two-way tube counts for a full 7 day period.

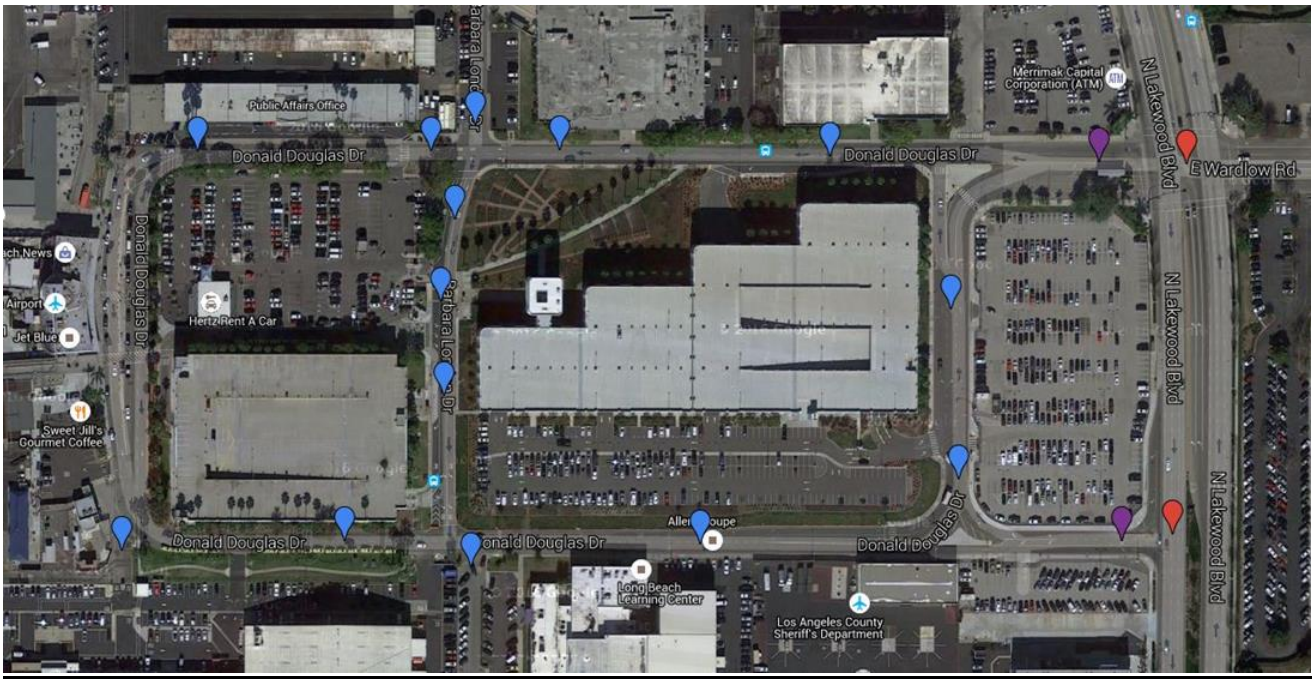


Figure 4 Map of Traffic Study Locations

In addition to vehicular traffic condition, passenger traffic entering and exiting the terminal was evaluated. Using the existing flight schedule with the Market Analysis simulated international flight schedule, passenger traffic models were created to review potential impacts to the terminal and front curb area.

The next step is to convert the passenger volumes below into vehicle volumes based on an assumed mode split. Using this data, a roadway curb analysis was performed to determine the Level of Service for the curb in front of the terminal and the outer curb that sits in the middle of the road lanes of Donald Douglas Drive in front of the terminal.

The methodology for determining capacity and level of service for the vehicle curbside used an industry standard approach that is described below.

STEP 1—The capacity and level of service analysis for the vehicle curbside used planning day flight schedules for two activity levels: 1) a current existing planning day flight schedule; and 2) a future planning day flight schedule with potential new international flights. The planning day flight schedules represent activity on an average day in a busy month, and included the following data:

- Airline
- Aircraft type and number of seats
- Scheduled arrival and departure times
- Load factor (percentage of passengers relative to total seats), assumed to be 85% for all flights
- Terminating factor (percentage of local passengers not connecting to another flight), assumed to be 100% for all flights

STEP 2—The planning day flight schedules were used to model passenger volumes throughout the planning day on a clock hour, 5-minute, and rolling 60-minute basis. Passenger volumes were calculated for arriving, departing and combined (total arriving and departing) flows. In addition to the data described in STEP 1, additional assumptions included:

- Passenger reporting profile assumptions for departing passengers (percentage at the terminal prior to scheduled departure time). The profile varied based on time of day and whether the flight was domestic or international.

- Passenger reporting profile assumptions for arriving passengers (percentage at the curb after scheduled arrival time).

STEP 3—Passenger volumes were converted to vehicle volumes based on the following factors:
- Average mode share (private vehicle, rental car, taxi, limousine, shuttle, and public transit).
- Average vehicle occupancy for each mode.

STEP 4—Vehicle volumes derived from the current existing flight schedule were compared to clock hour survey data available from the same time period. The purpose of this calibration was to ensure that the analytical models were reasonably representing actual volumes during the combined peak, which is used for subsequent curbside capacity and level of service analysis. The method used for this calibration was GEH statistic, a standard formula used in traffic modeling to compare two sets of traffic volumes. A GEH value of 5.0 or less is considered a good match between modeled and actual volumes. The modeled volumes during the combined peak (greatest demand on the curb) had a GEH value of 1.0 compared to survey data on May 19, 2016 and 2.7 on May 19, 2016.

STEP 5—Vehicle curbside capacity and level of service was analyzed for the current and future activity levels using the rolling 60-minute volume during the combined peak (largest total arriving and departing volume). The curb analysis used level of level of service designations from the Highway Capacity Manual ("LOS A" through "LOS F").

The key assumptions used in the curbside model are as follows:
- Peak hour design volume for each vehicle mode at the combined peak
- Average vehicle dwell time for each mode
- Effective vehicle length for each mode
- Effective curb length
- Number of curb parking lanes
- Number of curb through lanes
- Through lane capacity (vehicles per hour)

The results for the vehicle curbside analysis are as follows:
- The comparison of modeled to actual roadway clock hour volumes was a good match during the combined peak (largest total arriving and departing clock hour volume). This validates the model for use in the subsequent curbside analysis.
- The existing curbside is configured with dual inner and outer curbsides. Each curbside has two lanes. A single roadway lane goes into and out of each curbside. The level of service performance of the existing dual curbside is acceptable with the current existing flight schedule demand. The level of service performance of the existing dual curbside is at or near capacity with the future flight schedule demand. The level of service performance with the future flight schedule demand can be improved, made acceptable and better than exists today, with conversion to a four-lane single curb with two roadway lanes going into and out of the curbside.

With the existing flight schedule, the inner curb traffic received a Level of Service score of C; the outer curb traffic received a Level of Service score of A. With the simulated international flight schedule, the inner curb traffic received a Level of Service score of E; the outer curb traffic received a Level of Service score of B. The decrease in Level of Service score for the simulated flight schedule is due to the increased passenger flow from the international departures and arrivals.

A roadway curb Level of Service analysis was performed for a situation where there is no outer curb and only the existing curb directly in front of the terminal. It received a Level of Service Score of B.

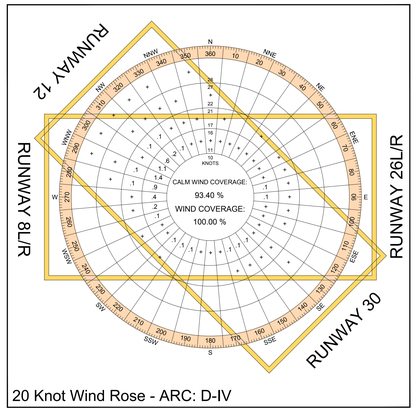
7. Critical Landside Components

The critical components of an airport are the areas in front of the terminal for passenger drop off and pickup, passenger and employee parking, and pre-security infrastructure. Most passengers will enter the airport through some mode of transportation such as personal cars, public transportation, taxis, etc.

8. Recommendation for Landside Infrastructure Improvement

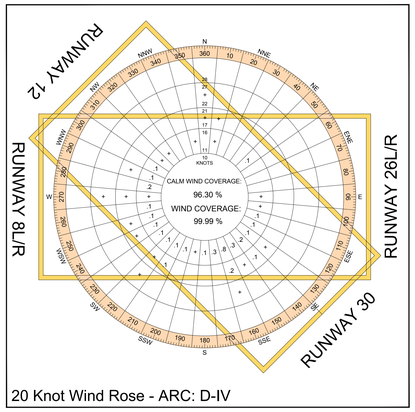
Based on analysis of the traffic study data and results of the traffic flow model , removing the island curb in front of the Terminal will ease vehicle congestion and improve the level of service for LGB. Removing the island curb will allow for the construction of two drop off/pickup lanes and two through-traffic lanes. Level of service is estimated to increase from E (poor) to B (good) for the simulated LGB schedule activity with international flights. This improvement is recommended regardless of development of the FIS Facility as it will also improve level of service from C (fair) to B (good) for the existing LGB schedule activity. Additional reduction of vehicle congestion in front of the Terminal can be realized through the relocation of the entrance to the Gulfstream leasehold to the intersection of Barbara London Drive and Donald Douglas Drive.

VFR WIND ROSE



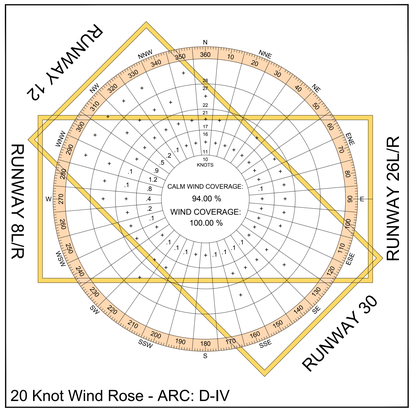
20 Knot Wind Rose - ARC: D-IV

IFR WIND ROSE



20 Knot Wind Rose - ARC: D-IV

ALL WEATHER WIND ROSE



20 Knot Wind Rose - ARC: D-IV

EX. / FUT. RUNWAY 12-30 WIND COVERAGE

CROSSWIND COMPONENT	VFR COVERAGE	IFR COVERAGE	ALL WEATHER COVERAGE
10.5 Knots	99.05%	98.99%	99.10%
13 Knots	99.67%	99.38%	99.66%
16 Knots	99.97%	99.78%	99.95%
20 Knots	100.00%	99.96%	99.99%

ALL RUNWAYS WIND COVERAGE

CROSSWIND COMPONENT	VFR COVERAGE	IFR COVERAGE	ALL WEATHER COVERAGE
10.5 Knots	99.78%	99.47%	99.77%
13 Knots	99.94%	99.75%	99.93%
16 Knots	100.00%	99.92%	99.99%
20 Knots	100.00%	99.99%	100.00%

(1)Data collected from the National Oceanic and Atmospheric Administration's (NOAA); National Climactic Data Center (NCDC); Station: Long Beach Daugherty Field Airport; Dates: 12/2005 through 12/2015; Number of Observations: 120,248.
(2)IFR Conditions occur approximately 7.5% of each year.

FUT. RUNWAYS 8L/R-26L/R WIND COVERAGE

CROSSWIND COMPONENT	VFR COVERAGE	IFR COVERAGE	ALL WEATHER COVERAGE
10.5 Knots	99.04%	97.73	98.99%
13 Knots	99.56%	98.69%	99.52%
16 Knots	99.90%	99.61%	99.88%
20 Knots	99.97%	99.93%	99.97%

EXISTING/FUTURE DECLARED DISTANCES

RUNWAY	TORA	TODA	LDA	ASDA
Existing/Future 12 (1)	10,000'	10,000'	8,650'	10,000'
Existing/Future 30 (1)	10,000'	10,000'	7,414'	9,414'
Existing 7L	6,192'	6,192'	4,887'	6,192'
Future 8L	6,192'	6,192'	4,887'	6,192'
Existing 25R	6,192'	6,192'	5,660'	6,192'
Future 26R	6,192'	6,192'	5,660'	6,192'
Existing 7R	5,423'	5,423'	5,423'	5,423'
Future 8R	3,918'	3,918'	3,918'	3,918'
Existing 25L	5,423'	5,423'	3,918'	5,423'
Future 26L	3,918'	3,918'	3,918'	3,918'

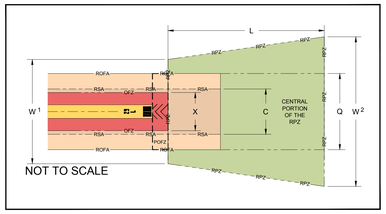
(1)See Sheet 6 for more detail regarding the existing and future declared distances at LGB.

AIRPORT DATA

CATEGORY	DATA
Airport Elevation	60.4' (MSL)
Existing Airport Reference Point	Lat. 33° 49' 03.480" Long. 118° 09' 05.310"
Future Airport Reference Point	Lat. 33° 49' 04.546" Long. 118° 09' 06.808"
Mean Max Temperature Hottest Month	83.8° F. / 28.8° C., August
Aircraft Rescue and Firefighting Index	C
Combined Wind Coverage (all Weather 20 kts)	100.00%
Distance & Direction From Long Beach	3 Miles NE
Time Zone	UTC -8 (UTC -7 during Daylight Saving Time)
Owner	City of Long Beach
Magnetic Declination	12° 3' East September 2016; Source: NOAA NGDC
Existing/Future Airport Reference Code (ARC)	D-IV
Terminal Navigational Aids	ILS / VOR / RNAV
Visual Navigational Aids	PAPI CL Lights, TDZ Lights, HIRL, REIL MALSR, Beacon
Airport Role	Commercial Service - Small Hub
Sectional Chart	Los Angeles
TRACON	Southern California TRACON (SCT)
ARTCC	Los Angeles Center
Airport Use	Public Facility
Location	Long Beach, CA

Long Beach Airport (Daugherty Field) (LGB)

SAFETY AREA KEY MAP



EXISTING/FUTURE RUNWAY DATA TABLE

CATEGORY	12		30		7L	8L	25R	26R	7R	8R	25L	26L
	EXISTING	FUTURE	EXISTING	FUTURE	EXISTING	FUTURE	EXISTING	FUTURE	EXISTING	FUTURE	EXISTING	FUTURE
Runway Length	10,000'	Same	10,000'	Same	6,192'	Same	6,192'	Same	5,423'	3,918'	5,423'	3,918'
Runway Width	200'	Same	200'	Same	150'	Same	150'	Same	150'	100'	150'	100'
End Elevation (MSL) (1)	60.4'	Same	25.7'	Same	58.1'	Same	38.1'	Same	52.8'	Same	31.3'	34.6'
Touchdown Zone Elevation (MSL)	52.9'	Same	38.4'	Same	52.8'	Same	47.6'	Same	58.1'	Same	45.8'	54.3
Pavement Classification Number (PCN)	62/F/A/X/T	Same	62/F/A/X/T	Same	54/F/B/W/T	Same	54/F/B/W/T	Same		Same		Same
Pavement Strength (x 1,000 lbs.)	S-30 D-200 DT-300	Same	S-30 D-200 DT-300	Same	S-30 D-70 DT-110	Same	S-30 D-70 DT-110	Same	S-30 D-75	S-12.5	S-30 D-75	S-12.5
Runway Lighting	HIRL / CL	Same	HIRL / CL / TDZ	Same	HIRL	Same	HIRL	Same	HIRL	Same	HIRL	Same
Runway Marking	Precision	Same	Precision	Same	Non-Precision	Same	Non-Precision	Same	Non-Precision	Visual	Non-Precision	Visual
Taxiway Lighting	MITL	Same	MITL	Same	MITL	Same	MITL	Same	MITL	Same	MITL	Same
FAR Part 77 Category	Non-Precision	Same	Precision	Same	Visual	Same	Non-Precision	Same	Visual	Visual (Utility)	Visual	Visual (Utility)
Runway Decision Height (MSL)	325'	Same	212'	Same	Visual	Same	304'	Same	Visual	Same	Visual	Same
Approach Visibility Minimums	1 1/8 Mile	Same	1/2 Mile	Same	Visual	Same	1 Mile	Same	Visual	Same	Visual	Same
Approach Slope	34:1	Same	50:1 / 40:1	Same	20:1	Same	34:1	Same	20:1	Same	20:1	Same
Departure Surface Slope	40:1	Same	40:1	Same	40:1	Same	40:1	Same	40:1	Same	40:1	Same
Runway Surface Composition	Asphalt	Same	Asphalt	Same	Asphalt	Same	Asphalt	Same	Asphalt	Same	Asphalt	Same
Runway End Coordinates (1) -Latitude -Longitude	33° 49' 34.331" 118° 09' 41.525"	Same	33° 48' 24.720" 118° 08' 17.317"	Same	33° 49' 21.937" 118° 09' 48.688"	Same	33° 49' 21.716" 118° 08' 35.294"	Same	33° 48' 49.784" 118° 09' 40.688"	33° 48' 50.031" 118° 09' 40.688"	33° 48' 49.827" 118° 08' 36.414"	33° 48' 50.063" 118° 08' 54.254"
Displaced Threshold -Displacement -Elevation	1350' 52.9'	Same	2,000' 31.2'	Same	1,305' 52.8'	Same	532' 39.5'	Same	None	None	1,505' 34.6'	None
Displaced Threshold Coordinates -Latitude -Longitude	33° 49' 24.937" 118° 09' 30.155"	Same	33° 48' 38.644" 118° 08' 34.157"	Same	33° 49' 21.894" 118° 09' 33.215"	Same	33° 49' 21.737" 118° 08' 41.599"	Same	None	None	33° 48' 49.820" 118° 08' 54.254"	None
Maximum Elevation	60.4'	Same	60.4'	Same	58.1'	Same	58.1'	Same	52.8'	Same	52.8'	Same
Minimum Elevation	25.7'	Same	25.7'	Same	38.1'	Same	38.1'	Same	31.3'	34.6'	31.3'	34.6'
Effective Gradient %	0.35	Same	0.35	Same	0.32	Same	0.32	Same	0.39	0.47	0.39	0.47
Maximum Gradient %	0.35	Same	0.35	Same	0.32	Same	0.32	Same	0.39	0.47	0.39	0.47
Runway Geodetic Azimuth	134.72°	Same	314.73°	Same	90.20°	Same	270.21°	Same	89.95°	Same	269.96°	Same
Magnetic Heading	122.63°	Same	302.65°	Same	78.12°	Same	258.13°	Same	77.87°	Same	257.88°	Same
Navaids and Visual Aids	PAPI, REIL GPS	Same	MALSR, PAPI ILS, GPS, VOR	Same	None	Same	PAPI, REIL GPS	Same	None	Same	PAPI, REIL	Same
Line of Sight Requirement Met	Yes	Same	Yes	Same	Yes	Same	Yes	Same	Yes	Same	Yes	Same
Approach Reference Code / Runway Design Code (RDC)	D/IV/5000	Same	D/IV/2400	Same	D/III/VIS	Same	D/III/5000	Same	B/II/VIS	B/II/VIS Small Airc.	B/II/VIS	B/II/VIS Small Airc.
Departure Reference Code	D/IV	Same	D/IV	Same	D/III	Same	D/III	Same	B/II	Same	B/II	Same
Aeronautical Survey Classification	Vertically Guided	Same	Vertically Guided	Same	Vertically Guided	Same	Vertically Guided	Same	Non-Vertically Guided	Same	Non-Vertically Guided	Same
Critical Design Aircraft	Boeing 767-300ER	Same	Boeing 767-300ER	Same	Boeing 737-800W	Same	Boeing 737-800W	Same	Cessna Citation II	Beechcraft King Air 200	Cessna Citation II	Beechcraft King Air 200
Taxiway Design Group	5	Same	5	Same	3	Same	3	Same	2	2	2	2
Critical Design Aircraft Wingspan	156.2'	Same	156.2'	Same	112.5'	Same	112.5'	Same	51.7'	54.5'	51.7'	54.5'
Criticial Design Aircraft Approach Speed (Knots)	145	Same	145	Same	142	Same	142	Same	108	103	108	103
Critical Design Aircraft Undercarriage Width	30.5'	Same	30.5'	Same	18.8'	Same	18.8'	Same	15.00'	16.25'	15.00'	16.25'
Critical Design Aircraft Tail Height	52.6'	Same	52.6'	Same	41.2'	Same	41.2'	Same	12.5'	15.0'	12.5'	15.0'
Critical Aircraft MTOW (LBS)	412,000	Same	412,000	Same	174,200	Same	174,200	Same	13,300	12,500	13,300	12,500
Blast Pad Dimensions (L x W in Feet)	200' X 250'	Same	200' X 250'	Same	None	200' X 200'	None	200' X 200'	None	150' x 95'	None	150' x 95'

(1)Runway end coordinates and elevations were surveyed in accordance with FAA AC 150/5300-18B by Woolpert.
(2)Horizontal Datum: North American Datum of 1983 (NAD 83 2010.00 Adjustment).
(3)Vertical Datum: North American Vertical Datum 1988 (NAVD 1988).
(4)Existing and future blast pads are asphalt.
(5)Taxiways are 75' wide unless otherwise dimensioned on Sheets 3 and 4 of this ALP set.
(6)Taxiway surface composition at LGB is composed of both AC and PCC, refer to the Taxiway Group Data Table.

EX. / FUT. SEPARATION & HOLD BAR DATA

DISTANCE FROM	DISTANCE TO	SEPARATION
Runway 12-30 Centerline	Runway 12-30 Holdbars	244'
Ex. Runway 7L-25R Centerline	Ex. Runway 7L-25R Holdbars	239'
Fut. Runway 8L-26R Centerline	Fut. Runway 8L-26R Holdbars	125'
Ex. Runway 7R-25L Centerline	Ex. Runway 7R-25L Holdbars	148'
Fut. Runway 8R-26L Centerline	Fut. Runway 8R-26L Holdbars	200'
Runway 12-30 Centerline	Taxiway D Centerline	350'/400' (1)
Runway 12-30 Centerline	Taxiway L Centerline	400'
Ex. Runway 7L-25R Centerline	Taxiway K Centerline	400'
Fut. Runway 8L-26R Centerline	Taxiway K Centerline	400'
Ex. Runway 7R-25L Centerline	Taxiway F Centerline	275'
Fut. Runway 8R-26L Centerline	Taxiway F Centerline	
Ex. Runway 7R-25L Centerline	Taxiway J Centerline	400'
Fut. Runway 8R-26L Centerline	Taxiway J Centerline	
Ex. Runway 7L-25R Centerline	Ex. Runway 7R-25L Centerline	3,239'
Fut. Runway 8L-26R Centerline	Fut. Runway 8R-26L Centerline	
Taxiway L1 Centerline	Taxiway L2 Centerline	340'
ADG IV Taxiway Centerline	Fixed Or Moveable Object	129.5'
ADG IV Taxilane Centerline	Fixed Or Moveable Object	112.5'
ADG IV TSA		171'
ADG IV Taxiway OFA		259'
ADG IV Taxilane OFA		225'
ADG IV TWY Wingtip Clearance		44'
ADG IV TLN Wingtip Clearance		27'
ADG III Taxiway Centerline	Fixed Or Moveable Object	93'
ADG III Taxilane Centerline	Fixed Or Moveable Object	81'
ADG III TSA		118'
ADG III Taxiway OFA		186'
ADG III Taxilane OFA		162'
ADG III TWY Wingtip Clearance		34'
ADG III TLN Wingtip Clearance		27'
ADG II Taxiway Centerline	Fixed Or Moveable Object	65.5'
ADG II Taxilane Centerline	Fixed Or Moveable Object	57.5'
ADG II TSA		79'
ADG II Taxiway OFA		131'
ADG II Taxilane OFA		115'
ADG II TWY Wingtip Clearance		26'
ADG II TLN Wingtip Clearance		18'
ADG I Taxilane OFA		79'
ADG I TLN Wingtip Clearance		15'
TDG 5 Edge Safety Margin		15'
TDG 5 Shoulder Width		30'
TDG 3 Edge Safety Margin		10'
TDG 3 Shoulder Width		20'
TDG 2 Edge Safety Margin		7.5'
TDG 2 Shoulder Width		15'
TDG 1A/B Edge Safety Margin		5'
TDG 1A/B Shoulder Width		10'

(1)Runway 12-30 has 350' centerline separation with Taxiway D between Taxiways D1 and D3. Between Taxiways D3 and F, Taxiway D tapers away from Runway 12-30 and reaches 400' separation north of Taxiway F until its terminus at Taxiway D4.

SURVEY MONUMENTS

PACS OR SACS	DESIGNATION	PID (1)	LAT (NAD 83)	LONG (NAD 83)	ELEVATION
PACS	LGB ARP 2	AD9431	33° 49' 03.05"	118° 09' 07.05"	39.0'
SACS	LGB AP 1961 STA K2	AD9433	33° 49' 34.42"	118° 09' 44.17"	60.8'
SACS	LGB AP 1961 STA L2	AD9432	33° 48' 23.30"	118° 08' 18.13"	23.5'

(1)PACS and SACS are protected by a concrete encasing. For each of the monuments listed in the above table, use the PID to retrieve the NGS Data Sheet which contains detailed information about each survey monument. Monuments are also identified in plan on Sheets 3 and 4 of this ALP set.

OBJECT FREE AREA AND OBSTACLE FREE ZONE DIMENSIONS

RUNWAY	OFA WIDTH (Q)	OFA LENGTH BEYOND STOP END	STANDARD OFA LENGTH	OFZ WIDTH (X)	OFZ LENGTH BEYOND STOP END	PRECISION OFZ
Existing 12	800'	414'	1,000'	400'	200'	None
Future 12	Same	Same	Same	Same	Same	None
Existing 30	800'	1,000'	1,000'	400'	200'	W 800' X L 200'
Future 30	Same	Same	Same	Same	Same	Same
Existing 7L	800'	170'	1000'	400'	163'	None
Future 8L	Same	Same	Same	Same	Same	None
Existing 25R	800'	340'	1000'	400'	200'	None
Future 26R	Same	Same	Same	Same	Same	None
Existing 7R	500'	300'	300'	400'	200'	None
Future 8R	Same	Same	Same	250'	Same	None
Existing 25L	500'	300'	300'	400'	200'	None
Future 26L	Same	Same	Same	250'	Same	None

ABBREVIATIONS

AC	Asphalt Cement
ADG	Airplane Design Group
ARC	Airport Reference Code
AIRC	Aircraft
ARFF	Aircraft Rescue and Firefighting
ARTCC	Air Route Traffic Control Center
ASDA	Accelerate-Stop Distance Available
ASOS	Automated Surface Observation System
ATCT	Air Traffic Control Tower
BRL	Building Restriction Line
CAT	Category
CL	Centerline
DME	Distance Measuring Equipment
D	Dual
DT	Dual Tandem
DH	Decision Height
EL or ELEV	Elevation
EX	Existing
FAR	Federal Aviation Regulations
FATO	Final Approach and Take Off
FOMO	Fixed or Moveable Object
FUT	Future
GA	General Aviation
GQS	Glide Path Qualification Surface
GPA	Glide Path Angle
GPS	Global Positioning System
HIRL	High Intensity Runway Lights
IFR	Instrument Flight Rules
ILS	Instrument Landing System
LAT	Latitude
LBS	Pounds
LDA	Landing Distance Available
LNAV	Lateral Navigation
LOC	Localizer
LONG	Longitude
LPV	Localizer Performance with Vertical Guidance
MALSR	Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights
MIRL	Medium Intensity Runway Lights
MSL	Mean Sea Level
MTOW	Maximum Takeoff Weight
NA	Not Authorized
NGS	National Geodetic Survey
NOAA	National Oceanic and Atmospheric Administration
NOTAM	Notices to Airmen
NGS	National Geodetic Survey
NPI	Non Precision Instrument
OCS	Obstacle Clearance Surface
OFA	Object Free Area
OFZ	Obstacle Free Zone
OL	Obstruction Light
PACS	Primary Airport Control Station
PAPI	Precision Approach Path Indicator
PCC	Portland Cement Concrete
PCN	Pavement Classification Number
PID	Point Identification
PIR	Precision Instrument Runway
POFZ	Precision Obstacle Free Zone
RDC	Runway Design Code
REIL	Runway End Identifier Lights
RNAV	Area Navigation
RNP	Required Navigation Performance
ROFA	Runway Object Free Area
ROFA	Runway Object Free Area
RPZ	Runway Protection Zone
RRC	Runway Reference Code
RSA	Runway Safety Area
RTR	Remote Transmitter and Receiver
RVR	Runway Visual Range
RWY	Runway
SACS	Secondary Airport Control Station
TLN	Taxilane
TWY	Taxiway
TBD	To Be Determined
TCH	Threshold Crossing Height
TDG	Taxiway Design Group
TDZ	Touchdown Zone
TDZE	Touchdown Zone Elevation
TERPS	Terminal Instrument Procedures
THLD	Threshold
TLOF	Touchdown and Lift Off
TODA	Take Off Distance Available
TOFA	Taxiway Object Free Area
TORA	Take Off Run Available
TRACON	Terminal Radar Approach Control
TSA	Taxiway Safety Area
S	Single
UTC	Coordinated Universal Time
VFR	Visual Flight Rules
VGSI	Visual Glide Slope Indicator
VIS	Visual
VNAV	Vertical Navigation
VOR/DME	Very High-Frequency (VHF) Omni-Directional Range / Distance Measuring Equipment
VORTAC	Very High-Frequency (VHF) Omni-Directional Range / Tactical Air Naviation
WAAS	Wide Area Augmentation System

RUNWAY PROTECTION ZONE AND RUNWAY SAFETY AREA DIMENSIONS

RUNWAY	RPZ LENGTH (L)	RPZ INNER WIDTH (W^1)	RPZ OUTER WIDTH (W^2)	RSA WIDTH (C)	RSA LENGTH BEYOND STOP END	STANDARD RSA LENGTH
Existing 12	1,700'	500'	1,010'	500'	1,000'	1,000'
Future 12	Same	Same	Same	Same	Same	Same
Existing 30	2,500'	1,000'	1,750'	500'	414' (1)	1,000'
Future 30	1,700'	500'	1,010'	Same	Same	Same
Existing 7L	1,700'	500'	1,010'	500'	219'	1,000'
Future 8L	Same	Same	Same	Same	Same	Same
Existing 25R	1,700'	500'	1,010'	500'	240' (2)	1,000'
Future 26R	Same	Same	Same	Same	Same	Same
Existing 7R	1,000'	500'	700'	150'	300'	300'
Future 8R	Same	250'	450'	Same	Same	Same
Existing 25L	1,000'	500'	700'	150'	300'	300'
Future 26L	Same	250'	450'	Same	Same	Same
Departure RPZ Existing 12	1,700'	500'	1,010'			
Departure RPZ Future 12	Same	Same	Same			
Departure RPZ Existing 30	1,700'	500'	1,010'			
Departure RPZ Future 30	Same	Same	Same			
Departure RPZ Existing 25R	1,700'	500'	1,010'			
Departure RPZ Future 26R	Same	Same	Same			
Departure RPZ Existing 7L	1,700'	500'	1,010'			
Departure RPZ Future 8L	Same	Same	Same			
Departure RPZ Existing 25L	1,000'	500'	700'			
Departure RPZ Future 26L	Same	250'	450'			
Departure RPZ Existing 7R	1,000'	500'	700'			
Departure RPZ Future 8R	Same	250'	450'			

(1)Declared Distances are applied in order to meet 1,000' RSA beyond runway end standard.
(2)FAA Determination Letter dated May 4, 2011 approves existing non-standard RSA length beyond runway end.

EXISTING NONSTANDARD CONDITIONS

DESCRIPTION (1)	DIMENSION	STANDARD
Runway 7R-25L Runway Blast Pads	0' X 0'	200' X 200'
Runway 7L-25R Runway Blast Pads	0' X 0'	95' X 150'
Runway 7R-25L Shoulder Width	0'	10'
Runway 7R-25L Shoulder Width	0'	10'
Runway 12-30 to Taxiway D Centerline Separation	350' (2)	400'
Runway 12-30 ROFA truncated by service road	831'	1,000'
Runway 7L-25R ROFA North of Runway uncontrolled	293'	400'
Runway 7L-25R ROFA South of Runway contains aircraft parking	391'	400'
Runway 7L-25R RSA from Runway 25R end	247'	1,000'
Runway 7L-25R RSA from Runway 7L end	163'	1,000'
Runway 7R-25L width	150'	75'
Taxiway D TSA (from Centerline)	49.5'	85.5'
Taxiway D OFA (from Centerline)	49.5'	129.5'
Taxiway L OFA (from Centerline)	81.3'	129.5'
Taxiway B OFA (from Centerline)	85'	129.5'
Taxiway J OFA (from Centerline)	69'	129.5'
Taxiway A OFA (from Centerline)	119'	129.5'
Taxiway B Width	65'	75'
Taxiway F Width	100'	75'
GA Hold Apron Within Taxiway K OFA	83.7'	129.5'
Compass Calibration Pad Within Taxiway J OFA	97.2'	129.5'
Helicopter Pad 1,2,4,5 & 6 TLOF Undersized	20 X 20'	33 X 33'
Helicopter Pads require windsock within 500' of pad		
Non-standard Helicopter Pad markings		
Roads in RPZs	No Action	
Use of Runway 16R-34L Alignment as Taxilane for ADG-III aircraft	Mitigation in Planning	
Use of service roads as Taxilanes for ADG-1A/B aircraft	Mitigation in Planning	

(1)Refer to Sheet 4 for proposed improvements to meet non-standard conditions.
(2)Portion South of Taxiway F of Taxiway D is non-standard. See Ex./Fut. Separation & Holdbar Table for detail.

TAXIWAY GROUP DATA

EXISTING TAXIWAY DESIGNATION	FUTURE TAXIWAY DESIGNATION	EXISTING TYPE	FUTURE TYPE	EXISTING ADG	FUTURE ADG	EXISTING TDG	FUTURE TDG	EXISTING WIDTH	FUTURE WIDTH	EXISTING SURFACE COMPOSITION	FUTURE SURFACE COMPOSITION
Taxiway A	Same	Parallel Taxiway	Same	IV	Same	5	Same	75'	Same	Asphalt	Same
Taxiway B	Same	Parallel Taxiway	Same	IV	Same	5	Same	65'	Same	Asphalt	Same
Taxiway C	Taxilane E	Taxiway	Taxilane	IV	IV	5	5	75'	75'	PCC	Same
Taxiway D	Same	Parallel Taxiway	Same	IV	Same	5	Same	75'	Same	Asphalt	Same
Taxiway D1	Same	Connector Taxiway	Same	IV	Same	5	Same	92'	Same	Asphalt	Same
Taxiway D2	Same	Connector Taxiway	Same	IV	Same	5	Same	101'	Same	Asphalt	Same
Taxiway D3	Same	Connector Taxiway	Same	IV	Same	5	Same	75'	Same	Asphalt	Same
Taxiway D4	Same	Connector Taxiway	Same	IV	Same	5	Same	75'	Same	Asphalt	Same
Taxiway E	Closed	Taxiway	Closed	II	N/A	3	N/A	50'	N/A	Asphalt	Same
Taxiway F	Same	Parallel Taxiway	Same	IV	II / III / IV	5	2 / 3 / 5	100'	35' / 50' / 75'	Asphalt	Same
Taxiway F1	Taxiway F2	Connector Taxiway	Same	II	IV	3	5	62'	75'	Asphalt	Same
Taxiway F2	Taxiway F3	Connector Taxiway	Same	II	Same	3	Same	63'	Same	Asphalt	Same
Taxiway F3	Taxiway F4	Connector Taxiway	Same	II	Same	3	Same	52'	Same	Asphalt	Same
Taxiway G	Same	Parallel Taxiway	Same	IV	Same	5	Same	75'	Same	Asphalt	Same
Taxiway J	Same	Parallel Taxiway	Same	III	Same	3	Same	75'	Same	Asphalt	Same
Taxiway J1	Taxiway N	Connector Taxiway	Same	II	Same	3	Same	45'	Same	Asphalt	Same
Taxiway J2	Same	Connector Taxiway	Same	III	IV	3	5	75'	Same	Asphalt	Same
Taxiway K	Same	Parallel Taxiway	Same	IV	Same	5	Same	75'	Same	PCC	Same
Taxiway K1	Same	Connector Taxiway	Same	IV	Same	5	Same	65'	Same	Asphalt	Same
Taxiway K2	Same	Connector Taxiway	Same	IV	Same	5	Same	130'	Same	Asphalt	Same
Taxiway K3	Same	Connector Taxiway	Same	IV	Same	5	Same	130'	Same	Asphalt	Same
Taxiway L	Same	Parallel Taxiway	Same	IV	Same	5	Same	75'	Same	Asphalt	Same
Taxiway L1	Same	Connector Taxiway	Same	IV	Same	5	Same	110'	Same	Asphalt	Same
Taxiway L2	Same	Connector Taxiway	Same	IV	Same	5	Same	130'	Same	Asphalt	Same
Taxiway L3	Same	Connector Taxiway	Same	IV	Same	5	Same	131'	Same	Asphalt	Same
Taxiway L4	Taxiway N	Connector Taxiway	Connector Taxiway	II	Same	3	Same	50'	Same	Asphalt	Same
Closed Runway 16L-34R	Taxiway C	Closed Runway	Connector Taxiway	II	IV	3	5	75'	75'	Asphalt	PCC
N/A	Taxiway F1	N/A	Connector Taxiway	N/A	IV	N/A	5	75'	75'	N/A	Asphalt
N/A	Taxiway J3	N/A	Connector Taxiway	N/A	II	N/A	3	N/A	35'	N/A	Asphalt
N/A	Taxilane M	N/A	Connector Taxiway	N/A	I	N/A	1B	N/A	25'	N/A	Asphalt

No.	Revision	Sponsor	Date
-	Revision	LGB	12/12/2011
		LGB	9/1/2016

AIRPORT DATA
LONG BEACH AIRPORT
LONG BEACH, CALIFORNIA

long beach airport

HNTB
6033 West Century Blvd, Suite 1050
Los Angeles, California 90045
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www.HNTB.com

DRAWN: KKP/JCDED REVIEW: JRB DATE: 9/01/2016 SHEET 2 OF 24

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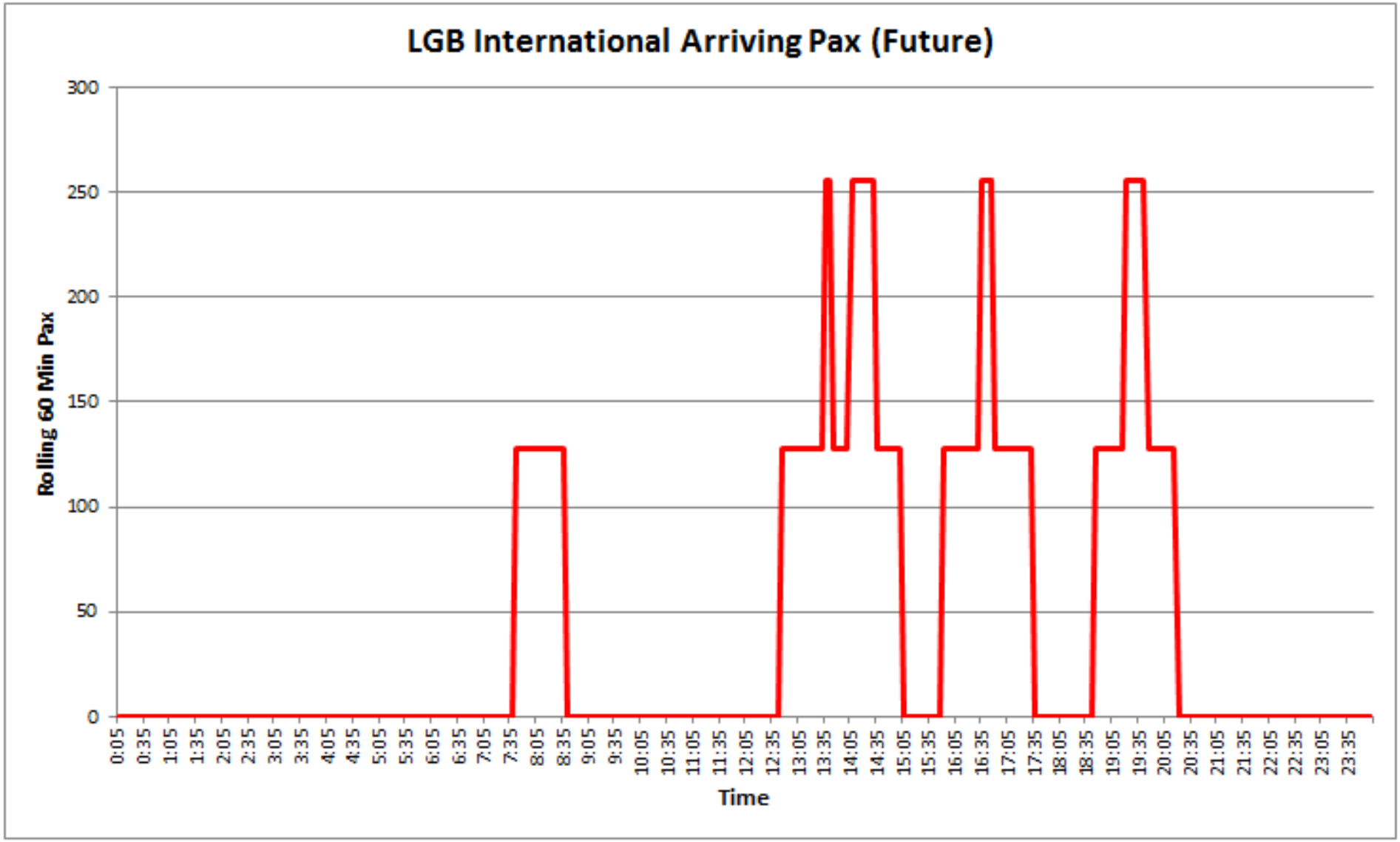
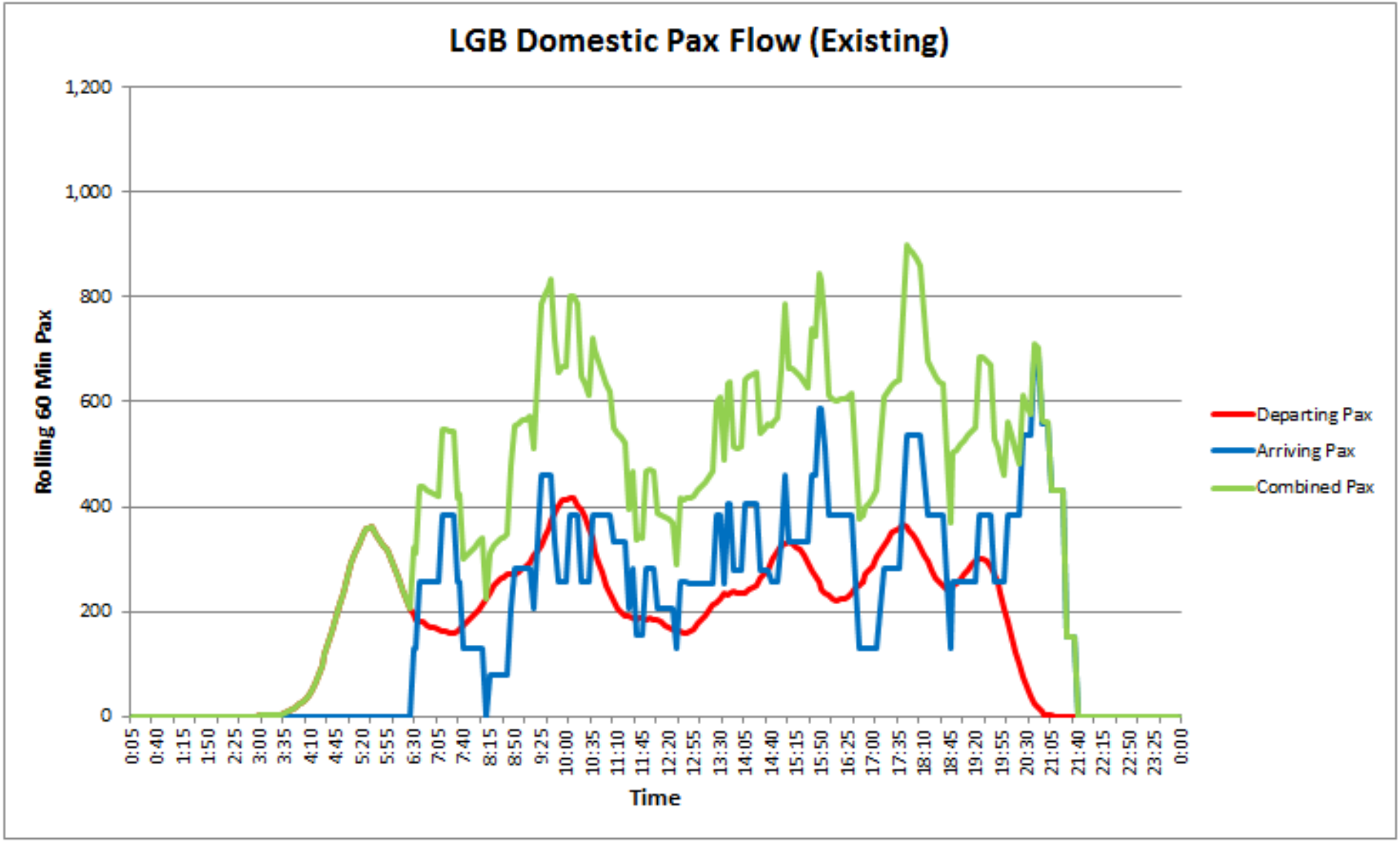
International Arriving Passenger Flow (Future Flight Schedule)

Rolling 60 Minute Volume



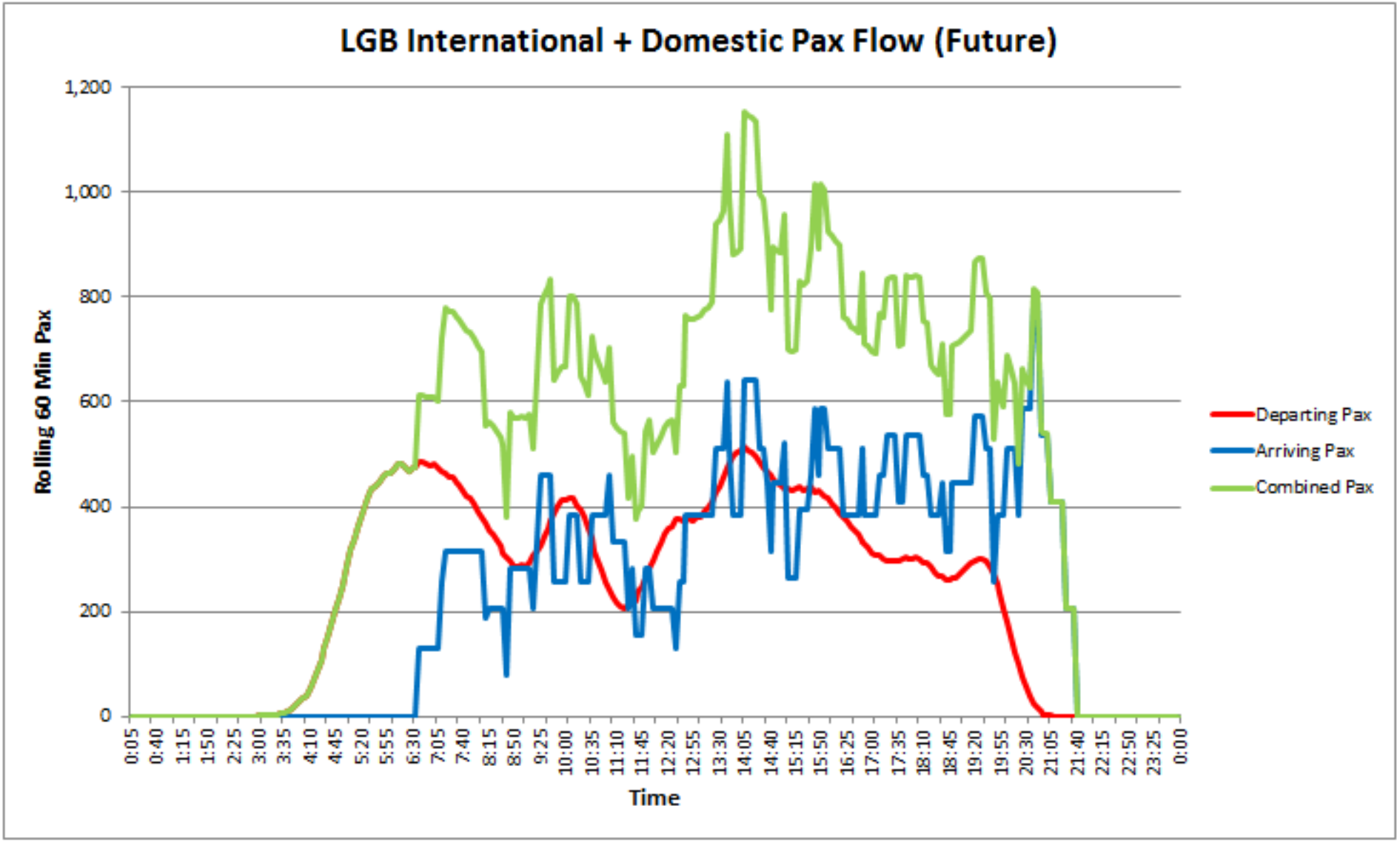
Domestic Passenger Flow (Existing Flight Schedule)

Rolling 60 Minute Volume



Domestic + International Passenger Flow (Future Flight Schedule)

Rolling 60 Minute Volume



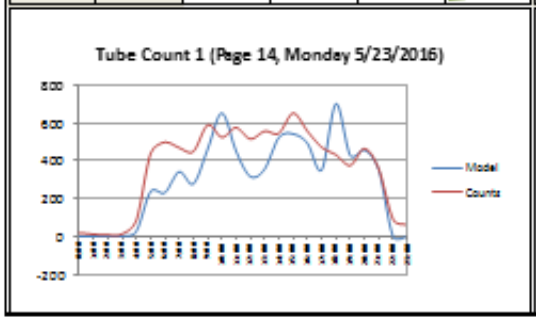
Roadway Vehicle Flow Calibration (Existing Flight Schedule)

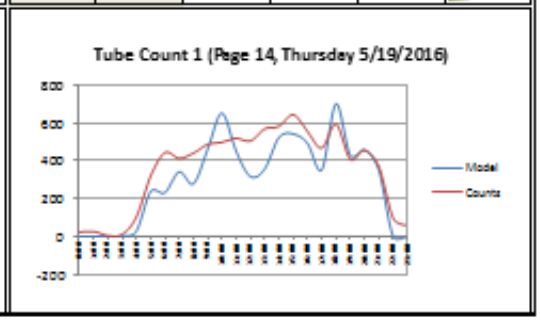
Clock Hour Volume

Long Beach Airport Curb Model Traffic Volumes

Source: Jacobs, LGB Traffic Tube Counts Report 5/26/2016

	Tube Count 1 (Page 14, Monday 5/23/2016)						Tube Count 1 (Page 14, Thursday 5/19/2016)						
	Model (vph)	Counts (vph)	Δ	Ratio	%	GEH (1,2)	Model (vph)	Counts (vph)	Δ	Ratio	%	GEH (1,2)	
0:00	0	19	-19	0.0	#DIV/0!	6.2	0	23	-23	0.0	#DIV/0!	6.8	
1:00	0	12	-12	0.0	#DIV/0!	4.9	0	27	-27	0.0	#DIV/0!	7.3	
2:00	0	8	-8	0.0	#DIV/0!	4.0	0	4	-4	0.0	#DIV/0!	2.8	
3:00	1	13	-12	0.1	-7.8	4.3	1	11	-10	0.1	-6.5	3.8	
4:00	27	85	-58	0.3	-2.1	7.7	27	103	-76	0.3	-2.8	9.4	
5:00	238	440	-202	0.5	-0.8	11.0	238	320	-82	0.7	-0.3	4.9	
6:00	231	499	-268	0.5	-1.2	14.0	231	444	-213	0.5	-0.9	11.6	
7:00	343	470	-127	0.7	-0.4	6.3	343	413	-70	0.8	-0.2	3.6	
8:00	278	450	-172	0.6	-0.6	9.0	278	441	-163	0.6	-0.6	8.6	
9:00	462	590	-128	0.8	-0.3	5.6	462	487	-25	0.9	-0.1	1.1	
10:00	653	525	128	1.2	0.2	5.3	653	498	155	1.3	0.2	6.5	
11:00	450	576	-126	0.8	-0.3	5.5	450	520	-70	0.9	-0.2	3.2	
12:00	317	515	-198	0.6	-0.6	9.7	317	505	-188	0.6	-0.6	9.3	
13:00	357	558	-201	0.6	-0.6	9.4	357	570	-213	0.6	-0.6	9.9	
14:00	524	546	-22	1.0	0.0	0.9	524	583	-59	0.9	-0.1	2.5	
15:00	543	653	-110	0.8	-0.2	4.5	543	645	-102	0.8	-0.2	4.2	
16:00	494	557	-63	0.9	-0.1	2.8	494	556	-62	0.9	-0.1	2.7	
17:00	352	472	-120	0.7	-0.3	5.9	352	467	-115	0.8	-0.3	5.7	
18:00	702	432	270	1.6	0.4	11.3	702	595	107	1.2	0.2	4.2	
19:00	429	376	53	1.1	0.1	2.7	429	408	21	1.1	0.0	1.0	Combined Peak
20:00	458	465	-7	1.0	0.0	0.3	458	457	1	1.0	0.0	0.1	
21:00	353	358	-5	1.0	0.0	0.3	353	371	-18	1.0	-0.1	0.9	
22:00	0	91	-91	0.0	#DIV/0!	13.5	0	98	-98	0.0	#DIV/0!	14.0	
23:00	0	61	-61	0.0	#DIV/0!	11.0	0	56	-56	0.0	#DIV/0!	10.6	
	7,214	8,771	-1,557	0.8	-22%	17.4	7,214	8,602	-1,388	0.8	-19%	15.6	





Notes:

1) GEH statistic is typically used in traffic modeling to compare two sets of traffic volumes.

2) GEH statistic of less than or equal to 5.0 considered a good match.

Roadway Vehicle Flow (Existing Flight Schedule)

Rolling 60 Minute Volume Based on Mode Share and Vehicle Occupancy

PEAK HOUR MODE SHARES, PASSENGER AND VEHICLE TRAFFIC FORECASTS
Existing Flight Schedule

During Peak Hour of Roadway Traffic Activity

Mode	Average Mode Share (1)	Peak Hour Originating + Terminating Passengers on Roadway	Vehicle Occupancy (Passengers per Vehicle) (1)	Peak Hour Vehicle Volume (2)
Private Vehicle				
Curbside	75.0%	645	1.1	586
Hourly Parking	0.0%	0	1.1	0
Daily Parking	0.0%	0	1.2	0
Rental Car	0.0%	0	2.1	0
Ground Transportation				
Taxi	10.0%	86	1.4	61
Limousine	5.0%	43	1.5	29
Door-to-Door Van	8.0%	69	3.3	21
Hotel/Motel Courtesy Shuttle	0.0%	0	1.6	0
Rental Car Courtesy Shuttle	0.0%	0	3.1	0
Economy Parking Courtesy Shuttle	0.0%	0	2.8	0
Airporters	0.0%	0	12.5	0
Public Transit	2.0%	17	4.0	4
Charter/Other Bus	0.0%	0	22.0	0
Total	**100.0%**	**860**		**702**

Notes:
(1) Mode shares and vehicle occupancy based on roadway volume calibration.
(2) One-way vehicle trips.
*** Total O&D passengers assumed to be the sum of peak hour originating and terminating passengers.

Roadway Curb LOS Analysis (Existing Flight Schedule)

Dual Inner and Outer Curbs

CURB ANALYSIS - INNER AND OUTER CURBS
Existing Flight Schedule

							Service Capacity				Thru Capacity		Total Capacity, V/C, LOS		
Location / Mode	Peak Hour Design Volume (veh/hr)	Vehicle Dwell Time (min)	Effective Vehicle Length (feet)	Vehicle Foot-Minutes	Average Foot-Minute per Vehicle	Total Number of Lanes	Number of Service Lanes	Utilization Factor	Effective Curb Length (feet)	Service Capacity (veh/hr)	Number of Thru Lanes	Thru Capacity (veh/hr)	Total Capacity (veh/hr)	Volume / Capacity Ratio	Level of Service
Inner Curb Traffic	60%														
Private Vehicle	210	1.50	25	7,885	37.5										
Taxicab	22	1.31	25	721	32.8										
Limousine	10	1.26	35	453	44.1										
Door-to-Door Van	7	2.00	35	523	70.0										
Public Transit	2	1.34	50	103	67.0										
Curb	*421*			9,687	23.0	2	1	0.50	350	456	1	570			
Thru	*0*						2	0.67		1,223	0	FALSE			
Total	**421**												**522**	**0.81**	**C**
OuterCurb Traffic	40%														
Private Vehicle	140	1.50	25	5,257	37.5										
Taxicab	22	1.31	25	721	32.8										
Limousine	7	1.26	35	302	44.1										
Door-to-Door Van	5	2.00	35	349	70.0										
Public Transit	1	1.34	50	69	67.0										
Curb	*281*			6,698	23.9	2	1	0.50	350	440	1	570			
Thru	*0*						2	0.67		1,179	0	FALSE			
Total	**281**												**513**	**0.55**	**A**

Roadway Vehicle Flow (Future Flight Schedule)

Rolling 60 Minute Volume Based on Mode Share and Vehicle Occupancy

PEAK HOUR MODE SHARES, PASSENGER AND VEHICLE TRAFFIC FORECASTS
Future Flight Schedule

During Peak Hour of Roadway Traffic Activity

Mode	Average Mode Share (1)	Peak Hour Originating + Terminating Passengers on Roadway	Vehicle Occupancy (Passengers per Vehicle) (1)	Peak Hour Vehicle Volume (2)
Private Vehicle				
Curbside	75.0%	866	1.1	787
Hourly Parking	0.0%	0	1.1	0
Daily Parking	0.0%	0	1.2	0
Rental Car	0.0%	0	2.1	0
Ground Transportation				
Taxi	10.0%	115	1.4	82
Limousine	5.0%	58	1.5	38
Door-to-Door Van	8.0%	92	3.3	28
Hotel/Motel Courtesy Shuttle	0.0%	0	1.6	0
Rental Car Courtesy Shuttle	0.0%	0	3.1	0
Economy Parking Courtesy Shuttle	0.0%	0	2.8	0
Airporters	0.0%	0	12.5	0
Public Transit	2.0%	23	4.0	6
Charter/Other Bus	0.0%	0	22.0	0
Total	**100.0%**	**1,154** ***		**941**

Notes:
(1) Mode shares and vehicle occupancy based on roadway volume calibration.
(2) One-way vehicle trips.
*** Total O&D passengers assumed to be the sum of peak hour originating and terminating passengers.

Roadway Curb LOS Analysis (Future Flight Schedule)

Dual Inner and Outer Curbs

CURB ANALYSIS - INNER AND OUTER CURBS
Future Flight Schedule

							Service Capacity				Thru Capacity		Total Capacity, V/C, LOS		
Location / Mode	Peak Hour Design Volume (veh/hr)	Vehicle Dwell Time (min)	Effective Vehicle Length (feet)	Vehicle Foot-Minutes	Average Foot-Minute per Vehicle	Total Number of Lanes	Number of Service Lanes	Utilization Factor	Effective Curb Length (feet)	Service Capacity (veh/hr)	Number of Thru Lanes	Thru Capacity (veh/hr)	Total Capacity (veh/hr)	Volume / Capacity Ratio	Level of Service
Inner Curb Traffic	60%														
Private Vehicle	210	1.50	25	7,885	37.5										
Taxicab	22	1.31	25	721	32.8										
Limousine	10	1.26	35	453	44.1										
Door-to-Door Van	7	2.00	35	523	70.0										
Public Transit	2	1.34	50	103	67.0										
Curb	*565*			9,687	17.1	2	1	0.50	350	612	1	570			
Thru	*0*						2	0.67		1,641	0	FALSE			
Total	**565**												**585**	**0.97**	**E**
OuterCurb Traffic	40%														
Private Vehicle	140	1.50	25	5,257	37.5										
Taxicab	22	1.31	25	721	32.8										
Limousine	7	1.26	35	302	44.1										
Door-to-Door Van	5	2.00	35	349	70.0										
Public Transit	1	1.34	50	69	67.0										
Curb	*377*			6,698	17.8	2	1	0.50	350	590	1	570			
Thru	*0*						2	0.67		1,582	0	FALSE			
Total	**377**												**577**	**0.65**	**B**

Roadway Curb LOS Analysis (Future Flight Schedule)

Single Inner Curb

CURB ANALYSIS - SINGLE INNER CURB
Future Flight Schedule

							Service Capacity				Thru Capacity		Total Capacity, V/C, LOS		
Location / Mode	Peak Hour Design Volume (veh/hr)	Vehicle Dwell Time (min)	Effective Vehicle Length (feet)	Vehicle Foot-Minutes	Average Foot-Minute per Vehicle	Total Number of Lanes	Number of Service Lanes	Utilization Factor	Effective Curb Length (feet)	Service Capacity (veh/hr)	Number of Thru Lanes	Thru Capacity (veh/hr)	Total Capacity (veh/hr)	Volume / Capacity Ratio	Level of Service
Curb Traffic															
Private Vehicle	350	1.50	25	13,142	37.5										
Taxicab	37	1.31	25	1,202	32.8										
Limousine	17	1.26	35	756	44.1										
Door-to-Door Van	12	2.00	35	872	70.0										
Public Transit	3	1.34	50	172	67.0										
Curb	*941*			16,144	17.1	4	2	0.50	350	1,225	2	1,450			
Thru	*0*						3	0.67		2,461	1	570			
Total	**941**												**1,356**	**0.69**	**B**

Feasibility Study for a Federal Inspection Service Facility at Long Beach Airport

Airline	Seat Capacity	Seat Utilization	Equip	Flt#	Inb Sta	Dept	Arvl	Total Arrivals
	Load Factor	85%				TO	LGB	
JetBlue	150	128	320	2135	SFO	6:15	7:35	1
JetBlue	150	128	320	217	AUS	7:10	8:04	2
Delta	70	60	CRJ7	tbd	SLC	7:00	8:08	commuter 1
JetBlue	150	128	320	tbd	GDL	7:00	8:35	3
American	90	77	CRJ9	5663	PHX	7:45	9:09	4
JetBlue	150	128	320	1121	PDX	7:15	9:36	5
Delta	90	77	CRJ9	4644	SLC	8:32	9:38	6
Southwest	148	126	737-700	972	OAK	8:35	10:00	7
JetBlue	150	128	320	1207	SEA	7:35	10:13	8
JetBlue	150	128	320	147	OAK	9:00	10:18	9
JetBlue	150	128	320	735	SFO	9:30	11:00	10
JetBlue	150	128	320	211	LAS	10:15	11:19	11
JetBlue	150	128	320	447	OAK	10:10	11:29	12
American	90	77	CRJ9	5661	PHX	10:35	11:55	13
Delta	90	77	CRJ9	4589	SLC	11:25	12:25	14
JetBlue	150	128	320	231	SLC	11:54	12:44	15
JetBlue	150	128	320	1435	SFO	11:59	13:27	16
JetBlue	150	128	320	tbd	LIR	8:35	13:40	17
Southwest	148	126	737-700	1024	OAK	12:20	13:45	18
JetBlue	150	128	320	213	JFK	11:32	14:20	19
JetBlue	150	128	320	tbd	XXX	tbd	14:30	20
JetBlue	150	128	320	877	LAS	13:24	14:32	21
JetBlue	150	128	320	1007	SEA	12:20	14:58	22
JetBlue	150	128	320	tbd	PVR	14:00	15:00	23
Delta	70	60	CRJ7	tbd	SLC	14:22	15:30	commuter 2
JetBlue	150	128	320	43	RNO	14:15	15:40	24
American	90	77	CRJ9	5619	PHX	14:35	15:55	25
JetBlue	150	128	320	1417	AUS	15:20	16:15	26
Southwest	148	126	737-700	18	OAK	15:05	16:30	27
JetBlue	150	128	320	1521	PDX	14:10	16:31	28
JetBlue	150	128	320	tbd	MEX	14:30	16:45	29
JetBlue	150	128	320	tbd	XXX	tbd	17:30	30
JetBlue	150	128	320	379	LAS	16:25	17:31	31
UPS	crew	crew	B763F	2908	SDF	16:10	17:35	32
JetBlue	150	128	320	407	SEA	15:00	17:40	33
FedEx	crew	crew	A300F	1351	MEM	16:00	17:47	34
Delta	90	77	CRJ9	4723	SLC	17:00	18:04	35
American	90	77	CRJ9	5668	PHX	16:43	18:15	36
JetBlue	150	128	320	365	SMF	17:13	18:33	37
JetBlue	150	128	320	531	SLC	17:50	18:37	38
JetBlue	150	128	320	879	LAS	17:35	18:38	39
Delta	70	60	CRJ7	tbd	SLC	18:22	19:30	commuter 3
JetBlue	150	128	320	1179	LAS	18:35	19:38	40
JetBlue	150	128	320	tbd	SJD	18:10	19:40	41
JetBlue	150	128	320	1635	SFO	18:20	19:43	42
JetBlue	150	128	320	tbd	CUN	16:50	20:15	43
JetBlue	150	128	320	1621	PDX	18:23	20:41	44
JetBlue	150	128	320	404	OAK	19:25	20:44	45
Southwest	148	126	737-700	2785	OAK	19:35	21:00	46
Delta	90	77	CRJ9	4639	SLC	20:15	21:17	47
JetBlue	150	128	320	405	BOS	18:00	21:18	48
American	90	77	CRJ9	5870	PHX	20:00	21:31	49
JetBlue	150	128	320	1013	JFK	18:25	21:35	50
	5,857	PAX/day						
	2,139,269	PAX/yr						

Feasibility Study for a Federal Inspection Service Facility at Long Beach Airport

Total Departures	Dept	Arvl	Outb Sta	Flt#	Equip	Seat Capacity	Seat Utilization	Airline
	FROM	LGB				Load Factor	85%	
1	6:40	8:09	PHX	5662	CRJ9	90	77	American
2	7:00	8:20	OAK	756	737-700	148	126	Southwest
3	7:00	8:15	OAK	148	320	150	128	JetBlue
4	7:20	1:10	SLC	4643	CRJ9	90	77	Delta
5	7:20	8:47	SFO	736	320	150	128	JetBlue
6	8:05	13:05	PVR	tbd	320	150	128	JetBlue
7	8:05	13:40	MEX	tbd	320	150	128	JetBlue
8	8:25	13:18	AUS	1416	320	150	128	JetBlue
9	8:30	11:08	SLC	232	320	150	128	JetBlue
10	9:00	11:35	SEA	406	320	150	128	JetBlue
commuter 1	9:00	11:40	SLC	tbd	CRJ7	70	60	Delta
11	9:20	16:10	CUN	tbd	320	150	128	JetBlue
12	9:45	tbd	XXX	tbd	320	150	128	JetBlue
13	10:00	11:20	PHX	5854	CRJ9	90	77	American
14	10:18	13:05	SLC	4644	CRJ9	90	77	Delta
15	10:25	11:33	LAS	880	320	150	128	JetBlue
16	10:30	11:50	OAK	1853	737-700	148	126	Southwest
17	11:10	13:21	PDX	1522	320	150	128	JetBlue
18	11:28	14:01	SEA	1006	320	150	128	JetBlue
19	11:49	13:14	SFO	1636	320	150	128	JetBlue
20	12:05	13:26	SMF	266	320	150	128	JetBlue
21	12:15	13:30	RNO	42	320	150	128	JetBlue
22	12:30	13:57	PHX	5685	CRJ9	90	77	American
23	13:05	15:52	SLC	4589	CRJ9	90	77	Delta
24	13:35	21:57	JFK	514	320	150	128	JetBlue
25	14:15	15:35	OAK	1863	737-700	148	126	Southwest
26	14:25	17:14	SJD	tbd	320	150	128	JetBlue
27	14:25	17:05	SLC	532	320	150	128	JetBlue
28	15:20	17:32	PDX	1622	320	150	128	JetBlue
29	15:20	tbd	XXX	tbd	320	150	128	JetBlue
30	15:45	21:55	LIR	tbd	320	150	128	JetBlue
31	15:45	16:52	LAS	380	320	150	128	JetBlue
commuter 2	16:00	18:47	SLC	tbd	CRJ7	70	60	Delta
32	16:18	17:38	SFO	1436	320	150	128	JetBlue
33	16:30	17:37	LAS	280	320	150	128	JetBlue
34	16:35	18:00	PHX	5698	CRJ9	90	77	American
35	17:00	18:20	OAK	1788	737-700	148	126	Southwest
36	17:30	18:43	OAK	348	320	150	128	JetBlue
37	17:30	22:30	GDL	tbd	320	150	128	JetBlue
38	17:40	19:53	PDX	1822	320	150	128	JetBlue
39	18:20	19:26	LAS	1980	320	150	128	JetBlue
40	18:32	21:15	SLC	4723	CRJ9	90	77	Delta
41	18:26	21:02	SEA	206	320	150	128	JetBlue
42	19:02	12:25	MEM	1351	A300F	crew	crew	FedEx
43	19:19	20:33	OAK	448	320	150	128	JetBlue
44	19:25	20:46	PHX	5616	CRJ9	90	77	American
45	19:34	2:09	SDF	905	767	crew	crew	UPS
46	19:55	21:01	LAS	1780	320	150	128	JetBlue
commuter 3	20:00	22:47	SLC	tbd	CRJ7	70	60	Delta
47	20:30	1:22	AUS	216	320	150	128	JetBlue
48	21:10	5:36	BOS	404	320	150	128	JetBlue
49	21:30	22:49	SFO	2136	320	150	128	JetBlue
50	21:32	5:49	JFK	14	320	150	128	JetBlue
4.3						5,857	PAX/day	
MAP						2,139,269	PAX/yr	

Feasibility Study for a Federal Inspection Service Facility at Long Beach Airport

Aircraft Parking	Airline	Seat Capacity	Seat Utilization	Equip	Flt#	Inb Sta	Dept	Arvl	Total Arrivals
		Load Factor	85%				TO	LGB	
6	JetBlue	150	128	320	2135	SFO	6:15	7:35	1
5	JetBlue	150	128	320	217	AUS	7:10	8:04	2
2	Delta	70	60	CRJ7	tbd	SLC	7:00	8:08	commuter 1
11	JetBlue	150	128	320	tbd	GDL	7:00	8:35	3
3	American	90	77	CRJ9	5663	PHX	7:45	9:09	4
4	JetBlue	150	128	320	1121	PDX	7:15	9:36	5
2	Delta	90	77	CRJ9	4644	SLC	8:32	9:38	6
1	Southwest	148	126	737-700	972	OAK	8:35	10:00	7
6	JetBlue	150	128	320	1207	SEA	7:35	10:13	8
7	JetBlue	150	128	320	147	OAK	9:00	10:18	9
5	JetBlue	150	128	320	735	SFO	9:30	11:00	10
8	JetBlue	150	128	320	211	LAS	10:15	11:19	11
4	JetBlue	150	128	320	447	OAK	10:10	11:29	12
3	American	90	77	CRJ9	5661	PHX	10:35	11:55	13
2	Delta	90	77	CRJ9	4589	SLC	11:25	12:25	14
6	JetBlue	150	128	320	231	SLC	11:54	12:44	15
4	JetBlue	150	128	320	1435	SFO	11:59	13:27	16
12	JetBlue	150	128	320	tbd	LIR	8:35	13:40	17
1	Southwest	148	126	737-700	1024	OAK	12:20	13:45	18
5	JetBlue	150	128	320	213	JFK	11:32	14:20	19
11	JetBlue	150	128	320	tbd	XXX	tbd	14:30	20
8	JetBlue	150	128	320	877	LAS	13:24	14:32	21
6	JetBlue	150	128	320	1007	SEA	12:20	14:58	22
12	JetBlue	150	128	320	tbd	PVR	14:00	15:00	23
2	Delta	70	60	CRJ7	tbd	SLC	14:22	15:30	commuter 2
7	JetBlue	150	128	320	43	RNO	14:15	15:40	24
3	American	90	77	CRJ9	5619	PHX	14:35	15:55	25
8	JetBlue	150	128	320	1417	AUS	15:20	16:15	26
1	Southwest	148	126	737-700	18	OAK	15:05	16:30	27
4	JetBlue	150	128	320	1521	PDX	14:10	16:31	28
11	JetBlue	150	128	320	tbd	MEX	14:30	16:45	29
12	JetBlue	150	128	320	tbd	XXX	tbd	17:30	30
6	JetBlue	150	128	320	379	LAS	16:25	17:31	31
TWY L	UPS	crew	crew	B763F	2908	SDF	16:10	17:35	32
5	JetBlue	150	128	320	407	SEA	15:00	17:40	33
TWY F	FedEx	crew	crew	A300F	1351	MEM	16:00	17:47	34
2	Delta	90	77	CRJ9	4723	SLC	17:00	18:04	35
3	American	90	77	CRJ9	5668	PHX	16:43	18:15	36
8	JetBlue	150	128	320	365	SMF	17:13	18:33	37
7	JetBlue	150	128	320	531	SLC	17:50	18:37	38
4	JetBlue	150	128	320	879	LAS	17:35	18:38	39
2	Delta	70	60	CRJ7	tbd	SLC	18:22	19:30	commuter 3
5	JetBlue	150	128	320	1179	LAS	18:35	19:38	40
11	JetBlue	150	128	320	tbd	SJD	18:10	19:40	41
6	JetBlue	150	128	320	1635	SFO	18:20	19:43	42
12	JetBlue	150	128	320	tbd	CUN	16:50	20:15	43
9	JetBlue	150	128	320	1621	PDX	18:23	20:41	44
8	JetBlue	150	128	320	404	OAK	19:25	20:44	45
1	Southwest	148	126	737-700	2785	OAK	19:35	21:00	46
2	Delta	90	77	CRJ9	4639	SLC	20:15	21:17	47
5	JetBlue	150	128	320	405	BOS	18:00	21:18	48
3	American	90	77	CRJ9	5870	PHX	20:00	21:31	49
7	JetBlue	150	128	320	1013	JFK	18:25	21:35	50
		5,857	PAX/day						
		2,139,269	PAX/yr						

Feasibility Study for a Federal Inspection Service Facility at Long Beach Airport

Total Departures	Dept	Arvl	Outb Sta	Flt#	Equip	Seat Capacity	Seat Utilization	Airline	Aircraft Parking
	FROM	LGB				Load Factor	85%		
1	6:40	8:09	PHX	5662	CRJ9	90	77	American	3
2	7:00	8:20	OAK	756	737-700	148	126	Southwest	1
3	7:00	8:15	OAK	148	320	150	128	JetBlue	7
4	7:20	1:10	SLC	4643	CRJ9	90	77	Delta	2
5	7:20	8:47	SFO	736	320	150	128	JetBlue	5
6	8:05	13:05	PVR	tbd	320	150	128	JetBlue	9
7	8:05	13:40	MEX	tbd	320	150	128	JetBlue	10
8	8:25	13:18	AUS	1416	320	150	128	JetBlue	6
9	8:30	11:08	SLC	232	320	150	128	JetBlue	4
10	9:00	11:35	SEA	406	320	150	128	JetBlue	5
commuter 1	9:00	11:40	SLC	tbd	CRJ7	70	60	Delta	2
11	9:20	16:10	CUN	tbd	320	150	128	JetBlue	9
12	9:45	tbd	XXX	tbd	320	150	128	JetBlue	8
13	10:00	11:20	PHX	5854	CRJ9	90	77	American	3
14	10:18	13:05	SLC	4644	CRJ9	90	77	Delta	2
15	10:25	11:33	LAS	880	320	150	128	JetBlue	4
16	10:30	11:50	OAK	1853	737-700	148	126	Southwest	1
17	11:10	13:21	PDX	1522	320	150	128	JetBlue	7
18	11:28	14:01	SEA	1006	320	150	128	JetBlue	6
19	11:49	13:14	SFO	1636	320	150	128	JetBlue	5
20	12:05	13:26	SMF	266	320	150	128	JetBlue	8
21	12:15	13:30	RNO	42	320	150	128	JetBlue	4
22	12:30	13:57	PHX	5685	CRJ9	90	77	American	3
23	13:05	15:52	SLC	4589	CRJ9	90	77	Delta	2
24	13:35	21:57	JFK	514	320	150	128	JetBlue	6
25	14:15	15:35	OAK	1863	737-700	148	126	Southwest	1
26	14:25	17:14	SJD	tbd	320	150	128	JetBlue	10
27	14:25	17:05	SLC	532	320	150	128	JetBlue	4
28	15:20	17:32	PDX	1622	320	150	128	JetBlue	8
29	15:20	tbd	XXX	tbd	320	150	128	JetBlue	9
30	15:45	21:55	LIR	tbd	320	150	128	JetBlue	10
31	15:45	16:52	LAS	380	320	150	128	JetBlue	6
commuter 2	16:00	18:47	SLC	tbd	CRJ7	70	60	Delta	2
32	16:18	17:38	SFO	1436	320	150	128	JetBlue	5
33	16:30	17:37	LAS	280	320	150	128	JetBlue	7
34	16:35	18:00	PHX	5698	CRJ9	90	77	American	3
35	17:00	18:20	OAK	1788	737-700	148	126	Southwest	1
36	17:30	18:43	OAK	348	320	150	128	JetBlue	8
37	17:30	22:30	GDL	tbd	320	150	128	JetBlue	9
38	17:40	19:53	PDX	1822	320	150	128	JetBlue	4
39	18:20	19:26	LAS	1980	320	150	128	JetBlue	6
40	18:32	21:15	SLC	4723	CRJ9	90	77	Delta	2
41	18:26	21:02	SEA	206	320	150	128	JetBlue	5
42	19:02	12:25	MEM	1351	A300F	crew	crew	FedEx	TWY F
43	19:19	20:33	OAK	448	320	150	128	JetBlue	8
44	19:25	20:46	PHX	5616	CRJ9	90	77	American	3
45	19:34	2:09	SDF	905	767	crew	crew	UPS	TWY L
46	19:55	21:01	LAS	1780	320	150	128	JetBlue	7
commuter 3	20:00	22:47	SLC	tbd	CRJ7	70	60	Delta	2
47	20:30	1:22	AUS	216	320	150	128	JetBlue	5
48	21:10	5:36	BOS	404	320	150	128	JetBlue	8
49	21:30	22:49	SFO	2136	320	150	128	JetBlue	6
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4.3						5,857	PAX/day		
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Feasibility Study for a Federal Inspection Service Facility at Long Beach Airport

Aircraft Parking	Airline	Seat Capacity	Seat Utilization	Equip	Flt#	Inb Sta	Dept	Arvl	Total Arrivals
		Load Factor	85%				TO	LGB	
4	JetBlue	150	128	320	2135	SFO	6:15	7:35	1
3	JetBlue	150	128	320	217	AUS	7:10	8:04	2
9	Delta	70	60	CRJ7	tbd	SLC	7:00	8:08	commuter 1
1	JetBlue	150	128	320	tbd	GDL	7:00	8:35	3
8	American	90	77	CRJ9	5663	PHX	7:45	9:09	4
7	JetBlue	150	128	320	1121	PDX	7:15	9:36	5
9	Delta	90	77	CRJ9	4644	SLC	8:32	9:38	6
10	Southwest	148	126	737-700	972	OAK	8:35	10:00	7
4	JetBlue	150	128	320	1207	SEA	7:35	10:13	8
6	JetBlue	150	128	320	147	OAK	9:00	10:18	9
3	JetBlue	150	128	320	735	SFO	9:30	11:00	10
5	JetBlue	150	128	320	211	LAS	10:15	11:19	11
7	JetBlue	150	128	320	447	OAK	10:10	11:29	12
8	American	90	77	CRJ9	5661	PHX	10:35	11:55	13
9	Delta	90	77	CRJ9	4589	SLC	11:25	12:25	14
4	JetBlue	150	128	320	231	SLC	11:54	12:44	15
7	JetBlue	150	128	320	1435	SFO	11:59	13:27	16
1	JetBlue	150	128	320	tbd	LIR	8:35	13:40	17
10	Southwest	148	126	737-700	1024	OAK	12:20	13:45	18
3	JetBlue	150	128	320	213	JFK	11:32	14:20	19
2	JetBlue	150	128	320	tbd	XXX	tbd	14:30	20
6	JetBlue	150	128	320	877	LAS	13:24	14:32	21
4	JetBlue	150	128	320	1007	SEA	12:20	14:58	22
1	JetBlue	150	128	320	tbd	PVR	14:00	15:00	23
9	Delta	70	60	CRJ7	tbd	SLC	14:07	15:15	commuter 2
5	JetBlue	150	128	320	43	RNO	14:15	15:40	24
8	American	90	77	CRJ9	5619	PHX	14:35	15:55	25
7	JetBlue	150	128	320	1417	AUS	15:20	16:15	26
10	Southwest	148	126	737-700	18	OAK	15:05	16:30	27
6	JetBlue	150	128	320	1521	PDX	14:10	16:31	28
1	JetBlue	150	128	320	tbd	MEX	14:30	16:45	29
2	JetBlue	150	128	320	tbd	XXX	tbd	17:30	30
3	JetBlue	150	128	320	379	LAS	16:25	17:31	31
TWY L	UPS	crew	crew	B763F	2908	SDF	16:10	17:35	32
4	JetBlue	150	128	320	407	SEA	15:00	17:40	33
TWY F	FedEx	crew	crew	A300F	1351	MEM	16:00	17:47	34
9	Delta	90	77	CRJ9	4723	SLC	17:00	18:04	35
8	American	90	77	CRJ9	5668	PHX	16:43	18:15	36
5	JetBlue	150	128	320	365	SMF	17:13	18:33	37
6	JetBlue	150	128	320	531	SLC	17:50	18:37	38
7	JetBlue	150	128	320	879	LAS	17:35	18:38	39
9	Delta	70	60	CRJ7	tbd	SLC	18:22	19:30	commuter 3
3	JetBlue	150	128	320	1179	LAS	18:35	19:38	40
1	JetBlue	150	128	320	tbd	SJD	18:10	19:40	41
4	JetBlue	150	128	320	1635	SFO	18:20	19:43	42
2	JetBlue	150	128	320	tbd	CUN	16:50	20:15	43
6	JetBlue	150	128	320	1621	PDX	18:23	20:41	44
5	JetBlue	150	128	320	404	OAK	19:25	20:44	45
10	Southwest	148	126	737-700	2785	OAK	19:35	21:00	46
9	Delta	90	77	CRJ9	4639	SLC	20:15	21:17	47
3	JetBlue	150	128	320	405	BOS	18:00	21:18	48
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15	10:25	11:33	LAS	880	320	150	128	JetBlue	7
16	10:30	11:50	OAK	1853	737-700	148	126	Southwest	10
17	11:10	13:21	PDX	1522	320	150	128	JetBlue	6
18	11:28	14:01	SEA	1006	320	150	128	JetBlue	4
19	11:49	13:14	SFO	1636	320	150	128	JetBlue	3
20	12:05	13:26	SMF	266	320	150	128	JetBlue	5
21	12:15	13:30	RNO	42	320	150	128	JetBlue	7
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48	21:10	5:36	BOS	404	320	150	128	JetBlue	5
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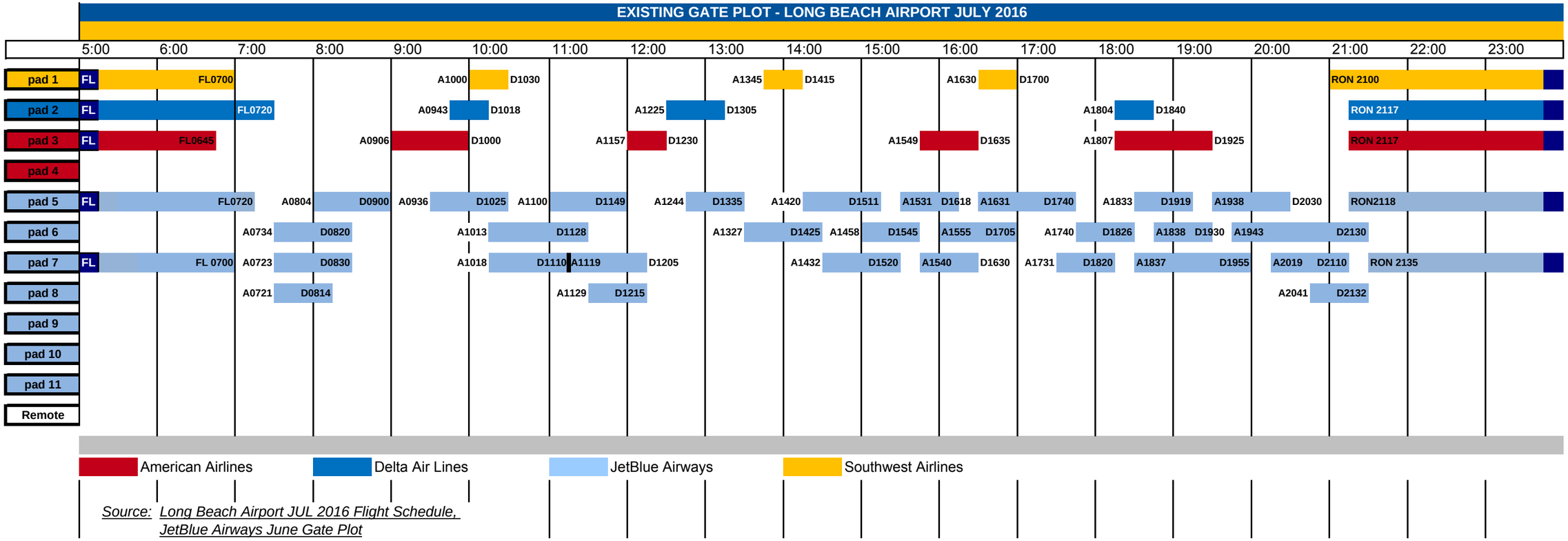
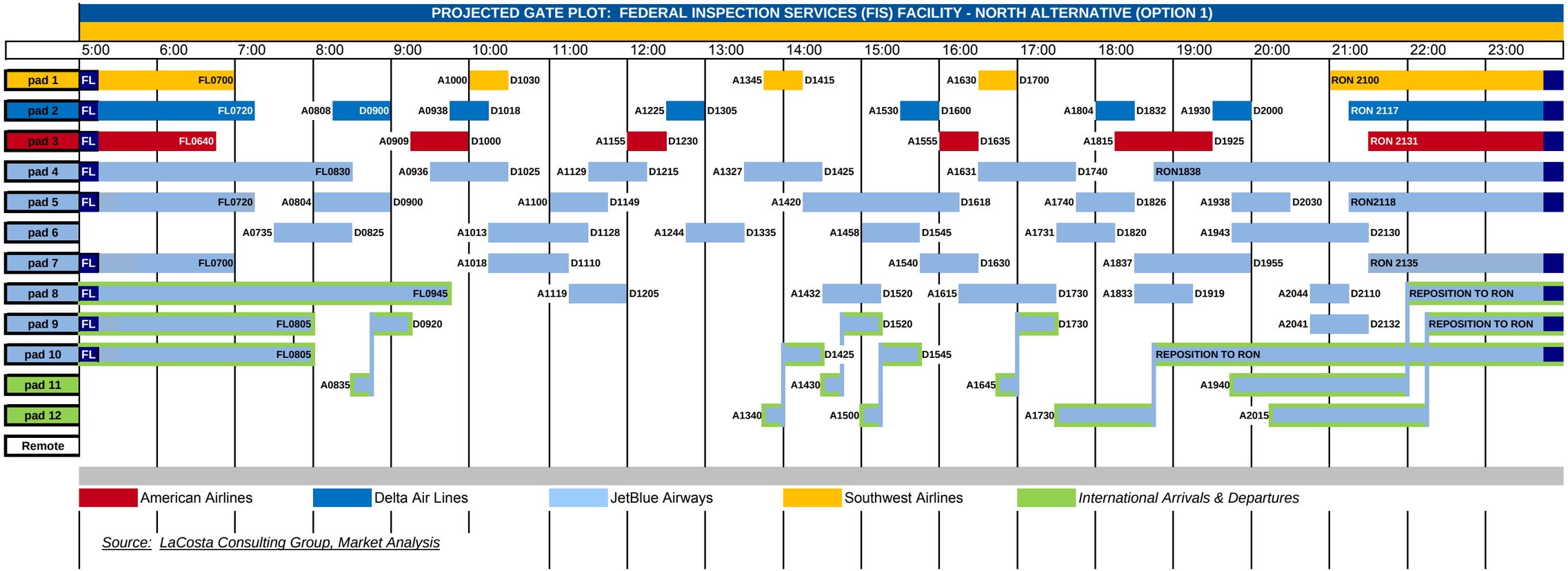
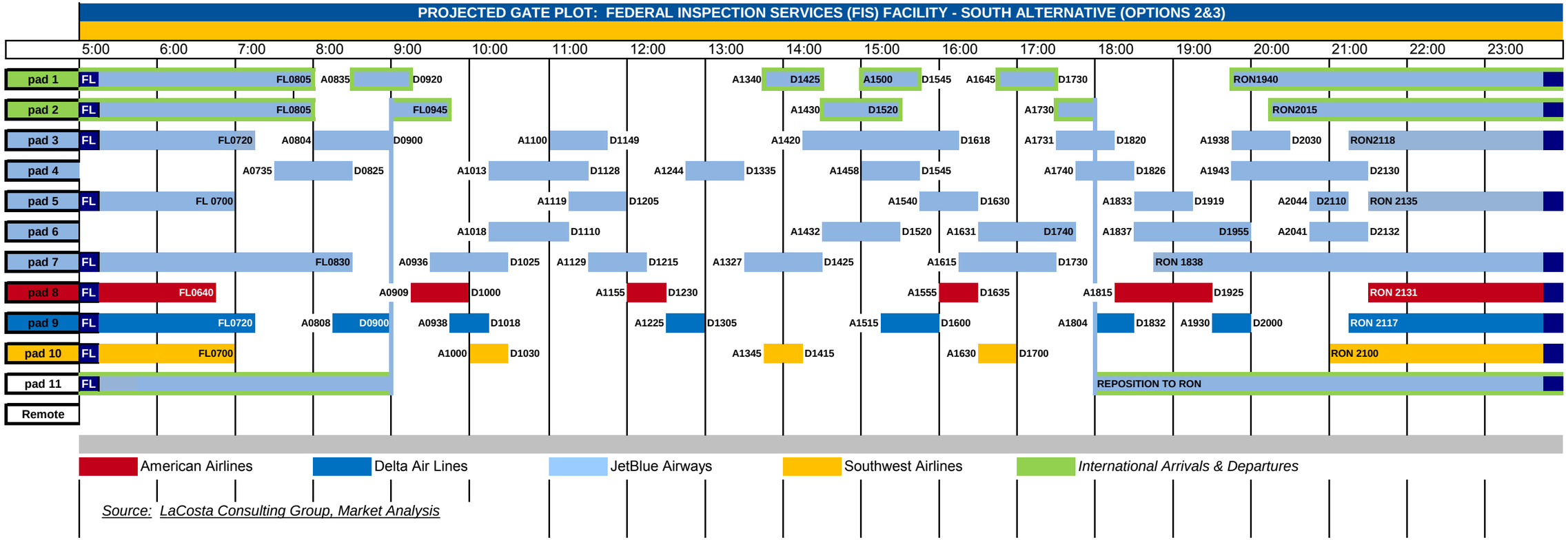


Source: Long Beach Airport JUL 2016 Flight Schedule, JetBlue Airways June Gate Plot



Source: LaCosta Consulting Group, Market Analysis



Source: LaCosta Consulting Group, Market Analysis

Quality Counts Background:

Quality Counts is a full-service transportation data collection firm headquartered in Tigard, Oregon, with additional offices in: Tampa, FL; Baton Rouge, LA; Houston, TX; Charlotte, NC; Vienna, VA; Chicago, IL, Philadelphia, PA; and Walnut Creek, CA. In addition to our fully staffed offices, we also have staffed locations where trained field technicians and a solid equipment base are available in: Honolulu, HI; Detroit, MI; Minneapolis-St Paul, MN; and Bismarck, ND among others.

Our projects and clients – both public and private – have given us extensive experience in the business of transportation data collection nationwide. Across the country QC holds continuing contracts with several state Departments of Transportation, Councils of Governments, Regional Planning Councils, Counties, and Cities of varying sizes. Our data, in addition to being trusted for use at the planning level, is also used for projects performed for the National Cooperative Highway Research Program (NCHRP).

Our parent company, Kittelson and Associates, Inc., is a nationally recognized engineering firm that's been in business for nearly 30 years. Since its inception in 2003, QC has conducted over 65,000 turning movement counts, 25,000 tube counts, 1,900 travel time surveys, and over 1,000 13-vehicle classification studies, along with thousands of hours of specialized studies including: Pedestrian Volume & Movement Counts, Bicycle Counts, Origin-Destination Surveys, Travel-Time Surveys, Vehicular Gap Studies, Radar Speed Surveys, Queue Length Surveys, Parking Demand/Supply Surveys, and many others.

We provide service to a wide range of consulting engineering firms, colleges, jurisdictions, municipalities, and developers, including the following subset of our client list:

AECOM
Caltrans
Cambridge Systematics
CH2M Hill
City of Pleasanton, California
County of San Mateo
DKS Associates
Fehr & Peers
Kimley-Horn and Associates
Washington County, OR
Parsons Brinckerhoff
Port of Portland

QC combines leading-edge technology with traditional transportation data collection techniques to ensure the most accurate and efficient data collection procedures. Whether clients require video or Wavetronix radar data collection options, traditional tube counts, or unique data collection procedures, QC has proven itself reliable time and time again. QC also features a convenient a convenient on-line ordering and database system (see www.qualitycounts.net). Utilizing an internally-developed online data warehouse, QC provides individuals with access to all of their data reports anytime with multiple formatting options.

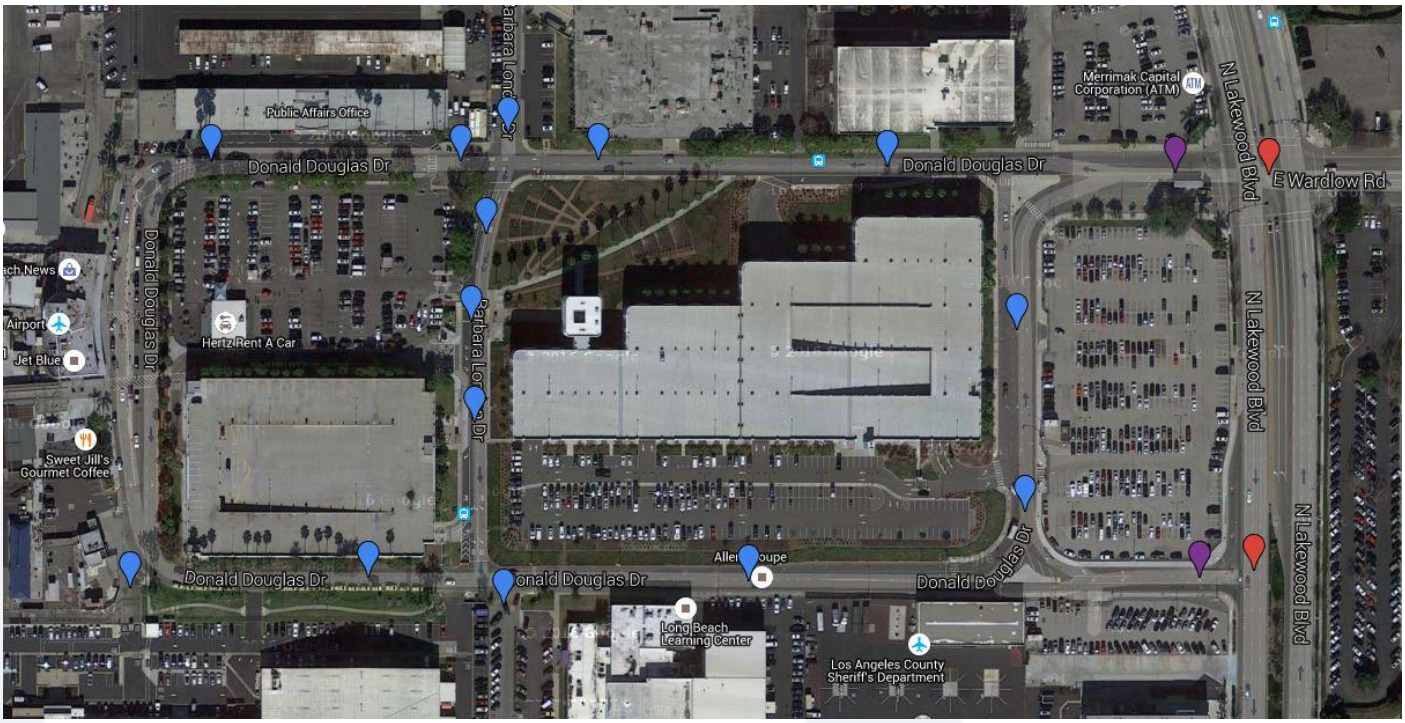
ADT Tube Counts:

If you've been driving for any length of time, you've no doubt driven over one of those black strips of tube stretched across the road. These small rubber hoses are used to measure the number of cars traveling a particular stretch of roadway over a given period – usually 24 hours. They're closed on one end and are held down by ropes tied to nails on the ground. The other end is plugged into a device called a counter (Jamar Apollyon). Finally, gorilla tape were used to keep the tubes from excessively moving. When the wheel of a car hits the tube, the pressure creates a pneumatic (air) pulse, which is measured by the counter. We call these "hits". The counter records each individual hit with a

timestamp; this information is later used to create reports about the number, type and speed of the vehicles using a stretch of roadway. QC field staff members are tasked with the proper deployment of our tube equipment which may be beneficial to the engineers working on the project. For this project, we utilized two road tubes per segment, using one of them as a back up. There were a total of 16 locations that were conducted using tube counts to collect data. These locations are indicated by the blue and purple pins on the map below (Fig. 1). Our tube counts will generally meet the following requirements:

1. Conducted on a midnight to midnight, 24-hour basis
2. Bi-directional
3. Conducted on Tuesday, Wednesday, or Thursday except holidays
4. No counts will be collected during adverse weather conditions.
5. No traffic counting will be allowed on City or School holidays.
6. Counts may be submitted in hard copy form and in electronic format (Excel (.xls) and Adobe Acrobat (.pdf)).

Fig. 1 - Long Beach Airport Map:



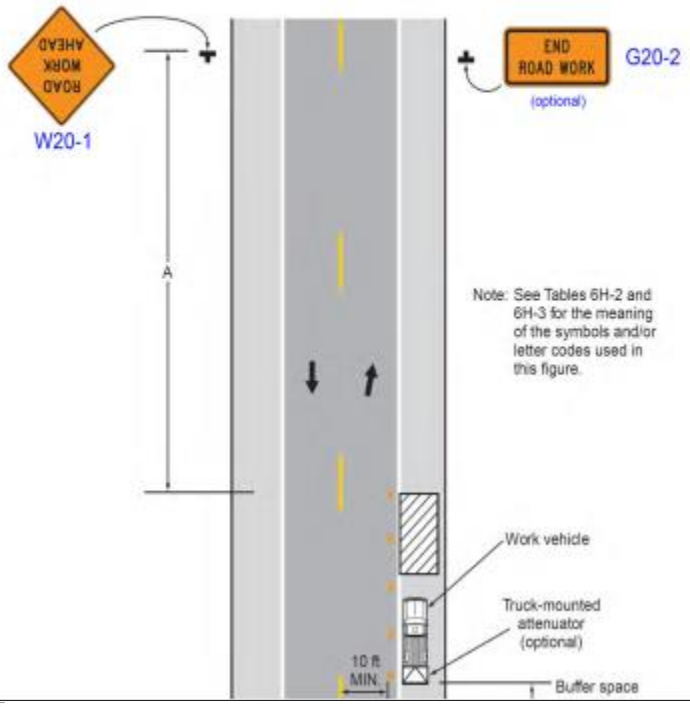
Work Zone Specifications:

Having conducted tens of thousands of road tube counts while servicing our government contracts and private sector clientele, QC has developed a great deal of expertise in these studies. We have fine-tuned our system to minimize the risks to both our staff and the public at large, while maximizing the accuracy of our counts.

Each set up will take no longer than 15 minutes. QC will not impede traffic in any way, but we will need to be parked on an accessible parking lot or the shoulder of the road (or nearby if applicable) during installations and take downs. Tape and road nails will be used to safely secure the road tubes to roads. For safety reasons, and to prevent the equipment from coming loose, QC will make sure our equipment is as secure as possible. The machine traffic counter will be placed well off the roadway attached to a sign or post with a chain and lock. The field technicians will be wearing reflective vests, hard hats and safety goggles. Reflective cones will also be used to surround the work zone out of traffic flow. We will use a flashing beacon light on top of our work vehicle. It will be parked as far off the roadway as possible during installation and takedown (Fig. 2). All fieldwork will be conducted during non-peak traffic hours.

Fig. 2 - Traffic Control Plan:

Figure 6H-6. Shoulder Work with Minor Encroachment (TA-6)



Methodology

Video-based Data Collection

Turn movement counts, non-intrusive class counts, pedestrian & bicycle counts

Since 2004, Quality Counts has used video cameras to capture turning movement count data. As such, QC maintains a smaller local staff of highly trained field technicians that work with our camera equipment and are specifically trained to capture turning movement counts in all situations, locally and across the country. Video is transferred to one of our dedicated Video Reduction Centers (VRC) where it is processed to produce highly accurate data.

The Video Reduction Team maintains a large staff of dedicated, highly-trained Data Reduction Technicians on both US coasts in our two Video Reduction Centers (VRCs). This enables QC to easily take on large projects and deliver consistent quality. Our Data Reduction Technicians are required to pass rigorous counting tests before joining the counting team, and work under supervision to count inbound video from our various offices. VRC management staff and project managers each review data and deliverables to ensure quality before delivery to the client.

The use of video data allows us to offer more accurate counts at a reduced cost, as we are able to return to the video as necessary to verify numbers without having to return to the field, and the counts are conducted in a controlled environment, where personnel can pause for breaks, or to regain their focus. Our extensive experience shows this method reduces the margin of error present in other methods of counting to achieve at least a 95% accuracy rating.

QC's local Operations Manager will serve as the main point of contact for the Client. Thorough communication between all parties involved is crucial for ensuring that the Client receives the accurate data it requires in a timely fashion. QC's success is in large part the result of its companywide dedication to exceptional communication with clients.

Special Considerations

Our extensive experience with analyzing video recorded traffic movements has demonstrated the following benefits to our process in respect to the scope of work outlined by the Client:

1. Having a video record to check against aerial photographs, signal phasing, and on-site paperwork is invaluable to ensuring count accuracy at such locations.
2. All of our personnel live and work in the United States.
3. Video records of turning movements allow for adjustment of counting strategy and addition of multiple counters if the traffic volume, intersection layout, or presence of many large vehicles or pedestrians requires it.
4. Performing a test-count a portion of each peak allows for verification of accuracy not possible for on-site counts.
5. Our extensive equipment inventory allows us to quickly and easily perform large-scale data collection projects, maximizing efficiency companywide.
6. Our rigorous vetting and testing of Data Reduction Technicians through our hiring process ensures accuracy of turning movement counts.
7. Our firm's national reputation of experienced and skilled personnel and rigorous quality control procedures will provide a data set from which to compare other past and future data sources.
8. Data is always backed up with video evidence.

Project Management

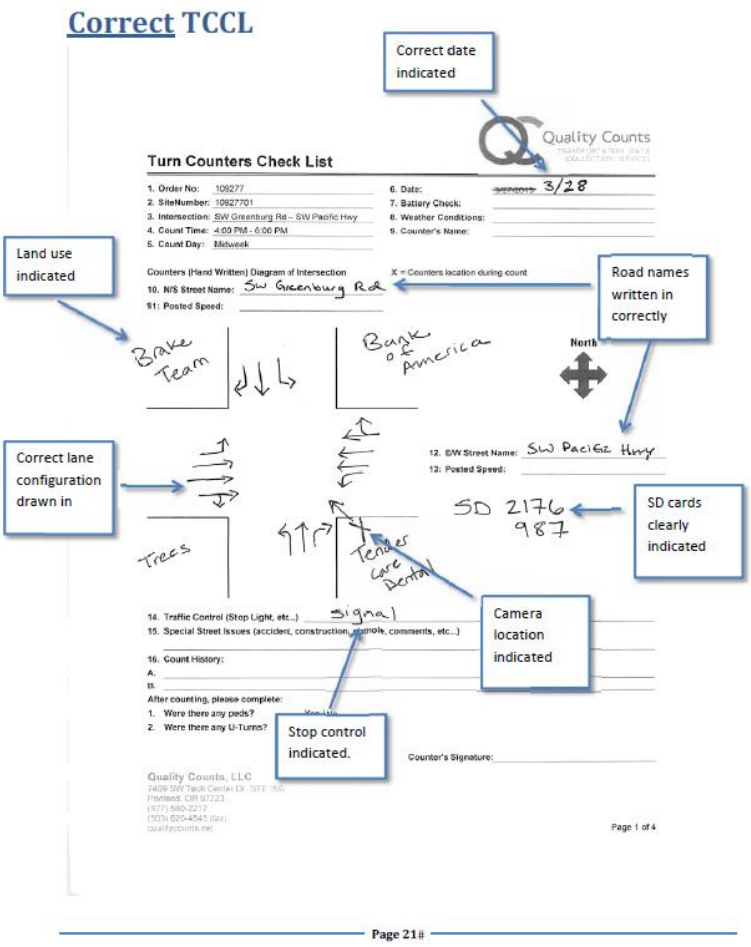
Quality Counts employs a multi-tiered system of project management. The local Operations Manager serves as the main point of contact for a client, while the Project Prime will be ultimately responsible for the completion of the project. Because of this responsibility, the Project Prime regularly communicates with Operations Manager to monitor the status of the project and will provide the final level of Quality Control/Assurance.

Operations Managers review all locations, map the locations using Google Maps, and then schedule counts based on availability of valid counting days, equipment, and staff with respect to the project deadline. It is standard practice to design equipment deployment routes in a manner that maximizes efficiency, and reduces the potential impact on local traffic. These routes are then reviewed with the Field Technician(s) who will be deploying equipment. Technicians are equipped with a map, detailed written instructions, and internal data collection/tracking forms for each location.

Under the direction of an Operations Manager, Technicians prepare and test equipment, verifying timestamps, lens cleanliness, battery voltage, and proper equipment functioning before performing traffic data collection. Each location has a count-specific coversheet we call the Turn/Tube Counter's Checklist, or TCCL (see figure 1), used to record details of the location and ensure effective internal project tracking. Preliminary information is added to the TCCL at the office. Once in the field, technicians create a graphic lane diagram of the intersection, noting any traffic control measures, speed limits, and land uses for reference.

The TCCL is sent to the VRC along with the collected video footage where it is used in project tracking and the quality control process.

Figure 1



Video Collection

After receiving the list of locations to be counted, QC Operations Managers will begin the preparation process to collect the requested data. Operations Managers will:

1. Map all locations using our online mapping and project management tools.
2. Review each location remotely using Google Street View.
3. Determine equipment requirements and optimal camera placements.
4. Prepare count-specific paperwork for project tracking.
5. Design optimal fieldwork routes.
6. Schedule video collection.
7. Notify the Video Reduction Center of anticipated schedule.

Project managers then communicate thoroughly with Field Technicians, providing them with printed maps of their routes, the requisite paperwork for each site, explanations of the project, and equipment requirements. Prior to leaving the office, Technicians prepare the required equipment bringing spare equipment with them to ensure efficient response in the event of unforeseen complications.

All vehicles used for traffic data collection will be equipped with a high-intensity roof-mounted strobe light which shall be activated as the traffic count vehicle approaches the work site. All Field Technicians shall wear high-visibility safety apparel that meets Performance Class 3 requirements of the ANSI/ISEA 107-2010 and safety glasses during field operations.

QC's light-weight and inconspicuous camera systems are easily installed by a single Field Technician in less than ten (10) minutes. The small, neutral-colored enclosures are mounted on existing infrastructure, well above the average individual's sight-line. In this way, QC is able to efficiently deploy numerous camera systems without impacting the public's behavior.

Data Reduction

QC has two Video Reduction Centers (VRCs), one on each U.S. coast, where our Video Reduction Team maintains a large staff of dedicated Data Reduction Technicians. This enables us to easily take on large projects and deliver consistent quality. Our Data Reduction Technicians are required to pass rigorous counting tests before joining our team, and work under supervision to count inbound video from our various offices. VRC Management Staff and Operations Managers each review data and deliverables to ensure quality before delivery to the client.

Video is reviewed in the field and then again at the local operations office before being sent to the VRC. At the VRC, video quality and accuracy of paperwork is verified before the video is backed-up on our secure server. Trained technicians then reduce the digital video footage into usable data, typically at speeds faster than real-time. This allows for more efficient collection of traffic data, and significantly increases efficiency when counting slow-moving traffic such as pedestrians and cyclists.

The use of video data allows us to offer more accurate counts at a reduced cost, as we are able to return to the video as necessary to verify numbers without having to return to the field. Also the counts are conducted in a controlled environment, where personnel can pause for breaks and speed up or slow down video as traffic volumes increase or decrease. Our extensive experience shows that manually counting from video efficiently achieves a 95% or greater accuracy rating and reduces the margin of error present in other data collection methods.

Quality Review

Once a project is undertaken, QC employs numerous quality control measures to ensure that accurate data is delivered to our customers. Video footage is reviewed by Field Technicians, and Operations Managers before being sent to our Video Reduction Center to ensure accuracy of camera angles and the ability to count requested traffic.

At the VRC all collected traffic data is subjected to our internal quality control process, conducted by VRC management staff. This procedure includes reviewing data for accuracy of lane configurations, consistent count volumes between adjacent intersections, accuracy of count details (times, dates, etc.), and data integrity. Sites are then subjected to test counts which consist of recounting 3 consecutive 5-minute segments of a location to verify accuracy. Similar reviews then occur at the project management level to further ensure quality control.

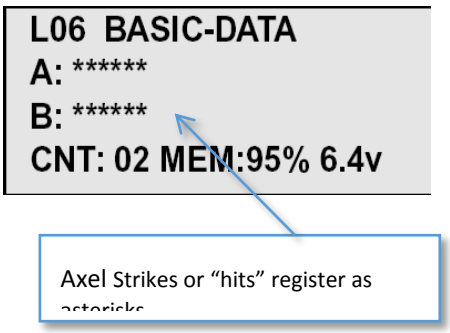
Automatic Traffic Recorders (ATR)

Tube counts for volume, class, speed, and gap data

Nationwide QC has over 600 ATR devices in several makes and Models. Equipment is often shipped between offices to meet fluctuating needs across the country. This requires a detailed system of equipment tracking, which we have implemented into our work-flow process. Every time a counter is deployed its serial number is recorded on the field log. Whenever a device malfunctions in the field this is recorded locally, and added to the companywide database. The equipment is then tested, using manufacturer's specifications. If the device passes the manufacturer's test, it is returned to service, if not, it is sent to the manufacturer for repair. In this way, QC is able to efficiently maintain properly functioning equipment.

However, QC knows that simply monitoring the function of equipment is not always sufficient, and proactively employs a thorough equipment testing procedure prior to installation. Road Tubes are visually inspected for cuts, punctures, or other obvious damage. Then a bicycle pump is connected to the open end of the tube and 40 psi of air pressure is applied to the tube. Technicians monitor a pressure gauge on the bicycle pump for 20 seconds to ensure that the tube holds pressure, and in this way verifies that there are no invisible defects in the tubes.

Each time personnel deploy and retrieve equipment. After tubes have been anchored to the roadway, the ATR device has been programmed, and the tubes have been attached, the technician performs a test count. By comparing hits registered to the actual number of cars passing over a set of tubes, one can determine whether the device is collecting accurate data. If the test count is successful the technician records this on the accompanying paperwork, and moves to the next site.



The details of the entire project are entered into Quality Counts' (QC) secure online project management and data warehousing site where project tracking paperwork called the "Counter's Checklist" is automatically generated. These field log forms are location specific, featuring each locations site code and relevant details supplied by the technician while on site including the following information:

- Project number
- GPS coordinates
- Graphic site drawing
- Posted Speed
- Equipment number
- Station ID number
- Project title
- Counter's name
- Land use notations
- Traffic control measures
- Date and Time
- Road conditions
- Street names
- Technician's name
- North/South, East/West
- Weather
- State Road Number
- Lane configuration

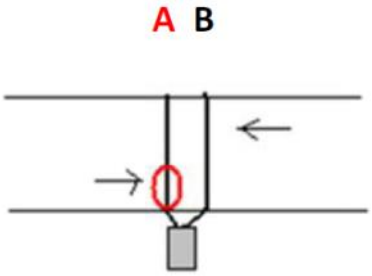
These forms, along with maps and street views of the locations to be counted will be provided to the Field Technicians who will install the equipment according to the project schedule. After receiving weekly assigned tasks and paperwork from the operations manager, field technicians prepare and test equipment functioning before leaving the office to install equipment. Once on-site the field technician will fill out the necessary information such as the weather, road conditions, lane configurations etc.

Traffic Data Collection

QC has deployed tens of thousands of ATR devices over the past decade, and has extensive experience collecting volume, classification, and speed data using pneumatic tube counters.

Quality Counts employs an internally developed training system designed to comprehensively train our field technicians in the process of correctly and safely installing several different models of ATR devices. Each count location is accompanied by a form called the "Tube Counter's Checklist" (TCCL), which includes a diagram of the count location, the project number, weather, GPS coordinates, date, day of the week, etc. Before leaving the office, tubes are visually inspected, then checked with an air pump to ensure they are airtight. The following are key elements of correctly installing tube counters:

Figure 2



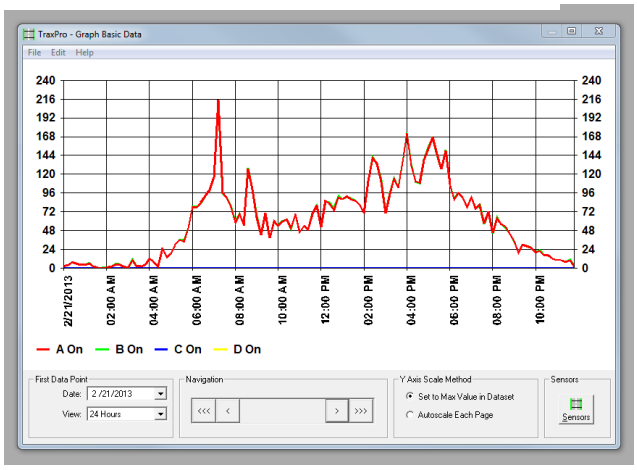
- Safety to Technicians and the motoring public is top priority
- Tubes are anchored to the road using nylon slip-knots, nails, and mastic tape
- Tube ends are plugged by knotting one end
- Pairs of tubes must be of the same length
- The tube plugged into the "A" port must be the tube which will be struck first by traffic in the lane closest to the ATR device as Figure 2 shows:
- Tubes must be placed perpendicular to the flow of traffic (away from curves, driveways, turn lanes, etc.)
- Tubes cannot be placed in areas where vehicles will stop or park on them (away from queues, and on street parking)
- Device serial numbers and locations are recorded on all paperwork at installation and verified on pickup to ensure project organization.
- The "B" tube must be placed at a precise distance from the "A" tube, according to manufacturer specifications.

Quality Counts utilizes an in-house developed software program and project tracking procedure to continually monitor the function of equipment and the performance of field technicians. These protocols allow for immediate response to faulty equipment, and problematic traffic count locations.

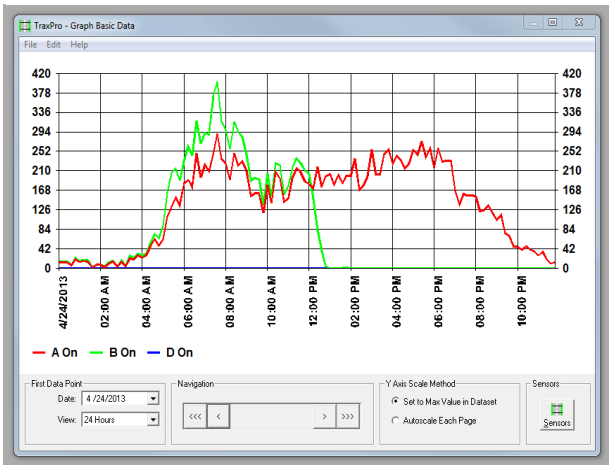
SOFTWARE APPLICATION - At the office raw counts are downloaded from the ATR device onto a computer. The computer is equipped with TraxPro and PetraPro software which is used to convert the data from the ATR device into a variety of file formats. During this process the software analyzes the quality of data collected according to the type of data needed.

In addition to software processing, Quality Counts personnel are trained to compare count data to expected conditions and identify potential malfunctions, such as consecutive periods with zero volumes, or high percentages of unclassed vehicles. Most processing of tube data is conducted remotely by the Operations Support Team. These individuals each process thousands of tube counts each year, and their specialization provides a high level of expertise in identifying problematic or inaccurate data.

Graph Showing Accurate Tube Data



Graph Showing Inaccurate Tube Data



Best Practices

QC's experience has allowed for the development of a thorough training process specifically designed around best practice solutions to typical complications of data collection. Below is a table listing some of the more common complications and QC's respective best practices.

Potential Causes of Inaccurate Data:	Quality Counts' Best Practice Solutions
Soft asphalt causes tubes to come loose	Large Spikes are used off the roadway to anchor tubes to ground.
Tubes Severed by high speeds	Mastic tape is used for added security. Alternative methods are available when necessary.
Tubes severed by deliberate braking, vandalism, public interference	All equipment is has "Traffic Survey in Progress" sticker with contact info provided.
Tubes installed too close to a stop sign or traffic control device	Install ATR devices at least 200 ft. upstream of traffic control devices.
Vehicles parking on Tubes	Install Tubes where on-street parking is prohibited, or install ATR at median if available.
Vehicles weaving or curve in road	Install tubes on straight roads, perpendicular to traffic flow, away from turn lanes.
Human Error in Manual Counts	All Manual counts are conducted from video can be verified.

Sun glare compromises video	Cameras angled to limit horizon view, or pointed north.
Water on lens (weather)	Rain-X coating on lens, rain guard shield on lens.
Malfunctioning equipment	Test counts are conducted on-site.
Bluetooth Devices too close to each other	Recommended 0.5 miles between units.

Table 1: potential causes of inaccurate traffic data and QC's best practices response

Accuracy

Quality Counts employs numerous quality assurance practices when conducting traffic studies, a typical project follows the initial quality assurance procedure displayed in figure 2.

The most efficient way to ensure the collection of accurate traffic data is by employing best practices when planning and conducting a traffic count project. QC's twelve years of nationwide experience has provided many opportunities to fine-tune our methodologies and best practices to ensure efficient collection of accurate traffic data. Table 1 summarizes many of the most common complications of data collection and quality counts solutions to avoid these problems.

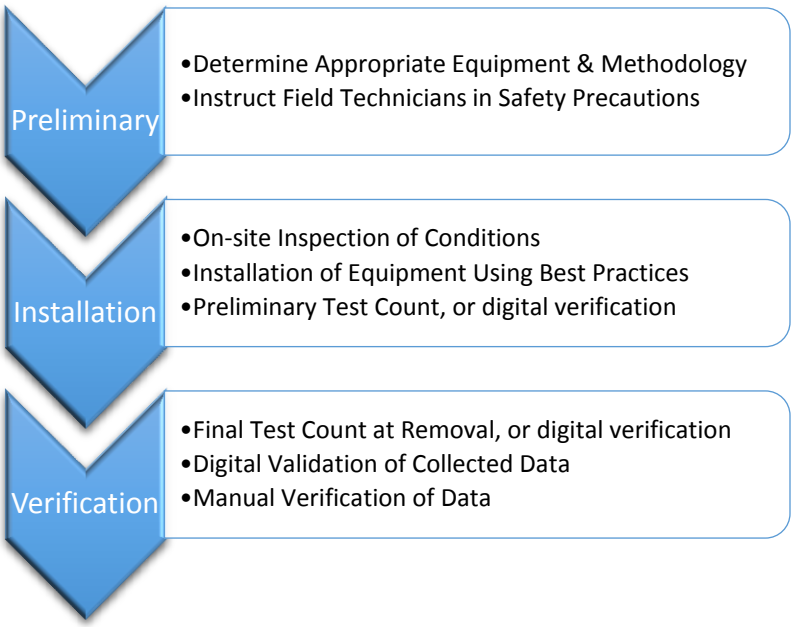
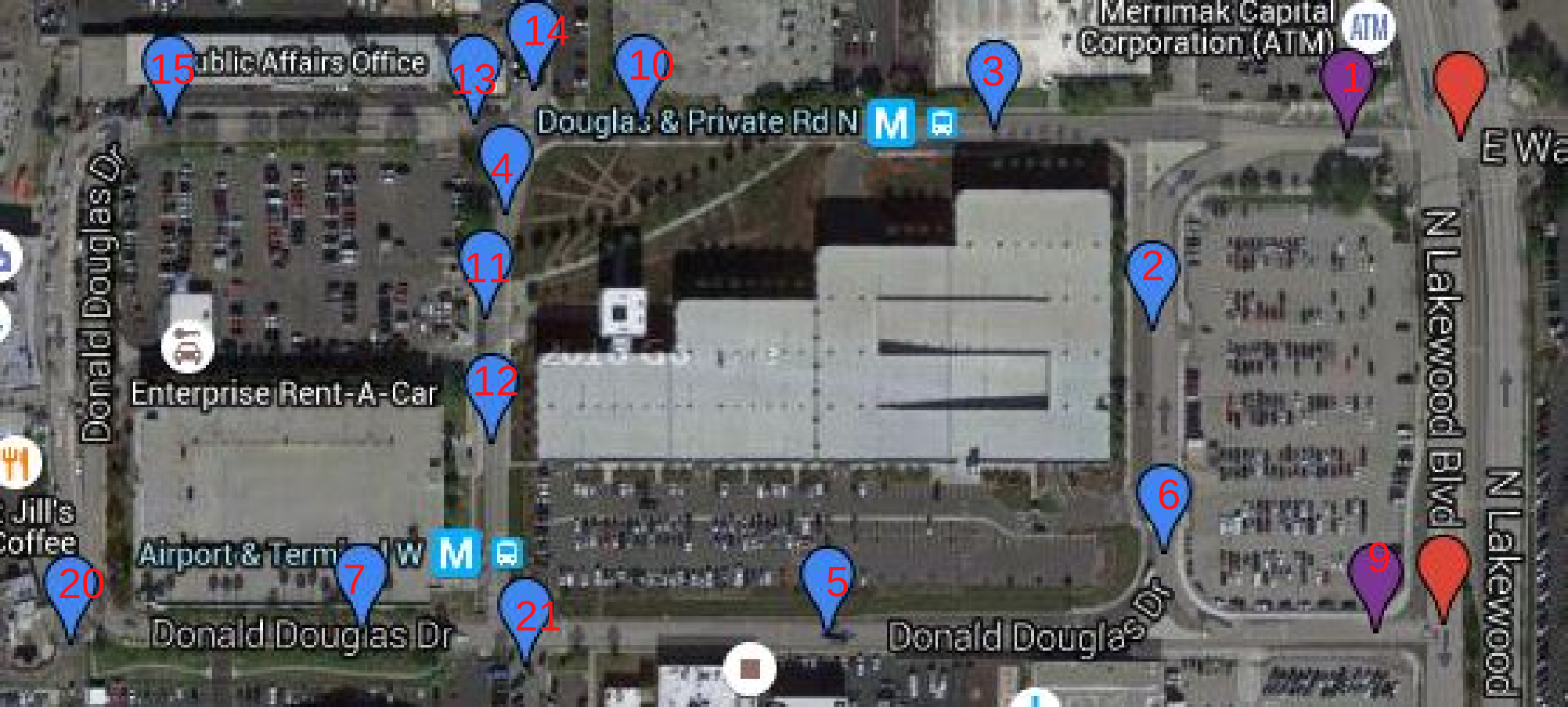


Figure 2: QC's initial quality assurance practices

Accuracy of count data must be verified even when best practices are used.

The final verification process of data is a comparison of simultaneous adjacent locations. Data is manually reviewed by Senior Operations Manager to ensure that data is consistent with typical traffic patterns and data at adjacent locations. When historical data is available, QC quality control personnel also have extensive experience comparing historical counts to collected data as an additional level of quality assurance.


Merrimak Capital Corporation (ATM)
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N Lakewood Blvd
N Lakewood
Donald Douglas Dr
Enterprise Rent-A-Car
Jill's Coffee
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21

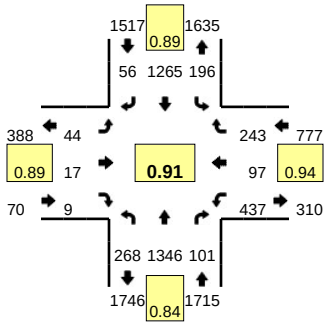
Type of peak hour being reported: Intersection Peak

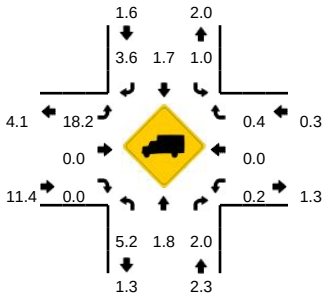
Method for determining peak hour: Total Entering Volume

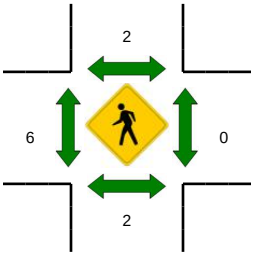
LOCATION: N Lakewood Blvd -- E Wardlow Rd
CITY/STATE: Long Beach, CA

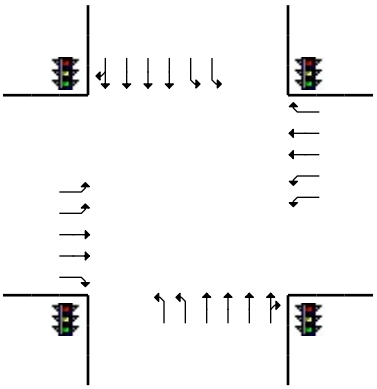
QC JOB #: 13777701
DATE: Tue, May 17 2016

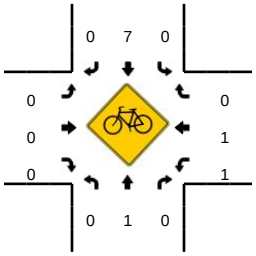
Peak-Hour: 7:15 AM -- 8:15 AM
Peak 15-Min: 7:45 AM -- 8:00 AM

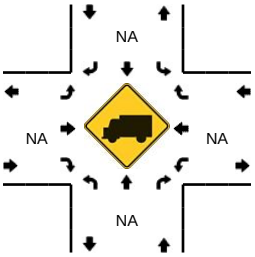


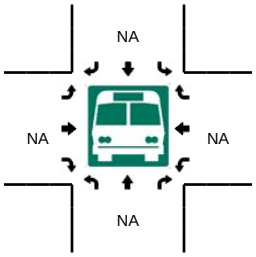












15-Min Count Period Beginning At	N Lakewood Blvd (Northbound)				N Lakewood Blvd (Southbound)				E Wardlow Rd (Eastbound)				E Wardlow Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:00 AM	66	250	9	16	28	275	13	2	7	7	1	0	57	21	52	0	804	
7:15 AM	70	332	21	11	49	302	9	1	6	3	1	1	104	23	47	0	980	
7:30 AM	52	311	37	11	68	344	16	0	10	3	4	1	121	25	61	0	1064	
7:45 AM	60	421	25	7	46	328	16	1	13	4	2	0	113	28	62	0	1126	3974
8:00 AM	51	282	18	6	29	291	15	2	13	7	2	0	99	21	73	0	909	4079
8:15 AM	55	344	21	5	35	314	17	0	11	2	3	0	78	20	56	0	961	4060
8:30 AM	44	316	36	6	37	291	23	3	15	5	1	0	61	14	68	0	920	3916
8:45 AM	83	301	27	10	29	244	12	1	8	4	1	0	66	36	60	0	882	3672

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	240	1684	100	28	184	1312	64	4	52	16	8	0	452	112	248	0	4504
Heavy Trucks	28	20	0		0	36	0		4	0	0		4	0	0		92
Pedestrians		4				0				0				0			4
Bicycles	0	1	0		0	5	0		0	0	0		0	0	0		6
Railroad																	
Stopped Buses																	

Comments:

Report generated on 5/25/2016 2:30 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

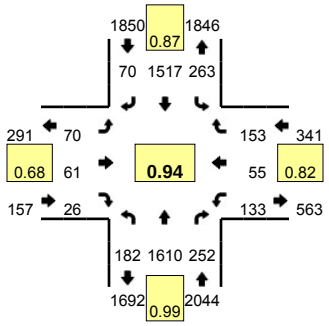
Type of peak hour being reported: Intersection Peak

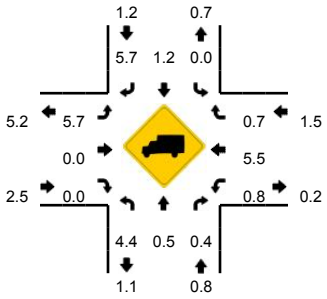
Method for determining peak hour: Total Entering Volume

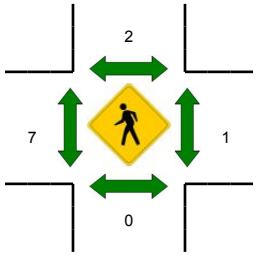
LOCATION: N Lakewood Blvd -- E Wardlow Rd
CITY/STATE: Long Beach, CA

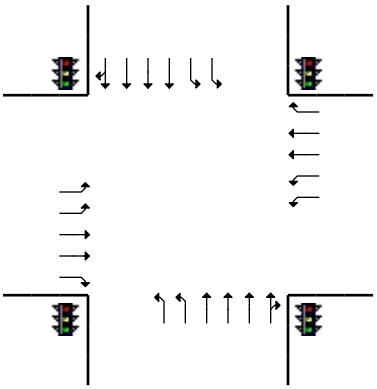
QC JOB #: 13777702
DATE: Tue, May 17 2016

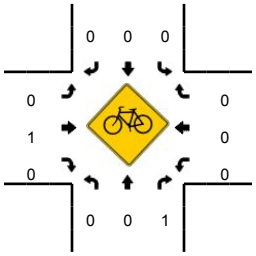
Peak-Hour: 4:45 PM -- 5:45 PM
Peak 15-Min: 5:00 PM -- 5:15 PM

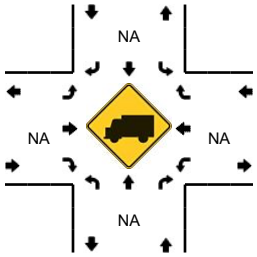


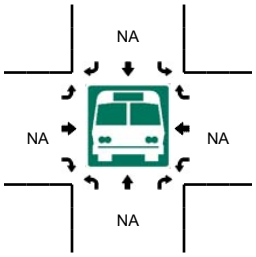












15-Min Count Period Beginning At	N Lakewood Blvd (Northbound)				N Lakewood Blvd (Southbound)				E Wardlow Rd (Eastbound)				E Wardlow Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	44	384	48	2	48	383	17	3	20	13	8	0	26	18	36	0	1050	
4:15 PM	57	363	48	2	49	391	23	3	15	11	9	0	24	20	34	0	1049	
4:30 PM	37	350	57	5	79	333	22	1	32	27	15	0	36	32	42	0	1068	
4:45 PM	45	392	52	3	52	343	20	4	21	14	7	0	24	9	39	0	1025	4192
5:00 PM	37	423	53	5	77	437	19	2	13	22	5	0	20	19	38	0	1170	4312
5:15 PM	46	393	69	8	72	351	19	5	16	18	10	0	58	12	33	0	1110	4373
5:30 PM	38	402	78	0	49	386	12	2	20	7	4	0	31	15	43	0	1087	4392
5:45 PM	45	385	58	2	35	319	15	2	9	6	4	0	23	15	39	0	957	4324

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	148	1692	212	20	308	1748	76	8	52	88	20	0	80	76	152	0	4680
Heavy Trucks	0	0	0		0	28	8		0	0	0		0	4	0		40
Pedestrians		0				4				0				0			4
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

Report generated on 5/25/2016 2:30 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

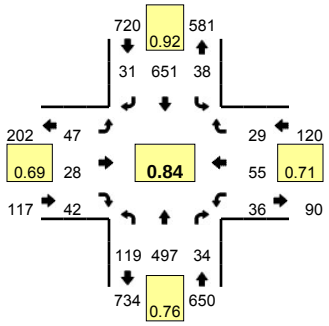
Type of peak hour being reported: Intersection Peak

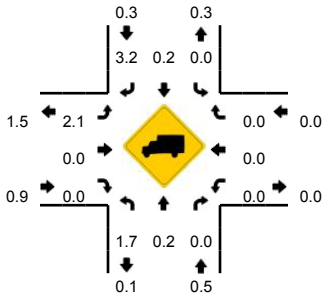
Method for determining peak hour: Total Entering Volume

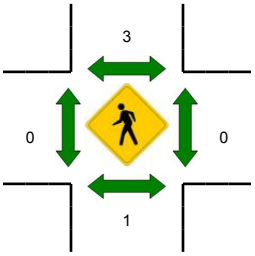
LOCATION: N Lakewood Blvd -- E Wardlow Rd
CITY/STATE: Long Beach, CA

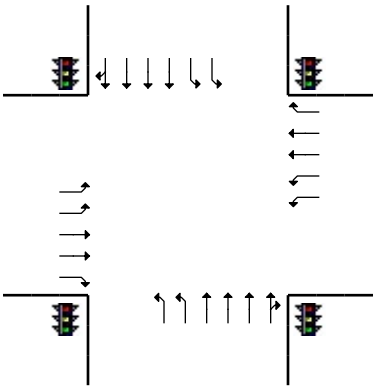
QC JOB #: 13777703
DATE: Tue, May 17 2016

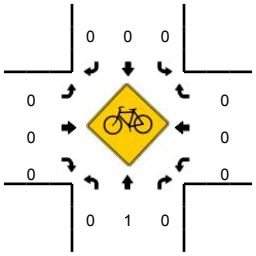
Peak-Hour: 9:00 PM -- 10:00 PM
Peak 15-Min: 9:15 PM -- 9:30 PM

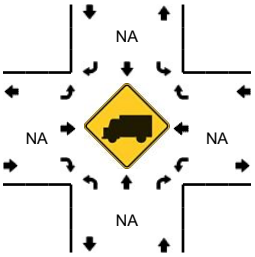


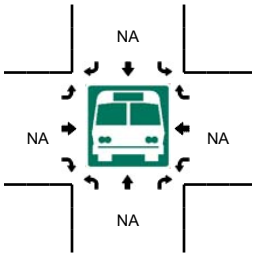












15-Min Count Period Beginning At	N Lakewood Blvd (Northbound)				N Lakewood Blvd (Southbound)				E Wardlow Rd (Eastbound)				E Wardlow Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
9:00 PM	28	128	10	1	11	179	4	1	4	5	5	1	9	9	12	0	407	
9:15 PM	43	163	6	2	8	166	11	0	15	10	10	1	12	21	9	0	477	
9:30 PM	27	107	10	2	4	157	10	6	17	11	21	0	8	16	6	0	402	
9:45 PM	16	99	8	0	5	149	6	3	9	2	6	0	7	9	2	0	321	1607
10:00 PM	20	102	7	1	7	134	1	3	15	10	8	0	9	7	4	0	328	1528
10:15 PM	3	86	4	1	6	101	0	4	2	1	5	0	4	1	3	0	221	1272
10:30 PM	3	75	5	0	5	82	1	2	10	10	8	0	2	0	3	0	206	1076
10:45 PM	4	71	7	3	3	71	1	0	2	1	2	0	6	2	4	0	177	932

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	172	652	24	8	32	664	44	0	60	40	40	4	48	84	36	0	1908
Heavy Trucks	8	0	0		0	0	0		4	0	0		0	0	0		12
Pedestrians		0				0				0				0			0
Bicycles	0	1	0		0	0	0		0	0	0		0	0	0		1
Railroad																	
Stopped Buses																	

Comments:

Report generated on 5/25/2016 2:30 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

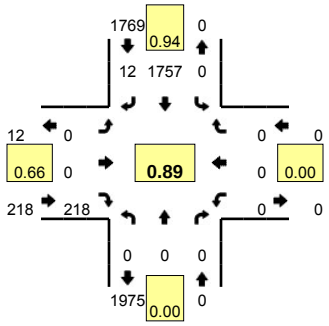
Type of peak hour being reported: Intersection Peak

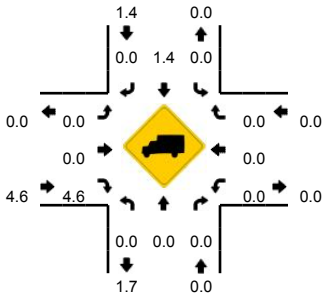
Method for determining peak hour: Total Entering Volume

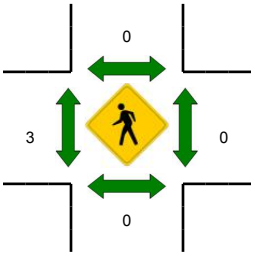
LOCATION: N Lakewood Blvd -- Donald Douglas Dr
CITY/STATE: Long Beach, CA

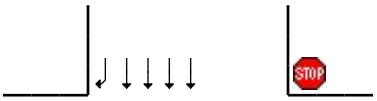
QC JOB #: 13777704
DATE: Tue, May 17 2016

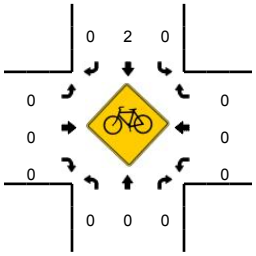
Peak-Hour: 7:15 AM -- 8:15 AM
Peak 15-Min: 7:45 AM -- 8:00 AM

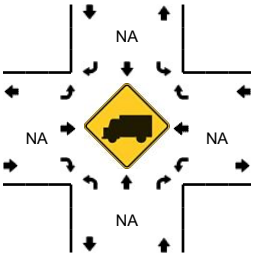


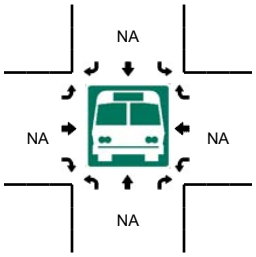












15-Min Count Period Beginning At	N Lakewood Blvd (Northbound)				N Lakewood Blvd (Southbound)				Donald Douglas Dr (Eastbound)				Donald Douglas Dr (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:00 AM	0	0	0	0	0	311	11	0	0	0	26	0	0	0	0	0	348	
7:15 AM	0	0	0	0	0	436	6	0	0	0	38	0	0	0	0	0	480	
7:30 AM	0	0	0	0	0	453	2	0	0	0	35	0	0	0	0	0	490	
7:45 AM	0	0	0	0	0	470	2	0	0	0	85	0	0	0	0	0	557	1875
8:00 AM	0	0	0	0	0	398	2	0	0	0	60	0	0	0	0	0	460	1987
8:15 AM	0	0	0	0	0	395	2	0	0	0	43	0	0	0	0	0	440	1947
8:30 AM	0	0	0	0	0	356	2	0	0	0	30	0	0	0	0	0	388	1845
8:45 AM	0	0	0	0	0	311	5	0	0	0	63	0	0	0	0	0	379	1667

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	0	0	0	1880	8	0	0	0	340	0	0	0	0	0	2228
Heavy Trucks	0	0	0		0	44	0		0	0	12		0	0	0		56
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

Report generated on 5/25/2016 2:30 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

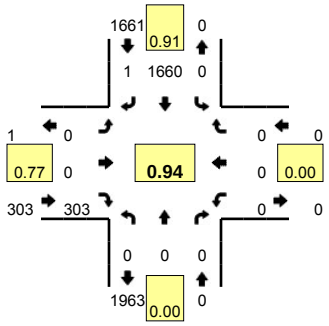
Type of peak hour being reported: Intersection Peak

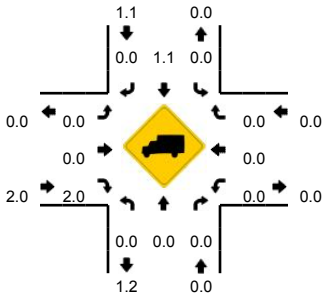
Method for determining peak hour: Total Entering Volume

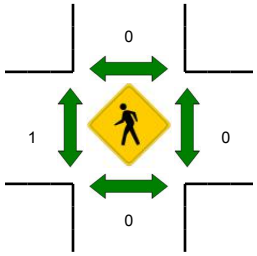
LOCATION: N Lakewood Blvd -- Donald Douglas Dr
CITY/STATE: Long Beach, CA

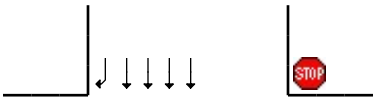
QC JOB #: 13777705
DATE: Tue, May 17 2016

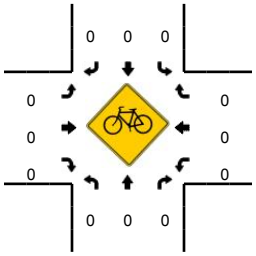
Peak-Hour: 4:30 PM -- 5:30 PM
Peak 15-Min: 5:00 PM -- 5:15 PM

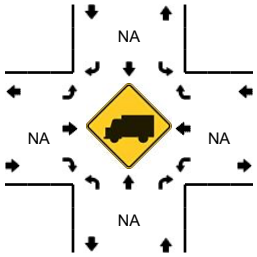


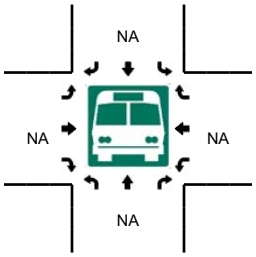












15-Min Count Period Beginning At	N Lakewood Blvd (Northbound)				N Lakewood Blvd (Southbound)				Donald Douglas Dr (Eastbound)				Donald Douglas Dr (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	0	0	0	0	0	393	1	0	0	0	56	0	0	0	0	0	450	
4:15 PM	0	0	0	0	0	432	1	0	0	0	56	0	0	0	0	0	489	
4:30 PM	0	0	0	0	0	376	1	0	0	0	99	0	0	0	0	0	476	
4:45 PM	0	0	0	0	0	386	0	0	0	0	77	0	0	0	0	0	463	1878
5:00 PM	0	0	0	0	0	462	0	0	0	0	59	0	0	0	0	0	521	1949
5:15 PM	0	0	0	0	0	436	0	0	0	0	68	0	0	0	0	0	504	1964
5:30 PM	0	0	0	0	0	401	1	0	0	0	49	0	0	0	0	0	451	1939
5:45 PM	0	0	0	0	0	372	2	0	0	0	43	0	0	0	0	0	417	1893

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	0	0	0	1848	0	0	0	0	236	0	0	0	0	0	2084
Heavy Trucks	0	0	0		0	28	0		0	0	8		0	0	0		36
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

Report generated on 5/25/2016 2:30 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

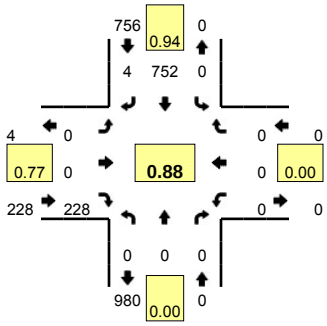
Type of peak hour being reported: Intersection Peak

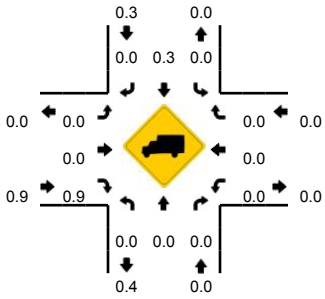
Method for determining peak hour: Total Entering Volume

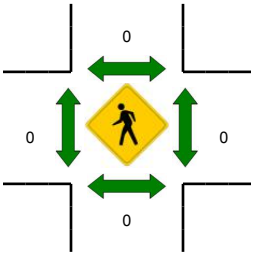
LOCATION: N Lakewood Blvd -- Donald Douglas Dr
CITY/STATE: Long Beach, CA

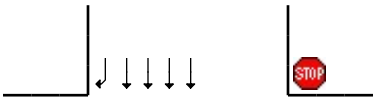
QC JOB #: 13777706
DATE: Tue, May 17 2016

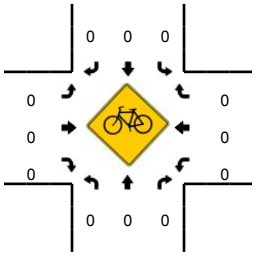
Peak-Hour: 9:00 PM -- 10:00 PM
Peak 15-Min: 9:15 PM -- 9:30 PM

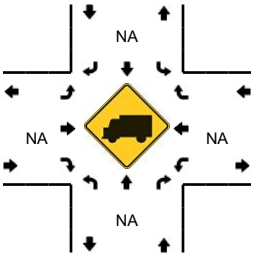


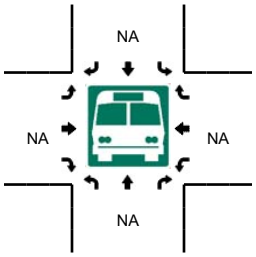












15-Min Count Period Beginning At	N Lakewood Blvd (Northbound)				N Lakewood Blvd (Southbound)				Donald Douglas Dr (Eastbound)				Donald Douglas Dr (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
9:00 PM	0	0	0	0	0	193	1	0	0	0	41	0	0	0	0	0	235	
9:15 PM	0	0	0	0	0	195	2	0	0	0	84	0	0	0	0	0	281	
9:30 PM	0	0	0	0	0	200	1	0	0	0	64	0	0	0	0	0	265	
9:45 PM	0	0	0	0	0	164	0	0	0	0	39	0	0	0	0	0	203	984
10:00 PM	0	0	0	0	0	141	2	0	0	0	73	0	0	0	0	0	216	965
10:15 PM	0	0	0	0	0	108	1	0	0	0	17	0	0	0	0	0	126	810
10:30 PM	0	0	0	0	0	90	0	0	0	0	24	0	0	0	0	0	114	659
10:45 PM	0	0	0	0	0	83	0	0	0	0	11	0	0	0	0	0	94	550

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	0	0	0	780	8	0	0	0	336	0	0	0	0	0	1124
Heavy Trucks	0	0	0		0	4	0		0	0	4		0	0	0		8
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

Report generated on 5/25/2016 2:30 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

LOCATION: Tube Count 1
SPECIFIC LOCATION: Tube Count
CITY/STATE: Long Beach, CA

QC JOB #: 13777707
DIRECTION: EB
DATE: May 17 2016 - May 22 2016

Start Time	Mon	Tue 17-May-16	Wed 18-May-16	Thu 19-May-16	Fri 20-May-16	Average Weekday Hourly Traffic	Sat 21-May-16	Sun 22-May-16	Average Week Hourly Traffic	Average Week Profile
12:00 AM		11	12	14	9	12	4	8	10	
1:00 AM		6	11	13	8	10	8	3	8	
2:00 AM		3	3	1	5	3	4	4	3	
3:00 AM		0	3	2	3	2	4	0	2	
4:00 AM		4	3	8	8	6	3	8	6	
5:00 AM		26	31	22	38	29	31	25	29	
6:00 AM		36	35	27	44	36	37	40	37	
7:00 AM		67	57	50	62	59	53	49	56	
8:00 AM		65	78	73	74	73	79	40	68	
9:00 AM		104	90	86	112	98	92	93	96	
10:00 AM		83	97	98	104	96	106	**100**	98	
11:00 AM		**132**	**158**	**153**	**222**	**166**	**110**	97	**145**	
12:00 PM		114	97	97	129	109	89	72	100	
1:00 PM		134	143	159	147	146	**127**	96	134	
2:00 PM		142	150	161	132	146	101	121	135	
3:00 PM		**265**	**298**	**260**	**293**	**279**	93	107	**219**	
4:00 PM		164	182	187	185	180	118	136	162	
5:00 PM		125	176	139	122	141	87	68	120	
6:00 PM		136	163	181	146	157	94	101	137	
7:00 PM		123	73	99	99	99	64	**148**	101	
8:00 PM		90	84	120	111	101	115	127	108	
9:00 PM		105	121	144	145	129	107	126	125	
10:00 PM		67	48	64	55	59	29	41	51	
11:00 PM		59	57	50	44	53	15	19	41	
Day Total		2061	2170	2208	2297	2189	1570	1629	1991	
% Weekday Average		94.2%	99.1%	100.9%	104.9%					
% Week Average		103.5%	109.0%	110.9%	115.4%	109.9%	78.9%	81.8%		
AM Peak Volume		11:00 AM 132	11:00 AM 158	11:00 AM 153	11:00 AM 222	11:00 AM 166	11:00 AM 110	10:00 AM 100	11:00 AM 145	
PM Peak Volume		3:00 PM 265	3:00 PM 298	3:00 PM 260	3:00 PM 293	3:00 PM 279	1:00 PM 127	7:00 PM 148	3:00 PM 219	

Comments:

LOCATION: Tube Count 1
SPECIFIC LOCATION: Tube Count
CITY/STATE: Long Beach, CA

QC JOB #: 13777707
DIRECTION: EB
DATE: May 23 2016 - May 23 2016

Start Time	Mon 23-May-16	Tue	Wed	Thu	Fri	Average Weekday Hourly Traffic	Sat	Sun	Average Week Hourly Traffic	Average Week Profile
12:00 AM	7					7			7	
1:00 AM	2					2			2	
2:00 AM	2					2			2	
3:00 AM	2					2			2	
4:00 AM	4					4			4	
5:00 AM	45					45			45	
6:00 AM	45					45			45	
7:00 AM	71					71			71	
8:00 AM	58					58			58	
9:00 AM	124					124			124	
10:00 AM	118					118			118	
11:00 AM	**184**					**184**			**184**	
12:00 PM	101					101			101	
1:00 PM	127					127			127	
2:00 PM	148					148			148	
3:00 PM	**287**					**287**			**287**	
4:00 PM	184					184			184	
5:00 PM	148					148			148	
6:00 PM	132					132			132	
7:00 PM	106					106			106	
8:00 PM	138					138			138	
9:00 PM	148					148			148	
10:00 PM	56					56			56	
11:00 PM	53					53			53	
Day Total	2290					2290			2290	
% Weekday Average	104.6%									
% Week Average	115.0%					100.0%				
AM Peak Volume	11:00 AM 184					11:00 AM 184			11:00 AM 184	
PM Peak Volume	3:00 PM 287					3:00 PM 287			3:00 PM 287	

Comments:

Quality Counts
TRANSPORTATION DATA COLLECTION

SUMMARY - Tube Count - Volume Data (Weekday)

LOCATION: Tube Count 1
SPECIFIC LOCATION: Tube Count
CITY/STATE: Long Beach, CA

QC JOB #: 13777707
DIRECTION: EB
DATE: May 17 2016 - May 23 2016

Start Time	Mon 23-May-16	Tue 17-May-16	Wed 18-May-16	Thu 19-May-16	Fri 20-May-16	Average Weekday Hourly Traffic			Average Weekday Profile
12:00 AM	7	11	12	14	9	11			
1:00 AM	2	6	11	13	8	8			
2:00 AM	2	3	3	1	5	3			
3:00 AM	2	0	3	2	3	2			
4:00 AM	4	4	3	8	8	5			
5:00 AM	45	26	31	22	38	32			
6:00 AM	45	36	35	27	44	37			
7:00 AM	71	67	57	50	62	61			
8:00 AM	58	65	78	73	74	70			
9:00 AM	124	104	90	86	112	103			
10:00 AM	118	83	97	98	104	100			
11:00 AM	**184**	**132**	**158**	**153**	**222**	**170**			
12:00 PM	101	114	97	97	129	108			
1:00 PM	127	134	143	159	147	142			
2:00 PM	148	142	150	161	132	147			
3:00 PM	**287**	**265**	**298**	**260**	**293**	**281**			
4:00 PM	184	164	182	187	185	180			
5:00 PM	148	125	176	139	122	142			
6:00 PM	132	136	163	181	146	152			
7:00 PM	106	123	73	99	99	100			
8:00 PM	138	90	84	120	111	109			
9:00 PM	148	105	121	144	145	133			
10:00 PM	56	67	48	64	55	58			
11:00 PM	53	59	57	50	44	53			
Day Total	2290	2061	2170	2208	2297	2207			
% Weekday Average	103.8%	93.4%	98.3%	100.0%	104.1%				
% Week Average									
AM Peak Volume	11:00 AM 184	11:00 AM 132	11:00 AM 158	11:00 AM 153	11:00 AM 222	11:00 AM 170			
PM Peak Volume	3:00 PM 287	3:00 PM 265	3:00 PM 298	3:00 PM 260	3:00 PM 293	3:00 PM 281			

Comments:

Quality Counts
TRANSPORTATION DATA COLLECTION

SUMMARY - Tube Count - Volume Data (Weekend)

LOCATION: Tube Count 1
SPECIFIC LOCATION: Tube Count
CITY/STATE: Long Beach, CA

QC JOB #: 13777707
DIRECTION: EB
DATE: May 21 2016 - May 22 2016

Start Time			Sat 21-May-16	Sun 22-May-16	Average Weekend Hourly Traffic	Average Weekend Profile
12:00 AM			4	8	6	
1:00 AM			8	3	6	
2:00 AM			4	4	4	
3:00 AM			4	0	2	
4:00 AM			3	8	6	
5:00 AM			31	25	28	
6:00 AM			37	40	39	
7:00 AM			53	49	51	
8:00 AM			79	40	60	
9:00 AM			92	93	93	
10:00 AM			106	**100**	103	
11:00 AM			**110**	97	**104**	
12:00 PM			89	72	81	
1:00 PM			**127**	96	112	
2:00 PM			101	121	111	
3:00 PM			93	107	100	
4:00 PM			118	136	**127**	
5:00 PM			87	68	78	
6:00 PM			94	101	98	
7:00 PM			64	**148**	106	
8:00 PM			115	127	121	
9:00 PM			107	126	117	
10:00 PM			29	41	35	
11:00 PM			15	19	17	
Day Total			1570	1629	1605	
% Weekday Average						
% Week Average			97.8%	101.5%		
AM Peak Volume			11:00 AM 110	10:00 AM 100	11:00 AM 104	
PM Peak Volume			1:00 PM 127	7:00 PM 148	4:00 PM 127	

Comments:

Quality Counts
TRANSPORTATION DATA COLLECTION

SUMMARY - Tube Count - Volume Data (Week)

LOCATION: Tube Count 1
SPECIFIC LOCATION: Tube Count
CITY/STATE: Long Beach, CA

QC JOB #: 13777707
DIRECTION: EB
DATE: May 17 2016 - May 23 2016

Start Time	Mon 23-May-16	Tue 17-May-16	Wed 18-May-16	Thu 19-May-16	Fri 20-May-16	Average Weekday Hourly Traffic	Sat 21-May-16	Sun 22-May-16	Average Week Hourly Traffic	Average Week Profile
12:00 AM	7	11	12	14	9	11	4	8	9	
1:00 AM	2	6	11	13	8	8	8	3	7	
2:00 AM	2	3	3	1	5	3	4	4	3	
3:00 AM	2	0	3	2	3	2	4	0	2	
4:00 AM	4	4	3	8	8	5	3	8	5	
5:00 AM	45	26	31	22	38	32	31	25	31	
6:00 AM	45	36	35	27	44	37	37	40	38	
7:00 AM	71	67	57	50	62	61	53	49	58	
8:00 AM	58	65	78	73	74	70	79	40	67	
9:00 AM	124	104	90	86	112	103	92	93	100	
10:00 AM	118	83	97	98	104	100	106	**100**	101	
11:00 AM	**184**	**132**	**158**	**153**	**222**	**170**	**110**	97	**151**	
12:00 PM	101	114	97	97	129	108	89	72	100	
1:00 PM	127	134	143	159	147	142	**127**	96	133	
2:00 PM	148	142	150	161	132	147	101	121	136	
3:00 PM	**287**	**265**	**298**	**260**	**293**	**281**	93	107	**229**	
4:00 PM	184	164	182	187	185	180	118	136	165	
5:00 PM	148	125	176	139	122	142	87	68	124	
6:00 PM	132	136	163	181	146	152	94	101	136	
7:00 PM	106	123	73	99	99	100	64	**148**	102	
8:00 PM	138	90	84	120	111	109	115	127	112	
9:00 PM	148	105	121	144	145	133	107	126	128	
10:00 PM	56	67	48	64	55	58	29	41	51	
11:00 PM	53	59	57	50	44	53	15	19	42	
Day Total	2290	2061	2170	2208	2297	2207	1570	1629	2030	
% Weekday Average	103.8%	93.4%	98.3%	100.0%	104.1%					
% Week Average	112.8%	101.5%	106.9%	108.8%	113.2%	108.7%	77.3%	80.2%		
AM Peak Volume	11:00 AM 184	11:00 AM 132	11:00 AM 158	11:00 AM 153	11:00 AM 222	11:00 AM 170	11:00 AM 110	10:00 AM 100	11:00 AM 151	
PM Peak Volume	3:00 PM 287	3:00 PM 265	3:00 PM 298	3:00 PM 260	3:00 PM 293	3:00 PM 281	1:00 PM 127	7:00 PM 148	3:00 PM 229	

Comments:

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

LOCATION: Tube Count 1
SPECIFIC LOCATION: Tube Count
CITY/STATE: Long Beach, CA

QC JOB #: 13777707
DIRECTION: EB/WB
DATE: May 17 2016 - May 22 2016

Start Time	Mon	Tue 17-May-16	Wed 18-May-16	Thu 19-May-16	Fri 20-May-16	Average Weekday Hourly Traffic	Sat 21-May-16	Sun 22-May-16	Average Week Hourly Traffic	Average Week Profile
12:00 AM		21	24	23	17	21	11	16	19	
1:00 AM		12	21	27	13	18	16	11	17	
2:00 AM		6	11	4	11	8	7	6	8	
3:00 AM		9	12	11	12	11	10	11	11	
4:00 AM		96	106	103	94	100	91	83	96	
5:00 AM		376	388	320	428	378	361	301	362	
6:00 AM		480	433	444	465	456	293	291	401	
7:00 AM		454	387	413	407	415	320	274	376	
8:00 AM		432	459	441	478	453	362	317	415	
9:00 AM		**541**	**547**	487	595	**543**	**532**	**470**	**529**	
10:00 AM		435	450	498	510	473	489	451	472	
11:00 AM		485	511	**520**	**636**	538	410	402	494	
12:00 PM		575	529	505	593	551	414	406	504	
1:00 PM		530	505	570	556	540	**474**	440	513	
2:00 PM		511	588	583	573	564	460	534	542	
3:00 PM		**593**	**664**	**645**	**686**	**647**	440	461	**582**	
4:00 PM		502	563	556	611	558	455	550	540	
5:00 PM		403	506	467	469	461	386	413	441	
6:00 PM		473	568	595	548	546	371	440	499	
7:00 PM		419	302	408	397	382	265	**554**	391	
8:00 PM		321	309	457	494	395	438	433	409	
9:00 PM		313	378	371	381	361	284	322	342	
10:00 PM		111	81	98	92	96	48	72	84	
11:00 PM		67	92	56	60	69	30	32	56	
Day Total		8165	8434	8602	9126	8584	6967	7290	8103	
% Weekday Average		95.1%	98.3%	100.2%	106.3%					
% Week Average		100.8%	104.1%	106.2%	112.6%	105.9%	86.0%	90.0%		
AM Peak Volume		9:00 AM 541	9:00 AM 547	11:00 AM 520	11:00 AM 636	9:00 AM 543	9:00 AM 532	9:00 AM 470	9:00 AM 529	
PM Peak Volume		3:00 PM 593	3:00 PM 664	3:00 PM 645	3:00 PM 686	3:00 PM 647	1:00 PM 474	7:00 PM 554	3:00 PM 582	

Comments:

LOCATION: Tube Count 1
SPECIFIC LOCATION: Tube Count
CITY/STATE: Long Beach, CA

QC JOB #: 13777707
DIRECTION: EB/WB
DATE: May 23 2016 - May 23 2016

Start Time	Mon 23-May-16	Tue	Wed	Thu	Fri	Average Weekday Hourly Traffic	Sat	Sun	Average Week Hourly Traffic	Average Week Profile
12:00 AM	19					19			19	
1:00 AM	12					12			12	
2:00 AM	8					8			8	
3:00 AM	13					13			13	
4:00 AM	85					85			85	
5:00 AM	440					440			440	
6:00 AM	499					499			499	
7:00 AM	470					470			470	
8:00 AM	450					450			450	
9:00 AM	**590**					**590**			**590**	
10:00 AM	525					525			525	
11:00 AM	576					576			576	
12:00 PM	515					515			515	
1:00 PM	558					558			558	
2:00 PM	546					546			546	
3:00 PM	**653**					**653**			**653**	
4:00 PM	557					557			557	
5:00 PM	472					472			472	
6:00 PM	432					432			432	
7:00 PM	376					376			376	
8:00 PM	465					465			465	
9:00 PM	358					358			358	
10:00 PM	91					91			91	
11:00 PM	61					61			61	
Day Total	8771					8771			8771	
% Weekday Average	102.2%									
% Week Average	108.2%					100.0%				
AM Peak Volume	9:00 AM 590					9:00 AM 590			9:00 AM 590	
PM Peak Volume	3:00 PM 653					3:00 PM 653			3:00 PM 653	

Comments:

Quality Counts
TRANSPORTATION DATA COLLECTION

SUMMARY - Tube Count - Volume Data (Weekday)

LOCATION: Tube Count 1
SPECIFIC LOCATION: Tube Count
CITY/STATE: Long Beach, CA

QC JOB #: 13777707
DIRECTION: EB/WB
DATE: May 17 2016 - May 23 2016

Start Time	Mon 23-May-16	Tue 17-May-16	Wed 18-May-16	Thu 19-May-16	Fri 20-May-16	Average Weekday Hourly Traffic			Average Weekday Profile
12:00 AM	19	21	24	23	17	21			
1:00 AM	12	12	21	27	13	17			
2:00 AM	8	6	11	4	11	8			
3:00 AM	13	9	12	11	12	11			
4:00 AM	85	96	106	103	94	97			
5:00 AM	440	376	388	320	428	390			
6:00 AM	499	480	433	444	465	464			
7:00 AM	470	454	387	413	407	426			
8:00 AM	450	432	459	441	478	452			
9:00 AM	**590**	**541**	**547**	487	595	**552**			
10:00 AM	525	435	450	498	510	484			
11:00 AM	576	485	511	**520**	**636**	546			
12:00 PM	515	575	529	505	593	543			
1:00 PM	558	530	505	570	556	544			
2:00 PM	546	511	588	583	573	560			
3:00 PM	**653**	**593**	**664**	**645**	**686**	**648**			
4:00 PM	557	502	563	556	611	558			
5:00 PM	472	403	506	467	469	463			
6:00 PM	432	473	568	595	548	523			
7:00 PM	376	419	302	408	397	380			
8:00 PM	465	321	309	457	494	409			
9:00 PM	358	313	378	371	381	360			
10:00 PM	91	111	81	98	92	95			
11:00 PM	61	67	92	56	60	67			
Day Total	8771	8165	8434	8602	9126	8618			
% Weekday Average	101.8%	94.7%	97.9%	99.8%	105.9%				
% Week Average									
AM Peak Volume	9:00 AM 590	9:00 AM 541	9:00 AM 547	11:00 AM 520	11:00 AM 636	9:00 AM 552			
PM Peak Volume	3:00 PM 653	3:00 PM 593	3:00 PM 664	3:00 PM 645	3:00 PM 686	3:00 PM 648			

Comments:

Quality Counts
TRANSPORTATION DATA COLLECTION

SUMMARY - Tube Count - Volume Data (Weekend)

LOCATION: Tube Count 1
SPECIFIC LOCATION: Tube Count
CITY/STATE: Long Beach, CA

QC JOB #: 13777707
DIRECTION: EB/WB
DATE: May 21 2016 - May 22 2016

Start Time			Sat 21-May-16	Sun 22-May-16	Average Weekend Hourly Traffic	Average Weekend Profile
12:00 AM			11	16	14	
1:00 AM			16	11	14	
2:00 AM			7	6	7	
3:00 AM			10	11	11	
4:00 AM			91	83	87	
5:00 AM			361	301	331	
6:00 AM			293	291	292	
7:00 AM			320	274	297	
8:00 AM			362	317	340	
9:00 AM			**532**	**470**	**501**	
10:00 AM			489	451	470	
11:00 AM			410	402	406	
12:00 PM			414	406	410	
1:00 PM			**474**	440	457	
2:00 PM			460	534	497	
3:00 PM			440	461	451	
4:00 PM			455	550	**503**	
5:00 PM			386	413	400	
6:00 PM			371	440	406	
7:00 PM			265	**554**	410	
8:00 PM			438	433	436	
9:00 PM			284	322	303	
10:00 PM			48	72	60	
11:00 PM			30	32	31	
Day Total			6967	7290	7134	
% Weekday Average						
% Week Average			97.7%	102.2%		
AM Peak Volume			9:00 AM 532	9:00 AM 470	9:00 AM 501	
PM Peak Volume			1:00 PM 474	7:00 PM 554	4:00 PM 503	

Comments:

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

SUMMARY - Tube Count - Volume Data (Week)

LOCATION: Tube Count 1
SPECIFIC LOCATION: Tube Count
CITY/STATE: Long Beach, CA

QC JOB #: 13777707
DIRECTION: EB/WB
DATE: May 17 2016 - May 23 2016

Start Time	Mon 23-May-16	Tue 17-May-16	Wed 18-May-16	Thu 19-May-16	Fri 20-May-16	Average Weekday Hourly Traffic	Sat 21-May-16	Sun 22-May-16	Average Week Hourly Traffic	Average Week Profile
12:00 AM	19	21	24	23	17	21	11	16	19	
1:00 AM	12	12	21	27	13	17	16	11	16	
2:00 AM	8	6	11	4	11	8	7	6	8	
3:00 AM	13	9	12	11	12	11	10	11	11	
4:00 AM	85	96	106	103	94	97	91	83	94	
5:00 AM	440	376	388	320	428	390	361	301	373	
6:00 AM	499	480	433	444	465	464	293	291	415	
7:00 AM	470	454	387	413	407	426	320	274	389	
8:00 AM	450	432	459	441	478	452	362	317	420	
9:00 AM	**590**	**541**	**547**	487	595	**552**	**532**	**470**	**537**	
10:00 AM	525	435	450	498	510	484	489	451	480	
11:00 AM	576	485	511	**520**	**636**	546	410	402	506	
12:00 PM	515	575	529	505	593	543	414	406	505	
1:00 PM	558	530	505	570	556	544	**474**	440	519	
2:00 PM	546	511	588	583	573	560	460	534	542	
3:00 PM	**653**	**593**	**664**	**645**	**686**	**648**	440	461	**592**	
4:00 PM	557	502	563	556	611	558	455	550	542	
5:00 PM	472	403	506	467	469	463	386	413	445	
6:00 PM	432	473	568	595	548	523	371	440	490	
7:00 PM	376	419	302	408	397	380	265	**554**	389	
8:00 PM	465	321	309	457	494	409	438	433	417	
9:00 PM	358	313	378	371	381	360	284	322	344	
10:00 PM	91	111	81	98	92	95	48	72	85	
11:00 PM	61	67	92	56	60	67	30	32	57	
Day Total	8771	8165	8434	8602	9126	8618	6967	7290	8195	
% Weekday Average	101.8%	94.7%	97.9%	99.8%	105.9%					
% Week Average	107.0%	99.6%	102.9%	105.0%	111.4%	105.2%	85.0%	89.0%		
AM Peak Volume	9:00 AM 590	9:00 AM 541	9:00 AM 547	11:00 AM 520	11:00 AM 636	9:00 AM 552	9:00 AM 532	9:00 AM 470	9:00 AM 537	
PM Peak Volume	3:00 PM 653	3:00 PM 593	3:00 PM 664	3:00 PM 645	3:00 PM 686	3:00 PM 648	1:00 PM 474	7:00 PM 554	3:00 PM 592	

Comments:

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

LOCATION: Tube Count 1
SPECIFIC LOCATION: Tube Count
CITY/STATE: Long Beach, CA

QC JOB #: 13777707
DIRECTION: WB
DATE: May 17 2016 - May 22 2016

Start Time	Mon	Tue 17-May-16	Wed 18-May-16	Thu 19-May-16	Fri 20-May-16	Average Weekday Hourly Traffic	Sat 21-May-16	Sun 22-May-16	Average Week Hourly Traffic	Average Week Profile
12:00 AM		10	12	9	8	10	7	8	9	
1:00 AM		6	10	14	5	9	8	8	9	
2:00 AM		3	8	3	6	5	3	2	4	
3:00 AM		9	9	9	9	9	6	11	9	
4:00 AM		92	103	95	86	94	88	75	90	
5:00 AM		350	357	298	390	349	330	276	334	
6:00 AM		**444**	398	**417**	421	420	256	251	365	
7:00 AM		387	330	363	345	356	267	225	320	
8:00 AM		367	381	368	404	380	283	277	347	
9:00 AM		437	**457**	401	**483**	**445**	**440**	**377**	**433**	
10:00 AM		352	353	400	406	378	383	351	374	
11:00 AM		353	353	367	414	372	300	305	349	
12:00 PM		**461**	432	408	**464**	**441**	325	334	404	
1:00 PM		396	362	411	409	395	347	344	378	
2:00 PM		369	**438**	**422**	441	418	**359**	413	**407**	
3:00 PM		328	366	385	393	368	347	354	362	
4:00 PM		338	381	369	426	379	337	**414**	378	
5:00 PM		278	330	328	347	321	299	345	321	
6:00 PM		337	405	414	402	390	277	339	362	
7:00 PM		296	229	309	298	283	201	406	290	
8:00 PM		231	225	337	383	294	323	306	301	
9:00 PM		208	257	227	236	232	177	196	217	
10:00 PM		44	33	34	37	37	19	31	33	
11:00 PM		8	35	6	16	16	15	13	16	
Day Total		6104	6264	6394	6829	6401	5397	5661	6112	
% Weekday Average		95.4%	97.9%	99.9%	106.7%					
% Week Average		99.9%	102.5%	104.6%	111.7%	104.7%	88.3%	92.6%		
AM Peak Volume		6:00 AM 444	9:00 AM 457	6:00 AM 417	9:00 AM 483	9:00 AM 445	9:00 AM 440	9:00 AM 377	9:00 AM 433	
PM Peak Volume		12:00 PM 461	2:00 PM 438	2:00 PM 422	12:00 PM 464	12:00 PM 441	2:00 PM 359	4:00 PM 414	2:00 PM 407	

Comments:

LOCATION: Tube Count 1
SPECIFIC LOCATION: Tube Count
CITY/STATE: Long Beach, CA

QC JOB #: 13777707
DIRECTION: WB
DATE: May 23 2016 - May 23 2016

Start Time	Mon 23-May-16	Tue	Wed	Thu	Fri	Average Weekday Hourly Traffic	Sat	Sun	Average Week Hourly Traffic	Average Week Profile
12:00 AM	12					12			12	
1:00 AM	10					10			10	
2:00 AM	6					6			6	
3:00 AM	11					11			11	
4:00 AM	81					81			81	
5:00 AM	395					395			395	
6:00 AM	454					454			454	
7:00 AM	399					399			399	
8:00 AM	392					392			392	
9:00 AM	**466**					**466**			**466**	
10:00 AM	407					407			407	
11:00 AM	392					392			392	
12:00 PM	414					414			414	
1:00 PM	**431**					**431**			**431**	
2:00 PM	398					398			398	
3:00 PM	366					366			366	
4:00 PM	373					373			373	
5:00 PM	324					324			324	
6:00 PM	300					300			300	
7:00 PM	270					270			270	
8:00 PM	327					327			327	
9:00 PM	210					210			210	
10:00 PM	35					35			35	
11:00 PM	8					8			8	
Day Total	6481					6481			6481	
% Weekday Average	101.2%									
% Week Average	106.0%					100.0%				
AM Peak Volume	9:00 AM 466					9:00 AM 466			9:00 AM 466	
PM Peak Volume	1:00 PM 431					1:00 PM 431			1:00 PM 431	

Comments:

Quality Counts
TRANSPORTATION DATA COLLECTION

SUMMARY - Tube Count - Volume Data (Weekday)

LOCATION: Tube Count 1
SPECIFIC LOCATION: Tube Count
CITY/STATE: Long Beach, CA

QC JOB #: 13777707
DIRECTION: WB
DATE: May 17 2016 - May 23 2016

Start Time	Mon 23-May-16	Tue 17-May-16	Wed 18-May-16	Thu 19-May-16	Fri 20-May-16	Average Weekday Hourly Traffic			Average Weekday Profile
12:00 AM	12	10	12	9	8	10			
1:00 AM	10	6	10	14	5	9			
2:00 AM	6	3	8	3	6	5			
3:00 AM	11	9	9	9	9	9			
4:00 AM	81	92	103	95	86	91			
5:00 AM	395	350	357	298	390	358			
6:00 AM	454	**444**	398	**417**	421	427			
7:00 AM	399	387	330	363	345	365			
8:00 AM	392	367	381	368	404	382			
9:00 AM	**466**	437	**457**	401	**483**	**449**			
10:00 AM	407	352	353	400	406	384			
11:00 AM	392	353	353	367	414	376			
12:00 PM	414	**461**	432	408	**464**	**436**			
1:00 PM	**431**	396	362	411	409	402			
2:00 PM	398	369	**438**	**422**	441	414			
3:00 PM	366	328	366	385	393	368			
4:00 PM	373	338	381	369	426	377			
5:00 PM	324	278	330	328	347	321			
6:00 PM	300	337	405	414	402	372			
7:00 PM	270	296	229	309	298	280			
8:00 PM	327	231	225	337	383	301			
9:00 PM	210	208	257	227	236	228			
10:00 PM	35	44	33	34	37	37			
11:00 PM	8	8	35	6	16	15			
Day Total	6481	6104	6264	6394	6829	6416			
% Weekday Average	101.0%	95.1%	97.6%	99.7%	106.4%				
% Week Average									
AM Peak Volume	9:00 AM 466	6:00 AM 444	9:00 AM 457	6:00 AM 417	9:00 AM 483	9:00 AM 449			
PM Peak Volume	1:00 PM 431	12:00 PM 461	2:00 PM 438	2:00 PM 422	12:00 PM 464	12:00 PM 436			

Comments:

Quality Counts
TRANSPORTATION DATA COLLECTION

SUMMARY - Tube Count - Volume Data (Weekend)

LOCATION: Tube Count 1
SPECIFIC LOCATION: Tube Count
CITY/STATE: Long Beach, CA

QC JOB #: 13777707
DIRECTION: WB
DATE: May 21 2016 - May 22 2016

Start Time			Sat 21-May-16	Sun 22-May-16	Average Weekend Hourly Traffic	Average Weekend Profile
12:00 AM			7	8	8	
1:00 AM			8	8	8	
2:00 AM			3	2	3	
3:00 AM			6	11	9	
4:00 AM			88	75	82	
5:00 AM			330	276	303	
6:00 AM			256	251	254	
7:00 AM			267	225	246	
8:00 AM			283	277	280	
9:00 AM			**440**	**377**	**409**	
10:00 AM			383	351	367	
11:00 AM			300	305	303	
12:00 PM			325	334	330	
1:00 PM			347	344	346	
2:00 PM			**359**	413	**386**	
3:00 PM			347	354	351	
4:00 PM			337	**414**	376	
5:00 PM			299	345	322	
6:00 PM			277	339	308	
7:00 PM			201	406	304	
8:00 PM			323	306	315	
9:00 PM			177	196	187	
10:00 PM			19	31	25	
11:00 PM			15	13	14	
Day Total			5397	5661	5536	
% Weekday Average						
% Week Average			97.5%	102.3%		
AM Peak Volume			9:00 AM 440	9:00 AM 377	9:00 AM 409	
PM Peak Volume			2:00 PM 359	4:00 PM 414	2:00 PM 386	

Comments:

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

SUMMARY - Tube Count - Volume Data (Week)

LOCATION: Tube Count 1
SPECIFIC LOCATION: Tube Count
CITY/STATE: Long Beach, CA

QC JOB #: 13777707
DIRECTION: WB
DATE: May 17 2016 - May 23 2016

Start Time	Mon 23-May-16	Tue 17-May-16	Wed 18-May-16	Thu 19-May-16	Fri 20-May-16	Average Weekday Hourly Traffic	Sat 21-May-16	Sun 22-May-16	Average Week Hourly Traffic	Average Week Profile
12:00 AM	12	10	12	9	8	10	7	8	9	
1:00 AM	10	6	10	14	5	9	8	8	9	
2:00 AM	6	3	8	3	6	5	3	2	4	
3:00 AM	11	9	9	9	9	9	6	11	9	
4:00 AM	81	92	103	95	86	91	88	75	89	
5:00 AM	395	350	357	298	390	358	330	276	342	
6:00 AM	454	**444**	398	**417**	421	427	256	251	377	
7:00 AM	399	387	330	363	345	365	267	225	331	
8:00 AM	392	367	381	368	404	382	283	277	353	
9:00 AM	**466**	437	**457**	401	**483**	**449**	**440**	**377**	**437**	
10:00 AM	407	352	353	400	406	384	383	351	379	
11:00 AM	392	353	353	367	414	376	300	305	355	
12:00 PM	414	**461**	432	408	**464**	**436**	325	334	405	
1:00 PM	**431**	396	362	411	409	402	347	344	386	
2:00 PM	398	369	**438**	**422**	441	414	**359**	413	**406**	
3:00 PM	366	328	366	385	393	368	347	354	363	
4:00 PM	373	338	381	369	426	377	337	**414**	377	
5:00 PM	324	278	330	328	347	321	299	345	322	
6:00 PM	300	337	405	414	402	372	277	339	353	
7:00 PM	270	296	229	309	298	280	201	406	287	
8:00 PM	327	231	225	337	383	301	323	306	305	
9:00 PM	210	208	257	227	236	228	177	196	216	
10:00 PM	35	44	33	34	37	37	19	31	33	
11:00 PM	8	8	35	6	16	15	15	13	14	
Day Total	6481	6104	6264	6394	6829	6416	5397	5661	6161	
% Weekday Average	101.0%	95.1%	97.6%	99.7%	106.4%					
% Week Average	105.2%	99.1%	101.7%	103.8%	110.8%	104.1%	87.6%	91.9%		
AM Peak Volume	9:00 AM 466	6:00 AM 444	9:00 AM 457	6:00 AM 417	9:00 AM 483	9:00 AM 449	9:00 AM 440	9:00 AM 377	9:00 AM 437	
PM Peak Volume	1:00 PM 431	12:00 PM 461	2:00 PM 438	2:00 PM 422	12:00 PM 464	12:00 PM 436	2:00 PM 359	4:00 PM 414	2:00 PM 406	

Comments:

LOCATION: Tube Count 9
SPECIFIC LOCATION: Tube Count 9
CITY/STATE: Long Beach, CA

QC JOB #: 13777708
DIRECTION: EB
DATE: May 17 2016 - May 22 2016

Start Time	Mon	Tue 17-May-16	Wed 18-May-16	Thu 19-May-16	Fri 20-May-16	Average Weekday Hourly Traffic	Sat 21-May-16	Sun 22-May-16	Average Week Hourly Traffic	Average Week Profile
12:00 AM		11	12	19	10	13	10	1	11	
1:00 AM		10	11	15	11	12	9	9	11	
2:00 AM		6	11	3	2	6	8	9	7	
3:00 AM		6	1	6	4	4	6	6	5	
4:00 AM		9	11	14	16	13	17	18	14	
5:00 AM		84	81	80	110	89	112	99	94	
6:00 AM		134	102	110	127	118	119	122	119	
7:00 AM		184	163	158	169	169	154	174	167	
8:00 AM		187	197	213	250	212	234	161	207	
9:00 AM		**315**	**333**	282	305	309	295	**270**	300	
10:00 AM		295	312	**332**	**354**	**323**	**349**	264	**318**	
11:00 AM		270	247	332	339	297	279	249	286	
12:00 PM		284	260	226	249	255	208	223	242	
1:00 PM		306	262	280	292	285	288	244	279	
2:00 PM		303	345	355	338	335	**335**	**364**	**340**	
3:00 PM		**340**	339	**367**	**372**	**355**	255	303	329	
4:00 PM		290	340	288	344	316	259	317	306	
5:00 PM		216	289	266	302	268	270	236	263	
6:00 PM		286	**354**	363	312	329	228	299	307	
7:00 PM		266	192	197	245	225	175	341	236	
8:00 PM		212	165	201	312	223	221	245	226	
9:00 PM		229	348	316	292	296	233	261	280	
10:00 PM		123	67	55	73	80	40	54	69	
11:00 PM		46	73	59	49	57	20	13	43	
Day Total		4412	4515	4537	4877	4589	4124	4282	4459	
% Weekday Average		96.1%	98.4%	98.9%	106.3%					
% Week Average		98.9%	101.3%	101.7%	109.4%	102.9%	92.5%	96.0%		
AM Peak Volume		9:00 AM 315	9:00 AM 333	10:00 AM 332	10:00 AM 354	10:00 AM 323	10:00 AM 349	9:00 AM 270	10:00 AM 318	
PM Peak Volume		3:00 PM 340	6:00 PM 354	3:00 PM 367	3:00 PM 372	3:00 PM 355	2:00 PM 335	2:00 PM 364	2:00 PM 340	

Comments:

LOCATION: Tube Count 9
SPECIFIC LOCATION: Tube Count 9
CITY/STATE: Long Beach, CA

QC JOB #: 13777708
DIRECTION: EB
DATE: May 23 2016 - May 23 2016

Start Time	Mon 23-May-16	Tue	Wed	Thu	Fri	Average Weekday Hourly Traffic	Sat	Sun	Average Week Hourly Traffic	Average Week Profile
12:00 AM	4					4			4	
1:00 AM	15					15			15	
2:00 AM	12					12			12	
3:00 AM	5					5			5	
4:00 AM	11					11			11	
5:00 AM	118					118			118	
6:00 AM	150					150			150	
7:00 AM	197					197			197	
8:00 AM	208					208			208	
9:00 AM	**334**					**334**			**334**	
10:00 AM	304					304			304	
11:00 AM	332					332			332	
12:00 PM	290					290			290	
1:00 PM	308					308			308	
2:00 PM	311					311			311	
3:00 PM	**344**					**344**			**344**	
4:00 PM	330					330			330	
5:00 PM	251					251			251	
6:00 PM	296					296			296	
7:00 PM	170					170			170	
8:00 PM	270					270			270	
9:00 PM	257					257			257	
10:00 PM	57					57			57	
11:00 PM	55					55			55	
Day Total	4629					4629			4629	
% Weekday Average	100.9%									
% Week Average	103.8%					100.0%				
AM Peak Volume	9:00 AM 334					9:00 AM 334			9:00 AM 334	
PM Peak Volume	3:00 PM 344					3:00 PM 344			3:00 PM 344	

Comments:

Quality Counts
TRANSPORTATION DATA COLLECTION

SUMMARY - Tube Count - Volume Data (Weekday)

LOCATION: Tube Count 9
SPECIFIC LOCATION: Tube Count 9
CITY/STATE: Long Beach, CA

QC JOB #: 13777708
DIRECTION: EB
DATE: May 17 2016 - May 23 2016

Start Time	Mon 23-May-16	Tue 17-May-16	Wed 18-May-16	Thu 19-May-16	Fri 20-May-16	Average Weekday Hourly Traffic			Average Weekday Profile
12:00 AM	4	11	12	19	10	11			
1:00 AM	15	10	11	15	11	12			
2:00 AM	12	6	11	3	2	7			
3:00 AM	5	6	1	6	4	4			
4:00 AM	11	9	11	14	16	12			
5:00 AM	118	84	81	80	110	95			
6:00 AM	150	134	102	110	127	125			
7:00 AM	197	184	163	158	169	174			
8:00 AM	208	187	197	213	250	211			
9:00 AM	**334**	**315**	**333**	282	305	314			
10:00 AM	304	295	312	**332**	**354**	**319**			
11:00 AM	332	270	247	332	339	304			
12:00 PM	290	284	260	226	249	262			
1:00 PM	308	306	262	280	292	290			
2:00 PM	311	303	345	355	338	330			
3:00 PM	**344**	**340**	339	**367**	**372**	**352**			
4:00 PM	330	290	340	288	344	318			
5:00 PM	251	216	289	266	302	265			
6:00 PM	296	286	**354**	363	312	322			
7:00 PM	170	266	192	197	245	214			
8:00 PM	270	212	165	201	312	232			
9:00 PM	257	229	348	316	292	288			
10:00 PM	57	123	67	55	73	75			
11:00 PM	55	46	73	59	49	56			
Day Total	4629	4412	4515	4537	4877	4592			
% Weekday Average	100.8%	96.1%	98.3%	98.8%	106.2%				
% Week Average									
AM Peak Volume	9:00 AM 334	9:00 AM 315	9:00 AM 333	10:00 AM 332	10:00 AM 354	10:00 AM 319			
PM Peak Volume	3:00 PM 344	3:00 PM 340	6:00 PM 354	3:00 PM 367	3:00 PM 372	3:00 PM 352			

Comments:

Quality Counts
TRANSPORTATION DATA COLLECTION

SUMMARY - Tube Count - Volume Data (Weekend)

LOCATION: Tube Count 9
SPECIFIC LOCATION: Tube Count 9
CITY/STATE: Long Beach, CA

QC JOB #: 13777708
DIRECTION: EB
DATE: May 21 2016 - May 22 2016

Start Time			Sat 21-May-16	Sun 22-May-16	Average Weekend Hourly Traffic	Average Weekend Profile
12:00 AM			10	1	6	
1:00 AM			9	9	9	
2:00 AM			8	9	9	
3:00 AM			6	6	6	
4:00 AM			17	18	18	
5:00 AM			112	99	106	
6:00 AM			119	122	121	
7:00 AM			154	174	164	
8:00 AM			234	161	198	
9:00 AM			295	**270**	283	
10:00 AM			**349**	264	**307**	
11:00 AM			279	249	264	
12:00 PM			208	223	216	
1:00 PM			288	244	266	
2:00 PM			**335**	**364**	**350**	
3:00 PM			255	303	279	
4:00 PM			259	317	288	
5:00 PM			270	236	253	
6:00 PM			228	299	264	
7:00 PM			175	341	258	
8:00 PM			221	245	233	
9:00 PM			233	261	247	
10:00 PM			40	54	47	
11:00 PM			20	13	17	
Day Total			4124	4282	4209	
% Weekday Average						
% Week Average			98.0%	101.7%		
AM Peak Volume			10:00 AM 349	9:00 AM 270	10:00 AM 307	
PM Peak Volume			2:00 PM 335	2:00 PM 364	2:00 PM 350	

Comments:

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

SUMMARY - Tube Count - Volume Data (Week)

LOCATION: Tube Count 9
SPECIFIC LOCATION: Tube Count 9
CITY/STATE: Long Beach, CA

QC JOB #: 13777708
DIRECTION: EB
DATE: May 17 2016 - May 23 2016

Start Time	Mon 23-May-16	Tue 17-May-16	Wed 18-May-16	Thu 19-May-16	Fri 20-May-16	Average Weekday Hourly Traffic	Sat 21-May-16	Sun 22-May-16	Average Week Hourly Traffic	Average Week Profile
12:00 AM	4	11	12	19	10	11	10	1	10	
1:00 AM	15	10	11	15	11	12	9	9	11	
2:00 AM	12	6	11	3	2	7	8	9	7	
3:00 AM	5	6	1	6	4	4	6	6	5	
4:00 AM	11	9	11	14	16	12	17	18	14	
5:00 AM	118	84	81	80	110	95	112	99	98	
6:00 AM	150	134	102	110	127	125	119	122	123	
7:00 AM	197	184	163	158	169	174	154	174	171	
8:00 AM	208	187	197	213	250	211	234	161	207	
9:00 AM	**334**	**315**	**333**	282	305	314	295	**270**	305	
10:00 AM	304	295	312	**332**	**354**	**319**	**349**	264	**316**	
11:00 AM	332	270	247	332	339	304	279	249	293	
12:00 PM	290	284	260	226	249	262	208	223	249	
1:00 PM	308	306	262	280	292	290	288	244	283	
2:00 PM	311	303	345	355	338	330	**335**	**364**	**336**	
3:00 PM	**344**	**340**	339	**367**	**372**	**352**	255	303	331	
4:00 PM	330	290	340	288	344	318	259	317	310	
5:00 PM	251	216	289	266	302	265	270	236	261	
6:00 PM	296	286	**354**	363	312	322	228	299	305	
7:00 PM	170	266	192	197	245	214	175	341	227	
8:00 PM	270	212	165	201	312	232	221	245	232	
9:00 PM	257	229	348	316	292	288	233	261	277	
10:00 PM	57	123	67	55	73	75	40	54	67	
11:00 PM	55	46	73	59	49	56	20	13	45	
Day Total	4629	4412	4515	4537	4877	4592	4124	4282	4483	
% Weekday Average	100.8%	96.1%	98.3%	98.8%	106.2%					
% Week Average	103.3%	98.4%	100.7%	101.2%	108.8%	102.4%	92.0%	95.5%		
AM Peak Volume	9:00 AM 334	9:00 AM 315	9:00 AM 333	10:00 AM 332	10:00 AM 354	10:00 AM 319	10:00 AM 349	9:00 AM 270	10:00 AM 316	
PM Peak Volume	3:00 PM 344	3:00 PM 340	6:00 PM 354	3:00 PM 367	3:00 PM 372	3:00 PM 352	2:00 PM 335	2:00 PM 364	2:00 PM 336	

Comments:

Quality Counts
TRANSPORTATION DATA COLLECTION

LOCATION: Tube Count 9
SPECIFIC LOCATION: Tube Count 9
CITY/STATE: Long Beach, CA

QC JOB #: 13777708
DIRECTION: EB/WB
DATE: May 17 2016 - May 22 2016

Start Time	Mon	Tue 17-May-16	Wed 18-May-16	Thu 19-May-16	Fri 20-May-16	Average Weekday Hourly Traffic	Sat 21-May-16	Sun 22-May-16	Average Week Hourly Traffic	Average Week Profile
12:00 AM		11	12	20	10	13	10	1	11	
1:00 AM		10	11	15	11	12	9	11	11	
2:00 AM		6	11	4	2	6	9	10	7	
3:00 AM		6	1	6	5	5	6	6	5	
4:00 AM		25	31	32	30	30	25	27	28	
5:00 AM		163	148	136	183	158	119	111	143	
6:00 AM		269	244	248	266	257	125	130	214	
7:00 AM		201	187	176	187	188	160	178	182	
8:00 AM		198	207	223	256	221	238	164	214	
9:00 AM		**322**	**340**	291	325	320	298	**273**	308	
10:00 AM		299	320	337	**362**	**330**	**358**	271	**325**	
11:00 AM		281	261	**349**	348	310	284	253	296	
12:00 PM		317	289	245	287	285	217	234	265	
1:00 PM		333	288	306	329	314	298	256	302	
2:00 PM		**365**	**407**	**413**	**392**	**394**	**350**	**373**	**383**	
3:00 PM		360	348	372	392	368	258	313	341	
4:00 PM		295	347	298	349	322	264	324	313	
5:00 PM		219	292	278	308	274	276	240	269	
6:00 PM		289	361	371	318	335	231	303	312	
7:00 PM		277	198	204	249	232	175	346	242	
8:00 PM		216	169	205	314	226	224	250	230	
9:00 PM		233	351	324	297	301	240	265	285	
10:00 PM		126	69	57	75	82	42	55	71	
11:00 PM		47	76	62	50	59	20	13	45	
Day Total		4868	4968	4972	5345	5042	4236	4407	4802	
% Weekday Average		96.5%	98.5%	98.6%	106.0%					
% Week Average		101.4%	103.5%	103.5%	111.3%	105.0%	88.2%	91.8%		
AM Peak Volume		9:00 AM 322	9:00 AM 340	11:00 AM 349	10:00 AM 362	10:00 AM 330	10:00 AM 358	9:00 AM 273	10:00 AM 325	
PM Peak Volume		2:00 PM 365	2:00 PM 407	2:00 PM 413	2:00 PM 392	2:00 PM 394	2:00 PM 350	2:00 PM 373	2:00 PM 383	

Comments:

LOCATION: Tube Count 9
SPECIFIC LOCATION: Tube Count 9
CITY/STATE: Long Beach, CA

QC JOB #: 13777708
DIRECTION: EB/WB
DATE: May 23 2016 - May 23 2016

Start Time	Mon 23-May-16	Tue	Wed	Thu	Fri	Average Weekday Hourly Traffic	Sat	Sun	Average Week Hourly Traffic	Average Week Profile
12:00 AM	4					4			4	
1:00 AM	15					15			15	
2:00 AM	12					12			12	
3:00 AM	5					5			5	
4:00 AM	31					31			31	
5:00 AM	192					192			192	
6:00 AM	298					298			298	
7:00 AM	225					225			225	
8:00 AM	218					218			218	
9:00 AM	342					342			342	
10:00 AM	312					312			312	
11:00 AM	**354**					**354**			**354**	
12:00 PM	317					317			317	
1:00 PM	334					334			334	
2:00 PM	**380**					**380**			**380**	
3:00 PM	364					364			364	
4:00 PM	335					335			335	
5:00 PM	260					260			260	
6:00 PM	298					298			298	
7:00 PM	176					176			176	
8:00 PM	273					273			273	
9:00 PM	258					258			258	
10:00 PM	59					59			59	
11:00 PM	55					55			55	
Day Total	5117					5117			5117	
% Weekday Average	101.5%									
% Week Average	106.6%					100.0%				
AM Peak Volume	11:00 AM 354					11:00 AM 354			11:00 AM 354	
PM Peak Volume	2:00 PM 380					2:00 PM 380			2:00 PM 380	

Comments:

SUMMARY - Tube Count - Volume Data (Weekday)

LOCATION: Tube Count 9
SPECIFIC LOCATION: Tube Count 9
CITY/STATE: Long Beach, CA

QC JOB #: 13777708
DIRECTION: EB/WB
DATE: May 17 2016 - May 23 2016

Start Time	Mon 23-May-16	Tue 17-May-16	Wed 18-May-16	Thu 19-May-16	Fri 20-May-16	Average Weekday Hourly Traffic			Average Weekday Profile
12:00 AM	4	11	12	20	10	11			
1:00 AM	15	10	11	15	11	12			
2:00 AM	12	6	11	4	2	7			
3:00 AM	5	6	1	6	5	5			
4:00 AM	31	25	31	32	30	30			
5:00 AM	192	163	148	136	183	164			
6:00 AM	298	269	244	248	266	265			
7:00 AM	225	201	187	176	187	195			
8:00 AM	218	198	207	223	256	220			
9:00 AM	342	**322**	**340**	291	325	324			
10:00 AM	312	299	320	337	**362**	**326**			
11:00 AM	**354**	281	261	**349**	348	319			
12:00 PM	317	317	289	245	287	291			
1:00 PM	334	333	288	306	329	318			
2:00 PM	**380**	**365**	**407**	**413**	**392**	**391**			
3:00 PM	364	360	348	372	392	367			
4:00 PM	335	295	347	298	349	325			
5:00 PM	260	219	292	278	308	271			
6:00 PM	298	289	361	371	318	327			
7:00 PM	176	277	198	204	249	221			
8:00 PM	273	216	169	205	314	235			
9:00 PM	258	233	351	324	297	293			
10:00 PM	59	126	69	57	75	77			
11:00 PM	55	47	76	62	50	58			
Day Total	5117	4868	4968	4972	5345	5052			
% Weekday Average	101.3%	96.4%	98.3%	98.4%	105.8%				
% Week Average									
AM Peak Volume	11:00 AM 354	9:00 AM 322	9:00 AM 340	11:00 AM 349	10:00 AM 362	10:00 AM 326			
PM Peak Volume	2:00 PM 380	2:00 PM 365	2:00 PM 407	2:00 PM 413	2:00 PM 392	2:00 PM 391			

Comments:

Quality Counts
TRANSPORTATION DATA COLLECTION

SUMMARY - Tube Count - Volume Data (Weekend)

LOCATION: Tube Count 9
SPECIFIC LOCATION: Tube Count 9
CITY/STATE: Long Beach, CA

QC JOB #: 13777708
DIRECTION: EB/WB
DATE: May 21 2016 - May 22 2016

Start Time			Sat 21-May-16	Sun 22-May-16	Average Weekend Hourly Traffic	Average Weekend Profile
12:00 AM			10	1	6	
1:00 AM			9	11	10	
2:00 AM			9	10	10	
3:00 AM			6	6	6	
4:00 AM			25	27	26	
5:00 AM			119	111	115	
6:00 AM			125	130	128	
7:00 AM			160	178	169	
8:00 AM			238	164	201	
9:00 AM			298	**273**	286	
10:00 AM			**358**	271	**315**	
11:00 AM			284	253	269	
12:00 PM			217	234	226	
1:00 PM			298	256	277	
2:00 PM			**350**	**373**	**362**	
3:00 PM			258	313	286	
4:00 PM			264	324	294	
5:00 PM			276	240	258	
6:00 PM			231	303	267	
7:00 PM			175	346	261	
8:00 PM			224	250	237	
9:00 PM			240	265	253	
10:00 PM			42	55	49	
11:00 PM			20	13	17	
Day Total			4236	4407	4328	
% Weekday Average						
% Week Average			97.9%	101.8%		
AM Peak Volume			10:00 AM 358	9:00 AM 273	10:00 AM 315	
PM Peak Volume			2:00 PM 350	2:00 PM 373	2:00 PM 362	

Comments:

Quality Counts
TRANSPORTATION DATA COLLECTION

SUMMARY - Tube Count - Volume Data (Week)

LOCATION: Tube Count 9
SPECIFIC LOCATION: Tube Count 9
CITY/STATE: Long Beach, CA

QC JOB #: 13777708
DIRECTION: EB/WB
DATE: May 17 2016 - May 23 2016

Start Time	Mon 23-May-16	Tue 17-May-16	Wed 18-May-16	Thu 19-May-16	Fri 20-May-16	Average Weekday Hourly Traffic	Sat 21-May-16	Sun 22-May-16	Average Week Hourly Traffic	Average Week Profile
12:00 AM	4	11	12	20	10	11	10	1	10	
1:00 AM	15	10	11	15	11	12	9	11	12	
2:00 AM	12	6	11	4	2	7	9	10	8	
3:00 AM	5	6	1	6	5	5	6	6	5	
4:00 AM	31	25	31	32	30	30	25	27	29	
5:00 AM	192	163	148	136	183	164	119	111	150	
6:00 AM	298	269	244	248	266	265	125	130	226	
7:00 AM	225	201	187	176	187	195	160	178	188	
8:00 AM	218	198	207	223	256	220	238	164	215	
9:00 AM	342	**322**	**340**	291	325	324	298	**273**	313	
10:00 AM	312	299	320	337	**362**	**326**	**358**	271	**323**	
11:00 AM	**354**	281	261	**349**	348	319	284	253	304	
12:00 PM	317	317	289	245	287	291	217	234	272	
1:00 PM	334	333	288	306	329	318	298	256	306	
2:00 PM	**380**	**365**	**407**	**413**	**392**	**391**	**350**	**373**	**383**	
3:00 PM	364	360	348	372	392	367	258	313	344	
4:00 PM	335	295	347	298	349	325	264	324	316	
5:00 PM	260	219	292	278	308	271	276	240	268	
6:00 PM	298	289	361	371	318	327	231	303	310	
7:00 PM	176	277	198	204	249	221	175	346	232	
8:00 PM	273	216	169	205	314	235	224	250	236	
9:00 PM	258	233	351	324	297	293	240	265	281	
10:00 PM	59	126	69	57	75	77	42	55	69	
11:00 PM	55	47	76	62	50	58	20	13	46	
Day Total	5117	4868	4968	4972	5345	5052	4236	4407	4846	
% Weekday Average	101.3%	96.4%	98.3%	98.4%	105.8%					
% Week Average	105.6%	100.5%	102.5%	102.6%	110.3%	104.3%	87.4%	90.9%		
AM Peak Volume	11:00 AM 354	9:00 AM 322	9:00 AM 340	11:00 AM 349	10:00 AM 362	10:00 AM 326	10:00 AM 358	9:00 AM 273	10:00 AM 323	
PM Peak Volume	2:00 PM 380	2:00 PM 365	2:00 PM 407	2:00 PM 413	2:00 PM 392	2:00 PM 391	2:00 PM 350	2:00 PM 373	2:00 PM 383	

Comments:

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

LOCATION: Tube Count 9
SPECIFIC LOCATION: Tube Count 9
CITY/STATE: Long Beach, CA

QC JOB #: 13777708
DIRECTION: WB
DATE: May 17 2016 - May 22 2016

Start Time	Mon	Tue 17-May-16	Wed 18-May-16	Thu 19-May-16	Fri 20-May-16	Average Weekday Hourly Traffic	Sat 21-May-16	Sun 22-May-16	Average Week Hourly Traffic	Average Week Profile
12:00 AM		0	0	1	0	0	0	0	0	
1:00 AM		0	0	0	0	0	0	2	0	
2:00 AM		0	0	1	0	0	1	1	1	
3:00 AM		0	0	0	1	0	0	0	0	
4:00 AM		16	20	18	14	17	8	9	14	
5:00 AM		79	67	56	73	69	7	**12**	49	
6:00 AM		**135**	**142**	**138**	**139**	**139**	6	8	**95**	
7:00 AM		17	24	18	18	19	6	4	15	
8:00 AM		11	10	10	6	9	4	3	7	
9:00 AM		7	7	9	20	11	3	3	8	
10:00 AM		4	8	5	8	6	**9**	7	7	
11:00 AM		11	14	17	9	13	5	4	10	
12:00 PM		33	29	19	38	30	9	11	23	
1:00 PM		27	26	26	37	29	10	**12**	23	
2:00 PM		**62**	**62**	**58**	**54**	**59**	**15**	9	**43**	
3:00 PM		20	9	5	20	14	3	10	11	
4:00 PM		5	7	10	5	7	5	7	7	
5:00 PM		3	3	12	6	6	6	4	6	
6:00 PM		3	7	8	6	6	3	4	5	
7:00 PM		11	6	7	4	7	0	5	6	
8:00 PM		4	4	4	2	4	3	5	4	
9:00 PM		4	3	8	5	5	7	4	5	
10:00 PM		3	2	2	2	2	2	1	2	
11:00 PM		1	3	3	1	2	0	0	1	
Day Total		456	453	435	468	454	112	125	342	
% Weekday Average		100.4%	99.8%	95.8%	103.1%					
% Week Average		133.3%	132.5%	127.2%	136.8%	132.7%	32.7%	36.5%		
AM Peak Volume		6:00 AM 135	6:00 AM 142	6:00 AM 138	6:00 AM 139	6:00 AM 139	10:00 AM 9	5:00 AM 12	6:00 AM 95	
PM Peak Volume		2:00 PM 62	2:00 PM 62	2:00 PM 58	2:00 PM 54	2:00 PM 59	2:00 PM 15	1:00 PM 12	2:00 PM 43	

Comments:

LOCATION: Tube Count 9
SPECIFIC LOCATION: Tube Count 9
CITY/STATE: Long Beach, CA

QC JOB #: 13777708
DIRECTION: WB
DATE: May 23 2016 - May 23 2016

Start Time	Mon 23-May-16	Tue	Wed	Thu	Fri	Average Weekday Hourly Traffic	Sat	Sun	Average Week Hourly Traffic	Average Week Profile
12:00 AM	0					0			0	
1:00 AM	0					0			0	
2:00 AM	0					0			0	
3:00 AM	0					0			0	
4:00 AM	20					20			20	
5:00 AM	74					74			74	
6:00 AM	**148**					**148**			**148**	
7:00 AM	28					28			28	
8:00 AM	10					10			10	
9:00 AM	8					8			8	
10:00 AM	8					8			8	
11:00 AM	22					22			22	
12:00 PM	27					27			27	
1:00 PM	26					26			26	
2:00 PM	**69**					**69**			**69**	
3:00 PM	20					20			20	
4:00 PM	5					5			5	
5:00 PM	9					9			9	
6:00 PM	2					2			2	
7:00 PM	6					6			6	
8:00 PM	3					3			3	
9:00 PM	1					1			1	
10:00 PM	2					2			2	
11:00 PM	0					0			0	
Day Total	488					488			488	
% Weekday Average	107.5%									
% Week Average	142.7%					100.0%				
AM Peak Volume	6:00 AM 148					6:00 AM 148			6:00 AM 148	
PM Peak Volume	2:00 PM 69					2:00 PM 69			2:00 PM 69	

Comments:

Quality Counts
TRANSPORTATION DATA COLLECTION

SUMMARY - Tube Count - Volume Data (Weekday)

LOCATION: Tube Count 9
SPECIFIC LOCATION: Tube Count 9
CITY/STATE: Long Beach, CA

QC JOB #: 13777708
DIRECTION: WB
DATE: May 17 2016 - May 23 2016

Start Time	Mon 23-May-16	Tue 17-May-16	Wed 18-May-16	Thu 19-May-16	Fri 20-May-16	Average Weekday Hourly Traffic			Average Weekday Profile
12:00 AM	0	0	0	1	0	0			
1:00 AM	0	0	0	0	0	0			
2:00 AM	0	0	0	1	0	0			
3:00 AM	0	0	0	0	1	0			
4:00 AM	20	16	20	18	14	18			
5:00 AM	74	79	67	56	73	70			
6:00 AM	**148**	**135**	**142**	**138**	**139**	**140**			
7:00 AM	28	17	24	18	18	21			
8:00 AM	10	11	10	10	6	9			
9:00 AM	8	7	7	9	20	10			
10:00 AM	8	4	8	5	8	7			
11:00 AM	22	11	14	17	9	15			
12:00 PM	27	33	29	19	38	29			
1:00 PM	26	27	26	26	37	28			
2:00 PM	**69**	**62**	**62**	**58**	**54**	**61**			
3:00 PM	20	20	9	5	20	15			
4:00 PM	5	5	7	10	5	6			
5:00 PM	9	3	3	12	6	7			
6:00 PM	2	3	7	8	6	5			
7:00 PM	6	11	6	7	4	7			
8:00 PM	3	4	4	4	2	3			
9:00 PM	1	4	3	8	5	4			
10:00 PM	2	3	2	2	2	2			
11:00 PM	0	1	3	3	1	2			
Day Total	488	456	453	435	468	459			
% Weekday Average	106.3%	99.3%	98.7%	94.8%	102.0%				
% Week Average									
AM Peak Volume	6:00 AM 148	6:00 AM 135	6:00 AM 142	6:00 AM 138	6:00 AM 139	6:00 AM 140			
PM Peak Volume	2:00 PM 69	2:00 PM 62	2:00 PM 62	2:00 PM 58	2:00 PM 54	2:00 PM 61			

Comments:

Quality Counts
TRANSPORTATION DATA COLLECTION

SUMMARY - Tube Count - Volume Data (Weekend)

LOCATION: Tube Count 9
SPECIFIC LOCATION: Tube Count 9
CITY/STATE: Long Beach, CA

QC JOB #: 13777708
DIRECTION: WB
DATE: May 21 2016 - May 22 2016

Start Time			Sat 21-May-16	Sun 22-May-16	Average Weekend Hourly Traffic	Average Weekend Profile
12:00 AM			0	0	0	
1:00 AM			0	2	1	
2:00 AM			1	1	1	
3:00 AM			0	0	0	
4:00 AM			8	9	9	
5:00 AM			7	**12**	**10**	
6:00 AM			6	8	7	
7:00 AM			6	4	5	
8:00 AM			4	3	4	
9:00 AM			3	3	3	
10:00 AM			**9**	7	8	
11:00 AM			5	4	5	
12:00 PM			9	11	10	
1:00 PM			10	**12**	11	
2:00 PM			**15**	9	**12**	
3:00 PM			3	10	7	
4:00 PM			5	7	6	
5:00 PM			6	4	5	
6:00 PM			3	4	4	
7:00 PM			0	5	3	
8:00 PM			3	5	4	
9:00 PM			7	4	6	
10:00 PM			2	1	2	
11:00 PM			0	0	0	
Day Total			112	125	123	
% Weekday Average						
% Week Average			91.1%	101.6%		
AM Peak Volume			10:00 AM 9	5:00 AM 12	5:00 AM 10	
PM Peak Volume			2:00 PM 15	1:00 PM 12	2:00 PM 12	

Comments:

Quality Counts
TRANSPORTATION DATA COLLECTION

SUMMARY - Tube Count - Volume Data (Week)

LOCATION: Tube Count 9
SPECIFIC LOCATION: Tube Count 9
CITY/STATE: Long Beach, CA

QC JOB #: 13777708
DIRECTION: WB
DATE: May 17 2016 - May 23 2016

Start Time	Mon 23-May-16	Tue 17-May-16	Wed 18-May-16	Thu 19-May-16	Fri 20-May-16	Average Weekday Hourly Traffic	Sat 21-May-16	Sun 22-May-16	Average Week Hourly Traffic	Average Week Profile
12:00 AM	0	0	0	1	0	0	0	0	0	
1:00 AM	0	0	0	0	0	0	0	2	0	
2:00 AM	0	0	0	1	0	0	1	1	0	
3:00 AM	0	0	0	0	1	0	0	0	0	
4:00 AM	20	16	20	18	14	18	8	9	15	
5:00 AM	74	79	67	56	73	70	7	**12**	53	
6:00 AM	**148**	**135**	**142**	**138**	**139**	**140**	6	8	**102**	
7:00 AM	28	17	24	18	18	21	6	4	16	
8:00 AM	10	11	10	10	6	9	4	3	8	
9:00 AM	8	7	7	9	20	10	3	3	8	
10:00 AM	8	4	8	5	8	7	**9**	7	7	
11:00 AM	22	11	14	17	9	15	5	4	12	
12:00 PM	27	33	29	19	38	29	9	11	24	
1:00 PM	26	27	26	26	37	28	10	**12**	23	
2:00 PM	**69**	**62**	**62**	**58**	**54**	**61**	**15**	9	**47**	
3:00 PM	20	20	9	5	20	15	3	10	12	
4:00 PM	5	5	7	10	5	6	5	7	6	
5:00 PM	9	3	3	12	6	7	6	4	6	
6:00 PM	2	3	7	8	6	5	3	4	5	
7:00 PM	6	11	6	7	4	7	0	5	6	
8:00 PM	3	4	4	4	2	3	3	5	4	
9:00 PM	1	4	3	8	5	4	7	4	5	
10:00 PM	2	3	2	2	2	2	2	1	2	
11:00 PM	0	1	3	3	1	2	0	0	1	
Day Total	488	456	453	435	468	459	112	125	362	
% Weekday Average	106.3%	99.3%	98.7%	94.8%	102.0%					
% Week Average	134.8%	126.0%	125.1%	120.2%	129.3%	126.8%	30.9%	34.5%		
AM Peak Volume	6:00 AM 148	6:00 AM 135	6:00 AM 142	6:00 AM 138	6:00 AM 139	6:00 AM 140	10:00 AM 9	5:00 AM 12	6:00 AM 102	
PM Peak Volume	2:00 PM 69	2:00 PM 62	2:00 PM 62	2:00 PM 58	2:00 PM 54	2:00 PM 61	2:00 PM 15	1:00 PM 12	2:00 PM 47	

Comments:

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

LOCATION: Tube Count 2
SPECIFIC LOCATION: Tube Count 2
CITY/STATE: Long Beach, CA

QC JOB #: 13777709
DIRECTION: NB
DATE: May 17 2016 - May 17 2016

Start Time	Mon	Tue 17-May-16	Wed	Thu	Fri	Average Weekday Hourly Traffic	Sat	Sun	Average Week Hourly Traffic	Average Week Profile
12:00 AM		9				9			9	
1:00 AM		7				7			7	
2:00 AM		2				2			2	
3:00 AM		2				2			2	
4:00 AM		9				9			9	
5:00 AM		49				49			49	
6:00 AM		90				90			90	
7:00 AM		175				175			175	
8:00 AM		131				131			131	
9:00 AM		221				221			221	
10:00 AM		211				211			211	
11:00 AM		**264**				**264**			**264**	
12:00 PM		269				269			269	
1:00 PM		253				253			253	
2:00 PM		283				283			283	
3:00 PM		**405**				**405**			**405**	
4:00 PM		307				307			307	
5:00 PM		272				272			272	
6:00 PM		330				330			330	
7:00 PM		254				254			254	
8:00 PM		149				149			149	
9:00 PM		292				292			292	
10:00 PM		103				103			103	
11:00 PM		62				62			62	
Day Total		4149				4149			4149	
% Weekday Average		100.0%								
% Week Average		100.0%				100.0%				
AM Peak Volume		11:00 AM 264				11:00 AM 264			11:00 AM 264	
PM Peak Volume		3:00 PM 405				3:00 PM 405			3:00 PM 405	

Comments:

Quality Counts
TRANSPORTATION DATA COLLECTION

LOCATION: Tube Count 3
SPECIFIC LOCATION: Tube Count 3
CITY/STATE: Long Beach, CA

QC JOB #: 13777710
DIRECTION: WB
DATE: May 17 2016 - May 17 2016

Start Time	Mon	Tue 17-May-16	Wed	Thu	Fri	Average Weekday Hourly Traffic	Sat	Sun	Average Week Hourly Traffic	Average Week Profile
12:00 AM		11				11			11	
1:00 AM		6				6			6	
2:00 AM		3				3			3	
3:00 AM		9				9			9	
4:00 AM		87				87			87	
5:00 AM		352				352			352	
6:00 AM		497				497			497	
7:00 AM		493				493			493	
8:00 AM		412				412			412	
9:00 AM		**562**				**562**			**562**	
10:00 AM		464				464			464	
11:00 AM		485				485			485	
12:00 PM		**601**				**601**			**601**	
1:00 PM		499				499			499	
2:00 PM		484				484			484	
3:00 PM		403				403			403	
4:00 PM		453				453			453	
5:00 PM		432				432			432	
6:00 PM		502				502			502	
7:00 PM		417				417			417	
8:00 PM		290				290			290	
9:00 PM		376				376			376	
10:00 PM		74				74			74	
11:00 PM		13				13			13	
Day Total		7925				7925			7925	
% Weekday Average		100.0%								
% Week Average		100.0%				100.0%				
AM Peak Volume		9:00 AM 562				9:00 AM 562			9:00 AM 562	
PM Peak Volume		12:00 PM 601				12:00 PM 601			12:00 PM 601	

Comments:

LOCATION: Tube Count 4
SPECIFIC LOCATION: Tube Count 4
CITY/STATE: Long Beach, CA

QC JOB #: 13777711
DIRECTION: SB
DATE: May 17 2016 - May 17 2016

Start Time	Mon	Tue 17-May-16	Wed	Thu	Fri	Average Weekday Hourly Traffic	Sat	Sun	Average Week Hourly Traffic	Average Week Profile
12:00 AM		6				6			6	
1:00 AM		1				1			1	
2:00 AM		0				0			0	
3:00 AM		2				2			2	
4:00 AM		29				29			29	
5:00 AM		101				101			101	
6:00 AM		138				138			138	
7:00 AM		**180**				**180**			**180**	
8:00 AM		169				169			169	
9:00 AM		173				173			173	
10:00 AM		167				167			167	
11:00 AM		171				171			171	
12:00 PM		**198**				**198**			**198**	
1:00 PM		173				173			173	
2:00 PM		181				181			181	
3:00 PM		159				159			159	
4:00 PM		167				167			167	
5:00 PM		137				137			137	
6:00 PM		146				146			146	
7:00 PM		115				115			115	
8:00 PM		77				77			77	
9:00 PM		107				107			107	
10:00 PM		27				27			27	
11:00 PM		8				8			8	
Day Total		2632				2632			2632	
% Weekday Average		100.0%								
% Week Average		100.0%				100.0%				
AM Peak Volume		7:00 AM 180				7:00 AM 180			7:00 AM 180	
PM Peak Volume		12:00 PM 198				12:00 PM 198			12:00 PM 198	

Comments:

Quality Counts
TRANSPORTATION DATA COLLECTION

LOCATION: Tube Count 5
SPECIFIC LOCATION: Tube Count 5
CITY/STATE: Long Beach, CA

QC JOB #: 13777712
DIRECTION: EB
DATE: May 17 2016 - May 17 2016

Start Time	Mon	Tue 17-May-16	Wed	Thu	Fri	Average Weekday Hourly Traffic	Sat	Sun	Average Week Hourly Traffic	Average Week Profile
12:00 AM		14				14			14	
1:00 AM		16				16			16	
2:00 AM		6				6			6	
3:00 AM		7				7			7	
4:00 AM		15				15			15	
5:00 AM		98				98			98	
6:00 AM		211				211			211	
7:00 AM		316				316			316	
8:00 AM		281				281			281	
9:00 AM		**458**				**458**			**458**	
10:00 AM		426				426			426	
11:00 AM		454				454			454	
12:00 PM		486				486			486	
1:00 PM		431				431			431	
2:00 PM		459				459			459	
3:00 PM		458				458			458	
4:00 PM		412				412			412	
5:00 PM		370				370			370	
6:00 PM		**512**				**512**			**512**	
7:00 PM		470				470			470	
8:00 PM		323				323			323	
9:00 PM		436				436			436	
10:00 PM		179				179			179	
11:00 PM		78				78			78	
Day Total		6916				6916			6916	
% Weekday Average		100.0%								
% Week Average		100.0%				100.0%				
AM Peak Volume		9:00 AM 458				9:00 AM 458			9:00 AM 458	
PM Peak Volume		6:00 PM 512				6:00 PM 512			6:00 PM 512	

Comments:

LOCATION: Tube Count 6
SPECIFIC LOCATION: Tube Count 6
CITY/STATE: Long Beach, CA

QC JOB #: 13777713
DIRECTION: NB
DATE: May 17 2016 - May 17 2016

Start Time	Mon	Tue 17-May-16	Wed	Thu	Fri	Average Weekday Hourly Traffic	Sat	Sun	Average Week Hourly Traffic	Average Week Profile
12:00 AM		3				3			3	
1:00 AM		6				6			6	
2:00 AM		3				3			3	
3:00 AM		1				1			1	
4:00 AM		19				19			19	
5:00 AM		57				57			57	
6:00 AM		91				91			91	
7:00 AM		72				72			72	
8:00 AM		102				102			102	
9:00 AM		119				119			119	
10:00 AM		140				140			140	
11:00 AM		**161**				**161**			**161**	
12:00 PM		155				155			155	
1:00 PM		227				227			227	
2:00 PM		**309**				**309**			**309**	
3:00 PM		248				248			248	
4:00 PM		222				222			222	
5:00 PM		161				161			161	
6:00 PM		266				266			266	
7:00 PM		199				199			199	
8:00 PM		63				63			63	
9:00 PM		97				97			97	
10:00 PM		33				33			33	
11:00 PM		23				23			23	
Day Total		2777				2777			2777	
% Weekday Average		100.0%								
% Week Average		100.0%				100.0%				
AM Peak Volume		11:00 AM 161				11:00 AM 161			11:00 AM 161	
PM Peak Volume		2:00 PM 309				2:00 PM 309			2:00 PM 309	

Comments:

LOCATION: Tube Count 7
SPECIFIC LOCATION: Tube Count 7
CITY/STATE: Long Beach, CA

QC JOB #: 13777714
DIRECTION: SB
DATE: May 17 2016 - May 17 2016

Start Time	Mon	Tue 17-May-16	Wed	Thu	Fri	Average Weekday Hourly Traffic	Sat	Sun	Average Week Hourly Traffic	Average Week Profile
12:00 AM		10				10			10	
1:00 AM		10				10			10	
2:00 AM		7				7			7	
3:00 AM		6				6			6	
4:00 AM		16				16			16	
5:00 AM		116				116			116	
6:00 AM		139				139			139	
7:00 AM		232				232			232	
8:00 AM		196				196			196	
9:00 AM		**310**				**310**			**310**	
10:00 AM		283				283			283	
11:00 AM		274				274			274	
12:00 PM		323				323			323	
1:00 PM		262				262			262	
2:00 PM		265				265			265	
3:00 PM		**327**				**327**			**327**	
4:00 PM		278				278			278	
5:00 PM		208				208			208	
6:00 PM		309				309			309	
7:00 PM		250				250			250	
8:00 PM		200				200			200	
9:00 PM		240				240			240	
10:00 PM		88				88			88	
11:00 PM		78				78			78	
Day Total		4427				4427			4427	
% Weekday Average		100.0%								
% Week Average		100.0%				100.0%				
AM Peak Volume		9:00 AM 310				9:00 AM 310			9:00 AM 310	
PM Peak Volume		3:00 PM 327				3:00 PM 327			3:00 PM 327	

Comments:

LOCATION: Tube Count 10
SPECIFIC LOCATION: Tube Count
CITY/STATE: Long Beach, CA

QC JOB #: 13777715
DIRECTION: WB
DATE: May 17 2016 - May 17 2016

Start Time	Mon	Tue 17-May-16	Wed	Thu	Fri	Average Weekday Hourly Traffic	Sat	Sun	Average Week Hourly Traffic	Average Week Profile
12:00 AM		9				9			9	
1:00 AM		6				6			6	
2:00 AM		3				3			3	
3:00 AM		9				9			9	
4:00 AM		66				66			66	
5:00 AM		305				305			305	
6:00 AM		424				424			424	
7:00 AM		448				448			448	
8:00 AM		395				395			395	
9:00 AM		**531**				**531**			**531**	
10:00 AM		448				448			448	
11:00 AM		456				456			456	
12:00 PM		**572**				**572**			**572**	
1:00 PM		456				456			456	
2:00 PM		456				456			456	
3:00 PM		386				386			386	
4:00 PM		456				456			456	
5:00 PM		396				396			396	
6:00 PM		481				481			481	
7:00 PM		404				404			404	
8:00 PM		272				272			272	
9:00 PM		367				367			367	
10:00 PM		69				69			69	
11:00 PM		12				12			12	
Day Total		7427				7427			7427	
% Weekday Average		100.0%								
% Week Average		100.0%				100.0%				
AM Peak Volume		9:00 AM 531				9:00 AM 531			9:00 AM 531	
PM Peak Volume		12:00 PM 572				12:00 PM 572			12:00 PM 572	

Comments:

Quality Counts
TRANSPORTATION DATA COLLECTION

LOCATION: Tube Count 11
SPECIFIC LOCATION: Tube Count
CITY/STATE: Long Beach, CA

QC JOB #: 13777716
DIRECTION: SB
DATE: May 17 2016 - May 17 2016

Start Time	Mon	Tue 17-May-16	Wed	Thu	Fri	Average Weekday Hourly Traffic	Sat	Sun	Average Week Hourly Traffic	Average Week Profile
12:00 AM		7				7			7	
1:00 AM		2				2			2	
2:00 AM		0				0			0	
3:00 AM		1				1			1	
4:00 AM		25				25			25	
5:00 AM		92				92			92	
6:00 AM		141				141			141	
7:00 AM		191				191			191	
8:00 AM		181				181			181	
9:00 AM		**235**				**235**			**235**	
10:00 AM		179				179			179	
11:00 AM		188				188			188	
12:00 PM		**234**				**234**			**234**	
1:00 PM		208				208			208	
2:00 PM		231				231			231	
3:00 PM		166				166			166	
4:00 PM		184				184			184	
5:00 PM		159				159			159	
6:00 PM		180				180			180	
7:00 PM		169				169			169	
8:00 PM		100				100			100	
9:00 PM		156				156			156	
10:00 PM		62				62			62	
11:00 PM		10				10			10	
Day Total		3101				3101			3101	
% Weekday Average		100.0%								
% Week Average		100.0%				100.0%				
AM Peak Volume		9:00 AM 235				9:00 AM 235			9:00 AM 235	
PM Peak Volume		12:00 PM 234				12:00 PM 234			12:00 PM 234	

Comments:

LOCATION: Tube Count 12
SPECIFIC LOCATION: Tube Count 12
CITY/STATE: Long Beach, CA

QC JOB #: 13777717
DIRECTION: SB
DATE: May 17 2016 - May 17 2016

Start Time	Mon	Tue 17-May-16	Wed	Thu	Fri	Average Weekday Hourly Traffic	Sat	Sun	Average Week Hourly Traffic	Average Week Profile
12:00 AM		9				9			9	
1:00 AM		2				2			2	
2:00 AM		0				0			0	
3:00 AM		1				1			1	
4:00 AM		25				25			25	
5:00 AM		97				97			97	
6:00 AM		163				163			163	
7:00 AM		219				219			219	
8:00 AM		190				190			190	
9:00 AM		**282**				**282**			**282**	
10:00 AM		238				238			238	
11:00 AM		234				234			234	
12:00 PM		262				262			262	
1:00 PM		282				282			282	
2:00 PM		**285**				**285**			**285**	
3:00 PM		211				211			211	
4:00 PM		252				252			252	
5:00 PM		204				204			204	
6:00 PM		266				266			266	
7:00 PM		233				233			233	
8:00 PM		154				154			154	
9:00 PM		234				234			234	
10:00 PM		89				89			89	
11:00 PM		11				11			11	
Day Total		3943				3943			3943	
% Weekday Average		100.0%								
% Week Average		100.0%				100.0%				
AM Peak Volume		9:00 AM 282				9:00 AM 282			9:00 AM 282	
PM Peak Volume		2:00 PM 285				2:00 PM 285			2:00 PM 285	

Comments:

LOCATION: Tube Count 13
SPECIFIC LOCATION: Tube Count 13
CITY/STATE: Long Beach, CA

QC JOB #: 13777718
DIRECTION: WB
DATE: May 17 2016 - May 17 2016

Start Time	Mon	Tue 17-May-16	Wed	Thu	Fri	Average Weekday Hourly Traffic	Sat	Sun	Average Week Hourly Traffic	Average Week Profile
12:00 AM		4				4			4	
1:00 AM		3				3			3	
2:00 AM		3				3			3	
3:00 AM		8				8			8	
4:00 AM		30				30			30	
5:00 AM		190				190			190	
6:00 AM		278				278			278	
7:00 AM		279				279			279	
8:00 AM		239				239			239	
9:00 AM		**360**				**360**			**360**	
10:00 AM		311				311			311	
11:00 AM		292				292			292	
12:00 PM		**384**				**384**			**384**	
1:00 PM		295				295			295	
2:00 PM		316				316			316	
3:00 PM		243				243			243	
4:00 PM		280				280			280	
5:00 PM		248				248			248	
6:00 PM		348				348			348	
7:00 PM		308				308			308	
8:00 PM		208				208			208	
9:00 PM		270				270			270	
10:00 PM		56				56			56	
11:00 PM		4				4			4	
Day Total		4957				4957			4957	
% Weekday Average		100.0%								
% Week Average		100.0%				100.0%				
AM Peak Volume		9:00 AM 360				9:00 AM 360			9:00 AM 360	
PM Peak Volume		12:00 PM 384				12:00 PM 384			12:00 PM 384	

Comments:

LOCATION: Tube Count 14
SPECIFIC LOCATION: Tube Count 14
CITY/STATE: Long Beach, CA

QC JOB #: 13777719
DIRECTION: NB
DATE: May 17 2016 - May 17 2016

Start Time	Mon	Tue 17-May-16	Wed	Thu	Fri	Average Weekday Hourly Traffic	Sat	Sun	Average Week Hourly Traffic	Average Week Profile
12:00 AM		1				1			1	
1:00 AM		2				2			2	
2:00 AM		0				0			0	
3:00 AM		0				0			0	
4:00 AM		19				19			19	
5:00 AM		31				31			31	
6:00 AM		54				54			54	
7:00 AM		57				57			57	
8:00 AM		59				59			59	
9:00 AM		62				62			62	
10:00 AM		79				79			79	
11:00 AM		**80**				**80**			**80**	
12:00 PM		57				57			57	
1:00 PM		61				61			61	
2:00 PM		53				53			53	
3:00 PM		35				35			35	
4:00 PM		**64**				**64**			**64**	
5:00 PM		63				63			63	
6:00 PM		36				36			36	
7:00 PM		42				42			42	
8:00 PM		26				26			26	
9:00 PM		39				39			39	
10:00 PM		6				6			6	
11:00 PM		0				0			0	
Day Total		926				926			926	
% Weekday Average		100.0%								
% Week Average		100.0%				100.0%				
AM Peak Volume		11:00 AM 80				11:00 AM 80			11:00 AM 80	
PM Peak Volume		4:00 PM 64				4:00 PM 64			4:00 PM 64	

Comments:

Quality Counts
TRANSPORTATION DATA COLLECTION

LOCATION: Tube Count 14
SPECIFIC LOCATION: Tube Count 14
CITY/STATE: Long Beach, CA

QC JOB #: 13777719
DIRECTION: NB/SB
DATE: May 17 2016 - May 17 2016

Start Time	Mon	Tue 17-May-16	Wed	Thu	Fri	Average Weekday Hourly Traffic	Sat	Sun	Average Week Hourly Traffic	Average Week Profile
12:00 AM		2				2			2	
1:00 AM		3				3			3	
2:00 AM		0				0			0	
3:00 AM		0				0			0	
4:00 AM		21				21			21	
5:00 AM		39				39			39	
6:00 AM		98				98			98	
7:00 AM		124				124			124	
8:00 AM		123				123			123	
9:00 AM		143				143			143	
10:00 AM		**189**				**189**			**189**	
11:00 AM		174				174			174	
12:00 PM		124				124			124	
1:00 PM		118				118			118	
2:00 PM		**127**				**127**			**127**	
3:00 PM		84				84			84	
4:00 PM		117				117			117	
5:00 PM		113				113			113	
6:00 PM		87				87			87	
7:00 PM		118				118			118	
8:00 PM		80				80			80	
9:00 PM		77				77			77	
10:00 PM		27				27			27	
11:00 PM		3				3			3	
Day Total		1991				1991			1991	
% Weekday Average		100.0%								
% Week Average		100.0%				100.0%				
AM Peak Volume		10:00 AM 189				10:00 AM 189			10:00 AM 189	
PM Peak Volume		2:00 PM 127				2:00 PM 127			2:00 PM 127	

Comments:

Quality Counts
TRANSPORTATION DATA COLLECTION

LOCATION: Tube Count 14
SPECIFIC LOCATION: Tube Count 14
CITY/STATE: Long Beach, CA

QC JOB #: 13777719
DIRECTION: SB
DATE: May 17 2016 - May 17 2016

Start Time	Mon	Tue 17-May-16	Wed	Thu	Fri	Average Weekday Hourly Traffic	Sat	Sun	Average Week Hourly Traffic	Average Week Profile
12:00 AM		1				1			1	
1:00 AM		1				1			1	
2:00 AM		0				0			0	
3:00 AM		0				0			0	
4:00 AM		2				2			2	
5:00 AM		8				8			8	
6:00 AM		44				44			44	
7:00 AM		67				67			67	
8:00 AM		64				64			64	
9:00 AM		81				81			81	
10:00 AM		**110**				**110**			**110**	
11:00 AM		94				94			94	
12:00 PM		67				67			67	
1:00 PM		57				57			57	
2:00 PM		74				74			74	
3:00 PM		49				49			49	
4:00 PM		53				53			53	
5:00 PM		50				50			50	
6:00 PM		51				51			51	
7:00 PM		**76**				**76**			**76**	
8:00 PM		54				54			54	
9:00 PM		38				38			38	
10:00 PM		21				21			21	
11:00 PM		3				3			3	
Day Total		1065				1065			1065	
% Weekday Average		100.0%								
% Week Average		100.0%				100.0%				
AM Peak Volume		10:00 AM 110				10:00 AM 110			10:00 AM 110	
PM Peak Volume		7:00 PM 76				7:00 PM 76			7:00 PM 76	

Comments:

LOCATION: Tube Count 15
SPECIFIC LOCATION: Tube Count 15
CITY/STATE: Long Beach, CA

QC JOB #: 13777720
DIRECTION: WB
DATE: May 17 2016 - May 17 2016

Start Time	Mon	Tue 17-May-16	Wed	Thu	Fri	Average Weekday Hourly Traffic	Sat	Sun	Average Week Hourly Traffic	Average Week Profile
12:00 AM		3				3			3	
1:00 AM		3				3			3	
2:00 AM		3				3			3	
3:00 AM		7				7			7	
4:00 AM		27				27			27	
5:00 AM		169				169			169	
6:00 AM		236				236			236	
7:00 AM		255				255			255	
8:00 AM		212				212			212	
9:00 AM		**338**				**338**			**338**	
10:00 AM		275				275			275	
11:00 AM		260				260			260	
12:00 PM		**355**				**355**			**355**	
1:00 PM		259				259			259	
2:00 PM		273				273			273	
3:00 PM		226				226			226	
4:00 PM		252				252			252	
5:00 PM		233				233			233	
6:00 PM		321				321			321	
7:00 PM		271				271			271	
8:00 PM		195				195			195	
9:00 PM		246				246			246	
10:00 PM		42				42			42	
11:00 PM		5				5			5	
Day Total		4466				4466			4466	
% Weekday Average		100.0%								
% Week Average		100.0%				100.0%				
AM Peak Volume		9:00 AM 338				9:00 AM 338			9:00 AM 338	
PM Peak Volume		12:00 PM 355				12:00 PM 355			12:00 PM 355	

Comments:

LOCATION: Tube Count 20
SPECIFIC LOCATION: Tube Count
CITY/STATE: Long Beach, CA

QC JOB #: 13777721
DIRECTION: EB
DATE: May 17 2016 - May 17 2016

Start Time	Mon	Tue 17-May-16	Wed	Thu	Fri	Average Weekday Hourly Traffic	Sat	Sun	Average Week Hourly Traffic	Average Week Profile
12:00 AM		0				0			0	
1:00 AM		2				2			2	
2:00 AM		0				0			0	
3:00 AM		0				0			0	
4:00 AM		2				2			2	
5:00 AM		41				41			41	
6:00 AM		**121**				**121**			**121**	
7:00 AM		48				48			48	
8:00 AM		18				18			18	
9:00 AM		25				25			25	
10:00 AM		27				27			27	
11:00 AM		59				59			59	
12:00 PM		75				75			75	
1:00 PM		53				53			53	
2:00 PM		53				53			53	
3:00 PM		**126**				**126**			**126**	
4:00 PM		52				52			52	
5:00 PM		77				77			77	
6:00 PM		17				17			17	
7:00 PM		57				57			57	
8:00 PM		10				10			10	
9:00 PM		11				11			11	
10:00 PM		0				0			0	
11:00 PM		5				5			5	
Day Total		879				879			879	
% Weekday Average		100.0%								
% Week Average		100.0%				100.0%				
AM Peak Volume		6:00 AM 121				6:00 AM 121			6:00 AM 121	
PM Peak Volume		3:00 PM 126				3:00 PM 126			3:00 PM 126	

Comments:

LOCATION: Tube Count 20
SPECIFIC LOCATION: Tube Count
CITY/STATE: Long Beach, CA

QC JOB #: 13777721
DIRECTION: EB/WB
DATE: May 17 2016 - May 17 2016

Start Time	Mon	Tue 17-May-16	Wed	Thu	Fri	Average Weekday Hourly Traffic	Sat	Sun	Average Week Hourly Traffic	Average Week Profile
12:00 AM		5				5			5	
1:00 AM		12				12			12	
2:00 AM		0				0			0	
3:00 AM		1				1			1	
4:00 AM		3				3			3	
5:00 AM		46				46			46	
6:00 AM		**129**				**129**			**129**	
7:00 AM		57				57			57	
8:00 AM		25				25			25	
9:00 AM		36				36			36	
10:00 AM		29				29			29	
11:00 AM		76				76			76	
12:00 PM		76				76			76	
1:00 PM		59				59			59	
2:00 PM		57				57			57	
3:00 PM		**139**				**139**			**139**	
4:00 PM		52				52			52	
5:00 PM		77				77			77	
6:00 PM		18				18			18	
7:00 PM		57				57			57	
8:00 PM		13				13			13	
9:00 PM		19				19			19	
10:00 PM		11				11			11	
11:00 PM		72				72			72	
Day Total		1069				1069			1069	
% Weekday Average		100.0%								
% Week Average		100.0%				100.0%				
AM Peak Volume		6:00 AM 129				6:00 AM 129			6:00 AM 129	
PM Peak Volume		3:00 PM 139				3:00 PM 139			3:00 PM 139	

Comments:

Quality Counts
TRANSPORTATION DATA COLLECTION

LOCATION: Tube Count 20
SPECIFIC LOCATION: Tube Count
CITY/STATE: Long Beach, CA

QC JOB #: 13777721
DIRECTION: WB
DATE: May 17 2016 - May 17 2016

Start Time	Mon	Tue 17-May-16	Wed	Thu	Fri	Average Weekday Hourly Traffic	Sat	Sun	Average Week Hourly Traffic	Average Week Profile
12:00 AM		5				5			5	
1:00 AM		10				10			10	
2:00 AM		0				0			0	
3:00 AM		1				1			1	
4:00 AM		1				1			1	
5:00 AM		5				5			5	
6:00 AM		8				8			8	
7:00 AM		9				9			9	
8:00 AM		7				7			7	
9:00 AM		11				11			11	
10:00 AM		2				2			2	
11:00 AM		**17**				**17**			**17**	
12:00 PM		1				1			1	
1:00 PM		6				6			6	
2:00 PM		4				4			4	
3:00 PM		13				13			13	
4:00 PM		0				0			0	
5:00 PM		0				0			0	
6:00 PM		1				1			1	
7:00 PM		0				0			0	
8:00 PM		3				3			3	
9:00 PM		8				8			8	
10:00 PM		11				11			11	
11:00 PM		**67**				**67**			**67**	
Day Total		190				190			190	
% Weekday Average		100.0%								
% Week Average		100.0%				100.0%				
AM Peak Volume		11:00 AM 17				11:00 AM 17			11:00 AM 17	
PM Peak Volume		11:00 PM 67				11:00 PM 67			11:00 PM 67	

Comments:

LOCATION: Tube Count 21
SPECIFIC LOCATION: Tube Count
CITY/STATE: Long Beach, CA

QC JOB #: 13777722
DIRECTION: NB
DATE: May 17 2016 - May 17 2016

Start Time	Mon	Tue 17-May-16	Wed	Thu	Fri	Average Weekday Hourly Traffic	Sat	Sun	Average Week Hourly Traffic	Average Week Profile
12:00 AM		2				2			2	
1:00 AM		10				10			10	
2:00 AM		1				1			1	
3:00 AM		0				0			0	
4:00 AM		2				2			2	
5:00 AM		7				7			7	
6:00 AM		9				9			9	
7:00 AM		15				15			15	
8:00 AM		9				9			9	
9:00 AM		20				20			20	
10:00 AM		8				8			8	
11:00 AM		**32**				**32**			**32**	
12:00 PM		28				28			28	
1:00 PM		23				23			23	
2:00 PM		21				21			21	
3:00 PM		**36**				**36**			**36**	
4:00 PM		27				27			27	
5:00 PM		14				14			14	
6:00 PM		29				29			29	
7:00 PM		9				9			9	
8:00 PM		5				5			5	
9:00 PM		11				11			11	
10:00 PM		5				5			5	
11:00 PM		6				6			6	
Day Total		329				329			329	
% Weekday Average		100.0%								
% Week Average		100.0%				100.0%				
AM Peak Volume		11:00 AM 32				11:00 AM 32			11:00 AM 32	
PM Peak Volume		3:00 PM 36				3:00 PM 36			3:00 PM 36	

Comments:

Quality Counts
TRANSPORTATION DATA COLLECTION

LOCATION: Tube Count 21
SPECIFIC LOCATION: Tube Count
CITY/STATE: Long Beach, CA

QC JOB #: 13777722
DIRECTION: NB/SB
DATE: May 17 2016 - May 17 2016

Start Time	Mon	Tue 17-May-16	Wed	Thu	Fri	Average Weekday Hourly Traffic	Sat	Sun	Average Week Hourly Traffic	Average Week Profile
12:00 AM		5				5			5	
1:00 AM		15				15			15	
2:00 AM		1				1			1	
3:00 AM		0				0			0	
4:00 AM		14				14			14	
5:00 AM		14				14			14	
6:00 AM		29				29			29	
7:00 AM		**66**				**66**			**66**	
8:00 AM		35				35			35	
9:00 AM		42				42			42	
10:00 AM		33				33			33	
11:00 AM		59				59			59	
12:00 PM		**78**				**78**			**78**	
1:00 PM		57				57			57	
2:00 PM		48				48			48	
3:00 PM		61				61			61	
4:00 PM		46				46			46	
5:00 PM		36				36			36	
6:00 PM		45				45			45	
7:00 PM		18				18			18	
8:00 PM		8				8			8	
9:00 PM		16				16			16	
10:00 PM		12				12			12	
11:00 PM		7				7			7	
Day Total		745				745			745	
% Weekday Average		100.0%								
% Week Average		100.0%				100.0%				
AM Peak Volume		7:00 AM 66				7:00 AM 66			7:00 AM 66	
PM Peak Volume		12:00 PM 78				12:00 PM 78			12:00 PM 78	

Comments:

LOCATION: Tube Count 21
SPECIFIC LOCATION: Tube Count
CITY/STATE: Long Beach, CA

QC JOB #: 13777722
DIRECTION: SB
DATE: May 17 2016 - May 17 2016

Start Time	Mon	Tue 17-May-16	Wed	Thu	Fri	Average Weekday Hourly Traffic	Sat	Sun	Average Week Hourly Traffic	Average Week Profile
12:00 AM		3				3			3	
1:00 AM		5				5			5	
2:00 AM		0				0			0	
3:00 AM		0				0			0	
4:00 AM		12				12			12	
5:00 AM		7				7			7	
6:00 AM		20				20			20	
7:00 AM		**51**				**51**			**51**	
8:00 AM		26				26			26	
9:00 AM		22				22			22	
10:00 AM		25				25			25	
11:00 AM		27				27			27	
12:00 PM		**50**				**50**			**50**	
1:00 PM		34				34			34	
2:00 PM		27				27			27	
3:00 PM		25				25			25	
4:00 PM		19				19			19	
5:00 PM		22				22			22	
6:00 PM		16				16			16	
7:00 PM		9				9			9	
8:00 PM		3				3			3	
9:00 PM		5				5			5	
10:00 PM		7				7			7	
11:00 PM		1				1			1	
Day Total		416				416			416	
% Weekday Average		100.0%								
% Week Average		100.0%				100.0%				
AM Peak Volume		7:00 AM 51				7:00 AM 51			7:00 AM 51	
PM Peak Volume		12:00 PM 50				12:00 PM 50			12:00 PM 50	

Comments:

Quality Counts
TRANSPORTATION DATA COLLECTION

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Appendix F. Rough Order of Magnitude (ROM) Cost Estimate

PLEASE NOTE: The information, analysis, assessments and opinions contained in this document are intended for general evaluation purposes only. This document is intended for use only by its specified client and is NOT intended for use, reliance or in making financial/investment decisions by outside parties.

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Feasibility Cost Estimate:
FIS Facility - Options Comparison

Item	Description		North FIS Facility - Option 1 Summary	South FIS Facility - Option 2 Summary	South FIS Facility - Option 3 Summary
1.1	Design	(approx. 7.0%)	$ 1,145,000	$ 921,000	$ 1,081,000
1.2	Administrative Costs	(approx. 3.0%)	$ 491,000	$ 395,000	$ 464,000
1.3	**Design & Administrative Costs Sub-Total**	**(approx. 10.0%)**	**$ 1,636,000**	**$ 1,316,000**	**$ 1,545,000**
2.1	SITEWORK		$ 931,000	$ 956,000	$ 813,000
2.2	BUILDING		$ 12,032,000	$ 10,817,000	$ 8,274,000
2.3	BAGGAGE CLAIM		$ 381,000	$ 1,379,000	$ 1,379,000
2.4	AIRCRAFT PARKING		$ 3,013,000	N/A	N/A
2.5	(E) CHECKPOINT RETROFIT		N/A	N/A	$ 575,000
2.6	NEW CHECKPOINT		N/A	N/A	$ 4,401,000
2.7	**Construction Costs Sub-Total**		**$ 16,357,000**	**$ 13,152,000**	**$ 15,442,000**
3.1	Utility Coordination Allowance	(approx. 4.0%)	$ 655,000	$ 527,000	$ 618,000
3.2	Construction Management	(approx. 7.0%)	$ 1,145,000	$ 921,000	$ 1,081,000
3.3	Testing/Inspection	(approx. 6.5%)	$ 1,064,000	$ 855,000	$ 1,004,000
3.4	Plan Check & Permit	(approx. 2.5%)	$ 409,000	$ 329,000	$ 387,000
3.5	**Project Sub-Total**		**$ 21,266,000**	**$ 17,100,000**	**$ 20,077,000**
4.1	Public Works/Financial Management Overhead	(approx. 1.37%)	$ 292,000	$ 235,000	$ 276,000
5.1	**TOTAL PROJECT COSTS**		**$ 21,558,000**	**$ 17,335,000**	**$ 20,353,000**
5.2	Budgetary Design & Permitting Costs		$ 1,554,000	$ 1,250,000	$ 1,468,000
5.3	Budgetary Construction & Utility Costs		$ 17,012,000	$ 13,679,000	$ 16,060,000
5.4	Budgetary City "Soft" Costs		$ 2,992,000	$ 2,406,000	$ 2,825,000
6.1	**Present Value Annual O&M Costs (20-YR CYCLE)**		**$ 377,000**	**$ 317,000**	**$ 322,000**
7.1	**Present Value Annual CBP Inspector Costs (20-YR CYCLE)**		**$ 2,141,000**	**$ 2,141,000**	**$ 2,141,000**

NOTES:

1. Estimated Design and Administrative Percentages applied to Construction Costs Sub-Total
2. Utility Coordination Allowance Percentage applied to Construction Costs Sub-Total
3. Estimated Construction Management and Testing/Inspection Percentages applied to Construction Costs Sub-Total
4. Plan Check/Permit Fees Percentage applied to Construction Costs Sub-Total
5. PW/FM Overhead Percentage is applied to all Project Costs
6. CBP Inspector - $140,874 (first year), $123,438 (succeeding years)
7. ADP costs per inspector - $21,062 (first year), $17,640 (succeeding years)
8. CBP Supervisor costs assumed at 1.15x inspector costs.
9. CBP Regular Shift assumed to be M-F: 1230 to 2130 hours
10. CBP OT Shifts assumed to be M-Su: 0730 to 1030 hours and Sa-Su: 1230 to 2130 hours
11. OT Cap used for estimation (2016 Los Angeles GS-11): $43.26 per hr.
12. CBP OT will come from LGB staff or other local resources

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Feasibility Cost Estimate:
North FIS Facility - Option 1 Summary

Item	Description			Estimated Cost
1.1	Design	(approx. 7.0%)		$ 1,145,000
1.2	Administrative Costs	(approx. 3.0%)		$ 491,000
	Design & Administrative Costs Sub-Total	**(approx. 10.0%)**		**$ 1,636,000**
2.1	North FIS - Option 1 SITEWORK Summary			$ 931,000
2.2	North FIS - Option 1 BUILDING Construction			$ 12,032,000
2.3	North FIS - Option 1 BAGGAGE CLAIM Summary			$ 381,000
2.4	North FIS - Option 1 AIRCRAFT PARKING Summary			$ 3,013,000
	Construction Costs Sub-Total			**$ 16,357,000**
3.1	Utility Coordination Allowance	(approx. 4.0%)		$ 655,000
3.2	Construction Management	(approx. 7.0%)		$ 1,145,000
3.3	Testing/Inspection	(approx. 6.5%)		$ 1,064,000
3.4	Plan Check & Permit	(approx. 2.5%)		$ 409,000
	Project Sub-Total	**(approx. 20.0%)**	130.0%	**$ 21,266,000**
4.1	Public Works/Financial Management Overhead	(approx. 1.37%)		$ 292,000
	TOTAL PROJECT COSTS			**$ 21,558,000**
5.1	Budgetary Design & Permitting Costs			$ 1,554,000
5.2	Budgetary Construction & Utility Costs			$ 17,012,000
5.3	Budgetary City "Soft" Costs			$ 2,992,000

NOTES:

1. Estimated Design and Administrative Percentages applied to Construction Costs Sub-Total
2. Utility Coordination Allowance Percentage applied to Construction Costs Sub-Total
3. Estimated Construction Management and Testing/Inspection Percentages applied to Construction Costs Sub-Total
4. Plan Check/Permit Fees Percentage applied to Construction Costs Sub-Total
5. PW/FM Overhead Percentage is applied to all Project Costs

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Feasibility Cost Estimate:
North FIS - Option 1 Construction

Item	Description		Estimated Quantity	Unit	Unit Cost	Extended Cost
	North FIS - Option 1 BUILDING Construction					
0.0	GENERAL REQUIREMENTS					SEE PRORATES
1.0	SITE WORK		SEE SEPARATE SITEWORK COST BELOW			
2.0	SUBSTRUCTURE		35,051	GFA	$20.48	$ 717,900
3.0	STRUCTURE		35,051	GFA	$44.82	$ 1,570,986
4.1	ENCLOSURE, VERTICAL		35,051	GFA	$23.46	$ 822,194
4.2	ENCLOSURE, HORIZONTAL		35,051	GFA	$16.54	$ 579,814
4.3	SUPPORT ITEMS		35,051	GFA	$1.84	$ 64,494
5.1	INTERNALS, VERTICAL		35,051	GFA	$28.68	$ 1,005,308
5.2	INTERNALS, HORIZONTAL		35,051	GFA	$11.57	$ 405,696
5.3	FINISHES, SPECIAL				INCLUDED IN 5.1 AND 5.2	
5.4	INTERIORS		35,051	GFA	$3.92	$ 137,551
6.0	SPECIALTIES		35,051	GFA	$2.56	$ 89,877
7.0	EQUIPMENT		35,051	GFA	$0.88	$ 30,871
8.0	SPECIAL CONSTRUCTION		35,051	GFA	N/A	$ -
9.0	CONVEYING		SEE SEPARATE BAGGAGE CLAIM COST BELOW			
10.1	PLUMBING		35,051	GFA	$8.98	$ 314,765
10.2	FIRE SPRINKLER SYSTEM		35,051	GFA	$5.41	$ 189,626
10.2	HVAC		35,051	GFA	$23.50	$ 823,614
11.0	ELECTRICAL		35,051	GFA	$44.38	$ 1,555,563
	SUBTOTAL ESTIMATED CONSTRUCTION COST				**$ 237.03**	**$ 8,308,259**
12.0	PRORATES:					
12.1	GENERAL CONDITIONS	(approx. 8.50%)			$ 20.15	$ 706,202
12.2	CONTINGENCY	(approx. 12.50%)			$ 32.15	$ 1,126,808
12.3	ESCALATION	(approx. 9.73%)			$ 28.15	$ 986,533
12.4	GEOGRAPHICAL FACTOR	(approx. 0.00%)			$ -	$ -
12.5	MARKET FACTOR	(approx. 0.00%)			$ -	$ -
	PRORATES SUBTOTAL				**$ 317.47**	**$ 11,127,802**
12.6	BONDS + INSURANCE	(approx. 2.00%)			$ 6.35	$ 222,556
12.7	CONTRACTOR'S FEE	(approx. 6.00%)			$ 19.43	$ 681,021
	TOTAL OF OPINION OF CONSTRUCTION BASE COST				**$ 343.25**	**$ 12,031,379**

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Feasibility Cost Estimate:
North FIS - Option 1 Construction

Item	Description	Estimated Quantity	Unit	Unit Cost	Extended Cost
	North FIS - Option 1 Separate Construction Costs				
101.1	SITEWORK (based on gross area)	40,251	SF	$ 15.96	$ 642,423
101.2	PRORATES (per Base Estimate)	(approx. 44.8%)			$ 287,884
101.3	North FIS - Option 1 SITEWORK Summary				**$ 930,307**
102.1	BAGGAGE CLAIM	210	LF	$ 1,250.00	$ 262,500
102.2	PRORATES (per Base Estimate)	(approx. 44.8%)			$ 117,632
102.3	North FIS - Option 1 BAGGAGE CLAIM Summary				**$ 380,132**
103.1	AIRCRAFT PARKING (POSITIONS 11 & 12)	91,500	SF	$ 30.00	$ 2,745,000
103.2	ESCALATION (per Base Estimate)	(approx. 9.7%)			$ 267,031
103.3	North FIS - Option 1 AIRCRAFT PARKING Summary				**$ 3,012,031**
	TOTAL ESTIMATED CONSTRUCTION COST FOR OPTION 1				**$ 16,353,849**

NOTES:
1. Costs provided by Jacobus & Yuang, Inc. July 22, 2016 (JYI# C2137A-R1)
2. Baggage Claim Cost estimate of $1,250 per LF based on previous bids (R-6815 and R-6874) received by Long Beach Airport.
3. Aircraft Parking Cost estimate based on Airport Capital Improvement Program (ACIP) submittal to FAA from Long Beach Airport. Unit cost of $30/SF is for construction only, assuming 15" PCC pavement / 6" CTB / 8" CTS, inclussive of electrical costs.

Life Cycle Cost Estimate

Project Name:	Federal Inspection Services (FIS) Facility
Option:	North FIS - Option 1
Date:	August 15, 2016

Component	Quantity	UNIT
Interior Conditioned Space	28,968	SF
Total Area	35,051	GSF

Escalation Factor	3.30%			1.000	1.033	1.067	1.097	1.133	1.171	1.210	1.249	1.291	1.333	1.377	1.423	1.470	1.518	1.568	1.620	1.673	1.729	1.786	1.845	1.906	1.968	2.033	2.101
							10.29										25%										50%
Cost Categories				2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039
Recurring Capital Costs																											
Item Description	**Quantity**	**Unit**	**Unit Cost**																								
4.1.1 EXTERIOR WALLS - GWB + PAINT, INT. OF EXT.	12,227	SF	$3.94				$ 52,861.02										$ 18,284.32										$ 50,595.51
4.2.1 ROOFING - MEMBRANE + COVERBOARD + TAPERED RIGID INSULATION	35,051	SF	$11.91				$ 458,069.73										$ 158,443.64										$ 438,437.84
4.3.1 SUPPORT ITEMS - MISC. PAINTING	35,051	SF	$0.22				$ 8,461.41										$ 2,926.75										$ 8,098.77
5.1.1 INTERIOR WALLS - GWB + PAINT	97,402	SF	$3.94				$ 421,098.33										$ 145,655.45										$ 403,050.95
5.1.2 CERAMIC WALL TILES + CEMENT BOARD	2,144	SF	$20.02				$ 47,098.63										$ 16,291.14										$ 45,080.08
5.2.1 CARPET FLOOR - OFFICES	2,160	SF	$5.41				$ 12,822.43										$ 4,435.20										$ 12,272.89
5.2.2 RESILIENT FLOORING	30,850	SF	$5.14				$ 173,995.38										$ 60,183.98										$ 166,538.31
5.2.3 CERAMIC FLOOR TILE - RESTROOMS	994	SF	$13.53				$ 14,757.19										$ 5,104.43										$ 14,124.73
5.2.4 RUBBER FLOORING - GYM	242	SF	$8.12				$ 2,156.21										$ 745.82										$ 2,063.80
5.2.5 SEALED CONCRETE FLOOR - KENNEL AREAS	805	SF	$1.62				$ 1,430.97										$ 494.96										$ 1,369.64
7.0.2 BREAK ROOM - FOOD SERVICE EQUIPMENT	242	SF	$21.08				$ 5,597.65										$ 1,936.19										$ 5,357.74
7.0.3 KENNEL AREA - KENNEL EQUIPMENT	805	SF	$9.37				$ 8,276.66										$ 2,862.85										$ 7,921.94
7.0.4 MISC. EQUIPMENT	35,051	SF	$0.52				$ 19,999.69										$ 6,917.77										$ 19,142.54
10.1.1 PLUMBING EQUIPMENT	1	LS	$16,236.08				$ 17,815.61										$ 6,162.31										$ 17,052.07
10.1.2 ROOF DRAIN SYSTEM	35,051	GSF	$1.35				$ 51,922.26										$ 17,959.61										$ 49,696.98
10.1.3 CONDENSATE DRAIN SYSTEM	35,051	GSF	$0.27				$ 10,384.45										$ 3,591.92										$ 9,939.40
10.1.4 GAS SYSTEM	35,051	GSF	$0.87				$ 33,461.01										$ 11,573.97										$ 32,026.95
10.1.5 MISC. PLUMBING SYSTEM	35,051	GSF	$1.35				$ 51,922.26										$ 17,959.61										$ 49,696.98
10.1.6 FIRE SPRINKLER SYSTEM	35,051	GSF	$5.41				$ 208,073.66										$ 71,971.46										$ 199,156.06
10.2.1 BUILDING HVAC EQUIPMENT - PACKAGED UNITS	35,051	GSF	$21.65				$ 832,679.24										$ 288,018.88										$ 796,992.38
10.2.2 MISC. HVAC SYSTEM	35,051	GSF	$1.62				$ 62,306.71										$ 21,551.53										$ 59,636.38
11.0.1 EQUIPMENT & PANEL BOARDS	35,051	GSF	$9.20				$ 353,840.60										$ 122,391.40										$ 338,675.75
11.0.2 LIGHTING SYSTEM	35,051	GSF	$10.28				$ 395,378.41										$ 136,759.08										$ 378,433.34
11.0.3 ELECTRICAL SYSTEM - COMMUNICATIONS	35,051	GSF	$5.95				$ 228,842.56										$ 79,155.30										$ 219,034.86
11.0.4 ELECTRICAL SYSTEM - SECURITY	35,051	GSF	$6.22				$ 239,227.01										$ 82,747.23										$ 228,974.26
11.0.5 ELECTRICAL SYSTEM - FIRE ALARM	35,051	GSF	$3.68				$ 141,536.24										$ 48,956.56										$ 135,470.30
11.0.6 MISC. ELECTRICAL SYSTEMS	35,051	GSF	$1.17				$ 44,999.29										$ 15,564.99										$ 43,070.72
101.0.1 ROADWAY PAVEMENT	3,500	SF	$15.00				$ 57,607.46					$ 16,940.27					$ 39,852.17					$ 23,438.16					$ 110,277.05
102.0.1 BAGGAGE CAROUSEL	210	LF	$1,250.00				$ 288,037.30										$ 99,630.42										$ 275,692.64
103.0.1 AIRCRAFT PARKING POSITIONS	91,500	SF	$30.00				$ 3,012,047.19					$ 177,146.83					$ 1,041,849.52					$ 490,192.42					$ 2,882,957.28
O & M Costs																											
INITIAL CAPITAL COSTS																											
ROOFING SUBTOTAL							$ 509,992.00										$ 176,403.25										$ 488,134.83
PAINTING/WALL TILE SUBTOTAL							$ 529,519.39										$ 183,157.66										$ 506,825.32
FLOORING SUBTOTAL							$ 205,162.18										$ 70,964.40										$ 196,369.36
EQUIPMENT SUBTOTAL							$ 1,526,246.73										$ 527,919.82										$ 1,460,835.06
SYSTEMS SUBTOTAL							$ 1,416,131.62										$ 489,831.65										$ 1,355,439.24
PAVEMENT SUBTOTAL							$ 3,069,654.65					$ 194,087.10					$ 1,081,701.69					$ 513,630.59					$ 2,993,234.33
ANNUAL EQUIPMENT MAINTENANCE	5.00%							$ 86,499.68	$ 89,354.17	$ 92,302.86	$ 95,348.85	$ 98,495.36	$ 101,745.71	$ 105,103.32	$ 108,571.73	$ 112,154.59	$ 115,855.70	$ 119,678.93	$ 123,628.34	$ 127,708.07	$ 131,922.44	$ 136,275.88	$ 140,772.98	$ 145,418.49	$ 150,217.30	$ 155,174.47	$ 160,295.23
ANNUAL EQUIPMENT OPERATING	0.50%							$ 8,649.97	$ 8,935.42	$ 9,230.29	$ 9,534.89	$ 9,849.54	$ 10,174.57	$ 10,510.33	$ 10,857.17	$ 11,215.46	$ 11,585.57	$ 11,967.89	$ 12,362.83	$ 12,770.81	$ 13,192.24	$ 13,627.59	$ 14,077.30	$ 14,541.85	$ 15,021.73	$ 15,517.45	$ 16,029.52
ANNUAL SYSTEMS MAINTENANCE	2.50%							$ 40,129.47	$ 41,453.74	$ 42,821.71	$ 44,234.83	$ 45,694.58	$ 47,202.50	$ 48,760.18	$ 50,369.27	$ 52,031.45	$ 53,748.49	$ 55,522.19	$ 57,354.42	$ 59,247.12	$ 61,202.27	$ 63,221.95	$ 65,308.27	$ 67,463.45	$ 69,689.74	$ 71,989.50	$ 74,365.15
ANNUAL SYSTEMS OPERATING	0.50%							$ 8,025.89	$ 8,290.75	$ 8,564.34	$ 8,846.97	$ 9,138.92	$ 9,440.50	$ 9,752.04	$ 10,073.85	$ 10,406.29	$ 10,749.70	$ 11,104.44	$ 11,470.88	$ 11,849.42	$ 12,240.45	$ 12,644.39	$ 13,061.65	$ 13,492.69	$ 13,937.95	$ 14,397.90	$ 14,873.03
CUSTODIAL SERVICES ($1.647/SF/MONTH)	28,968	SF/MO	$0.49					$ 193,123.84	$ 199,496.93	$ 206,080.33	$ 212,880.98	$ 219,906.05	$ 227,162.95	$ 234,659.33	$ 242,403.08	$ 250,402.39	$ 258,665.66	$ 267,201.63	$ 276,019.29	$ 285,127.92	$ 294,537.14	$ 304,256.87	$ 314,297.35	$ 324,669.16	$ 335,383.24	$ 346,450.89	$ 357,883.77
TOTAL				**$0**	**$0**	**$0**	**$0**	**$336,429**	**$347,531**	**$359,000**	**$370,847**	**$577,172**	**$395,726**	**$408,785**	**$422,275**	**$436,210**	**$2,980,584**	**$465,475**	**$480,836**	**$496,703**	**$513,095**	**$1,043,657**	**$547,518**	**$565,586**	**$584,250**	**$603,530**	**$7,624,285**
Discount Factor	6%			1.000	1.060	1.124	1.191	1.262	1.338	1.419	1.504	1.594	1.689	1.791	1.898	2.012	2.133	2.261	2.397	2.540	2.693	2.854	3.026	3.207	3.400	3.604	3.820
Discounted Annnual Cost				**$0**	**$0**	**$0**	**$0**	**$266,483**	**$259,695**	**$253,080**	**$246,634**	**$362,125**	**$234,230**	**$228,264**	**$222,449**	**$216,783**	**$1,397,414**	**$205,880**	**$200,636**	**$195,525**	**$190,545**	**$365,639**	**$180,962**	**$176,352**	**$171,860**	**$167,483**	**$1,996,017**
			Present Value Costs:	**$7,538,056**																							

NOTES:

1. Estimated Interior Conditioned Space based on CBP Airport Technical Design Standards.
2. Total Area based on CBP Airport Technical Design Standards.
3. Annual Escalation of 3.3% based on comparison of Sierra West Group Indeces from 2006 and 2016.
4. Annual Discount Factor of 6.0% based on discussions with Frasca & Associates.
5. Recurring Capital Costs assume 25% replacement at year 10 and 50% replacement at year 20.
6. Roadway [Asphalt] Pavement assumes 25% replacement at year 5, 50% replacement at year 10, 25% at year 15, and full replacement at year 20.
7. Aircraft Parking [Concrete] Pavement assumes 10% replacement at year 5, 25% replacement at year 10, 10% at year 15, and 25% replacement at year 20.
8. Custodial Services based on 3 FTE at a present hourly rate of $30/hr. plus $10.26/hr for fringe benefits.

1	CBP INSPECTORS (PER SHIFT)	10	2	1				$3,706,490	$ 3,507,647	$ 3,623,399	$ 3,742,971	$ 3,866,489	$ 3,994,083	$ 4,125,888	$ 4,262,042	$ 4,402,690	$ 4,547,978	$ 4,698,062	$ 4,853,098	$ 5,013,250	$ 5,178,687	$ 5,349,584	$ 5,526,120	$ 5,708,482	$ 5,896,862	$ 6,091,459	$ 6,292,477
	Discounted Annnual Cost				**$0**	**$0**	**$0**	**$0**	**$2,935,887**	**$2,621,118**	**$2,554,353**	**$2,489,290**	**$2,425,883**	**$2,364,092**	**$2,303,874**	**$2,245,191**	**$2,188,002**	**$2,132,270**	**$2,077,957**	**$2,025,028**	**$1,973,447**	**$1,923,180**	**$1,874,194**	**$1,826,455**	**$1,779,932**	**$1,734,594**	**$1,690,411**	**$1,647,353**
				Present Value Costs:	**$42,812,510**																						

CBP NOTES:

9. CBP Inspector - $140,874 (first year), $123,438 (succeeding years)
10. ADP costs per inspector - $21,062 (first year), $17,640 (succeeding years)
11. CBP Supervisor costs assumed at 1.15x inspector costs.
12. CBP Regular Shift assumed to be M-F: 1230 to 2130 hours
13. CBP OT Shifts assumed to be M-Su: 0730 to 1030 hours and Sa-Su: 1230 to 2130 hours
14. OT Cap used for estimation (2016 Los Angeles GS-11): $43.26 per hr.
15. CBP OT will come from LGB staff or other local resources

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Feasibility Cost Estimate:
South FIS Facility - Option 2 Summary

Item	Description			Estimated Cost
1.1	Design	(approx. 7.0%)		$ 921,000
1.2	Administrative Costs	(approx. 3.0%)		$ 395,000
	Design & Administrative Costs Sub-Total	**(approx. 10.0%)**		**$ 1,316,000**
2.1	South FIS - Option 2 SITEWORK Summary			$ 956,000
2.2	South FIS - Option 2 BUILDING Construction			$ 10,817,000
2.3	South FIS - Option 2 BAGGAGE CLAIM Summary			$ 1,379,000
	Construction Costs Sub-Total			**$ 13,152,000**
3.1	Utility Coordination Allowance	(approx. 4.0%)		$ 527,000
3.2	Construction Management	(approx. 7.0%)		$ 921,000
3.3	Testing/Inspection	(approx. 6.5%)		$ 855,000
3.4	Plan Check & Permit	(approx. 2.5%)		$ 329,000
	Project Sub-Total	**(approx. 20.0%)**	130.0%	**$ 17,100,000**
4.1	Public Works/Financial Management Overhead	(approx. 1.37%)		$ 235,000
	TOTAL PROJECT COSTS			**$ 17,335,000**
5.1	Budgetary Design & Permitting Costs			$ 1,250,000
5.2	Budgetary Construction & Utility Costs			$ 13,679,000
5.3	Budgetary City "Soft" Costs			$ 2,406,000

NOTES:
1. Estimated Design and Administrative Percentages applied to Construction Costs Sub-Total
2. Utility Coordination Allowance Percentage applied to Construction Costs Sub-Total
3. Estimated Construction Management and Testing/Inspection Percentages applied to Construction Costs Sub-Total
4. Plan Check/Permit Fees Percentage applied to Construction Costs Sub-Total
5. PW/FM Overhead Percentage is applied to all Project Costs

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Feasibility Cost Estimate:
South FIS - Option 2 Construction

Item	Description		Estimated Quantity	Unit	Unit Cost	Extended Cost
	South FIS - Option 2 BUILDING Construction					
0.0	GENERAL REQUIREMENTS					SEE PRORATES
1.0	SITE WORK		SEE SEPARATE SITEWORK COST BELOW			
2.0	SUBSTRUCTURE		30,672	GFA	$20.48	$ 628,212
3.0	STRUCTURE		30,672	GFA	$44.82	$ 1,374,719
4.1	ENCLOSURE, VERTICAL		30,672	GFA	$25.79	$ 791,097
4.2	ENCLOSURE, HORIZONTAL		30,672	GFA	$16.63	$ 510,068
4.3	SUPPORT ITEMS		30,672	GFA	$1.84	$ 56,436
5.1	INTERNALS, VERTICAL		30,672	GFA	$31.75	$ 973,861
5.2	INTERNALS, HORIZONTAL		30,672	GFA	$11.66	$ 357,696
5.3	FINISHES, SPECIAL				INCLUDED IN 5.1 AND 5.2	
5.4	INTERIORS		30,672	GFA	$3.93	$ 120,540
6.0	SPECIALTIES		30,672	GFA	$2.66	$ 81,469
7.0	EQUIPMENT		30,672	GFA	$0.93	$ 28,593
8.0	SPECIAL CONSTRUCTION		30,672	GFA	N/A	$ -
9.0	CONVEYING		SEE SEPARATE BAGGAGE CLAIM COST BELOW			
10.1	PLUMBING		30,672	GFA	$9.71	$ 297,949
10.2	FIRE SPRINKLER SYSTEM		30,672	GFA	$5.41	$ 165,936
10.2	HVAC		30,672	GFA	$23.53	$ 721,715
11.0	ELECTRICAL		30,672	GFA	$44.38	$ 1,361,222
	SUBTOTAL ESTIMATED CONSTRUCTION COST				**$ 243.53**	**$ 7,469,513**
12.0	PRORATES:					
12.1	GENERAL CONDITIONS	(approx. 8.50%)			$ 20.70	$ 634,909
12.2	CONTINGENCY	(approx. 12.50%)			$ 33.03	$ 1,013,053
12.3	ESCALATION	(approx. 9.73%)			$ 28.92	$ 886,939
12.4	GEOGRAPHICAL FACTOR	(approx. 0.00%)			$ -	$ -
12.5	MARKET FACTOR	(approx. 0.00%)			$ -	$ -
	PRORATES SUBTOTAL				**$ 326.17**	**$ 10,004,414**
12.6	BONDS + INSURANCE	(approx. 2.00%)			$ 6.52	$ 200,088
12.7	CONTRACTOR'S FEE	(approx. 6.00%)			$ 19.96	$ 612,270
	TOTAL OF OPINION OF CONSTRUCTION BASE COST				**$ 352.66**	**$ 10,816,772**

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Feasibility Cost Estimate:
South FIS - Option 2 Construction

Item	Description	Estimated Quantity	Unit	Unit Cost	Extended Cost
	South FIS - Option 2 Separate Construction Costs				
101.1	SITEWORK (based on gross area)	38,732	SF	$ 17.04	$ 659,952
101.2	PRORATES (per Base Estimate)	(approx. 44.8%)			$ 295,740
101.3	South FIS - Option 2 SITEWORK Summary				**$ 955,692**
102.1	BAGGAGE CLAIM DEMOLITION	658	LF	$ 250.00	$ 164,500
102.2	BAGGAGE CLAIM	630	LF	$ 1,250.00	$ 787,500
102.3	PRORATES (per Base Estimate)	(approx. 44.8%)			$ 426,613
102.4	South FIS - Option 2 BAGGAGE CLAIM Summary				**$ 1,378,613**
	TOTAL ESTIMATED CONSTRUCTION COST FOR OPTION 2				**$ 13,151,077**

NOTES:

1. Costs provided by Jacobus & Yuang, Inc. July 22, 2016 (JYI# C2137A-R1)
2. Baggage Claim Cost estimate of $1,250 per LF based on previous bids (R-6815 and R-6874) received by Long Beach Airport.
3. Aircraft Parking Cost estimate based on Airport Capital Improvement Program (ACIP) submittal to FAA from Long Beach Airport. Unit cost of $30/SF is for construction only, assuming 15" PCC pavement / 6" CTB / 8" CTS, inclussive of electrical costs.

Life Cycle Cost Estimate

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Project Name:	**Federal Inspection Services (FIS) Facility**
Option:	**South FIS - Option 2**
Date:	**August 15, 2016**

Component	Quantity	UNIT
Interior Conditioned Space	25,349	SF
Total Area	30,672	GSF

Item	Description	Quantity	Unit	Unit Cost	2016	2017	2018	2019
	Escalation Factor	3.30%			1.000	1.033	1.067	1.097 (10.29)
	Cost Categories				**2016**	**2017**	**2018**	**2019**
	Recurring Capital Costs							
Item	**Description**	**Quantity**	**Unit**	**Unit Cost**				
4.1.1	EXTERIOR WALLS - GWB + PAINT, INT. OF EXT.	11,826	SF	$3.94				$ 51,127.38
4.2.1	ROOFING - MEMBRANE + COVERBOARD + TAPERED RIGID INSULATION	30,672	SF	$11.91				$ 400,842.06
4.3.1	SUPPORT ITEMS - MISC. PAINTING	30,672	SF	$0.22				$ 7,404.30
5.1.1	INTERIOR WALLS - GWB + PAINT	94,096	SF	$3.94				$ 406,805.49
5.1.2	CERAMIC WALL TILES + CEMENT BOARD	2,144	SF	$20.02				$ 47,098.63
5.2.1	CARPET FLOOR - OFFICES	2,160	SF	$5.41				$ 12,822.43
5.2.2	RESILIENT FLOORING	26,471	SF	$5.14				$ 149,297.62
5.2.3	CERAMIC FLOOR TILE - RESTROOMS	994	SF	$13.53				$ 14,757.19
5.2.4	RUBBER FLOORING - GYM	242	SF	$8.12				$ 2,156.21
5.2.5	SEALED CONCRETE FLOOR - KENNEL AREAS	805	SF	$1.62				$ 1,430.97
7.0.2	BREAK ROOM - FOOD SERVICE EQUIPMENT	242	SF	$21.08				$ 5,597.65
7.0.3	KENNEL AREA - KENNEL EQUIPMENT	805	SF	$9.37				$ 8,276.66
7.0.4	MISC. EQUIPMENT	30,672	SF	$0.52				$ 17,501.08
10.1.1	PLUMBING EQUIPMENT	1	LS	$16,236.08				$ 17,815.61
10.1.2	ROOF DRAIN SYSTEM	30,672	GSF	$1.35				$ 45,435.50
10.1.3	CONDENSATE DRAIN SYSTEM	30,672	GSF	$0.27				$ 9,087.10
10.1.4	GAS SYSTEM	30,672	GSF	$0.87				$ 29,280.65
10.1.5	MISC. PLUMBING SYSTEM	30,672	GSF	$1.35				$ 45,435.50
10.1.6	FIRE SPRINKLER SYSTEM	30,672	GSF	$5.41				$ 182,078.55
10.2.1	BUILDING HVAC EQUIPMENT - PACKAGED UNITS	30,672	GSF	$21.65				$ 728,650.75
10.2.2	MISC. HVAC SYSTEM	30,672	GSF	$1.62				$ 54,522.60
11.0.1	EQUIPMENT & PANEL BOARDS	30,672	GSF	$9.20				$ 309,634.50
11.0.2	LIGHTING SYSTEM	30,672	GSF	$10.28				$ 345,982.90
11.0.3	ELECTRICAL SYSTEM - COMMUNICATIONS	30,672	GSF	$5.95				$ 200,252.75
11.0.4	ELECTRICAL SYSTEM - SECURITY	30,672	GSF	$6.22				$ 209,339.85
11.0.5	ELECTRICAL SYSTEM - FIRE ALARM	30,672	GSF	$3.68				$ 123,853.80
11.0.6	MISC. ELECTRICAL SYSTEMS	30,672	GSF	$1.17				$ 39,377.43
101.0.1	ROADWAY PAVEMENT	3,500	SF	$15.00				$ 57,607.46
102.0.1	BAGGAGE CAROUSEL	630	LF	$1,250.00				$ 864,111.90
103.0.1	AIRCRAFT PARKING POSITIONS	0	SF	$30.00				$ -
	O & M Costs							
INITIAL CAPITAL COSTS	ROOFING SUBTOTAL							$ 446,277.55
	PAINTING/WALL TILE SUBTOTAL							$ 512,435.80
	FLOORING SUBTOTAL							$ 180,464.42
	EQUIPMENT SUBTOTAL							$ 1,951,588.14
	SYSTEMS SUBTOTAL							$ 1,239,211.12
	PAVEMENT SUBTOTAL							$ 57,607.46
	EQUIPMENT MAINTENANCE	5.00%						
	EQUIPMENT OPERATING	0.50%						
	SYSTEMS MAINTENANCE	2.50%						
	SYSTEMS OPERATING	0.50%						
	CUSTODIAL SERVICES ($1.647/SF/MONTH)	25,349	SF/MO	$0.56				
	TOTAL				$0	$0	$0	$0
	Discount Factor	6%			1.000	1.060	1.124	1.191
	Discounted Annnual Cost				$0	$0	$0	$0
				Present Value Costs:	**$6,327,948**			

Description	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029 (25%)
Escalation Factor	1.133	1.171	1.210	1.249	1.291	1.333	1.377	1.423	1.470	1.518
EXTERIOR WALLS - GWB + PAINT, INT. OF EXT.										$ 17,684.66
ROOFING - MEMBRANE + COVERBOARD + TAPERED RIGID INSULATION										$ 138,648.92
SUPPORT ITEMS - MISC. PAINTING										$ 2,561.11
INTERIOR WALLS - GWB + PAINT										$ 140,711.64
CERAMIC WALL TILES + CEMENT BOARD										$ 16,291.14
CARPET FLOOR - OFFICES										$ 4,435.20
RESILIENT FLOORING										$ 51,641.17
CERAMIC FLOOR TILE - RESTROOMS										$ 5,104.43
RUBBER FLOORING - GYM										$ 745.82
SEALED CONCRETE FLOOR - KENNEL AREAS										$ 494.96
BREAK ROOM - FOOD SERVICE EQUIPMENT										$ 1,936.19
KENNEL AREA - KENNEL EQUIPMENT										$ 2,862.85
MISC. EQUIPMENT										$ 6,053.52
PLUMBING EQUIPMENT										$ 6,162.31
ROOF DRAIN SYSTEM										$ 15,715.87
CONDENSATE DRAIN SYSTEM										$ 3,143.17
GAS SYSTEM										$ 10,128.01
MISC. PLUMBING SYSTEM										$ 15,715.87
FIRE SPRINKLER SYSTEM										$ 62,979.91
BUILDING HVAC EQUIPMENT - PACKAGED UNITS										$ 252,036.04
MISC. HVAC SYSTEM										$ 18,859.05
EQUIPMENT & PANEL BOARDS										$ 107,100.76
LIGHTING SYSTEM										$ 119,673.46
ELECTRICAL SYSTEM - COMMUNICATIONS										$ 69,266.26
ELECTRICAL SYSTEM - SECURITY										$ 72,409.43
ELECTRICAL SYSTEM - FIRE ALARM										$ 42,840.31
MISC. ELECTRICAL SYSTEMS										$ 13,620.42
ROADWAY PAVEMENT					$ 16,940.27					$ 39,852.17
BAGGAGE CAROUSEL										$ 298,891.26
AIRCRAFT PARKING POSITIONS					$ -					$ -
ROOFING SUBTOTAL										$ 154,364.80
PAINTING/WALL TILE SUBTOTAL										$ 177,248.55
FLOORING SUBTOTAL										$ 62,421.59
EQUIPMENT SUBTOTAL										$ 675,042.93
SYSTEMS SUBTOTAL										$ 428,635.88
PAVEMENT SUBTOTAL					$ 16,940.27					$ 39,852.17
EQUIPMENT MAINTENANCE	$ 110,605.80	$ 114,255.80	$ 118,026.24	$ 121,921.10	$ 125,944.50	$ 130,100.67	$ 134,393.99	$ 138,828.99	$ 143,410.35	$ 148,142.89
EQUIPMENT OPERATING	$ 11,060.58	$ 11,425.58	$ 11,802.62	$ 12,192.11	$ 12,594.45	$ 13,010.07	$ 13,439.40	$ 13,882.90	$ 14,341.03	$ 14,814.29
SYSTEMS MAINTENANCE	$ 35,116.00	$ 36,274.83	$ 37,471.90	$ 38,708.47	$ 39,985.85	$ 41,305.38	$ 42,668.46	$ 44,076.52	$ 45,531.05	$ 47,033.57
SYSTEMS OPERATING	$ 7,023.20	$ 7,254.97	$ 7,494.38	$ 7,741.69	$ 7,997.17	$ 8,261.08	$ 8,533.69	$ 8,815.30	$ 9,106.21	$ 9,406.71
CUSTODIAL SERVICES ($1.647/SF/MONTH)	$ 193,123.84	$ 199,496.93	$ 206,080.33	$ 212,880.98	$ 219,906.05	$ 227,162.95	$ 234,659.33	$ 242,403.08	$ 250,402.39	$ 258,665.66
TOTAL	$356,929	$368,708	$380,875	$393,444	$423,368	$419,840	$433,695	$448,007	$462,791	$2,015,629
Discount Factor	1.262	1.338	1.419	1.504	1.594	1.689	1.791	1.898	2.012	2.133
Discounted Annnual Cost	$282,722	$275,520	$268,502	$261,663	$265,627	$248,503	$242,173	$236,004	$229,993	$945,006

Description	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039 (50%)
Escalation Factor	1.568	1.620	1.673	1.729	1.786	1.845	1.906	1.968	2.033	2.101
EXTERIOR WALLS - GWB + PAINT, INT. OF EXT.										$ 48,936.17
ROOFING - MEMBRANE + COVERBOARD + TAPERED RIGID INSULATION										$ 383,662.82
SUPPORT ITEMS - MISC. PAINTING										$ 7,086.97
INTERIOR WALLS - GWB + PAINT										$ 389,370.68
CERAMIC WALL TILES + CEMENT BOARD										$ 45,080.08
CARPET FLOOR - OFFICES										$ 12,272.89
RESILIENT FLOORING										$ 142,899.04
CERAMIC FLOOR TILE - RESTROOMS										$ 14,124.73
RUBBER FLOORING - GYM										$ 2,063.80
SEALED CONCRETE FLOOR - KENNEL AREAS										$ 1,369.64
BREAK ROOM - FOOD SERVICE EQUIPMENT										$ 5,357.74
KENNEL AREA - KENNEL EQUIPMENT										$ 7,921.94
MISC. EQUIPMENT										$ 16,751.02
PLUMBING EQUIPMENT										$ 17,052.07
ROOF DRAIN SYSTEM										$ 43,488.23
CONDENSATE DRAIN SYSTEM										$ 8,697.65
GAS SYSTEM										$ 28,025.75
MISC. PLUMBING SYSTEM										$ 43,488.23
FIRE SPRINKLER SYSTEM										$ 174,275.05
BUILDING HVAC EQUIPMENT - PACKAGED UNITS										$ 697,422.34
MISC. HVAC SYSTEM										$ 52,185.87
EQUIPMENT & PANEL BOARDS										$ 296,364.23
LIGHTING SYSTEM										$ 331,154.81
ELECTRICAL SYSTEM - COMMUNICATIONS										$ 191,670.34
ELECTRICAL SYSTEM - SECURITY										$ 200,367.99
ELECTRICAL SYSTEM - FIRE ALARM										$ 118,545.69
MISC. ELECTRICAL SYSTEMS										$ 37,689.80
ROADWAY PAVEMENT					$ 23,438.16					$ 110,277.05
BAGGAGE CAROUSEL										$ 827,077.91
AIRCRAFT PARKING POSITIONS					$ -					$ -
ROOFING SUBTOTAL										$ 427,151.05
PAINTING/WALL TILE SUBTOTAL										$ 490,473.90
FLOORING SUBTOTAL										$ 172,730.10
EQUIPMENT SUBTOTAL										$ 1,867,947.24
SYSTEMS SUBTOTAL										$ 1,186,101.18
PAVEMENT SUBTOTAL					$ 23,438.16					$ 110,277.05
EQUIPMENT MAINTENANCE	$ 153,031.61	$ 158,081.65	$ 163,298.34	$ 168,687.19	$ 174,253.87	$ 180,004.24	$ 185,944.38	$ 192,080.55	$ 198,419.21	$ 204,967.04
EQUIPMENT OPERATING	$ 15,303.16	$ 15,808.16	$ 16,329.83	$ 16,868.72	$ 17,425.39	$ 18,000.42	$ 18,594.44	$ 19,208.05	$ 19,841.92	$ 20,496.70
SYSTEMS MAINTENANCE	$ 48,585.68	$ 50,189.01	$ 51,845.24	$ 53,556.14	$ 55,323.49	$ 57,149.16	$ 59,035.09	$ 60,983.24	$ 62,995.69	$ 65,074.55
SYSTEMS OPERATING	$ 9,717.14	$ 10,037.80	$ 10,369.05	$ 10,711.23	$ 11,064.70	$ 11,429.83	$ 11,807.02	$ 12,196.65	$ 12,599.14	$ 13,014.91
CUSTODIAL SERVICES ($1.647/SF/MONTH)	$ 267,201.63	$ 276,019.29	$ 285,127.92	$ 294,537.14	$ 304,256.87	$ 314,297.35	$ 324,669.16	$ 335,383.24	$ 346,450.89	$ 357,883.77
TOTAL	$493,839	$510,136	$526,970	$544,360	$585,762	$580,881	$600,050	$619,852	$640,307	$4,916,117
Discount Factor	2.261	2.397	2.540	2.693	2.854	3.026	3.207	3.400	3.604	3.820
Discounted Annnual Cost	$218,426	$212,862	$207,440	$202,156	$205,218	$191,989	$187,098	$182,333	$177,688	$1,287,026

NOTES:

1. Estimated Interior Conditioned Space based on CBP Airport Technical Design Standards.
2. Total Area based on CBP Airport Technical Design Standards.
3. Annual Escalation of 3.3% based on comparison of Sierra West Group Indeces from 2006 and 2016.
4. Annual Discount Factor of 6.0% based on discussions with Frasca & Associates.
5. Recurring Capital Costs assume 25% replacement at year 10 and 50% replacement at year 20.
6. Roadway [Asphalt] Pavement assumes 25% replacement at year 5, 50% replacement at year 10, 25% at year 15, and full replacement at year 20.
7. Custodial Services based on 3 FTE at a present hourly rate of $30/hr. plus $10.26/hr for fringe benefits.

Item	Description				2016	2017	2018	2019
1	CBP INSPECTORS (PER SHIFT)	10	2	1				
	Discounted Annnual Cost				$0	$0	$0	$0
				Present Value Costs:	**$42,812,510**			

Description	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
CBP INSPECTORS (PER SHIFT)	$ 3,706,490	$ 3,507,647	$ 3,623,399	$ 3,742,971	$ 3,866,489	$ 3,994,083	$ 4,125,888	$ 4,262,042	$ 4,402,690	$ 4,547,978
Discounted Annnual Cost	$2,935,887	$2,621,118	$2,554,353	$2,489,290	$2,425,883	$2,364,092	$2,303,874	$2,245,191	$2,188,002	$2,132,270

Description	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039
CBP INSPECTORS (PER SHIFT)	$ 4,698,062	$ 4,853,098	$ 5,013,250	$ 5,178,687	$ 5,349,584	$ 5,526,120	$ 5,708,482	$ 5,896,862	$ 6,091,459	$ 6,292,477
Discounted Annnual Cost	$2,077,957	$2,025,028	$1,973,447	$1,923,180	$1,874,194	$1,826,455	$1,779,932	$1,734,594	$1,690,411	$1,647,353

CBP NOTES:

8. CBP Inspector - $140,874 (first year), $123,438 (succeeding years)
9. ADP costs per inspector - $21,062 (first year), $17,640 (succeeding years)
10. CBP Supervisor costs assumed at 1.15x inspector costs.
11. CBP Regular Shift assumed to be M-F: 1230 to 2130 hours
12. CBP OT Shifts assumed to be M-Su: 0730 to 1030 hours and Sa-Su: 1230 to 2130 hours
13. OT Cap used for estimation (2016 Los Angeles GS-11): $43.26 per hr.
14. CBP OT will come from LGB staff or other local resources

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Feasibility Cost Estimate:
South FIS Facility - Option 3 Summary

Item	Description			Estimated Cost
1.1	Design	(approx. 7.0%)		$ 1,081,000
1.2	Administrative Costs	(approx. 3.0%)		$ 464,000
	Design & Administrative Costs Sub-Total	**(approx. 10.0%)**		**$ 1,545,000**
2.1	South FIS - Option 3 SITEWORK Summary			$ 813,000
2.2	South FIS - Option 3 BUILDING Construction			$ 8,274,000
2.3	South FIS - Option 3 BAGGAGE CLAIM Summary			$ 1,379,000
2.4	South FIS - Option 3 (E) CHECKPOINT RETROFIT Summary			$ 575,000
2.5	South FIS - Option 3 NEW CHECKPOINT Summary			$ 4,401,000
	Construction Costs Sub-Total			**$ 15,442,000**
3.1	Utility Coordination Allowance	(approx. 4.0%)		$ 618,000
3.2	Construction Management	(approx. 7.0%)		$ 1,081,000
3.3	Testing/Inspection	(approx. 6.5%)		$ 1,004,000
3.4	Plan Check & Permit	(approx. 2.5%)		$ 387,000
	Project Sub-Total	**(approx. 20.0%)**	130.0%	**$ 20,077,000**
4.1	Public Works/Financial Management Overhead	(approx. 1.37%)		$ 276,000
	TOTAL PROJECT COSTS			**$ 20,353,000**
5.1	Budgetary Design & Permitting Costs			$ 1,468,000
5.2	Budgetary Construction & Utility Costs			$ 16,060,000
5.3	Budgetary City "Soft" Costs			$ 2,825,000

NOTES:
1. Estimated Design and Administrative Percentages applied to Construction Costs Sub-Total
2. Utility Coordination Allowance Percentage applied to Construction Costs Sub-Total
3. Estimated Construction Management and Testing/Inspection Percentages applied to Construction Costs Sub-Total
4. Plan Check/Permit Fees Percentage applied to Construction Costs Sub-Total
5. PW/FM Overhead Percentage is applied to all Project Costs

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Feasibility Cost Estimate:
South FIS - Option 3 Summary

Item	Description		Estimated Quantity	Unit	Unit Cost	Extended Cost
	South FIS - Option 3 BUILDING Construction					
0.0	GENERAL REQUIREMENTS					SEE PRORATES
1.0	SITE WORK		SEE SEPARATE SITEWORK COST BELOW			
2.0	SUBSTRUCTURE		21,656	GFA	$20.48	$ 443,550
3.0	STRUCTURE		21,656	GFA	$44.82	$ 970,622
4.1	ENCLOSURE, VERTICAL		21,656	GFA	$33.16	$ 718,181
4.2	ENCLOSURE, HORIZONTAL		21,656	GFA	$16.88	$ 365,649
4.3	SUPPORT ITEMS		21,656	GFA	$1.84	$ 39,846
5.1	INTERNALS, VERTICAL		21,656	GFA	$42.93	$ 929,798
5.2	INTERNALS, HORIZONTAL		21,656	GFA	$12.05	$ 260,904
5.3	FINISHES, SPECIAL				INCLUDED IN 5.1 AND 5.2	
5.4	INTERIORS		21,656	GFA	$3.95	$ 85,515
6.0	SPECIALTIES		21,656	GFA	$2.49	$ 53,875
7.0	EQUIPMENT		21,656	GFA	$0.25	$ 5,414
8.0	SPECIAL CONSTRUCTION		21,656	GFA	N/A	$ -
9.0	CONVEYING		SEE SEPARATE BAGGAGE CLAIM COST BELOW			
10.1	PLUMBING		21,656	GFA	$11.90	$ 257,786
10.2	FIRE SPRINKLER SYSTEM		21,656	GFA	$5.41	$ 117,159
10.2	HVAC		21,656	GFA	$23.27	$ 503,935
11.0	ELECTRICAL		21,656	GFA	$44.38	$ 961,093
	SUBTOTAL ESTIMATED CONSTRUCTION COST				**$ 263.82**	**$ 5,713,327**
12.0	PRORATES:					
12.1	GENERAL CONDITIONS	(approx. 8.50%)			$ 22.42	$ 485,633
12.2	CONTINGENCY	(approx. 12.50%)			$ 35.78	$ 774,870
12.3	ESCALATION	(approx. 9.73%)			$ 31.33	$ 678,407
12.4	GEOGRAPHICAL FACTOR	(approx. 0.00%)			$ -	$ -
12.5	MARKET FACTOR	(approx. 0.00%)			$ -	$ -
	PRORATES SUBTOTAL				**$ 353.35**	**$ 7,652,237**
12.6	BONDS + INSURANCE	(approx. 2.00%)			$ 7.07	$ 153,045
12.7	CONTRACTOR'S FEE	(approx. 6.00%)			$ 21.63	$ 468,317
	TOTAL OF OPINION OF CONSTRUCTION BASE COST				**$ 382.05**	**$ 8,273,599**

long beach airport

JACOBS

Feasibility Cost Estimate:
South FIS - Option 3 Summary

Item	Description	Estimated Quantity	Unit	Unit Cost	Extended Cost
	South FIS - Option 3 Separate Construction Costs				
101.1	SITEWORK (based on gross area)	28,196	SF	$ 19.89	$ 560,940
101.2	PRORATES (per Base Estimate)	(approx. 44.8%)			$ 251,370
101.3	South FIS - Option 3 SITEWORK Summary				**$ 812,310**
102.1	BAGGAGE CLAIM DEMOLITION	658	LF	$ 250.00	$ 164,500
102.2	BAGGAGE CLAIM	630	LF	$ 1,250.00	$ 787,500
102.3	PRORATES (per Base Estimate)	(approx. 44.8%)			$ 426,613
102.4	South FIS - Option 3 BAGGAGE CLAIM Summary				**$ 1,378,613**
103.1	(E) CHECKPOINT RETROFIT	6,750	SF	$ 58.82	$ 397,038
103.2	PRORATES (per Base Estimate)	(approx. 44.8%)			$ 177,922
103.3	South FIS - Option 3 (E) CHECKPOINT RETROFIT Summary				**$ 574,960**
104.1	NEW CHECKPOINT	8,700	SF	$ 349.27	$ 3,038,666
104.2	PRORATES (per Base Estimate)	(approx. 44.8%)			$ 1,361,696
104.3	South FIS - Option 3 NEW CHECKPOINT Summary				**$ 4,400,362**
	TOTAL ESTIMATED CONSTRUCTION COST FOR OPTION 3				**$ 15,439,844**

NOTES:
1. Costs provided by Jacobus & Yuang, Inc. July 22, 2016 (JYI# C2137A-R1)
2. Baggage Claim Cost estimate of $1,250 per LF based on previous bids (R-6815 and R-6874) received by Long Beach Airport.
3. Aircraft Parking Cost estimate based on Airport Capital Improvement Program (ACIP) submittal to FAA from Long Beach Airport. Unit cost of $30/SF is for construction only, assuming 15" PCC pavement / 6" CTB / 8" CTS, inclussive of electrical costs.

Life Cycle Cost Estimate

Project Name:	Federal Inspection Services (FIS) Facility
Option:	South FIS - Option 3
Date:	August 15, 2016

Component	Quantity	UNIT
Interior Conditioned Space	25,088	SF
Total Area - FIS Facility	21,656	GSF
Total Area - NEW CHECKPOINT	8,700	GSF

Item	Description	Quantity	Unit	Unit Cost	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039
	Escalation Factor	3.30%			1.000	1.033	1.067	1.097	1.133	1.171	1.210	1.249	1.291	1.333	1.377	1.423	1.470	1.518	1.568	1.620	1.673	1.729	1.786	1.845	1.906	1.968	2.033	2.101
	Cost Categories							10.29										25%										50%
	Recurring Capital Costs																											
4.1.1	EXTERIOR WALLS - GWB + PAINT, INT. OF EXT.	10,692	SF	$3.94				$ 46,224.75										$ 15,988.87										$ 44,243.66
4.2.1	ROOFING - MEMBRANE + COVERBOARD + TAPERED RIGID INSULATION	21,656	SF	$11.91				$ 283,014.98										$ 97,893.23										$ 270,885.56
4.2.2	[(NEW CHECKPOINT] BUILDING ROOFING	8,700	GSF	$15.23				$ 145,391.35										$ 50,290.02										$ 139,160.19
4.2.3	[NEW CHECKPOINT] CANOPY ROOFING	3,768	SF	$16.58				$ 68,551.17										$ 23,711.45										$ 65,613.21
4.2.4	[NEW CHECKPOINT] EXTERIOR SOFFIT - PAINT U/S CANOPY	3,768	SF	$1.00				$ 4,134.57										$ 1,430.12										$ 3,957.37
4.3.1	SUPPORT ITEMS - MISC. PAINTING	21,656	SF	$0.22				$ 5,227.82										$ 1,808.27										$ 5,003.76
5.1.1	INTERIOR WALLS - GWB + PAINT	86,010	SF	$3.94				$ 371,847.27										$ 128,619.80										$ 355,910.69
5.1.2	CERAMIC WALL TILES + CEMENT BOARD	2,144	SF	$20.02				$ 47,098.63										$ 16,291.14										$ 45,080.08
5.2.1	CARPET FLOOR - OFFICES	1,188	SF	$5.41				$ 7,052.34										$ 2,439.36										$ 6,750.09
5.2.2	RESILIENT FLOORING	19,474	SF	$5.14				$ 109,834.23										$ 37,991.02										$ 105,126.97
5.2.3	CERAMIC FLOOR TILE - RESTROOMS	994	SF	$13.53				$ 14,757.19										$ 5,104.43										$ 14,124.73
5.2.4	RUBBER FLOORING - GYM	0	SF	$8.12				$ -										$ -										$ -
5.2.5	SEALED CONCRETE FLOOR - KENNEL AREAS	0	SF	$1.62				$ -										$ -										$ -
5.2.6	[NEW CHECKPOINT] FLOORING + BASES	8,700	GSF	$5.42				$ 51,741.37										$ 17,897.04										$ 49,523.85
7.0.2	BREAK ROOM - FOOD SERVICE EQUIPMENT	0	SF	$21.08				$ -										$ -										$ -
7.0.3	KENNEL AREA - KENNEL EQUIPMENT	0	SF	$9.37				$ -										$ -										$ -
7.0.4	MISC. EQUIPMENT	21,656	SF	$0.25				$ 5,940.70										$ 2,054.85										$ 5,686.09
10.1.1	PLUMBING EQUIPMENT	1	LS	$16,236.08				$ 17,815.61										$ 6,162.31										$ 17,052.07
10.1.2	ROOF DRAIN SYSTEM	21,656	GSF	$1.35				$ 32,079.78										$ 11,096.21										$ 30,704.91
10.1.3	CONDENSATE DRAIN SYSTEM	21,656	GSF	$0.27				$ 6,415.96										$ 2,219.24										$ 6,140.98
10.1.4	GAS SYSTEM	21,656	GSF	$0.87				$ 20,673.64										$ 7,150.89										$ 19,787.61
10.1.5	MISC. PLUMBING SYSTEM	21,656	GSF	$1.35				$ 32,079.78										$ 11,096.21										$ 30,704.91
10.1.6	FIRE SPRINKLER SYSTEM	21,656	GSF	$5.41				$ 128,556.76										$ 44,467.03										$ 123,047.10
10.1.7	[NEW CHECKPOINT] PLUMBING, COMPLETE	8,700	GSF	$3.64				$ 34,748.82										$ 12,019.41										$ 33,259.56
10.1.8	[NEW CHECKPOINT] FIRE PROTECTION - BUILDING	8,700	GSF	$5.00				$ 47,731.90										$ 16,510.18										$ 45,686.21
10.1.9	[NEW CHECKPOINT] FIRE PROTECTION - CANOPY	3,768	SF	$3.96				$ 16,372.90										$ 5,663.29										$ 15,671.19
10.2.1	BUILDING HVAC EQUIPMENT - PACKAGED UNITS	21,656	GSF	$21.65				$ 514,464.68										$ 177,950.33										$ 492,415.82
10.2.2	MISC. HVAC SYSTEM	21,656	GSF	$1.62				$ 38,495.74										$ 13,315.45										$ 36,845.90
10.2.3	[NEW CHECKPOINT] BUILDING HVAC SYSTEM	8,700	GSF	$27.93				$ 266,630.37										$ 92,225.89										$ 255,203.16
11.0.1	EQUIPMENT & PANEL BOARDS	21,656	GSF	$9.20				$ 218,617.79										$ 75,618.61										$ 209,248.29
11.0.2	LIGHTING SYSTEM	21,656	GSF	$10.28				$ 244,281.61										$ 84,495.58										$ 233,812.23
11.0.3	ELECTRICAL SYSTEM - COMMUNICATIONS	21,656	GSF	$5.95				$ 141,388.68										$ 48,905.52										$ 135,329.06
11.0.4	ELECTRICAL SYSTEM - SECURITY	21,656	GSF	$6.22				$ 147,804.63										$ 51,124.76										$ 141,470.04
11.0.5	ELECTRICAL SYSTEM - FIRE ALARM	21,656	GSF	$3.68				$ 87,447.11										$ 30,247.45										$ 83,699.32
11.0.6	MISC. ELECTRICAL SYSTEMS	21,656	GSF	$1.17				$ 27,802.48										$ 9,616.72										$ 26,610.92
11.0.7	[NEW CHECKPOINT] ELECTRICAL POWER	8,700	GSF	$9.03				$ 86,203.80										$ 29,817.39										$ 82,509.29
11.0.8	[NEW CHECKPOINT] LIGHTING SYSTEM	8,700	GSF	$11.02				$ 105,201.10										$ 36,388.44										$ 100,692.40
11.0.9	[NEW CHECKPOINT] DATA/TELEPHONE SYSTEM	8,700	GSF	$5.83				$ 55,655.39										$ 19,250.87										$ 53,270.12
11.0.10	[NEW CHECKPOINT] MUFIDS/VISUAL PAGING/P.A.	8,700	GSF	$3.82				$ 36,467.17										$ 12,613.78										$ 34,904.26
11.0.11	[NEW CHECKPOINT] FIRE ALARM SYSTEM	8,700	GSF	$6.08				$ 58,041.98										$ 20,076.38										$ 55,554.43
11.0.12	[NEW CHECKPOINT] SECURITY SYSTEM	8,700	GSF	$15.69				$ 149,782.69										$ 51,808.96										$ 143,363.32
11.0.13	[NEW CHECKPOINT] MISCELLANEOUS SYSTEM	8,700	GSF	$3.80				$ 36,276.24										$ 12,547.74										$ 34,721.52
101.0.1	ROADWAY PAVEMENT	3,500	SF	$15.00				$ 57,607.46					$ 16,940.27					$ 39,852.17					$ 23,438.16					$ 110,277.05
102.0.1	BAGGAGE CAROUSEL	630	LF	$1,250.00				$ 864,111.90										$ 298,891.26										$ 827,077.91
103.0.1	AIRCRAFT PARKING POSITIONS	0	SF	$30.00				$ -					$ -					$ -					$ -					$ -
	O & M Costs																											
INITIAL CAPITAL COSTS	ROOFING SUBTOTAL							$ 529,037.29										$ 182,990.91										$ 506,363.88
	PAINTING/WALL TILE SUBTOTAL							$ 474,533.03										$ 164,138.20										$ 454,195.56
	FLOORING SUBTOTAL							$ 183,385.13										$ 63,431.84										$ 175,525.63
	EQUIPMENT SUBTOTAL							$ 1,741,903.30										$ 602,514.17										$ 1,667,249.04
	SYSTEMS SUBTOTAL							$ 1,647,106.13										$ 569,724.38										$ 1,576,514.68
	PAVEMENT SUBTOTAL							$ 57,607.46					$ 16,940.27					$ 39,852.17					$ 23,438.16					$ 110,277.05
	EQUIPMENT MAINTENANCE	5.00%							$ 98,721.96	$ 101,979.79	$ 105,345.12	$ 108,821.51	$ 112,412.62	$ 116,122.24	$ 119,954.27	$ 123,912.76	$ 128,001.88	$ 132,225.95	$ 136,589.40	$ 141,096.85	$ 145,753.05	$ 150,562.90	$ 155,531.48	$ 160,664.01	$ 165,965.93	$ 171,442.80	$ 177,100.41	$ 182,944.73
	EQUIPMENT OPERATING	0.50%							$ 9,872.20	$ 10,197.98	$ 10,534.51	$ 10,882.15	$ 11,241.26	$ 11,612.22	$ 11,995.43	$ 12,391.28	$ 12,800.19	$ 13,222.59	$ 13,658.94	$ 14,109.69	$ 14,575.30	$ 15,056.29	$ 15,553.15	$ 16,066.40	$ 16,596.59	$ 17,144.28	$ 17,710.04	$ 18,294.47
	SYSTEMS MAINTENANCE	2.50%							$ 46,674.68	$ 48,214.94	$ 49,806.04	$ 51,449.64	$ 53,147.47	$ 54,901.34	$ 56,713.08	$ 58,584.62	$ 60,517.91	$ 62,515.00	$ 64,577.99	$ 66,709.07	$ 68,910.47	$ 71,184.51	$ 73,533.60	$ 75,960.21	$ 78,466.90	$ 81,056.31	$ 83,731.16	$ 86,494.29
	SYSTEMS OPERATING	0.50%							$ 9,334.94	$ 9,642.99	$ 9,961.21	$ 10,289.93	$ 10,629.49	$ 10,980.27	$ 11,342.62	$ 11,716.92	$ 12,103.58	$ 12,503.00	$ 12,915.60	$ 13,341.81	$ 13,782.09	$ 14,236.90	$ 14,706.72	$ 15,192.04	$ 15,693.38	$ 16,211.26	$ 16,746.23	$ 17,298.86
	CUSTODIAL SERVICES ($1.647/SF/MONTH)	25,088	SF/MO	$0.57					$ 193,123.84	$ 199,496.93	$ 206,080.33	$ 212,880.98	$ 219,906.05	$ 227,162.95	$ 234,659.33	$ 242,403.08	$ 250,402.39	$ 258,665.66	$ 267,201.63	$ 276,019.29	$ 285,127.92	$ 294,537.14	$ 304,256.87	$ 314,297.35	$ 324,669.16	$ 335,383.24	$ 346,450.89	$ 357,883.77
	TOTAL				$0	$0	$0	$0	$357,728	$369,533	$381,727	$394,324	$424,277	$420,779	$434,665	$449,009	$463,826	$2,101,784	$494,944	$511,277	$528,149	$545,578	$587,020	$582,180	$601,392	$621,238	$641,739	$5,153,042
	Discount Factor	6%			1.000	1.060	1.124	1.191	1.262	1.338	1.419	1.504	1.594	1.689	1.791	1.898	2.012	2.133	2.261	2.397	2.540	2.693	2.854	3.026	3.207	3.400	3.604	3.820
	Discounted Annual Cost				$0	$0	$0	$0	$283,354	$276,136	$269,103	$262,248	$266,197	$249,058	$242,715	$236,532	$230,507	$985,398	$218,914	$213,338	$207,904	$202,608	$205,659	$192,418	$187,517	$182,740	$178,086	$1,349,052
				Present Value Costs:	$6,439,484																							

NOTES:
1. Estimated Interior Conditioned Space based on CBP Airport Technical Design Standards.
2. Total Area based on CBP Airport Technical Design Standards.
3. Annual Escalation of 3.3% based on comparison of Sierra West Group Indeces from 2006 and 2016.
4. Annual Discount Factor of 6.0% based on discussions with Frasca & Associates.
5. Recurring Capital Costs assume 25% replacement at year 10 and 50% replacement at year 20.
6. Roadway [Asphalt] Pavement assumes 25% replacement at year 5, 50% replacement at year 10, 25% at year 15, and full replacement at year 20.
7. Custodial Services based on 3 FTE at a present hourly rate of $30/hr. plus $10.26/hr for fringe benefits.

Life Cycle Cost Estimate

Project Name:	Federal Inspection Services (FIS) Facility
Option:	South FIS - Option 3
Date:	August 15, 2016

Component	Quantity	UNIT
Interior Conditioned Space	25,088	SF
Total Area - FIS Facility	21,656	GSF
Total Area - NEW CHECKPOINT	8,700	GSF

								10.29										25%									50%
	Escalation Factor	3.30%			1.000	1.033	1.067	1.097	1.133	1.171	1.210	1.249	1.291	1.333	1.377	1.423	1.470	1.518	1.568	1.620	1.673	1.729	1.786	1.845	1.906	1.968	2.033	2.101
	Cost Categories				2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039
1	CBP INSPECTORS (PER SHIFT)	10	2	1					$3,706,490	$ 3,507,647	$ 3,623,399	$ 3,742,971	$ 3,866,489	$ 3,994,083	$ 4,125,888	$ 4,262,042	$ 4,402,690	$ 4,547,978	$ 4,698,062	$ 4,853,098	$ 5,013,250	$ 5,178,687	$ 5,349,584	$ 5,526,120	$ 5,708,482	$ 5,896,862	$ 6,091,459	$ 6,292,477
	Discounted Annnual Cost				$0	$0	$0	$0	$2,935,887	$2,621,118	$2,554,353	$2,489,290	$2,425,883	$2,364,092	$2,303,874	$2,245,191	$2,188,002	$2,132,270	$2,077,957	$2,025,028	$1,973,447	$1,923,180	$1,874,194	$1,826,455	$1,779,932	$1,734,594	$1,690,411	$1,647,353
				Present Value Costs:	$42,812,510																						

CBP NOTES:

9. CBP Inspector - $140,874 (first year), $123,438 (succeeding years)
10. ADP costs per inspector - $21,062 (first year), $17,640 (succeeding years)
11. CBP Supervisor costs assumed at 1.15x inspector costs.
12. CBP Regular Shift assumed to be M-F: 1230 to 2130 hours
13. CBP OT Shifts assumed to be M-Su: 0730 to 1030 hours and Sa-Su: 1230 to 2130 hours
14. OT Cap used for estimation (2016 Los Angeles GS-11): $43.26 per hr.
15. CBP OT will come from LGB staff or other local resources

JACOBUS & YUANG, INC.
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Suite 220
Camarillo, CA 93010
TEL (213) 688-1341 or (805) 339-9434
FAX (866) 431-3256

LONG BEACH AIRPORT FEDERAL INSPECTION SERVICE (FIS) FACILITY

BUDGETARY OPINION OF PROBABLE COST

JYI# C2137A-R2

July 25, 2016

PREPARED FOR:

JACOBS

BY:

JACOBUS & YUANG, INC.

PROJECT: NEW F.I.S. FACILITY AT LONG BEACH AIRPORT	**JOB #:**	**C2137A-R2**
LOCATION: LONG BEACH, CA	**DATE:**	**22-Jul-16**
CLIENT: JACOBS	**REVISED:**	**25-Jul-16**
SUBJECT: BUDGETARY OPINION OF PROBABLE COST - COST SUMMARY		

ITEM NO.	DESCRIPTION	EST QTY	UNIT	UNIT COST	TOTAL COST
	SUMMARY OF ESTIMATE			**$**	**$**
	OPTION1: NORTH F.I.S.				
	- SITEWORK (based on gross area)	40,251	SF	23.11	930,307
	- NEW F.I.S. BUILDING	35,051	SF	343.25	12,031,379
	- BAGGAGE CLAIM	210	LF	1,810.15	380,132
	- NEW AIRCRAFT PARKING	91,500	SF	32.92	3,012,031
	TOTAL ESTIMATED CONSTRUCTION COST FOR OPTION 1				**16,353,850**
	OPTION 2: SOUTH F.I.S.				
	- SITEWORK (based on gross area)	38,732	SF	24.67	955,692
	- NEW F.I.S. BUILDING	30,672	SF	352.66	10,816,772
	- BAGGAGE CLAIM	630	LF	2,188.27	1,378,613
	TOTAL ESTIMATED CONSTRUCTION COST FOR OPTION 2				**13,151,076**
	OPTION 3: SOUTH F.I.S.				
	- SITEWORK (based on gross area)	24,696	SF	32.89	812,310
	- NEW F.I.S. BUILDING	21,656	SF	382.05	8,273,599
	- BAGGAGE CLAIM	630	LF	2,188.27	1,378,613
	- RE-PURPOSED SECURITY CHECK POINT BUILDING	6,750	SF	85.18	574,960
	- NEW SECURITY CHECK POINT BUILDING + RELATED SITEWORK	8,700	SF	505.79	4,400,362
	TOTAL ESTIMATED CONSTRUCTION COST FOR OPTION 3				**15,439,844**

PROJECT: NEW F.I.S. FACILITY AT LONG BEACH AIRPORT	**JOB #:**	**C2137A-R2**
LOCATION: LONG BEACH, CA	**DATE:**	**22-Jul-16**
CLIENT: JACOBS	**REVISED:**	**25-Jul-16**
SUBJECT: BUDGETARY OPINION OF PROBABLE COST - COST SUMMARY		

ITEM NO.	DESCRIPTION	EST QTY	UNIT	UNIT COST	TOTAL COST

NOTES:

1.0 NO ALLOWANCE IS INCLUDED FOR HAZARDOUS MATERIAL ABATEMENT RELATED TO SITE DEMOLITION OR TO EXISTING BUILDING FACILITIES.

2.0 ARCHITECTURAL DESIGN FEES ARE EXCLUDED

3.0 TYPICAL SOFT COSTS BEYOND REGULAR GENERAL CONTRACTOR COSTS ARE EXCLUDED

4.0 COSTS ARE BASED ON PREVAILING WAGE RATES

5.0 ESTIMATED COSTS ASSUME AT LEAST 4 TO 5 COMPETITIVE RESPONSIVE BIDS SHALL BE RECEIVED FROM GENERAL CONTRACTORS, BIDDING ALL ESTIMATED FACILITIES AS ONE PROJECT

6.0 ESTIMATE IS DERIVED FROM ESTIMATES PREPARED FOR THE FACILITES CONTAINED IN THIS DOCUMENT PERFORMED BY JYI IN PAST YEARS. COSTS FROM PREVIOUS ESTIMATES HAD BEEN ESCALATED TO ADJUST FOR INFLATIONARY ESCALATION TO CURRENT DATE. THE ESCALATION CALCULATION BELOW, ESCALATES THE NEWLY DERIVED NUMBER TO A FUTURE MIDPOINT OF CONSTRUCTION. BASED ON COMPARING SIERRA WEST GROUP INDECES FROM END 2006 TO 2ND QUARTER 2016 THERE IS A 3.3% INCREASE

7.0 ALL WORK IS ASSUMED TO BE PERFORMED DURING REGULAR WORKING HOURS

8.0 SWING SPACE PREPARATION IS NOT INCLUDED FOR CURRENT BUILDING OCCUPANTS

9.0 OVER EXCAVATION IS BASED ON 2' DEEP BELOW SITE AREAS, AND 5' DEEP BELOW BUILDING PAD AREAS

10.0 AN ALLOWANCE IS INCLUDED FOR RELOCATING SCREENING EQUIPMENT FROM EXISTING BUILDING TO NEW SECURITY BUILDING

11.0 AN ALLOWANCE IS INCLUDED FOR BAGGAGE HANDLING EQUIPMENT.

BASE MONTH	Jul-16
CONSTRUCTION START MONTH	Oct-18
CONSTRUCTION DURATION (MONTHS) - AVERAGED FOR ALL PROJECT COMPONENTS	16
MID POINT OF CONSTRUCTION	Jun-19
% ANNUAL ESCALATION	3.30%
ALLOWANCE FOR ESCALATION (TO MIDPOINT OF CONSTRUCTION)	9.73%

DEFINITIONS

OPINION OF COST

An Opinion of Cost is prepared from a survey of the quantities of work-items prepared from written or drawn information provided at the Conceptual stage of the design.

Historical costs, information provided by contractors and suppliers, plus judgmental evaluation by the Estimator are used as appropriate as the basis for pricing.

Allowances as appropriate will be included for items of work which are not indicated on the design documents, provided that the Estimator is made aware of them, or which, in the judgement of the Estimator, are required for completion of the work.

JYI cannot, however, be responsible for items or work of an unusual nature of which we have not been informed.

BID

An offer to enter a contract to perform work for a fixed sum, to be completed within a limited period of time.

PROJECT: NEW F.I.S. FACILITY AT LONG BEACH AIRPORT	**JOB #:**	**C2137A-R2**
LOCATION: LONG BEACH, CA	**DATE:**	**22-Jul-16**
CLIENT: JACOBS	**REVISED:**	**25-Jul-16**
SUBJECT: BUDGETARY OPINION OF PROBABLE COST - COST SUMMARY		

ITEM NO.	DESCRIPTION	EST QTY	UNIT	UNIT COST	TOTAL COST

MARKET CONDITIONS

In the current market conditions for construction, our experience shows the following results on competitive bids, as a differential from JYI final estimates:

Number of bids	Percentage Differential
1.....	+ 25 to 50%
2-3.....	+ 10 to 25%
4-5.....	+ 0 to 10%
6-7.....	+ 0 to - 5%
8 or more....	+ 0 to -10%

Accordingly, it is extremely important to ensure that a minimum of 4-5 valid bids are received

PROJECT: NEW F.I.S. FACILITY AT LONG BEACH AIRPORT	**JOB #:**	**C2137A-R2**
LOCATION: : LONG BEACH, CA	**DATE:**	**22-Jul-16**
CLIENT: JACOBS	**REVISED:**	**25-Jul-16**
SUBJECT: BUDGETARY OPINION OF PROBABLE COST - NEW NORTH F.I.S. FACILITY - OPTION 1	**GFA:**	**35,051**

ITEM NO.	DESCRIPTION	EST QTY	UNIT	UNIT COST	TOTAL COST
	SUMMARY OF ESTIMATE			**$**	**$**
1.0	SITEWORK				
2.0	SUBSTRUCTURE	8.6%		20.48	717,900
3.0	STRUCTURE	18.9%		44.82	1,570,986
4.1	ENCLOSURE, VERTICAL	9.9%		23.46	822,194
4.2	ENCLOSURE, HORIZONTAL	7.0%		16.54	579,814
4.3	SUPPORT ITEMS	0.8%		1.84	64,494
5.1	INTERNALS, VERTICAL	12.1%		28.68	1,005,308
5.2	INTERNALS, HORIZONTAL	4.9%		11.57	405,696
5.3	FINISHES, SPECIAL				
5.4	INTERIORS	1.7%		3.92	137,551
6.0	SPECIALTIES	1.1%		2.56	89,877
7.0	EQUIPMENT	0.4%		0.88	30,871
8.0	SPECIAL CONSTRUCTION				
9.0	CONVEYING				
10.1	PLUMBING + FIRE PROTECTION	6.1%		14.39	504,391
10.2	HVAC	9.9%		23.50	823,614
11.0	ELECTRICAL	18.7%		44.38	1,555,563
	SUBTOTAL	**100.0%**		**237.03**	**8,308,259**
12.00	PRORATES:				
12.10	GENERAL CONDITIONS	8.50%		20.15	706,202
12.20	CONTINGENCY	12.50%		32.15	1,126,808
12.30	ESCALATION	9.73%		28.15	986,533
12.40	GEOGRAPHICAL FACTOR				
12.50	MARKET FACTOR				
	SUBTOTAL			**317.48**	**11,127,802**
12.60	BONDS	2.00%		6.35	222,556
12.70	CONTRACTOR'S FEE	6.00%		19.43	681,021
	TOTAL OF OPINION OF CONSTRUCTION BASE COST			**343.26**	**12,031,379**

PROJECT: NEW F.I.S. FACILITY AT LONG BEACH AIRPORT		**JOB #:**	**C2137A-R2**
LOCATION: : LONG BEACH, CA		**DATE:**	**22-Jul-16**
CLIENT: JACOBS		**REVISED:**	**25-Jul-16**
SUBJECT: BUDGETARY OPINION OF PROBABLE COST - NEW NORTH F.I.S. FACILITY - OPTION 1		**GFA:**	**35,051**

ITEM NO.	DESCRIPTION	EST QTY	UNIT	UNIT COST	TOTAL COST
	SEPARATE COST (See detail @ end of estimate)				
	SITEWORK	40,251	SF	23.11	**930,307**
	BAGGAGE CLAIM	210	LF	1,810.15	**380,132**
	STERILE CORRIDOR FROM AIRCRAFT	3,178	SF		
	AIRCRAFT PARKING (POSITIONS 11 & 12)	91,500	SF	32.92	**3,012,031**

TOTAL OF OPINION OF CONSTRUCTION BASE COST PLUS SEPARATE COST	**16,353,850**

FLOOR AREA SUMMARY	NET SF AREA	GROSSED UP AREA
ENTRY CORRIDOR		**6,353**
GENERAL AREAS	**18,493**	**19,080**
BAGGAGE CLAIM	4,770	5,772
CIRCULATION	2,640	3,196
COUNTER TERRORISM RESPONSE - CTR	475	575
RESTROOM	696	842
QUEUING	2,732	0
PASSENGER PROCESSING	1,476	1,786
COMMAND & CONTROL CENTER - CCC	225	272
WIRING/IDF	116	140
LAN/TELCO	180	218
RADIO/TEL ROOM	60	73
LACTATION ROOM	80	97
STAFF BREAK ROOM	200	242
GYM	200	242
LOCKERS	164	199
MALE HOLD ROOM	115	139
FEMALE HOLD ROOM	115	139
JUVENILE HOLD ROOM	115	139
INTERVIEW ROOM	80	97
SEARCH ROOM	80	97
DETAINEE BAGGAGE STORAGE	50	61
AGRI LAB	150	182
AGRI DISPOSAL	150	182
ICE OFFICE	150	182
MEN'S TOILET	63	76
WOMEN'S TOILET	63	76
WAITING	250	303
GENERAL STORAGE	150	182
SUPERVISOR'S OFFICE	150	182

PROJECT: NEW F.I.S. FACILITY AT LONG BEACH AIRPORT		**JOB #:**	**C2137A-R2**
LOCATION: : LONG BEACH, CA		**DATE:**	**22-Jul-16**
CLIENT: JACOBS		**REVISED:**	**25-Jul-16**
SUBJECT: BUDGETARY OPINION OF PROBABLE COST - NEW NORTH F.I.S. FACILITY - OPTION 1		**GFA:**	**35,051**

ITEM NO.	DESCRIPTION	EST QTY	UNIT	UNIT COST	TOTAL COST
	PORT DIRECTOR'S OFFICE	225		272	
	CHIEF OFFICER'S OFFICE	200		242	
	ADIT	150		182	
	GENERAL OFFICES	256		310	
	WASHER/DRYER	60		73	
	DRY FOOD STORAGE	75		91	
	K9 KENNEL	123		149	
	K9 PROCESSING	150		182	
	K9 FOOD PREP	150		182	
	K9 GENERAL STORAGE	50		61	
	K9 TRAINING AID STORAGE	64		77	
	K9 TRAINING AID STORAGE	64		77	
	K9 WORK AREA	64		77	
	TEMP SEIZED PROPERTY	60		73	
	SECURE STORAGE	100		121	
	PPE STORAGE	65		79	
	WEAPONS CLEANING	80		97	
	WEAPONS STORAGE	100		121	
	SHIPS OFFICE	402		487	
	TRIAGE PODIUM	180		218	
	EXIT PODIUM	180		218	
	ADDITIONAL AREAS			**6,310**	
	CORRIDOR BETWEEN ENTRY/EXIT			3,144	
	INTERNAL CORRIDOR			1,008	
	SECONDARY AREA			2,158	
	TOTAL FLOOR AREA			**31,743**	

PROJECT: NEW F.I.S. FACILITY AT LONG BEACH AIRPORT	**JOB #:**	**C2137A-R2**
LOCATION: : LONG BEACH, CA	**DATE:**	**22-Jul-16**
CLIENT: JACOBS	**REVISED:**	**25-Jul-16**
SUBJECT: BUDGETARY OPINION OF PROBABLE COST - NEW NORTH F.I.S. FACILITY - OPTION 1	**GFA:**	**35,051**

ITEM NO.	DESCRIPTION	EST QTY	UNIT	UNIT COST	TOTAL COST
1.0	SITEWORK				$
	SEE SEPARATE SITEWORK COST @ END OF ESTIMATE				
	SUBTOTAL OF SITEWORK				
2.0	SUBSTRUCTURE				$
	FOUNDATIONS/S.O.G./CURBS				
	FOUNDATON, COMPLETE	35,051	SF	9.26	324,572
	SLAB ON-GRADE INCLUDING CURBS	35,051	SF	10.82	379,252
	MISC. SUBSTRUCTURE ALLOWANCE	35,051	GSF	0.40	14,076
	SUBTOTAL OF SUBSTRUCTURE				**717,900**
3.0	STRUCTURE				$
	STEEL STRUCTURE				
	STRUCTURAL STEEL (INCL. BRACED OR MOMENT FRAMES, COLUMNS, & BEAMS), COMPLETE	280	TON	5,000.00	1,402,040
	METAL DECK				
	METAL DECK + CLOSURE STEELS - ROOF	35,051	SF	4.82	168,946
	SUBTOTAL OF STRUCTURE				**1,570,986**
4.1	ENCLOSURE, VERTICAL				$
	EXTERIOR WALL				
	METAL STUD	14,994	SF	8.12	121,747
	METAL PANEL + ATTACHMENTS	5,997	SF	32.47	194,736
	CEMENT PLASTER + LATH/V.B.	8,996	SF	16.24	146,097
	CEMENT PLASTER + LATH/V.B., ROOF SIDE	2,767	SF	16.24	44,932
	GLAS-MAT SHEATHING	17,760	SF	4.05	71,929
	GWB + PAINT, INT. OF EXT.	12,227	SF	3.94	48,173
	BATT INSULATION	12,227	SF	1.08	13,205
	ANTI-GRAFFITTI COATING	8,996	SF	1.89	17,003
	EXTERIOR DOOR + HARDWARES + PAINT				
	ALUM-GLASS DOOR/ALUM FRAME, DUAL LEAF	2	PR	6,819.15	13,638
	HM DOOR/HM FRAME, DUAL LEAF	2	PR	2,898.14	5,796
	HM DOOR/HM FRAME, SINGLE LEAF	4	EA	1,704.79	6,819
	PANIC HARDWARE	10	EA	947.10	9,471
	EXTERIOR WINDOWS				
	STOREFRONTS	1,328	SF	74.14	98,460
	ALLOWANCE FOR PUNCHED WINDOWS	398	SF	75.77	30,188
	SUBTOTAL OF ENCLOSURE, VERTICAL				**822,194**

PROJECT: NEW F.I.S. FACILITY AT LONG BEACH AIRPORT		**JOB #:**	**C2137A-R2**
LOCATION: : LONG BEACH, CA		**DATE:**	**22-Jul-16**
CLIENT: JACOBS		**REVISED:**	**25-Jul-16**
SUBJECT: BUDGETARY OPINION OF PROBABLE COST - NEW NORTH F.I.S. FACILITY - OPTION 1		**GFA:**	**35,051**

ITEM NO.	DESCRIPTION	EST QTY	UNIT	UNIT COST	TOTAL COST
4.2	ENCLOSURE, HORIZONTAL				$
	ROOFING			-	-
	ASSUME MEMBRANE ROOFING + COVERBOARD + TAPERED RIGID INSULATION	35,051	SF	11.91	417,457
	ALLOWANCE FOR WALKWAY PADS	701	SF	5.95	4,171
	METAL COPING/FLASHING	922	LF	20.02	18,463
	CANTS & COUNTERFLASHING	922	LF	11.64	10,735
	ALLOWANCE FOR SKYLIGHT	1,402	SF	92.00	128,988
	SUBTOTAL OF ENCLOSURE, HORIZONTAL				**579,814**
4.3	SUPPORT ITEMS				$
	MISC. SUPPORT ITEMS				
	MISC. METALS ALLOWANCE	35,051	GSF	0.54	18,928
	ROUGH CARPENTRY ALLOWANCE	35,051	GSF	0.32	11,216
	MISC. SHEET METAL ALLOWANCE	35,051	GSF	0.27	9,464
	MISC. FIREPROOFING/FIRESTOPPING ALLOWANCE	35,051	GSF	0.22	7,711
	CAULKING & SEALANTS ALLOWANCE	35,051	GSF	0.27	9,464
	MISC. PAINTING ALLOWANCE	35,051	GSF	0.22	7,711
	SUBTOTAL OF SUPPORT ITEMS				**64,494**
5.1	INTERNALS, VERTICAL				$
	INTERIOR WALLS				
	METAL STUD	50,403	SF	7.38	371,974
	GWB + PAINT	97,402	SF	3.94	383,764
	ALLOWANCE, PREMIUM FOR FIRE-RATED PARTITIONS	1	LS	18,890.00	18,890
	BATT INSULATION	50,403	SF	1.08	54,435
	CERAMIC WALL TILES + CEMENT BOARD	2,144	SF	20.02	42,923
	CEMENT PLASTER - K9 KENNEL ROOM	1,260	SF	13.53	17,048
	INTERIOR DOORS				
	INTERIOR DOORS/FRAMES, PER LEAF	43	EA	2,435.41	105,756
	ALLOWANCE, FIRE-RATED DOORS	1	LS	2,640.00	2,640
	INTERIOR GLAZINGS				
	INTERIOR WINDOWS - ALLOWANCE	132	SF	59.53	7,878
	SUBTOTAL OF INTERNALS, VERTICAL				**1,005,308**
5.2	INTERNALS, HORIZONTAL				$
	FLOORING + BASES				
	CARPET FLOOR - OFFICES	2,160	SF	5.41	11,686
	RESILIENT FLOORING	30,850	SF	5.14	158,569
	CERAMIC FLOOR TILE - RESTROOMS	994	SF	13.53	13,449
	RUBBER FLOORING - GYM	242	SF	8.12	1,965

PROJECT: NEW F.I.S. FACILITY AT LONG BEACH AIRPORT	**JOB #:**	**C2137A-R2**
LOCATION: : LONG BEACH, CA	**DATE:**	**22-Jul-16**
CLIENT: JACOBS	**REVISED:**	**25-Jul-16**
SUBJECT: BUDGETARY OPINION OF PROBABLE COST - NEW NORTH F.I.S. FACILITY - OPTION 1	**GFA:**	**35,051**

ITEM NO.	DESCRIPTION	EST QTY	UNIT	UNIT COST	TOTAL COST
	SEALED CONCRETE FLOOR - KENNEL AREAS	805	SF	1.62	1,304
	CEILING				
	GWB CEILING + FRAMES + PAINT	2,296	SF	11.91	27,345
	ACT T-BAR CEILING	32,755	SF	5.68	186,048
	MISC. CEILING SOFFITS/BULKING	1	LS	5,330.00	5,330
	SUBTOTAL OF INTERNALS, HORIZONTAL				**405,696**
5.3	FINISHES, SPECIAL				$
	SEE CERAMIC TILE FINISHES ELSEWHERE				
	SUBTOTAL OF FINISHES, SPECIAL				
5.4	INTERIORS				$
	CABINETRY				
	ALLOWANCE FOR CABINETRY	35,051	GSF	2.71	94,988
	METAL FABRICATIONS				
	ALLOWANCE FOR ROOF HATCH + LADDER	1	EA	1,353.01	1,353
	ALLOWANCE FOR MISC. METAL FABRICATIONS	35,051	GSF	1.08	37,855
	MISCELLANEOUS				
	MISC. INTERIOR ELEMENTS	35,051	GSF	0.10	3,355
	SUBTOTAL OF INTERIORS				**137,551**
6.0	SPECIALTIES				$
	SPECIALTIES				
	RESTROOM SPECIALTIES	994	SF	12.37	12,296
	FIRE PROTECTION SPECIALTIES	35,051	GSF	0.40	14,020
	VISUAL AIDS/WALL PANELLING	35,051	GSF	0.11	3,856
	LOCKERS, ASSUME 2-TIER	20	EA	514.14	10,283
	SIGNAGE	35,051	GSF	0.60	21,031
	MISC. SPECIALTIES	35,051	GSF	0.81	28,391
	SUBTOTAL OF SPECIALTIES				**89,877**
7.0	EQUIPMENT				$
	SECURITY SCREEN DETECTION SYSTEM EQUIPMENT			-	
	PASSENGER PROCESSING EQUIPMENT				**N.I.C.**
	HOLD ROOMS				**N.I.C.**
	BAGGAGE HANDLING EQUIPMENT			-	
	BAGGAGE CAROUSEL			-	**SEP. PRICE #2**
	FOOD SERVICE EQUIPMENT				
	BREAK ROOM	242	SF	21.08	5,101
	KENNEL EQUIPMENT			-	
	KENNEL AREA - METAL CAGE ALLOWANCE	805	SF	9.37	7,543
	MISC. EQUIPMENT ALLOWANCE	35,051	GSF	0.52	18,227

PROJECT: NEW F.I.S. FACILITY AT LONG BEACH AIRPORT	**JOB #:**	**C2137A-R2**
LOCATION: : LONG BEACH, CA	**DATE:**	**22-Jul-16**
CLIENT: JACOBS	**REVISED:**	**25-Jul-16**
SUBJECT: BUDGETARY OPINION OF PROBABLE COST - NEW NORTH F.I.S. FACILITY - OPTION 1	**GFA:**	**35,051**

ITEM NO.	DESCRIPTION	EST QTY	UNIT	UNIT COST	TOTAL COST
	SUBTOTAL OF EQUIPMENT				**30,871**
8.0	SPECIAL CONSTRUCTION				$
	THIS SECTION NOT APPLICABLE				
	SUBTOTAL OF SPECIAL CONSTRUCTION				
9.0	CONVEYING				$
	THIS SECTION NOT APPLICABLE				
	SUBTOTAL OF CONVEYING				
10.1	PLUMBING				$
	PLUMBING WORK				
	PLUMBING EQUIPMENT				
	PLUMBING EQUIPMENT	1	LS	16,236.08	16,236
	PLUMBING FIXTURES				
	TOILET FIXTURES + ROUGH-INS	22	EA	6,575.61	144,663
	AGRI LAB SINK + ROUGH-INS - ALLOWANCE	1	EA	6,900.34	6,900
	DRINKING FOUNTAIN, HI-LO + ROUGH-INS - ALLOWANCE	1	EA	6,827.27	6,827
	PLUMBING PREMIUM				
	ROUGH-INS FOR - BREAK ROOM FIXTURES & EQUIPMENT	242	SF	4.25	1,029
	ROUGH-INS FOR - KENNEL AREAS	805	SF	4.33	3,486
	ROUGH-INS FOR - WASHER/DRYER	1	PR	1,028.29	1,028
	ROOF DRAIN SYSTEM	35,051	GSF	1.35	47,319
	CONDENSATE DRAIN SYSTEM	35,051	GSF	0.27	9,464
	GAS SYSTEM	35,051	GSF	0.87	30,494
	MISC. PLUMBING SYSTEM/TESTING	35,051	GSF	1.35	47,319
	FIRE PROTECTION				
	FIRE SPRINKLER SYSTEM	35,051	GSF	5.41	189,626
	SUBTOTAL OF PLUMBING				**504,391**
10.2	HVAC				$
	HVAC SYSTEM				
	BUILDING HVAC SYSTEM - PACKAGED UNITS	35,051	GSF	21.65	758,854
	PREMIUM FOR BREAKROOM	242	SF	5.95	1,440
	PREMIUM FOR K9 KENNEL AREAS	805	SF	8.12	6,537
	MISC. HVAC SYSTEM/TESTING	35,051	GSF	1.62	56,783
	SUBTOTAL OF HVAC				**823,614**
11.0	ELECTRICAL				$

PROJECT: NEW F.I.S. FACILITY AT LONG BEACH AIRPORT	**JOB #:**	**C2137A-R2**
LOCATION: : LONG BEACH, CA	**DATE:**	**22-Jul-16**
CLIENT: JACOBS	**REVISED:**	**25-Jul-16**
SUBJECT: BUDGETARY OPINION OF PROBABLE COST - NEW NORTH F.I.S. FACILITY - OPTION 1	**GFA:**	**35,051**

ITEM NO.	DESCRIPTION	EST QTY	UNIT	UNIT COST	TOTAL COST
	ELECTRICAL SYSTEM				
	EQUIPMENT & PANEL BOARDS	35,051	GSF	9.20	322,469
	SECONDARY FEEDERS	35,051	GSF	4.09	143,359
	BRANCH POWER	35,051	GSF	3.79	132,843
	LIGHTING SYSTEM	35,051	GSF	10.28	360,324
	COMMUNICATIONS	35,051	GSF	5.95	208,553
	SECURITY	35,051	GSF	6.22	218,017
	FIRE ALARM	35,051	GSF	3.68	128,988
	MISC. ELECTRICAL SYSTEM/TESTING	35,051	GSF	1.17	41,010
	SUBTOTAL OF ELECTRICAL				**1,555,563**
	SEPARATE COST				$
1.0	**SITEWORK**				
	DEMO WORK				
	SAWCUT/DEMO OF (E) SITE PAVING + 5' BEYOND PERIMETER, ETC. INCLUDING HAUL OFF	40,251	SF	1.08	43,471
	MIDDLE CURB & SIDEWALK DEMO	3,336	SF	5.00	16,680
	MISC. ALLOWANCE FOR DEMO & RESTORATION TO (E) ADJACENT STRUCTURES AFFECTED BY NEW WORK	1	LS	5,412.03	5,412
	SITE PREPARATION				
	SITE CLEARING	40,251	SF	0.11	4,428
	ROUGH GRADING	40,251	SF	0.22	8,855
	EROSION CONTROL	40,251	SF	0.16	6,440
	OVER EXCAVATION				
	OVER EXCAVATION, ASSUME 1.5'D BELOW PAVING BASE - 5' BEYOND PERIMETER	483	CY	13.53	6,540
	OVER EXCAVATION, ASSUME 3'D BELOW FOOTING (TOTAL IS 7'D BELOW SLAB BASE)	11,460	CY	13.53	155,055
	SITE PAVING				
	ALLOWANCE FOR SITE PAVING @ 5' BEYOND IMPROVEMENTS FOOTPRINT	5,200	SF	27.06	140,712
	ROADWAY PAVEMENT, 7" AC/12" CAB	3,500	SF	15.00	52,500
	SITE UTILITIES				
	STORM DRAINS & CONNECTIONS	1	LS	62,240.00	62,240
	SEWER & CONNECTIONS	1	LS	11,090.00	11,090
	INCOMING DOMESTIC WATER & CONNECTIONS	1	LS	31,120.00	31,120
	INCOMING FIRE WATER & CONNECTIONS	1	LS	27,330.00	27,330
	INCOMING GAS & CONNECTIONS	1	LS	20,160.00	20,160
	INCOMING POWER SERVICE & CONNECTIONS	1	LS	33,590.00	33,590
	INCOMING COMMUNICATIONS SERVICE & CONNECTIONS	1	LS	16,800.00	16,800
	SUBTOTAL				**642,423**

PROJECT: NEW F.I.S. FACILITY AT LONG BEACH AIRPORT		**JOB #:**	**C2137A-R2**
LOCATION: : LONG BEACH, CA		**DATE:**	**22-Jul-16**
CLIENT: JACOBS		**REVISED:**	**25-Jul-16**
SUBJECT: BUDGETARY OPINION OF PROBABLE COST - NEW NORTH F.I.S. FACILITY - OPTION 1		**GFA:**	**35,051**

ITEM NO.	DESCRIPTION	EST QTY	UNIT	UNIT COST	TOTAL COST
	TOTAL INCLUDING PRORATES PER BASE ESTIMATE	**144.8%**			**930,307**
2.0	**BAGGAGE CLAIM**				
	NEW BAGGAGE CLAIM - AIR SIDE	70	LF	1,250.00	87,500
	NEW BAGGAGE CLAIM - PASS. SIDE	140	LF	1,250.00	175,000
	SUBTOTAL				**262,500**
	TOTAL INCLUDING PRORATES PER BASE ESTIMATE	**144.8%**			**380,132**
3.0	**AIRCRAFT PARKING (POSITIONS 11 & 12)**				
	CONSTRUCTION COST per Airport Capital Improvement Program (ACIP) submittal to the FAA from Long Beach Airport.	91,500	SF	30.00	2,745,000
	ADMIN/DESIGN COST				N.I.C.
	CONSTRUCTION MANAGEMENT/ INSPECTION				N.I.C.
	SUBTOTAL				**2,745,000**
	TOTAL INCLUDING ESCALATION PER BASE ESTIMATE	**9.7%**			**3,012,031**

PROJECT: NEW F.I.S. FACILITY AT LONG BEACH AIRPORT	**JOB #:**	**C2137A-R2**
LOCATION : LONG BEACH, CA	**DATE:**	**22-Jul-16**
CLIENT: JACOBS	**REVISED:**	**25-Jul-16**
SUBJECT: BUDGETARY OPINION OF PROBABLE COST - NEW SOUTH F.I.S. FACILITY - OPTION 2	**GFA:**	**30,672**

ITEM NO.	DESCRIPTION	EST QTY	UNIT	UNIT COST	TOTAL COST
	SUMMARY OF ESTIMATE			**$**	**$**
1.0	SITEWORK				
2.0	SUBSTRUCTURE	8.4%		20.48	628,212
3.0	STRUCTURE	18.4%		44.82	1,374,719
4.1	ENCLOSURE, VERTICAL	10.6%		25.79	791,097
4.2	ENCLOSURE, HORIZONTAL	6.8%		16.63	510,068
4.3	SUPPORT ITEMS	0.8%		1.84	56,436
5.1	INTERNALS, VERTICAL	13.0%		31.75	973,861
5.2	INTERNALS, HORIZONTAL	4.8%		11.66	357,696
5.3	FINISHES, SPECIAL				
5.4	INTERIORS	1.6%		3.93	120,540
6.0	SPECIALTIES	1.1%		2.66	81,469
7.0	EQUIPMENT	0.4%		0.93	28,593
8.0	SPECIAL CONSTRUCTION				
9.0	CONVEYING				
10.1	PLUMBING + FIRE PROTECTION	6.2%		15.12	463,885
10.2	HVAC	9.7%		23.53	721,715
11.0	ELECTRICAL	18.2%		44.38	1,361,222
	SUBTOTAL	**100.0%**		**243.53**	**7,469,513**
12.00	PRORATES:				
12.10	GENERAL CONDITIONS	8.50%		20.70	634,909
12.20	CONTINGENCY	12.50%		33.03	1,013,053
12.30	ESCALATION	9.73%		28.92	886,939
12.40	GEOGRAPHICAL FACTOR				
12.50	MARKET FACTOR				
	SUBTOTAL			**326.18**	**10,004,414**
12.60	BONDS	2.00%		6.52	200,088
12.70	CONTRACTOR'S FEE	6.00%		19.96	612,270
	TOTAL OF OPINION OF CONSTRUCTION BASE COST			**352.66**	**10,816,772**

PROJECT: NEW F.I.S. FACILITY AT LONG BEACH AIRPORT	**JOB #:**	**C2137A-R2**
LOCATION : LONG BEACH, CA	**DATE:**	**22-Jul-16**
CLIENT: JACOBS	**REVISED:**	**25-Jul-16**
SUBJECT: BUDGETARY OPINION OF PROBABLE COST - NEW SOUTH F.I.S. FACILITY - OPTION 2	**GFA:**	**30,672**

ITEM NO.	DESCRIPTION	EST QTY	UNIT	UNIT COST	TOTAL COST
	SEPARATE COST (See detail @ end of estimate)				
	SITEWORK	38,732	SF	24.67	**955,692**
	BAGGAGE CLAIM	630	LF	2,188.27	**1,378,613**
	STERILE CORRIDOR FROM AIRCRAFT	1,395	SF		

TOTAL OF OPINION OF CONSTRUCTION BASE COST PLUS SEPARATE COST	**13,151,076**

FLOOR AREA SUMMARY	NET SF AREA	GROSSED UP AREA
ENTRY CORRIDOR		**1,815**
GENERAL AREAS	**18,493**	**25,419**
BAGGAGE CLAIM	4,770	9,075
CIRCULATION	2,640	3,196
COUNTER TERRORISM RESPONSE - CTR	475	575
RESTROOM	696	842
QUEUING	2,732	3,308
PASSENGER PROCESSING	1,476	1,786
COMMAND & CONTROL CENTER - CCC	225	0
WIRING/IDF	116	140
LAN/TELCO	180	218
RADIO/TEL ROOM	60	73
LACTATION ROOM	80	97
STAFF BREAK ROOM	200	242
GYM	200	242
LOCKERS	164	199
MALE HOLD ROOM	115	139
FEMALE HOLD ROOM	115	139
JUVENILE HOLD ROOM	115	139
INTERVIEW ROOM	80	97
SEARCH ROOM	80	97
DETAINEE BAGGAGE STORAGE	50	61
AGRI LAB	150	182
AGRI DISPOSAL	150	182
ICE OFFICE	150	182
MEN'S TOILET	63	76
WOMEN'S TOILET	63	76
WAITING	250	303
GENERAL STORAGE	150	182
SUPERVISOR'S OFFICE	150	182
PORT DIRECTOR'S OFFICE	225	272
CHIEF OFFICER'S OFFICE	200	242
ADIT	150	182

PROJECT: NEW F.I.S. FACILITY AT LONG BEACH AIRPORT	**JOB #:**	**C2137A-R2**
LOCATION : LONG BEACH, CA	**DATE:**	**22-Jul-16**
CLIENT: JACOBS	**REVISED:**	**25-Jul-16**
SUBJECT: BUDGETARY OPINION OF PROBABLE COST - NEW SOUTH F.I.S. FACILITY - OPTION 2	**GFA:**	**30,672**

ITEM NO.	DESCRIPTION	EST QTY	UNIT	UNIT COST	TOTAL COST
	GENERAL OFFICES	256		310	
	WASHER/DRYER	60		73	
	DRY FOOD STORAGE	75		91	
	K9 KENNEL	123		149	
	K9 PROCESSING	150		182	
	K9 FOOD PREP	150		182	
	K9 GENERAL STORAGE	50		61	
	K9 TRAINING AID STORAGE	64		77	
	K9 TRAINING AID STORAGE	64		77	
	K9 WORK AREA	64		77	
	TEMP SEIZED PROPERTY	60		73	
	SECURE STORAGE	100		121	
	PPE STORAGE	65		79	
	WEAPONS CLEANING	80		97	
	WEAPONS STORAGE	100		121	
	SHIPS OFFICE	402		487	
	TRIAGE PODIUM	180		218	
	EXIT PODIUM	180		218	
	ADDITIONAL AREAS			**3,166**	
	CORRIDOR BETWEEN ENTRY/EXIT				
	INTERNAL CORRIDOR			1,008	
	SECONDARY AREA			2,158	
	TOTAL FLOOR AREA			**30,400**	

PROJECT: NEW F.I.S. FACILITY AT LONG BEACH AIRPORT	**JOB #:**	**C2137A-R2**
LOCATION : LONG BEACH, CA	**DATE:**	**22-Jul-16**
CLIENT: JACOBS	**REVISED:**	**25-Jul-16**
SUBJECT: BUDGETARY OPINION OF PROBABLE COST - NEW SOUTH F.I.S. FACILITY - OPTION 2	**GFA:**	**30,672**

ITEM NO.	DESCRIPTION	EST QTY	UNIT	UNIT COST	TOTAL COST
1.0	SITEWORK				$
	SEE SEPARATE SITEWORK COST @ END OF ESTIMATE				
	SUBTOTAL OF SITEWORK				
2.0	SUBSTRUCTURE				$
	FOUNDATIONS/S.O.G./CURBS				
	FOUNDATON, COMPLETE	30,672	SF	9.26	284,023
	SLAB ON-GRADE INCLUDING CURBS	30,672	SF	10.82	331,871
	MISC. SUBSTRUCTURE ALLOWANCE	30,672	GSF	0.40	12,318
	SUBTOTAL OF SUBSTRUCTURE				**628,212**
3.0	STRUCTURE				$
	STEEL STRUCTURE				
	STRUCTURAL STEEL (INCL. BRACED OR MOMENT FRAMES, COLUMNS, & BEAMS), COMPLETE	245	TON	5,000.00	1,226,880
	METAL DECK				
	METAL DECK + CLOSURE STEELS - ROOF	30,672	SF	4.82	147,839
	SUBTOTAL OF STRUCTURE				**1,374,719**
4.1	ENCLOSURE, VERTICAL				$
	EXTERIOR WALL				
	METAL STUD	14,502	SF	8.12	117,754
	METAL PANEL + ATTACHMENTS	5,801	SF	32.47	188,349
	CEMENT PLASTER + LATH/V.B.	8,701	SF	16.24	141,305
	CEMENT PLASTER + LATH/V.B., ROOF SIDE	2,676	SF	16.24	43,458
	GLAS-MAT SHEATHING	17,178	SF	4.05	69,570
	GWB + PAINT, INT. OF EXT.	11,826	SF	3.94	46,594
	BATT INSULATION	11,826	SF	1.08	12,772
	ANTI-GRAFFITTI COATING	8,701	SF	1.89	16,445
	EXTERIOR DOOR + HARDWARES + PAINT				
	ALUM-GLASS DOOR/ALUM FRAME, DUAL LEAF	2	PR	6,819.15	13,638
	HM DOOR/HM FRAME, DUAL LEAF	2	PR	2,898.14	5,796
	HM DOOR/HM FRAME, SINGLE LEAF	2	EA	1,704.79	3,410
	PANIC HARDWARE	8	EA	947.10	7,577
	EXTERIOR WINDOWS				
	STOREFRONTS	1,284	SF	74.14	95,231
	ALLOWANCE FOR PUNCHED WINDOWS	385	SF	75.77	29,198
	SUBTOTAL OF ENCLOSURE, VERTICAL				**791,097**

PROJECT: NEW F.I.S. FACILITY AT LONG BEACH AIRPORT	**JOB #:**	**C2137A-R2**
LOCATION : LONG BEACH, CA	**DATE:**	**22-Jul-16**
CLIENT: JACOBS	**REVISED:**	**25-Jul-16**
SUBJECT: BUDGETARY OPINION OF PROBABLE COST - NEW SOUTH F.I.S. FACILITY - OPTION 2	**GFA:**	**30,672**

ITEM NO.	DESCRIPTION	EST QTY	UNIT	UNIT COST	TOTAL COST
4.2	ENCLOSURE, HORIZONTAL				$
	ROOFING			-	-
	ASSUME MEMBRANE ROOFING + COVERBOARD + TAPERED RIGID INSULATION	30,672	SF	11.91	365,304
	ALLOWANCE FOR WALKWAY PADS	613	SF	5.95	3,650
	METAL COPING/FLASHING	892	LF	20.02	17,858
	CANTS & COUNTERFLASHING	892	LF	11.64	10,383
	ALLOWANCE FOR SKYLIGHT	1,227	SF	92.00	112,873
	SUBTOTAL OF ENCLOSURE, HORIZONTAL				**510,068**
4.3	SUPPORT ITEMS				$
	MISC. SUPPORT ITEMS				
	MISC. METALS ALLOWANCE	30,672	GSF	0.54	16,563
	ROUGH CARPENTRY ALLOWANCE	30,672	GSF	0.32	9,815
	MISC. SHEET METAL ALLOWANCE	30,672	GSF	0.27	8,281
	MISC. FIREPROOFING/FIRESTOPPING ALLOWANCE	30,672	GSF	0.22	6,748
	CAULKING & SEALANTS ALLOWANCE	30,672	GSF	0.27	8,281
	MISC. PAINTING ALLOWANCE	30,672	GSF	0.22	6,748
	SUBTOTAL OF SUPPORT ITEMS				**56,436**
5.1	INTERNALS, VERTICAL				$
	INTERIOR WALLS				
	METAL STUD	48,750	SF	7.38	359,775
	GWB + PAINT	94,096	SF	3.94	370,738
	ALLOWANCE, PREMIUM FOR FIRE-RATED PARTITIONS	1	LS	18,260.00	18,260
	BATT INSULATION	48,750	SF	1.08	52,650
	CERAMIC WALL TILES + CEMENT BOARD	2,144	SF	20.02	42,923
	CEMENT PLASTER - K9 KENNEL ROOM	1,260	SF	13.53	17,048
	INTERIOR DOORS				
	INTERIOR DOORS/FRAMES, PER LEAF	42	EA	2,435.41	102,287
	ALLOWANCE, FIRE-RATED DOORS	1	LS	2,560.00	2,560
	INTERIOR GLAZINGS				
	INTERIOR WINDOWS - ALLOWANCE	128	SF	59.53	7,620
	SUBTOTAL OF INTERNALS, VERTICAL				**973,861**
5.2	INTERNALS, HORIZONTAL				$
	FLOORING + BASES				
	CARPET FLOOR - OFFICES	2,160	SF	5.41	11,686
	RESILIENT FLOORING	26,471	SF	5.14	136,061
	CERAMIC FLOOR TILE - RESTROOMS	994	SF	13.53	13,449
	RUBBER FLOORING - GYM	242	SF	8.12	1,965
	SEALED CONCRETE FLOOR - KENNEL AREAS	805	SF	1.62	1,304

PROJECT: NEW F.I.S. FACILITY AT LONG BEACH AIRPORT	**JOB #:**	**C2137A-R2**
LOCATION : LONG BEACH, CA	**DATE:**	**22-Jul-16**
CLIENT: JACOBS	**REVISED:**	**25-Jul-16**
SUBJECT: BUDGETARY OPINION OF PROBABLE COST - NEW SOUTH F.I.S. FACILITY - OPTION 2	**GFA:**	**30,672**

ITEM NO.	DESCRIPTION	EST QTY	UNIT	UNIT COST	TOTAL COST
	CEILING				
	GWB CEILING + FRAMES + PAINT	2,296	SF	11.91	27,345
	ACT T-BAR CEILING	28,376	SF	5.68	161,176
	MISC. CEILING SOFFITS/BULKING	1	LS	4,710.00	4,710
	SUBTOTAL OF INTERNALS, HORIZONTAL				**357,696**
5.3	FINISHES, SPECIAL				$
	SEE CERAMIC TILE FINISHES ELSEWHERE				
	SUBTOTAL OF FINISHES, SPECIAL				
5.4	INTERIORS				$
	CABINETRY				
	ALLOWANCE FOR CABINETRY	30,672	GSF	2.71	83,121
	METAL FABRICATIONS				
	ALLOWANCE FOR ROOF HATCH + LADDER	1	EA	1,353.01	1,353
	ALLOWANCE FOR MISC. METAL FABRICATIONS	30,672	GSF	1.08	33,126
	MISCELLANEOUS				
	MISC. INTERIOR ELEMENTS	30,672	GSF	0.10	2,940
	SUBTOTAL OF INTERIORS				**120,540**
6.0	SPECIALTIES				$
	SPECIALTIES				
	RESTROOM SPECIALTIES	994	SF	12.37	12,296
	FIRE PROTECTION SPECIALTIES	30,672	GSF	0.40	12,269
	VISUAL AIDS/WALL PANELLING	30,672	GSF	0.11	3,374
	LOCKERS, ASSUME 2-TIER	20	EA	514.14	10,283
	SIGNAGE	30,672	GSF	0.60	18,403
	MISC. SPECIALTIES	30,672	GSF	0.81	24,844
	SUBTOTAL OF SPECIALTIES				**81,469**
7.0	EQUIPMENT				$
	SECURITY SCREEN DETECTION SYSTEM EQUIPMENT			-	
	PASSENGER PROCESSING EQUIPMENT				**N.I.C.**
	HOLD ROOMS				**N.I.C.**
	BAGGAGE HANDLING EQUIPMENT			-	
	BAGGAGE CAROUSEL			-	**SEP. PRICE #2**
	FOOD SERVICE EQUIPMENT				
	BREAK ROOM	242	SF	21.08	5,101
	KENNEL EQUIPMENT			-	
	KENNEL AREA - METAL CAGE ALLOWANCE	805	SF	9.37	7,543
	MISC. EQUIPMENT ALLOWANCE	30,672	GSF	0.52	15,949
	SUBTOTAL OF EQUIPMENT				**28,593**

PROJECT: NEW F.I.S. FACILITY AT LONG BEACH AIRPORT	**JOB #:**	**C2137A-R2**
LOCATION : LONG BEACH, CA	**DATE:**	**22-Jul-16**
CLIENT: JACOBS	**REVISED:**	**25-Jul-16**
SUBJECT: BUDGETARY OPINION OF PROBABLE COST - NEW SOUTH F.I.S. FACILITY - OPTION 2	**GFA:**	**30,672**

ITEM NO.	DESCRIPTION	EST QTY	UNIT	UNIT COST	TOTAL COST
8.0	SPECIAL CONSTRUCTION				$
	THIS SECTION NOT APPLICABLE				
	SUBTOTAL OF SPECIAL CONSTRUCTION				
9.0	CONVEYING				$
	THIS SECTION NOT APPLICABLE				
	SUBTOTAL OF CONVEYING				
10.1	PLUMBING				$
	PLUMBING WORK				
	PLUMBING EQUIPMENT				
	PLUMBING EQUIPMENT	1	LS	16,236.08	16,236
	PLUMBING FIXTURES				
	TOILET FIXTURES + ROUGH-INS	22	EA	6,575.61	144,663
	AGRI LAB SINK + ROUGH-INS - ALLOWANCE	1	EA	6,900.34	6,900
	DRINKING FOUNTAIN, HI-LO + ROUGH-INS - ALLOWANCE	1	EA	6,827.27	6,827
	PLUMBING PREMIUM				
	ROUGH-INS FOR - BREAK ROOM FIXTURES & EQUIPMENT	242	SF	4.25	1,029
	ROUGH-INS FOR - KENNEL AREAS	805	SF	4.33	3,486
	ROUGH-INS FOR - WASHER/DRYER	1	PR	1,028.29	1,028
	ROOF DRAIN SYSTEM	30,672	GSF	1.35	41,407
	CONDENSATE DRAIN SYSTEM	30,672	GSF	0.27	8,281
	GAS SYSTEM	30,672	GSF	0.87	26,685
	MISC. PLUMBING SYSTEM/TESTING	30,672	GSF	1.35	41,407
	FIRE PROTECTION				
	FIRE SPRINKLER SYSTEM	30,672	GSF	5.41	165,936
	SUBTOTAL OF PLUMBING				**463,885**
10.2	HVAC				$
	HVAC SYSTEM				
	BUILDING HVAC SYSTEM - PACKAGED UNITS	30,672	GSF	21.65	664,049
	PREMIUM FOR BREAKROOM	242	SF	5.95	1,440
	PREMIUM FOR K9 KENNEL AREAS	805	SF	8.12	6,537
	MISC. HVAC SYSTEM/TESTING	30,672	GSF	1.62	49,689
	SUBTOTAL OF HVAC				**721,715**
11.0	ELECTRICAL				$
	ELECTRICAL SYSTEM				
	EQUIPMENT & PANEL BOARDS	30,672	GSF	9.20	282,182
	SECONDARY FEEDERS	30,672	GSF	4.09	125,448

PROJECT: NEW F.I.S. FACILITY AT LONG BEACH AIRPORT	**JOB #:**	**C2137A-R2**
LOCATION : LONG BEACH, CA	**DATE:**	**22-Jul-16**
CLIENT: JACOBS	**REVISED:**	**25-Jul-16**
SUBJECT: BUDGETARY OPINION OF PROBABLE COST - NEW SOUTH F.I.S. FACILITY - OPTION 2	**GFA:**	**30,672**

ITEM NO.	DESCRIPTION	EST QTY	UNIT	UNIT COST	TOTAL COST
	BRANCH POWER	30,672	GSF	3.79	116,247
	LIGHTING SYSTEM	30,672	GSF	10.28	315,308
	COMMUNICATIONS	30,672	GSF	5.95	182,498
	SECURITY	30,672	GSF	6.22	190,780
	FIRE ALARM	30,672	GSF	3.68	112,873
	MISC. ELECTRICAL SYSTEM/TESTING	30,672	GSF	1.17	35,886
	SUBTOTAL OF ELECTRICAL				**1,361,222**
	SEPARATE COST				$
1.0	**SITEWORK**				
	DEMO WORK				
	SAWCUT/DEMO OF (E) SITE PAVING + 5' BEYOND PERIMETER, ETC. INCL. HAUL OFF	35,232	SF	1.08	38,051
	MIDDLE CURB & SIDEWALK DEMO	3,336	SF	5.00	16,680
	MISC. ALLOWANCE FOR DEMO & RESTORATION TO (E) ADJACENT STRUCTURES AFFECTED BY NEW WORK	1	LS	10,824.06	10,824
	SITE PREPARATION				
	SITE CLEARING	38,732	SF	0.11	4,261
	ROUGH GRADING	38,732	SF	0.22	8,521
	EROSION CONTROL	38,732	SF	0.16	6,197
	OVER EXCAVATION				
	OVER EXCAVATION, ASSUME 1.5'D BELOW PAVING BASE - 5' BEYOND PERIMETER	565	CY	13.53	7,640
	OVER EXCAVATION, ASSUME 3'D BELOW FOOTING (TOTAL IS 7'D BELOW SLAB BASE)	10,028	CY	13.53	135,684
	SITE PAVING				
	ALLOWANCE FOR SITE PAVING @ 5' BEYOND IMPROVEMENTS FOOTPRINT	4,560	SF	27.06	123,394
	ROADWAY PAVEMENT, 7" AC/12" CAB	3,500	SF	15.00	52,500
	SITE UTILITIES				
	ALLOWANCE FOR UTILITY DEMO & RELOCATION AFFECTED BY NEW WORK	1	LS	162,360	162,360
	STORM DRAINS & CONNECTIONS	1	LS	15,590.00	15,590
	SEWER & CONNECTIONS	1	LS	9,420.00	9,420
	INCOMING DOMESTIC WATER & CONNECTIONS	1	LS	6,660.00	6,660
	INCOMING FIRE WATER & CONNECTIONS	1	LS	9,250.00	9,250
	INCOMING GAS & CONNECTIONS	1	LS	15,120.00	15,120
	INCOMING POWER SERVICE & CONNECTIONS	1	LS	25,200.00	25,200
	INCOMING COMMUNICATIONS SERVICE & CONNECTIONS	1	LS	12,600.00	12,600
	SUBTOTAL OF SITEWORK				**659,952**
	TOTAL INCLUDING PRORATES PER BASE ESTIMATE	**144.8%**			**955,692**

PROJECT: NEW F.I.S. FACILITY AT LONG BEACH AIRPORT	**JOB #:**	**C2137A-R2**
LOCATION : LONG BEACH, CA	**DATE:**	**22-Jul-16**
CLIENT: JACOBS	**REVISED:**	**25-Jul-16**
SUBJECT: BUDGETARY OPINION OF PROBABLE COST - NEW SOUTH F.I.S. FACILITY - OPTION 2	**GFA:**	**30,672**

ITEM NO.	DESCRIPTION	EST QTY	UNIT	UNIT COST	TOTAL COST
2.0	**BAGGAGE CLAIM**				
	DEMO				
	DEMO (E) BAGGAGE CLAIM - AIR SIDE	312	LF	250.00	78,000
	DEMO (E) BAGGAGE CLAIM - PASS. SIDE	346	LF	250.00	86,500
	NEW				
	NEW BAGGAGE CLAIM - AIR SIDE	210	LF	1,250.00	262,500
	NEW BAGGAGE CLAIM - PASS. SIDE	420	LF	1,250.00	525,000
	SUBTOTAL				**952,000**
	TOTAL INCLUDING PRORATES PER BASE ESTIMATE	**144.8%**			**1,378,613**

PROJECT: NEW F.I.S. FACILITY AT LONG BEACH AIRPORT	**JOB #:**	**C2137A-R2**
LOCATION : LONG BEACH, CA	**DATE:**	**22-Jul-16**
CLIENT: JACOBS	**REVISED:**	**25-Jul-16**
SUBJECT: BUDGETARY OPINION OF PROBABLE COST - NEW SOUTH F.I.S. FACILITY (REDUCED AREA) - OPTION 3	**GFA:**	**21,656**

ITEM NO.	DESCRIPTION	EST QTY	UNIT	UNIT COST	TOTAL COST
	SUMMARY OF ESTIMATE			**$**	**$**
1.0	SITE WORK				
2.0	SUBSTRUCTURE	7.8%		20.48	443,550
3.0	STRUCTURE	17.0%		44.82	970,622
4.1	ENCLOSURE, VERTICAL	12.6%		33.16	718,181
4.2	ENCLOSURE, HORIZONTAL	6.4%		16.88	365,649
4.3	SUPPORT ITEMS	0.7%		1.84	39,846
5.1	INTERNALS, VERTICAL	16.3%		42.93	929,798
5.2	INTERNALS, HORIZONTAL	4.6%		12.05	260,904
5.3	FINISHES, SPECIAL				
5.4	INTERIORS	1.5%		3.95	85,515
6.0	SPECIALTIES	0.9%		2.49	53,875
7.0	EQUIPMENT	0.1%		0.25	5,414
8.0	SPECIAL CONSTRUCTION				
9.0	CONVEYING				
10.1	PLUMBING + FIRE PROTECTION	6.6%		17.31	374,945
10.2	HVAC	8.8%		23.27	503,935
11.0	ELECTRICAL	16.8%		44.38	961,093
	SUBTOTAL	**100.0%**		**$263.82**	**5,713,327**
12.00	PRORATES:				
12.10	GENERAL CONDITIONS	8.50%		22.42	485,633
12.20	CONTINGENCY	12.50%		35.78	774,870
12.30	ESCALATION	9.73%		31.33	678,407
12.40	GEOGRAPHICAL FACTOR				
12.50	MARKET FACTOR				
	SUBTOTAL			**$353.35**	**7,652,237**
12.60	BONDS	2.00%		7.07	153,045
12.70	CONTRACTOR'S FEE	6.00%		21.63	468,317
	TOTAL OF OPINION OF CONSTRUCTION BASE COST			**382.05**	**8,273,599**

PROJECT: NEW F.I.S. FACILITY AT LONG BEACH AIRPORT		**JOB #:**	**C2137A-R2**
LOCATION: LONG BEACH, CA		**DATE:**	**22-Jul-16**
CLIENT: JACOBS		**REVISED:**	**25-Jul-16**
SUBJECT: BUDGETARY OPINION OF PROBABLE COST - NEW SOUTH F.I.S. FACILITY (REDUCED AREA) - OPTION 3		**GFA:**	**21,656**

ITEM NO.	DESCRIPTION	EST QTY	UNIT	UNIT COST	TOTAL COST
	SEPARATE COST (See detail @ end of estimate)				
	SITEWORK	24,696	SF	32.89	**812,310**
	BAGGAGE CLAIM	630	LF	2,188.27	**1,378,613**
	STERILE CORRIDOR FROM AIRCRAFT	1,395	SF		

TOTAL OF OPINION OF CONSTRUCTION BASE COST PLUS SEPARATE COST	**10,464,522**

FLOOR AREA SUMMARY	**NET SF AREA**	**GROSSED UP AREA**
ENTRY CORRIDOR		**1,815**
GENERAL AREAS		**16,675**
BAGGAGE CLAIM		5,772
CIRCULATION		1,888
COUNTER TERRORISM RESPONSE - CTR		575
RESTROOM		842
QUEUING		3,308
PASSENGER PROCESSING		1,786
COMMAND & CONTROL CENTER - CCC		0
WIRING/IDF		
LAN/TELCO		
RADIO/TEL ROOM		
LACTATION ROOM		
STAFF BREAK ROOM		
GYM		
LOCKERS		
MALE HOLD ROOM		
FEMALE HOLD ROOM		
JUVENILE HOLD ROOM		
INTERVIEW ROOM		
SEARCH ROOM		
DETAINEE BAGGAGE STORAGE		61
AGRI LAB		182
AGRI DISPOSAL		182
ICE OFFICE		182
MEN'S TOILET		76
WOMEN'S TOILET		76
WAITING		303
GENERAL STORAGE		
SUPERVISOR'S OFFICE		
PORT DIRECTOR'S OFFICE		272
CHIEF OFFICER'S OFFICE		242

PROJECT: NEW F.I.S. FACILITY AT LONG BEACH AIRPORT	**JOB #:**	**C2137A-R2**
LOCATION: LONG BEACH, CA	**DATE:**	**22-Jul-16**
CLIENT: JACOBS	**REVISED:**	**25-Jul-16**
SUBJECT: BUDGETARY OPINION OF PROBABLE COST - NEW SOUTH F.I.S. FACILITY (REDUCED AREA) - OPTION 3	**GFA:**	**21,656**

ITEM NO.	DESCRIPTION	EST QTY	UNIT	UNIT COST	TOTAL COST
	ADIT			182	
	GENERAL OFFICES			310	
	WASHER/DRYER				
	DRY FOOD STORAGE				
	K9 KENNEL				
	K9 PROCESSING				
	K9 FOOD PREP				
	K9 GENERAL STORAGE				
	K9 TRAINING AID STORAGE				
	K9 TRAINING AID STORAGE				
	K9 WORK AREA				
	TEMP SEIZED PROPERTY				
	SECURE STORAGE				
	PPE STORAGE				
	WEAPONS CLEANING				
	WEAPONS STORAGE				
	SHIPS OFFICE				
	TRIAGE PODIUM			218	
	EXIT PODIUM			218	
	ADDITIONAL AREAS			**3,166**	
	CORRIDOR BETWEEN ENTRY/EXIT				
	INTERNAL CORRIDOR			1,008	
	SECONDARY AREA			2,158	
	TOTAL FLOOR AREA			**21,656**	

PROJECT: NEW F.I.S. FACILITY AT LONG BEACH AIRPORT	**JOB #:**	**C2137A-R2**
LOCATION: LONG BEACH, CA	**DATE:**	**22-Jul-16**
CLIENT: JACOBS	**REVISED:**	**25-Jul-16**
SUBJECT: BUDGETARY OPINION OF PROBABLE COST - NEW SOUTH F.I.S. FACILITY (REDUCED AREA) - OPTION 3	**GFA:**	**21,656**

ITEM NO.	DESCRIPTION	EST QTY	UNIT	UNIT COST	TOTAL COST
1.0	SITEWORK				$
	SEE SEPARATE SITEWORK COST @ END OF ESTIMATE				
	SUBTOTAL OF SITEWORK				
2.0	SUBSTRUCTURE				$
	FOUNDATIONS/S.O.G./CURBS				
	FOUNDATON, COMPLETE	21,656	SF	9.26	200,535
	SLAB ON-GRADE INCLUDING CURBS	21,656	SF	10.82	234,318
	MISC. SUBSTRUCTURE ALLOWANCE	21,656	GSF	0.40	8,697
	SUBTOTAL OF SUBSTRUCTURE				**443,550**
3.0	STRUCTURE				$
	STEEL STRUCTURE				
	STRUCTURAL STEEL (INCL. BRACED OR MOMENT FRAMES, COLUMNS, & BEAMS), COMPLETE	173	TON	5,000.00	866,240
	METAL DECK				
	METAL DECK + CLOSURE STEELS - ROOF	21,656	SF	4.82	104,382
	SUBTOTAL OF STRUCTURE				**970,622**
4.1	ENCLOSURE, VERTICAL				$
	EXTERIOR WALL				
	METAL STUD	13,112	SF	8.12	106,467
	METAL PANEL + ATTACHMENTS	5,245	SF	32.47	170,294
	CEMENT PLASTER + LATH/V.B.	7,867	SF	16.24	127,760
	CEMENT PLASTER + LATH/V.B., ROOF SIDE	2,419	SF	16.24	39,292
	GLAS-MAT SHEATHING	15,531	SF	4.05	62,901
	GWB + PAINT, INT. OF EXT.	10,692	SF	3.94	42,127
	BATT INSULATION	10,692	SF	1.08	11,548
	ANTI-GRAFFITTI COATING	7,867	SF	1.89	14,869
	EXTERIOR DOOR + HARDWARES + PAINT				
	ALUM-GLASS DOOR/ALUM FRAME, DUAL LEAF	2	PR	6,819.15	13,638
	HM DOOR/HM FRAME, DUAL LEAF	2	PR	2,898.14	5,796
	HM DOOR/HM FRAME, SINGLE LEAF	2	EA	1,704.79	3,410
	PANIC HARDWARE	8	EA	947.10	7,577
	EXTERIOR WINDOWS				
	STOREFRONTS	1,161	SF	74.14	86,103
	ALLOWANCE FOR PUNCHED WINDOWS	348	SF	75.77	26,399
	SUBTOTAL OF ENCLOSURE, VERTICAL				**718,181**
4.2	ENCLOSURE, HORIZONTAL				$

PROJECT: NEW F.I.S. FACILITY AT LONG BEACH AIRPORT		**JOB #:**	**C2137A-R2**
LOCATION: LONG BEACH, CA		**DATE:**	**22-Jul-16**
CLIENT: JACOBS		**REVISED:**	**25-Jul-16**
SUBJECT: BUDGETARY OPINION OF PROBABLE COST - NEW SOUTH F.I.S. FACILITY (REDUCED AREA) - OPTION 3		**GFA:**	**21,656**

ITEM NO.	DESCRIPTION	EST QTY	UNIT	UNIT COST	TOTAL COST
	ROOFING			-	-
	ASSUME MEMBRANE ROOFING + COVERBOARD + TAPERED RIGID INSULATION	21,656	SF	11.91	257,923
	ALLOWANCE FOR WALKWAY PADS	433	SF	5.95	2,577
	METAL COPING/FLASHING	804	LF	20.02	16,096
	CANTS & COUNTERFLASHING	804	LF	11.64	9,359
	ALLOWANCE FOR SKYLIGHT	866	SF	92.00	79,694
	SUBTOTAL OF ENCLOSURE, HORIZONTAL				**365,649**
4.3	SUPPORT ITEMS				$
	MISC. METALS ALLOWANCE	21,656	GSF	0.54	11,694
	ROUGH CARPENTRY ALLOWANCE	21,656	GSF	0.32	6,930
	MISC. SHEET METAL ALLOWANCE	21,656	GSF	0.27	5,847
	MISC. FIREPROOFING/FIRESTOPPING ALLOWANCE	21,656	GSF	0.22	4,764
	CAULKING & SEALANT ALLOWANCE	21,656	GSF	0.27	5,847
	MISC. PAINTING ALLOWANCE	21,656	GSF	0.22	4,764
	SUBTOTAL OF SUPPORT ITEMS				**39,846**
5.1	INTERNALS, VERTICAL				$
	INTERIOR WALLS				
	METAL STUD	44,077	SF	7.38	325,288
	GWB + PAINT	86,010	SF	3.94	338,879
	ALLOWANCE, PREMIUM FOR FIRE-RATED PARTITIONS	1	LS	66,420.00	66,420
	BATT INSULATION	44,077	SF	1.08	47,603
	CERAMIC WALL TILES + CEMENT BOARD	2,144	SF	20.02	42,923
	INTERIOR DOORS				
	INTERIOR DOORS/FRAMES, PER LEAF	38	EA	2,435.41	92,546
	ALLOWANCE, FIRE-RATED DOORS	1	LS	9,250.00	9,250
	INTERIOR GLAZINGS				
	INTERIOR WINDOWS - ALLOWANCE	116	SF	59.53	6,889
	SUBTOTAL OF INTERNALS, VERTICAL				**929,798**
5.2	INTERNALS, HORIZONTAL				$
	FLOORING + BASES				
	CARPET FLOOR - OFFICES	1,188	SF	5.41	6,427
	RESILIENT FLOORING	19,474	SF	5.14	100,096
	CERAMIC FLOOR TILE - RESTROOMS	994	SF	13.53	13,449
	CEILING				
	GWB CEILING + FRAMES + PAINT	1,419	SF	11.91	16,900
	ACT T-BAR CEILING	21,231	SF	5.68	120,592
	MISC. CEILING SOFFITS/BULKING	1	LS	3,440.00	3,440
	SUBTOTAL OF INTERNALS, HORIZONTAL				**260,904**

PROJECT: NEW F.I.S. FACILITY AT LONG BEACH AIRPORT	**JOB #:**	**C2137A-R2**
LOCATION: LONG BEACH, CA	**DATE:**	**22-Jul-16**
CLIENT: JACOBS	**REVISED:**	**25-Jul-16**
SUBJECT: BUDGETARY OPINION OF PROBABLE COST - NEW SOUTH F.I.S. FACILITY (REDUCED AREA) - OPTION 3	**GFA:**	**21,656**

ITEM NO.	DESCRIPTION	EST QTY	UNIT	UNIT COST	TOTAL COST
5.3	FINISHES, SPECIAL				$
	SEE CERAMIC TILE FINISHES ELSEWHERE				
	SUBTOTAL OF FINISHES, SPECIAL				
5.4	INTERIORS				$
	CABINETRY				
	ALLOWANCE FOR CABINETRY	21,656	GSF	2.71	58,688
	METAL FABRICATIONS				
	ALLOWANCE FOR ROOF HATCH + LADDER	1	EA	1,353.01	1,353
	ALLOWANCE FOR MISC. METAL FABRICATIONS	21,656	GSF	1.08	23,388
	MISCELLANEOUS				
	MISC. INTERIOR ELEMENTS	21,656	GSF	0.10	2,086
	SUBTOTAL OF INTERIORS				**85,515**
6.0	SPECIALTIES				$
	SPECIALTIES				
	RESTROOM SPECIALTIES	994	SF	12.37	12,296
	FIRE PROTECTION SPECIALTIES	21,656	GSF	0.40	8,662
	VISUAL AIDS/WALL PANELLING	21,656	GSF	0.11	2,382
	SIGNAGE	21,656	GSF	0.60	12,994
	MISC. SPECIALTIES	21,656	GSF	0.81	17,541
	SUBTOTAL OF SPECIALTIES				**53,875**
7.0	EQUIPMENT				$
	SECURITY SCREEN DETECTION SYSTEM EQUIPMENT			-	
	PASSENGER PROCESSING EQUIPMENT				**N.I.C.**
	HOLD ROOMS				**N.I.C.**
	BAGGAGE HANDLING EQUIPMENT			-	
	BAGGAGE CAROUSEL			-	**N.I.C.**
	MISC. EQUIPMENT ALLOWANCE	21,656	GSF	0.25	5,414
	SUBTOTAL OF EQUIPMENT				**5,414**

PROJECT: NEW F.I.S. FACILITY AT LONG BEACH AIRPORT	**JOB #:**	**C2137A-R2**
LOCATION: LONG BEACH, CA	**DATE:**	**22-Jul-16**
CLIENT: JACOBS	**REVISED:**	**25-Jul-16**
SUBJECT: BUDGETARY OPINION OF PROBABLE COST - NEW SOUTH F.I.S. FACILITY (REDUCED AREA) - OPTION 3	**GFA:**	**21,656**

ITEM NO.	DESCRIPTION	EST QTY	UNIT	UNIT COST	TOTAL COST
8.0	SPECIAL CONSTRUCTION				$
	THIS SECTION NOT APPLICABLE				
	SUBTOTAL OF SPECIAL CONSTRUCTION				
9.0	CONVEYING				$
	THIS SECTION NOT APPLICABLE				
	SUBTOTAL OF CONVEYING				
10.1	PLUMBING				$
	PLUMBING EQUIPMENT				
	PLUMBING EQUIPMENT	1	LS	16,236.08	16,236
	PLUMBING FIXTURES				
	TOILET FIXTURES + ROUGH-INS	22	EA	6,575.61	144,663
	AGRI LAB SINK + ROUGH-INS - ALLOWANCE	1	EA	6,900.34	6,900
	DRINKING FOUNTAIN, HI-LO + ROUGH-INS - ALLOWANCE	1	EA	6,827.27	6,827
	ROOF DRAIN SYSTEM	21,656	GSF	1.35	29,236
	CONDENSATE DRAIN SYSTEM	21,656	GSF	0.27	5,847
	GAS SYSTEM	21,656	GSF	0.87	18,841
	MISC. PLUMBING SYSTEM/TESTING	21,656	GSF	1.35	29,236
	FIRE PROTECTION				
	FIRE SPRINKLER SYSTEM	21,656	GSF	5.41	117,159
	SUBTOTAL OF PLUMBING				**374,945**
10.2	HVAC				$
	HVAC SYSTEM				
	BUILDING HVAC SYSTEM - PACKAGED UNITS	21,656	GSF	21.65	468,852
	MISC. HVAC SYSTEM/TESTING	21,656	GSF	1.62	35,083
	SUBTOTAL OF HVAC				**503,935**
11.0	ELECTRICAL				$
	ELECTRICAL SYSTEM				
	EQUIPMENT & PANEL BOARDS	21,656	GSF	9.20	199,235
	SECONDARY FEEDERS	21,656	GSF	4.09	88,573
	BRANCH POWER	21,656	GSF	3.79	82,076
	LIGHTING SYSTEM	21,656	GSF	10.28	222,624
	COMMUNICATIONS	21,656	GSF	5.95	128,853
	SECURITY	21,656	GSF	6.22	134,700
	FIRE ALARM	21,656	GSF	3.68	79,694
	MISC. ELECTRICAL SYSTEM/TESTING	21,656	GSF	1.17	25,338

PROJECT: NEW F.I.S. FACILITY AT LONG BEACH AIRPORT	**JOB #:**	**C2137A-R2**
LOCATION: LONG BEACH, CA	**DATE:**	**22-Jul-16**
CLIENT: JACOBS	**REVISED:**	**25-Jul-16**
SUBJECT: BUDGETARY OPINION OF PROBABLE COST - NEW SOUTH F.I.S. FACILITY (REDUCED AREA) - OPTION 3	**GFA:**	**21,656**

ITEM NO.	DESCRIPTION	EST QTY	UNIT	UNIT COST	TOTAL COST
	SUBTOTAL OF ELECTRICAL				**961,093**
	SEPARATE COST				$
1.0	**SITEWORK**				
	DEMO WORK				
	SAWCUT/DEMO OF (E) SITE PAVING + 5' BEYOND PERIMETER, ETC. INCLUDING HAUL OFF	24,696	SF	1.08	26,672
	MIDDLE CURB & SIDEWALK DEMO	3,336	SF	5.00	16,680
	ALLOWANCE FOR DEMO & RESTORATION TO (E) ADJACENT STRUCTURES AFFECTED BY NEW WORK	1	LS	10,824.06	10,824
	SITE PREPARATION				
	SITE CLEARING	28,196	SF	0.11	3,102
	ROUGH GRADING	28,196	SF	0.22	6,203
	EROSION CONTROL	28,196	SF	0.16	4,511
	OVER EXCAVATION				
	OVER EXCAVATION, ASSUME 1.5'D BELOW PAVING BASE - 5' BEYOND PERIMETER	458	CY	13.53	6,199
	OVER EXCAVATION, ASSUME 3'D BELOW FOOTING (TOTAL IS 7'D BELOW SLAB BASE)	7,081	CY	13.53	95,800
	SITE PAVING				
	ALLOWANCE FOR SITE PAVING @ 5' BEYOND IMPROVEMENTS FOOTPRINT	3,040	SF	27.06	82,262
	ROADWAY PAVEMENT, 7" AC/12" CAB	3,500	SF	15.00	52,500
	SITE UTILITIES				
	ALLOWANCE FOR UTILITY DEMO & RELOCATION AFFECTED BY NEW WORK	1	LS	162,361	162,361
	STORM DRAINS & CONNECTIONS	1	LS	15,586.64	15,587
	SEWER & CONNECTIONS	1	LS	9,416.93	9,417
	INCOMING DOMESTIC WATER & CONNECTIONS	1	LS	6,656.79	6,657
	INCOMING FIRE WATER & CONNECTIONS	1	LS	9,254.57	9,255
	INCOMING GAS & CONNECTIONS	1	LS	15,117.09	15,117
	INCOMING POWER SERVICE & CONNECTIONS	1	LS	25,195.15	25,195
	INCOMING COMMUNICATIONS SERVICE & CONNECTIONS	1	LS	12,597.58	12,598
	SUBTOTAL OF SITEWORK				**560,940**
	TOTAL INCLUDING PRORATES PER BASE ESTIMATE	**144.8%**			**812,310**
2.0	**BAGGAGE CLAIM**				
	DEMO				
	DEMO (E) BAGGAGE CLAIM - AIR SIDE	312	LF	250.00	78,000
	DEMO (E) BAGGAGE CLAIM - PASS. SIDE	346	LF	250.00	86,500
	NEW				
	NEW BAGGAGE CLAIM - AIR SIDE	210	LF	1,250.00	262,500

PROJECT: NEW F.I.S. FACILITY AT LONG BEACH AIRPORT	**JOB #:**	**C2137A-R2**
LOCATION: LONG BEACH, CA	**DATE:**	**22-Jul-16**
CLIENT: JACOBS	**REVISED:**	**25-Jul-16**
SUBJECT: BUDGETARY OPINION OF PROBABLE COST - NEW SOUTH F.I.S. FACILITY (REDUCED AREA) - OPTION 3	**GFA:**	**21,656**

ITEM NO.	DESCRIPTION	EST QTY	UNIT	UNIT COST	TOTAL COST
	NEW BAGGAGE CLAIM - PASS. SIDE	420	LF	1,250.00	525,000
	SUBTOTAL				**952,000**
	TOTAL INCLUDING PRORATES PER BASE ESTIMATE	**144.8%**			**1,378,613**

PROJECT: NEW F.I.S. FACILITY AT LONG BEACH AIRPORT	**JOB #:**	**C2137A-R2**
LOCATION : LONG BEACH, CA	**DATE:**	**22-Jul-16**
CLIENT: JACOBS	**REVISED:**	**25-Jul-16**
SUBJECT: BUDGETARY OPINION OF PROBABLE COST - RETROFIT EXISTING SECURITY CHECKPOINT BUILDING	**GFA:**	**6,750**

ITEM NO.	DESCRIPTION	EST QTY	UNIT	UNIT COST	TOTAL COST
	SUMMARY OF ESTIMATE			**$**	**$**
1.0	SITE WORK				
2.0	SUBSTRUCTURE				
3.0	STRUCTURE				
4.1	ENCLOSURE, VERTICAL				
4.2	ENCLOSURE, HORIZONTAL				
4.3	SUPPORT ITEMS	2.1%		1.23	8,303
5.1	INTERNALS, VERTICAL	17.3%		10.20	68,850
5.2	INTERNALS, HORIZONTAL	24.9%		14.66	98,956
5.3	FINISHES, SPECIAL				
5.4	INTERIORS	13.5%		7.94	53,595
6.0	SPECIALTIES	3.1%		1.84	12,420
7.0	EQUIPMENT	0.6%		0.34	2,295
8.0	SPECIAL CONSTRUCTION				
9.0	CONVEYING				
10.1	PLUMBING + FIRE PROTECTION	4.2%		2.46	16,606
10.2	HVAC	15.6%		9.16	61,830
11.0	ELECTRICAL	18.7%		10.99	74,183
	SUBTOTAL	**100.0%**		**$58.82**	**397,038**
12.00	PRORATES:				
12.10	GENERAL CONDITIONS	8.50%		5.00	33,748
12.20	CONTINGENCY	12.50%		7.98	53,848
12.30	ESCALATION	9.73%		6.98	47,145
12.40	GEOGRAPHICAL FACTOR				
12.50	MARKET FACTOR				
	SUBTOTAL			**$78.78**	**531,779**
12.60	BONDS	2.00%		1.58	10,636
12.70	CONTRACTOR'S FEE	6.00%		4.82	32,545
	TOTAL OF OPINION OF CONSTRUCTION BASE COST			**85.18**	**574,960**

PROJECT: NEW F.I.S. FACILITY AT LONG BEACH AIRPORT	**JOB #:**	**C2137A-R2**
LOCATION : LONG BEACH, CA	**DATE:**	**22-Jul-16**
CLIENT: JACOBS	**REVISED:**	**25-Jul-16**
SUBJECT: BUDGETARY OPINION OF PROBABLE COST - RETROFIT EXISTING SECURITY CHECKPOINT BUILDING	**GFA:**	**6,750**

ITEM NO.	DESCRIPTION	EST QTY	UNIT	UNIT COST	TOTAL COST
1.0	SITEWORK				$
	THIS SECTION NOT APPLICABLE				
	SUBTOTAL OF SITEWORK				
2.0	SUBSTRUCTURE				$
	THIS SECTION NOT APPLICABLE				
	SUBTOTAL OF SUBSTRUCTURE				
3.0	STRUCTURE				$
	STRUCTURE RE-WORK - ASSUME N/A				
	SUBTOTAL OF STRUCTURE				
				0.03	
4.1	ENCLOSURE, VERTICAL				$
	EXTERIOR WALLS - ASSUME NO CHANGE				-
	SUBTOTAL OF ENCLOSURE, VERTICAL				
4.2	ENCLOSURE, HORIZONTAL				$
	THIS SECTION NOT APPLICABLE				
	SUBTOTAL OF ENCLOSURE, HORIZONTAL				
4.3	SUPPORT ITEMS				$
	CAULKING & SEALANTS ALLOWANCE	6,750	GSF	0.61	4,118
	MISC. RE-PAINTING ALLOWANCE	6,750	GSF	0.62	4,185
	SUBTOTAL OF SUPPORT ITEMS				**8,303**
5.1	INTERNALS, VERTICAL				$
	INTERIOR WALLS	6,750	GSF	9.38	63,315
	INTERIOR DOORS/WINDOWS	6,750	GSF	0.82	5,535
	SUBTOTAL OF INTERNALS, VERTICAL				**68,850**
5.2	INTERNALS, HORIZONTAL				$
	FLOORING + BASES	6,750	GSF	6.11	41,243
	CEILING, COMPLETE	6,750	GSF	8.55	57,713

PROJECT: NEW F.I.S. FACILITY AT LONG BEACH AIRPORT	**JOB #:**	**C2137A-R2**
LOCATION : LONG BEACH, CA	**DATE:**	**22-Jul-16**
CLIENT: JACOBS	**REVISED:**	**25-Jul-16**
SUBJECT: BUDGETARY OPINION OF PROBABLE COST - RETROFIT EXISTING SECURITY CHECKPOINT BUILDING	**GFA:**	**6,750**

ITEM NO.	DESCRIPTION	EST QTY	UNIT	UNIT COST	TOTAL COST
	SUBTOTAL OF INTERNALS, HORIZONTAL				**98,956**
5.3	FINISHES, SPECIAL				$
	SEE CERAMIC TILE FINISHES ELSEWHERE				
	SUBTOTAL OF FINISHES, SPECIAL				
5.4	INTERIORS				$
	CASEWORK	6,750	GSF	4.28	28,890
	MISC. INTERIOR ELEMENTS	6,750	GSF	3.66	24,705
	SUBTOTAL OF INTERIORS				**53,595**
6.0	SPECIALTIES				$
	BUILDING SPECIALTIES INCLUDING SIGNAGE, COMPLETE	6,750	GSF	1.84	12,420
	SUBTOTAL OF SPECIALTIES				**12,420**
7.0	EQUIPMENT				$
	SECURITY SCREENING EQUIPMENT				**N.I.C.**
	DEMO EXISTING	6,750	GSF	0.34	2,295
	SUBTOTAL OF EQUIPMENT				**2,295**
8.0	SPECIAL CONSTRUCTION				$
	THIS SECTION NOT APPLICABLE				
	SUBTOTAL OF SPECIAL CONSTRUCTION				
9.0	CONVEYING				$
	THIS SECTION NOT APPLICABLE				
	SUBTOTAL OF CONVEYING				
10.1	PLUMBING				$
	PLUMBING REMODEL	6,750	GSF	0.93	6,278
	FIRE SPRINKLER REMODEL	6,750	GSF	1.53	10,328
	SUBTOTAL OF PLUMBING				**16,606**

PROJECT: NEW F.I.S. FACILITY AT LONG BEACH AIRPORT		**JOB #:**	**C2137A-R2**
LOCATION : LONG BEACH, CA		**DATE:**	**22-Jul-16**
CLIENT: JACOBS		**REVISED:**	**25-Jul-16**
SUBJECT: BUDGETARY OPINION OF PROBABLE COST - RETROFIT EXISTING SECURITY CHECKPOINT BUILDING		**GFA:**	**6,750**

ITEM NO.	DESCRIPTION	EST QTY	UNIT	UNIT COST	TOTAL COST
10.2	HVAC				$
	HVAC REMODEL - OFFICE DISTRIBUTION ONLY	6,750	GSF	9.16	61,830
	SUBTOTAL OF HVAC				**61,830**
11.0	ELECTRICAL				$
	ALLOWANCE FOR ELECTRICAL UPGRADE TO OFFICE STANDARDS	6,750	GSF	10.99	74,183
	SUBTOTAL OF ELECTRICAL				**74,183**

PROJECT: NEW F.I.S. FACILITY AT LONG BEACH AIRPORT	**JOB #:**	**C2137A-R2**
LOCATION: LONG BEACH	**DATE:**	**21-Jul-16**
CLIENT: JACOBS	**REVISED:**	**25-Jul-16**
SUBJECT: BUDGETARY OPINION OF PROBABLE COST - NEW SECURITY CHECKPOINT BUILDING	**GFA:**	**8,700**

ITEM NO.	DESCRIPTION	EST QTY	UNIT	UNIT COST	TOTAL COST
	SUMMARY OF ESTIMATE			**$**	**$**
1.0	SITE WORK	12.4%		43.31	376,795
2.0	SUBSTRUCTURE	4.7%		16.35	142,245
3.0	STRUCTURE	15.3%		53.42	464,771
4.1	ENCLOSURE, VERTICAL	17.1%		59.68	519,216
4.2	ENCLOSURE, HORIZONTAL	6.5%		22.84	198,742
4.3	SUPPORT ITEMS	1.2%		4.32	37,584
5.1	INTERNALS, VERTICAL	4.6%		15.96	138,852
5.2	INTERNALS, HORIZONTAL	7.4%		25.98	226,026
5.3	FINISHES, SPECIAL				
5.4	INTERIORS	0.4%		1.29	11,223
6.0	SPECIALTIES	1.5%		5.09	44,283
7.0	EQUIPMENT	2.1%		7.47	65,000
8.0	SPECIAL CONSTRUCTION				
9.0	CONVEYING				
10.1	PLUMBING + FIRE PROTECTION	3.0%		10.36	90,089
10.2	HVAC	8.0%		27.93	242,991
11.0	ELECTRICAL	15.8%		55.27	480,849
	SUBTOTAL	**100.0%**		**$349.27**	**3,038,666**
12.00	PRORATES:				
12.10	GENERAL CONDITIONS	8.50%		29.69	258,287
12.20	CONTINGENCY	12.50%		47.37	412,119
12.30	ESCALATION	9.73%		41.47	360,815
12.40	GEOGRAPHICAL FACTOR				
12.50	MARKET FACTOR				
	SUBTOTAL			**$467.80**	**4,069,887**
12.60	BONDS	2.00%		9.36	81,398
12.70	CONTRACTOR'S FEE	6.00%		28.63	249,077
	TOTAL OF OPINION OF CONSTRUCTION BASE COST			**505.79**	**4,400,362**

PROJECT: NEW F.I.S. FACILITY AT LONG BEACH AIRPORT	**JOB #:**	**C2137A-R2**
LOCATION: LONG BEACH	**DATE:**	**21-Jul-16**
CLIENT: JACOBS	**REVISED:**	**25-Jul-16**
SUBJECT: BUDGETARY OPINION OF PROBABLE COST - NEW SECURITY CHECKPOINT BUILDING	**GFA:**	**8,700**

ITEM NO.	DESCRIPTION	EST QTY	UNIT	UNIT COST	TOTAL COST
1.0	SITEWORK				$
	SITE PREP				
	SITE DEMO & PROTECTION, COMPLETE	13,186	SF	1.88	24,790
	EARTHWORK/GRADING/EXPORT	13,186	SF	0.99	13,054
	OVER EXCAVATION	13,186	SF	1.96	25,845
	EROSION CONTROL	13,186	SF	0.08	1,055
	HARDSCAPE				
	CONCRETE PAVING/CURB	3,190	SF	7.02	22,394
	ASPHALT OVERLAY	2,184	SF	2.87	6,268
	ASPHALT PAVING	1,300	SF	5.14	6,682
	SITE WALL/MISC.				
	SITE WALL (STUD & PLASTER)	26	LF	401.69	10,444
	EXISTING CANOPY REPAIR	1,352	SF	19.70	26,634
	UTILITIES				
	STORM DRAINS	13,186	SF	8.30	109,444
	SANITARY SEWER	13,186	SF	4.78	63,029
	DOMESTIC WATER	13,186	SF	0.03	435
	FIRE WATER	13,186	SF	1.03	13,582
	NATURAL GAS	13,186	SF	0.55	7,252
	SITE ELECTRICAL	13,186	SF	1.93	25,449
	MISC. SITE UTILITIES	13,186	SF	1.55	20,438
	SUBTOTAL OF SITEWORK				**376,795**
2.0	SUBSTRUCTURE				$
	FOUNDATIONS/S.O.G./CURBS	8,700	GSF	9.28	80,736
	S.O.G./CURBS	8,700	GSF	7.07	61,509
	SUBTOTAL OF SUBSTRUCTURE				**142,245**
3.0	STRUCTURE				$
	STEEL STRUCTURES	8,700	GSF	30.45	264,915
	METAL DECK	8,700	GSF	4.08	35,496
	CANOPY + DECK	3,768	SF	43.62	164,360
	SUBTOTAL OF STRUCTURE				**464,771**
4.1	ENCLOSURE, VERTICAL				$
	EXTERIOR WALLS	8,700	GSF	23.92	208,104
	EXTERIOR DOORS W/ SECURITY DEVICES	8,700	GSF	6.75	58,725
	EXTERIOR WINDOWS	8,700	GSF	29.01	252,387
	SUBTOTAL OF ENCLOSURE, VERTICAL				**519,216**

PROJECT: NEW F.I.S. FACILITY AT LONG BEACH AIRPORT		**JOB #:**	**C2137A-R2**
LOCATION: LONG BEACH		**DATE:**	**21-Jul-16**
CLIENT: JACOBS		**REVISED:**	**25-Jul-16**
SUBJECT: BUDGETARY OPINION OF PROBABLE COST - NEW SECURITY CHECKPOINT BUILDING		**GFA:**	**8,700**

ITEM NO.	DESCRIPTION	EST QTY	UNIT	UNIT COST	TOTAL COST
4.2	ENCLOSURE, HORIZONTAL				$
	BUILDING ROOFING, COMPLETE	8,700	GSF	15.23	132,501
	CANOPY ROOFING, COMPLETE	3,768	SF	16.58	62,473
	EXTERIOR SOFFIT - PAINT U/S CANOPY	3,768	SF	1.00	3,768
	SUBTOTAL OF ENCLOSURE, HORIZONTAL				**198,742**
4.3	SUPPORT ITEMS				$
	MISC. METALS ALLOWANCE	8,700	GSF	1.00	8,700
	ROUGH CARPENTRY ALLOWANCE	8,700	GSF	0.50	4,350
	MISC. SHEET METAL ALLOWANCE	8,700	GSF	0.75	6,525
	MISC. FIREPROOFING/FIRESTOPPING ALLOWANCE	8,700	GSF	1.32	11,484
	CAULKING & SEALANT ALLOWANCE	8,700	GSF	0.75	6,525
	SUBTOTAL OF SUPPORT ITEMS				**37,584**
5.1	INTERNALS, VERTICAL				$
	INTERIOR WALLS	8,700	GSF	14.95	130,065
	INTERIOR DOORS	8,700	GSF	1.01	8,787
	INTERIOR WINDOWS				NONE
	SUBTOTAL OF INTERNALS, VERTICAL				**138,852**
5.2	INTERNALS, HORIZONTAL				$
	FLOORING + BASES	8,700	GSF	5.42	47,154
	CEILING, COMPLETE	8,700	GSF	20.56	178,872
	SUBTOTAL OF INTERNALS, HORIZONTAL				**226,026**
5.3	FINISHES, SPECIAL				$
	SEE CERAMIC TILE FINISHES ELSEWHERE				
	SUBTOTAL OF FINISHES, SPECIAL				
5.4	INTERIORS				$
	CABINETRY	8,700	GSF	0.50	4,350
	METAL FABRICATIONS/MISC. METALS	8,700	GSF	0.36	3,132
	MISC. INTERIOR ELEMENTS	8,700	GSF	0.43	3,741
	SUBTOTAL OF INTERIORS				**11,223**
6.0	SPECIALTIES				$
	BUILDING SPECIALTIES INCLUDING SIGNAGE, COMPLETE	8,700	GSF	5.09	44,283
	SUBTOTAL OF SPECIALTIES				**44,283**

PROJECT: NEW F.I.S. FACILITY AT LONG BEACH AIRPORT	**JOB #:**	**C2137A-R2**
LOCATION: LONG BEACH	**DATE:**	**21-Jul-16**
CLIENT: JACOBS	**REVISED:**	**25-Jul-16**
SUBJECT: BUDGETARY OPINION OF PROBABLE COST - NEW SECURITY CHECKPOINT BUILDING	**GFA:**	**8,700**

ITEM NO.	DESCRIPTION	EST QTY	UNIT	UNIT COST	TOTAL COST
7.0	EQUIPMENT				$
	RELOCATE SECURITY SCREENING EQUIPMENT FROM (E) BUILDING TO NEW SCREENING BUILDING - ALLOWANCE PER JACOBS	1	LS	25,000.00	25,000
	FLIGHT MONITORING EQUIPMENT	4	EA	10,000.00	40,000
	SUBTOTAL OF EQUIPMENT				**65,000**
8.0	SPECIAL CONSTRUCTION				$
	THIS SECTION NOT APPLICABLE				
	SUBTOTAL OF SPECIAL CONSTRUCTION				
9.0	CONVEYING				$
	THIS SECTION NOT APPLICABLE				
	SUBTOTAL OF CONVEYING				
10.1	PLUMBING				$
	PLUMBING, COMPLETE	8,700	GSF	3.64	31,668
	FIRE PROTECTION - BUILDING	8,700	GSF	5.00	43,500
	FIRE PROTECTION - CANOPY	3,768	SF	3.96	14,921
	SUBTOTAL OF PLUMBING				**90,089**
10.2	HVAC				$
	BUILDING HVAC SYSTEM, COMPLETE	8,700	GSF	27.93	242,991
	SUBTOTAL OF HVAC				**242,991**
11.0	ELECTRICAL				$
	POWER	8,700	GSF	9.03	78,561
	LIGHTING	8,700	GSF	11.02	95,874
	DATA/TELEPHONE SYSTEM	8,700	GSF	5.83	50,721
	MUFIDS/VISUAL PAGING/P.A. SYSTEM	8,700	GSF	3.82	33,234
	FIRE ALARM SYSTEM	8,700	GSF	6.08	52,896
	SECURITY SYSTEM	8,700	GSF	15.69	136,503
	MISCELLANEOUS	8,700	GSF	3.80	33,060
	SUBTOTAL OF ELECTRICAL				**480,849**

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Appendix G. Financial Feasibility Report

PLEASE NOTE: The information, analysis, assessments and opinions contained in this document are intended for general evaluation purposes only. This document is intended for use only by its specified client and is NOT intended for use, reliance or in making financial/investment decisions by outside parties.

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Feasibility Study for a Potential FIS Facility for Long Beach Airport: Financial Feasibility Report

long beach airport

September 24, 2016

Frasca & Associates, LLC

New York | Atlanta | Houston | San Francisco | Washington, DC

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Appendix: Financial Feasibility Model

This report is provided as a deliverable to Jacobs Engineering Group, Inc. as the deliverable for the scope of services under subcontract W9Y17400-S16-0003.

Summary

Frasca & Associates, LLC (FRASCA) has evaluated the financial feasibility of the Potential FIS Facility for Long Beach Airport. For purposes of this analysis, we relied upon information provided by other members of the Jacobs consulting team related to projected capital and operating costs of a FIS and forecasted international passenger demand. We also utilized historical financial information from the Airport.

Jacobs provided three options for the Potential FIS Facility, with capital costs ranging from $17.3 million to $21.6 million. The Potential FIS Facility provides only facilities required by Customs and Border Protection to process international arriving passengers; all international flights would use existing terminal facilities. LaCosta Consulting Group (LCG) forecasted that demand for international flights, under the Airport's existing slot regime, would result in 379,281 annual FIS arriving passengers after a three year ramp up period. These passengers would be new activity for the Airport, not displacing existing domestic activity. Jacobs also provided annual expense projections for operating costs, major maintenance and U.S. Customs and Border Protection (CBP) costs, as detailed herein.

Based upon these inputs, FRASCA developed a financial feasibility model to evaluate the affordability of the Potential FIS Facility. For purposes of this analysis, we reviewed the Airport's funding capacity, including the outstanding airport revenue bonds that successfully financed the new terminal concourse and parking garage and the Airport's Passenger Facility Charge (PFC) program. Further, we assessed the projected demand for the Potential FIS Facility, noting that it is driven by JetBlue's strategic plans to serve Mexico and Latin America. Based upon these factors, we developed a financing plan that included $3 million of Airport PFC funding with the balance of the capital costs funded directly by JetBlue, as the primary user of the facility[1]. We also assessed the incremental concession and ground transportation revenues that would be generated from the international passenger activity. Consistent with the Airport's existing "modified residual" airline rate methodology, we assumed that these revenues would be used to offset a portion of the facility operating expenses.

The resulting effective "FIS Charge"[2], reflecting the net capital and operating expenses for the Potential FIS Facility, is projected to be approximately $13 per FIS arriving passenger in 2020 (reflecting start-up costs and the initial ramp-up of international activity) and then approximately $6 per FIS arriving passenger over the next ten years. This fee level is in the range of FIS charges at other comparable airports in California.

Based upon these analyses as detailed in this report, we believe that the Potential FIS Facility would be financially feasible.

[1] This preliminary financing plan assumes that JetBlue would have the right to recover a portion of its capital investment from other airlines that utilize the FIS via the FIS Charge, which would be paid by the other airlines on a per arriving passenger basis.

[2] The effective fee includes both the recovery of JetBlue's assumed capital investment and the ongoing net operating expenses of the Airport in the facility.

1.) Financial Position of Long Beach Airport

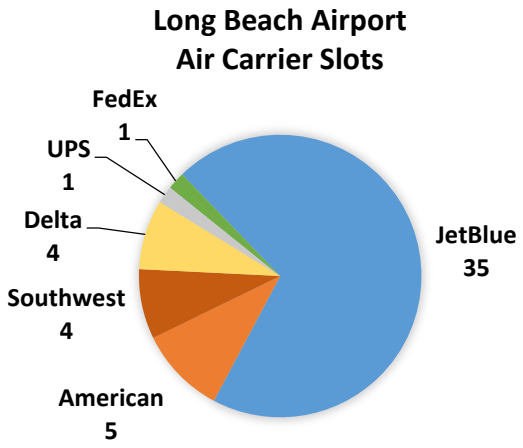
Airport Overview:

Long Beach Airport (LGB) is a "small hub"[3] commercial service airport serving the Los Angeles – Long Beach – Riverside Combined Statistical Area. The Air Trade Area (ATA) is the second largest in the United States and the City of Long Beach is the second largest city in the ATA. LGB competes for traffic with other commercial airports in the ATA, including Los Angeles International (LAX), John Wayne-Orange County (SNA), Hollywood Burbank, and Ontario International Airports.

LGB primarily serves an "origin and destination" (O&D) market, with 95.1% of passengers representing either local residents or visitors to the ATA. Only 4.9% of LGB's passenger traffic utilizes the Airport for connecting flights.

Passenger Airlines Serving the Airport (as of August 2016)
American Airlines*
Delta Air Lines*
JetBlue Airways
Southwest Airlines
* Includes service provided by regional affiliates

The number of commercial flights at LGB is regulated by the Airport Noise Compatibility Ordinance (Ordinance). One component of the Ordinance currently permits air carriers (passenger and all-cargo) to operate a minimum of 50 flights per day and commuter carriers[4] to operate a minimum of 25 flights per day. The current allocation of air carrier slots is below:



[3] As classified by the Federal Aviation Administration (FAA).
[4] Limited to aircraft having a certificated maximum take-off weight of less than 75,000 pounds.

The air carrier slots are fully allocated, but have not been fully utilized, as airlines do not schedule flights for every day of the week or at off-peak times of the year. JetBlue is the largest operator at LGB, with a market share of 70% of the air carrier slots and 83% of enplaned passengers.

Of the 25 commuter slots, three are allocated to Delta and the balance is unallocated.

For purposes of this report, no change to the number or allocation of slots has been assumed.

Long Beach Airport Financial Structure:

LGB operates as a financially self-sustaining enterprise fund of the City. As such, it does not receive any City general revenue funds or taxes. Rather, all operating and capital costs of LGB are recovered from the operations of the Airport. LGB's revenues include:

- *Direct Airline Revenues*: Rates and charges directly paid by the airlines for use of the airfield and terminal including landing fees, terminal rents, common use fees, and ramp remain overnight charges
- *Indirect Airline Revenues*: Revenues derived from passenger traffic activity including terminal concessions, parking, rental car, and ground transportation
- *Non-Airline Revenues*: Revenues not related to airline activity including general aviation fuel fees and rents from fixed base operators and real estate tenants

Like other commercial airports in the U.S., LGB may also receive FAA Airport Improvement Program (AIP) grants for certain eligible capital costs and Transportation Security Agency (TSA) grants for certain eligible security expenditures. LGB also can and does impose a Passenger Facility Charge (PFC) to fund certain eligible capital costs approved by the FAA.

The financial operations of LGB are established by an annual adoption of a Rate Ordinance by the City Council and the granting of Commercial Use Permits to the airlines. The permits allow the use of LGB's facilities on a month-to-month basis and are cancellable on thirty days' notice.

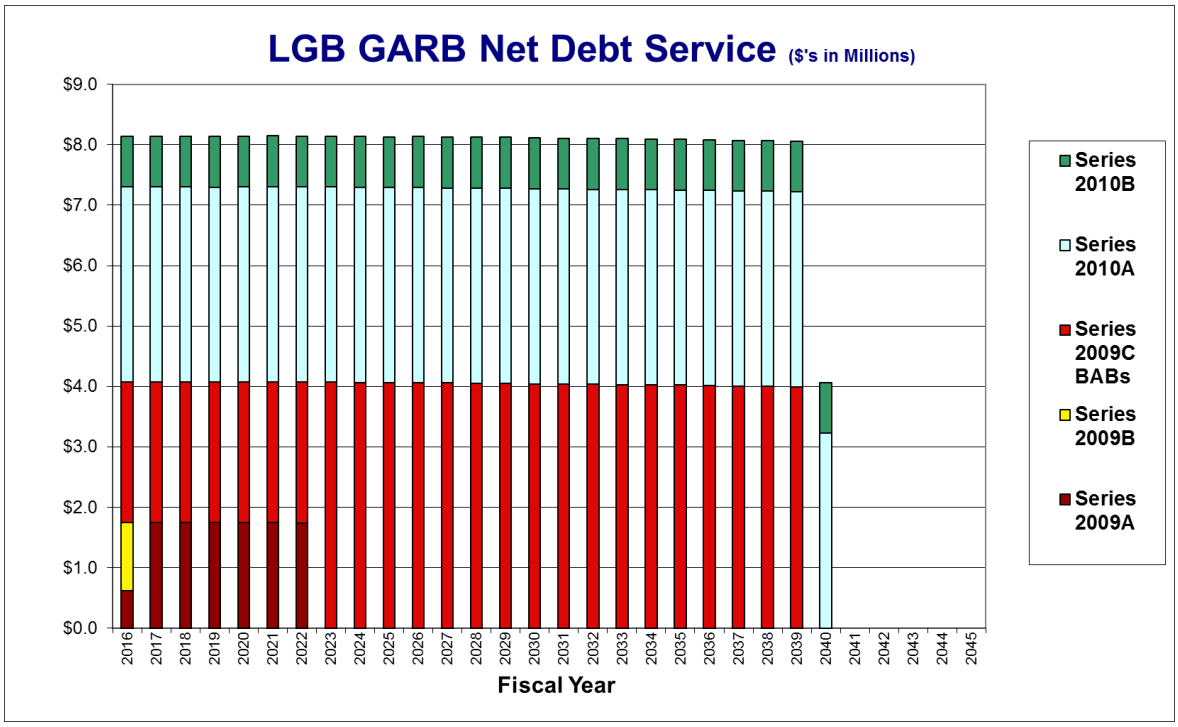
Airport Debt:

The City has previously issued Airport Revenue Bonds to fund critical airport infrastructure projects at LGB. In connection with these bond issuances, LGB adopted financial policies and used these policies to develop a long-term capital improvement program and funding plan. This information was shared with bond rating agencies and investors to support the transaction.

The currently outstanding debt, as of July 1, 2016, totals $110.2 million. These bonds funded the following projects:

Bond Series	Projects Funded
2009	✓ New parking garage
2010	✓ New terminal concourse ✓ Related infrastructure ✓ Airfield improvements

All debt service on the Bonds is secured by and payable solely from Airport Net Revenues, including airline fees and rents; parking and concession revenues and other airport revenues. As discussed further below, the Series 2010 debt service is also partially funded by PFC revenues. No funding from the City and no City tax dollars are used to fund any of this debt service.



LGB Passenger Facility Charge (PFC) Program:

LGB's PFC revenues are a function of the PFC collection rate and the level of eligible enplaned passengers. Similar to most commercial hub airports in the U.S., LGB has been approved to impose and use a $4.50 per enplaned passenger PFC rate (of which, the Airport receives $4.39 with the $0.11 balance retained by the collecting airline), the maximum PFC level currently allowed by federal statute.

LGB is currently authorized to impose and collect PFCs through April 1, 2034 for the funding of projects approved by the FAA (including those discussed below). Any additional PFC funding for new projects would require FAA approval and result in an extension of the PFC collection period beyond 2034.

PFC revenues (collections plus interest) in FY 2015 were $5.3 million. The Airport's unspent PFC fund balance as of the end of FY 2015 was $16.1 million. The balance of unspent PFC funds varies over time as capital projects are implemented, but the Airport has an informal policy to maintain a minimum balance of PFCs funds to meet projected spending needs for debt service and upcoming "PAYGO" ("Pay-As-You-GO"; i.e., funding capital expenditures as incurred, rather than borrowing funds for the project) funded projects in its capital plan given the risks of declining PFC revenues if traffic activity declines.

LGB has programmed PFCs to fund 85% of the Series 2010A debt service (approximately $2.75 million per year of PFC funding, related to the new terminal project) and 100% of the Series 2010B debt service (approximately $0.84 million of PFC funding per year, related to airfield improvements). Pledged PFCs (i.e., the amounts committed to bondholders to fund debt service) equal the lesser of actual PFC Revenues or 125% of the amount of PFC funded debt service. LGB, under its FAA-approved PFC applications, may choose to apply more or less PFCs to fund the Series 2010 debt service in any given fiscal year as long as total PFC expenditures remain within approved amounts in aggregate over the 30 year term of the bonds. Any debt service amounts not paid for with PFC revenues are to be paid from operating revenues (airline rates and charges and nonairline revenues).

Fiscal Year (ending September 30th)	PFC-Funded Debt Service ($M)
2012	$0.84
2013	$3.58
2014	$3.59
2015	$3.59
2016 (estimate)	$3.59

LGB anticipates continuing to use approximately $3.6 million of PFC revenues per year to fund future debt service while the Series 2010 Bonds are outstanding. PFCs are also planned to be used for several PAYGO-funded projects from approved applications.

Furthermore, the Airport has no plans to further leverage PFCs but rather has programmed most of its remaining PFCs for ongoing airfield and other infrastructure rehabilitation projects, primarily as the local match to AIP grant funding. A PFC application will be developed in the near future and is likely to include funding for the following projects:

- Runway 7R-25L Improvements
- Northwest Focus Area Pavement Removal
- Runway 16L-34R Conversion to Taxiway C
- Ticket Counter Belt Improvements

Airport Financial Performance:

LGB has maintained sound financial performance in recent years. LGB's financial performance is in line with industry medians for the key industry metrics:

Financial Metric	LGB (FY 2015)	Moody's Medians[5]
Debt Service Coverage (Cash-based)	1.49x	1.53x
Debt per Enplaned Passenger	$86	$70
Days' Cash on Hand	526	560
Airline Cost per Enplaned Passenger	$8.92	$8.42

LGB has maintained solid credit ratings of A3 (Stable Outlook) from Moody's and A- (Negative Outlook) from Fitch Ratings. The primary credit concern from the rating agencies about the Airport has been the decrease in passenger traffic since 2012 as JetBlue reduced its flights after the issuance of airport bonds in 2009 and 2010. The cut in traffic levels led Moody's to downgrade the Airport from A2 to A3 on October 13, 2014 and Fitch to assign a negative outlook on the credit on July 9, 2015[6]. In 2016, this trend has started to reverse, as new service by Southwest Airlines in June 2016 to Oakland and the competitive response by JetBlue is expected to result in a recovery in passenger traffic.

[5] Source: *Moody's US Airport Medians Fiscal 2014*, published November 12, 2015. The medians listed are for all airports rated by Moody's.

[6] Fitch maintained its Negative Outlook on LGB in a report issued July 25, 2016.

2.) Key Factors Impacting the Financial Feasibility of a Potential FIS Facility

To determine the financial feasibility of any potential capital project at an airport, the following variables are key factors:

1. ***Demand for the Project***: U.S. commercial hub airports are financially self-sustaining enterprises. As such, discretionary capital projects (i.e., other than projects necessary to meet federal and state regulatory requirements and to comply with safety and security needs) are evaluated relative to the demand for the project from airlines, passengers, and other stakeholders.

2. ***Capital Cost of the Project***: The upfront investment requirements of a project are assessed to determine the ability of the airport or tenants to fund the new facility.

3. ***Operating Costs of the Project***: The annual operating expenses as well as the life-cycle major maintenance requirements of a project are assessed to determine the ongoing financial commitments necessary to support a new facility.

4. ***Airline/Tenant Commitments***: Airline/tenant commitments can come in different forms, including tenant capital investment in the new facility and long-term lease agreements, where applicable.

5. ***Funding Plan for the Project***: Airport funding sources are limited and, in the case of federal grants and PFCs, also restricted in their use. The residual funding source, once PAYGO sources are exhausted, is debt. Debt capacity is constrained by existing debt levels, bond covenants, and affordability considerations for airlines and other users. The highest priority projects for airports are those that maintain existing assets and infrastructure and ensure safe and secure operations, with other projects prioritized to meet strategic objectives related to operational, capacity, and customer service needs. Like any potential capital project, the Potential FIS Facility would need to compete with LGB's ongoing capital plan for finite funding sources.

These factors are evaluated in the following section of this report for the Potential FIS Facility.

3.) Projected Traffic Demand for a Potential FIS Facility

Key assumptions for the projected traffic demand for a Potential FIS Facility are taken from the Market Analysis report prepared by the LaCosta Consulting Group ("LCG") for Jacobs. LCG evaluated the role of a Potential FIS Facility at LGB in the Southern California Airport market; airline interest in providing international flights at LGB; and a projection of the international markets and service levels if a Potential FIS Facility were to be provided at LGB.

LCG assumed that the "noise budget" at LGB remains capped at the current 50 air carrier slots per day.

LCG determined that for planning purposes there would be an initial start-up of 6 international flights per day in the first year increasing to 8 daily flights by year five. LGC analyzed several factors and drivers of demand in its traffic forecast, including: the U.S.-Mexico market; price elasticity and new capacity; business in the Long Beach metro area; community of interest (friends and family and U.S. ex-patriates); vacation destinations; convention business; port business; general aviation business; and geographic attributes.

Further, additional factors that support the projected demand for the Potential FIS Facility are:

- JetBlue has no current international service from the West Coast and Long Beach, which serves as a focus city for the carrier, would be a logical location for flights to Mexico and Central America

- Growth in international flight activity as carriers such as Southwest are adding flights from LAX and SNA to vacation destinations in Mexico and Central America

- LGB's attractive and convenient terminal facilities

LCG's forecast assumed:

- No change in the number or allocations of slots at LGB.

- The use of 150-seat A320 aircraft with an average load factor of 85%.

- International departures (by year) as shown in the following table.

Year	1	2	3	4	5
Scheduled Daily Flights	First six months: 3 Last six months: 6	6	6	8	8
Ad Hoc & Charter	--	36.5 annual flights	36.5 annual flights	54.8 annual flights	54.8 annual flights

Source: LCG Market Analysis (Appendix A)

Based upon these assumptions, LCG's forecasted international enplanement activity is:

Year	1	2	3	4	5
Seats	246,375	333,975	336,713	446,213	446,213
Enplanements	**209,419**	**283,879**	**286,206**	**379,281**	**379,281**
Departures	1,643	2,227	2,245	2,975	2,975

Source: LCG Market Analysis (Appendix A)

LCG has stated that the above demand forecast for international departures and enplanements is **incremental** to the current service levels at LGB. In other words, the forecasted international activity, while remaining fully within the current Airport noise budget, would utilize existing slots that are not today used for domestic flights. This finding is a key update from FRASCA's prior analyses in 2013.

LCG also assumed that the charter and ad hoc scheduled flights would utilize slots that result from the cancellation of scheduled flights. Since this activity would not be incremental to the Airport's existing traffic levels, we have not included this demand in the financial feasibility projections.

Year	1	2	3	4	5
Incremental Enplanements at LGB	**209,419**	**283,879**	**286,206**	**379,281**	**379,281**

Assumptions:

- A320 aircraft with 150 seats
- 85% average load factor
- Average daily international departures:
  - Year 1: 4.5
  - Years 2-3: 6
  - Years 4-5 (and thereafter): 8

4.) Estimated Project Capital and Operating Costs

Capital Costs:

Jacobs Engineering provided an assessment of the facility requirements for the Potential FIS Facility at LGB and prepared an initial capital budget for the project.

($'s in millions)	North FIS Facility – Option 1	South FIS Facility – Option 2	South FIS Facility – Option 3
Design & Administrative Costs	$1.636	$1.316	$1.545
Construction Costs	16.357	13.152	15.442
Construction Management & Overhead	3.565	2.867	3.363
Total	**$21.266**	**$17.100**	**$20.353**
Source: Jacobs Engineering			

Jacobs estimated that a Potential FIS facility would total between 21,656 square feet to 38,732 square feet depending upon the option.

Direct Operating and Major Maintenance Expenses:

Jacobs provided a 20-year forecast of operating expenses and major maintenance expenses for the Potential FIS Facility.

Annual operating expenses range from $336,000 to $358,000 for the first year of the potential facility's operation. Jacobs developed these estimates based upon the following assumptions:

- Custodial Services Expenses: annual expenses based upon three full time equivalent staff with a salary of $20.346 per hour plus $10.26 in benefits.

- Equipment Maintenance Expense: annual expenses equal to 5% of the capital investment in equipment.

- Equipment Operating Expense: annual expenses equal to 0.5% of the capital investment in equipment.

- System Maintenance Expense: annual expenses equal to 2.5% of the capital investment in systems.

- Systems Operating Expense: annual expenses equal to 0.5% of the capital investment in systems.

Annual cost inflation is assumed to be 3.3% per annum.

Based upon Jacobs' estimates, major maintenance expenses include:

- Recurring Capital Costs assume 25% replacement at year 10 and 50% replacement at year 20.

- Asphalt Pavement assumes 25% replacement at year 5, 50% replacement at year 10, 25% at year 15, and full replacement at year 20.

- Aircraft Parking [Concrete] Pavement assumes 10% replacement at year 5, 25% replacement at year 10, 10% at year 15, and 25% replacement at year 20.

Customs and Border Protection Costs:

For purposes of this study, Jacobs assumed that the Potential FIS Facility would be designated as a User Fee Airport ("UFA")[7] by U.S. Customs and Border Protection. A UFA is an airport designated to receive CBP services for the purposes of processing aircraft entering the United States and its passengers, crew and cargo. An approved UFA receiving CBP services is responsible for payment of the following fees:

- Per Inspector - $140,874 for the first year and $123,438 for succeeding years (Supervisors cost 1.15x inspector costs)

- ADP costs per inspector - $17,042 to $21,062 (1st year) and $13,620 to $17,640 for succeeding years depending on the location

[7] Alternatively, an airport meeting certain criteria including, but not limited to, 15,000 international air passengers may be designated as a "Port of Entry" facility by CBP. At User Fee airports, the airport operator is responsible for all costs associated with federal inspection services including CBP staffing. Once an airport is designated as a Port of Entry, such CBP costs are the responsibility of the federal government. Although the forecasted activity for the Airport exceeds the minimum international air passenger level to be designated as a Port of Entry, Jacobs conservatively assumed that CBP costs would remain the responsibility of the Airport for financial modelling and projection purposes.

- Other associated costs such as overtime

CBP staffing levels are contingent upon actual flight operations. Final staffing levels will be negotiated with CBP and included in a final MOU with the Airport. For purposes of this report, based upon the projected activity levels from LCG in the Market Analysis, Jacobs developed the following CBP staffing estimates per eight hour shift:

- Inspectors: 10
- Agriculture Officers: 2
- Supervisor: 1

Further, based upon the flight schedule from the Market Analysis, Jacobs assumed that CBP would staff the Potential FIS Facility with a regular shift on weekdays from 12:30 to 21:30 hours and assign overtime shifts on weekdays from 07:30 to 10:30 hours and weekends from 12:30 to 21:30 hours.

Annual costs for CBP services based upon Jacobs' projections are $3.7 million in 2020.

5.) Alternative Capital Funding Sources

The typical funding sources for capital projects at an airport include:

1. Airport Investment
    a. Airport Cash Reserves on a PAYGO basis
    b. General Airport Revenue Bonds (GARB) proceeds
2. Airport Improvement Program (AIP) grants
3. Airport Passenger Facility Charges (PFC) revenue
4. Customer Facility Charges (CFC) revenue
5. Tenant Investment
    a. Direct tenant funds
    b. Special facility bonds directly funded by tenant rental payments

For a project such as the Potential FIS Facility, funding generally comes from airport investment, airport PFC revenue and/or tenant investment. While terminal projects can meet AIP grant eligibility requirements, AIP funding for airports of LGB's size is targeted almost exclusively to airfield projects, which are the highest priority for the FAA under the National Plan for Integrated Air Systems. Further, under California statute, rental car CFC revenue is limited to funding certain rental car facilities and related common transportation systems. For purposes of this analysis, we have assumed that no AIP grant or CFC funding is available.

LGB's Current Capital Plan:

The Airport maintains an updated rolling five-year Capital Improvement Plan (CIP) to identify the capital investments needed to maintain LGB in a state of good repair, to meet demand requirements, to satisfy regulatory, safety and security requirements, and to maintain strong customer service standards. The current Fiscal Year 2017-2021 CIP includes the following:

FY 2017-2021 Capital Improvement Plan Project			
Year	Project	Description	Amount
FY2017	AP1070	Airfield Improvements, As-Needed	1,000,000
FY2017	AP1038	Baggage Claim Area Improvements	1,669,334
FY2017	AP1270	Car Rental Facilities – CSB	2,317,896
FY2017	AP1270	Car Rental Facilities – QTA	436,620
FY2017	AP1030	Ground Transportation Center	129,289
FY2017	AP1210	Lot A Parking Garage Improvements	1,510,008
FY2017	AP1030	Phase 1 Adjacent Roadway Improvements	1,250,428

FY 2017-2021 Capital Improvement Plan Project			
Year	**Project**	**Description**	**Amount**
FY2017	AP1030	Phase 3 Adjacent Roadway Improvements	101,624
FY2017	AP1130	Security System Improvements, As-Needed	100,000
FY2017	AP1030	Terminal Area Improvements As-Needed	100,000
FY2017	AP1030	Terminal Renovation	2,592,364
FY2018	AP1070	AGS Phase 3 - Taxiway F Realignment & Reconstruction	11,219,000
FY2018	AP1070	AGS Phase 4 - Taxiway D Realignment & Reconstruction Between TWY E and TWY F	3,809,000
FY2018	AP1070	Airfield Improvements, As-Needed	1,000,000
FY2018	AP1270	Car Rental Facilities – CSB	1,554,261
FY2018	AP1270	Car Rental Facilities – QTA	2,041,653
FY2018	AP1030	Ground Transportation Center	774,248
FY2018	AP1030	Phase 3 Adjacent Roadway Improvements	597,922
FY2018	AP1130	Security System Improvements, As-Needed	100,000
FY2018	AP1030	Terminal Area Improvements As-Needed	100,000
FY2018	AP1030	Terminal Renovation	2,386,395
FY2019	AP1070	Airfield Improvements, As-Needed	1,000,000
FY2019	AP1035	Airport Support Facilities	771,927
FY2019	AP1270	Car Rental Facilities – QTA	1,985,871
FY2019	AP1030	Ground Transportation Center	1,564,376
FY2019	AP1035	In-line Baggage Screening Facility	1,380,594
FY2019	AP1030	Phase 3 Adjacent Roadway Improvements	1,156,560
FY2019	AP1130	Security System Improvements, As-Needed	100,000
FY2019	AP1030	Terminal Area Improvements As-Needed	100,000
FY2020	AP1070	AGS Phase 5 - Runway 16L-34R Conversion to Taxiway C	13,923,000
FY2020	AP1070	Airfield Improvements, As-Needed	1,000,000
FY2020	AP1035	Airport Support Facilities	3,086,173
FY2020	AP1030	Ground Transportation Center	271,087
FY2020	AP1035	In-line Baggage Screening Facility	6,000,114
FY2020	AP1030	Phase 3 Adjacent Roadway Improvements	247,893
FY2020	AP1130	Security System Improvements, As-Needed	100,000
FY2020	AP1030	Terminal Area Improvements As-Needed	100,000
FY2020	AP1050	UST Removal and System Mod at Site 29 2	150,000
FY2020	AP1050	UST System Replacement at ARFF 16 - Site 16 2	350,000
FY2021	AP1070	Airfield Improvements, As-Needed	1,000,000
FY2021	AP1035	Airport Support Facilities	5,134,899
FY2021	AP1035	In-line Baggage Screening Facility	5,633,291
FY2021	AP1130	Security System Improvements, As-Needed	100,000
FY2021	AP1030	Terminal Area Improvements As-Needed	100,000
		Total	**$80,045,830**

Potential Funding Options for a Potential FIS Facility:

Based upon the Airport's outstanding debt level relative to peer airports and the nature of the projected demand for the Potential FIS Facility, we do not believe that GARB funding and additional leveraging by LGB is prudent at this time. The Airport has utilized a significant portion of its debt (and PFC) capacity to fund facilities such as its award-winning terminal concourse as well as Parking Garage B and airfield improvements that are used by all LGB passengers, not just a small subset as would be the case with the Potential FIS Facility. These investments have enhanced operations and customer service at LGB and are utilized by all of the Airport's airlines and passengers. As noted earlier, LGB has slightly above average debt levels (as measured by debt per enplaned passenger compared to industry medians) and has crafted its Capital Plan to avoid any further bond issuance in the next several years.

The Potential FIS Facility, while serving projected international demand in the Long Beach region, is also a function of the strategic plans and route strategies of LGB's leading passenger airline, JetBlue. Although the facility would be available to all airlines serving the Airport, at this time, the forecast projects that only JetBlue would utilize the Potential FIS Facility and serve international markets from LGB. If another carrier were to express interest in adding international service at LGB, there would be no impact to the funding plan.

Based upon these factors, for this analysis, we have assumed the following funding approach for the Potential FIS Facility:

- ***PFC PAYGO Funding***: PFC funding of $3.0 million consistent with the Airport's initial conceptual planning assumptions from 2013. LGB's PFC program has not significantly changed in the past few years, and this level of PFC funding remains reasonable.

- ***Tenant Investment***: We have assumed that JetBlue would fund the balance of the capital requirements of the potential project with internal funds. For purposes of financial modeling, we assumed this investment would be amortized by JetBlue over 20 years (including 3 years of interest only amortization to allow for the ramp-up of passenger activity) at a 6% discount rate.

6.) Proforma Financial Results

FRASCA evaluated the financial feasibility of the Potential FIS Facility for Long Beach Airport by developing a pro-forma financial model for the project, utilizing the cost estimates provided by Jacobs and traffic forecast developed by LCG for the Market Analysis as noted earlier in this report.

FIS fees vary significantly from airport to airport. International "gateway" airports such as Los Angeles, San Francisco, New York JFK, Newark Liberty, Miami, Chicago O'Hare, Houston Intercontinental and others charge full cost recovery and fees can be significant. Other hub airports set FIS fees based upon an assessment of market conditions and such rates may or may not allow for full cost recovery. For our analysis of a reasonable FIS fee for LGB, we have surveyed FIS rates at other Southern California and airports in the Southwest U.S.:

Airport	Current FIS Fees[8]
Orange County – John Wayne Airport	Effective fee of $6.80 (2016) per FIS arriving passenger based upon allocated costs and FIS square footage
San Diego International Airport	$2.00 per arriving international seat
Oakland International Airport	$10.00 per arriving international passenger
Fresno Yosemite International Airport	$12.00 per deplaned passenger using the FIS facility
Phoenix Sky Harbor International Airport	Fee per FIS arriving passenger: $1.30 (2016); $2.55 (2017) & $4.00 (2018) Per aircraft turn fee: $430 (2016); $562.70 (2017) & $662 (2018)

[8] Source: Airport reports and records.

As noted earlier, we developed a financing plan that included $3 million of Airport PFC funding with the balance of the capital costs funded directly by JetBlue, as the primary user of the facility[9]. The resulting FIS Capital Charge, required based upon the net capital investment, would range from **$3.52 to $4.65 per FIS arriving passenger,** after the ramp-up in projected FIS activity. This capital charge reflects the amortization JetBlue's capital investment in the facility[10]. Under federal PFC regulations, the PFC funding of a capital project is not allowed to be included in the airline rate base[11]. As such, the Airport's PFC funding of a portion of the Potential FIS Facility would not be recovered from JetBlue or other users of the facility.

	Projected FIS Capital Charge Reflecting Cost of JetBlue's Assumed Capital Investment[12]			
	2020	2021	2022	2023 - 2039
North FIS Facility – Option 1	$4.65	$3.43	$3.43	$4.56
South FIS Facility – Option 2	$3.59	$2.65	$2.65	$3.52
South FIS Facility – Option 3	$4.35	$3.21	$3.21	$4.26

We also reviewed forecasted operating expenses and major maintenance expense projections prepared by Jacobs for the Potential FIS Facility. Major maintenance expenses, for purposes of the projections, were assumed to be funded over time (Year 10 expenditures were assumed to be funded in level amounts over the prior five years and the combined Year 15 and 20 expenditures were funded in level payments over Years 11 to 20).

Third, U.S. Customs and Border Protection costs, as developed by Jacobs and assuming the Airport were designated a User Fee Airport as noted above, were included. Actual CBP staffing level and costs would be negotiated between CBP and the City based upon actual flight activity and included in a Memorandum of Understanding. Based upon Jacobs' estimates, CBP costs would be $3.7 million in 2020, $3.5 million in 2021, $3.6 million in 2022 and increased for annual cost of living inflationary adjustments thereafter.

Under the Airport's existing "modified residual" airline rate methodology, the Airport utilizes non-airline revenues in excess of required financial targets to offset airline rates. For the

[9] This preliminary financing plan assumes that JetBlue would have the right to recover a portion of its capital investment from other airlines that utilize the FIS via the FIS Charge, which would be paid by the other airlines on a per arriving passenger basis.

[10] For purposes of this analysis, JetBlue's direct capital investment is assumed to be amortized at 5.0% over 20 years, with the first three years being interest only. JetBlue may elect to fund this investment with cash, debt or other funds it has available.

[11] PFC Assurance #8.

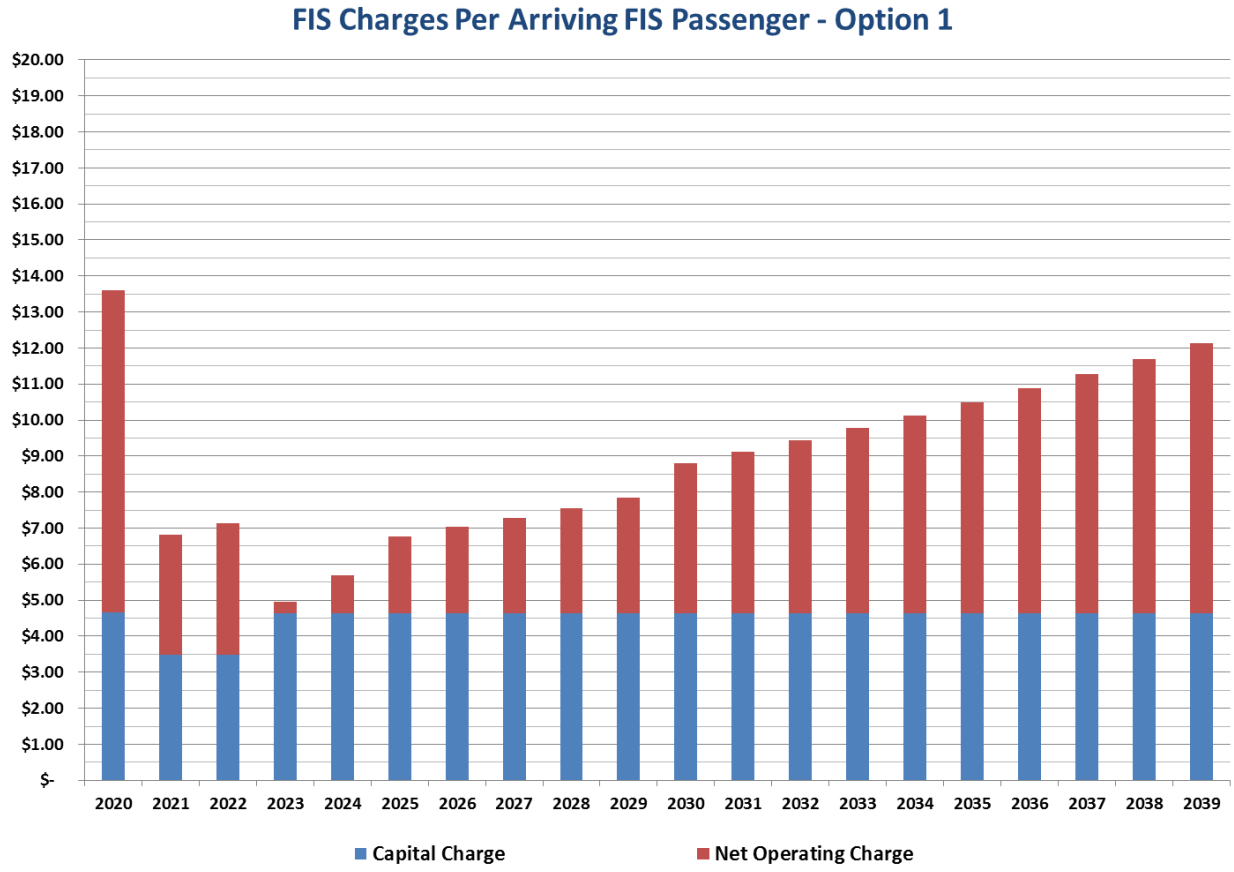
[12] For JetBlue, these amounts would be their imputed costs to amortize the assumed capital investment made in the Potential FIS Facility. If other carriers were to utilize the facility, JetBlue would charge these amounts to recover a share of their capital investment from these other carriers.

Potential FIS Facility, we analyzed the incremental revenues to the Airport from terminal concessions (restaurants and retail shops in the terminal), parking and rental cars based upon the forecasted international passenger activity. The incremental revenues per enplaned passenger, based upon current passenger spending rates using year-to-date FY 2016 data, are assumed to be:

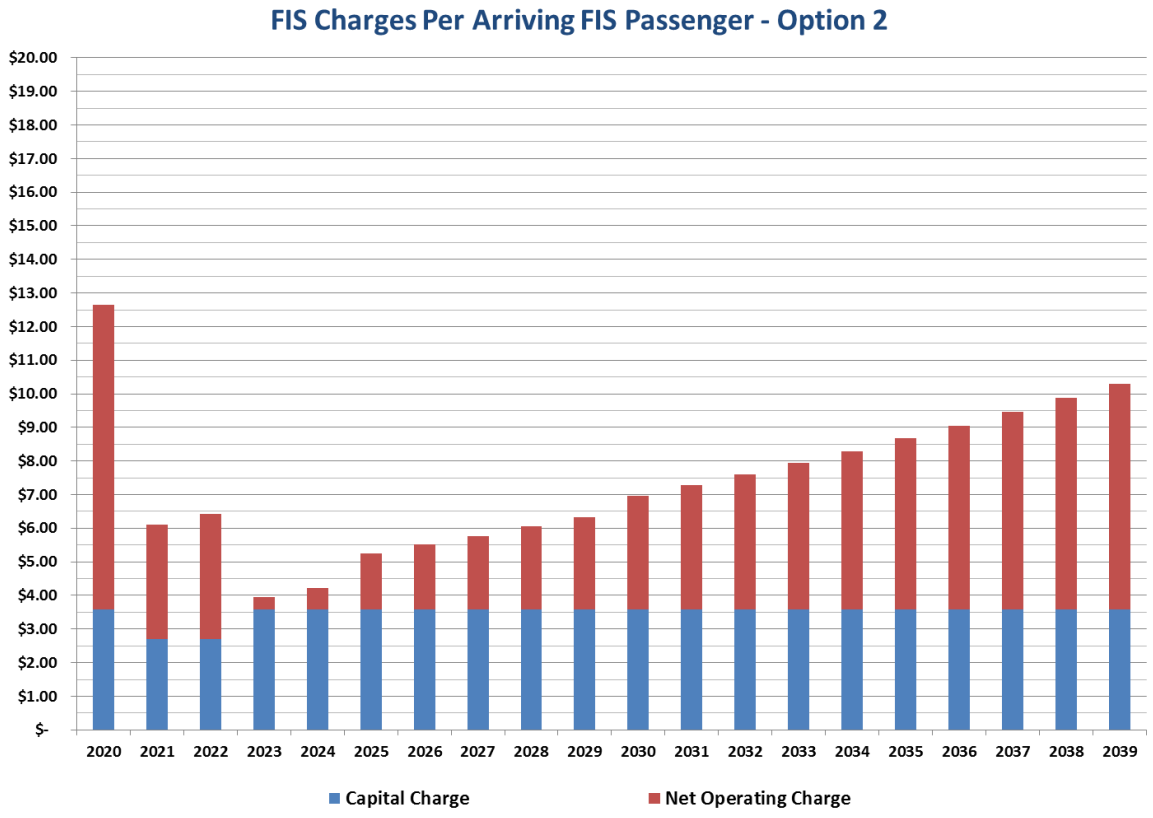
- Terminal Concessions [13],: $1.75 per enplaned passenger
- Parking: $6.00 per enplaned passenger
- Rental Car: $2.10 per enplaned passenger

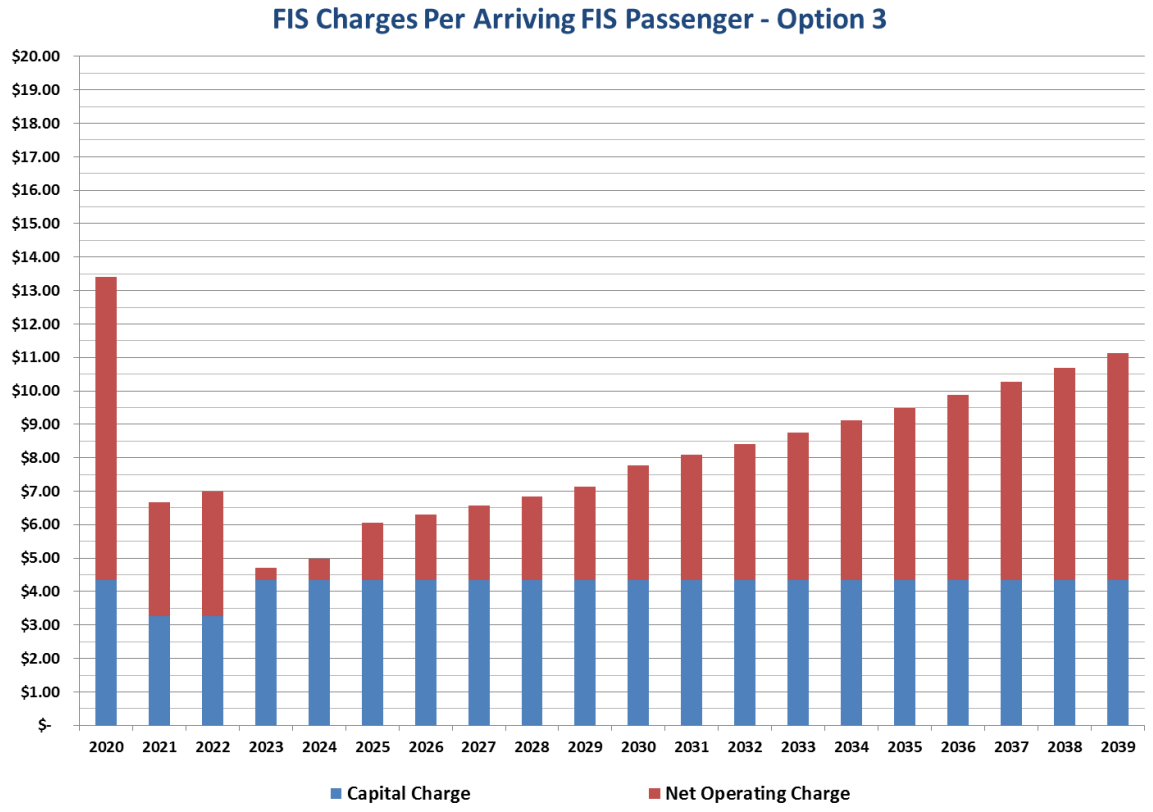
Based upon the projected international traffic, these non-airline revenues are forecasted to be $2.2 million in 2020, $3.0 million in 2021, $3.0 million in 2022 and $4.1 million in 2023, with inflationary increases thereafter.

The following graphs reflect the projected FIS Charges per Arriving FIS Passenger for each of the facility options.



[13] For purposes of this analysis, we did not adjust the current spending and concessions rental revenue per passenger that is currently generated at LGB. Depending upon the profile of the international passengers, additional revenues from duty free sales may be possible.


FIS Charges Per Arriving FIS Passenger - Option 2
$20.00
$19.00
$18.00
$17.00
$16.00
$15.00
$14.00
$13.00
$12.00
$11.00
$10.00
$9.00
$8.00
$7.00
$6.00
$5.00
$4.00
$3.00
$2.00
$1.00
$-
2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035 2036 2037 2038 2039
Capital Charge
Net Operating Charge


FIS Charges Per Arriving FIS Passenger - Option 3
$20.00
$19.00
$18.00
$17.00
$16.00
$15.00
$14.00
$13.00
$12.00
$11.00
$10.00
$9.00
$8.00
$7.00
$6.00
$5.00
$4.00
$3.00
$2.00
$1.00
$-
2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035 2036 2037 2038 2039
Capital Charge
Net Operating Charge

The projected FIS Charges in the previous graphs reflect the following:

	JetBlue	Other Potential Carriers
Capital Charge (*blue bars*)	Imputed charge reflecting amortization of JetBlue's capital investment in the facility	Charge paid by other potential users of the facility to JetBlue to reimburse a pro-rata share of its capital investment
Net Operating Charge (*red bars*)	Fees paid to the Airport to recover the ongoing net operating costs of the facility	Fees paid to the Airport to recover the ongoing net operating costs of the facility

Other than the initial year FIS Charges, which reflect the start-up CBP expenses and the ramp-up of international passenger activity, the FIS Charges in each of the three options are approximately $6 per arriving FIS passenger over the first ten years of the forecast period.

Based upon these analyses as detailed above, we believe that the Potential FIS Facility would be financially feasible.

long beach airport

FINANCIAL FEASIBILITY STUDY
POTENTIAL FIS FACILITY

Prepared By: Frasca & Associates, LLC
Date: September 24, 2016

Long Beach Airport
FIS Financial Feasibility Study
Financial Proforma - Option 1

	2020	2021	2022	2023	2024	2025	2026	2027	2028
FIS Arriving Passengers	209,419	283,879	283,879	379,281	379,281	379,281	379,281	379,281	379,281
New FIS Capital Charges									
Net Capital Amortization	$ 974,295	$ 974,295	$ 974,295	$ 1,728,000	$ 1,728,000	$ 1,728,000	$ 1,728,000	$ 1,728,000	$ 1,728,000
FIS Capital Charge / FIS PAX	**$ 4.65**	**$ 3.43**	**$ 3.43**	**$ 4.56**	**$ 4.56**	**$ 4.56**	**$ 4.56**	**$ 4.56**	**$ 4.56**
New FIS Net Operating & Maintenance Expenditures									
O&M Expenses	$ 336,429	$ 347,531	$ 359,000	$ 370,847	$ 383,084	$ 395,726	$ 408,785	$ 422,275	$ 436,210
Major Maintenance	-	-	-	-	194,087	505,996	505,996	505,996	505,996
CBP Costs	3,706,490	3,507,647	3,623,399	3,742,971	3,866,489	3,994,083	4,125,888	4,262,042	4,402,690
Less: Concession Revenues	(2,168,000)	(2,975,000)	(3,013,000)	(4,075,000)	(4,126,000)	(4,178,000)	(4,230,000)	(4,283,000)	(4,336,000)
Net Operating Requirement	$ 1,874,919	$ 880,178	$ 969,398	$ 38,818	$ 317,661	$ 717,805	$ 810,669	$ 907,313	$ 1,008,896
FIS Operating Charge /FIS PAX	**$ 8.95**	**$ 3.10**	**$ 3.41**	**$ 0.10**	**$ 0.84**	**$ 1.89**	**$ 2.14**	**$ 2.39**	**$ 2.66**
Aggregate FIS Cost / FIS PAX	**$ 13.61**	**$ 6.53**	**$ 6.85**	**$ 4.66**	**$ 5.39**	**$ 6.45**	**$ 6.69**	**$ 6.95**	**$ 7.22**

2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039
379,281	379,281	379,281	379,281	379,281	379,281	379,281	379,281	379,281	379,281	379,281
$ 1,728,000	$ 1,728,000	$ 1,728,000	$ 1,728,000	$ 1,728,000	$ 1,728,000	$ 1,728,000	$ 1,728,000	$ 1,728,000	$ 1,728,000	$ 1,728,000
$ 4.56	**$ 4.56**	**$ 4.56**	**$ 4.56**	**$ 4.56**	**$ 4.56**	**$ 4.56**	**$ 4.56**	**$ 4.56**	**$ 4.56**	**$ 4.56**
$ 450,605	$ 465,475	$ 480,836	$ 496,703	$ 513,095	$ 530,027	$ 547,518	$ 565,586	$ 584,250	$ 603,530	$ 623,447
505,996	751,447	751,447	751,447	751,447	751,447	751,447	751,447	751,447	751,447	751,447
4,547,978	4,698,062	4,853,098	5,013,250	5,178,687	5,349,584	5,526,120	5,708,482	5,896,862	6,091,459	6,292,477
(4,391,000)	(4,446,000)	(4,501,000)	(4,557,000)	(4,614,000)	(4,672,000)	(4,730,000)	(4,790,000)	(4,849,000)	(4,910,000)	(4,971,000)
$ 1,113,579	$ 1,468,984	$ 1,584,380	$ 1,704,400	$ 1,829,229	$ 1,959,057	$ 2,095,085	$ 2,235,515	$ 2,383,559	$ 2,536,436	$ 2,696,370
$ 2.94	**$ 3.87**	**$ 4.18**	**$ 4.49**	**$ 4.82**	**$ 5.17**	**$ 5.52**	**$ 5.89**	**$ 6.28**	**$ 6.69**	**$ 7.11**
$ 7.49	**$ 8.43**	**$ 8.73**	**$ 9.05**	**$ 9.38**	**$ 9.72**	**$ 10.08**	**$ 10.45**	**$ 10.84**	**$ 11.24**	**$ 11.67**

Long Beach Airport
FIS Financial Feasibility Study
Financial Proforma - Option 2

	2020	2021	2022	2023	2024	2025	2026	2027	2028
FIS Arriving Passengers	209,419	283,879	283,879	379,281	379,281	379,281	379,281	379,281	379,281
New FIS Capital Charges									
Net Capital Amortization	$ 752,588	$ 752,588	$ 752,588	$ 1,335,000	$ 1,335,000	$ 1,335,000	$ 1,335,000	$ 1,335,000	$ 1,335,000
FIS Capital Charge / FIS PAX	**$ 3.59**	**$ 2.65**	**$ 2.65**	**$ 3.52**	**$ 3.52**	**$ 3.52**	**$ 3.52**	**$ 3.52**	**$ 3.52**
New FIS Net Operating & Maintenance Expenditures									
O&M Expenses	$ 356,929	$ 368,708	$ 380,875	$ 393,444	$ 406,428	$ 419,840	$ 433,695	$ 448,007	$ 462,791
Major Maintenance	-	-	-	-	16,940	307,513	307,513	307,513	307,513
CBP Costs	3,706,490	3,507,647	3,623,399	3,742,971	3,866,489	3,994,083	4,125,888	4,262,042	4,402,690
Less: Concession Revenues	(2,168,000)	(2,975,000)	(3,013,000)	(4,075,000)	(4,126,000)	(4,178,000)	(4,230,000)	(4,283,000)	(4,336,000)
Net Operating Requirement	$ 1,895,420	$ 901,355	$ 991,274	$ 61,415	$ 163,857	$ 543,437	$ 637,096	$ 734,562	$ 836,994
FIS Operating Charge /FIS PAX	**$ 9.05**	**$ 3.18**	**$ 3.49**	**$ 0.16**	**$ 0.43**	**$ 1.43**	**$ 1.68**	**$ 1.94**	**$ 2.21**
Aggregate FIS Cost / FIS PAX	**$ 12.64**	**$ 5.83**	**$ 6.14**	**$ 3.68**	**$ 3.95**	**$ 4.95**	**$ 5.20**	**$ 5.46**	**$ 5.73**

2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039
379,281	379,281	379,281	379,281	379,281	379,281	379,281	379,281	379,281	379,281	379,281
$ 1,335,000	$ 1,335,000	$ 1,335,000	$ 1,335,000	$ 1,335,000	$ 1,335,000	$ 1,335,000	$ 1,335,000	$ 1,335,000	$ 1,335,000	$ 1,335,000
$ 3.52	**$ 3.52**	**$ 3.52**	**$ 3.52**	**$ 3.52**	**$ 3.52**	**$ 3.52**	**$ 3.52**	**$ 3.52**	**$ 3.52**	**$ 3.52**
$ 478,063	$ 493,839	$ 510,136	$ 526,970	$ 544,360	$ 562,324	$ 580,881	$ 600,050	$ 619,852	$ 640,307	$ 661,437
307,513	427,812	427,812	427,812	427,812	427,812	427,812	427,812	427,812	427,812	427,812
4,547,978	4,698,062	4,853,098	5,013,250	5,178,687	5,349,584	5,526,120	5,708,482	5,896,862	6,091,459	6,292,477
(4,391,000)	(4,446,000)	(4,501,000)	(4,557,000)	(4,614,000)	(4,672,000)	(4,730,000)	(4,790,000)	(4,849,000)	(4,910,000)	(4,971,000)
$ 942,555	$ 1,173,713	$ 1,290,046	$ 1,411,032	$ 1,536,860	$ 1,667,720	$ 1,804,813	$ 1,946,344	$ 2,095,526	$ 2,249,577	$ 2,410,725
$ 2.49	**$ 3.09**	**$ 3.40**	**$ 3.72**	**$ 4.05**	**$ 4.40**	**$ 4.76**	**$ 5.13**	**$ 5.52**	**$ 5.93**	**$ 6.36**
$ 6.00	**$ 6.61**	**$ 6.92**	**$ 7.24**	**$ 7.57**	**$ 7.92**	**$ 8.28**	**$ 8.65**	**$ 9.04**	**$ 9.45**	**$ 9.88**

Long Beach Airport
FIS Financial Feasibility Study
Financial Proforma - Option 3

	2020	2021	2022	2023	2024	2025	2026	2027	2028
FIS Arriving Passengers	209,419	283,879	283,879	379,281	379,281	379,281	379,281	379,281	379,281
New FIS Capital Charges									
Net Capital Amortization	$ 911,033	$ 911,033	$ 911,033	$ 1,616,000	$ 1,616,000	$ 1,616,000	$ 1,616,000	$ 1,616,000	$ 1,616,000
FIS Capital Charge / FIS PAX	**$ 4.35**	**$ 3.21**	**$ 3.21**	**$ 4.26**	**$ 4.26**	**$ 4.26**	**$ 4.26**	**$ 4.26**	**$ 4.26**
New FIS Net Operating & Maintenance Expenditures									
O&M Expenses	$ 357,728	$ 369,533	$ 381,727	$ 394,324	$ 407,337	$ 420,779	$ 434,665	$ 449,009	$ 463,826
Major Maintenance	-	-	-	-	16,940	324,530	324,530	324,530	324,530
CBP Costs	3,706,490	3,507,647	3,623,399	3,742,971	3,866,489	3,994,083	4,125,888	4,262,042	4,402,690
Less: Concession Revenues	(2,168,000)	(2,975,000)	(3,013,000)	(4,075,000)	(4,126,000)	(4,178,000)	(4,230,000)	(4,283,000)	(4,336,000)
Net Operating Requirement	$ 1,896,218	$ 902,179	$ 992,126	$ 62,295	$ 164,766	$ 561,393	$ 655,083	$ 752,581	$ 855,046
FIS Operating Charge /FIS PAX	**$ 9.05**	**$ 3.18**	**$ 3.49**	**$ 0.16**	**$ 0.43**	**$ 1.48**	**$ 1.73**	**$ 1.98**	**$ 2.25**
Aggregate FIS Cost / FIS PAX	**$ 13.40**	**$ 6.39**	**$ 6.70**	**$ 4.42**	**$ 4.70**	**$ 5.74**	**$ 5.99**	**$ 6.24**	**$ 6.52**

2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039
379,281	379,281	379,281	379,281	379,281	379,281	379,281	379,281	379,281	379,281	379,281
$ 1,616,000	$ 1,616,000	$ 1,616,000	$ 1,616,000	$ 1,616,000	$ 1,616,000	$ 1,616,000	$ 1,616,000	$ 1,616,000	$ 1,616,000	$ 1,616,000
$ 4.26	**$ 4.26**	**$ 4.26**	**$ 4.26**	**$ 4.26**	**$ 4.26**	**$ 4.26**	**$ 4.26**	**$ 4.26**	**$ 4.26**	**$ 4.26**
$ 479,132	$ 494,944	$ 511,277	$ 528,149	$ 545,578	$ 563,582	$ 582,180	$ 601,392	$ 621,238	$ 641,739	$ 662,916
324,530	451,356	451,356	451,356	451,356	451,356	451,356	451,356	451,356	451,356	451,356
4,547,978	4,698,062	4,853,098	5,013,250	5,178,687	5,349,584	5,526,120	5,708,482	5,896,862	6,091,459	6,292,477
(4,391,000)	(4,446,000)	(4,501,000)	(4,557,000)	(4,614,000)	(4,672,000)	(4,730,000)	(4,790,000)	(4,849,000)	(4,910,000)	(4,971,000)
$ 960,641	$ 1,198,362	$ 1,314,731	$ 1,435,755	$ 1,561,621	$ 1,692,522	$ 1,829,657	$ 1,971,231	$ 2,120,456	$ 2,274,554	$ 2,435,749
$ 2.53	**$ 3.16**	**$ 3.47**	**$ 3.79**	**$ 4.12**	**$ 4.46**	**$ 4.82**	**$ 5.20**	**$ 5.59**	**$ 6.00**	**$ 6.42**
$ 6.79	**$ 7.42**	**$ 7.73**	**$ 8.05**	**$ 8.38**	**$ 8.72**	**$ 9.08**	**$ 9.46**	**$ 9.85**	**$ 10.26**	**$ 10.68**

Long Beach Airport
FIS Financial Feasibility Study
Table 1: Capital Cost Assumptions

		NORTH FIS FACILITY - Option 1	SOUTH FIS FACILITY - Option 2	SOUTH FIS FACILITY - Option 3
Project Cost Estimate				
1.1 Design	7.0%	$ 1,145,000	$ 921,000	$ 1,081,000
1.2 Administrative Costs	3.0%	491,000	395,000	464,000
Design & Adminstrative Subtotal		1,636,000	1,316,000	1,545,000
2.1 Sitework		931,000	956,000	813,000
2.2 Building		12,032,000	10,817,000	8,274,000
2.3 Baggage Claim		381,000	1,379,000	1,379,000
2.4 Aircraft Parking		3,013,000		
2.5 (E) Checkpoint Retrofit				575,000
2.6 New Checkpoint				4,401,000
Construction Costs Subtotal		16,357,000	13,152,000	15,442,000
3.1 Utility Coordination	4.0%	655,000	527,000	618,000
3.2 Construction Management	7.0%	1,145,000	921,000	1,081,000
3.3 Testing/Inspection	6.5%	1,064,000	855,000	1,004,000
3.4 Plan Check/Permit	2.5%	409,000	329,000	387,000
Project Sub-Total		$ 21,266,000	$ 17,100,000	$ 20,077,000
Public Works/Financial Management Overhead	1.37%	292,000	235,000	276,000
TOTAL PROJECT COSTS		**$ 21,558,000**	**$ 17,335,000**	**$ 20,353,000**
Potential PFC Funding		3,000,000	3,000,000	3,000,000
Net Project Costs		**$ 18,558,000**	**$ 14,335,000**	**$ 17,353,000**
Annual Amortization of FIS Investment:				
Construction Period (years) 1>:		1	1	1
Term (years):		20	20	20
Interest Only Period (years):		3	3	3
Amortization Rate:		5.00%	5.00%	5.00%
Capitalized Interest		927,900	716,750	867,650
Total Project Cost		$ 19,485,900	$ 15,051,750	$ 18,220,650
Initial Period - Interest Only Payments		**$ 974,295**	**$ 752,588**	**$ 911,033**
Annual Capital Amortization		**$ 1,728,000**	**$ 1,335,000**	**$ 1,616,000**

Source: Jacobs Cost Estimate, dated July 26, 2016
1> Jacobs estimates 16 months fro contruction; 1 year is used for purposes of capitalized interest

Long Beach Airport
FIS Financial Feasibility Study
Table 2-1: Operating and Maintenance Costs - Option 1

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Equipment Maintenance	86,500	89,354	92,303	95,349	98,495	101,746	105,103	108,572	112,155	115,856
Equipment Operating	8,650	8,935	9,230	9,535	9,850	10,175	10,510	10,857	11,215	11,586
Systems Maintenance	40,129	41,454	42,822	44,235	45,695	47,202	48,760	50,369	52,031	53,748
Systems Operating	8,026	8,291	8,564	8,847	9,139	9,440	9,752	10,074	10,406	10,750
Custodial Services	193,124	199,497	206,080	212,881	219,906	227,163	234,659	242,403	250,402	258,666
Subtotal - O&M Expenses	336,429	347,531	359,000	370,847	383,084	395,726	408,785	422,275	436,210	450,605
Major Maintenance:										
Roofing										176,403
Painting/Wall Tile										183,158
Flooring										70,964
Equipment										527,920
Systems										489,832
Pavement					194,087					1,081,702
Subtotal - Major Maintenance	-	-	-	-	194,087	-	-	-	-	2,529,978
Deposits to Major Maintenance Fund *					194,087	505,996	505,996	505,996	505,996	505,996

Source: Jacobs

Notes:
Estimated Interior Conditioned Space based on CBP Airport Technical Design Standards.
Total Area based on CBP Airport Technical Design Standards.
Annual Escalation of 3.3% based on comparison of Sierra West Group Indeces from 2006 and 2016.
Recurring Capital Costs assume 25% replacement at year 10 and 50% replacement at year 20.
Roadway [Asphalt] Pavement assumes 25% replacement at year 5, 50% replacement at year 10, 25% at year 15, and full replacement at
Aircraft Parking [Concrete] Pavement assumes 10% replacement at year 5, 25% replacement at year 10, 10% at year 15, and 25% replacement at year 20.
Custodial Services based on 3 FTE at a present hourly rate of $30/hr. plus $10.26/hr for fringe benefits.

* Assumes Major Maintenance requirements are funded over time.

2030	2031	2032	2033	2034	2035	2036	2037	2038	2039
119,679	123,628	127,708	131,922	136,276	140,773	145,418	150,217	155,174	160,295
11,968	12,363	12,771	13,192	13,628	14,077	14,542	15,022	15,517	16,030
55,522	57,354	59,247	61,202	63,222	65,308	67,463	69,690	71,990	74,365
11,104	11,471	11,849	12,240	12,644	13,062	13,493	13,938	14,398	14,873
267,202	276,019	285,128	294,537	304,257	314,297	324,669	335,383	346,451	357,884
465,475	480,836	496,703	513,095	530,027	547,518	565,586	584,250	603,530	623,447
									488,135
									506,825
									196,369
									1,460,835
									1,355,439
				513,631					2,993,234
-	-	-	-	513,631	-	-	-	-	7,000,838
751,447	751,447	751,447	751,447	751,447	751,447	751,447	751,447	751,447	751,447

Long Beach Airport
FIS Financial Feasibility Study
Table 2-2: Operating and Maintenance Costs - Option 2

	2020	2021	2022	2023	2024	2025	2026	2027	2028
Equipment Maintenance	110,606	114,256	118,026	121,921	125,944	130,101	134,394	138,829	143,410
Equipment Operating	11,061	11,426	11,803	12,192	12,594	13,010	13,439	13,883	14,341
Systems Maintenance	35,116	36,275	37,472	38,708	39,986	41,305	42,668	44,077	45,531
Systems Operating	7,023	7,255	7,494	7,742	7,997	8,261	8,534	8,815	9,106
Custodial Services	193,124	199,497	206,080	212,881	219,906	227,163	234,659	242,403	250,402
Subtotal - O&M Expenses	356,929	368,708	380,875	393,444	406,428	419,840	433,695	448,007	462,791
Major Maintenance:									
Roofing									
Painting/Wall Tile									
Flooring									
Equipment									
Systems									
Pavement					16,940				
Subtotal - Major Maintenance	-	-	-	-	16,940	-	-	-	-
Deposits to Major Maintenance Fund *					16,940	307,513	307,513	307,513	307,513

Source: Jacobs

Notes:
Estimated Interior Conditioned Space based on CBP Airport Technical Design Standards.
Total Area based on CBP Airport Technical Design Standards.
Annual Escalation of 3.3% based on comparison of Sierra West Group Indeces from 2006 and 2016.
Recurring Capital Costs assume 25% replacement at year 10 and 50% replacement at year 20.
Roadway [Asphalt] Pavement assumes 25% replacement at year 5, 50% at year 10, 25% at year 15, and full replacement at year 20.
Aircraft Parking [Concrete] Pavement assumes 10% replacement at year 5, 25% at year 10, 10% at year 15, and 25% at year 20.
Custodial Services based on 3 FTE at a present hourly rate of $30/hr. plus $10.26/hr for fringe benefits.

* Assumes Major Maintenance requirements are funded over time.

2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039
148,143	153,032	158,082	163,298	168,687	174,254	180,004	185,944	192,081	198,419	204,967
14,814	15,303	15,808	16,330	16,869	17,425	18,000	18,594	19,208	19,842	20,497
47,034	48,586	50,189	51,845	53,556	55,323	57,149	59,035	60,983	62,996	65,075
9,407	9,717	10,038	10,369	10,711	11,065	11,430	11,807	12,197	12,599	13,015
258,666	267,202	276,019	285,128	294,537	304,257	314,297	324,669	335,383	346,451	357,884
478,063	493,839	510,136	526,970	544,360	562,324	580,881	600,050	619,852	640,307	661,437
154,365										427,151
177,249										490,474
62,422										172,730
675,043										1,867,947
428,636										1,186,101
39,852					23,438					110,277
1,537,566	-	-	-	-	23,438	-	-	-	-	4,254,681
307,513	427,812	427,812	427,812	427,812	427,812	427,812	427,812	427,812	427,812	427,812

Long Beach Airport
FIS Financial Feasibility Study
Table 2-3: Operating and Maintenance Costs - Option 3

	2020	2021	2022	2023	2024	2025	2026	2027	2028
Equipment Maintenance	98,722	101,980	105,345	108,822	112,413	116,122	119,954	123,913	128,002
Equipment Operating	9,872	10,198	10,535	10,882	11,241	11,612	11,995	12,391	12,800
Systems Maintenance	46,675	48,215	49,806	51,450	53,147	54,901	56,713	58,585	60,518
Systems Operating	9,335	9,643	9,961	10,290	10,629	10,980	11,343	11,717	12,104
Custodial Services	193,124	199,497	206,080	212,881	219,906	227,163	234,659	242,403	250,402
Subtotal - O&M Expenses	357,728	369,533	381,727	394,324	407,337	420,779	434,665	449,009	463,826
Major Maintenance:									
Roofing									
Painting/Wall Tile									
Flooring									
Equipment									
Systems									
Pavement					16,940				
Subtotal - Major Maintenance	-	-	-	-	16,940	-	-	-	-
Deposits to Major Maintenance Fund *					16,940	324,530	324,530	324,530	324,530

Source: Jacobs

Notes:
Estimated Interior Conditioned Space based on CBP Airport Technical Design Standards.
Total Area based on CBP Airport Technical Design Standards.
Annual Escalation of 3.3% based on comparison of Sierra West Group Indeces from 2006 and 2016.
Recurring Capital Costs assume 25% replacement at year 10 and 50% replacement at year 20.
Roadway [Asphalt] Pavement assumes 25% replacement at year 5, 50% replacement at year 10, 25% at year 15, and full replacement at
Aircraft Parking [Concrete] Pavement assumes 10% replacement at year 5, 25% replacement at year 10, 10% at year 15, and 25% replacement at year
Custodial Services based on 3 FTE at a present hourly rate of $30/hr. plus $10.26/hr for fringe benefits.

* Assumes Major Maintenance requirements are funded over time.

2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039
132,226	136,589	141,097	145,753	150,563	155,531	160,664	165,966	171,443	177,100	182,945
13,223	13,659	14,110	14,575	15,056	15,553	16,066	16,597	17,144	17,710	18,294
62,515	64,578	66,709	68,910	71,185	73,534	75,960	78,467	81,056	83,731	86,494
12,503	12,916	13,342	13,782	14,237	14,707	15,192	15,693	16,211	16,746	17,299
258,666	267,202	276,019	285,128	294,537	304,257	314,297	324,669	335,383	346,451	357,884
479,132	494,944	511,277	528,149	545,578	563,582	582,180	601,392	621,238	641,739	662,916
182,991										506,364
164,138										454,196
63,432										175,526
602,514										1,667,249
569,724										1,576,515
39,852					23,438					110,277
1,622,652	-	-	-	-	23,438	-	-	-	-	4,490,126
324,530	451,356	451,356	451,356	451,356	451,356	451,356	451,356	451,356	451,356	451,356

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FIS Financial Feasibility Study

Table 2-4: U.S. Customs and Border Protection - User Fee Airport Cost Estimates (Per Jacobs)

	2020	2021	2022	2023	2024	2025	2026	2027	2028
CBP Costs	3,706,490	3,507,647	3,623,399	3,742,971	3,866,489	3,994,083	4,125,888	4,262,042	4,402,690

Source: Jacobs; August 16, 2016

Notes:

CBP Inspector - $140,874 (first year), $123,438 (succeeding years)
ADP costs per inspector - $21,062 (first year), $17,640 (succeeding years)
CBP Supervisor costs assumed at 1.15x inspector costs.
CBP Regular Shift assumed to be M-F: 1230 to 2130 hours
CBP OT Shifts assumed to be M-Su: 0730 to 1030 hours and Sa-Su: 1230 to 2130 hours
OT Cap used for estimation (2016 Los Angeles GS-11): $43.26 per hour

2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039
4,547,978	4,698,062	4,853,098	5,013,250	5,178,687	5,349,584	5,526,120	5,708,482	5,896,862	6,091,459	6,292,477

Long Beach Airport
FIS Financial Feasibility Study
Table 3: International Enplaned Passengers

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2039
International Enplanements	209,419	283,879	283,879	379,281	379,281	379,281	379,281	379,281	379,281	379,281	379,281	379,281
International Arrivals	209,419	283,879	283,879	379,281	379,281	379,281	379,281	379,281	379,281	379,281	379,281	379,281

Source: LaCosta Consulting Group (Years 1-5)
Note: International traffic levels are assumed to stabilize at Year 4.

Long Beach Airport
FIS Financial Feasibility Study
Table 3: International Enplaned Passengers

	2020	2021	2022	2023	2024	2025
International Enplanements	209,419	283,879	283,879	379,281	379,281	379,281
International Arrivals	209,419	283,879	283,879	379,281	379,281	379,281
Airport Revenues/EPAX						
Terminal Concessions	$ 1.84	$ 1.86	$ 1.89	$ 1.91	$ 1.93	$ 1.96
Parking	$ 6.31	$ 6.38	$ 6.46	$ 6.55	$ 6.63	$ 6.71
Rental Car	$ 2.21	$ 2.23	$ 2.26	$ 2.29	$ 2.32	$ 2.35
Non-Airline Revenues for FIS PAX	$ 2,168,000	$ 2,975,000	$ 3,013,000	$ 4,075,000	$ 4,126,000	$ 4,178,000

Assumptions

FY 2016 Terminal Concessions Revenues per Enplaned Passenger	$ 1.75
FY 2016 Parking Revenues per Enplaned Passenger	$ 6.00
FY 2016 Rental Car Revenues per Enplaned Passenger	$ 2.10
Annual Inflation	2.5%

Annual growth in revenues per EPAX is equal to one-half the inflation rate

2026	2027	2028	2029	2039
379,281	379,281	379,281	379,281	379,281
379,281	379,281	379,281	379,281	379,281
$ 1.98	$ 2.01	$ 2.03	$ 2.06	$ 2.33
$ 6.79	$ 6.88	$ 6.96	$ 7.05	$ 7.98
$ 2.38	$ 2.41	$ 2.44	$ 2.47	$ 2.79
$ 4,230,000	$ 4,283,000	$ 4,336,000	$ 4,391,000	$ 4,971,000

Table 5: FIS Facility Square Footage Assumptions

	NORTH FIS FACILITY - Option 1	SOUTH FIS FACILITY - Option 2	SOUTH FIS FACILITY - Option 3
New FIS Facility	35,051	38,732	21,656
Baggage Claim	210	630	630
Re-Purposed Security Checkpoint Building	-	-	6,750
New Security Checkpoint Building & Sitework	-	-	8,700
New Aircraft Parking	91,500	-	-

Source: Jacobus & Yuang, Inc. Budgetary Opinion of Probable Cost, dated July 25, 2016

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Appendix H. Frequently Asked Questions and Public Comments

PLEASE NOTE: The information, analysis, assessments and opinions contained in this document are intended for general evaluation purposes only. This document is intended for use only by its specified client and is NOT intended for use, reliance or in making financial/investment decisions by outside parties.

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Frequently Asked Questions

Throughout the course of the Study, community comments were recorded on comment cards distributed at the community meetings. In addition, an email account was set up to collect responses electronically throughout the duration of the Study. All comments have been attached in Appendix H.

The frequently asked questions were noted and responses to the questions are provided below:

1) What is a FIS?

   A FIS Facility is a single processing complex that evolved from the consolidation and integration of U.S. customs, immigration, and agriculture operations, offices, and support functions. The FIS Facility unifies both passenger processing and baggage/cargo processing for safe and efficient flow of passengers and goods into and out of the United States. The FIS Facility would have a CBP security area to accommodate international air commerce designated for processing passengers, crew, baggage and effects arriving from, or departing to, foreign countries, as well as aircraft deplaning, ramp areas, and other restricted areas designated by the local CBP port director.

2) Will the FIS Facility increase air pollution and noise?

   Environmental impacts including noise, air pollution, and vehicular traffic were studied in the 2006 Long Beach Airport Terminal Area Improvement Project Final Environmental Impact Report No. 37-03 (FEIR 37-03), certified by the Long Beach City Council on June 20, 2006. FEIR 37-03 considered an "Optimized Flight Scenario" of 52 daily air carrier slots and 25 commuter slots (current allocation is 50 daily air carrier slots and 3 commuter slots). Each slot represents one takeoff and one landing. The scope of the Feasibility Study includes a preliminary assessment of required Environmental Review processes should the City decide to proceed with development of a FIS Facility.

   The introduction of commercial international flights would not alter the type of aircraft or operational procedures at LGB. Therefore, commercial aircraft emissions would not be expected to change. The introduction of CBP facilities would have the potential to incrementally reduce regional air emissions as it relates to general aviation operations. Currently, general aviation and charter aircraft traveling to LGB from international destination are required to be cleared at an airport with CBP facilities. [1] As a result, for these aircraft an additional stop is required. The additional take-off and landing would result in incrementally greater emissions. Though this would not change the local emissions at LGB, the additional flights do contribute to the regional emissions. Counterbalancing this, there is the potential that some general aviation and charter aircraft will utilize LGB as a stopping point for CBP services though Long Beach is not the final destination. On a regional scale these additional take off and lands would not have an effect on regional air quality. It should be noted, based on the Market Analysis (Appendix A), expected increases in general aviation would be nominal and would not have a substantial increase on the localized air quality.
   The City's Airport Noise Ordinance is the controlling mechanism for aircraft noise. The FIS Facility would not change the number of flights at the Airport. What would change is the destination of a portion of the flights. As shown in the Market Analysis prepared for this Feasibility Study (Appendix A), the international cities that would likely be served are Vancouver, Canada and multiple cities in Mexico and Central America. These international destinations would be substituted for domestic destinations because the cap of an average of 50 average daily commercial carrier flights would not be modified unless the overall noise levels associated with the commercial carrier flights is reduced to less than noise budget allocated for commercial carriers per the Airport Noise Ordinance. There is the potential that the international flights would travel greater distances than the domestic flights they are replacing. In these instances, it is reasonably assumed the aircraft would have to carry additional fuel and luggage weight could be greater. As a heavier aircraft, the noise characteristics of the international flights may be

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slightly greater than if the same type of aircraft travels to a closer locale. It is speculative as to whether this incremental noise increase would be sufficient to influence the Community Noise Equivalent Level (CNEL) contours. However, the City's Airport Noise Ordinance would address this issue because if the CNEL contours were to increase beyond what is allowed in the Airport Noise Ordinance, then the total number of flights would be reduced accordingly. Similarly, if the FIS Facility is available at LGB there could be an incremental increase in general aviation and charter aircraft utilizing the Airport.

During construction of the FIS Facility there would be construction noise. The closest sensitive receptor to the FIS Facility locations would be the homes west of Clark Avenue. These homes are more than 3,500 feet from either the northern or southern locations. As a result, the construction noise levels would be less than significant. Once constructed, the noise levels associated with use of the FIS Facility would not be substantially different from the existing conditions in the terminal area.

3) Will having international service allow for the possibility of more drug cartels coming from Mexico and South America? What are the consequences?

The scope of the Feasibility Study includes a Security Risk Assessment. Smuggling of narcotics, weapons, and people are an issue regardless of arrival by air, sea, or land; however, air travel to a security controlled airport like LGB makes it much more difficult to smuggle large quantities. The cargo capacity of two large nearby seaports and their inability to screen every container arriving in the ports makes it much easier for a smuggler to transport items. The US/Mexico border is also a much more porous avenue for transporting contraband. While the airports will continue to deal with small quantities of contraband hidden on or inside a person or their luggage, the risks of large quantities arriving via airport is much lower.

4) Will having international service at LGB decrease my property value due to more noise and air pollution?

Evaluation of the impact of the FIS Facility to property values and property taxes is not included in the scope of the Feasibility Study.

5) What are the impacts to the local community (i.e. Long Beach only), not the region, in terms of the economy, air traffic, noise, pollution, etc.?

The scope of the Feasibility Study includes quantification of the economic impact to the City of Long Beach and the local/regional economy related to a FIS Facility. The Economic Impact Analysis used results from a 2016 tenant survey, business list analysis, interviews, LGB expenditures and forecast data within the IMPLAN database. The analysis identified the economic impacts of LGB and the potential contribution of a FIS Facility. The annual economic contribution of LGB and their tenants is approximately 45,000 jobs and $10.3 billion in output. The potential annual economic contribution of a FIS Facility is approximately 350 jobs and $36.4 million of additional output. The potential additional economic expenditures from international travelers is estimated to range between $57 million to $104 million during the five year establishment period following initiation of international service. The international business and tourist travel impacts are estimated to generate approximately 1,400 jobs and $185.6 million annually following the establishment period. Construction of the FIS facility would generate financial output valued between $31 million and $38 million depending on the selected option generating between 203 and 253 jobs.

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6) How does the economic value of international flights to Mexico and Central America compare to adding flights to Washington, D.C. or Chicago?

Although evaluation of transcontinental flights is not included in the scope of the Feasibility Study, it should be noted that the Economic Impact Analysis quantified the economic benefits from domestic flights based on historical operational averages. International operations are forecast to be incremental to domestic operations; therefore the economic benefit from international flights will also be incremental to the economic benefit from domestic flights.

Airline routes are determined by market factors outside the control of the City. Federal regulations prohibit the City from influencing route decisions.

7) Is there the possibility that the addition of international flights compromise the Noise Ordinance?

The City Attorney's Office will analyze potential impacts to the Long Beach Noise Ordinance resulting from the development of a FIS Facility at Long Beach Airport. However, if the CNEL contours were to increase beyond what is allowed in the Noise Ordinance, then the total number of daily flights would be reduced in accordance with the procedures established in the Noise Ordinance.

8) What is the cost of the FIS Facility to the City?

There is no cost to the City's General Fund for the FIS Facility. The cost is dependent upon final negotiation with the airlines. The Airport will develop fair and reasonable user fees to recover capital expenditure and net operating expenses. The resulting effective FIS Facility Charge, reflecting the net capital and operating expenses for the potential FIS Facility, is projected to be approximately $13 per FIS arriving passenger in Year 1 (reflecting start-up costs and the initial ramp-up of international activity) and then approximately $6 per FIS arriving passenger over the next ten years.

9) When will the Study be available to the public for comment and how?

In accordance with August 9, 2016 City Council Action, the Study will be posted to all relevant City websites a minimum of 15 days prior to any public meetings to discuss the report.

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QUESTION / COMMENT CARD

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [ ] Market Analysis
- [ ] Airport Scope & Capability
- [x] Financial Feasibility
- [x] Environmental Assessment
- [x] Economic Impact
- [ ] Security Assessment
- [x] Noise Ordinance
- [ ] Other

Name (Optional):

Email (Optional):

Zip Code (Optional): 90807

Please provide your question or comment in the field below:

I Recommend that more in-depth studies be done to determine noise and pollution impact are multiple sites (perhaps 100's) & its impact on life expectancy & property values.

Our family has issues with asthma related to pollution, and we're concerned the increase of flights will agravate their health.

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [ ] Market Analysis
- [ ] Airport Scope & Capability
- [ ] Financial Feasibility
- [x] Environmental Assessment
- [ ] Economic Impact
- [ ] Security Assessment
- [ ] Noise Ordinance
- [ ] Other_____

Name (Optional): John DeLaTorre

Email (Optional): John.Delatorre@verizon.net

Zip Code (Optional): 90807

Please provide your question or comment in the field below:

Is the impact of a completed Facility going to increase Noise and Air pollution; more Autos, larger more polluting planes?

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [x] Market Analysis
- [ ] Airport Scope & Capability
- [ ] Financial Feasibility
- [ ] Environmental Assessment
- [ ] Economic Impact
- [ ] Security Assessment
- [ ] Noise Ordinance
- [ ] Other

Name (Optional): MIKE VACCARO

Email (Optional): mike@mikevaccaro.com

Zip Code (Optional): 90807

Please provide your question or comment in the field below:

1. Why? Will my FedEx package arrive faster
Isn't there enough room @ LAX
2. Will the City make income from airport
expansion
3. What percentage with International flights,
~~[illegible]~~ will our home values fall based
on other airports that have gone from local
to international

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [ ] Market Analysis
- [ ] Airport Scope & Capability
- [ ] Financial Feasibility
- [ ] Environmental Assessment
- [ ] Economic Impact
- [ ] Security Assessment
- [ ] Noise Ordinance
- [x] Other

Name (Optional):

Email (Optional):

Zip Code (Optional):

Please provide your question or comment in the field below:

Jet Blue has asked the city to do this study on behalf of the Airport & airline industry.

Is there any way the citizens can have the same power to have the city do a study from neighborhood residents' point of view?

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [x] Market Analysis
- [x] Airport Scope & Capability
- [ ] Financial Feasibility
- [ ] Environmental Assessment
- [ ] Economic Impact
- [ ] Security Assessment
- [ ] Noise Ordinance
- [ ] Other_____

Name (Optional): Sidika Kilic

Email (Optional): sidikakilic@yahoo.com

Zip Code (Optional): 90815

Please provide your question or comment in the field below:

1. Does the Scope "3-2-6 Model flow of traffic" include the impact of increased traffic to 405 Freeway?
2. What is the area covered around the airport to study traffic on Surface streets.
3. Jet Blue or Alaska Airlines is considering buying Virgine America, which is mainly an international Airline. Is Jet Blue ahead of this FIS?

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [ ] Market Analysis
- [ ] Airport Scope & Capability
- [ ] Financial Feasibility
- [ ] Environmental Assessment
- [ ] Economic Impact
- [x] Security Assessment
- [ ] Noise Ordinance
- [ ] Other_____

Name (Optional): _____

Email (Optional): _____

Zip Code (Optional): kollinss45@gmail.com

Please provide your question or comment in the field below:

Talk about the security study for terrorism risk. All terrorists attacks have occurred at international airports.

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [ ] Market Analysis
- [ ] Airport Scope & Capability
- [ ] Financial Feasibility
- [x] Environmental Assessment
- [ ] Economic Impact
- [ ] Security Assessment
- [ ] Noise Ordinance
- [ ] Other_____

Name (Optional): _____

Email (Optional): _____

Zip Code (Optional): _____

Please provide your question or comment in the field below:

what are sources of pollution data being used?

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [ ] Market Analysis
- [ ] Airport Scope & Capability
- [ ] Financial Feasibility
- [ ] Environmental Assessment
- [x] Economic Impact
- [ ] Security Assessment
- [ ] Noise Ordinance
- [ ] Other

Name (Optional): David

Email (Optional):

Zip Code (Optional): 90807

Please provide your question or comment in the field below:

My business is stopped by airplane takeoff noise. Will you sound proof my business? or funds for that purpose.

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [ ] Market Analysis
- [ ] Airport Scope & Capability
- [ ] Financial Feasibility
- [x] Environmental Assessment
- [ ] Economic Impact
- [ ] Security Assessment
- [ ] Noise Ordinance
- [ ] Other_____

Name (Optional): David

Email (Optional):

Zip Code (Optional): 90807

Please provide your question or comment in the field below:

Is traffic abatement included in the study?

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [ ] Market Analysis
- [ ] Airport Scope & Capability
- [ ] Financial Feasibility
- [ ] Environmental Assessment
- [ ] Economic Impact
- [ ] Security Assessment
- [x] Noise Ordinance
- [ ] Other _____

Name (Optional): David

Email (Optional):

Zip Code (Optional): 90807

Please provide your question or comment in the field below:

Is the total noise being reduced?
From airport and airport adjacent sources.

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 1

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [ ] Market Analysis
- [ ] Airport Scope & Capability
- [ ] Financial Feasibility
- [ ] Environmental Assessment
- [x] Economic Impact
- [ ] Security Assessment
- [ ] Noise Ordinance
- [ ] Other_____

Name (Optional): _____

Email (Optional): _____

Zip Code (Optional): _____

Please provide your question or comment in the field below:

will any new economic data be generated or will you use old data?

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [ ] Market Analysis
- [x] Airport Scope & Capability
- [ ] Financial Feasibility
- [ ] Environmental Assessment
- [ ] Economic Impact
- [ ] Security Assessment
- [ ] Noise Ordinance
- [ ] Other_____

Name (Optional): DAVID ALPERN

Email (Optional): alpern@hotmail.com

Zip Code (Optional): 90815

Please provide your question or comment in the field below:

Regarding 3.6.2 → following the Brussels attack it is reasonable to assume that an international LGB may become the weakest link (as vs. LAX) for terrorists seeking easier access into USA. Please expand 3.6.2 to address increased terror access risk.

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

☐ Market Analysis ☐ Airport Scope & Capability ☐ Financial Feasibility ☐ Environmental Assessment

☐ Economic Impact ☐ Security Assessment ☐ Noise Ordinance ☐ Other_____

Name (Optional): David McKenna

Email (Optional): drmckenna1@earthlink.net

Zip Code (Optional): 90807

Please provide your question or comment in the field below:

Will this FS explore the worst case scenario one where the City proceeds with this project and the City's noise and curfew ordinances are brought into litigation and we lose. What will be the long term effect on the City's impacted areas. What will be the projected loss in property values and City revenues. will long Beach become another Lynwood.

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [ ] Market Analysis
- [ ] Airport Scope & Capability
- [ ] Financial Feasibility
- [x] Environmental Assessment
- [ ] Economic Impact
- [ ] Security Assessment
- [ ] Noise Ordinance
- [ ] Other_____

Name (Optional): _____

Email (Optional): _____

Zip Code (Optional): 90815

Please provide your question or comment in the field below:

why isn't there analysis on how it will affect the surrounding / affected neighborhoods living working & ~~[illegible]~~ / our school children

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [ ] Market Analysis
- [ ] Airport Scope & Capability
- [ ] Financial Feasibility
- [x] Environmental Assessment
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- [ ] Security Assessment
- [x] Noise Ordinance
- [ ] Other_____

Name (Optional): _____

Email (Optional): _____

Zip Code (Optional): 90807

Please provide your question or comment in the field below:

People's freedom, home value, + peace of mind should take precedent over big business.
Our neighborhoods continue to get rolled + we seem powerless to do anything about it.
WE ARE LONG BEACH's #1 value.

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 1

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

Steven Peters

- [ ] Market Analysis
- [ ] Airport Scope & Capability
- [ ] Financial Feasibility
- [x] Environmental Assessment
- [ ] Economic Impact 2 areas?
- [ ] Security Assessment
- [ ] Noise Ordinance
- [ ] Other _____

Name (Optional): _____

Email (Optional): cdancer43@yahoo.com

Zip Code (Optional): _____

Please provide your question or comment in the field below:

What is the Feasibility Study costing taxpayers?

will you study the possibility of increased private, corporate air traffic? the possible number of flights, the hours at which they will travel.

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 1

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [ ] Market Analysis
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- [ ] Financial Feasibility
- [x] Environmental Assessment
- [ ] Economic Impact
- [ ] Security Assessment
- [x] Noise Ordinance
- [ ] Other _____

Name (Optional): PAUL DASILVA

Email (Optional): _____

Zip Code (Optional): 90815 4TH DISTRICT

Please provide your question or comment in the field below:

STUDY: DOOR TO DOOR NEIGHBORHOOD
STUDY FOR ~~APPROACH AND~~ IMPACT
ON PROPERTY VALUE + QUALITY of LIFE.
ENVIRONMENT: AIR QUALITY, NOISE, TRAFFIC
(ASK US!)

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD

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- [ ] Financial Feasibility
- [x] Environmental Assessment
- [ ] Economic Impact
- [ ] Security Assessment
- [x] Noise Ordinance
- [ ] Other _____

Name (Optional): Paul DaSilva

Email (Optional): _____

Zip Code (Optional): 90815

Please provide your question or comment in the field below:

NEXT MEETING NEEDS TO BE IN THE IMPACTED DISTRICTS

4TH DISTRICT @ BIXBY SCHOOL AUDITORIUM

8TH DISTRICT: CAL HEIGHTS BAPTIST CHURCH

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD

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- ☐ Financial Feasibility
- ☐ Environmental Assessment
- ☐ Economic Impact
- ☐ Security Assessment
- ☐ Noise Ordinance
- ☐ Other_____

Name (Optional): _____

Email (Optional): _____

Zip Code (Optional): _____

Please provide your question or comment in the field below:

ALL COUNCIL MEMBERS,
CITY OFFICIALS, MAYOR
IN ATTENDANCE.

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD

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- [ ] Financial Feasibility
- [ ] Environmental Assessment
- [x] Economic Impact
- [ ] Security Assessment
- [ ] Noise Ordinance
- [ ] Other _____

Name (Optional): _____

Email (Optional): _____

Zip Code (Optional): _____

Please provide your question or comment in the field below:

The American Appraisal Institute has a information on identifying & Qualifying economic Obsolescence. Any study needs to look at and evaluate the influence on the surrounding neighborhoods – Thus Neighborhoods are facing an economic obsolescence or economic obsolescence.

Economic obsolescence or external obsolescence is the loss in value resulting from influences external to the property (Neighborhood) itself. External conditions causing EO may be international, national industry-based, or local in origin. Various external factors affect potential economic returns, thus having a direct impact on the market value of an asset or property

Questions and comments may also be submitted via email to: LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 1

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [ ] Market Analysis
- [ ] Airport Scope & Capability
- [x] Financial Feasibility
- [ ] Environmental Assessment
- [x] Economic Impact
- [ ] Security Assessment
- [ ] Noise Ordinance
- [ ] Other_____

Name (Optional): _____

Email (Optional): _____

Zip Code (Optional): 90807

Please provide your question or comment in the field below:

WILL THE ECONOMIC/FINANCIAL ANALYSIS ALSO INCLUDE THE PROBABILITY AND IMPACT OF AIRLINES CHANGING THEIR BUSINESS PLAN AND STOP FLYING INTERNATIONALLY FROM LONG BEACH AIRPORT?

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

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- [ ] Financial Feasibility
- [x] Environmental Assessment
- [ ] Economic Impact
- [ ] Security Assessment
- [x] Noise Ordinance
- [ ] Other

Name (Optional): Theresa Hew

Email (Optional): lthew1@yahoo.com

Zip Code (Optional): 90807

Please provide your question or comment in the field below:

Please consider analyzing noise and pollution from multiple points or geographic areas of Long Beach. We are 52 square miles of city. Some sections of our city are heavily impacted by airport noise and pollution more than others. Districts 4, 5, 7 & 8 are most heavily impacted.

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD

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- [x] Financial Feasibility
- [ ] Environmental Assessment
- [ ] Economic Impact
- [x] Security Assessment
- [x] Noise Ordinance
- [ ] Other

Name (Optional): DAN GALLAGHER

Email (Optional): ICEMAP@AOL.COM

Zip Code (Optional): 90815

Please provide your question or comment in the field below:

WE ARE PRO AIRPORT - VERY CONCERNED ABOUT THE FINANCIAL IMPACT - TRAFFIC IMPACT - AND MOST IMPORTANT THE NOISE ORDINANCE

THANK YOU FOR YOUR PRESENTATION

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- ☐ Market Analysis
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- ☐ Financial Feasibility
- ☐ Environmental Assessment
- ☐ Economic Impact
- ☐ Security Assessment
- ☐ Noise Ordinance
- ☐ Other _____

Legal assessment

Name (Optional): _____

Email (Optional): _____

Zip Code (Optional): _____

Please provide your question or comment in the field below:

_____

_____

_____

_____

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_____

_____

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD

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- [ ] Financial Feasibility
- [x] Environmental Assessment
- [ ] Economic Impact
- [ ] Security Assessment
- [x] Noise Ordinance
- [ ] Other

Name (Optional): Laurie Angel

Email (Optional): lcangel@charter.net

Zip Code (Optional): 90805

Please provide your question or comment in the field below:

you are doing this study assuming the noise ordinance remains. Are you going to assess the risks and possible impacts or how are you may that will challenge the noise ordinance? I strongly believe adding this facility will inherently weaken or collapse the noise ordinance

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [ ] Market Analysis
- [ ] Airport Scope & Capability
- [x] Financial Feasibility
- [x] Environmental Assessment
- [x] Economic Impact
- [ ] Security Assessment
- [ ] Noise Ordinance
- [ ] Other

Name (Optional): Laurie Angel

Email (Optional): lcangel@charter.net

Zip Code (Optional): 90805

Please provide your question or comment in the field below:

Will/Can you consider a triple bottom line analysis of this proposed project where the financial considerations also include other impacts such as loss of property value/property tax revenue/adverse impacts to people/air quality, etc.

How will you consider/include quality of life impacts?

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

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- [x] Airport Scope & Capability
- [ ] Financial Feasibility
- [ ] Environmental Assessment
- [ ] Economic Impact
- [ ] Security Assessment
- [ ] Noise Ordinance
- [ ] Other

Name (Optional): Laurie Angel

Email (Optional): lcangel@charter.net

Zip Code (Optional): 90805

Please provide your question or comment in the field below:

when assessing the probability of a Port of Entry or User Fee Airport to what extent will FAA/ government projections for demand in this region for more flights and/or international flights be considered

Also include and consider demand when there already exist numerous international facilities nearby.

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD

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- ☐ Financial Feasibility
- ☐ Environmental Assessment
- ☐ Economic Impact
- ☐ Security Assessment
- ☐ Noise Ordinance
- ☐ Other _____

Name (Optional): _____

Email (Optional): kollins55@gmail.com

Zip Code (Optional): 90808

Please provide your question or comment in the field below:

The airport will be become an arm of the port.
It will become a cargo facility.

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD

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- ☐ Financial Feasibility
- ☐ Environmental Assessment
- ☐ Economic Impact
- ☐ Security Assessment
- ☐ Noise Ordinance
- ☐ Other _____

Name (Optional): _____

Email (Optional): kollinss65@gmail.com

Zip Code (Optional): 90808

Please provide your question or comment in the field below:

The time constraint for the airport needs to remains the same. 7am - 10pm, I think is the time allowed for planes to land or depart. Then a fine is applied. The fine is now $100 - $300. It needs to be a prohibitive amount of money. Perhaps $500,000 to start. Enough that someone would think twice about landing after hours. Perhaps my fine isn't enough.

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

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- [ ] Financial Feasibility
- [ ] Environmental Assessment
- [x] Economic Impact
- [ ] Security Assessment
- [ ] Noise Ordinance
- [ ] Other_____

Name (Optional): SUREN DEORAM

Email (Optional): SDEORAM @ NETSCAPE-NET

Zip Code (Optional): 90808

Please provide your question or comment in the field below:

1. WHAT IS THE CURRENT ECONOMIC IMPACT ~~OF~~ TO LONG BEACH FROM JET BLUE FLIGHTS?

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [ ] Market Analysis
- [x] Airport Scope & Capability
- [ ] Financial Feasibility
- [ ] Environmental Assessment
- [ ] Economic Impact
- [ ] Security Assessment
- [ ] Noise Ordinance
- [ ] Other_____

Name (Optional): SUSEN DEORAM

Email (Optional): SDEORAM@NETSCAPE.NET

Zip Code (Optional): 90808

Please provide your question or comment in the field below:

1. How is the traffic modeled?
THERE IS A MALL ON LAKEWOOD BLVD 1.5 miles away.

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 1

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [x] Market Analysis
- [ ] Airport Scope & Capability
- [ ] Financial Feasibility
- [x] Environmental Assessment
- [x] Economic Impact
- [ ] Security Assessment
- [ ] Noise Ordinance
- [ ] Other _____

Name (Optional): Bruce Alton

Email (Optional): altonbr@gmail.com

Zip Code (Optional): 90807

Please provide your question or comment in the field below:

Will the ~~market~~ environmental analysis & economic impact study include ~~the~~ an assessment of negative neighborhood impacts?

Scope of study ~~to~~ should only address long Beach zip codes.

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD

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- [ ] Airport Scope & Capability
- [ ] Financial Feasibility
- [ ] Environmental Assessment
- [ ] Economic Impact
- [ ] Security Assessment
- [x] Noise Ordinance
- [ ] Other

Name (Optional): BRUCE ALTON

Email (Optional): ALTONBR@gmail.com

Zip Code (Optional): 90807

Please provide your question or comment in the field below:

How will JACOBS address the occurance of INTERNATIONAL corporate/PRIVATE jet GA. operations? Will the study look AT the full use of the noise bucket allowance and the resulting neighborhood ~~impact~~ IMPACT.

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 1

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

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- ☐ Environmental Assessment
- ☐ Economic Impact
- ☐ Security Assessment
- ☐ Noise Ordinance
- ☒ Other Conflict of Interest

Name (Optional): Bruce Alton

Email (Optional): Altonbe@gmail.com

Zip Code (Optional): 90807

Please provide your question or comment in the field below:

As feasibility study ~~contractor~~ consultant, will Jacobs be barred from bidding on any future construction of an FIS?

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD

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- [ ] Market Analysis
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- [ ] Environmental Assessment
- [ ] Economic Impact
- [ ] Security Assessment
- [ ] Noise Ordinance
- [x] Other (1) CONFLICT OF INTEREST (2) NEIGHBORHOOD IMPACT.

Name (Optional): RICK ALSAGOFF

Email (Optional): RALSAGOFF@FT.NEWYORKLIFE.COM

Zip Code (Optional): 90807

Please provide your question or comment in the field below:

(1) FEASIBILITY STUDY DONE BY GROUP THAT CAN ALSO BID ON ~~[illegible]~~ AIRPORT WORK IF AN ~~CUSTOMS~~ INTL CUSTOMS FACILITY IS BUILT.

(2) WHAT ABOUT NEGATIVE IMPACT ON THE NEIGHBORHOODS?

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 1

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [ ] Market Analysis
- [ ] Airport Scope & Capability
- [ ] Financial Feasibility
- [ ] Environmental Assessment
- [ ] Economic Impact
- [ ] Security Assessment
- [ ] Noise Ordinance
- [x] Other Quality of Life

Name (Optional): John Applegnist

Email (Optional): jcapplegnist@verizon.net

Zip Code (Optional): 1845 N. College Circle

Please provide your question or comment in the field below:

Has the quality of life of the people in the districts been considered under the flight paths?

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [ ] Market Analysis
- [ ] Airport Scope & Capability
- [ ] Financial Feasibility
- [ ] Environmental Assessment
- [x] Economic Impact
- [ ] Security Assessment
- [ ] Noise Ordinance
- [ ] Other

Name (Optional):

Email (Optional): jeapplequist@verizon.net

Zip Code (Optional):

Please provide your question or comment in the field below:

Will you consider the economic impact on housing values in the 4th & 8th District.

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [ ] Market Analysis
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- [ ] Financial Feasibility
- [x] Environmental Assessment
- [ ] Economic Impact
- [ ] Security Assessment
- [ ] Noise Ordinance
- [ ] Other _____

Name (Optional): Christine Applegquist

Email (Optional): _____

Zip Code (Optional): _____

Please provide your question or comment in the field below:

Why is the proposed international terminal facility being referred to as an enhancement but not an expansion? Will the terminal expand airport facilities?

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

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- [ ] Financial Feasibility
- [ ] Environmental Assessment
- [ ] Economic Impact
- [x] Security Assessment
- [ ] Noise Ordinance
- [ ] Other

Name (Optional): Raman Vasishth

Email (Optional): Harrier1@Yahoo.com

Zip Code (Optional): 90808

Please provide your question or comment in the field below:

WOULD APPRECIATE INFORMATION REGARD A CHANGE IN THE FOOTPRINT ~~tat~~ FOR NAMING THE SECURITY DEPARTMENTS THE WOULD BE ADDED TO ENHANCE THE CUSTOMS ~~DEPAR~~ DEPARTMENT AND ADDED PERSONELL TO STAFF THOSE FACTIONS (A BREAKOUT

ALSO I WOULD LIKE TO SEE A LISTING OF ALL REGULATIONS & ORDINENCES JACOBS HAS CAPTURED IN ITS REPORT

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD

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- [ ] Economic Impact
- [x] Security Assessment
- [ ] Noise Ordinance
- [ ] Other_____

Name (Optional): RAMAN VASISHTH

Email (Optional): HARRIER1@YAHOO.COM

Zip Code (Optional): 90808

Please provide your question or comment in the field below:

I WOULD LIKE TO SEE SEPERATE BREAKOUT OF AN ASSESSMENT O/ ~~WHAT TO DO~~ RELATING ~~TO A TO INCREASE RISK~~ REQUIREMENT TO MEET ~~A~~ TERRORIST THREATS.

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD

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- [x] Environmental Assessment
- [ ] Economic Impact
- [ ] Security Assessment
- [ ] Noise Ordinance
- [ ] Other_____

Name (Optional): Karen Emmett

Email (Optional): ~~tt~~ k.emmett@verizon.net

Zip Code (Optional): 90815

Please provide your question or comment in the field below:

Extremely concern about the overall pollutions around my house, especially noise pollution. It is so difficult to have a peaceful weekend at home anymore.
Stop Airport International Expansion.

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD

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- [x] Environmental Assessment
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- [ ] Security Assessment
- [ ] Noise Ordinance
- [ ] Other_____

Name (Optional): _____

Email (Optional): _____

Zip Code (Optional): _____

Please provide your question or comment in the field below:

(1) How will your study consider the "Next Gen" flight patterns and not just the approach path. You also need to consider impact on changes on the flight paths from L.B, LAX and O.C.

(2) Under the environmental study, please include the need

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD

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- [x] Noise Ordinance
- [ ] Other _____

Name (Optional): B. De La Torre

Email (Optional): delatorre.birgit@verizon.net

Zip Code (Optional): 90807

Please provide your question or comment in the field below:

(1) Study the potential increase and extent of increase in private commercial jets, especially with the distinct possibility of S. Monica airport closing.

(2) Study the possibility of direct coastal jets coming in to Long Beach and what the consequences would be.

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [ ] Market Analysis
- [ ] Airport Scope & Capability
- [x] Financial Feasibility
- [ ] Environmental Assessment
- [ ] Economic Impact
- [ ] Security Assessment
- [ ] Noise Ordinance
- [ ] Other

Name (Optional): B. DeLaTorre

Email (Optional): delatorre@verizon.net

Zip Code (Optional): 90807

Please provide your question or comment in the field below:

(1) When you assess financial & economic impact of an international terminal, will you please focus your study/data on Long Beach only, not the region.

(2) Include reduction in property tax income due to potential property values.

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport 1

- [ ] Market Analysis
- [x] Airport Scope & Capability (2)
- [ ] Financial Feasibility
- [ ] Environmental Assessment
- [x] Economic Impact (1)
- [ ] Security Assessment
- [ ] Noise Ordinance
- [ ] Other _____

Name (Optional): B. DeLaTorre

Email (Optional): _____

Zip Code (Optional): 90807

Please provide your question or comment in the field below:

(1) What will the impact of more private jets be on income of hotels, motels, ~~private~~ + landlords – Consider that the fine is quite low.

(2) The study should include economic impact and ~~pt~~ environmental impact, ~~to~~ without the ~~p~~ limits of the noise ordinance.

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 1

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [ ] Market Analysis
- [ ] Airport Scope & Capability
- [ ] Financial Feasibility
- [x] Environmental Assessment
- [ ] Economic Impact
- [ ] Security Assessment
- [ ] Noise Ordinance
- [ ] Other _____

Name (Optional): Laurie Angel

Email (Optional): LeangeL@charter.net

Zip Code (Optional): 90805

Please provide your question or comment in the field below:

Must look at local environmental impacts not averaged nor smoothed over the region but the cummulative local impacts of air, traffic, noise in addition to proposed expansion of ~~I-710~~ freeway, traffic increases in traffic on all freeways (SR605, SR405, SR91), including rail and port! - MAJOR IMPACTS already!

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 1

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

☐ Market Analysis ☐ Airport Scope & Capability ☐ Financial Feasibility ☐ Environmental Assessment

☐ Economic Impact ☐ Security Assessment ☐ Noise Ordinance ☐ Other_____

Name (Optional): Janice Sampson

Email (Optional): Puvungna1@aol.com

Zip Code (Optional): 90815

Please provide your question or comment in the field below:

Curfews are not followed now by Jet Blue. Will these international flights obey curfews and will fines ever go up and curfews obeyed. I worry the drug cartels from Mexico and South America will bring in more drugs requiring more ATF officers, drug sniffing dogs, more fear by local people. We should be concerned about the potential for terrorism in our local community.

Our health is of great concern. Many of my neighbors have died of cancer and our kids suffer with breathing problems.

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

over ↓

JACOBS

LAX and John Wayne are international - why can't they take these flights and leave our good airport alone.

We have done so many environmental studies already. Don't you see this international idea is bad for the community around the airport. Just talk to the residents who live in the LB airport area - we can tell you how bad the noise and pollution is. It is already at a maximum.

We are going to have trouble selling our homes if this goes through. I lived in Los Altos for 35 years and worry how I have worked and paid off my home and now we have to worry about our quality of life and value of our homes.

QUESTION / COMMENT CARD

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [ ] Market Analysis
- [ ] Airport Scope & Capability
- [ ] Financial Feasibility
- [ ] Environmental Assessment
- [ ] Economic Impact
- [ ] Security Assessment
- [ ] Noise Ordinance
- [x] Other

Name (Optional):

Email (Optional):

Zip Code (Optional):

Please provide your question or comment in the field below:

This meeting place had the worst Parking - Worst Place in Long Beach for Parking! Plenty of other Locations... Like the Water Department !!

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

FIRST	LAST	EMAIL	ZIP CODE	TOPIC	COMMENT

QUESTION / COMMENT CARD

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [ ] Market Analysis
- [ ] Airport Scope & Capability
- [x] Financial Feasibility
- [x] Environmental Assessment
- [x] Economic Impact
- [ ] Security Assessment
- [ ] Noise Ordinance
- [ ] Other_____

Name (Optional): Marilyn Shaul

Email (Optional): ms.shop1acct@gmail.com

Zip Code (Optional): 90808

Please provide your question or comment in the field below:

- Will study address changes to home values surrounding the airport? (0–10 miles – close to airport)
- Organization of meeting is bad. This is not community input. I want to ask questions about multiple areas – no way I'd have time to do this tonight running around the room.
- Will flight patterns change? (ie. will I have planes landing over my house in the future?)

(over)

Questions and comments may also be submitted via email to: LGBFIScomments@gmail.com

JACOBS

- Will impacts to community to build FIS be studied? for example, will many trucks to build facility increase noise, traffic around airport?
- Are you analyzing if 3 local international airports (LAX, Orange Co, Ontario) are under/over capacity? Do we really need another international airport in this area?
- Will you be evaluating if large planes, like Airbus A380 could land at LGB and what impact that will have?

QUESTION / COMMENT CARD 1

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [x] Market Analysis
- [ ] Airport Scope & Capability
- [ ] Financial Feasibility
- [ ] Environmental Assessment
- [ ] Economic Impact
- [ ] Security Assessment
- [ ] Noise Ordinance
- [ ] Other_____

Name (Optional): Caroline Haprov

Email (Optional): haprov316@yahoo.com

Zip Code (Optional): 90807

Please provide your question or comment in the field below:

① I see nothing good to LB coming out of the expansion to add customs facility to LB Muni airport. my property value will decrease. air quality is already impacted by existing air traffic.

② pto

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

(2) Is this an independant study? will Jacobs engineering be barred from the bidding process.

QUESTION / COMMENT CARD 2

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [ ] Market Analysis
- [ ] Airport Scope & Capability
- [ ] Financial Feasibility
- [ ] Environmental Assessment
- [ ] Economic Impact
- [ ] Security Assessment
- [x] Noise Ordinance
- [ ] Other _____

Name (Optional): _____

Email (Optional): _____

Zip Code (Optional): 90803

Please provide your question or comment in the field below:

Is there the possibility that the addition of International flights seriously compromise the validity of the Noise compatibility such that the City of LB loses management of the airport facility?

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 2

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [ ] Market Analysis
- [x] Airport Scope & Capability
- [ ] Financial Feasibility
- [ ] Environmental Assessment
- [ ] Economic Impact
- [ ] Security Assessment
- [ ] Noise Ordinance
- [x] Other

Name (Optional):

Email (Optional):

Zip Code (Optional): 90803

Please provide your question or comment in the field below:

How many commercial & general aviation flights do you anticipate that are international?

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 2

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [ ] Market Analysis
- [x] Airport Scope & Capability
- [ ] Financial Feasibility
- [x] Environmental Assessment
- [ ] Economic Impact
- [ ] Security Assessment
- [x] Noise Ordinance
- [ ] Other _____

Name (Optional): _____

Email (Optional): _____

Zip Code (Optional): 90803

Please provide your question or comment in the field below: 3.1.13

The Noise ordinance deals with loud commercial flights however according to this feasibility study will allow general aviation activities which can fly at all hours.

Time restrictions

Will there be restrictions to arrival + departure time for general aviation?

Will there be different landing fees for international G.A.

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 2

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [ ] Market Analysis
- [ ] Airport Scope & Capability
- [ ] Financial Feasibility
- [x] Environmental Assessment
- [ ] Economic Impact
- [ ] Security Assessment
- [x] Noise Ordinance
- [ ] Other _____

Name (Optional): Laurie Smith

Email (Optional):

Zip Code (Optional): 90803

Please provide your question or comment in the field below:

Will the feasibility study include the proposed FAA SoCal Metroplex Draft EA LGB proposed procedures for take off + landings of commercial + general aviation (3.1.13)?

Referring to FAA Nextgen + RNAV waypoints

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 2

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [ ] Market Analysis
- [ ] Airport Scope & Capability
- [ ] Financial Feasibility
- [ ] Environmental Assessment
- [x] Economic Impact
- [ ] Security Assessment
- [ ] Noise Ordinance
- [ ] Other_____

Name (Optional): Ian Manzano

Email (Optional): ian0203@yahoo.com

Zip Code (Optional): 90804

Please provide your question or comment in the field below:

The Long Beach Airport is a significant source of economic activity for not just the City of Long Beach but to the surrounding areas. LGB needs to improve its competitiveness w/ other airports such as SNA, VNY, and LAX. The FIS is one way of doing this.

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 2

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- ☐ Market Analysis
- ☐ Airport Scope & Capability
- ☐ Financial Feasibility
- ☐ Environmental Assessment
- ☐ Economic Impact
- ☐ Security Assessment
- ☐ Noise Ordinance
- ☐ Other_____

Name (Optional): _____

Email (Optional): _____

Zip Code (Optional): _____

Please provide your question or comment in the field below:

NEW FEASIBILITY STUDY
THAT INCLUDES THE COST of
NEW FACILITY AND
VERSUS EXISTING FACILITIES (JOHN WAYNE, SAN BERNARDINO)

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 2

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [ ] Market Analysis
- [ ] Airport Scope & Capability
- [ ] Financial Feasibility
- [ ] Environmental Assessment
- [x] Economic Impact
- [ ] Security Assessment
- [ ] Noise Ordinance
- [ ] Other

Name (Optional): Chai Ithr

Email (Optional):

Zip Code (Optional): 90803

Please provide your question or comment in the field below:

What are the assumptions for LBC tourism based on?

Please include a factor (visible measure) that shows migration out of the LBC due to proximity to other desirable areas.

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 2

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [ ] Market Analysis
- [ ] Airport Scope & Capability
- [ ] Financial Feasibility
- [x] Environmental Assessment
- [ ] Economic Impact
- [x] Security Assessment
- [ ] Noise Ordinance
- [x] Other

Name (Optional): Jean Prendergast

Email (Optional): violaplayer57@gmail.com -or- jean.prendergast@lafwp.com

Zip Code (Optional): 90808

Please provide your question or comment in the field below:

1. Was the FIS discussed in the 2007 FEIR? If so, to what degree? Isn't an EIR written in 2007 outdated at this point?
2. Will the security risks also become a part of the environmental documentation, and if not, what avenue for review/input will the neighbors have with regards to security risks associated with a new FIS facility?
3. What is a FIS facility anyway?? Didn't see a description the materials.
4. Really don't want to see this facility built here.

Questions and comments may also be submitted via email to: LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 2

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [x] Market Analysis
- [ ] Airport Scope & Capability
- [ ] Financial Feasibility
- [ ] Environmental Assessment
- [ ] Economic Impact
- [ ] Security Assessment
- [ ] Noise Ordinance
- [ ] Other

Name (Optional): JIM McDANIEL

Email (Optional): jamesbmcdaniel@gmail.com

Zip Code (Optional): 90807

Please provide your question or comment in the field below:

Currently there are 25 regional carrier slots that are widely unused. There is a concern that a FIS may spur some carriers to start using those slots (e.g. Alaska flying Q400s to Loreto). Will the study evaluate the specific issue of increased commuter carrier flights?

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 2

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- ☐ Market Analysis
- ☐ Airport Scope & Capability
- ☐ Financial Feasibility
- ☐ Environmental Assessment
- ☐ Economic Impact
- ☐ Security Assessment
- ☐ Noise Ordinance
- ☒ Other REPORT AVAILABILITY

Name (Optional): _____

Email (Optional): _____

Zip Code (Optional): 90807

Please provide your question or comment in the field below:

THE REPORT SHOULD BE MADE AVAILABLE TO THE PUBLIC AT LEAST 2 WKS BEFORE IT IS TO APPEAR ON COUNCIL'S AGENDA.

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 2

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [ ] Market Analysis
- [ ] Airport Scope & Capability
- [ ] Financial Feasibility
- [ ] Environmental Assessment
- [ ] Economic Impact
- [ ] Security Assessment
- [x] Noise Ordinance
- [ ] Other

Name (Optional): Bob Joy

Email (Optional): bob.joy@verizon.net

Zip Code (Optional): 90805

Please provide your question or comment in the field below:

The Two working days between council agenda publication and a Council vote means the public will not have any reasonable opportunity to asses the content of the FIS study and make their opinions known to the Council. For a decision of this importance this time period is not sufficient. Why are the results of a publicly funded study not being made available to the public in time for the public to influence ~~the~~ Council decisions based on the study?

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

2

QUESTION / COMMENT CARD

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [ ] Market Analysis
- [ ] Airport Scope & Capability
- [ ] Financial Feasability
- [ ] Envirionmental Assesment
- [ ] Economic Impact
- [ ] Security Assessment
- [x] Noise Ordinance
- [ ] Other

Name (Optional): Bob Joy

Email (Optiional): bob.joy@verizon.net

Zip Code (Optional): 90805

Please provide your question or comment in the field below:

It's very possible that a Federal Inspection Facility at our airport could trigger a successful legal challenge to our noise ordinance by any Jet Blue competitor who wants more slots than our Noise Ordinance currently allows. The City Attorney's office is responsible for assessing the possibility of such a challenge as part of this study. That assessment, to be accurate, must use the **completed** forecast of international flight demand that will be provided by this Jacobs study in sections 3.1.3 through 3.1.7.

My question is: When does the City Attorney's office plan to start their assessment of the vulnerability of our noise ordinance to a legal challenge and ~~how long do they believe the assessment will take?~~

Will That report be made available To The public before The Council Votes on implementing The FIS?

Questions and comments may also be submitted via email to: LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 2

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

☐ Market Analysis ☐ Airport Scope & Capability ☐ Financial Feasibility ☐ Environmental Assessment

☐ Economic Impact ☐ Security Assessment ☐ Noise Ordinance ☐ Other_____

Name (Optional): _____

Email (Optional): _____

Zip Code (Optional): _____

Please provide your question or comment in the field below:

_____

_____

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Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 2

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- ☐ Market Analysis
- ☐ Airport Scope & Capability
- ☐ Financial Feasibility
- ☐ Environmental Assessment
- ☐ Economic Impact
- ☐ Security Assessment
- ☐ Noise Ordinance
- ☐ Other_____

Name (Optional): _____

Email (Optional): _____

Zip Code (Optional): _____

Please provide your question or comment in the field below:

LETS HEAR ABOUT INTERNATIONAL AIR FREIGHT

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 2

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [ ] Market Analysis
- [ ] Airport Scope & Capability
- [x] Financial Feasibility
- [ ] Environmental Assessment
- [ ] Economic Impact
- [ ] Security Assessment
- [ ] Noise Ordinance
- [ ] Other_____

Name (Optional): Glenn Ray

Email (Optional): glenn@manilb.com

Zip Code (Optional): 90803

Please provide your question or comment in the field below:

Facilities are underutilized!

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 2

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [ ] Market Analysis
- [x] Airport Scope & Capability
- [x] Financial Feasibility
- [x] Environmental Assessment
- [ ] Economic Impact
- [ ] Security Assessment
- [x] Noise Ordinance
- [ ] Other _____

Name (Optional): _____

Email (Optional): _____

Zip Code (Optional): 90803

Please provide your question or comment in the field below:

What mitigation to the local city & residents will the feasibility study include?
such as: air emissions (leaded/avgas etc)
car traffic emissions getting to airport
noise impact on schools & residents

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 2

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [ ] Market Analysis
- [x] Airport Scope & Capability
- [ ] Financial Feasibility
- [x] Environmental Assessment
- [ ] Economic Impact
- [ ] Security Assessment
- [ ] Noise Ordinance
- [ ] Other

Name (Optional): Laurie Smith

Email (Optional):

Zip Code (Optional): 90803

Please provide your question or comment in the field below:

Regarding 3.1.13 - General aviation at this airport is allowed to use ~~avgas~~ leaded fuel. Can the airport ~~[illegible]~~ guarantee that ~~there~~ any and all ~~any~~ international flights be restricted to those flights which ~~are~~ are NOT using leaded gas / Avgas

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 2

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

☐ Market Analysis ☐ Airport Scope & Capability ☐ Financial Feasibility ☐ Environmental Assessment

☐ Economic Impact ☐ Security Assessment ☒ Noise Ordinance ☐ Other_____

Name (Optional): ANGEL J PERSA

Email (Optional): angeljpersa49@yahoo.com

Zip Code (Optional): 90807

Please provide your question or comment in the field below:

1) IT was not clear if Taxpayers Funds paid for study?
2) why is there not a stated time period for L.B. city resident to review & comment on this study before council action?
3) in (3.2.1) why is not changing the layout of current airfield so planes are landing north to south instead of ~~over~~ over current residential area!
4) ASK the right question. Local means residents of Long Beach
5) FIS facility will increase security risk noise & infestation due to international flights

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 2

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [ ] Market Analysis
- [x] Airport Scope & Capability
- [x] Financial Feasibility
- [x] Environmental Assessment
- [ ] Economic Impact
- [ ] Security Assessment
- [ ] Noise Ordinance
- [ ] Other _____

Name (Optional): Judy Weldon

Email (Optional): Judyweldon j@[redacted].com aol

Zip Code (Optional): 90815

Please provide your question or comment in the field below:

(1) Study cover the Minimum Number of flights required to cover cost of operating an International terminal

(2) With (1) major runway #30 – can it handle all flights when most take offs between 7-9:30AM and arrivals between 5-8:30PM.

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 2

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [ ] Market Analysis
- [ ] Airport Scope & Capability
- [x] Financial Feasibility
- [ ] Environmental Assessment
- [ ] Economic Impact
- [x] Security Assessment
- [x] Noise Ordinance
- [ ] Other _____

Name (Optional): Judy Weldon

Email (Optional): judyweldonj@aol.com

Zip Code (Optional): 90815

Please provide your question or comment in the field below:

(1) Does the study address the possibility of other foreign airlines subsidized by their governments, that would fly into LB possibly hurt rather than help LB & surrounding cities economy?

(Study cover) #7 (General fund)

(2) Additional insert on Long Beach (outside the airport) to make the "Harbor" aware of potential terrorist threat because of International flights. A risk to National economy!

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 2

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [x] Market Analysis
- [ ] Airport Scope & Capability
- [ ] Financial Feasibility
- [x] Environmental Assessment
- [ ] Economic Impact
- [ ] Security Assessment
- [ ] Noise Ordinance
- [ ] Other _____

Name (Optional): Coby Skye

Email (Optional): COBY@GREENS.ORG

Zip Code (Optional): 90814

Please provide your question or comment in the field below:

I'm disappointed that our City is wasting time & money on a study our community does not want. Furthering my disappointment is the overwhelming focus of this feasibility study on the benefits of this project to airline companies, with ZERO focus on community impacts and a fig leaf focus on the environment primarily designed to minimize costs for CEQA compliance.

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 2

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [ ] Market Analysis
- [ ] Airport Scope & Capability
- [ ] Financial Feasibility
- [x] Environmental Assessment
- [x] Economic Impact
- [ ] Security Assessment
- [x] Noise Ordinance
- [ ] Other

Name (Optional): GABRIELLE WEEKS

Email (Optional): GABRIELLEWEEKS@GMAIL.COM

Zip Code (Optional): 90814

Please provide your question or comment in the field below:

I LOVE OUR LEED CERTIFIED, SMALL, MANAGABLE AIRPORT. WE DON'T NEED TO TRY TO BE LAX, WE ALREADY HAVE AN LAX.
YOU'VE HEARD THAT OUR NOISE ORDINANCE IS SACRED TO THE COMMUNITY. THIS STUDY IS A WASTE OF MONEY & EFFORT. I WISH IT HAD BEEN SPENT ON ENGINEERING STUDIES TO ADD SOLAR PANELS AND VERTICAL AXIS WIND POWER TO THE AIRPORT, AND ALL CITY STRUCTURES AND PARKING LOTS.

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

→ AND IF THER WAS STILL MONEY PER STUDIES, PLAN TO UPGRADE WEATHERIZATION OR IMPROVE ALL OUR CITY BUILDINGS TO LEED STANDARD.

OSLO & COPENHAGEN HAVE REMOTE, AWKWARD SUBSTAINS.

WILL YOUR INTERNATIONAL EXPANSION COSTS BE THROWN ON TO DOMESTIC FLIGHTS ALSO HURTING OUR TICKET SALES? TRAVELERS CHOOSE LGB BECAUSE WE ARE LESS EXPENSIVE AND LESS CHAOTIC THAN BIG AIRPORTS.

CURRENT AIRPORT TENANTS VIOLATE THE NOISE ORDINANCE ALREADY, FIX THAT FIRST.

QUESTION / COMMENT CARD 2

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- ☐ Market Analysis
- ☐ Airport Scope & Capability
- ☐ Financial Feasibility
- ☐ Environmental Assessment
- ☐ Economic Impact
- ☐ Security Assessment
- ☐ Noise Ordinance
- ☐ Other _____

Name (Optional): _____

Email (Optional): _____

Zip Code (Optional): _____

Please provide your question or comment in the field below:

FINES FOR NOISE ORDINANCES
MUST BE SEVERE.

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 2

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- ☐ Market Analysis
- ☐ Airport Scope & Capability
- ☐ Financial Feasibility
- ☐ Environmental Assessment
- ☐ Economic Impact
- ☐ Security Assessment
- ☐ Noise Ordinance
- ☐ Other _____

Name (Optional): PAUL DASILVA

Email (Optional): _____

Zip Code (Optional): _____

Please provide your question or comment in the field below:

NOW FEASIBILITY STUDY IS NEEDED

COMPARISON OF COST TO BUILD NEW FACILITY IN LONG BEACH, ENVIRONMENT, CITIZEN CONCERNS VERSUS EXISTING FACILITIES THAT HAVE AVAILABLE INTERNATIONAL BAYS OPEN IE. JOHN WAYNS SNA AND SAN BERNARDINO.

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 2

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [ ] Market Analysis
- [ ] Airport Scope & Capability
- [ ] Financial Feasibility
- [ ] Environmental Assessment
- [ ] Economic Impact
- [ ] Security Assessment
- [ ] Noise Ordinance
- [x] Other

Name (Optional): Dr S. Zasueta

Email (Optional): DrZas@aol.com

Zip Code (Optional): 90807

Please provide your question or comment in the field below:

1. Want a public review of the studies prior to City Council agenda item

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 2

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [x] Market Analysis
- [ ] Airport Scope & Capability
- [ ] Financial Feasibility
- [ ] Environmental Assessment
- [ ] Economic Impact
- [ ] Security Assessment
- [ ] Noise Ordinance
- [ ] Other

Name (Optional): Laurie Angel

Email (Optional): lcangel@charter.net

Zip Code (Optional): 90805

Please provide your question or comment in the field below:

The mix and balance of domestic vs. international flights must be considered within the context of this region and existing international facilities. And how the addition of international flights to LB airport will eliminate or reduce the availability of domestic flights or even worse just add to the number of flights overall.

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 2

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [ ] Market Analysis
- [ ] Airport Scope & Capability
- [ ] Financial Feasibility
- [ ] Environmental Assessment
- [ ] Economic Impact
- [ ] Security Assessment
- [ ] Noise Ordinance
- [x] Other reporting back/reports

Name (Optional): Laurie Angel

Email (Optional): lcangel@charter.net

Zip Code (Optional): 90805

Please provide your question or comment in the field below:

When the report(s) come in they must be available at least 2 weeks before a study session. A vote will not be appropriate

or a special meeting would be preferred.

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 2

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [ ] Market Analysis
- [ ] Airport Scope & Capability
- [ ] Financial Feasibility
- [ ] Environmental Assessment
- [x] Economic Impact
- [ ] Security Assessment
- [ ] Noise Ordinance
- [ ] Other_____

Name (Optional): Laurie Angel

Email (Optional): lcangel@charter.net

Zip Code (Optional): 90805

Please provide your question or comment in the field below:

The study must evaluate the quality of jobs. and report on the potential pay & quality of those jobs. Long Beach has plenty of low paying jobs (tourism & hotel) We need good paying jobs - that people can sustain families.
What will be the impact of these new jobs) on businesses on housing, schools, city services
There are costs associated with an economic study, not just benefits

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 2

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- ☐ Market Analysis
- ☐ Airport Scope & Capability
- ☐ Financial Feasibility
- ☐ Environmental Assessment
- ☐ Economic Impact
- ☐ Security Assessment
- ☐ Noise Ordinance
- ☐ Other _____

Name (Optional): _____

Email (Optional): _____

Zip Code (Optional): _____

Please provide your question or comment in the field below:

IS THERE A LIKELYHOOD OF AIR FREIGHT TRAFFIC IF WE HAVE AN FIS?

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 2

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- ☐ Market Analysis
- ☐ Airport Scope & Capability
- ☐ Financial Feasibility
- ☐ Environmental Assessment
- ☐ Economic Impact
- ☐ Security Assessment
- ☐ Noise Ordinance
- ☐ Other _____

Name (Optional): _____

Email (Optional): _____

Zip Code (Optional): _____

Please provide your question or comment in the field below:

IN THE STUDY WILL THE EFFECTS OF INCREASED NOISE ON SCHOOL CHILDREN BE INCLUDED? THERE ARE OVER A DOZEN SCHOOLS EFFECTED BY THE AIRPORT.

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 2

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [ ] Market Analysis
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- [ ] Financial Feasibility
- [ ] Environmental Assessment
- [ ] Economic Impact
- [ ] Security Assessment
- [ ] Noise Ordinance
- [x] Other Safety

Name (Optional): Glenn Ray

Email (Optional): glenn@manilb.com

Zip Code (Optional): 90802

Please provide your question or comment in the field below:

Will the issue of safety be studied about the flight that must clear customs at other area airports and then reposition to LGB?

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 2

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- ☐ Market Analysis
- ☐ Airport Scope & Capability
- ☐ Financial Feasibility
- ☐ Environmental Assessment
- ☐ Economic Impact
- ☐ Security Assessment
- ☐ Noise Ordinance
- ☐ Other GA

Name (Optional): Glenn Roy

Email (Optional): glenn@manilb.com

Zip Code (Optional): 90803

Please provide your question or comment in the field below:

What is the impact from General Aviation Clearing customs @ LGB?

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 2

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [ ] Market Analysis
- [ ] Airport Scope & Capability
- [ ] Financial Feasibility
- [ ] Environmental Assessment
- [x] Economic Impact
- [ ] Security Assessment
- [x] Noise Ordinance
- [ ] Other_____

Name (Optional): Glenn Ray

Email (Optional): glenn@manilb.com

Zip Code (Optional): 90803

Please provide your question or comment in the field below:

Would larger aircraft than currently are being used, be utilized by any of the current entrants holding slots?

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 2

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [x] Market Analysis
- [ ] Airport Scope & Capability
- [ ] Financial Feasibility
- [ ] Environmental Assessment
- [ ] Economic Impact
- [ ] Security Assessment
- [ ] Noise Ordinance
- [ ] Other_____

Name (Optional): Glenn Ray

Email (Optional): glenn@manilb.com

Zip Code (Optional): 90803

Please provide your question or comment in the field below:

What is the estimated passenger count coming from Mexico and South America.

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 2

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

☐ Market Analysis ☐ Airport Scope & Capability ☐ Financial Feasibility ☐ Environmental Assessment

☐ Economic Impact ☐ Security Assessment ☐ Noise Ordinance ☐ Other_____

Name (Optional): _____

Email (Optional): Pipe in the room has mold/water damage

Zip Code (Optional): & sewer ~~noise~~ noise problem & increase traffic

Please provide your question or comment in the field below: Should data be given who benefits

I believe the airport issue is pretty in an international flight sense about the mighty dollars that promote expanding the L.B city government. If we looks at the result of the airport has damaged the surrounding area. It needs to look at the Inglewood. Where ~~[illegible]~~ the values of the has plummet

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 2

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [ ] Market Analysis
- [ ] Airport Scope & Capability
- [ ] Financial Feasibility
- [ ] Environmental Assessment
- [ ] Economic Impact
- [ ] Security Assessment
- [x] Noise Ordinance
- [ ] Other_____

Name (Optional): Sonia Preiser

Email (Optional): soniapreiser@yahoo-com

Zip Code (Optional): 90815

Please provide your question or comment in the field below:

We already have enough flights and noise in my Los Altos neighborhood. The military flights are deafening (noise wise) as they pass in groups of 3. Isn't that punishment enough? If more planes are added by the International flights that would really ruin the quality of life (more noise + pollution) in our area.

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 2

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- ☐ Market Analysis
- ☐ Airport Scope & Capability
- ☐ Financial Feasibility
- ☐ Environmental Assessment
- ☐ Economic Impact
- ☐ Security Assessment
- ☐ Noise Ordinance
- ☐ Other_____

Name (Optional): _____

Email (Optional): SKOGSBERG@AOL.COM

Zip Code (Optional): _____

Please provide your question or comment in the field below:

(1) THE STUDY MUST BE AVAILABLE TO THE CITIZENS OF LONG BEACH WAY AHEAD OF THE CITY COUNCIL.

(2) FOLLOWING THE MONEY — WHOSE POCKETS WILL GET RICHEST WITH THIS DEVELOPMENT OF JETBLUE? THE CITY OF LONG BEACH MUST TAKE PRECEDENCE IN QUALITY OF LIFE.

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 2

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

☐ Market Analysis ☐ Airport Scope & Capability ☐ Financial Feasibility ☐ Environmental Assessment

☐ Economic Impact ☐ Security Assessment ☐ Noise Ordinance ☐ Other _____

Name (Optional): SAL SANDERS

Email (Optional): Salaborlaw@aol.com

Zip Code (Optional): 90808

Please provide your question or comment in the field below:

We are against having a FIS Facility at the Long Beach Airport. Once the Feds get involved it no longer is under the control of Long Beach. The inevitable result is further expansion of LGB to the detriment of the people of L.B. Noise, traffic, gas and vehicles, air quality, property values are no longer under the City's control. Don't trust the "expert" consultants, no Politicians, just blue, steel, to abide by any environmental estimate or control. LGB is - or used to be - one of the best kept secrets, but the word is out. We don't want or need an LAX at L.B. Keep it little, keep the Feds out.

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 2

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [ ] Market Analysis
- [ ] Airport Scope & Capability
- [ ] Financial Feasibility
- [x] Environmental Assessment
- [ ] Economic Impact
- [ ] Security Assessment
- [x] Noise Ordinance
- [ ] Other

Name (Optional): Glenn Skalland

Email (Optional): gskalland@aol.com

Zip Code (Optional): 90807

Please provide your question or comment in the field below:

Study needs to address probability of challenges to noise ordinance.
Also, describe scenarios if ordinance is gone.
Can a prediction (probability) be made concerning likelihood based on potential economic gains, that a business could realize by having 24 hr access to airport and/or increased # of flights.

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 2

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [ ] Market Analysis
- [ ] Airport Scope & Capability
- [ ] Financial Feasibility
- [x] Environmental Assessment
- [ ] Economic Impact
- [ ] Security Assessment
- [x] Noise Ordinance
- [ ] Other _____

Name (Optional): Glenn Skalland

Email (Optional): _____

Zip Code (Optional): _____

Please provide your question or comment in the field below:

Assuming noise ordinance remains intact, what is the limit to the # of flights allowed by current technologies & the "sound cap"?
Could flights increase by How many?, And if so, what would the environmental impact be?

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 2

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [ ] Market Analysis
- [x] Airport Scope & Capability
- [x] Financial Feasibility
- [x] Environmental Assessment
- [x] Economic Impact
- [x] Security Assessment
- [x] Noise Ordinance
- [ ] Other _____

Name (Optional): _____

Email (Optional): _____

Zip Code (Optional): 90807

Please provide your question or comment in the field below:

I am concerned about foreign planes coming in at all hours of the day & night, possibly bringing in drugs or illegal activity.

Also, who will pay for customs to be open many many hours for only 1 or 2 or 3 of international flight a day, since small private & foreign planes could come in at any time.

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 2

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [ ] Market Analysis
- [ ] Airport Scope & Capability
- [ ] Financial Feasibility
- [x] Environmental Assessment
- [x] Economic Impact
- [x] Security Assessment
- [x] Noise Ordinance
- [ ] Other _____

Name (Optional): _____

Email (Optional): _____

Zip Code (Optional): 90806

Please provide your question or comment in the field below:

We are concerned about noise, traffic, what is the impact environmentally? Costs to the city??

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 2

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [ ] Market Analysis
- [ ] Airport Scope & Capability
- [ ] Financial Feasibility
- [x] Environmental Assessment
- [x] Economic Impact
- [x] Security Assessment
- [x] Noise Ordinance
- [ ] Other _____

Name (Optional): _____

Email (Optional): _____

Zip Code (Optional): 90805

Please provide your question or comment in the field below:

NO international flights!

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 2

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [ ] Market Analysis
- [x] Airport Scope & Capability
- [x] Financial Feasibility
- [x] Environmental Assessment
- [x] Economic Impact
- [x] Security Assessment
- [x] Noise Ordinance
- [ ] Other _____

Name (Optional): _____

Email (Optional): _____

Zip Code (Optional): 90807

Please provide your question or comment in the field below:

NO INT'L NOISE NO INT'L
AIRPOR LAX is enough

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 2

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [ ] Market Analysis
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- [ ] Financial Feasibility
- [x] Environmental Assessment
- [ ] Economic Impact
- [ ] Security Assessment
- [ ] Noise Ordinance
- [ ] Other _____

Name (Optional): _____

Email (Optional): birgebergeron@verizon.net

Zip Code (Optional): 90807

Please provide your question or comment in the field below:

I have worked at a school in the landing path and I live in the take-off path. The noise level at the school interrupts lessons and makes it impossible to give instructions to children ~~th~~ both on the campus and in the classroom. My question is: How much time is spent actually measuring the sound impact both in and outside the classrooms?

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 2

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [ ] Market Analysis
- [ ] Airport Scope & Capability
- [ ] Financial Feasibility
- [x] Environmental Assessment
- [ ] Economic Impact
- [ ] Security Assessment
- [x] Noise Ordinance
- [x] Other _____

Name (Optional): _____

Email (Optional): _____

Zip Code (Optional): 90807

Please provide your question or comment in the field below:

One of the major concerns is, how the increase in flights is going to generate more air pollution and noise pollution, and the effect on the citizens, especially those on the flight path. In the last few years I have developed asthma and my son now 26 was diagnose with asthma when he was in his teens, we both use asthma inhalers.
Please include, the health effect on the citizens, too.

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport 2

- [ ] Market Analysis
- [x] Airport Scope & Capability
- [ ] Financial Feasibility
- [ ] Environmental Assessment
- [ ] Economic Impact
- [ ] Security Assessment
- [ ] Noise Ordinance
- [ ] Other

Name (Optional): Jane Nadeau

Email (Optional): Janenadeau@ymail.com

Zip Code (Optional): 90807

Please provide your question or comment in the field below:

ARE you going to look at the traffic impact on surrounding surface streets?

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 2

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

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- [ ] Airport Scope & Capability
- [ ] Financial Feasibility
- [ ] Environmental Assessment
- [ ] Economic Impact
- [ ] Security Assessment
- [ ] Noise Ordinance
- [x] Other

Name (Optional): LLOYD FOX

Email (Optional): RIVERSIDE66@gmail.com

Zip Code (Optional): 90803

Please provide your question or comment in the field below:

I believe that Mr. Peters said that 85% of Jacobs Engineering's airport analysis/consulting revenue comes from airport clients.

① How many FIS Feasibility Studies have been performed by Jacobs in the past 10 years?

② Of the 7 FIS studies done in the past 10 years by Jacobs have determined that the FIS study was ⓐ feasible and ⓑ not feasible?

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 2

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [ ] Market Analysis
- [ ] Airport Scope & Capability
- [ ] Financial Feasibility
- [ ] Environmental Assessment
- [ ] Economic Impact
- [ ] Security Assessment
- [ ] Noise Ordinance
- [x] Other methods

Name (Optional): _____

Email (Optional): _____

Zip Code (Optional): _____

Please provide your question or comment in the field below:

What is your method for eliminating bias in data collection and analysis?

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 2

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

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- [ ] Financial Feasibility
- [ ] Environmental Assessment
- [x] Economic Impact
- [ ] Security Assessment
- [ ] Noise Ordinance
- [ ] Other _____

Name (Optional): _____

Email (Optional): _____

Zip Code (Optional): _____

Please provide your question or comment in the field below:

Please format report for use in a later cost-benefit analysis.

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 2

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

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- ☐ Financial Feasibility
- ☐ Environmental Assessment
- ☐ Economic Impact
- ☐ Security Assessment
- ☐ Noise Ordinance
- ☐ Other_____

Name (Optional): _____

Email (Optional): _____

Zip Code (Optional): _____

Please provide your question or comment in the field below:

Please take into consideration: ① air quality hazards of ↑ planes
② ↓ housing value
③ schools in flight pattern
(teachers stop teaching during flight)

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 2

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- [ ] Environmental Assessment
- [x] Economic Impact
- [ ] Security Assessment
- [ ] Noise Ordinance
- [ ] Other _____

Name (Optional): MIKE POWELL

Email (Optional): Otter182@aol.com

Zip Code (Optional): 90815

Please provide your question or comment in the field below:

Is part of your study to take into account potential home value changes with a change to an international airport

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 2

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

☐ Market Analysis ☐ Airport Scope & Capability ☐ Financial Feasibility ☐ Environmental Assessment

☐ Economic Impact ☐ Security Assessment ☐ Noise Ordinance ☐ Other_____

Name (Optional): MARIE GREEN

Email (Optional): MOKELLYGRE@AOL.COM

Zip Code (Optional): 90815

Please provide your question or comment in the field below:

I SUPPORT INTERNATIONAL OPERATIONS. I LIVE @ [redacted], 400 Feet off of Runway 30.

This is a phenomenal opportunity for our city.

I MANAGE FIS GUEST SERVICES AT LAX FOR THE CITY OF LOS ANGELES. I'M CONFIDENT THAT THIS IS IN THE CITY'S BEST ~~INTERESTS~~ INTERESTS.

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 2

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [ ] Market Analysis
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- [ ] Financial Feasibility
- [ ] Environmental Assessment
- [ ] Economic Impact
- [ ] Security Assessment
- [ ] Noise Ordinance
- [x] Other Capacity

Name (Optional): _____

Email (Optional): _____

Zip Code (Optional): _____

Please provide your question or comment in the field below:

"FAA Metroplex Regarding Phoenix movement" question on 3/30 was brought up but dismissed

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 2

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- [ ] Financial Feasibility
- [x] Environmental Assessment
- [ ] Economic Impact
- [ ] Security Assessment
- [ ] Noise Ordinance
- [ ] Other _____

Name (Optional): _____

Email (Optional): Mello.joe@gmail.com

Zip Code (Optional): 90815

Please provide your question or comment in the field below:

2007 Assumptions: Will the "Validity" of those ~~of~~ your assumptions be looked at in hindsight?

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 2

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [x] Market Analysis
- [ ] Airport Scope & Capability
- [ ] Financial Feasibility
- [ ] Environmental Assessment
- [ ] Economic Impact
- [ ] Security Assessment
- [ ] Noise Ordinance
- [ ] Other _____

Name (Optional): _____

Email (Optional): mello.joe@gmail.com

Zip Code (Optional): 90815

Please provide your question or comment in the field below:

Will San Bernadino Inter Airport capacity be studied along with the other local airports named? tonight.

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 2

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [ ] Market Analysis
- [ ] Airport Scope & Capability
- [ ] Financial Feasibility
- [x] Environmental Assessment
- [x] Economic Impact
- [ ] Security Assessment
- [ ] Noise Ordinance
- [ ] Other_____

Name (Optional): RON PETERS

Email (Optional): rmaurino@verizon.net

Zip Code (Optional): 90808

Please provide your question or comment in the field below:

- WHAT IS THE TIMELINE? IT SEEMS THERE IS NO STUDY DONE NOW AND ONCE COMPLETED, THE PUBLIC WILL ONLY HAVE 3-4 DAYS TO REVIEW BEFORE THE CITY COUNCIL VOTES? IS THIS CORRECT?
- WHY WOULDN'T AN ECOLOGICAL/ENVIRONMENTAL STUDY BE INCLUDED BEFORE THE CITY COUNCIL VOTES TO AUTHORIZE?
- WHAT WILL THE IMPACT BE TO REAL ESTATE VALUES AROUND THE AIRPORT?

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 2

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

☐ Market Analysis ☐ Airport Scope & Capability ☐ Financial Feasibility ☐ Environmental Assessment

☐ Economic Impact ☐ Security Assessment ☐ Noise Ordinance ☐ Other

Name (Optional): Kevin McAchren 04/20/16

Email (Optional):

Zip Code (Optional): 90808

Please provide your question or comment in the field below:

The first study session seemed to degenerate into an anti - F.I.S. facility rather quickly. Same people in attendance that opposed additional flights, new terminal facility, etc. No need for fact-finding here! ("Round up the usual suspects.") My opinion: The development of this facility is necessary for trade, travel, tourism. We have an international port which is beginning to emphasize trade relationships with Latin America. We have an ever-growing convention/tourism business. Also, we have a diverse ethnic population which will use and benefit with service south of the border. Establishment of F.I.S. should be "no brainer".

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 2

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [ ] Market Analysis
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- [ ] Environmental Assessment
- [x] Economic Impact
- [ ] Security Assessment
- [ ] Noise Ordinance
- [ ] Other_____

Name (Optional): _____

Email (Optional): _____

Zip Code (Optional): _____

Please provide your question or comment in the field below:

We need to provide what AIRLINES Need. I work @ LGB and Have seen the Traffic decline. We need more capability to create positive economic impacts.

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 2

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [ ] Market Analysis
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- [ ] Financial Feasibility
- [ ] Environmental Assessment
- [x] Economic Impact
- [ ] Security Assessment
- [ ] Noise Ordinance
- [ ] Other_____

Name (Optional): _____

Email (Optional): _____

Zip Code (Optional): _____

Please provide your question or comment in the field below:

If the study shows that adding the facility is, in fact, "feasible", with a positive financial impact to the area, we should embrace the facility. We should not continue to pump revenue into and give potential revenue opportunities to surrounding airports.

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 2

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- ☐ Financial Feasibility
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- ☐ Economic Impact
- ☐ Security Assessment
- ☐ Noise Ordinance
- ☐ Other_____

Name (Optional): _____

Email (Optional): _____

Zip Code (Optional): _____

Please provide your question or comment in the field below:

This meeting has at times given the very best examples of the very worst cases of tunnel vision.

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 2

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [ ] Market Analysis
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- [ ] Financial Feasibility
- [ ] Environmental Assessment
- [x] Economic Impact
- [ ] Security Assessment
- [ ] Noise Ordinance
- [ ] Other

Name (Optional):

Email (Optional): Mello.joe@gmail.com

Zip Code (Optional):

Please provide your question or comment in the field below:

Percentage of orignation of Passengers : ie! will it be Americans flying out & Back vs. Mexican or S Americans flying into US then out ?

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 2

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [ ] Market Analysis
- [ ] Airport Scope & Capability
- [x] Financial Feasibility
- [ ] Environmental Assessment
- [ ] Economic Impact
- [ ] Security Assessment
- [ ] Noise Ordinance
- [ ] Other_____

Name (Optional): _____

Email (Optional): Mello.joe@gmail.com

Zip Code (Optional): _____

Please provide your question or comment in the field below:

IF the Airport is "LIMITED" to 50 flights - how can the regional economy be impacted any more?

Questions and comments may also be submitted via email to LGBFIScomments@gmail.com

JACOBS

QUESTION / COMMENT CARD 2

Feasibility Study for a Federal Inspection Service (FIS) Facility at Long Beach Airport

- [x] Market Analysis
- [x] Airport Scope & Capability
- [ ] Financial Feasibility
- [ ] Environmental Assessment
- [x] Economic Impact
- [ ] Security Assessment
- [ ] Noise Ordinance
- [ ] Other _____

Name (Optional): _____

Email (Optional): _____

Zip Code (Optional): _____

Please provide your question or comment in the field below:

We need to ensure LGB airport's long term competitiveness in the region. This means being able to accomodate increased passenger load from new markets that will provide economic stability to the city and surrounding areas.

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

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- [ ] Noise Ordinance
- [ ] Other

Name (Optional): MACSHALL BLESOFSKY

Email (Optional): MACSHALLBLESOFSKY@yahoo.com

Zip Code (Optional): 90807

Please provide your question or comment in the field below:

WHAT IS THE ~~IMPA~~ IMPACT ON THE VALUE OF THE ~~H~~HOUSING + REALESTATE ON THOSE NEIGHBORHOODS THAT ARE IN THE FLIGHT PATH?

THIS IS LEFT OUT OF THE FEASIBILY STUDY.

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☐ Market Analysis ☐ Airport Scope & Capability ☐ Financial Feasibility ☐ Environmental Assessment

☐ Economic Impact ☐ Security Assessment ☐ Noise Ordinance ☒ Other fines

Name (Optional): Susan Collins

Email (Optional): kollinss65@gmail.com

Zip Code (Optional): 90803

Please provide your question or comment in the field below:

I think the fines for planes coming after hours is outdated. $100-300 is hardly a deterrant for averting bad behavior. I would like to see fines big enough that companies and private flyers would think twice about landing after hours. And keeping up a schedule to update fines, so it doesn't end up like the fines are today.

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- [x] Environmental Assessment
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- [ ] Security Assessment
- [ ] Noise Ordinance
- [ ] Other _____

Name (Optional): Joe Sopo

Email (Optional): homes@joesopo.com

Zip Code (Optional): 90808

Please provide your question or comment in the field below:

Becoming an international airport will create a larger probability of having our noise ordinance challenged, shouldn't we have an environmental impact study ~~that~~ of our airport, neighborhood & city without noise ordinance

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

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- [ ] Market Analysis
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- [ ] Economic Impact
- [ ] Security Assessment
- [ ] Noise Ordinance
- [ ] Other_____

Name (Optional): ALEXIS AMADOR MARRERO

Email (Optional): E.Edandme@verizon.net

Zip Code (Optional): 90815

Please provide your question or comment in the field below:

[Comment] I am concerned about increased pollution, noise + air pollution. We already have lots of children with asthma + air quality is a concern (from the jam report 4-20). I am also concerned about Mayor Garcia + how he distributes his concern for the citizens of Long Beach. He voiced his concern for the Westside of Long Beach + the pollution that might be brought by the Railyard, why couldn't he question on behalf of the eastside potential increased pollution an expansion might create! [Question] When will an EIR (air + noise pollution) be completed? Hopefully before council votes.

Questions and comments may also be submitted via email to:
LGBFIScomments@gmail.com

JACOBS

over →

Gmail

Lee Andrews Group <lgbfiscomments@gmail.com>

FIS

1 message

[redacted] Wed, Mar 30, 2016 at 9:39 PM

To: LGBFIScomments@gmail.com

1) What area will your study cover that the other ones different?

2) How much financially (percentage)is the airport responsible for operating an International airport. And what percentage if any would fall on the city budget? Is this covered under "financial feasibilty"? And a "what if" the airport could not cover their costs?

[redacted]

Sent from my Verizon Wireless 4G LTE smartphone

Gmail

Lee Andrews Group <lgbfiscomments@gmail.com>

Economic Impact Comment

1 message

[redacted] Thu, Mar 31, 2016 at 12:17 AM

To: lgbfiscomments@gmail.com

In relation to Economic Impact to the Local and Regional Economy: the study should include and make calculations and reference to the financial and economic impact on the neighborhoods in Long Beach effected by the airport. I have attached a piece from the American Appraisal on "Identifying and Quantifying Economic Obsolescence."

Economic obsolescence, also referred to as external **obsolescence**, is the loss in value resulting from influences external to the property itself. External conditions causing EO may be international, national, industry-based, or local in origin.

Therefore, allowing international flights will/could result in increased air traffic creating an external condition to the neighborhoods in Long Beach under the flight patters which would create an economic obsolescence for the real estate stock in these areas. The external obsolescence will decrease quality of life and decrease the value for these homes. This will have a negative impact on home values for existing and future residents which should be calculated in this report and future reports. It will also effect property tax revenues for the city as a cost of expanding the airport to include international flights.

Attached below are some examples of calculations.

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Identifying and Quantifying Economic Obsolescence

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This article was authored by **Michael J. Remsha**, P.E., ASA, CMI, Vice President and Managing Director

Introduction

Economic obsolescence: You can't see it, you can't touch it, and you can't smell it (at least most of the time), so how are appraisers supposed to quantify it? No one ever said being an appraiser was easy. It takes years of training, experience, and hard work to be able to investigate an industry, analyze market data, and derive factors such as economic obsolescence ("EO").

Economic obsolescence, also referred to as external obsolescence, is the loss in value resulting from influences external to the property itself. External conditions causing EO may be international, national, industry-based, or local in origin. Various external factors affect potential economic returns, thus having a direct impact on the market value of an asset or property.

This paper will discuss a number of procedures that can be used to identify and quantify EO. The appraiser must study the subject property and its industry, as appropriate, to determine if EO exists, and if it does, how to measure and apply it. These procedures may not apply to every property or industry, and may not be appropriate in the case of certain U.S. Federal Tax or financial reporting matters where other perspectives may apply.

To determine if EO is present, a review must be made of the economics of the subject property and the industry in which it competes, as of a chosen point in time - the appraisal date. This review can be made by examining the earnings history of the subject property and any local or other influences that may affect the economic performance of the subject and its assets. For typical real estate, especially small generic properties, the effects of local market conditions can be very important. Zoning, the local economy, unemployment, and industry factors can affect the value of real estate. Larger real estate properties may not be affected by local economics as significantly, but they can be affected by the regional, national,

and even global economy. Major properties that typically include real estate and significant other capital assets, and going concern influences (business values such as tangible and intangible assets and working capital) can be affected by local economic factors, but usually are more significantly affected by industry-wide economic conditions.

Industry economic conditions affect all aspects of a business, and commonly, entire businesses are appraised, not just real estate or just machinery and equipment. Some typical properties that would be appraised as a business include cement plants, steel mills, paper mills, petrochemical and chemical plants, and other processing plants; oil and gas production, mining, and other facilities in the extractive industries; and any other assemblies of assets that compete in a specific industry. Typical sources of data that can be used to review the economics of an industry include annual stockholder reports of companies in the industry, 10K reports to the Securities and Exchange Commission, industry publications discussing product and raw material price changes, investment banking and brokerage reports, and government studies. By using such data, the appraiser can determine if the earnings in the industry – and hence, of the subject property – have been, are currently, or will be affected by some outside economic influence that will reduce earnings and, therefore, the value of the business and its assets.

Of course, if certain assets in the plant or in the industry are generic such that they could be used by other industries, the EO of the current user may not be appropriate for that specific asset. For example, EO in the typewriter industry may be significant, but the real estate associated with a typewriter plant could be used by many different users. Therefore, it would be appropriate to apply the EO penalty to the machinery and equipment used to manufacture typewriters, but not to the buildings. The appraiser must practice careful analysis.

Quantification

Overview

To quantify EO, an appraiser must first investigate the existence of economic conditions that may reduce the value of a business and, hence, its assets. Then, the EO must be quantified in an objective manner. EO may exist in any industry or property where the following attributes are found:

- Reduced demand for the company's products
- Overcapacity in the industry
- Dislocation of raw material supplies
- Increasing cost of raw materials, labor, utilities, or transportation, while the selling price of the product remains fixed or increases at a much lower rate
- Government regulations that require capital expenditures to be made with little or no return on the new investment
- Environmental considerations that require capital expenditures to be made with little or no return on the new investment

EO is present when better economic opportunities exist for an investment. The economic principles of supply and demand, and competition drive the loss of value associated with EO. Typically, EO cannot be reduced by capital investments, but it can change and even decline to zero through changing industry conditions.

EO can be quantified using many different methods, including the following:

- Market-Derived Approach
- Income Approach
- Utilization Analysis
- Return-on-Capital Analysis
- Equity-to-Book Ratio Analysis
- Gross Margin Analysis
- Government Regulations Analysis
- Income Shortfall Analysis
- Best of the Best Technique

Every method may not be applicable in every valuation problem. Determination of the appropriate method will depend on the availability of data for review and the type of asset being valued. The following sections discuss each method in greater detail.

Market-Derived Approach

A very simple and direct approach is to derive EO from the market by reviewing sales of similar properties. This is especially useful for real estate where similar properties are available in the local or regional market and sufficient information is available on properties that have sold. In this approach, the following steps are applied:

Step 1	Deduct land value from the sale price of the property that sold; the result is the value of only non-land assets. Beca the cost approach and land is typically valued using the sales comparison approach, the land value is removed from
Step 2	Develop the current cost new of non-land assets.
Step 3	Calculate all depreciation and obsolescence, except EO, and deduct it from the current cost new of non-land assets
Step 4	Deduct the adjusted sale price (Step 1) from the current cost new less depreciation and obsolescence (Step 3).

The result is an indication of EO based on a market transaction, a sale of a similar property. This approach can be used to calculate EO as a dollar amount, or as a percentage of the cost of reproduction new ("CRN"), cost of replacement ("COR"), or even the cost of replacement less physical depreciation ("CORLD"). An example follows:

Sale Price of Similar Property	$1,000,000
Less Value of Land	200,000
Sale Price of Non-land Assets	$800,000
Cost Approach Indication of Value of Property Sold	
COR	$1,500,000

Less Physical Depreciation	500,000
CORLD	$1,000,000
Less Functional Obsolescence	0
Cost Approach Indication of Value Before EO	$1,000,000
Less Sale Price of Non-land Assets	800,000
Indicated EO	$200,000
Indicated EO as Percent of CORLD	20%

Hence, based on the above, EO is $200,000, or 13% of the COR, or 20% of the CORLD. The dollar amount of EO is the same, but the percent will vary depending on how it is measured and how it is to be used.

Several sales should be reviewed in the analysis to develop a market-derived conclusion. Preferably, the sales should be similar in age and location to the subject, and have little or no functional obsolescence, if possible (one less item to analyze). Sometimes this is not possible, but an attempt should be made to locate comparables that have economic factors similar to those of the subject. Also, if the calculated EO for the comparables is based on a percentage of their CORLD, then the deduction for EO applied to the subject property must be taken before the deduction of any dollar amount for functional obsolescence. Percentage deductions must always be deducted first, dollar deductions last.

Income Approach

A common valuation technique used by the financial community is simply to develop the income approach to indicate the value of the property being appraised. The income approach quantifies all forms of depreciation and obsolescence - physical, functional, and economic. However, when quantifying depreciation and obsolescence through use of the income approach, EO cannot be separately delineated in the analysis without relying on the cost approach. A modification of this approach is to develop all aspects of the cost approach, with the exception of EO, as in the market-derived approach previously discussed, then subtract the income approach indication of value from the partially completed cost approach; the difference is EO. The primary problem with this approach is that the result really relies on just one approach to value, the income approach. As a general rule, using this technique, the result of the cost approach to value will always equal the result of the income approach to value. Although EO has been developed, it is totally dependent on the basic assumptions of the income approach. An example, based on the previous example used in the Market-Derived Approach section, follows:

EO in this example is therefore $100,000. If the income approach indication of value were to change based on a different set of projections or even a different discount rate, the dollar amount of EO also would change.

Income Approach Indication of Value	$1,100,000
Less Value of Land	200,000
Income Approach Indication of Value of Non-land Assets	$900,000
Cost Approach Indication of Value Before EO	$1,000,000
Less Income Approach Indication of Value of Non-land Assets	900,000
Indicated EO	$100,000

Utilization Analysis

Other totally independent procedures are available to quantify the effects of EO. One simple approach is to review the asset's utilization. If the asset is being utilized at less than 100% or whatever is the norm for the industry, then EO exists because demand in the industry is substantially less than the available supply. Mathematically, this is based on the relationship whereby EO equals actual utilized capacity (demand) divided by maximum capacity (supply) with the result taken to an exponent (scale factor), subtracted from 1. The scale factor is a relationship of cost to capacity, which reflects the concept that as capacity increases, the cost of construction increases at a different rate, typically a slower rate. Typical scale factors are 0.6 to 0.7, based on data published in engineering and construction texts.

The typewriter industry circa 1999 will be used as an example of this type of calculation. Because of the use of personal computers, demand for typewriters has been greatly reduced. While the manufacturing supply potential is still in place, the demand is not. Let's say the machinery and equipment at a certain plant has the capacity (supply) to manufacture 100,000 units per year, but demand is for only 1,000 units per year. The magnitude of EO in the industry and in the assets located at the plant is calculated as follows:

$$EO = 1 - (\text{Demand}/\text{Capacity})^{0.7}$$

$= 1 - (1{,}000/100{,}000)^{0.7}$

$= 1 - 0.01^{0.7}$

$= 96\%$

Note that to convert the 96% figure into a dollar amount, one can multiply it by the CRN, COR, or CORLD. Percentage deductions are always deducted before dollar deductions. The order of the mathematical calculation is not important; the result will be the same (the associative principle of algebra).

The subject company in our example has some income from production of the product, but the machinery and equipment is severely underutilized and, hence, exhibits a high level of EO, 96%. The market for typewriters has been replaced due to a new form of office equipment, personal computers.

Some unenlightened practitioners may argue that EO cannot exist if capacity at the subject or in the industry is nearly or fully used. This is not always true. It can be true only if earnings in the industry can support the capital investment at a market-based rate of return. If utilization is at 100%, but the industry (including the subject) is only breaking even or losing money, then EO is strongly indicated. Utilization can be at what is considered the norm in the industry because of economic influences outside the property, such as high consumer demand, and yet the company may have low levels of profitability because of competition or some other outside influence on the subject property. An example would be any U.S. company competing with companies located in foreign countries where raw materials or operating expenses are less than in the United States. A U.S. plant with a maximum capacity of 100,000 units per year and high demand for its products may have an output of 100,000 units per year. But because of imports from overseas, the price (i.e., value) received for the products produced may just cover expenses; therefore, earnings are low or negative, and the return on the investments in the business are reduced. The magnitude of EO in the industry, based on utilization only (that is, with a blindfold on), is "calculated" to be zero. Of course, this is incorrect.

As can be seen in the example above, a company may have low or negative earnings from the manufacture of a product, yet the equipment may still be utilized at 100%. The plant is likely experiencing financial difficulties because of reduced earnings caused by competition; hence, EO exists and must be quantified using an earnings-related approach. The practitioner can't just plug numbers into formulas to calculate a result and call it EO. Thoughtful, reasoned analysis is required. Several questions must be investigated and answered: Are expected earnings reasonable for the subject property? How do the property's earnings compare to the industry? How do the property's and industry's earnings compare to those in alternative investments?

If a plant is new and "state-of-the-art," it still can exhibit EO. For example, if a plant was built to manufacture a product, and because of changes in government regulations or consumer preferences, the demand for the product or maybe even the primary raw material disappears, EO for the plant and the industry could suddenly be 100%, and the plant would shut down. This could happen today (2001) in the MTBE industry if the U.S. government follows the lead of California and bans the use of MTBE (a blendstock used in reformulated gasoline) in the entire country. The MTBE plants would have the option of shutting down or maybe, if even possible, spending capital to modify the facilities to produce another product. EO can be sudden and significant, especially if a government body is involved.

Return-on-Capital Analysis

Another approach to quantifying EO is a return-on-capital (or investment) analysis. In such an analysis, the relationship of earnings is compared to the magnitude of investment used to generate those earnings. A simple and direct approach to apply the return-on-capital analysis is to review the relationships of publicly traded companies in the same or a similar line of business as the subject property as of the appraisal date to a benchmark to determine if EO exists and at what level. One method is to compare the percent earned on total capital (return on capital) for the year prior to the appraisal date with the percent earned on total capital during a time frame when it was higher (that is, the good old days of more reasonable returns; the time frame may be one year or over several years).

A convenient publication to utilize in this analysis is *Value Line Investment Survey ("Value Line")*. *Value Line* publishes a significant amount of current and historical financial data on thousands of publicly traded stocks on a continuous basis. One of the components of a *Value Line* analysis is percent earned on total capital.

Value Line defines *percent earned on total capital* as" a company's return on its stockholders' equity and long-term debt obligations." As defined in the financial community, the summation of long-term debt and stockholders' equity represents the total invested capital of a business or the business enterprise. When the economics of the industry are good, the return on capital will be high; when poor, low. Hence, a return-on-capital analysis is a meaningful indicator of economic obsolescence.

To develop an example analysis, returns for a typical industry were reviewed based on data published in *Value Line*. A review follows, showing *Value Line*-type data for a sample industry:

Company	Five-Year Mean 1990-1995 (%)	Current Data (%)
Algoma Industries	14.7	10.1
Kewaunee Industries	12.6	8.7
Manitowoc Mfg.	11.0	7.1
Menomonee Cos.	10.9	12.1
Okauchee Services	8.3	8.0
Sheboygan Industries	11.1	10.1
Waukesha Mfg	9.1	6.1
Low	8.3	6.1
High	14.7	12.1
Median	11.0	8.7
Mean	11.1	8.9

Conclude	11.0	9.0

EO can be determined using the following formula:

$$EO = \frac{\text{Five-Year Mean - Current Data}}{\text{Five-Year Mean}}$$

Therefore, using the data presented above, EO in this example can be calculated as follows:

$$EO = \frac{11.0 - 9.0}{11.0} = \frac{2.0}{11.0} = 18\%$$

Accordingly, based on the return-on-capital analysis, the economic penalty, or EO, on assets in the sample industry is 18%.

This is a meaningful indicator of EO when the practitioner can identify companies followed by *Value Line* that are in an industry similar to the subject property and have a minimal amount of diversification. For example, if the subject property were an oil refinery, several companies followed by *Value Line* would be considered good comparables because they are primarily oil refining companies with few other assets in other sectors of the oil and gas industry, or other industries. In other words, the economics of the subject property would be influenced by the same or similar factors as the economics of the comparable companies. If the subject property were a single tissue (paper) mill, this approach may not be as meaningful because *Value Line* does not track any companies that own just tissue mills. All the paper industry companies followed are diversified and, hence, may experience different economic factors than the subject.

After finding the comparable companies, the second step is to study the history of the industry to find a period of time when the return on capital was good (that is, again, what industry insiders would call "the good old days"). For the oil refining industry, this can be identified as the late 1970s, and 1988, the years before supply and demand disruptions and expensive government regulations.

The practitioner must study the subject property's economics and locate companies to be used as comparables that are as similar as possible to the subject. Of course, no comparable will be perfect. The goal is to locate comparables that are in a *similar* economic environment.

Equity-to-Book Ratio Analysis

Another method for determining the EO present in an industry is to analyze investors' perceptions of investment in that industry using common stock (equity) prices. Indicative of investors' perception of the obsolescence present in the investment is the ratio of price paid for common stock relative to its book value. Book value of the stock relates to the original capital contributed to the firm in exchange for the stock plus retained earnings which have accumulated since the initial investment.

From a legal perspective, stockholders own the firm in which they have invested. From an investor's viewpoint, stock ownership is considered to represent a net ownership position in the firm's assets. At any point in time, if the total value of all assets is considered and all liabilities are deducted, the net amount is representative of the total value of the common stock or the value of the common equity in the firm. Thus, an investor purchasing shares of common stock is making a decision on the value of the total assets.

The book value of common stocks of publicly held companies is calculated with reasonable consistency for most publicly traded companies due to accounting regulations. The regulations involve not only the general methodology used in the calculations, but also the type of data available to investors. Because of the consistency of reporting, book values are useful as a benchmark for certain types of measurements. However, book values will not specifically represent fair market value of the assets, primarily because they are based on historical costs.

To estimate EO affecting assets in a sample industry, information in Standard & Poor's ("S&P") *Analyst's Handbook* was analyzed for a sample industry's stock, on a per-share basis. The information represents indices that are based on stock prices (the annual high and low are reported) and also an index for the industry book value (one number is reported). For baseline comparison purposes, the same information is available on a group of industrial companies known as the S&P Industrials, which represents the S&P 500 after removing any nonindustrial stock. Comparisons of stock price and book value are possible based on these annual data for the subject industry and also for the benchmark Industrials. To calculate the equity-to-book ratio for this study, the mean common stock price is divided by the book value per share as published in the *Analyst's Handbook*. The sample analysis follows:

	S & P Indexes Per Share	
	Industrials	Sample Industry
Book Value	168	210
Stock Prices High Low Mean	 888 709 799	 821 652 737
Stock Price/Book Value	4.8	3.5

EO can be determined using the following formula:

Industrials - Sample Industry

EO = Industrials

Therefore, using the data presented above, EO in this example is calculated as follows:

$$EO = \frac{4.8 - 3.5}{4.8} = \frac{1.3}{4.8} = 27\%$$

This relationship is indicative of investors' relative valuation of the sample industry assets when compared with general industrial stocks. Owners of general industrial stocks appear willing to pay about 27% more for such stocks than they would pay for stock in the sample industry, based on the equity-to-book-value ratio. By this method, EO of 27% is indicated. To the extent that EO exists in the general industrial companies used in this analysis, the EO conclusion for the sample industry is somewhat understated.

Gross Margin Analysis

Another method that can be used to quantify EO is the study of company or industry returns by comparing gross (profit) margins over time. Simply put, the *gross margin* is a company's revenues less its cost of raw materials. Revenues can be measured by multiplying the number of units produced by the value of those units in the market. The cost of raw materials can be developed in a similar manner.

An appraiser should be able to gather information on the company being appraised by reviewing the last five to ten years of the company's financial data. This analysis is typically developed on a unit-of-production basis (dollars per pound of production, or dollars per barrel of throughput [inputs to the plant], for example). If gross margins have been declining, or currently are lower than in the past, EO may be present even if utilization is high. Of course, if EO does exist, then the industry must first be analyzed to find the reasons for the obsolescence. Typical reasons could be an overcapacity of products available, which is driving prices down; an increase in the cost of raw materials caused by a shortage in the market; or maybe just "cutthroat" competition. Remember, EO is commonly caused by supply-and demand problems and competition. If gross margins are lower than in the past, EO can be measured using the following formula:

$$EO = \frac{\text{Past Gross Margins} - \text{Current Gross Margins}}{\text{Past Gross Margins}}$$

An example of this technique follows:

Past Gross Margins $2.00 per unit
Current Gross Margins $1.00 per unit

$$EO = \frac{\$2.00 - \$1.00}{\$2.00} = 50\%$$

Generally, EO is considered incurable, as investments typically cannot be made to make it go away. But it can change and even decline to zero if industry economics change. If a competitor's plant suddenly goes out of business, a shortage of products may occur. When demand is constant and supply goes down, economic theory says that prices will tend to increase. When prices increase for the products produced, revenues will go up for the plant. EO may be reduced or even disappear until another new plant is built, increasing supply, or imports arrive from other parts of the country or from foreign countries.

Government Regulations Analysis

The implementation of government regulations can cause EO, as well. The government's regulation of public utilities provides a good example. For much of the 20th century, state and federal governments structured public utilities' earnings on the investment in the tangible assets used to serve the public in a monopoly situation. Because the public utilities were allowed to have a monopoly, the government wanted to protect the public by controlling the utilities' earnings. This was done through "rate base" regulation. *Rate base*is defined as the original cost of the assets being used to serve the public less allowed (rate base) depreciation. The public utilities would supply the government body information created using unique utility accounting practices for this purpose. The government would permit a certain allowed return on this investment, the rate base, which was determined by actual costs of debt and a market-based allowed return on equity. If the utility earned the allowed amount, good; if the utility earned less, too bad (poor management?). If the utility earned too much, the excess earnings had to be returned to the rate payers through a rate adjustment. To increase earnings, the utility would have to file a request (rate case) to have its allowed return increased. If the rate case took too long to come before the review board and equity returns were rising, a level of EO resulted from the regulatory lag (that is, the allowed rate of return was not permitted to be increased fast enough, and the utility was not being given the opportunity to earn on its rate base at current market rates). The level of EO can be measured by the following formula:

$$EO = \frac{\text{Current Market Return} - \text{Allowed Return}}{\text{Current Market Return}}$$

An example of this technique follows:

Allowed Return 10%
Current Market Return 13%

$$EO = \frac{13\% - 10\%}{13\%} = \frac{3\%}{13\%} = 23\%$$

This means, because of regulatory lag (bureaucracy), the utility in our example is not able to earn at market rates, and therefore, the owners of the utility must accept a lower level of earnings. This loss of earnings is a form of EO that reduces the value of the utility's property.

Another form of government-caused EO is rent controls. In certain areas of the United States, rent in apartment buildings is controlled by the local government. The intention is to provide affordable housing for existing tenants. While the market may be changing the market rental rates of apartments in an area (generally increasing with inflation), local government laws

sometimes prevent landlords from increasing rental rates. This regulation causes EO, which is manifest in a reduction in the value of the property. EO in this situation can be determined by the following formula:

$$EO = \frac{\text{Current Market Rental Rate - Current Allowed Rental Rate}}{\text{Current Market Rental Rate}}$$

An example of this technique follows:

Current Allowed Rental Rate $500 per month
Current Market Rental Rate $1,000 per month

$$EO = \frac{\$1{,}000 - \$500}{\$1{,}000} = \frac{\$500}{\$1{,}000} = 50\%$$

Again, because of local government controls, EO exists, and the value of the property is reduced.

Consider the position of a potential buyer. If a potential buyer knows that the earnings will be reduced by local government rent controls, will a purchase offer be based on the property's earnings limited by local regulations, or on current market rental rates that do not apply to the property? Of course, the prudent investor will base the offer to purchase on the property's permitted earnings, not on market earnings that do not apply. Rent controls reduce the value of a property because earnings are controlled, reduced. That's economic obsolescence.

Another form of government-regulation-based EO is the lack of return on investments made for pollution control equipment or mandated environmental remediation. The Clean Air Act of 1990 Amendment required many heavy industries to invest in pollution-control-related equipment that did not increase capacity or profits. In fact, in many cases, the new equipment actually increased operating expenses through higher labor requirements and more energy consumption, thus reducing earnings. The plants had two choices: invest in the pollution-control equipment, or shut down. The investment is considered a necessary capital expenditure or a form of curable functional obsolescence, and the resulting reduction on the return on investment, a form of EO. Government regulations constantly require industry to make new plant investments. When the required investments do not generate income, EO is the result.

Income Shortfall Analysis

Another means of indicating EO is an income shortfall analysis. This approach is similar to those discussed above for regulatory lag or rent control techniques, except that the income shortfall is caused by "the market." For example, suppose the subject property is in a very competitive industry. The company has made large investments to modernize and meet environmental requirements, and essentially to invest in long-term future operations. Because of supply and demand economics and competition, earnings are not available to support the investment in the plant assets. The company had the option of investing in the new environmental equipment or shutting down. EO exists because the earnings generated by the plant do not support the level of investment made in the plant. In an income shortfall analysis, EO can be determined using the following formula:

$$EO = \frac{\text{Required Return on Investment - Current Return on Investment}}{\text{Required Return on Investment}}$$

Therefore, continuing the example above, the calculation is as follows:

Required Return on Investment 15%
Current Return on Investment 10%

$$EO = \frac{15\% - 10\%}{15\%} = \frac{5\%}{15\%} = 33\%$$

Another way to calculate the EO caused by an income shortfall is to calculate the differential in earnings. This can be determined by the following formula:

$$EO = \frac{\text{Calculated Return - Projected Return}}{\text{Calculated Return}}$$

An example of this method follows:

Current Investment $1,000,000
Current Income $100,000

$$EO = \frac{\text{Current Income}}{\text{Current Investment}} = 10\%$$

Projected Investment $1,500,000
Projected Income $100,000

$$\text{Projected Return} = \frac{\text{Projected Income}}{\text{Projected Investment}} = 7\%$$

$$EO = \frac{10\% - 7\%}{10\%} = 30\%$$

This income shortfall calculation of EO is very similar to the first calculation, in which the required and current returns were known. In this example, the returns are calculated based on the investment in the property and the return received or projected after a new investment is made that provided no additional income. The result is similar: EO exists and is significant.

Best of the Best Technique

The "Best of the Best" technique was derived in the 1960s by Lionel Thatcher, Professor of Business and Economics at the University of Wisconsin, and Richard Dubielzig, Director of the Utilities Tax Division of the Wisconsin Department of

Taxation. This method of quantifying EO involves selecting several economic performance indicators for comparable companies, such as rate of return, gross or net margins, and utilization, among others, for comparison against the subject. Three steps are used:

Step 1 Select the best economic performance indicators of the comparable properties or companies.

Step 2 Compare the subject property's indicators against the best indicators in the market to obtain a relationship to the standard, or Best of the Best.

Step 3 Calculate the subject's average relationship to the standard and subtract from 1 to develop an opinion of EO.

The above method was commonly used in the valuation of railroads for property tax purposes. A simple example follows:

Economic Performance Indicator	Subject Property (%)	Best of the Best (%)	Subject/Best (%)
Rate of Return	6	10	60
Net Margin	2	3	67
Utilization	75	90	83
Average			70

Using the 70% indication of the subject's relationship to the Best of the Best results in an EO indication of 30% (1 - 70%). This method could be applied to any subject, or in any industry, where reliable economic performance data are available for similar properties. The primary problem with this method is obtaining reliable economic performance data.

Summary

The choice of which method to use depends on the availability of data to utilize and the type of property being valued.

Entrepreneurial Profit

Entrepreneurial profit is the anticipated profit an investor requires to construct and sell a property. It is a reward to the entrepreneur for the inherent risks of investing time and money in the construction of a property.

Entrepreneurial profit must be market based; it is not automatic. The market will not automatically reward an entrepreneur for hard work and risky investments. Most likely, this type of profit will exist in generic industrial, commercial, and residual properties in an expanding market where demand is greater than supply. It will not exist in unique or special-purpose properties that are built by users and are not for sale in the general marketplace. Of course, if EO exists, entrepreneurial profit is negative. Both cannot exist at the same time (that is, both cannot be positive or negative).

A lack of new construction is generally an indicator that EO may exist. However, EO can exist in the presence of new construction, as well. Sometimes, a large corporation will replace an old functionally obsolete plant with a new, modern, state-of-the-art plant to reduce operating costs and create a stronger presence in the industry. While EO still exists in the industry, which reduces the earnings of the company, the reduced operating expenses resulting from a new plant will make it a stronger participant in the industry and potentially even help to drive out the competition. This may reduce and even eliminate some of the competition and, also, reduce or eliminate EO.

Conclusion

Economic obsolescence is present when better economic opportunities exist for an investment. When a government entity steps in and attempts to control the market through regulations, EO is created externally and reduces the value of assets. The loss of value associated with EO also is caused by the economic principles of supply and demand, and competition. EO typically cannot be reduced by capital investments, but it can change, and even decline to zero through changing industry conditions.

An enlightened appraiser will investigate the existence of EO and quantify it based on market indicators. Ideally, more than one method will be utilized and the results correlated to conclude the magnitude of the EO.

This text has covered a number of procedures that can be used to quantify the effects of EO. These procedures will not apply to every property or industry, and other more appropriate indicators may apply. The appraiser must study the subject property and its industry, as appropriate, to determine if EO exists, and if it does, how to measure it. Careful analysis and study are required, and the process described herein may not be appropriate for matters pertaining to certain U.S. Federal Tax or financial reporting.

You can't see it, you can't touch it, and you can't smell it, but you can measure it using the appraiser's proper valuation tools. It's in the market, and if an informed appraiser is alert, it will be heard. When the market speaks, appraisers listen.

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Identifying and Quantifying Economic Obsolescence

This article was authored by **Michael J. Remsha**, P.E., ASA, CMI, Vice President and Managing Director

Introduction

Economic obsolescence: You can't see it, you can't touch it, and you can't smell it (at least most of the time), so how are appraisers supposed to quantify it? No one ever said being an appraiser was easy. It takes years of training, experience, and hard work to be able to investigate an industry, analyze market data, and derive factors such as economic obsolescence ("EO").

Economic obsolescence, also referred to as *external obsolescence*, is the loss in value resulting from influences external to the property itself. External conditions causing EO may be international, national, industry-based, or local in origin. Various external factors affect potential economic returns, thus having a direct impact on the market value of an asset or property.

This paper will discuss a number of procedures that can be used to identify and quantify EO. The appraiser must study the subject property and its industry, as appropriate, to determine if EO exists, and if it does, how to measure and apply it. These procedures may not apply to every property or industry, and may not be appropriate in the case of certain U.S. Federal Tax or financial reporting matters where other perspectives may apply.

To determine if EO is present, a review must be made of the economics of the subject property and the industry in which it competes, as of a chosen point in time - the appraisal date. This review can be made by examining the earnings history of the subject property and any local or other influences that may affect the economic performance of the subject and its assets. For typical real estate, especially small generic properties, the effects of local market conditions can be very important. Zoning, the local economy, unemployment, and industry factors can affect the value of real estate. Larger real estate properties may not be affected by local economics as significantly, but they can be affected by the regional, national, and

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even global economy. Major properties that typically include real estate and significant other capital assets, and going concern influences (business values such as tangible and intangible assets and working capital) can be affected by local economic factors, but usually are more significantly affected by industry-wide economic conditions.

Industry economic conditions affect all aspects of a business, and commonly, entire businesses are appraised, not just real estate or just machinery and equipment. Some typical properties that would be appraised as a business include cement plants, steel mills, paper mills, petrochemical and chemical plants, and other processing plants; oil and gas production, mining, and other facilities in the extractive industries; and any other assemblies of assets that compete in a specific industry. Typical sources of data that can be used to review the economics of an industry include annual stockholder reports of companies in the industry, 10K reports to the Securities and Exchange Commission, industry publications discussing product and raw material price changes, investment banking and brokerage reports, and government studies. By using such data, the appraiser can determine if the earnings in the industry – and hence, of the subject property – have been, are currently, or will be affected by some outside economic influence that will reduce earnings and, therefore, the value of the business and its assets.

Of course, if certain assets in the plant or in the industry are generic such that they could be used by other industries, the EO of the current user may not be appropriate for that specific asset. For example, EO in the typewriter industry may be significant, but the real estate associated with a typewriter plant could be used by many different users. Therefore, it would be appropriate to apply the EO penalty to the machinery and equipment used to manufacture typewriters, but not to the buildings. The appraiser must practice careful analysis.

Quantification

Overview

To quantify EO, an appraiser must first investigate the existence of economic conditions that may reduce the value of a business and, hence, its assets. Then, the EO must be quantified in an objective manner. EO may exist in any industry or property where the following attributes are found:

- Reduced demand for the company's products
- Overcapacity in the industry
- Dislocation of raw material supplies
- Increasing cost of raw materials, labor, utilities, or transportation, while the selling price of the product remains fixed or increases at a much lower rate
- Government regulations that require capital expenditures to be made with little or no return on the new investment
- Environmental considerations that require capital expenditures to be made with little or no return on the new investment

EO is present when better economic opportunities exist for an investment. The economic principles of supply and demand, and competition drive the loss of value associated with

EO. Typically, EO cannot be reduced by capital investments, but it can change and even decline to zero through changing industry conditions.
EO can be quantified using many different methods, including the following:

- Market-Derived Approach
- Income Approach
- Utilization Analysis
- Return-on-Capital Analysis
- Equity-to-Book Ratio Analysis
- Gross Margin Analysis
- Government Regulations Analysis
- Income Shortfall Analysis
- Best of the Best Technique

Every method may not be applicable in every valuation problem. Determination of the appropriate method will depend on the availability of data for review and the type of asset being valued. The following sections discuss each method in greater detail.

Market-Derived Approach

A very simple and direct approach is to derive EO from the market by reviewing sales of similar properties. This is especially useful for real estate where similar properties are available in the local or regional market and sufficient information is available on properties that have sold. In this approach, the following steps are applied:

Step 1 Deduct land value from the sale price of the property that sold; the result is the value of only non-land assets. Because EO is an attribute of the cost approach and land is typically valued using the sales comparison approach, the land value is removed from the analysis.

Step 2 Develop the current cost new of non-land assets.

Step 3 Calculate all depreciation and obsolescence, except EO, and deduct it from the current cost new of non-land assets.

Step 4 Deduct the adjusted sale price (Step 1) from the current cost new less depreciation and obsolescence (Step 3).

The result is an indication of EO based on a market transaction, a sale of a similar property. This approach can be used to calculate EO as a dollar amount, or as a percentage of the cost of reproduction new ("CRN"), cost of replacement ("COR"), or even the cost of replacement less physical depreciation ("CORLD"). An example follows:

Sale Price of Similar Property	$1,000,000
Less Value of Land	200,000
Sale Price of Non-land Assets	$800,000
Cost Approach Indication of Value of Property Sold	
COR	$1,500,000
Less Physical Depreciation	500,000
CORLD	$1,000,000
Less Functional Obsolescence	0
Cost Approach Indication of Value Before EO	$1,000,000
Less Sale Price of Non-land Assets	800,000
Indicated EO	$200,000
Indicated EO as Percent of CORLD	20%

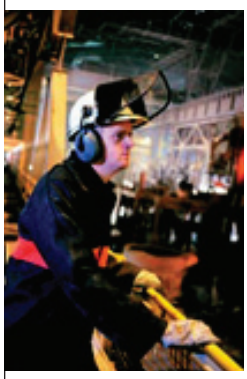
Hence, based on the above, EO is $200,000, or 13% of the COR, or 20% of the CORLD. The dollar amount of EO is the same, but the percent will vary depending on how it is measured and how it is to be used.

Several sales should be reviewed in the analysis to develop a market-derived conclusion. Preferably, the sales should be similar in age and location to the subject, and have little or no functional obsolescence, if possible (one less item to analyze). Sometimes this is not possible, but an attempt should be made to locate comparables that have economic factors similar to those of the subject. Also, if the calculated EO for the comparables is based on a percentage of their CORLD, then the deduction for EO applied to the subject property must be taken before the deduction of any dollar amount for functional obsolescence. Percentage deductions must always be deducted first, dollar deductions last.

Income Approach

A common valuation technique used by the financial community is simply to develop the income approach to indicate the value of the property being appraised. The income approach quantifies all forms of depreciation and obsolescence - physical, functional, and economic. However, when quantifying depreciation and obsolescence through use of the income approach, EO cannot be separately delineated in the analysis without relying on the cost approach. A modification of this approach is to develop all aspects of the cost approach, with the exception of EO, as in the market-derived approach previously discussed, then subtract the income approach indication of value from the partially

completed cost approach; the difference is EO. The primary problem with this approach is that the result really relies on just one approach to value, the income approach. As a general rule, using this technique, the result of the cost approach to value will always equal the result of the income approach to value. Although EO has been developed, it is totally dependent on the basic assumptions of the income approach. An example, based on the previous example used in the Market-Derived Approach section, follows:



EO in this example is therefore $100,000. If the income approach indication of value were to change based on a different set of projections or even a different discount rate, the dollar amount of EO also would change.

Income Approach Indication of Value	$1,100,000
Less Value of Land	200,000
Income Approach Indication of Value of Non-land Assets	$900,000
Cost Approach Indication of Value Before EO	$1,000,000
Less Income Approach Indication of Value of Non-land Assets	900,000
Indicated EO	$100,000

Utilization Analysis

Other totally independent procedures are available to quantify the effects of EO. One simple approach is to review the asset's utilization. If the asset is being utilized at less than 100% or whatever is the norm for the industry, then EO exists because demand in the industry is substantially less than the available supply. Mathematically, this is based on the relationship whereby EO equals actual utilized capacity (demand) divided by maximum capacity (supply) with the result taken to an exponent (scale factor), subtracted from 1. The scale factor is a relationship of cost to capacity, which reflects the concept that as capacity increases, the cost of construction increases at a different rate, typically a slower rate. Typical scale factors are 0.6 to 0.7, based on data published in engineering and construction texts.

The typewriter industry circa 1999 will be used as an example of this type of calculation. Because of the use of personal computers, demand for typewriters has been greatly reduced. While the manufacturing supply potential is still in place, the demand is not. Let's say the machinery and equipment at a certain plant has the capacity (supply) to manufacture 100,000 units per year, but demand is for only 1,000 units per year. The magnitude of EO in the industry and in the assets located at the plant is calculated as follows:

$$
\begin{aligned}
EO &= 1 - (\text{Demand}/\text{Capacity})^{0.7} \\
&= 1 - (1{,}000/100{,}000)^{0.7} \\
&= 1 - 0.01^{0.7} \\
&= 96\%
\end{aligned}
$$

Note that to convert the 96% figure into a dollar amount, one can multiply it by the CRN, COR, or CORLD. Percentage deductions are always deducted before dollar deductions. The order of the mathematical calculation is not important; the result will be the same (the associative principle of algebra).

The subject company in our example has some income from production of the product, but the machinery and equipment is severely underutilized and, hence, exhibits a high level of EO, 96%. The market for typewriters has been replaced due to a new form of office equipment, personal computers.

Some unenlightened practitioners may argue that EO cannot exist if capacity at the subject or in the industry is nearly or fully used. This is not always true. It can be true only if earnings in the industry can support the capital investment at a market-based rate of return. If utilization is at 100%, but the industry (including the subject) is only breaking even or losing money, then EO is strongly indicated. Utilization can be at what is considered the norm in the industry because of economic influences outside the property, such as high consumer demand, and yet the company may have low levels of profitability because of competition or some other outside influence on the subject property. An example would be any U.S. company competing with companies located in foreign countries where raw materials or operating expenses are less than in the United States. A U.S. plant with a maximum capacity of 100,000 units per year and high demand for its products may have an output of 100,000 units per year. But because of imports from overseas, the price (i.e., value) received for the products produced may just cover expenses; therefore, earnings are low or negative, and the return on the investments in the business are reduced. The magnitude of EO in the industry, based on utilization only (that is, with a blindfold on), is "calculated" to be zero. Of course, this is incorrect.

As can be seen in the example above, a company may have low or negative earnings from the manufacture of a product, yet the equipment may still be utilized at 100%. The plant is likely experiencing financial difficulties because of reduced earnings caused by competition; hence, EO exists and must be quantified using an earnings-related approach. The practitioner can't just plug numbers into formulas to calculate a result and call it EO. Thoughtful, reasoned analysis is required. Several questions must be investigated and answered: Are expected earnings reasonable for the subject property? How do the property's earnings compare to the industry? How do the property's and industry's earnings compare to those in alternative investments?

If a plant is new and "state-of-the-art," it still can exhibit EO. For example, if a plant was built to manufacture a product, and because of changes in government regulations or consumer preferences, the demand for the product or maybe even the primary raw material disappears, EO for the plant and the industry could suddenly be 100%, and the plant would shut down. This could happen today (2001) in the MTBE industry if the U.S. government follows the lead of California and bans the use of MTBE (a blendstock used in reformulated gasoline) in the entire country. The MTBE plants would have the option of shutting down or maybe, if even possible, spending capital to modify the facilities to produce another product. EO can be sudden and significant, especially if a government body is involved.

Return-on-Capital Analysis

Another approach to quantifying EO is a return-on-capital (or investment) analysis. In such an analysis, the relationship of earnings is compared to the magnitude of investment used to generate those earnings. A simple and direct approach to apply the return-on-capital

analysis is to review the relationships of publicly traded companies in the same or a similar line of business as the subject property as of the appraisal date to a benchmark to determine if EO exists and at what level. One method is to compare the percent earned on total capital (return on capital) for the year prior to the appraisal date with the percent earned on total capital during a time frame when it was higher (that is, the good old days of more reasonable returns; the time frame may be one year or over several years).

A convenient publication to utilize in this analysis is *Value Line Investment Survey ("Value Line")*. *Value Line* publishes a significant amount of current and historical financial data on thousands of publicly traded stocks on a continuous basis. One of the components of a *Value Line* analysis is percent earned on total capital.

Value Line defines *percent earned on total capital* as "a company's return on its stockholders' equity and long-term debt obligations." As defined in the financial community, the summation of long-term debt and stockholders' equity represents the total invested capital of a business or the business enterprise. When the economics of the industry are good, the return on capital will be high; when poor, low. Hence, a return-on-capital analysis is a meaningful indicator of economic obsolescence.

To develop an example analysis, returns for a typical industry were reviewed based on data published in *Value Line*. A review follows, showing *Value Line*-type data for a sample industry:

Company	Five-Year Mean 1990-1995 (%)	Current Data (%)
Algoma Industries	14.7	10.1
Kewaunee Industries	12.6	8.7
Manitowoc Mfg.	11.0	7.1
Menomonee Cos.	10.9	12.1
Okauchee Services	8.3	8.0
Sheboygan Industries	11.1	10.1
Waukesha Mfg.	9.1	6.1
Low	8.3	6.1
High	14.7	12.1
Median	11.0	8.7
Mean	11.1	8.9
Conclude	11.0	9.0

EO can be determined using the following formula:

$$EO = \frac{\text{Five-Year Mean - Current Data}}{\text{Five-Year Mean}}$$

Therefore, using the data presented above, EO in this example can be calculated as follows:

$$EO = \frac{11.0 - 9.0}{11.0} = \frac{2.0}{11.0} = 18\%$$

Accordingly, based on the return-on-capital analysis, the economic penalty, or EO, on assets in the sample industry is 18%.

This is a meaningful indicator of EO when the practitioner can identify companies followed by *Value Line* that are in an industry similar to the subject property and have a minimal amount of diversification. For example, if the subject property were an oil refinery, several companies followed by *Value Line* would be considered good comparables because they are primarily oil refining companies with few other assets in other sectors of the oil and gas industry, or other industries. In other words, the economics of the subject property would be influenced by the same or similar factors as the economics of the comparable companies. If the subject property were a single tissue (paper) mill, this approach may not be as meaningful because *Value Line* does not track any companies that own just tissue mills. All the paper industry companies followed are diversified and, hence, may experience different economic factors than the subject.

After finding the comparable companies, the second step is to study the history of the industry to find a period of time when the return on capital was good (that is, again, what industry insiders would call "the good old days"). For the oil refining industry, this can be identified as the late 1970s, and 1988, the years before supply and demand disruptions and expensive government regulations.

The practitioner must study the subject property's economics and locate companies to be used as comparables that are as similar as possible to the subject. Of course, no comparable will be perfect. The goal is to locate comparables that are in a *similar* economic environment.

Equity-to-Book Ratio Analysis

Another method for determining the EO present in an industry is to analyze investors' perceptions of investment in that industry using common stock (equity) prices. Indicative of investors' perception of the obsolescence present in the investment is the ratio of price paid for common stock relative to its book value. Book value of the stock relates to the original capital contributed to the firm in exchange for the stock plus retained earnings which have accumulated since the initial investment.

From a legal perspective, stockholders own the firm in which they have invested. From an investor's viewpoint, stock ownership is considered to represent a net ownership position in the firm's assets. At any point in time, if the total value of all assets is considered and all

liabilities are deducted, the net amount is representative of the total value of the common stock or the value of the common equity in the firm. Thus, an investor purchasing shares of common stock is making a decision on the value of the total assets.

The book value of common stocks of publicly held companies is calculated with reasonable consistency for most publicly traded companies due to accounting regulations. The regulations involve not only the general methodology used in the calculations, but also the type of data available to investors. Because of the consistency of reporting, book values are useful as a benchmark for certain types of measurements. However, book values will not specifically represent fair market value of the assets, primarily because they are based on historical costs.

To estimate EO affecting assets in a sample industry, information in Standard & Poor's ("S&P") *Analyst's Handbook* was analyzed for a sample industry's stock, on a per-share basis. The information represents indices that are based on stock prices (the annual high and low are reported) and also an index for the industry book value (one number is reported). For baseline comparison purposes, the same information is available on a group of industrial companies known as the S&P Industrials, which represents the S&P 500 after removing any nonindustrial stock. Comparisons of stock price and book value are possible based on these annual data for the subject industry and also for the benchmark Industrials. To calculate the equity-to-book ratio for this study, the mean common stock price is divided by the book value per share as published in the *Analyst's Handbook*. The sample analysis follows:

	S & P Indexes Per Share	
	Industrials	Sample Industry
Book Value	168	210
Stock Prices High Low Mean	 888 709 799	 821 652 737
Stock Price/Book Value	4.8	3.5

EO can be determined using the following formula:

$$EO = \frac{\text{Industrials - Sample Industry}}{\text{Industrials}}$$

Therefore, using the data presented above, EO in this example is calculated as follows:

$$EO = \frac{4.8 - 3.5}{4.8} = \frac{1.3}{4.8} = 27\%$$

This relationship is indicative of investors' relative valuation of the sample industry assets when compared with general industrial stocks. Owners of general industrial stocks appear willing to pay about 27% more for such stocks than they would pay for stock in the sample industry, based on the equity-to-book-value ratio. By this method, EO of 27% is indicated. To the extent that EO exists in the general industrial companies used in this analysis, the EO conclusion for the sample industry is somewhat understated.

Gross Margin Analysis

Another method that can be used to quantify EO is the study of company or industry returns by comparing gross (profit) margins over time. Simply put, the *gross margin* is a company's revenues less its cost of raw materials. Revenues can be measured by multiplying the number of units produced by the value of those units in the market. The cost of raw materials can be developed in a similar manner.

An appraiser should be able to gather information on the company being appraised by reviewing the last five to ten years of the company's financial data. This analysis is typically developed on a unit-of-production basis (dollars per pound of production, or dollars per barrel of throughput [inputs to the plant], for example). If gross margins have been declining, or currently are lower than in the past, EO may be present even if utilization is high. Of course, if EO does exist, then the industry must first be analyzed to find the reasons for the obsolescence. Typical reasons could be an overcapacity of products available, which is driving prices down; an increase in the cost of raw materials caused by a shortage in the market; or maybe just "cutthroat" competition. Remember, EO is commonly caused by supply-and demand problems and competition. If gross margins are lower than in the past, EO can be measured using the following formula:

$$EO = \frac{\text{Past Gross Margins - Current Gross Margins}}{\text{Past Gross Margins}}$$

An example of this technique follows:

Past Gross Margins	$2.00 per unit
Current Gross Margins	$1.00 per unit

$$EO = \frac{\$2.00 - \$1.00}{\$2.00} = 50\%$$

Generally, EO is considered incurable, as investments typically cannot be made to make it go away. But it can change and even decline to zero if industry economics change. If a competitor's plant suddenly goes out of business, a shortage of products may occur. When demand is constant and supply goes down, economic theory says that prices will tend to increase. When prices increase for the products produced, revenues will go up for the plant. EO may be reduced or even disappear until another new plant is built, increasing supply, or imports arrive from other parts of the country or from foreign countries.

Government Regulations Analysis

The implementation of government regulations can cause EO, as well. The government's regulation of public utilities provides a good example. For much of the 20th century, state and federal governments structured public utilities' earnings on the investment in the tangible assets used to serve the public in a monopoly situation. Because the public utilities were allowed to have a monopoly, the government wanted to protect the public by controlling the utilities' earnings. This was done through "rate base" regulation. *Rate base* is defined as the original cost of the assets being used to serve the public less allowed (rate base) depreciation. The public utilities would supply the government body information created using unique utility accounting practices for this purpose. The government would permit a certain allowed return on this investment, the rate base, which was determined by actual costs of debt and a market-based allowed return on equity. If the utility earned the allowed amount, good; if the utility earned less, too bad (poor management?). If the utility earned too much, the excess earnings had to be returned to the rate payers through a rate adjustment. To increase earnings, the utility would have to file a request (rate case) to have its allowed return increased. If the rate case took too long to come before the review board and equity returns were rising, a level of EO resulted from the regulatory lag (that is, the allowed rate of return was not permitted to be increased fast enough, and the utility was not being given the opportunity to earn on its rate base at current market rates). The level of EO can be measured by the following formula:

$$EO = \frac{\text{Current Market Return - Allowed Return}}{\text{Current Market Return}}$$

An example of this technique follows:

Allowed Return	10%
Current Market Return	13%

$$EO = \frac{13\% - 10\%}{13\%} = \frac{3\%}{13\%} = 23\%$$

This means, because of regulatory lag (bureaucracy), the utility in our example is not able to earn at market rates, and therefore, the owners of the utility must accept a lower level of earnings. This loss of earnings is a form of EO that reduces the value of the utility's property.

Another form of government-caused EO is rent controls. In certain areas of the United States, rent in apartment buildings is controlled by the local government. The intention is to provide affordable housing for existing tenants. While the market may be changing the market rental rates of apartments in an area (generally increasing with inflation), local government laws sometimes prevent landlords from increasing rental rates. This regulation causes EO, which is manifest in a reduction in the value of the property. EO in this situation can be determined by the following formula:

$$EO = \frac{\text{Current Market Rental Rate - Current Allowed Rental Rate}}{\text{Current Market Rental Rate}}$$

An example of this technique follows:

Current Allowed Rental Rate	$500 per month
Current Market Rental Rate	$1,000 per month

$$EO = \frac{\$1{,}000 - \$500}{\$1{,}000} = \frac{\$500}{\$1{,}000} = 50\%$$

Again, because of local government controls, EO exists, and the value of the property is reduced.

Consider the position of a potential buyer. If a potential buyer knows that the earnings will be reduced by local government rent controls, will a purchase offer be based on the property's earnings limited by local regulations, or on current market rental rates that do not apply to the property? Of course, the prudent investor will base the offer to purchase on the property's permitted earnings, not on market earnings that do not apply. Rent controls reduce the value of a property because earnings are controlled, reduced. That's economic obsolescence.

Another form of government-regulation-based EO is the lack of return on investments made for pollution control equipment or mandated environmental remediation. The Clean Air Act of 1990 Amendment required many heavy industries to invest in pollution-control-related equipment that did not increase capacity or profits. In fact, in many cases, the new equipment actually increased operating expenses through higher labor requirements and more energy consumption, thus reducing earnings. The plants had two choices: invest in the pollution-control equipment, or shut down. The investment is considered a necessary capital expenditure or a form of curable functional obsolescence, and the resulting reduction on the return on investment, a form of EO. Government regulations constantly require industry to make new plant investments. When the required investments do not generate income, EO is the result.

Income Shortfall Analysis

Another means of indicating EO is an income shortfall analysis. This approach is similar to those discussed above for regulatory lag or rent control techniques, except that the income shortfall is caused by "the market." For example, suppose the subject property is in a very competitive industry. The company has made large investments to modernize and meet environmental requirements, and essentially to invest in long-term future operations. Because of supply and demand economics and competition, earnings are not available to support the investment in the plant assets. The company had the option of investing in the new environmental equipment or shutting down. EO exists because the earnings generated by the plant do not support the level of investment made in the plant. In an income shortfall analysis, EO can be determined using the following formula:

$$EO = \frac{\text{Required Return on Investment - Current Return on Investment}}{\text{Required Return on Investment}}$$

Therefore, continuing the example above, the calculation is as follows:

Required Return on Investment	15%
Current Return on Investment	10%

$$EO = \frac{15\% - 10\%}{15\%} = \frac{5\%}{15\%} = 33\%$$

Another way to calculate the EO caused by an income shortfall is to calculate the differential in earnings. This can be determined by the following formula:

$$EO = \frac{\text{Calculated Return – Projected Return}}{\text{Calculated Return}}$$

An example of this method follows:

Current Investment	$1,000,000
Current Income	$100,000

$$\text{Calculated Return} = \frac{\text{Current Income}}{\text{Current Investment}} = 10\%$$

Projected Investment	$1,500,000
Projected Income	$100,000

$$\text{Projected Return} = \frac{\text{Projected Income}}{\text{Projected Investment}} = 7\%$$

$$EO = \frac{10\% - 7\%}{10\%} = 30\%$$

This income shortfall calculation of EO is very similar to the first calculation, in which the required and current returns were known. In this example, the returns are calculated based on the investment in the property and the return received or projected after a new investment is made that provided no additional income. The result is similar: EO exists and is significant.

Best of the Best Technique

The “Best of the Best” technique was derived in the 1960s by Lionel Thatcher, Professor of Business and Economics at the University of Wisconsin, and Richard Dubielzig, Director of the Utilities Tax Division of the Wisconsin Department of Taxation. This method of quantifying EO involves selecting several economic performance indicators for comparable companies, such as rate of return, gross or net margins, and utilization, among others, for comparison against the subject. Three steps are used:

Step 1 Select the best economic performance indicators of the comparable properties or companies.

Step 2 Compare the subject property's indicators against the best indicators in the market to obtain a relationship to the standard, or Best of the Best.

Step 3 Calculate the subject's average relationship to the standard and subtract from 1 to develop an opinion of EO.

The above method was commonly used in the valuation of railroads for property tax purposes. A simple example follows:

Economic Performance Indicator	Subject Property (%)	Best of the Best (%)	Subject/Best (%)
Rate of Return	6	10	60
Net Margin	2	3	67
Utilization	75	90	83
Average			70

Using the 70% indication of the subject's relationship to the Best of the Best results in an EO indication of 30% (1 - 70%). This method could be applied to any subject, or in any industry, where reliable economic performance data are available for similar properties. The primary problem with this method is obtaining reliable economic performance data.

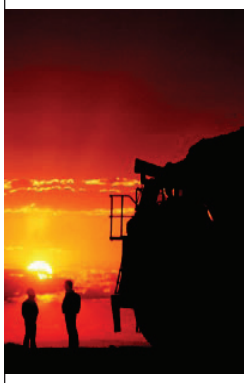
Summary

The choice of which method to use depends on the availability of data to utilize and the type of property being valued.

Entrepreneurial Profit

Entrepreneurial profit is the anticipated profit an investor requires to construct and sell a property. It is a reward to the entrepreneur for the inherent risks of investing time and money in the construction of a property.

Entrepreneurial profit must be market based; it is not automatic. The market will not automatically reward an entrepreneur for hard work and risky investments. Most likely, this type of profit will exist in generic industrial, commercial, and residual properties in an expanding market where demand is greater than supply. It will not exist in unique or special-purpose properties that are built by users and are not for sale in the general marketplace. Of course, if EO exists, entrepreneurial profit is negative. Both cannot exist at the same time (that is, both cannot be positive or negative).



A lack of new construction is generally an indicator that EO may exist. However, EO can exist in the presence of new construction, as well. Sometimes, a large corporation will replace an old functionally obsolete plant with a new, modern, state-of-the-art plant to reduce operating costs and create a stronger presence in the industry. While EO still exists in the industry, which reduces the earnings of the company, the reduced operating expenses resulting from a new plant will make it a stronger participant in the industry and potentially even help to drive out the competition. This may reduce and even eliminate some of the competition and, also, reduce or eliminate EO.

Conclusion

Economic obsolescence is present when better economic opportunities exist for an investment. When a government entity steps in and attempts to control the market through regulations, EO is created externally and reduces the value of assets. The loss of value associated with EO also is caused by the economic principles of supply and demand, and competition. EO typically cannot be reduced by capital investments, but it can change, and even decline to zero through changing industry conditions.

An enlightened appraiser will investigate the existence of EO and quantify it based on market indicators. Ideally, more than one method will be utilized and the results correlated to conclude the magnitude of the EO.

This text has covered a number of procedures that can be used to quantify the effects of EO. These procedures will not apply to every property or industry, and other more appropriate indicators may apply. The appraiser must study the subject property and its industry, as appropriate, to determine if EO exists, and if it does, how to measure it. Careful analysis and study are required, and the process described herein may not be appropriate for matters pertaining to certain U.S. Federal Tax or financial reporting.

You can't see it, you can't touch it, and you can't smell it, but you can measure it using the appraiser's proper valuation tools. It's in the market, and if an informed appraiser is alert, it will be heard. When the market speaks, appraisers listen.

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About the author:

Michael J. Remsha *is a vice president and managing director with American Appraisal Associates, Inc., in Milwaukee, Wisconsin. In this capacity, he provides direction and technical support on the valuation of special-purpose and personal property. He has been a full-time appraiser since 1977. He has testified as an expert witness before various county and state tax boards and courts in 15 states. Mr. Remsha is an Accredited Senior Appraiser (ASA) of the American Society of Appraisers. He served as a committee member and/or officer on the Machinery & Technical Specialties Committee from 1994 to 1999, and on the Technical Valuation Committee as a committee member and/or officer from 1989 to 1994. Mr. Remsha is certified in Wisconsin as a Professional Engineer (PE), is licensed as a Certified General Appraiser in several states, and is a Certified Member of the Institute (CMI) in the Institute for Professionals in Taxation.*

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Gmail

Lee Andrews Group <lgbfiscomments@gmail.com>

Re: Economic Impact Comment

1 message

[redacted] Thu, Mar 31, 2016 at 6:14 AM

Cc: lgbfiscomments@gmail.com

This was an excellent point you made last night, Rick!

[redacted]

On Mar 31, 2016, at 12:17 AM, [redacted] wrote:

In relation to Economic Impact to the Local and Regional Economy: the study should include and make calculations and reference to the financial and economic impact on the neighborhoods in Long Beach effected by the airport. I have attached a piece from the American Appraisal on "Identifying and Quantifying Economic Obsolescence."

Economic obsolescence, also referred to as external **obsolescence**, is the loss in value resulting from influences external to the property itself. External conditions causing EO may be international, national, industry-based, or local in origin.

Therefore, allowing international flights will/could result in increased air traffic creating an external condition to the neighborhoods in Long Beach under the flight patters which would create an economic obsolescence for the real estate stock in these areas. The external obsolescence will decrease quality of life and decrease the value for these homes. This will have a negative impact on home values for existing and future residents which should be calculated in this report and future reports. It will also effect property tax revenues for the city as a cost of expanding the airport to include international flights.

Attached below are some examples of calculations.

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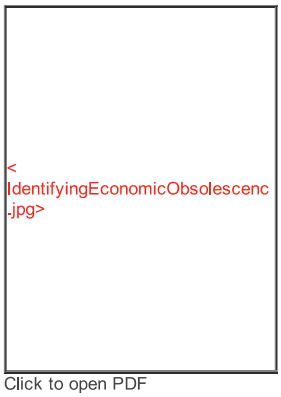

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This article was authored by **Michael J. Remsha**, P.E., ASA, CMI, Vice President and Managing Director

Introduction

Economic obsolescence: You can't see it, you can't touch it, and you can't smell it (at least most of the time), so how are appraisers supposed to quantify it? No one ever said being an appraiser was easy. It takes years of training, experience, and hard work to be able to investigate an industry, analyze market data, and derive factors such as economic obsolescence ("EO").

Economic obsolescence, also referred to as external obsolescence, is the loss in value resulting from influences external to the property itself. External conditions causing EO may be international, national, industry-based, or local in origin. Various external factors affect potential economic returns, thus having a direct impact on the market value of an asset or property.

This paper will discuss a number of procedures that can be used to identify and quantify EO. The appraiser must study the subject property and its industry, as appropriate, to determine if EO exists, and if it does, how to measure and apply it. These procedures may not apply to every property or industry, and may not be appropriate in the case of certain U.S. Federal Tax or financial reporting matters where other perspectives may apply.

To determine if EO is present, a review must be made of the economics of the subject property and the industry in which it competes, as of a chosen point in time - the appraisal date. This review can be made by examining the earnings history of

the subject property and any local or other influences that may affect the economic performance of the subject and its assets. For typical real estate, especially small generic properties, the effects of local market conditions can be very important. Zoning, the local economy, unemployment, and industry factors can affect the value of real estate. Larger real estate properties may not be affected by local economics as significantly, but they can be affected by the regional, national, and even global economy. Major properties that typically include real estate and significant other capital assets, and going concern influences (business values such as tangible and intangible assets and working capital) can be affected by local economic factors, but usually are more significantly affected by industry-wide economic conditions.

Industry economic conditions affect all aspects of a business, and commonly, entire businesses are appraised, not just real estate or just machinery and equipment. Some typical properties that would be appraised as a business include cement plants, steel mills, paper mills, petrochemical and chemical plants, and other processing plants; oil and gas production, mining, and other facilities in the extractive industries; and any other assemblies of assets that compete in a specific industry. Typical sources of data that can be used to review the economics of an industry include annual stockholder reports of companies in the industry, 10K reports to the Securities and Exchange Commission, industry publications discussing product and raw material price changes, investment banking and brokerage reports, and government studies. By using such data, the appraiser can determine if the earnings in the industry – and hence, of the subject property – have been, are currently, or will be affected by some outside economic influence that will reduce earnings and, therefore, the value of the business and its assets.

Of course, if certain assets in the plant or in the industry are generic such that they could be used by other industries, the EO of the current user may not be appropriate for that specific asset. For example, EO in the typewriter industry may be significant, but the real estate associated with a typewriter plant could be used by many different users. Therefore, it would be appropriate to apply the EO penalty to the machinery and equipment used to manufacture typewriters, but not to the buildings. The appraiser must practice careful analysis.

Quantification

Overview
To quantify EO, an appraiser must first investigate the existence of economic conditions that may reduce the value of a business and, hence, its assets. Then, the EO must be quantified in an objective manner. EO may exist in any industry or property where the following attributes are found:

- Reduced demand for the company's products
- Overcapacity in the industry
- Dislocation of raw material supplies
- Increasing cost of raw materials, labor, utilities, or transportation, while the selling price of the product remains fixed or increases at a much lower rate
- Government regulations that require capital expenditures to be made with little or no return on the new investment
- Environmental considerations that require capital expenditures to be made with little or no return on the new investment

EO is present when better economic opportunities exist for an investment. The economic principles of supply and demand, and competition drive the loss of value associated with EO. Typically, EO cannot be reduced by capital investments, but it can change and even decline to zero through changing industry conditions.

EO can be quantified using many different methods, including the following:

- Market-Derived Approach
- Income Approach
- Utilization Analysis
- Return-on-Capital Analysis
- Equity-to-Book Ratio Analysis
- Gross Margin Analysis
- Government Regulations Analysis
- Income Shortfall Analysis
- Best of the Best Technique

Every method may not be applicable in every valuation problem. Determination of the appropriate method will depend on the availability of data for review and the type of asset being valued. The following sections discuss each method in greater detail.

Market-Derived Approach
A very simple and direct approach is to derive EO from the market by reviewing sales of similar properties. This is especially useful for real estate where similar properties are available in the local or regional market and sufficient information is available on properties that have sold. In this approach, the following steps are applied:

Step 1	Deduct land value from the sale price of the property that sold; the result is the value of only non-land assets. Beca the cost approach and land is typically valued using the sales comparison approach, the land value is removed from
Step 2	Develop the current cost new of non-land assets.
Step 3	Calculate all depreciation and obsolescence, except EO, and deduct it from the current cost new of non-land assets
Step 4	Deduct the adjusted sale price (Step 1) from the current cost new less depreciation and obsolescence (Step 3).

The result is an indication of EO based on a market transaction, a sale of a similar property. This approach can be used to calculate EO as a dollar amount, or as a percentage of the cost of reproduction new ("CRN"), cost of replacement ("COR"), or even the cost of replacement less physical depreciation ("CORLD"). An example follows:

Sale Price of Similar Property	$1,000,000
Less Value of Land	200,000
Sale Price of Non-land Assets	$800,000
Cost Approach Indication of Value of Property Sold	
COR	$1,500,000
Less Physical Depreciation	500,000

CORLD	$1,000,000
Less Functional Obsolescence	0
Cost Approach Indication of Value Before EO	$1,000,000
Less Sale Price of Non-land Assets	800,000
Indicated EO	$200,000
Indicated EO as Percent of CORLD	20%

Hence, based on the above, EO is $200,000, or 13% of the COR, or 20% of the CORLD. The dollar amount of EO is the same, but the percent will vary depending on how it is measured and how it is to be used.

Several sales should be reviewed in the analysis to develop a market-derived conclusion. Preferably, the sales should be similar in age and location to the subject, and have little or no functional obsolescence, if possible (one less item to analyze). Sometimes this is not possible, but an attempt should be made to locate comparables that have economic factors similar to those of the subject. Also, if the calculated EO for the comparables is based on a percentage of their CORLD, then the deduction for EO applied to the subject property must be taken before the deduction of any dollar amount for functional obsolescence. Percentage deductions must always be deducted first, dollar deductions last.

Income Approach

A common valuation technique used by the financial community is simply to develop the income approach to indicate the value of the property being appraised. The income approach quantifies all forms of depreciation and obsolescence - physical, functional, and economic. However, when quantifying depreciation and obsolescence through use of the income approach, EO cannot be separately delineated in the analysis without relying on the cost approach. A modification of this approach is to develop all aspects of the cost approach, with the exception of EO, as in the market-derived approach previously discussed, then subtract the income approach indication of value from the partially completed cost approach; the difference is EO. The primary problem with this approach is that the result really relies on just one approach to value, the income approach. As a general rule, using this technique, the result of the cost approach to value will always equal the result of the income approach to value. Although EO has been developed, it is totally dependent on the basic assumptions of the income approach. An example, based on the previous example used in the Market-Derived Approach section, follows:

EO in this example is therefore $100,000. If the income approach indication of value were to change based on a different set of projections or even a different discount rate, the dollar amount of EO also would change.

Income Approach Indication of Value	$1,100,000
Less Value of Land	200,000
Income Approach Indication of Value of Non-land Assets	$900,000
Cost Approach Indication of Value Before EO	$1,000,000
Less Income Approach Indication of Value of Non-land Assets	900,000
Indicated EO	$100,000

Utilization Analysis

Other totally independent procedures are available to quantify the effects of EO. One simple approach is to review the asset's utilization. If the asset is being utilized at less than 100% or whatever is the norm for the industry, then EO exists because demand in the industry is substantially less than the available supply. Mathematically, this is based on the relationship whereby EO equals actual utilized capacity (demand) divided by maximum capacity (supply) with the result taken to an exponent (scale factor), subtracted from 1. The scale factor is a relationship of cost to capacity, which reflects the concept that as capacity increases, the cost of construction increases at a different rate, typically a slower rate. Typical scale factors are 0.6 to 0.7, based on data published in engineering and construction texts.

The typewriter industry circa 1999 will be used as an example of this type of calculation. Because of the use of personal computers, demand for typewriters has been greatly reduced. While the manufacturing supply potential is still in place, the demand is not. Let's say the machinery and equipment at a certain plant has the capacity (supply) to manufacture 100,000 units per year, but demand is for only 1,000 units per year. The magnitude of EO in the industry and in the assets located at the plant is calculated as follows:

$$EO = 1 - (\text{Demand}/\text{Capacity})^{0.7}$$

$$= 1 - (1{,}000/100{,}000)^{0.7}$$

$$= 1 - 0.01^{0.7}$$

$$= 96\%$$

Note that to convert the 96% figure into a dollar amount, one can multiply it by the CRN, COR, or CORLD. Percentage

deductions are always deducted before dollar deductions. The order of the mathematical calculation is not important; the result will be the same (the associative principle of algebra).

The subject company in our example has some income from production of the product, but the machinery and equipment is severely underutilized and, hence, exhibits a high level of EO, 96%. The market for typewriters has been replaced due to a new form of office equipment, personal computers.

Some unenlightened practitioners may argue that EO cannot exist if capacity at the subject or in the industry is nearly or fully used. This is not always true. It can be true only if earnings in the industry can support the capital investment at a market-based rate of return. If utilization is at 100%, but the industry (including the subject) is only breaking even or losing money, then EO is strongly indicated. Utilization can be at what is considered the norm in the industry because of economic influences outside the property, such as high consumer demand, and yet the company may have low levels of profitability because of competition or some other outside influence on the subject property. An example would be any U.S. company competing with companies located in foreign countries where raw materials or operating expenses are less than in the United States. A U.S. plant with a maximum capacity of 100,000 units per year and high demand for its products may have an output of 100,000 units per year. But because of imports from overseas, the price (i.e., value) received for the products produced may just cover expenses; therefore, earnings are low or negative, and the return on the investments in the business are reduced. The magnitude of EO in the industry, based on utilization only (that is, with a blindfold on), is "calculated" to be zero. Of course, this is incorrect.

As can be seen in the example above, a company may have low or negative earnings from the manufacture of a product, yet the equipment may still be utilized at 100%. The plant is likely experiencing financial difficulties because of reduced earnings caused by competition; hence, EO exists and must be quantified using an earnings-related approach. The practitioner can't just plug numbers into formulas to calculate a result and call it EO. Thoughtful, reasoned analysis is required. Several questions must be investigated and answered: Are expected earnings reasonable for the subject property? How do the property's earnings compare to the industry? How do the property's and industry's earnings compare to those in alternative investments?

If a plant is new and "state-of-the-art," it still can exhibit EO. For example, if a plant was built to manufacture a product, and because of changes in government regulations or consumer preferences, the demand for the product or maybe even the primary raw material disappears, EO for the plant and the industry could suddenly be 100%, and the plant would shut down. This could happen today (2001) in the MTBE industry if the U.S. government follows the lead of California and bans the use of MTBE (a blendstock used in reformulated gasoline) in the entire country. The MTBE plants would have the option of shutting down or maybe, if even possible, spending capital to modify the facilities to produce another product. EO can be sudden and significant, especially if a government body is involved.

Return-on-Capital Analysis

Another approach to quantifying EO is a return-on-capital (or investment) analysis. In such an analysis, the relationship of earnings is compared to the magnitude of investment used to generate those earnings. A simple and direct approach to apply the return-on-capital analysis is to review the relationships of publicly traded companies in the same or a similar line of business as the subject property as of the appraisal date to a benchmark to determine if EO exists and at what level. One method is to compare the percent earned on total capital (return on capital) for the year prior to the appraisal date with the percent earned on total capital during a time frame when it was higher (that is, the good old days of more reasonable returns; the time frame may be one year or over several years).

A convenient publication to utilize in this analysis is *Value Line Investment Survey ("Value Line")*. *Value Line* publishes a significant amount of current and historical financial data on thousands of publicly traded stocks on a continuous basis. One of the components of a *Value Line* analysis is percent earned on total capital.

Value Line defines *percent earned on total capital* as" a company's return on its stockholders' equity and long-term debt obligations." As defined in the financial community, the summation of long-term debt and stockholders' equity represents the total invested capital of a business or the business enterprise. When the economics of the industry are good, the return on capital will be high; when poor, low. Hence, a return-on-capital analysis is a meaningful indicator of economic obsolescence.

To develop an example analysis, returns for a typical industry were reviewed based on data published in *Value Line*. A review follows, showing *Value Line*-type data for a sample industry:

Company	Five-Year Mean 1990-1995 (%)	Current Data (%)
Algoma Industries	14.7	10.1
Kewaunee Industries	12.6	8.7
Manitowoc Mfg.	11.0	7.1
Menomonee Cos.	10.9	12.1
Okauchee Services	8.3	8.0
Sheboygan Industries	11.1	10.1
Waukesha Mfg	9.1	6.1
Low	8.3	6.1
High	14.7	12.1
Median	11.0	8.7
Mean	11.1	8.9
Conclude	11.0	9.0

EO can be determined using the following formula:

$$EO = \frac{\text{Five-Year Mean - Current Data}}{\text{Five-Year Mean}}$$

Therefore, using the data presented above, EO in this example can be calculated as follows:

$$EO = \frac{11.0 - 9.0}{11.0} = \frac{2.0}{11.0} = 18\%$$

Accordingly, based on the return-on-capital analysis, the economic penalty, or EO, on assets in the sample industry is 18%.

This is a meaningful indicator of EO when the practitioner can identify companies followed by *Value Line* that are in an industry similar to the subject property and have a minimal amount of diversification. For example, if the subject property were an oil refinery, several companies followed by *Value Line* would be considered good comparables because they are primarily oil refining companies with few other assets in other sectors of the oil and gas industry, or other industries. In other words, the economics of the subject property would be influenced by the same or similar factors as the economics of the comparable companies. If the subject property were a single tissue (paper) mill, this approach may not be as meaningful because *Value Line* does not track any companies that own just tissue mills. All the paper industry companies followed are diversified and, hence, may experience different economic factors than the subject.

After finding the comparable companies, the second step is to study the history of the industry to find a period of time when the return on capital was good (that is, again, what industry insiders would call "the good old days"). For the oil refining industry, this can be identified as the late 1970s, and 1988, the years before supply and demand disruptions and expensive government regulations.

The practitioner must study the subject property's economics and locate companies to be used as comparables that are as similar as possible to the subject. Of course, no comparable will be perfect. The goal is to locate comparables that are in a *similar* economic environment.

Equity-to-Book Ratio Analysis

Another method for determining the EO present in an industry is to analyze investors' perceptions of investment in that industry using common stock (equity) prices. Indicative of investors' perception of the obsolescence present in the investment is the ratio of price paid for common stock relative to its book value. Book value of the stock relates to the original capital contributed to the firm in exchange for the stock plus retained earnings which have accumulated since the initial investment.

From a legal perspective, stockholders own the firm in which they have invested. From an investor's viewpoint, stock ownership is considered to represent a net ownership position in the firm's assets. At any point in time, if the total value of all assets is considered and all liabilities are deducted, the net amount is representative of the total value of the common stock or the value of the common equity in the firm. Thus, an investor purchasing shares of common stock is making a decision on the value of the total assets.

The book value of common stocks of publicly held companies is calculated with reasonable consistency for most publicly traded companies due to accounting regulations. The regulations involve not only the general methodology used in the calculations, but also the type of data available to investors. Because of the consistency of reporting, book values are useful as a benchmark for certain types of measurements. However, book values will not specifically represent fair market value of the assets, primarily because they are based on historical costs.

To estimate EO affecting assets in a sample industry, information in Standard & Poor's ("S&P") *Analyst's Handbook* was analyzed for a sample industry's stock, on a per-share basis. The information represents indices that are based on stock prices (the annual high and low are reported) and also an index for the industry book value (one number is reported). For baseline comparison purposes, the same information is available on a group of industrial companies known as the S&P Industrials, which represents the S&P 500 after removing any nonindustrial stock. Comparisons of stock price and book value are possible based on these annual data for the subject industry and also for the benchmark Industrials. To calculate the equity-to-book ratio for this study, the mean common stock price is divided by the book value per share as published in the *Analyst's Handbook*. The sample analysis follows:

<ID_page91.jpg>

EO can be determined using the following formula:

$$EO = \frac{\text{Industrials - Sample Industry}}{\text{Industrials}}$$

Therefore, using the data presented above, EO in this example is calculated as follows:

$$EO = \frac{4.8 - 3.5}{4.8} = \frac{1.3}{4.8} = 27\%$$

This relationship is indicative of investors' relative valuation of the sample industry assets when compared with general industrial stocks. Owners of general industrial stocks appear willing to pay about 27% more for such stocks than they would pay for stock in the sample industry, based on the equity-to-book-value ratio. By this method, EO of 27% is indicated. To the extent that EO exists in the general industrial companies used in this analysis, the EO conclusion for the sample industry is somewhat understated.

Gross Margin Analysis

Another method that can be used to quantify EO is the study of company or industry returns by comparing gross (profit) margins over time. Simply put, the *gross margin* is a company's revenues less its cost of raw materials. Revenues can be measured by multiplying the number of units produced by the value of those units in the market. The cost of raw materials can be developed in a similar manner.

An appraiser should be able to gather information on the company being appraised by reviewing the last five to ten years of the company's financial data. This analysis is typically developed on a unit-of-production basis (dollars per pound of production, or dollars per barrel of throughput [inputs to the plant], for example). If gross margins have been declining, or currently are lower than in the past, EO may be present even if utilization is high. Of course, if EO does exist, then the industry must first be analyzed to find the reasons for the obsolescence. Typical reasons could be an overcapacity of products available, which is driving prices down; an increase in the cost of raw materials caused by a shortage in the market; or maybe just "cutthroat" competition. Remember, EO is commonly caused by supply-and demand problems and competition. If gross margins are lower than in the past, EO can be measured using the following formula:

$$EO = \frac{\text{Past Gross Margins - Current Gross Margins}}{\text{Past Gross Margins}}$$

An example of this technique follows:

Past Gross Margins $2.00 per unit
Current Gross Margins $1.00 per unit

$$EO = \frac{\$2.00 - \$1.00}{\$2.00} = 50\%$$

Generally, EO is considered incurable, as investments typically cannot be made to make it go away. But it can change and even decline to zero if industry economics change. If a competitor's plant suddenly goes out of business, a shortage of products may occur. When demand is constant and supply goes down, economic theory says that prices will tend to increase. When prices increase for the products produced, revenues will go up for the plant. EO may be reduced or even disappear until another new plant is built, increasing supply, or imports arrive from other parts of the country or from foreign countries.

Government Regulations Analysis

The implementation of government regulations can cause EO, as well. The government's regulation of public utilities provides a good example. For much of the 20th century, state and federal governments structured public utilities' earnings on the investment in the tangible assets used to serve the public in a monopoly situation. Because the public utilities were allowed to have a monopoly, the government wanted to protect the public by controlling the utilities' earnings. This was done through "rate base" regulation. *Rate base*is defined as the original cost of the assets being used to serve the public less allowed (rate base) depreciation. The public utilities would supply the government body information created using unique utility accounting practices for this purpose. The government would permit a certain allowed return on this investment, the rate base, which was determined by actual costs of debt and a market-based allowed return on equity. If the utility earned the allowed amount, good; if the utility earned less, too bad (poor management?). If the utility earned too much, the excess earnings had to be returned to the rate payers through a rate adjustment. To increase earnings, the utility would have to file a request (rate case) to have its allowed return increased. If the rate case took too long to come before the review board and equity returns were rising, a level of EO resulted from the regulatory lag (that is, the allowed rate of return was not permitted to be increased fast enough, and the utility was not being given the opportunity to earn on its rate base at current market rates). The level of EO can be measured by the following formula:

$$EO = \frac{\text{Current Market Return - Allowed Return}}{\text{Current Market Return}}$$

An example of this technique follows:

Allowed Return 10%
Current Market Return 13%

$$EO = \frac{13\% - 10\%}{13\%} = \frac{3\%}{13\%} = 23\%$$

This means, because of regulatory lag (bureaucracy), the utility in our example is not able to earn at market rates, and therefore, the owners of the utility must accept a lower level of earnings. This loss of earnings is a form of EO that reduces the value of the utility's property.

Another form of government-caused EO is rent controls. In certain areas of the United States, rent in apartment buildings is controlled by the local government. The intention is to provide affordable housing for existing tenants. While the market may be changing the market rental rates of apartments in an area (generally increasing with inflation), local government laws sometimes prevent landlords from increasing rental rates. This regulation causes EO, which is manifest in a reduction in the value of the property. EO in this situation can be determined by the following formula:

$$EO = \frac{\text{Current Market Rental Rate - Current Allowed Rental Rate}}{\text{Current Market Rental Rate}}$$

An example of this technique follows:

Current Allowed Rental Rate $500 per month
Current Market Rental Rate $1,000 per month

$$EO = \frac{\$1,000 - \$500}{\$1,000} = \frac{\$500}{\$1,000} = 50\%$$

Again, because of local government controls, EO exists, and the value of the property is reduced.

Consider the position of a potential buyer. If a potential buyer knows that the earnings will be reduced by local government rent controls, will a purchase offer be based on the property's earnings limited by local regulations, or on current market rental rates that do not apply to the property? Of course, the prudent investor will base the offer to purchase on the property's permitted earnings, not on market earnings that do not apply. Rent controls reduce the value of a property because earnings are controlled, reduced. That's economic obsolescence.

Another form of government-regulation-based EO is the lack of return on investments made for pollution control equipment or mandated environmental remediation. The Clean Air Act of 1990 Amendment required many heavy industries to invest in pollution-control-related equipment that did not increase capacity or profits. In fact, in many cases, the new equipment actually increased operating expenses through higher labor requirements and more energy consumption, thus reducing earnings. The plants had two choices: invest in the pollution-control equipment, or shut down. The investment is considered a necessary capital expenditure or a form of curable functional obsolescence, and the resulting reduction on the return on investment, a form of EO. Government regulations constantly require industry to make new plant investments. When the required investments do not generate income, EO is the result.

Income Shortfall Analysis

Another means of indicating EO is an income shortfall analysis. This approach is similar to those discussed above for regulatory lag or rent control techniques, except that the income shortfall is caused by "the market." For example, suppose the subject property is in a very competitive industry. The company has made large investments to modernize and meet environmental requirements, and essentially to invest in long-term future operations. Because of supply and demand economics and competition, earnings are not available to support the investment in the plant assets. The company had the option of investing in the new environmental equipment or shutting down. EO exists because the earnings generated by the plant do not support the level of investment made in the plant. In an income shortfall analysis, EO can be determined using the following formula:

$$EO = \frac{\text{Required Return on Investment - Current Return on Investment}}{\text{Required Return on Investment}}$$

Therefore, continuing the example above, the calculation is as follows:

Required Return on Investment 15%
Current Return on Investment 10%

$$EO = \frac{15\% - 10\%}{15\%} = \frac{5\%}{15\%} = 33\%$$

Another way to calculate the EO caused by an income shortfall is to calculate the differential in earnings. This can be determined by the following formula:

$$EO = \frac{\text{Calculated Return - Projected Return}}{\text{Calculated Return}}$$

An example of this method follows:

Current Investment $1,000,000
Current Income $100,000

$$EO = \frac{\text{Current Income}}{\text{Current Investment}} = 10\%$$

Projected Investment $1,500,000
Projected Income $100,000

$$\text{Projected Return} = \frac{\text{Projected Income}}{\text{Projected Investment}} = 7\%$$

$$EO = \frac{10\% - 7\%}{10\%} = 30\%$$

This income shortfall calculation of EO is very similar to the first calculation, in which the required and current returns were known. In this example, the returns are calculated based on the investment in the property and the return received or projected after a new investment is made that provided no additional income. The result is similar: EO exists and is significant.

Best of the Best Technique

The "Best of the Best" technique was derived in the 1960s by Lionel Thatcher, Professor of Business and Economics at the University of Wisconsin, and Richard Dubielzig, Director of the Utilities Tax Division of the Wisconsin Department of Taxation. This method of quantifying EO involves selecting several economic performance indicators for comparable companies, such as rate of return, gross or net margins, and utilization, among others, for comparison against the subject. Three steps are used:

Step 1 Select the best economic performance indicators of the comparable properties or companies.

Step 2 Compare the subject property's indicators against the best indicators in the market to obtain a relationship to the standard, or Best of the Best.

Step 3 Calculate the subject's average relationship to the standard and subtract from 1 to develop an opinion of EO.

The above method was commonly used in the valuation of railroads for property tax purposes. A simple example follows:

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Using the 70% indication of the subject's relationship to the Best of the Best results in an EO indication of 30% (1 - 70%). This method could be applied to any subject, or in any industry, where reliable economic performance data are available for similar properties. The primary problem with this method is obtaining reliable economic performance data.

Summary

The choice of which method to use depends on the availability of data to utilize and the type of property being valued.

Entrepreneurial Profit

Entrepreneurial profit is the anticipated profit an investor requires to construct and sell a property. It is a reward to the entrepreneur for the inherent risks of investing time and money in the construction of a property.

Entrepreneurial profit must be market based; it is not automatic. The market will not automatically reward an entrepreneur for hard work and risky investments. Most likely, this type of profit will exist in generic industrial, commercial, and residual properties in an expanding market where demand is greater than supply. It will not exist in unique or special-purpose properties that are built by users and are not for sale in the general marketplace. Of course, if EO exists, entrepreneurial profit is negative. Both cannot exist at the same time (that is, both cannot be positive or negative).

A lack of new construction is generally an indicator that EO may exist. However, EO can exist in the presence of new construction, as well. Sometimes, a large corporation will replace an old functionally obsolete plant with a new, modern, state-of-the-art plant to reduce operating costs and create a stronger presence in the industry. While EO still exists in the industry, which reduces the earnings of the company, the reduced operating expenses resulting from a new plant will make it a stronger participant in the industry and potentially even help to drive out the competition. This may reduce and even eliminate some of the competition and, also, reduce or eliminate EO.

Conclusion

Economic obsolescence is present when better economic opportunities exist for an investment. When a government entity steps in and attempts to control the market through regulations, EO is created externally and reduces the value of assets. The loss of value associated with EO also is caused by the economic principles of supply and demand, and competition. EO typically cannot be reduced by capital investments, but it can change, and even decline to zero through changing industry conditions.

An enlightened appraiser will investigate the existence of EO and quantify it based on market indicators. Ideally, more than one method will be utilized and the results correlated to conclude the magnitude of the EO.

This text has covered a number of procedures that can be used to quantify the effects of EO. These procedures will not apply to every property or industry, and other more appropriate indicators may apply. The appraiser must study the subject property and its industry, as appropriate, to determine if EO exists, and if it does, how to measure it. Careful analysis and

study are required, and the process described herein may not be appropriate for matters pertaining to certain U.S. Federal Tax or financial reporting.

You can't see it, you can't touch it, and you can't smell it, but you can measure it using the appraiser's proper valuation tools. It's in the market, and if an informed appraiser is alert, it will be heard. When the market speaks, appraisers listen.

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This paper is based on a presentation given at the 2001 Property Tax Symposium in La Jolla, California, sponsored by the Institute for Professionals in Taxation; the presentation was based on an article published in the Machinery and Technical Specialties Journal of the American Society of Appraisers, Volume 16, Number 1, 2000.

About the author:

Michael J. Remsha *is a vice president and managing director with American Appraisal Associates, Inc., in Milwaukee, Wisconsin. In this capacity, he provides direction and technical support on the valuation of special-purpose and personal property. He has been a full-time appraiser since 1977. He has testified as an expert witness before various county and state tax boards and courts in 15 states. Mr. Remsha is an Accredited Senior Appraiser (ASA) of the American Society of Appraisers. He served as a committee member and/or officer on the Machinery & Technical Specialties Committee from 1994 to 1999, and on the Technical Valuation Committee as a committee member and/or officer from 1989 to 1994. Mr. Remsha is certified in Wisconsin as a Professional Engineer (PE), is licensed as a Certified General Appraiser in several states, and is a Certified Member of the Institute (CMI) in the Institute for Professionals in Taxation.*

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Gmail

Lee Andrews Group <lgbfiscomments@gmail.com>

Comments from March 30, 2016 Meeting

1 message

[redacted] Fri, Apr 1, 2016 at 1:06 PM

To: LGBFIScomments@gmail.com

Hello:

Thanks for having the meeting on March 30, 2016.

I am sorry that the meeting devolved the way it did. I was frankly embarrassed for my fellow citizens.

I wanted to say, it sounds like you have a good plan and I look forward to hearing the results of your work.

Hang in in there!

Best,

[redacted]

Gmail

Lee Andrews Group <lgbfiscomments@gmail.com>

Jacobs Consultant Comment Sheet

1 message

[redacted] Sun, Apr 10, 2016 at 1:35 PM

To: lgbfiscomments@gmail.com

Please see the attached comment/questions submitted for April 20th community meeting.

Please be aware this email attachment was also sent to all LB councilmen, the mayor and the LBG airport manager.

Respectfully:

[redacted]

Jacobs Consultant Comment Sheet.docx
15K

Jacobs Consultant, Question / Comment

Feasibility Study for a Federal Inspection Service (FIS) Facility at the LB Airport

[redacted]

After attending the 1st public comment meeting for the FIS Facility it became readily apparent that the meeting should open with an explanation and scope of the project. Where does the City want and expect this to go? Residents have been fed that the FIS Facility is needed because Jet Blue wishes to use its new slots to fly south of the border, and so process passengers returning from Mexico. If this is not the case, it needs to be cleared up immediately.

If this is the case, it is hard to understand why the City is needlessly spending money for a consulting firm and all the accompanying studies. As I look at it, whether Jet Blue flies from Seattle or Cancun they will be processing the same number of customers and flights. The only difference is the FIS Facility. That said, this study should have been made **PRIOR** to the City granting the availability of the 9 new slots, not on the effects of building an FIS Facility unless there's a hidden agenda.

So here is the rub and maybe the City Airport Manager and the City Council need to answer this question. "What are the real intentions of the City concerning the FIS?" Even if all 9 new flights were to come from Mexico, processing an additional 1,000 to 1,500 returning passengers would not require traffic and environmental studies of this proportion. Noise studies if needed should have been accomplished **PRIOR** to the City Airport Manager granting the 9 new additional slots. So again I ask "What is the actual scope of this project going to encompass?"

Going forward from here residents need to know what additional consequences building the FIS Facility will bring on us. If General Aviation noise values are currently at 45%, do we need to anticipate a doubling of this air traffic? How about Charter and Industrial Operators, what kind of increase will we expect in their traffic? Per the *Long Beach Neighborhoods First* website's fact sheet, Long Beach Airport "…*will serve all international flights* meeting the guidelines of our Noise Compatibility Ordinance and Customs requirements." A definition of "*all international flight*s" is needed to tell us exactly what the residents of Long Beach are to expect. How many other airlines could be internationally flying by changing their slot locations from domestic to international?

As a follow-up comment, it is my understanding the noise requirements are treated as a "Bucket" for noise values based on sound amplitude and duration. Originally when the ordnance was established commercial aircraft were louder and so only 15 flights a day could be allowed before the noise "bucket" was filled. As aircraft got quieter, it allowed more aircraft flights before the maximum noise value would be reached. This is incremental creep of the noise ordinance, allowing for more flights. I for one could stand being disturbed less often by louder aircraft and I'm sure many residents would agree. This creep also goes for allowing Jet Blue to fly late (between 10:00 and 11:00pm) and just pay a relatively small fine. By the City agreeing to this, they have given Jet Blue the green light to fly as late as they wish as long as Jet Blue's purse is open to pay the relatively small fines levied against them. Again, incremental regulation creep is diminishing the noise abatement regulations and reducing the neighborhood's quality of life.

So in the end by allowing the FIS Facility to be constructed at the airport, how much more incremental creep, i.e. more flights, will we see and where will all this take us?

When discussing economic factors, has anyone considered the drop in property tax revenue due to diminishing property values?

Gmail

Lee Andrews Group <lgbfiscomments@gmail.com>

In favor of establishing FIS Faciity @ LGB in concept.

1 message

[redacted]

Sun, Apr 10, 2016 at 2:31 PM

Dear Jacobs Team,

My wife and I attended the first meeting about 2 weeks ago at the Long Beach Gas Department Auditorium. We felt your approach was intelligent. We felt the opponents were poorly behaved. We left when they began yelling. I would welcome any information or questions you wish to send to this E-mail address. [redacted]

Gmail

Lee Andrews Group <lgbfiscomments@gmail.com>

Jacobs Consultant Comment Sheet

1 message

[redacted] Mon, Apr 11, 2016 at 1:47 PM
To: district1@longbeach.gov, district2@longbeach.gov, district3@longbeach.gov, district4@longbeach.gov, district5@longbeach.gov, dee.andrews@longbeach.gov, district7@longbeach.gov, district8@longbeach.gov, district9@longbeach.gov, Mayor@longbeach.gov, lgbarpt@longbeach.gov
Cc: lgbfiscomments@gmail.com

Mayor, LB-Councilpersons & LGB Airport manager-

The attached document is a copy of the comments drafted for Jacobs Consulting firm in response to the last community meeting concerning the proposed FIS Facility at Long Beach Airport. Hopefully placed in text are some of the questions which were left unanswered by that meeting. I will add that the meeting was poorly organized starting with the choice of facility which has very limited parking, of which the City took up the lion's share of. As for the meeting itself, the consulting firm expected the audience to move from station to station with questions (which would have resulted in repeated questions and answers) without so much as an explanation of what the exact scope and extent of the LGB development would be. In review of the meeting, I believe the real discussion isn't the FIS Facility itself but what is the City doing behind the scenes over and above the FIS which will lead to increased traffic through the airport, thus degrading the neighborhood quality of life further.

I truly hope you take a few minutes to read my comments as these were expressed by many of the residents in attendance.

Respectfully:

[redacted]

Jacobs Consultant Comment Sheet.docx
15K

Jacobs Consultant, Question / Comment

Feasibility Study for a Federal Inspection Service (FIS) Facility at the LB Airport

[redacted]

After attending the 1st public comment meeting for the FIS Facility it became readily apparent that the meeting should open with an explanation and scope of the project. Where does the City want and expect this to go? Residents have been fed that the FIS Facility is needed because Jet Blue wishes to use its new slots to fly south of the border, and so process passengers returning from Mexico. If this is not the case, it needs to be cleared up immediately.

If this is the case, it is hard to understand why the City is needlessly spending money for a consulting firm and all the accompanying studies. As I look at it, whether Jet Blue flies from Seattle or Cancun they will be processing the same number of customers and flights. The only difference is the FIS Facility. That said, this study should have been made **PRIOR** to the City granting the availability of the 9 new slots, not on the effects of building an FIS Facility unless there's a hidden agenda.

So here is the rub and maybe the City Airport Manager and the City Council need to answer this question. "What are the real intentions of the City concerning the FIS?" Even if all 9 new flights were to come from Mexico, processing an additional 1,000 to 1,500 returning passengers would not require traffic and environmental studies of this proportion. Noise studies if needed should have been accomplished **PRIOR** to the City Airport Manager granting the 9 new additional slots. So again I ask "What is the actual scope of this project going to encompass?"

Going forward from here residents need to know what additional consequences building the FIS Facility will bring on us. If General Aviation noise values are currently at 45%, do we need to anticipate a doubling of this air traffic? How about Charter and Industrial Operators, what kind of increase will we expect in their traffic? Per the *Long Beach Neighborhoods First* website's fact sheet, Long Beach Airport "…*will serve all international flights* meeting the guidelines of our Noise Compatibility Ordinance and Customs requirements." A definition of "*all international flight*s" is needed to tell us exactly what the residents of Long Beach are to expect. How many other airlines could be internationally flying by changing their slot locations from domestic to international?

As a follow-up comment, it is my understanding the noise requirements are treated as a "Bucket" for noise values based on sound amplitude and duration. Originally when the ordnance was established commercial aircraft were louder and so only 15 flights a day could be allowed before the noise "bucket" was filled. As aircraft got quieter, it allowed more aircraft flights before the maximum noise value would be reached. This is incremental creep of the noise ordinance, allowing for more flights. I for one could stand being disturbed less often by louder aircraft and I'm sure many residents would agree. This creep also goes for allowing Jet Blue to fly late (between 10:00 and 11:00pm) and just pay a relatively small fine. By the City agreeing to this, they have given Jet Blue the green light to fly as late as they wish as long as Jet Blue's purse is open to pay the relatively small fines levied against them. Again, incremental regulation creep is diminishing the noise abatement regulations and reducing the neighborhood's quality of life.

So in the end by allowing the FIS Facility to be constructed at the airport, how much more incremental creep, i.e. more flights, will we see and where will all this take us?

When discussing economic factors, has anyone considered the drop in property tax revenue due to diminishing property values?

Gmail

Lee Andrews Group <lgbfiscomments@gmail.com>

Public Comment Card

1 message

[redacted]

Mon, Apr 11, 2016 at 10:08 PM

Living in Bixby Knolls, I love having an airport within 2 miles of my home. It has allowed for quick, convenient trips to Portland, San Francisco, San Jose and New York. I also experience the downside -- noise, air pollution, and grime from jet fuel. I am willing to live with these consequences to have an airport close by. But I don't want to see the number of flights increase. I am comforted by the fact that we have a noise ordinance in place to restrict the number of flights. I do not want to see an overseas terminal constructed for these reasons.

1. **Could jeopardize the noise ordinance.** I feel the construction of a Customs Facility might jeopardize or open the door to modifications in our current noise ordinance and flight cap.

2. **We don't need it.** We have similar within 25 minutes and 4 within an hour to service international flights. It is duplicative – there are customs facilities available at LAX, John Wayne, Ontario and Bob Hope Airports. These airports are close by and convenient.

3. **The numbers just don't pencil out.** The former airport manager felt and provided a study as evidence that the proposed customs facility is not economically viable and could cause a debt burden for the airport, which would become a debt burden for the city.

4. **It doesn't service the population.** The construction of this overseas terminal does not service the population of Long Beach, who want access to flights up the coast to Seattle, Portland, San Francisco and San Jose, or across country to Chicago or New York – not daily flights to Cancun or other resort destinations.

5. **It puts our property in jeopardy.** A federal customs facility would open the door to a new category of international operators who may try to petition for the large aircraft flight slots that are currently filled and aren't currently available under Long Beach's protective airport ordinance. Most planes, more noise and more pollution threaten to jeopardize the beautiful and historically recognized neighborhoods of, California Heights, along with Bixby Knolls and Los Altos along with decreasing their property values.

Please consider the people of Long Beach – not just those who live under the flight path -- but those who use the airport and those who would be shorted the convenience of local, in-state and national flights that a municipal airport is supposed to provide. Additionally, as Mario Rodriguez pointed out in the first Frasca & Associates Assessment conducted in 2014, this endeavor is not economically viable, and the citizenry of Long Beach will suffer from shorted services after city funds are used to bail out this endeavor. Thank you.

–

[redacted]

Gmail

Lee Andrews Group <lgbfiscomments@gmail.com>

Long Beach Airport Association (LBAA) Position on FIS at LGB

1 message

[redacted] Mon, Apr 18, 2016 at 2:40 PM

To: "LGBFIScomments@gmail.com" <LGBFIScomments@gmail.com>

[redacted]

Advancing Aviation, Economic Growth and Business Diversity

On behalf of the Long Beach Airport Association (LBAA) please find the attached comments related to the LGB FIS feasibility study now underway.

For our members, please submit your own comments directly to: LGBFIScomments@gmail.com

Here is the link to the feasibility study presentation: http://www.lgb.org/civicax/filebank/blobdload.aspx?BlobID=3070

[redacted]

Long Beach Airport Assoc (LBAA) Position on FIS at LGB.pdf
190K

LBAA

Advancing Aviation, Economic Growth and Business Diversity

POSITION ON US CUSTOMS SERVICES @ LGB

- Many of our members and business owners are residents of the City of Long Beach. They believe the Airport is an asset for the entire City, not select community groups or districts. All members of the community, business and residents deserve to be heard and not drowned out or be intimated by those residents preventing open discussion by attempting to take over public hearings with raucous behavior and screening guest at the door with banners and signs.

- The majority of business and home owners enjoy flying into and out of the LGB Airport and would appreciate more destinations domestically and internationally, in conformance with the permitted commercial flight slots.

- The Long Beach Airport has had international flights for decades. International clearances only stopped in 2006 when US Customs redirected all LA basin aircraft into LAX. Previously LGB served international clearances for both general aviation and commercial charters weekly. The current consideration evaluating the US Customs clearance at LGB must recognize such service is not NEW.

- Community surveys have and will show overwhelming support by the residents in the City of Long Beach for the convenience of flying in and out of the Long Beach Airport as an alternative to other basin airports. We believe that same community will benefit from a service enhancement such as international clearances, that do not change the flight allocation process or noise ordinance. Maybe the City should conduct a city wide survey?

- The world today depends on connectivity to a global economy and Long Beach needs to remain competitive by incorporating international service within the existing regulations of the airport. US Customs service will make Long Beach more readily available to visitors and businesses, assisting in business attraction and retention efforts. Given the location of the Port of Long Beach as an international gateway, the Long Beach Airport should provide the same direct access and enhance the City as a truly international destination.

- The fact that LGB would be a destination for international flights does not limit or restrict the City's ability to properly manage the noise ordinance or commercial slot allocation process. US Custom clearances would not be operated 24/7, and staffing hours would be consistent with the hours of operation provided by the noise ordinance.

- A new US Customs clearance facility (FIS) will not expand the terminal hold room, parking positions, vehicle parking garage or add flights above those already authorized.

- LGB is a diverse airport with balance of general aviation, business aviation, commercial, manufacturing and many other related aviation service industries. This balance is protected by the noise ordinance and maximizing the potential for airport business within these regulations is reasonable and prudent…including the addition of US Custom's clearance service

- Airports such as Fresno, Bakersfield, Oakland, Palm Springs, Monterey, San Jose, Sacramento, and many others much smaller cities than Long Beach in the State of California, with noise mitigation measures in place, have US Custom Clearance Services. Such services will improve the airport budget and can provide direct and indirect economic benefit and the financial stability of Long Beach by encouraging international business and leisure travel.

- A US Customs clearance facility will not utilize any general fund money, it will be constructed by JetBlue directly and existing Passenger Facility Charges (PFCs), and the ongoing expense will be maintained by user fees paid by all the LGB airlines and the passengers who use it.

- We are an international city in a very diverse Southern California region. US Customs clearances will provide efficiency to other businesses at the airport, such as businesses like Gulfstream, Mercedes, Virgin Galactic, etc., who already utilize corporate aircraft into Long Beach, but must first stop somewhere first before arriving. An FIS facility at LGB will address environmental balance on a larger scale by eliminating unnecessary take offs and repositioning flights, noise, pollution and easing airspace congestion, by permitting direct flights from other cities where these aircraft must now first stop, only because they can't land directly at LGB.

- We want you to know that while there is a vocal community from certain neighborhoods against this study and the consideration for US Custom clearances at LGB, there is a HUGE majority in the City and each district that supports it and want to see the airport maximize its economic benefit impacts under the current noise compatibility regulations.

Gmail

Lee Andrews Group <lgbfiscomments@gmail.com>

Human Risk Study

1 message

[redacted] Mon, Apr 18, 2016 at 10:16 PM

To: LGBFIScomments@gmail.com

Sirs, I submit the following question/concern for your official file. If this is not in your scope of responsibilities please pass my concern on to airport staff for their response.

Please review the attached link which explains the importance and due diligence airport operators owe the public, especially children and seniors, living near airports! QUESTION: Why is it that LGB (Long Beach Airport) has never performed such an important study and evaluation?

http://onlinepubs.trb.org/Onlinepubs/acrp/acrp_rpt_135.pdf

[redacted]

ACRP

REPORT 135

AIRPORT COOPERATIVE RESEARCH PROGRAM

Sponsored by the Federal Aviation Administration

Understanding Airport Air Quality and Public Health Studies Related to Airports

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AIRPORT COOPERATIVE RESEARCH PROGRAM

ACRP REPORT 135

Understanding Airport Air Quality and Public Health Studies Related to Airports

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AIRPORT COOPERATIVE RESEARCH PROGRAM

Airports are vital national resources. They serve a key role in transportation of people and goods and in regional, national, and international commerce. They are where the nation's aviation system connects with other modes of transportation and where federal responsibility for managing and regulating air traffic operations intersects with the role of state and local governments that own and operate most airports. Research is necessary to solve common operating problems, to adapt appropriate new technologies from other industries, and to introduce innovations into the airport industry. The Airport Cooperative Research Program (ACRP) serves as one of the principal means by which the airport industry can develop innovative near-term solutions to meet demands placed on it.

The need for ACRP was identified in *TRB Special Report 272: Airport Research Needs: Cooperative Solutions* in 2003, based on a study sponsored by the Federal Aviation Administration (FAA). The ACRP carries out applied research on problems that are shared by airport operating agencies and are not being adequately addressed by existing federal research programs. It is modeled after the successful National Cooperative Highway Research Program and Transit Cooperative Research Program. The ACRP undertakes research and other technical activities in a variety of airport subject areas, including design, construction, maintenance, operations, safety, security, policy, planning, human resources, and administration. The ACRP provides a forum where airport operators can cooperatively address common operational problems.

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ACRP REPORT 135

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FOREWORD

By Joseph D. Navarrete
Staff Officer
Transportation Research Board

ACRP Report 135: Understanding Airport Air Quality and Public Health Studies Related to Airports provides airport industry stakeholders with an overview of what is known and not known regarding the impact of airport activity on air quality and public health. The report effectively communicates key information about this technically challenging and frequently sensitive topic through the use of frequently asked questions, a topic overview, critiques of recent studies, and recommendations for further research. The report will help practitioners address air quality and public health issues that may arise at their airport.

The communities surrounding airports have become increasingly aware of potential impacts to air quality and public health from airport operations. A number of airport air quality and health studies have been completed or are underway in North America and Europe; most of these studies have been required by regulatory agencies or legislated in response to airport improvement projects or to the public health concerns from local government or citizen groups. These studies vary in method, scope, and duration, and include air sampling, modeling, and health assessment. There is a need to compile and assess relevant information on airport air quality and public health studies to provide an understanding of how these studies can be useful for airport operators.

The research, led by Wyle, was focused on an extensive and thorough critique of air quality and public health literature. This review included not only airport-centric studies but also studies that address pollutants related to airport emissions even if the study's focus was not on airports. The sources of these studies included universities, state air agencies, the FAA, and airport monitoring studies. Both domestic and a limited number of international sources were included.

The report begins with a review of air quality standards and regulations. It then focuses on airport air quality issues, including source characteristics and emissions contributions, airport operations, geography, meteorology, mitigation measures, airport emissions and dispersion modeling, air quality measurement capabilities, and aircraft landing/takeoff emissions impacts vs. impacts at cruising altitude. The report then provides an overview of air quality health impacts and risk, followed by a discussion of the industry's current understanding of airport air quality health impacts. The report concludes with recommendations for future research. Key features of the report include a summary of findings in the form of frequently asked questions and an extensive table summarizing the literature review.

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Note: Photographs, figures, and tables in this report may have been converted from color to grayscale for printing. The electronic version of the report (posted on the web at www.trb.org) retains the color versions.

Summary of Findings

This section provides a summary of the basic findings presented for a broad readership. Technical information is provided in the body of the report. To support airport operators, the purpose of this study was to evaluate the existing body of knowledge on airport air quality and public health to help better understand and respond to concerns over airport-related air quality health concerns. The work was accomplished through a review of past studies and a critical synthesis where conclusions were drawn from a preponderance of the evidence. This involved summarizing, corroborating, and refuting findings from the existing literature to extract general conclusions applicable to most airports. Since it is difficult to generalize to all airports, the conclusions were qualified to indicate that findings at specific airports may differ.

To assist airport novice users, this report provides primer-type information in Chapters 2 through 4. These sections provide background information necessary to understand the conclusions drawn from the synthesis. In addition, Appendix B, Frequently Asked Questions (FAQs), provides direct answers to popular questions—those that are likely to be asked by novices. Chapter 5 presents the synthesis work shaped in the form of two basic questions: (1) What pollutants are of most concern at an airport? (2) What are the airport's contributions to local air quality and health impacts? The key findings for airports are as follows:

- **Factors that affect airport contributions to local air quality and public health**—In addition to pollutant type, there are many factors that can affect airport contributions to local air quality and public health. These include pollutant emissions (largely affected by source characteristics and operations), pollutant toxicity, and exposure. In addition, a person's background and condition also can play a significant role in affecting his/her health. Factors such as age, gender, pre-existing disease status, and co-exposures to other risk factors can all affect susceptibility to air pollutants. See Section 4.2 and the FAQs.
- **Ability to state conclusions for specific airports**—Since all airports are different, it is very difficult to make general statements about airport air quality contributions and health impacts. Airport contributions to air quality can depend on many different factors including, but not limited to, airport source types (e.g., aircraft fleet mixes), source operations, airport layout and location, surrounding geography, and meteorology. See Sections 3.1–3.5.
- **Pollutant(s) that pose the biggest health risk at airports**—Airport risk assessment studies have shown that fine particulate matter ($PM_{2.5}$) dominates the overall health risks posed by airport emissions. The risk for fine particles is orders of magnitude higher than that for the closest hazardous air pollutant (HAP), formaldehyde, although the ability to quantify the non-cancer health effects of HAPs is limited. $PM_{2.5}$ levels have been found to vary significantly at different airports. Although PM_{10} is a health concern, the fact that much of the coarser portion is filtered out by the upper respiratory tract in human beings makes it less of a concern than are the finer particles. See Chapter 4 and Section 5.1.

- **Secondary PM (PM not directly emitted from a source but formed in the atmosphere) at airports**—Studies indicate that secondary PM may form at significant distances downstream from an airport (many miles) adding to health impacts, and thus, requiring large-scale (e.g., regional) modeling to determine overall PM health impacts. In addition, the impacts of different PM components including black carbon, nitrates, and sulfates need to be taken into account as well as PM size distributions. See Chapter 4 and Section 5.2.
- **Airport contributions of ultrafine PM (PM sized below 0.1 μm diameter)**—In addition to the suspected health concerns of ultrafine PM from airport sources (along the lines of the current understanding of $PM_{2.5}$), measurement studies have shown that ultrafine concentrations tend to be highly elevated near an airport (near runways) with persistence above background levels at distances of 600 m downwind of an airport. As such, ultrafine PM generated by airports is suspected of having a broader impact than that generated by roadway vehicles. See Chapter 4 and Section 5.2.
- **Consistency of airport contributions of HAPs**—Concentrations of HAPs at airports seem to vary without clear, consistent levels of contributions. While some studies suggest that HAP concentrations near airports may be similar to background levels, there appears to be enough evidence suggesting otherwise—keeping in mind there are noticeable uncertainties with measured concentration levels. See Section 5.2.
- **Airport contribution levels of most criteria gases**—Airport studies appear to indicate that most criteria gases (e.g., CO, NO_2, and SO_2) generated from airports generally tend to result in similar concentrations to background (or urban) levels in surrounding communities, although with appreciable contributions closer to the emission sources and variable conclusions depending on background levels. Although health effects of criteria gases are well defined, quantitative health risk assessments for these gases are relatively limited in comparison to ozone and PM. See Chapter 4 and Section 5.2.
- **Airport contributions to ozone**—Because of the nature of ozone chemistry, ozone levels around airports tend to be lower than background levels (i.e., airports tend to be a sink for ozone). Although ozone levels in the vicinity of an airport may be depressed, airports can contribute to the formation of ozone on a larger regional level, thus resulting in increased health impacts. See Section 5.2.
- **Lead as a concern at airports**—Lead is a health concern at general aviation (GA) airports and will continue to be an issue as long as AvGas is used. Current studies indicate that lead emissions can noticeably persist at distances close to 1,000 meters downwind of an airport. As such, studies indicate that lead contributions near GA airports may not be negligible. See Section 5.2.
- **Airport air quality and public health research**—The state of airport air quality and health research is currently not mature enough to allow definitive conclusions in most cases. As such, all conclusions should be considered snapshots in time since future research may provide further details. However, the current research efforts appear to be aligned with the prioritization of pollutant health risks. Based on the relative number of studies and the recent focus, available resources appear to be correctly being applied to PM and HAPs research, with consideration of ozone for regional-scale analyses. See Sections 5.1–5.2 and Appendix A at the back of the report.
- **Correlating airport contributions to local air quality**—Regarding airport contributions to local air quality, studies have shown that airport emissions and resulting concentration contributions can be well correlated to airport operations (e.g., aircraft usage) as part of source identification and apportionment work. The more pertinent issue is in quantifying the contributions. The current research efforts appear to be aligned with the need for further measurements and understanding of health impacts. See Sections 5.1–5.2.

CHAPTER 1

Introduction

The communities surrounding airports have become increasingly aware of airport emissions and how they contribute to local air quality that may affect public health. The growth in airport operations as well as increased public awareness of health impacts, has spurred the need for airport operators to more fully understand the potential for health impacts and to develop better information and methods to share with the public. Understanding airport contributions to air quality is challenging because it involves many factors including, but not limited to, the following:

- Airport source characteristics (including pollutant emission rates),
- Type of pollutants,
- Location of sources and population,
- Meteorology,
- Seasonality, and
- Geography.

Understanding airport contributions to local air quality can be complex because any of these factors can significantly impact airport contributions. They also can contribute in different ways and interfere dramatically with each other (i.e., one factor can interfere with the efficacy of another). For example, one airport may generate lower emissions of certain pollutants, such as nitrogen oxides (NO_x), but because the surrounding region experiences weather conditions and a geography that is more conducive to the formation of ozone (O_3), the airport may be seen as contributing more to the detriment of local air quality than another airport that may produce higher emissions of NO_x. The story becomes more complicated when health effects are being considered, as this depends on the location of the population as well as their vulnerability characteristics. Two different airports may have similar sources (e.g., similar aircraft fleet mixes) resulting in similar concentrations for each pollutant, but if the population surrounding one of the airports is directly downwind of the airport while the population for the other airport is predominantly upwind, the former airport may be seen as contributing more to public health impacts than the latter airport.

These examples illustrate the interactive nature of various factors but they also show that airports can vary significantly for each factor. As such, definitive generalizations cannot be made when considering the air quality and corresponding health impacts from airports. Each airport needs to be considered separately when assessing specific air quality contributions and potential public health impacts. With these qualifiers in mind, some conclusions can be drawn from the existing literature of airport studies to help better understand the state of research and its findings.

Common Terms

Emission—The release of a pollutant from a source (e.g., aircraft engine) and quantified in mass units such as kilograms and pounds.

Emission Factor—The rate of release of a pollutant from a source, typically quantified as mass per activity (e.g., grams/hour).

Concentration—The amount (mass) of pollutant(s) within a volume of air with units such as parts per million (ppm) and micrograms per cubic meter (μg/m^3). A concentration value represents the quality of the air to which human beings can potentially be exposed.

Receptor—A location of interest where an air quality concentration is experienced (e.g., a location representing public exposure).

Dispersion—The scattering or diffusion of a pollutant in the air after release from a source.

Health Risk—The chance of harm due to exposure to a pollutant.

Toxicity—The degree to which a pollutant can harm a human being.

Exposure—Refers to the "contact" a human being may experience with a pollutant (i.e., breathing in a pollutant).

1.1 Goal and Scope

Many studies have used different methods and data to characterize airport contributions to local air quality and potential health impacts. As such, the scope and approaches utilized in airport-related air quality and public health studies vary widely, resulting in conclusions that can vary widely as well. This variability and insufficient information can make it difficult for airports to properly respond to proximate communities that are concerned about health impacts and look to the airports for answers.

Because of the lack of specific guidance regarding the understanding of airport impacts on public health, the Transportation Research Board (TRB) funded this project under the Airport Cooperative Research Program (ACRP). The goal of the project was to develop a guidebook to help inform airport operators and allow them to better respond to public concerns over air quality and health impacts in the vicinity of airports.

Overall, the project involved a formal literature review and a critical synthesis of the existing knowledge base. This included reviews of each of the aforementioned factors affecting airport contributions to local air quality and of health impact assessments involving risk estimations to provide an understanding of the current state of knowledge of airport contributions to air quality and health impacts. It should be noted that while pertinent (airport-centric) health-related studies were reviewed in the development of this report, it is not an exhaustive summary, as there are thousands of health studies that address pollutants related to airport emissions but are not specific to airport settings.

The composition of the literature materials reviewed for this section includes reports, documents, and articles from various sources including universities, state air agencies, FAA, airport monitoring studies, etc. Most of the reviewed literature is focused on the United States,

Pollutants of Interest at Airports

Criteria Pollutants
- Carbon monoxide (CO)
- Lead (Pb)
- Nitrogen dioxide (NO_2)
- Particulate matter with an aerodynamic diameter 10 μm (PM_{10}) or less—coarse particles
- Particulate matter with an aerodynamic diameter 2.5 μm ($PM_{2.5}$) or less—fine particles
- Ozone (O_3)
- Sulfur dioxide (SO_2)

Hydrocarbons (HCs)
Volatile Organic Compounds (VOCs)
Hazardous Air Pollutants (HAPs)
- Volatile organic compounds
- Aldehydes and ketones
- Dioxins and furans
- Polycyclic aromatic hydrocarbons (PAHs)
- Metal compounds

Ultrafine PM
- Particulate matter with an aerodynamic diameter less than 0.1 μm

Other PM Types and Components
- Black carbon (BC or elemental carbon)
- Nitrates
- Sulfates

but some non-U.S. studies also were included. Since there were many potential studies to review, the focus was first placed on those that directly covered airport air quality contributions and health impacts. After this, the reviews were expanded to include documents related to airport ambient measurements and airport air quality modeling. Then more general health impact documents were included. Appendix A provides a list of the documents reviewed under this project in the form of a matrix, look-up table where each document has been assigned categorization factors for easier grouping and identification.

The overall scope of this project involved answering key questions related to airport health impacts. As such, it included the development of concise summaries of findings from the literature and appropriately interpreting and critiquing the materials. Although not all of the literature materials listed in Appendix A were cited, they were all reviewed for this project.

1.2 Organization

Chapters 2 through 4 present concise background materials to help better understand airport air quality issues and concepts. Chapter 2 provides a review of air quality regulations. Chapter 3 provides descriptions of airport sources and factors affecting airport air quality. Chapter 4 provides a concise primer on pollutant health effects and risk assessments.

Chapter 5 presents the findings of the researchers' critical reviews. This chapter is comprised of two sections dealing with pollutant prioritizations and quantifying the contribution of airports to local air quality and health impacts. Chapters 6 and 7 provide the conclusions and recommendations for future research. The recommendations also serve to point out any knowledge gaps.

The last three sections provide a list of acronyms; Appendix A, the matrix of references; and Appendix B, Frequently Asked Questions (FAQs). The FAQs section was added to help readers obtain quick answers to commonly asked questions.

CHAPTER 2

Ambient Air Quality Standards and Regulations

The following sections provide overviews of the predominant air quality standards and regulations as they apply to airports.

2.1 Clean Air Act (CAA) and the National Environmental Policy Act (NEPA)

For decades following the establishment of commercial-service airports in the United States, the common complaint from neighboring communities was aircraft noise, which was considered more of an annoyance as opposed to a health concern. This focus on noise continued through the introduction of the large commercial turboprop-engine aircraft in the 1950s and the turbofan engines in the 1960s. However, with the initial enactment of the Air Pollution Control Act in 1955, and then the Clean Air Act (CAA) in 1970, and the Clean Air Act Amendments (CAAA) in 1990, emissions and air quality were given increasingly greater scrutiny. The 1990 CAAA brought sweeping changes that included various measures to further control and regulate emissions.

Along with the CAA in 1970, the National Environmental Policy Act (NEPA) was enacted to serve as a national policy on protecting the environment—requiring environmental evaluations for federal actions with significant impacts on the environment. In compliance with this, the FAA is required to provide an accounting of emissions projected to occur from aircraft and other sources of harmful emissions at airports when seeking to expand or improve operations. As part of the NEPA process, FAA is required to evaluate all potential environmental impacts caused by an action at an airport by comparing build and alternative cases with those of the corresponding

Standards Versus Pollutants

Primary and Secondary Standards refer to the ambient standards established as the National Ambient Air Quality Standards (NAAQS) for criteria pollutants for the protection of public health (primary standards) and protection of the environment (secondary standards).

Primary and Secondary Pollutants refer to whether pollutants are emitted directly from a source (primary pollutants—e.g., NO_x, CO, VOCs, $PM_{2.5}$, etc.) or formed in the atmosphere through chemical reactions and/or physical processes (secondary pollutants—e.g., O_3, PM nitrates, PM sulfates, etc.).

no-build (baseline) case. The amendments also established the General Conformity Rule that sets thresholds above which an air quality assessment would be required in areas of the country already experiencing poor air quality (i.e., within maintenance and nonattainment areas).

2.2 National Ambient Air Quality Standards (NAAQS)

Under the CAA, ambient air concentration limits of six (6) criteria pollutants having adverse human health and environmental effects were established by the EPA as the National Ambient Air Quality Standards (NAAQS) summarized in Table 2-1.

The NAAQS reflect concentration values (e.g., $\mu g/m^3$) that have been developed through various scientific and health studies. The EPA defines the NAAQS on two levels: primary and secondary. Primary standards protect public health, particularly for sensitive populations such as asthmatics, children, and the elderly. Secondary standards address public welfare by protecting against the reduction of visibility and damage to animals, crops, vegetation, and buildings. The NAAQS have been updated frequently during the past two decades and the current standards can be found on the EPA website at http://epa.gov/air/criteria.html.

The EPA uses the NAAQS values for each criteria pollutant to signify the health status of each county within the United States. The following designations are used to signify the status of each county:

- Nonattainment—Any area that does not meet (or that contributes to ambient air quality in a nearby area that does not meet) the national primary or secondary ambient air quality standard for the pollutant.
- Attainment—Any area . . . that meets the national primary or secondary air quality standard for the pollutant.
- Unclassifiable—Any area that cannot be classified on the basis of available information as meeting or not meeting the national primary or secondary air quality standards for the pollutant.

Nonattainment areas are also further designated as being marginal, moderate, serious, severe, or extreme depending on how much the area's concentrations are above the ambient standards. Based on the county(ies) in which an airport is located, it must abide by the attainment status of the county for all NEPA and General Conformity evaluations.

Table 2-1. National Ambient Air Quality Standards.

Pollutant	Averaging Period	Primary Standards	Secondary Standards	
Carbon Monoxide (CO)	8 hours	9 ppm	None	
	1 hour	35 ppm		
Lead (Pb)	Rolling 3-month average	0.15 $\mu g/m^3$	Same as Primary	
Nitrogen Dioxide (NO_2)	Annual	53 ppb	Same as Primary	
	1 hour	100 ppb	None	
Particulate Matter (PM_{10})	24 hours	150 $\mu g/m^3$	Same as Primary	
Particulate Matter ($PM_{2.5}$)	Annual	12 $\mu g/m^3$	15.0 $\mu g/m^3$	
	24 hours	35 $\mu g/m^3$	Same as Primary	
Ozone (O_3)	8 hours	0.075 ppm	Same as Primary	
Sulfur Dioxide (SO_2)	1 hour	75 ppb	3-hour	0.5 ppm

Source: http://epa.gov/air/criteria.html

While the NAAQS include PM_{10} and $PM_{2.5}$, currently there are no standards for much smaller PM size ranges such as the ultrafine range (i.e., PM with an aerodynamic diameter smaller than 0.1 μm). Similarly, there are no general, ambient standards for hazardous air pollutants (HAPs) also known as air toxics (see Section 2.5). However, it should be noted that the Occupational Safety & Health Administration (OSHA) and the National Institute for Occupational Safety and Health (NIOSH) have concentration standards for workplaces in the form of permissible exposure limits (PELs) and recommended exposure limits (RELs). These standards would apply to airport employees.

2.3 State Implementation Plan

The 1970 CAA required states to develop a legislative plan to implement the NAAQS and ensure the standards are met and maintained. The plan referred to is the State Implementation Plan (SIP), and includes many other provisions related to control of emissions from industry. A SIP is intended to serve two purposes, to demonstrate how a state's air quality management program will implement additional or revised NAAQS, and identify the emission control strategies relied on to meet and/or maintain the NAAQS. An inventory of estimated emissions from airports located within each state, and the emissions projected to occur in the future from those airports, are included in the states' SIP budgets and are considered in the states' plans to reduce further emissions of harmful pollutants and maintain pollutant concentrations at an acceptable level.

2.4 General Conformity

To assess the impact of new projects on a SIP, either General Conformity or Transportation Conformity evaluations need to be performed. Most airport projects require General Conformity evaluations that include the quantification of the expected net emissions from a project (i.e., emissions beyond the status quo or no-build case). These are compared to established *de minimis* levels to determine if they will have a significant impact on the overall state's emissions inventory. Depending on the magnitude of the project emissions levels, an evaluation of its compliance with the SIP may need to be made (i.e., whether the regional emissions budget can absorb the project emissions). In addition, atmospheric dispersion modeling may need to be conducted to better assess the impact of the project emissions.

2.5 Emissions Standards and Permits

To control emissions, the New Source Performance Standards (NSPS) serve as federal emissions standards that apply to new and modified sources on a category basis. The standards are typically specified in terms of emissions per amount of fuel/feedstock or the product (e.g., 0.60 pounds of NO_x per million BTU of coal for steam electric power plants). Similar to the NSPS, the National Emission Standards for Hazardous Air Pollutants (NESHAP) were established to control mass emissions of HAPs (air toxics) through the promotion of technology-based standards for each facility type. These standards apply to equipment used at airports such as power generators, boilers, etc. Section 112 of Title I of the CAA includes provisions for implementing NESHAP and lists each of the close to 200 HAP species, some of which are exemplified below:

- Acetaldehyde,
- Benzene,
- 1,3-Butadiene,
- Formaldehyde,
- Toluene,
- Trichloroethylene, and
- Lead compounds.

The full list can be found at the EPA air toxics website, http://www.epa.gov/ttn/atw/. Emissions and concentrations of each HAP species will vary at airports, with many below the detection limits of ambient monitoring and sampling equipment. It should be noted that lead is both a criteria pollutant and a HAP.

In addition to the NSPS and NESHAPs, there are various rules to limit and control the release of air emissions. The New Source Review (NSR) permitting program was established as part of the 1977 Clean Air Act Amendments, and is intended to protect air quality degradations, especially in pristine areas such as National Parks. Under the NSR, there are three preconstruction permits that control the source construction, emissions limits, and source operations: prevention of significant deterioration (PSD), nonattainment NSR, and minor NSR. These permits are required based on the equipment size and air quality status of the region, and airports must apply for permits accordingly for new equipment.

The CAA Title V permits are named after Title V of the 1990 CAAA, and they generally apply to all major sources including those operated at airports. These operating permits provide permission on a facilitywide basis and cover emissions limits and monitoring requirements, recordkeeping, and reporting. Title V permits are usually issued by state agencies and are legally enforceable documents. Airports must maintain these permits for their equipment and follow the reporting requirements.

2.6 Indoor Air Pollution

Human health concerns typically focus on the quality of outdoor air with the corresponding NAAQS set to protect and promote human health and welfare from ambient air quality impacts. In contrast, the EPA currently does not regulate indoor air quality although guidance from the EPA's Indoor Environments Division (IED) is offered on educating and helping the public reduce exposures to indoor pollutants. Both gaseous and PM pollutants can be generated from various indoor sources including, but not limited to, combustion sources (e.g., using oil, gas, etc.), smoking (e.g., tobacco use), cleaning solutions, building materials, and furniture (e.g., formaldehyde released from pressed-wood products). In addition to these sources, indoor air pollution can escalate if inadequate ventilation exists and not enough outdoor air is allowed to mix with the indoor air, thus diluting indoor air pollutant concentrations.

While not the main focus for airports, indoor air still needs to be considered to allow for a comprehensive understanding of potential public health impacts from air pollution. Indoor air pollution at airports can occur for both airport personnel (e.g., within maintenance facilities, boiler room, offices, etc.) and the public/passengers (e.g., within terminal buildings, aircraft, etc.). In general, indoor air pollution is not a concern at airports as there no significant indoor sources and, typically, buildings are well ventilated.

CHAPTER 3

Airport Air Quality Background

This chapter provides an overview of the issues and components related to understanding airport air quality contributions.

3.1 Airport Source Characteristics

Airport emissions sources include those involving the combustion of fossil fuels and various fugitive sources. Emissions from mobile combustion equipment (e.g., aircraft) are generally considered the main sources at airports, but other sources also can contribute significant emissions as well. Emission characteristics depend on several factors that include, but are not limited to, the type of source (i.e., mobile, stationary, or fugitive), equipment power setting, fuel type, and pollution control technologies implemented.

3.1.1 Source Types and Pollutants

Although other sources of emissions exist at airports, mobile sources are often the largest sources of emissions. Aircraft, as well as their auxiliary power units (APUs), ground access vehicles (GAVs), and ground support equipment (GSE) make up the bulk of emissions from mobile sources, although GSE can be both mobile and stationary. Stationary equipment sources include waste incinerators, boilers for producing heat and hot water, and power plants. When airports propose projects that require construction work (e.g., runway modifications, new terminal buildings, etc.), the emissions from construction equipment and associated activities must be accounted for as part of the project even though the emissions are temporary in nature.

Like combustion-related sources (i.e., emissions from equipment exhaust), fugitive sources also must be considered. These include activities other than combustion such as maintenance activities, fuel storage operations, painting, and other activities that can result in the release of volatilized compounds. The re-entrainment of PM from the operation of mobile equipment (e.g., airport GAVs, construction equipment, etc.) and construction activities also needs to be considered.

Table 3-1 provides a summary of the types of pollutants that potentially can be generated by the different sources at an airport. Although aircraft have been grouped separately, the types of pollutants emitted from combustion sources are similar even though the quantities emitted per pollutant may be different. As such, the main difference is between combustion activities and those involving fugitive emissions. Table 3-1 also provides a subset of pollutants that tend to be of primary interest with regard to health concerns. This is an indication of the pollutants that are receiving the most focus based on health concerns and continuing research. Although the criteria pollutants continue to be a concern (including the secondary formation of ozone), the current focus is largely on HAP and PM (including ultrafine) emissions.

Table 3-1. Airport sources and associated pollutant emissions.

Source Types	Pollutants That Can Potentially Be Emitted	Main Pollutants of Interest for Health Concerns and Research
• Aircraft main engines (jet, turboprop, and piston/GA) • APU	• Criteria: CO, HC/VOC, NO_x, PM_{10}, $PM_{2.5}$, SO_x • Criteria: Pb (only GA aircraft using AvGas) • HAPs: VOCs, aldehydes and ketones, PAHs, dioxins and furans • Ultrafine PM • Other PM species: black carbon, nitrates, sulfates	• Criteria: HC/VOC, NO_x, $PM_{2.5}$ • Criteria: Pb (only GA aircraft using AvGas) • HAPs: VOCs, aldehydes and ketones, PAHs • Ultrafine PM • Other PM species: black carbon, nitrates, sulfates
• GSE (baggage tractor, belt loader, service truck, etc.) • GAV (passenger vehicles, airport-owned vehicles, shuttle buses, etc.) • Construction—combustion (on-road and off-road equipment)	• Criteria: CO, HC/VOC, NO_x, PM_{10}, $PM_{2.5}$, SO_x • HAPs: VOCs, aldehydes and ketones, PAHs, dioxins and furans • Ultrafine PM • Other PM species: black carbon, nitrates, sulfates	• Criteria: CO, HC/VOC, NO_x, $PM_{2.5}$, SO_x • HAPs: VOCs, aldehydes and ketones, PAHs
• Stationary sources—combustion (boiler/heater, incinerator, power generator, etc.) • Training fires	• Criteria: CO, HC/VOC, NO_x, PM_{10}, $PM_{2.5}$, SO_x • HAPs: VOCs, aldehydes and ketones, PAHs, dioxins and furans, metals, acids (metals and acids generally not associated with training fires) • Ultrafine PM • Other PM species: black carbon, nitrates, sulfates	• Criteria: CO, HC/VOC, NO_x, $PM_{2.5}$, SO_x • HAPs: VOCs, aldehydes and ketones, PAHs, dioxins and furans
• Stationary sources—fugitive (maintenance, painting/coating, etc.) • Construction—fugitive (demolition, asphalt paving, wind erosion, dust re-entrainment from roadways, etc.)	• Criteria: PM_{10}, $PM_{2.5}$ • HAPs: VOCs • Other PM species: black carbon, nitrates, sulfates	• Criteria: $PM_{2.5}$ • HAPs: VOCs

3.1.2 Equipment Power Settings

Equipment power settings refer to the mode of operation of equipment such as an aircraft, GAV, or GSE. The settings are important since both the emission factors and types of pollutants emitted can vary significantly from one mode to another. For example, the following modes are typically used to describe the different power settings aircraft engines experience during normal operations at an airport:

- Takeoff,
- Climb out,
- Approach, and
- Idle/taxi.

The standard power settings range from 7 percent at idle/taxi to 100 percent during takeoff. Emission factors for pollutants such as CO and hydrocarbons including HAPs tend to be higher at low power conditions while NO_x emission factors tend to be higher at higher power settings (i.e., using fuel-based emission factors such as gram of pollutant per kg of fuel burned). For GSE, modes are typically not associated with the equipment. Rather, power settings in horsepower are generally used with time and power-based emission factors (e.g., gram of pollutant per horsepower per hour of equipment usage). In addition to mobile equipment, it should be noted that

stationary source equipment such as power plants, incinerators, etc., also have different modes of operation even though emissions from such sources are typically assessed assuming constant, average emission factors.

3.1.3 Fuel Types

Several types of fuels are used at airports. Jet A is used by jet and turboprop engines while AvGas is used by piston-engine aircraft. Diesel has typically been used for GSE but electric equipment, as well as gasoline and alternative fuels, has increasingly been used for ground equipment.

Jet A is denser and has a higher energy content than gasoline, but also results in greater carbon (e.g., CO_2) output on a per energy basis. This does not, however, provide any implications for air pollutant emissions (especially involving CO and hydrocarbons/VOCs) as it depends on many factors including the specific combustion technologies and pollution controls used. But based on fuel content of certain chemicals such as sulfur (which is higher in Jet A as opposed to motor vehicle gasoline, for example), it can be expected that aircraft emissions may have higher SO_x emissions on an energy output basis than do motor vehicles.

Due to the continued use of lead in AvGas, general aviation (GA) airports have come under scrutiny for their lead contributions to local air quality. Historically, human exposures to lead have occurred through the use of lead in paints and automobile fuels (i.e., the use of tetraethyl lead in fuels to reduce engine "knocking"). Although these uses have largely been phased out, lead continues to be actively used in aviation gasoline (AvGas or 100LL). Most GA aircraft with piston engines use AvGas.

Diesel fuel is typically used to power many GSE types while unleaded gasoline has generally been used for GAVs (although some GSE can use gasoline and GAVs can use diesel as well). These fuels have different characteristics that contribute to different pollutant emissions. For example, diesel has been associated with increased PM emissions. Some airports have installed charging stations that support using electric GSE. Airport buses and shuttles as well as GSE and GAVs also may use alternative fuels such as compressed natural gas (CNG).

3.1.4 Pollution Control Technologies

Pollution control technologies (or pollution controls, for short) typically refer to some device or equipment that helps to reduce pollutant emissions. Aircraft engines do not have a separate piece of equipment used to control emissions. Emissions reductions are generally achieved through new combustor designs. In contrast, ground mobile equipment such as GSE and GAVs typically use catalytic material (i.e., as part of a catalytic converter) located in the exhaust system to convert pollutants such as CO and unburned hydrocarbons (including HAPs) to CO_2 and water. Stationary sources (e.g., incinerators, power plants, etc.) also may use catalysts but they typically employ controls such as scrubbers and baghouses to convert or filter out pollutants depending on the size and design of the equipment/systems.

3.2 Source Emissions Contributions

With all of the differences among airports, the mix of emissions contributions from sources at each airport may be different as well. There may be differences in source activities, geography, and infrastructure (e.g., airports with excellent transport infrastructure and/or a large proportion of freight operations may be expected to have a reduced contribution from the landside road network). Nevertheless, it is generally accepted that emissions source contributions may

Table 3-2. On- and off-airport inventory of emissions at Airport XYZ (unit-less example values).

Source Group	CO	VOC	NO_x	SO_x	PM_{10}	$PM_{2.5}$
Aircraft	446	188	837	76	16	13
GSE	551	21	322	10	8	5
APU	37	2	32	5	-	-
Parking facilities	31	5	5	0.01	0.2	0.2
On-airport roadways	141	12	58	0.4	5	4
Off-airport roadways	3542	374	590	6	171	33
On-airport, airport-owned stationary sources	9	0.3	31	0.3	1.4	1.1
On-airport, not airport-owned stationary sources	15	5	7	0.3	5	4
Off-airport stationary sources	230	155	69	6	22	21
Off-road sources	932	122	341	6	21	18
Total	**5934**	**884**	**2292**	**110**	**250**	**99**

be described through the following approximate rank where the first source—aircraft—are generally the highest emitters:

- Aircraft in the landing and take-off (LTO) phase;
- Road vehicles on airport landside roads and on the road network around the airport;
- Ground support equipment (GSE);
- Airport ground access vehicles (GAVs);
- Aircraft auxiliary power units (APUs);
- Airport heating and boiler plants;
- Evaporative losses (e.g., fuel storage, maintenance, etc.); and
- Airport fire training exercises.

It should be noted that this is a general rank and that it is dependent on pollutant type as well and will vary by airport. For example, depending on how much of the roadways may be included in an airport air quality study, road vehicle emissions could be significantly greater than emission levels from aircraft.

The variation in these source contributions may be illustrated by considering the emissions generated by Airport XYZ (a fictitious airport) presented in Table 3-2. In this example, it is clear that there are many different sources that may contribute to local air quality, and that the relative magnitude of these contributions is dependent upon the pollutant of interest. This example illustrates how aircraft are generally the most significant source of emissions, but they can produce fewer emissions than GSE (e.g., CO emissions) and roadway vehicles. In fact, the off-airport roadway emissions can be significantly higher than aircraft emissions depending on roadway coverage. Depending on the layout, equipment types, and operations at each airport, the emissions inventories can be very different than this example inventory. However, in general, aircraft, GSE, and roadway vehicles tend to be the largest sources of emissions at an airport.

3.3 Airport Operations

Airport operations essentially mean the activities (e.g., usage) of a source such as aircraft, GSE, boiler, etc., such that the greater the usage, the greater the magnitude of emissions. But more than that, airport operations refer to the complexities associated with analyzing source operations and the temporal impacts of the associated emissions on air quality. For example, the distribution and transport of pollutants at an airport are determined by the airport layout and the operations schedule. Airports usually have a schedule that reflects a “peak day” and “peak hour”

of operations (e.g., Thursdays between 5:00 p.m. and 6:00 p.m.). Even the choice of runway will influence pollutant transport, as runway use is determined by prevailing winds. Emissions from other mobile sources and GSE also would likely peak (i.e., maximized usage occurs) around the same time.

Airport emission trends follow a familiar pattern with decreased emissions from the individual sources due to improved design and/or efficiency, and increased emissions within source categories due to airport growth. This is the challenge for airport operators (and more broadly the aviation industry): that the growth of the airport and overall emissions will tend to exceed any operational or technological improvements for emissions reduction. An emissions inventory, usually completed on an annual basis, is used to track the amount of emissions from each source category over time including operational improvements. In contrast, air quality assessments must be performed with more detailed information taking into account appropriate temporal conditions (e.g., time of day, concentration averaging periods, etc.) to properly determine pollutant concentrations that can be compared to health benchmarks (e.g., NAAQS). This is in addition to all of the other factors including meteorology and spatial information (i.e., source and receptor locations and geography). All of the factors must be taken into account accurately when assessing air quality trends.

3.4 Geography

Physical geography can play a significant role in both airport operations and local air pollutant dispersion. Ranges of mountains not only require a specific aircraft approach procedure but can define their own weather and channel air sheds to form distinct wind patterns. The emissions from airports in valleys would not tend to disperse as rapidly in comparison to emissions at airports in open terrain that experiences no major geographical hindrance to dispersion.

For example, Los Angeles and LAX sit in a bowl ringed by mountains to the north and east that trap pollutants in an urban basin such that in warm weather, a cool sea breeze is drawn onshore at ground level creating a temperature inversion that prevents pollutants from dispersing and can result in photochemical smog. Similarly, Mexico City's MEX Airport is situated at over 7,000 feet above mean sea level in a basin constrained by mountains with intense solar radiation; these characteristics combine to cause air quality problems involving both primary and secondary pollutants. Even with relatively flat terrain, changes in land use (e.g., urban sprawl) also may appreciably affect the surrounding meteorology through changes in the local surface energy budget (e.g., urban heat island effect) impacting diurnal air temperatures and wind patterns, thereby affecting the dispersion of pollutants.

3.5 Meteorology

Wind direction and the prevailing meteorological conditions are particularly important to the way emitted air pollutants disperse. Below the mixing height (nominally about 3,000 feet above ground level), dispersion occurs based on the turbulent strength of the atmosphere (largely defined by the diurnal heating and cooling cycle) and mean wind characteristics. Overall, the daily and seasonal meteorological components that affect local concentrations of pollutants include wind direction, wind speed, mixing depth, ambient temperature, relative humidity, and solar insolation (i.e., solar energy received on a surface).

Winds are of particular significance in that they determine the direction in which airport emissions will move and the area over which they will disperse. Wind patterns often demonstrate correlations with seasonality—for example, wind may flow predominately northwest in the winter

to predominantly southwest in the summer as is the case at New York's John F. Kennedy International Airport (JFK). Similarly, predominant wind speeds may show seasonal trends. Periods of very low or nil wind may lead to stagnation near the point of emission leading to localized pollution episodes (increased concentrations).

Varying wind patterns arise on a small scale as a result of the interaction of air flows with local topography, and on a larger scale from synoptic wind patterns that may be modified by differential heating effects such as the sea–land breeze cycle (which is strongest in early summer but also can occur later in the year) and complex, typically nocturnal, local drainage flows. It should be noted that sea breezes may be observed even tens of miles inland. Different wind patterns at different locations are therefore to be expected, and this is reflected in the choice of runway orientations at any given airport.

3.6 Mitigation Measures for Airport Source Emissions

Typically, it is the airport operator that leads the preparation and delivery of an airport air quality management plan, comprising a measurement program, air quality assessments, and various mitigation activities. However, many emission sources at an airport, and the two most significant—aircraft and access road traffic (as well as GSE in many cases)—are not within the direct control of the airport operator. Therefore, any airport mitigation plan needs to be developed in collaboration with airport tenants in order to properly account for all potential sources of emissions and reductions.

A range of mitigation options is available at airports to reduce local air quality pollutants. Mitigation options are typically described against each emissions source, as is the case in this section. However, mitigation options also can be considered according to the type of measure that is being implemented (see Table 3-3).

In the United States, the FAA runs the Voluntary Airport Low Emission (VALE) Program. As the program title suggests, it is voluntary, and any airport in a nonattainment area is eligible to take part in the program. It provides airport operators with a legal mechanism to raise funds through their Passenger Facility Charge (PFC), and provides funding for the financing of certain air quality pollutant mitigation initiatives (Airport Improvement Program funds) such as low emission vehicles, refueling and recharging facilities, and gate electrification. The FAA also created the Zero-Emissions Airport Vehicles and Infrastructure Pilot Program in 2012, which provides funds for the purchasing of zero-emissions vehicles at airports and the supporting infrastructure.

In addition to the nonattainment status of an area, airport emissions reduction programs may be triggered from findings of significant impacts of non-criteria pollutants (e.g., HAPs). Like these largely voluntary measures rooted in sustainability-type programs, airports may be incentivized from increasing public pressure associated with the need to better understand airport contributions to local air quality and scrutiny from the public on health concerns.

3.7 Airport Emissions and Dispersion Modeling Capabilities

To assess potential health impacts from airports, pollutant loading into the local and regional atmosphere, and concentrations, need to be quantified. Since measurements can be costly and may not be representative (e.g., for certain locations or time periods), modeling is necessary—for both emissions and atmospheric dispersion. The following sections provide overviews of the current state-of-the-art capabilities in these areas, as well as their limitations.

Table 3-3. Categorization of air pollutant emissions mitigation measures.

Options	Notes
Technology	Technological options can be further categorized as those relating to • Fuel efficiency, • Electric equipment, • Design of engines/combustors, and • Control devices. For aircraft, technology changes are applied to the airframe or aircraft engines. Electric GSE with charging stations have been used commonly at airports to reduce fossil fuel use. The use of ground power and preconditioned air at gates is also a common practice that helps to reduce APU usage. Emissions abatement technologies are applied to road vehicles, such as catalytic convertors and particulate traps to vehicle exhaust systems. Centralized de-icing facilities can help reduce aircraft queuing near gate areas and reduce idling emissions.
Fuels	Alternative fuels can offer a reduction in some pollutants. Examples of alternative fuels for GSE and GAVs include compressed natural gas (CNG) and liquefied natural gas (LNG). Airport operators can consider alternative fuels (e.g., biofuels) for their vehicles. Biofuels used in aircraft also will have implications for air quality at airports.
Operational	Certain operational changes can reduce emissions. These include finding alternatives to travel, minimizing route distances, avoiding or reducing delays (reducing queues), minimizing weight, and using optimal power and speed. Such measures are applicable to aircraft and road vehicles. Examples may include the implementation of single-engine taxiing, towing aircraft using alternative power, and use of high-speed taxiways.
Policy	Policy options can be subdivided as follows: Regulatory—includes regulations that set limits on particular sources of emissions (e.g., International Civil Aviation Organization [ICAO] aircraft certification standards, road vehicle exhaust standards) or ambient pollutant concentrations (e.g., National Ambient Air Quality Standards [NAAQS]). Economic—Utilizing economic incentives and disincentives for promoting a particular course of action that is environmentally beneficial. An example is aircraft emissions charging at some airports. Voluntary—When an airport decides to mitigate the emissions of pollutants in the absence of regulatory requirements or economic incentives to do so.

3.7.1 Emissions Modeling

The first steps in any air quality modeling work are those related to quantifying emissions. Modeling emissions for airport sources is similar to those for other industries since many of the sources are the same (e.g., GAVs are the same sources as those found on highways and boilers/incinerators are similar to those found in industrial applications). For modeling emissions, there are two key categories of data:

- Emission factors and
- Activity information.

Emission factors are generally in the form of mass amount of a pollutant per some unit activity. For example, grams per mile and grams per second are common units for an emission factor. These factors are specific to each pollutant and can encompass many different characteristics of a source including but not limited to the following:

- Type of equipment,
- Emissions control technology,
- Fuel type, and
- Power setting.

Although some emission factors may be static (e.g., available in a data table), others may need to be modeled based on these characteristics. Once an emission factor is available, it can be applied (e.g., multiplied) with activity data to calculate emissions. The activity data represents some measure of use or operation of the source (e.g., hours of usage). Both the emission factors

and activity data can be complicated—for example, they are typically dependent on power settings for many equipment types. Emission factors for aircraft, GSE, and GAVs are dependent on power settings (or modes of operation).

Currently, the state-of-the-art emissions modeling capability for airports is represented by the FAA's Emissions and Dispersion Modeling System (EDMS, see http://www.faa.gov/about/office_org/headquarters_offices/apl/research/models/edms_model/), which is to be replaced by the Aviation Environmental Design Tool (AEDT, see http://www.faa.gov/about/office_org/headquarters_offices/apl/research/models/aedt/). FAA's long-term goal is to have AEDT encompass the full capabilities of EDMS (both emissions and dispersion modeling), and therefore, AEDT can be considered as a newer version of EDMS, as well as other FAA models. In keeping with this long-term view of the models, herein they are simply referred together as "EDMS/AEDT." The sources modeled in EDMS/AEDT are categorized as follows:

- Aircraft,
- Auxiliary power units (APUs),
- Ground support equipment (GSE),
- Ground access vehicles (GAV),
- Stationary sources, and
- Training fires.

The underlying datasets in EDMS/AEDT were obtained from various sources and are generally considered the best publicly available emission factors and activity information on a national level (i.e., for general use at all U.S. airports). However, it is recommended that specific equipment and activity information be obtained for each airport whenever possible to improve the accuracy of emissions inventories. Although EDMS models emission factors for GAVs, AEDT will not do so. When using AEDT to study airports, emission factors for GAVs will need to be modeled separately using the EPA's Motor Vehicle Emissions Simulator (MOVES).

Although EDMS/AEDT is considered state of the art, there are still various areas for improvement, some of which are currently under research (e.g., through ACRP, FAA, etc.). Users need to be mindful that uncertainties exist with the underlying modeling data and methods. To a certain extent, these uncertainties can be decreased by collecting airport-specific activity information (e.g., aircraft operations, GSE hours of usage, etc.). With the conservative nature of the model, a common tactic has been to model worst (or near-worst) cases and compare the resulting emissions inventories to regulatory limits such as the General Conformity *de minimis* levels. As such, if the worst case produces lower results than regulatory limits, then a more accurately modeled scenario would also be below the limits. This tactic can serve as both a screening approach as well as (in some cases) a means of allaying concerns over worst-case scenarios.

3.7.2 Dispersion Modeling

As the name implies, dispersion modeling refers to the process of predicting the dispersion of pollutants in the atmosphere once they have been released from a source. There are different scales of assessments—for airports, local-scale (e.g., within a local community) and larger, regional scales may apply. The larger the scale (and, generally, the more time involved for dispersion), the greater the dispersion generally resulting in lower concentrations experienced by the public for directly released pollutants. However, in each scale, secondarily formed pollutants (e.g., through atmospheric chemistry) also can impact local populations. Ozone and PM species are examples of such secondary pollutants.

Much of the local-scale modeling is conducted through the use of Gaussian models. The EPA's AERMOD modeling system (see http://www.epa.gov/ttn/scram/dispersion_prefrec.htm) is based

on a Gaussian methodology and is the regulatory workhorse model used for most local air quality assessments. AERMOD represents the state of the art in the current scientific understanding of the dispersive nature of the atmosphere. In contrast, regional-scale modeling requires the use of grid-based models such as the EPA's Community Multiscale Air Quality (CMAQ) modeling system. Grid models are necessary since they can appropriately model atmospheric chemistry and the influence of background concentrations, whereas Gaussian models are limited in that regard. Some chemistry such as that involving NO_2 can be modeled through simplified methods in Gaussian models, but ozone and secondary particulate matter formation require grid models.

Although this airport dispersion modeling capability exists, relatively little dispersion modeling work has been conducted in comparison to emissions inventory development. Most regulatory studies (e.g., NEPA-related studies) have only required the development of emissions inventories. However, dispersion modeling is necessary to better understand potential health impacts since emissions inventories do not provide a direct correlation with pollutant concentrations experienced by the public.

Because of the additional factors affecting dispersion, predicted concentrations can have significantly greater uncertainties than emissions inventories. Concentrations are highly dependent on meteorology and the spatial relationship between sources (e.g., aircraft) and receptors (i.e., population). Any uncertainties in these factors—as well as various others such as the surrounding geography, seasonality, source activities, etc.—can drastically affect modeled concentrations. Also, it should be noted that dispersion modeling is only as accurate as the modeled emissions will allow. That is, any uncertainties in the emissions will carry through to the concentrations.

Airport air quality studies including those demonstrated in *ACRP Report 71: Guidance for Quantifying the Contribution of Airport Emissions to Local Air Quality* (Kim et al. 2012) illustrate the challenges of accurately predicting pollutant concentrations arising from airport emissions. As such, model users need to understand the potential limitations and uncertainties of these dispersion modeling processes. Considering all of the potential sources of uncertainty, the EPA has indicated that air quality models with predictions within a factor of two (compared to actual values) may be considered acceptable—and that it is difficult to be more accurate.

It also should be noted that although alternative models exist, AERMOD is a static model generally used to predict concentrations by hour (i.e., average concentration for each hour). So although AERMOD can provide hour-by-hour concentrations, it is considered a static model due to its Gaussian plume methodology. As the need for health impact assessments increase, finer time-varying models such as those employing Gaussian puffs rather than plumes may be necessary. Such time-varying models may allow better correlations of source activities with population exposures, although the importance of this modeling refinement would depend on pollutant and health outcomes (i.e., whether short-term or long-term exposure is under consideration).

3.8 Air Quality Measurement Capabilities

From the literature review conducted for this reporting, even though dispersion modeling has been conducted less than emissions inventory development, dispersion modeling has been used more to characterize air quality contributions from airports than measurements (monitoring). This is in large part due to the costs and resources required to conduct measurements often resulting in limitations on the number of measurement sites and samples that can be supported. Although measurements have further drawbacks of not being source-specific (difficult to assess contributions from specific sources) and have uncertainties in the monitoring equipment/methods and influences from various other factors (e.g., meteorology)

that may cause difficulties in obtaining good samples, measurements are generally considered to provide the best information because they represent real-world values.

Uncertainties in measurements can vary depending on the types of equipment employed. For example, readings from continuous gas analyzers tend to be more accurate than air samples (gaseous or particulate matter) collected and analyzed over an averaging period (e.g., 1 hour, 24 hours, etc.). Although uncertainties exist, if proper measurement protocols are followed, measured concentrations will tend to be more accurate than modeled results, which can involve greater degrees of errors. An indication of the level of errors that can be expected through dispersion modeling can be found in 40 CFR Part 51, Appendix W, which indicates that modeling is considered "reasonably reliable" if the results are within a factor of two of actual values. Appendix W also states, "Measurements are particularly useful in assessing the accuracy of model estimates. The use of air quality measurements alone however could be preferable . . . when models are found to be unacceptable and monitoring data with sufficient spatial and temporal coverage are available." However, as previously indicated, the costs and resource requirements associated with measurements frequently make modeling more attractive.

A compromise that includes both measurements and modeling is possible. For example, limited monitoring can be used to help establish background concentrations and measured data can be used to help validate modeled values. Also, measured meteorological data could be used to support more accurate modeling. Modeling can be used to provide greater spatial coverage and cover greater time periods to establish temporal trends.

Generally, methods and equipment are related either to regulatory needs or research at airports. In terms of regulatory needs, the criteria pollutants as defined in the NAAQS dominate at U.S. airports. The promulgation of reference and equivalent measurement methods for specific pollutants also results in the type of equipment used. Table 3-4 provides a high-level overview of the most common types of measurement equipment by pollutant.

3.9 Aircraft LTO Versus Cruise Emissions Impacts

For completeness, a brief overview of cruise emissions versus LTO emissions is provided in this section. The long used ICAO LTO cycle at airports includes takeoff, climb out, approach, and idle/taxi modes. These modes are defined as occurring below 3,000 feet altitude above ground level, which is nominally considered an average mixing height where an inversion layer occurs that tends to prevent the lower air (including pollutants) from mixing into the upper layers. Therefore, only the emissions occurring below this mixing height are included in an airport air quality study.

Although aircraft generally continue climbing well above 3,000 feet, their flight segments above this height are defined as part of the overall cruise mode. Cruise emissions are typically excluded in airport air quality studies because they occur above the mixing height and are considered to have negligible effects on local air quality. In addition, there is no defined, standard power setting for cruise but there are power settings for the LTO modes; and there are no defined emission factors for cruise. However, cruise emissions have the potential for secondary effects on larger scales (e.g., regional, national, and global). These effects may include acid deposition, ozone formation, secondary PM, etc., and may have detrimental effects to human populations at significant distances from the airport.

Table 3-4. Air pollutant measurement equipment by pollutant.

Pollutant	Sampling Description	Equipment
CO	Continuous sampling	Reference or equivalent method (i.e., non-dispersive infrared)
CO	Short-term or hot-spot sampling	Air sampling units with the reference or equivalent method used to test captured air
NO_x	Continuous sampling	Reference or equivalent method (i.e., chemiluminescence)
NO_x	Short-term or hot-spot sampling	Air sampling units with the reference or equivalent method used to test captured air (note: reactivity of gases must be considered)
SO_x	Continuous sampling	Reference or equivalent method (i.e., spectrophotochemical); note: not generally recommended at airports
O_3	Continuous sampling	Reference or equivalent method (i.e., ultraviolet absorption)
Pb	Continuous sampling	Reference or equivalent method (i.e., filter in high-volume sampler)
Pb	Short-term or hot-spot sampling	Air sampling filter units
PM_{10} and/or $PM_{2.5}$	Continuous sampling	Reference or equivalent method (i.e., filter with impaction specific for PM_{10} and/or $PM_{2.5}$)
PM_{10} and/or $PM_{2.5}$	Short-term or hot-spot sampling	Air sampling filter units specific for PM_{10} and/or $PM_{2.5}$
Ultrafine PM	Continuous sampling	Scanning Mobility Particle Sizer (SMPS), Aerosol Time-of-Flight Mass Spectrometer (AFOTMS), or Micro-Orifice Uniform Deposit Impactor (MOUDI)
Black Carbon	Continuous sampling	Aethalometer
Black Carbon	Short-term or hot-spot sampling	Air sampling filter units specific for black carbon (i.e., quartz fiber filters) with elemental carbon (EC)/organic carbon (OC) analysis
PM Nitrates and Sulfates	Short-term or hot-spot sampling	Air sampling filter units specific for black carbon (i.e., quartz fiber filters) and ion chromatography
CO_2	Continuous sampling	Non-dispersive infrared
CO_2	Short-term or hot-spot sampling	Air sampling units with the reference or equivalent method used to test captured air
VOCs/HAPs	Continuous sampling	Flame ionization detector (note: not generally recommended)
VOCs/HAPs	Short-term or hot-spot sampling	Evacuated canisters or sample cartridges; formaldehyde may be used with proportionality factors to determine other HAP concentrations
PAHs	Continuous sampling	Photo-electric Aerosol Sensor (PAS) for particle-bound PAHs
PAHs	Short-term or hot-spot sampling	Air sampling filter and adsorbent unit specific for PAHs and high-speed liquid chromatography (HPLC)
Meteorology	Continuous sampling	u,v,w sonic anemometers and aspirated thermometers at two heights with appropriate data logger system; relative humidity and barometric pressure also can be measured
Meteorology	Short-term or hot-spot sampling	u,v,w sonic anemometers with appropriate data logger

CHAPTER 4

Air Quality Health Impacts and Risks

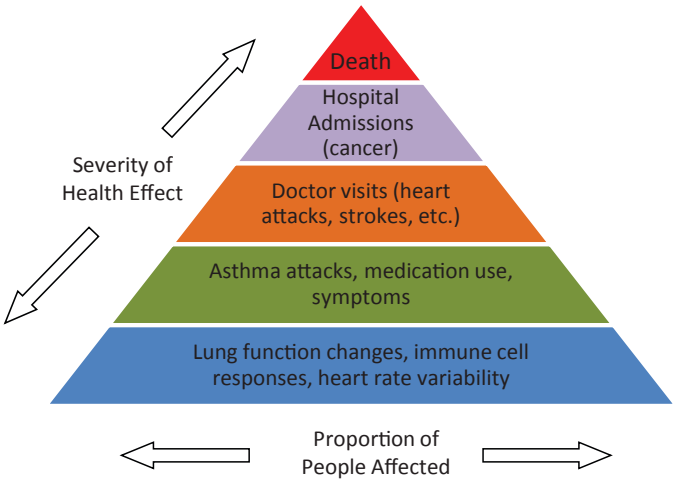
This chapter serves as a primer on understanding potential air pollutant health impacts and health risks.

4.1 Pollutant Health Impacts Overview

Each of the pollutants targeted in this report can be categorized as either a criteria pollutant or a hazardous air pollutant (HAP). HAPs are also referred to as air toxics or as both criteria pollutants and HAPs (e.g., Lead, Pb, is regulated as a criteria pollutant but Pb-based compounds are on the EPA's HAPs list). Each of these pollutants has health effects that range from mild to severe chronic and acute health effects, as well as premature death. Figure 4-1 provides an overview of the population proportions associated with the severity of health effects—in general, the more severe the effect, the smaller the proportion of the population affected. The figure describes different degrees of health effects, and it should be understood that different pollutants will have different health impacts and levels of severity. The following sections describe the potential health effects of each pollutant.

There are six (6) criteria pollutants. A discussion of concerns over their public health impacts follow:

- **Carbon monoxide (CO)** is a colorless and odorless gas that can cause various physiological damages by displacing oxygen in the bloodstream. At high concentrations, CO has known health effects including dizziness, unconsciousness, and death. At lower concentrations more typical of ambient settings in the United States, individuals with cardiovascular disease are at risk of myocardial infarctions (heart attacks) or other exacerbations.
- **Lead (Pb)** is a soft, malleable metal in the "heavy metal" category. Pb is a concern for its ability to cause a range of neurological damage from all exposure pathways (inhalation, ingestion, and dermal contact).
- **Nitrogen dioxide (NO_2)** is one of the nitrogen oxides (NO_x) that is part a family of gases, mainly represented by NO and NO_2, that can contribute to respiratory disease exacerbations. In addition to its direct health impacts, NO_x is well known as a precursor to ozone (O_3) formation. Furthermore, NO_x also contributes to the formation of nitrate aerosols that can have respiratory and cardiovascular health effects.
- **Ozone (O_3)** is a pollutant that generally is not directly emitted from most sources. Within the troposphere, it is formed through a complex interaction (chemical reaction) mainly involving NO_x, and volatile organic compounds (VOCs) in the presence of sunlight. O_3 can contribute to respiratory health effects through inflammation of airways and decrements in lung function, with evidence of increased respiratory symptoms among sensitive individuals such as asthmatics and those with chronic obstructive pulmonary disease, as well as evidence of increased



Source: Adapted from Environmental Health & Engineering, Inc. (EH&E) (2011). "Emissions of Hazardous Air Pollutants from Coal-Fired Power Plants." EH&E Report 17505. Prepared for the American Lung Association, Washington, D.C., March 7.

Figure 4-1. Severity of health effects versus proportion of people affected.

hospitalizations and premature deaths. Because of the formation of O_3 from directly emitted pollutants (from many different sources) within a relatively large area, O_3 is characterized as a regional issue even though it is a local air quality concern.

- **Particulate matter (PM)** is tiny solid, liquid, or mixed solid and liquid particles suspended in the air. These are of concern since ambient concentrations of PM have been shown to be correlated with serious respiratory and cardiovascular illnesses and premature mortality. PM sizes (aerodynamic diameters) range from greater than 100 µm to the ultrafine range of below 0.1 µm. The smaller the size, the deeper they are able to penetrate into the respiratory system, possibly even resulting in blockages of the gas–blood interfaces within the lungs. Figure 4-2 provides an overview of the portions of the respiratory system affected by the different PM size ranges. While the discrete PM size ranges shown generally correspond to different degrees of respiratory penetration, it should be understood that different size ranges can be deposited

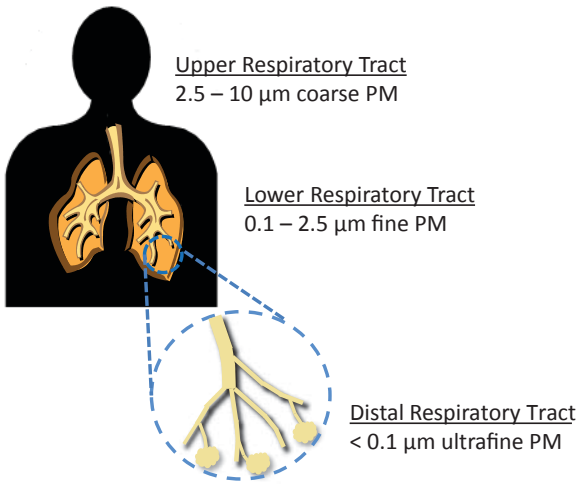


Figure 4-2. PM penetration into the human respiratory system.

throughout the respiratory system. PM with a size range of 10 μm or less are referred to as PM_{10} and those with a size range of 2.5 μm or less are referred to as $PM_{2.5}$. NAAQS concentrations are currently only specified for these two size ranges. In addition to these regulated size ranges, PM in the ultrafine range (less than 0.1 μm in diameter) is thought to contribute to health effects. Ultrafine particles are of particular concern at airports because of relatively higher concentrations (higher than background) found near aircraft operations. Other PM types and components include nitrates, sulfates, and black carbon (BC). Also known as elemental carbon (EC), BC is composed of pure carbon clusters and is differentiated from organic carbon (OC), which is composed of organic compounds. BC is a significant contributor to the health effects caused by $PM_{2.5}$ and ultrafines. Nitrates and sulfates can penetrate deep in the respiratory system and can also react with other chemicals to form harmful compounds (e.g., acids).

- **Sulfur dioxide (SO_2)** is a sulfur oxide (SO_x). So_x refers to a family of gases mainly represented by SO_2 that can act as irritants to the respiratory system and can contribute to asthma attacks and other health outcomes. As with NO_x, concerns about SO_x often relate to its ability to form sulfate aerosols in the atmosphere, with the corresponding health effects seen for fine particulate matter.

HAPs are generally defined as those pollutants that are known or suspected of being able to cause serious health effects such as cancer, birth defects, etc. The EPA maintains a list of close to 200 HAPs comprised of VOCs, aldehydes, polycyclic aromatic hydrocarbons (PAHs), dioxins, furans, metals, acids, etc. A discussion of the formation and concerns over these pollutants follows:

- **Volatile organic compounds (VOCs)** are comprised of a large group of carbon-based compounds with relatively high vapor pressures. The EPA further defines these as chemicals that participate in atmospheric photochemical reactions. They are emitted through evaporation from certain operations (e.g., painting, dry cleaning, etc.) and through incomplete combustion of fossil fuels. Indoor concentrations of VOCs are usually higher than outdoor concentrations—up to 10 times higher. Health effects depend on the specific species as well as exposure duration, but some short-term effects may include headaches, nausea, sore throat/eyes/nose, etc. Long-term effects may include cancer. Examples of VOCs include benzene, toluene, xylene, 1,3-butadiene, etc.
- **Aldehydes and ketones** are subsets of VOCs. Sometimes they are treated separately, which is in part due to the different methods required to measure these compounds. Both groups of compounds are made up of a double-bonded carbon-oxygen core (C=O). An aldehyde has at least one hydrogen bonded to the carbon atom while a ketone has two hydrocarbon groups attached to the carbon atom. Aldehydes are used in production of commercial applications including the production of alcohols, resins, detergents, perfumes, etc. Ketones have industrial uses as solvents, polymer precursors, and pharmaceuticals, etc. As VOCs, both groups have relatively high vapor pressures, and their health effects are similar: irritation of the eyes and air passages under short-term exposure and lower concentrations. Long-term exposures and/or high concentrations can cause depressions of the central nervous system and cancer. Examples of aldehydes are formaldehyde, acrolein, and acetaldehyde. Examples of ketones are acetone and acetophenone. Methyl ethyl ketone (MEK) is also a ketone but not a HAP—EPA removed this from their official list.
- **Polycyclic aromatic hydrocarbons (PAHs)** are comprised of a group of compounds that generally have more than two benzene rings (a ring of six carbon atoms). They tend to stick to solid particles (e.g., soot) and are formed from incomplete combustion processes such as those from coal burning, automobile gasoline combustion, forest fires, coke and coal tar processing, etc. Animal testing has indicated that it is reasonable to expect PAHs to cause birth defects and cancer. Examples of PAHs include anthracene, benzo-a-pyrene, naphthalene, chrysene, etc. Of these, only naphthalene is currently listed on the EPA HAPs list.

- **Dioxins and furans** are comprised of a family of toxic substances that are similar in chemical structure and more formally referred to as polychlorinated dibenzo-para-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs). In addition to exposures through ingestion of food containing these compounds, exposures through inhalation of emissions from incineration (e.g., of municipal solid waste), copper smelters, cement kilns, coal-fired power plants, etc., are common. Potential health effects include birth defects, suppressed immune system, changes in hormone levels, and cancer. On the EPA HAPs list, these pollutants are listed as 2,3,7,8-Tetracholordibenzo-p-dioxin and dibenzofurans.
- **Metals** make up a small but important portion of the EPA HAPs list. Either in elemental form or as part of a compound, they can typically be emitted as PM from combustion sources including power plants, industrial operations, ore refining, etc. Three of the common metals are mercury (Hg), lead (Pb), and chromium (Cr). Exposure to air emissions of Hg can result in various disorders including tremors, emotional changes, neuromuscular changes, changes in nervous response, reductions in cognitive function, etc. As previously indicated, exposures to Pb can result in neurological damage. Air exposure to Cr (III), the most common form of chromium in the air, can result in damage to the respiratory system. Exposure to Cr (VI) can result in more serious respiratory damage, as well as lung cancer.
- **Acids** make up a small subset of the EPA HAPs list, and hydrochloric acid (HCl) and hydrogen fluoride (HF) are two of the more well-known HAPs. In addition to being used in various industrial activities such as refining ore, metals processing, glass etching, aluminum production, etc., they also can be generated through combustion of coal and other fuels containing chlorine (Cl) and fluorine (F). Acute health effects of these acids are similar in that they are corrosive and can cause serious damage to the respiratory system. Chronic effects for HCl include gastritis, bronchitis, and dermatitis as well as hyperplasia of the nasal mucosa, larynx, and trachea. HF chronic effects include increased bone density and damage to the liver, kidneys, and lungs.

To ensure no misunderstandings regarding these health effects, it should be noted that while the descriptions provide a comprehensive view of the current understanding of health impacts by pollutant type (or category), they do not directly indicate the risks associated with airport air quality impacts. Other details such as emissions and exposure need to be taken into account and are discussed in the next section.

4.2 Health Risk Factors

As defined by the EPA (see http://www.epa.gov/risk_assessment/basicinformation.htm), health risk is "the chance of harmful effects to human health or to ecological systems resulting from exposure to an environmental stressor" where stressors are described as "any physical, chemical, or biological entity that can induce an adverse response." Characterizations of risk are accomplished by conducting both exposure pathway assessments (how the pollutant interacts with the population) and dose-response assessments (how much of the pollutant is required to cause harm). These are general definitions used to describe risk for environmental impacts.

For air quality, health risk can be described as being influenced by three components: emissions, exposure, and toxicity. As indicated in Figure 4-3, each of these components encompasses details regarding the source, pollutants, and the exposed public. The emissions of each pollutant depend on source characteristics. Source characteristics include emission factors (or rates) that are dependent on type of source, equipment age, emissions control, etc. Toxicity is the degree to which a pollutant can harm a human being. Toxicity is characterized differently for criteria air pollutants versus HAPs. For criteria air pollutants, concentration–response relationships are generally constructed from epidemiological literature. These epidemiological studies typically contain concentrations representative of the current range of concentrations in the United States, and the concentration–response functions are applied as continuous functions to quantify

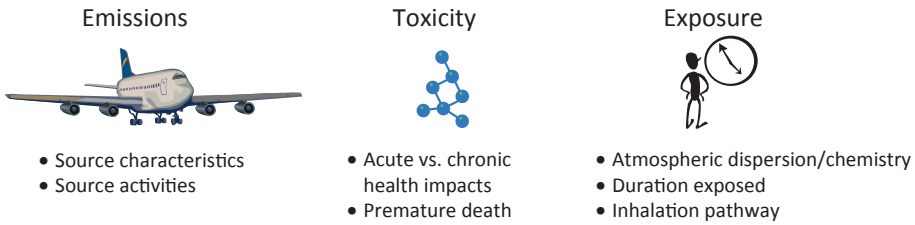


Figure 4-3. Air quality health risk components.

incremental health effects of concentration changes. For HAPs, conventional risk assessment differentiates between carcinogenic effects and non-cancer effects, with the presumption that most carcinogens demonstrate low-dose linearity and that most non-cancer health effects display a putative population threshold. There are an increasing number of counterexamples that contradict this model, but most health risk assessments to date maintain this structure. Within the structure, for non-cancer health effects, inhalation reference concentrations (RfCs) are used. For carcinogenic effects, unit risk factors are used. The EPA defines these terms as follows:

- RfC: An estimate (with uncertainty spanning perhaps an order of magnitude) of a continuous inhalation exposure of a chemical to the human population through inhalation (including sensitive subpopulations), that is likely to be without risk of deleterious noncancer effects during a lifetime. (See http://www.epa.gov/ttn/atw/hlthef/hapglossaryrev.html.)
- Unit Risk: A unit risk is an upper-bound excess lifetime cancer risk estimated to result from continuous exposure to an agent at a concentration of 1 μg/L in water or 1 μg/m^3 in air. (See http://www.epa.gov/iris/help_ques.htm.)

Exposure encompasses both the pathway leading to the interaction between pollutants and the exposed population (i.e., concentrations experienced by the population) as well as the duration of the interaction. This is partly dependent on how pollutants disperse in the atmosphere and undergo chemical conversions to form other pollutants. It also is dependent on the size and activities of the local population and their locations.

In general, the health impacts from specific sources can be evaluated from either an individual perspective or a population perspective, and this holds for airport emissions as well. In the former case, the influential factors will be those that cause an individual to have greater risk from airport emissions than other individuals. In the latter case, the influential factors will be those that cause the public health burden from airport emissions to be greater. The factors will overlap but will not be identical.

From an individual perspective, proximity to the airport is clearly the dominant factor, although not necessarily in a simple distance-dependent fashion. Multiple studies indicate that being immediately downwind of a primary departure runway significantly increases exposures to multiple combustion pollutants, including ultrafine particulate matter, NO_x, and black carbon. However, some studies indicate the potential for exposure over a fairly broad geographic area, especially related to arrivals—appreciable impacts can be observed more than 1 km from the airport, in a manner that is not strictly distance-dependent. The common influence of wind direction on aircraft movement patterns and plume dynamics creates challenges in interpreting monitoring data, but location relative to prevailing winds is clearly an important factor for individual risk. When spatiotemporal patterns differ across pollutants, which locations are most important from an individual health perspective are more difficult to ascertain, but evidence shows similar patterns across most pollutants with major public health implications. The one major exception is ozone, which has a large public health burden but is generally reduced in close proximity to airports given the significant local contribution of NO_x emissions.

From a population perspective, proximity and prevailing winds clearly influence the population health burden from airport emissions as well, but population density and spatial patterns of at-risk populations also must be considered. For example, pollutants such as fine particulate matter (with significant contributions from secondary formation) may have public health impacts that can span hundreds (or thousands) of kilometers. Thus, even if individual health impacts may be greatest at relatively close proximity to an airport, the public health impacts will be spread over a very large geographic area where the characteristics of the exposed population needs to be taken into account. That is, health impacts will be influenced not only by exposures, but also health status and other factors that make individuals or subpopulations more susceptible to the effects of air pollution. Elderly individuals and young children, as well as those with pre-existing respiratory or cardiovascular disease, are generally considered to be at greatest risk. That main point is that population-based health assessments that take into account the exposed area and population characteristics may show differing results from an individual perspective where distance is the major factor.

Two general approaches can be used to estimate the public health burden associated with either an individual source (such as an airport) or a source category (such as LTO emissions). Epidemiological investigations involve developing new associations between exposures and health outcomes for a defined population, which can be interpreted as causal given supporting evidence from other epidemiological and toxicological studies. There have been numerous epidemiological studies evaluating ambient air pollution and its effects on respiratory and cardiovascular health, and the methods for conducting these studies are well established in the literature. However, epidemiological studies rarely associate air pollution specific to aviation with health outcomes. This is both because the contribution from aviation to ambient air pollution is generally small and because the pollutants associated with aviation are similar to those from traffic and other local combustion sources. There have been a limited number of occupational epidemiological studies of airport workers, which can better capture exposures specific to the airport environment but may not generalize to the public given differences in exposure levels and health status.

Because direct epidemiological studies of air pollution specific to airports are generally impractical, it is far more common to use health risk assessment methods to quantify the health impacts of airport emissions. These methods typically involve bottom-up analyses linking airport emissions inventories with atmospheric fate-and-transport models, yielding estimates of the marginal contribution of airport emissions to ambient air quality across a region. These contributions are then linked with concentration–response functions for mortality and morbidity, derived from the general air pollution epidemiological literature. In other words, air pollution epidemiology provides the association between specific pollutants and health outcomes, and this evidence is assumed to be applicable to airport-related air pollution. For pollutants that do not differ by source, this approach has fewer uncertainties, beyond exposure assessment uncertainties and general concerns about whether the epidemiological evidence can be interpreted as causal. For fine particulate matter, where the composition from aviation may differ from the ambient composition in a manner that influences health effects, there are additional uncertainties. However, the application of ambient air pollution epidemiology to determine contributions from specific source categories is a well-established approach in the health risk assessment literature, and constituent-specific epidemiology could be used when available and based on statistical models appropriate for health risk assessment.

CHAPTER 5

Current Understanding of Airport Air Quality Health Impacts

This chapter provides the current state of research related to potential health impacts from airport pollutant emissions. It has been organized to respond to the following basic, key questions:

- What pollutants are of most concern at an airport?
- What are the airport contributions to local air quality and health impacts?

The answers to these questions were obtained through a preponderance of the existing research studies conducted in this area. The latter question is a combination of airport contributions to ambient pollutant concentration levels as well as potential health impacts (risks). Because these issues typically accompany each other, they were integrated into one overall question. With on-going research in all of these areas, it should be noted that the answers are representative of a snapshot in time, and they may change with future research. Although there are some overlaps in the answers, they are kept to a minimum but are necessary to properly answer each question.

To promote the understanding of airport health impacts, this section tackles two basic questions dealing with the pollutants of most concern (highest risk) and the airport contributions to local air quality and potential health impacts.

The purpose of answering these questions is to better understand the current health implications of air pollutants generated by airports as a whole. The overall results and conclusions are not intended for scrutinizing individual airports because each airport presents unique characteristics.

5.1 What Pollutants Are of Most Concern at an Airport?

5.1.1 Evaluations

At first glance, the answer to the question of which pollutants are of most concern may simply be based on what pollutants are emitted by the airport and their toxicities. But in order to answer this question, one must consider the risks associated with each pollutant. As previously explained, risk involves taking into account emissions and exposure in addition to toxicity. Just considering toxicity may cause undue attention to be paid to a pollutant that may be emitted in small quantities at an airport such that it may pose minimal risks to the public. In contrast, just focusing on pollutants with high emission rates overall (for the whole airport) may cause undue attention to pollutants with relatively low toxicity that may have little or no impact on the public. In addition, the exposure pathway needs to be considered. If an airport is located in a region

where the geography and meteorological patterns are such that most of the emitted pollutants tend to move away from populated areas, the risks associated with that airport may be less than with an airport with lower levels of emissions but with dispersion and atmospheric chemistry conditions that are conducive to exposing larger portions of the public.

As a result, it can be very difficult to determine risks in a general sense across all airports (or even a group of airports) since each has distinctly different characteristics (e.g., mixes of sources, airport layout, operations, etc.). Therefore, each airport needs to be assessed separately for each pollutant, and all of the aforementioned factors need to be taken into account.

That said, researchers still attempt to define risks in a general sense to provide helpful information that may be used as a screening-type starting point to help the aviation community make better decisions regarding airport planning efforts and emissions mitigation measures. That is, the research results could help identify which pollutants to target for such efforts so airports could make efficient use of resources, and also serve as a basis for future research work.

In developing *ACRP Report 7—Aircraft and Airport-Related Hazardous Air Pollutants: Research Needs and Analysis* (Wood et al. 2008), researchers focused on prioritizing HAP compounds. The prioritization was conducted based on combining emissions rates and toxicity, but without consideration of possible variability in the emissions-to-exposure relationship. Although both exposure pathway and the characteristics of the exposed groups were described as a necessary component in risk assessments, they were not included because they were outside the scope of the project. As such, the resulting prioritized list and research was intended to serve as an initial assessment to help identify information gaps.

The study involved reviewing emissions inventories from several major airports (e.g., BOS, PHL, ORD) for emissions contributions from each of the airport sources (aircraft, GSE, GAV, etc.), and the development of risk-based concentrations (RBCs) to serve as measures of toxicity for each pollutant. The resulting prioritized list is provided in Table 5-1.

Table 5-1 compares the prioritized list of pollutants developed from *ACRP Report 7* to those from an FAA 2003 analysis (URS 2003) and the ORD 2005 airport modernization environmental impact statement (EIS) (FAA 2005). The FAA-developed list was based just on emission rates while the ORD study used both emission rates and toxicity. The different results between the ACRP and ORD studies are largely attributed to different toxicity weighting schemes. These lists show similarities such as formaldehyde being included within the top three in all lists, but significant differences such as the fifth-place location of acrolein on the FAA list while it is first on the other two lists.

A study conducted under the FAA's Partnership for AiR Transportation Noise & Emissions Reduction (PARTNER) Program also involved the development of a prioritized list of pollutants

Table 5-1. Prioritized list of pollutants from *ACRP Report 7*.

This ACRP Review	FAA 2003	ORD 2005
Acrolein	Formaldehyde	Acrolein
Formaldehyde	Acetaldehyde	1,3-Butadiene
1,3-Butadiene	Benzene	Formaldehyde
Naphthalene	Toluene	Benzene
Benzene	Acrolein	Acetaldehyde
Acetaldehyde	1,3-Butadiene	Naphthalene
Ethylbenzene	Xylene	Toluene
	Lead	
	Naphthalene	
	Propanal (Propionaldehyde)	

Source: Wood et al. 2008

emitted from airport sources (Levy 2008). The study included assessments of emissions of criteria pollutants and HAPs but focused on fine particles ($PM_{2.5}$), ozone, and a selected group of HAPs (formaldehyde, acetaldehyde, benzene, toluene, acrolein, etc.). This reduced pollutant focus was based on a screening analysis that determined that the excluded compounds pose significantly less risk. Also, for pollutants such as NO_2, the literature was considered inadequate to develop the required concentration-response functions for the required risk assessments, and preliminary evidence indicated a greater criteria pollutant health impact from $PM_{2.5}$ and ozone (EPA 2004 and 2005).

The study included emissions from three airports: Chicago O'Hare International Airport (ORD), Hartsfield-Atlanta International Airport (ATL), and T.F. Green Airport (PVD). These airports were selected based on size, likely magnitude of impact, and location. Emissions inventories for each airport were prepared with the FAA's EDMS/AEDT, and dispersion modeling was performed using AERMOD and CMAQ, the latter of which was used with different grid cell sizes.

For the main comparison work, an intake fraction was defined as a "unitless measure characterizing the total population exposure to a compound per unit emissions of that compound or its precursor." This metric was used to represent population-based exposures, which correspond directly with health risks for pollutants with linear concentration-response functions, and it allowed for rapid comparisons among pollutants and airports. The intake fraction also allowed for rapid estimation of health risks, as it was beyond the scope of this screening-level analysis to conduct more detailed health risk modeling.

Tables 5-2 and 5-3 provide comparisons of the risks by pollutant for each airport studied. The risk values (deaths/year) indicate that fine particles ($PM_{2.5}$) clearly dominate the overall risk and their impacts are magnitudes higher than the other pollutants. For example, the risks for ORD are as follows:

- Total fine particles: 15 deaths/year,
- Total HAPs (air toxics): 0.09 deaths/year, and
- Highest ranking HAP (Formaldehyde): 0.043 deaths/year.

These results are consistent with general EPA risk statistics that also show significantly higher risks posed by fine particles (see http://www.epa.gov/ttn/atw/nata1999/tables.html). Furthermore, the study was simplified (for comparison purposes) such that the HAPs risks are actually cancer risks with only a fraction of that corresponding to death. As such, the relative contribution of fine particles would be even higher in comparison. Non-cancer effects such as those from acrolein and various other pollutants were not considered as part of the prioritizations, because the data available were not amenable to quantification, although the researchers noted that ambient acrolein in the grid cells surrounding the three airports exceeded its RfC, implying potential health effects. This would imply that other HAPs with respiratory effects also could contribute health effects following the non-cancer risk assessment approach used by EPA and others; this would potentially include acetaldehyde, formaldehyde, naphthalene, styrene, and toluene. The negative values for ozone risk in Table 5-3 are indicative of the nuances of ozone chemistry where increasing NO_x emissions can reduce ozone concentrations over an area.

As part of the study, the prioritized list of HAPs by risk was compared to rankings based on just emissions and emissions with toxicity (potency). As indicated in Table 5-4, formaldehyde is at the top of each list, but there are significant differences. For example, without taking into account toxicity or exposure, the emissions-based list shows acetaldehyde as second while the others have the pollutant in sixth place. This comparison helps to exemplify the need to include all aspects of risk so that the relative impacts of such pollutants are properly understood.

Table 5-2. Population risk (deaths/year) for three airports using AERMOD (50-km radius).

	ORD		ATL		PVD	
Pollutant		% of air toxics risk		% of air toxics risk		% of air toxics risk
Formaldehyde	4.3E-02	48%	3.4E-02	48%	2.7E-03	48%
Acetaldehyde	3.7E-03	4%	2.9E-03	4%	2.3E-04	4%
Benzene	6.4E-03	7%	4.9E-03	7%	4.0E-04	7%
1,3-butadiene	1.9E-02	22%	1.5E-02	21%	1.2E-03	22%
Naphthalene	6.9E-03	8%	5.4E-03	8%	4.4E-04	8%
Styrene	9.7E-03	11%	7.5E-03	11%	6.1E-04	11%
Phenanthrene	1.7E-06	0%	1.3E-06	0%	9.4E-08	0%
Fluoranthene	4.8E-05	0%	3.9E-05	0%	2.1E-06	0%
Pyrene	1.3E-06	0%	1.0E-06	0%	6.0E-08	0%
Anthracene	2.5E-07	0%	2.3E-07	0%	1.3E-08	0%
Benzo[b]fluoranthene	1.1E-04	0%	9.1E-05	0%	4.9E-06	0%
Benzo[k]fluoranthene	1.1E-04	0%	9.1E-05	0%	4.9E-06	0%
Benz[a]anthracene	1.6E-05	0%	1.6E-05	0%	8.8E-07	0%
Benzo[a]pyrene	1.5E-04	0%	1.6E-04	0%	8.7E-06	0%
Chrysene	2.0E-06	0%	2.0E-06	0%	8.8E-08	0%
Indeno[1,2,3-c,d]pyrene	1.1E-04	0%	9.1E-05	0%	4.9E-06	0%
Total air toxics	9.0E-02		7.0E-02		5.7E-03	
Total fine particulate matter	15.0		7.2		0.65	

Source: Levy et al. 2008

Table 5-3. Population risk (deaths/year) for three airports using CMAQ (12- and 36-km grids).

	ORD		ATL		PVD	
Pollutant	12 km	36 km	12 km	36 km	12 km	36 km
Formaldehyde	5.9E-02	4.2E-02	4.3E-02	3.5E-02	2.8E-03	2.2E-03
Acetaldehyde	4.0E-03	2.8E-03	3.0E-03	2.3E-03	1.9E-04	1.5E-04
Benzene	4.5E-03	3.5E-03	3.7E-03	2.9E-03	2.4E-04	1.9E-04
1,3-butadiene	1.4E-02	9.2E-03	9.9E-03	7.2E-03	6.4E-04	4.9E-04
Naphthalene	4.9E-03	3.4E-03	3.7E-03	2.9E-03	2.3E-04	1.9E-04
Total air toxics	8.6E-02	6.0E-02	6.3E-02	5.0E-02	4.1E-03	3.2E-03
Total fine particulate matter	12	7.9	4.5	4.2	0.57	0.48
% Sulfate	49%	52%	59%	64%	41%	37%
% Nitrate	-2%	-5%	-12%	-8%	13%	21%
% EC	15%	16%	19%	16%	13%	12%
% OC	21%	20%	18%	12%	18%	15%
% Ammonium	17%	17%	15%	16%	15%	16%
% Other	1%	0%	0%	0%	0%	-1%
Ozone	-1.9	-2.3	-2.1	-1.9	-0.2	-0.1

Source: Levy et al. 2008

Table 5-4. HAPs rankings based on different prioritization schemes.

Pollutant	Ranking, emissions only	Ranking, emissions*potency	Ranking, risk
Formaldehyde	1	1	1
Acetaldehyde	2	6	6
Benzene	3	5	5
1,3-butadiene	4	2	2
Naphthalene	6	4	4
Styrene	5	3	3
Phenanthrene	7	14	14
Fluoranthene	9	11	11
Pyrene	8	15	15
Anthracene	13	16	16
Benzo[b]fluoranthene	10	8	9
Benzo[k]fluoranthene	10	8	9
Benz[a]anthracene	15	12	12
Benzo[a]pyrene	16	7	7
Chrysene	14	13	13
Indeno[1,2,3-c,d]pyrene	12	10	8

Source: Levy et al. 2008

The pollutants selected for this project represent those that have the greatest risks based on airport emission levels and toxicity.

Another study conducted under the PARTNER Program (Project 15) used a combination of CMAQ and the Environmental Benefits Mapping and Analysis Program (BenMAP) to study airport air quality impacts from 325 U.S. airports, focusing on the nonattainment areas (Ratliff et al. 2009). BenMAP uses health impact functions for criteria air pollutants to relate changes in air concentrations to a change in the incidence of a health endpoint. Only the impacts from PM and ozone were included in the study. Similar to the previous studies, the modeled results indicated that almost all of the health impacts were due to fine particles with about 160 cases of PM-related premature mortality per year. Health impacts such as chronic bronchitis, non-fatal heart attacks, respiratory and cardiovascular illness, also were associated with aircraft emissions.

Although health concerns are associated with each of the criteria pollutants, the greatest risks (i.e., cancer and morbidity) seem to be posed by PM and HAPs. Specifically, fine PM ($PM_{2.5}$) appears to pose the greatest risk to human health—magnitudes higher than HAP species. Formaldehyde was ranked as the HAP species having the greatest risk. Although ultrafines are inherently included as part of $PM_{2.5}$, further research is necessary to better understand potential health impacts from ultrafines.

5.1.2 Summaries and Conclusions

Studies such as these illustrate the need to conduct further research on more pollutants and other airports, but they indicate that, with regard to the potential for health impacts (risk), fine particulate matter appears to pose the greatest risk. As such, much of the current research in airport air quality has focused on fine particles. Among criteria air pollutants, ozone also can contribute significantly to public health impacts, although it would have a lesser impact in the near field and has been excluded from some previous analyses given methodological limitations. For HAPs, formaldehyde was ranked as having the highest risk followed by others such as 1,3-butadiene, styrene, naphthalene, benzene, acetaldehyde, etc. Although fine particles may pose much greater risk, it does not negate the need to further investigate other pollutants. In addition, although many previous analyses have focused on fine particulate matter mortality given its large contribution to monetized health impacts, additional health outcomes from $PM_{2.5}$ and other pollutants merit inclusion.

5.2 What Are the Airport Contributions to Local Air Quality and Health Impacts?

5.2.1 Evaluations

The health effects of each pollutant are summarized in Chapter 4. Although there are uncertainties associated with the toxicities, exposures, etc., the effects are well documented. Organizations such as the EPA and the World Health Organization (WHO) provide extensive information on pollutant health effects.

- EPA Risk: http://www.epa.gov/oia/air/pollution.htm
- WHO Risk: http://www.who.int/mediacentre/factsheets/fs313/en/

Although the overall airport emissions characteristics (mix of pollutants, chemical characteristics, sizes ranges for PM, etc.) may not be the same as other sources, the health effects of each pollutant are the same. That is, all other things being equal, a mass of a pollutant emitted from an airport will produce the same health effects as the same amount from other sources (or another airport)—if the pollutants are identical (no differences in characteristics).

This section presents summaries of selected studies to illustrate the air pollutant concentration levels (and their variability) that can be found at different airports and implications for their contributions to local air quality.

As such, most studies that have addressed the question of airport impacts on local air quality and health impacts have used data from measurements or modeling results to provide indications of exposure (either with emissions or ambient pollutant concentrations) and have linked these data with literature-based concentration-response functions within human health risk assessments. These encompass correlating aircraft activities (e.g., aircraft operations) with emissions, modeling how those emissions influence concentrations, and comparing airport concentration contributions to background levels. Since no two airports are the same, it is difficult to make general statements regarding airport contributions to local air quality because this depends on many factors including emissions strength (emission factors), airport layout, local meteorology, etc. Although further studies are needed, the available findings from the literature can be used to provide some general understandings of airport contributions. As such, each of the studies cited

in the references was reviewed, and the following abridged summaries of selected references provide an indication of the wide range of different types of studies and results available for consideration for further details:

- *ACRP Report 71: Guidance for Quantifying the Contribution of Airport Emissions to Local Air Quality* (Kim et al. 2012). The goal of the project was to better understand the use of modeling and measurement capabilities to determine airport contributions to air quality. This included measurements of ambient concentrations for both criteria pollutants and HAPs.
- *The Impact of NOx, CO and VOC Emissions on the Air Quality of Zurich Airport* (Schurmann 2007). Ambient measurements of criteria pollutants were performed to assess the impact of airport emissions on local air quality.
- *T.F. Green Airport Air Monitoring Study* (RIDEM 2008). A monitoring study was conducted by the Rhode Island Department of Environmental Management (RIDEM) to assess air quality levels and health risks to surrounding neighborhoods. Measurement sites were located around the airport with some near runways. The goal of the study was to characterize HAP concentrations in communities near the airport, assess contributions from different sources (e.g., aircraft, GSE, motor vehicles), verify modeling outputs, and develop a baseline that can be used to assess impacts of future airport changes.
- *Preliminary Study and Analysis of Toxic Air Pollutants from O'Hare International Airport and the Resulting Health Risks Created by These Toxic Emissions in Surrounding Residential Communities* (ENVIRON 2000). The study used emissions data collected in 1999 to conduct a health risk assessment for the airport.
- *General Aviation Airport Air Monitoring Study* (SCAQMD 2010). The goal of the study was to characterize the ambient levels of several important air toxics and ultrafines in communities adjacent to Van Nuys Airport (VNY) and Santa Monica Municipal Airport (SMO).
- *Teterboro Airport Detailed Air Quality Evaluation* (ENVIRON 2008). The study involved measurements of various pollutants including volatile organic compounds (VOCs) and PM to investigate health risks associated with airport operations.
- *ACRP Report 7: Aircraft and Airport-Related Hazardous Air Pollutants* (Wood 2008). San Leandro Measurements: After JETS-APEX2, the Aerodyne Mobile Laboratory spent 2 days at the San Leandro Marina, which is about 2 km downwind of the OAK runway.
- *Aircraft Emissions' Contributions to Organic Aerosols in a Regional Air Quality Model Using the Volatility Basis Set* (Woody 2012). The focus of this work was to estimate contributions of aircraft emissions from ATL to $PM_{2.5}$, focusing on organic aerosols, using a research version of CMAQ v4.7.
- *Relationships between Emissions-Related Aviation Regulations and Human Health* (Sequeira 2008). The study was conducted under the Energy Policy Act of 2005 to assess aircraft impacts on air quality in the United States.
- *Risk Factors of Jet Fuel Combustion Products* (Tesseraux 2004). Using available monitoring data, the possibilities and limitations for a risk assessment approach were determined for the population living around large airports. Measurement data from German airports at Frankfurt and Hamburg, as well as from ORD, were presented (Spicer 1994, Eickhoff 1998, and EPA 2002).
- *Detecting and Quantifying Aircraft and Other On-Airport Contributions to Ambient Nitrogen Oxides in the Vicinity of a Large International Airport* (Carslaw 2006). Based on concerns over the building of a third runway at London-Heathrow International Airport (LHR), data from NO_x monitoring sites near the airport were used to assess contributions by the airport.
- *LAX Air Quality and Source Apportionment Study* (Tetra Tech 2013). The Los Angeles International Airport (LAX) Air Quality Source Apportionment Study (AQSAS) was conducted to measure criteria pollutant HAP concentrations in the vicinity of LAX and to assess the potential impacts of airport-related emissions on ambient air quality of communities adjacent to the airport.

- *Current and Future Particulate-Matter-Related Mortality Risks in the United States from Aviation Emissions during Landing and Takeoff* (Levy 2012). A study was conducted to systematically quantify aviation contributions to air quality concentrations and corresponding public health effects using 99 airports.
- *Development and Evaluation of an Air Quality Modeling Approach to Assess Near-Field Impacts of Lead Emissions from Piston-Engine Aircraft Operating on Leaded Aviation Gasoline* (Carr 2011). A new methodology is presented on modeling the dispersion of lead emissions from general aviation aircraft.

These example studies illustrate the fact that recent and current research tends to follow the pollutant prioritization scheme previously discussed (i.e., significant focus on PM). Although more research is necessary, the information gathered from existing studies allows for a snapshot-in-time summary of airport impacts. This is a temporary summary since further research is expected, including both measurement and modeling efforts. In particular, measurements will be necessary to help assess actual conditions at an airport, as well as to validate modeling efforts. Based on the research work conducted thus far, it is expected that as the research work continues, some of the details may become clarified and corrected, but many of the more general understandings will likely remain intact.

Along those lines, one of the first general issues is whether airports have a discernible influence on local air quality. Some studies have indicated that pollutant concentration levels near an airport are similar to urban levels (e.g., Tesseraux 2004, McGulley 1995, and KM Chng 1999), which can result in a misunderstanding that airports overall contribute little or no pollutants to local air quality. Contrary to this, there have been several measurement studies that indicate that concentrations around airports are elevated (e.g., Wood 2008, RIDEM 2008, Zhu 2011). Depending on the pollutant, the contributions may range from a small or negligible contribution (e.g., some criteria pollutants and HAPs species) to significant contributions (e.g., ultrafine particles). Also, background concentrations may affect pollutants through chemical conversions. In addition, various modeling studies have quantified the concentration contributions and associated health risks (e.g., Levy 2008, Sequeira 2008, and Barrett 2012, etc.)

Although there have been differing conclusions from past studies, the preponderance of the evidence appears to indicate the concentrations of pollutants (depending on the pollutant) are generally elevated in the vicinity of airports.

Modeled estimates and measured findings for the specific contributions to local air quality and health impacts are varied and depend on pollutants. The focus of each study—which pollutants and heath assessments were included and which were left out—also is important. The following summaries provide examples of quantified airport contributions to ambient concentrations as well as health-related statistics.

- On a national level, the modeling study conducted under PARTNER Project 15 (Ratliff 2009 and Sequeira 2008) found aircraft emissions contributing to the following criteria pollutant concentrations:
  - Annual $PM_{2.5}$: 0.01 μg/m^3 (0.08 percent) and
  - 8-hour ozone: 0.10 ppb (0.12 percent).

  These contributions represent averages across the U.S. airports selected for this study. As such, individual airports may experience significantly different outcomes.

The airport concentrations (largely monitored data) presented herein were obtained from publicly available documents for illustration purposes to summarize and help expand the understanding of airport contributions to local air quality. Since most of the cited studies were research efforts, the concentrations should not be taken out of context and used for regulatory purposes. For further details and to understand the context of each dataset, it is recommended that the cited sources be reviewed accordingly.

- Measurements were conducted at Dulles International Airport (IAD) on the airside adjacent to an apron area (Kim et al. 2012). The measured 1-hour concentrations for criteria pollutants were all much lower than the NAAQS, and in most cases, *much* lower:
  - NO_2: Typically below 30 ppb,
  - CO: Typically below 1 ppm,
  - SO_2: Typically below 3 ppb,
  - O_3: Typically below 20 ppb in the winter and below 50 in the summer, and
  - $PM_{2.5}$: Typically below 25 μg/m^3 (24-hour samples).

  These measured levels seem to suggest that the airport's contributions to local air quality tend to be small.
- The measurements and modeling conducted under the LAX Source Apportionment Study provided a lot of detailed information. A summary follows (Tetra Tech 2013):
  - CO, NO_2, SO_2, and Pb ambient concentrations within the communities next to LAX were below threshold levels for state and national standards.
  - $PM_{2.5}$ concentrations were near air quality standard levels and had compositions of
    - 50–75 percent ammonium nitrate, ammonium sulfate, and unapportioned organic matter;
    - 20–30 percent sea salt aerosol, soil-derived fugitive dust, and wood smoke;
    - 1–2 percent jet exhaust; and
    - 8–17 percent diesel plus gasoline vehicle exhaust.
  - Airport $PM_{2.5}$ concentration contributions were estimated to be 5–20 percent.
  - CMAQ modeling showed most of the nitrates, sulfates, and most of the residual organic matter were formed outside of the study area.
  - Winter: airport accounted for 15–22 percent of CO and NO_x concentrations.
  - Summer: airport accounted for 40–50 percent CO and 50–74 percent NO_x concentrations at some measurement sites.
  - Airport SO_2 contributions ranged from 10–80 percent depending on season.
  - HAP concentrations were consistently lower than the levels found elsewhere in the basin area.
  - The generally low concentration levels can be attributed to the coastal location of LAX.
  - Ultrafine composition was found to be largely composed of sulfuric acid aerosols from jet exhaust and their number concentrations east of LAX were found to be higher than typical values in the region.
- Using measured data near LHR, Carslaw et al. (2006) found that aircraft NO_x concentrations could be detected at least 2.6 km from the airport. At the airport boundary, approximately 27 percent of the annual mean NO_x and NO_2 concentrations were found to be due to aircraft. At distances of 2 to 3 km downwind of the airport, an upper limit of 15 percent contribution from the airport was estimated.
- Ellerman et al. (2010) used measurement data from Copenhagen Airport to show that the number of ultrafine particles (43,000 particles/cm^3) in an apron area was approximately

Particles/cm^3 is a measure of the number of particles over a unit volume (particle concentration) and should not be confused with PM mass concentrations such as μg/m^3.

Particles/cm^3 cannot be converted to mass concentrations without the use of (or assumptions involving) the density of the particles.

It also should be noted that particle counting equipment does not typically differentiate between primary and secondarily formed particles (i.e., particles formed in the atmosphere). As such, studies that do not explicitly account for the effects of secondary particles may overestimate the number of particles.

4.4 times greater than the levels found at a background site (near a major roadway). In contrast, a site located on the east side of the airport (closer to the airport boundary) experienced 12,000 particles/cm^3 or 22 percent higher than the same background concentration. The study also found that 90 percent of the particles were in the lower end of the ultrafine size range of 6–40 nm.

- From measurements downwind of Santa Monica Municipal Airport (SMO), Hu et al. (2009) found elevated concentrations of ultrafine particles beyond 660 m downwind of SMO. At distances of 100 and 660 m downwind, respectively, ultrafine concentrations were found to be 10 and 2.5 times greater than background levels.
- Using measured data near runways at LAX, Hsu et al. (2013) observed median ultrafine particle concentrations of 150,000 particles/cm^3. In some cases, concentrations exceeded 1,000,000 particles/cm^3, which is far in excess of levels seen near roadway sources. However, the concentrations were observed to drop rapidly with distance—by an order of magnitude before reaching the airport boundaries.
- Based on data collected at the LAX blast fence (downwind sites up to 600 m from a runway and upwind of a major runway), Zhu et al. (2011) found high spikes in ultrafine particle concentrations. Time-averaged concentrations of $PM_{2.5}$, two carbonyl compounds, formaldehyde, and acrolein, were found to be elevated compared to background levels. As ultrafine particle and black carbon levels have previously shown to return to background levels at 300 m downwind for roadway sources, the persistence of airport ultrafine concentrations up to 600 m seem to indicate that airport emissions may have a broader spatial impact than roadway sources.
- Using data from a monitoring study in the vicinity of LAX, Westerdahl et al. (2008) found the following:
  - Upwind site:
    - Ultrafine particles ranged from 58 to 3,800 particles/cm^3 at below 90 nm size,
    - NO_x ranged from 4–22 ppb,
    - BC ranged from 0.2–0.6 μg/m^3, and
    - PM-PAH ranged from 18–36 ng/m^3.
  - Downwind site:
    - Ultrafine particles—50,000 particles/cm^3, 500 m downwind at 10–15 nm size and
    - Black carbon, PM-PAH, and NO_x levels were "elevated to a lesser extent."
- A monitoring study near PVD showed the following results (Rhode Island 2007):
  - None of the HAP species measured exceeded the acute health and non-cancer benchmarks.
  - Concentrations of benzene, 1,3-butadiene, formaldehyde, acetaldehyde, acetone, chloroform, carbon tetrachloride, and perchloroethylene exceeded the cancer benchmark levels.
  - Formaldehyde concentrations at all sites were greater than 10 times the cancer risk benchmark.

  - Acetaldehyde and acetone were 2.5–3 times higher than the cancer risk benchmark.
  - Black carbon concentrations in communities were higher in areas near roadways.
  - Although a non-reference method (with a bias towards higher readings) was used to measure $PM_{2.5}$, the levels were still below the NAAQS in the communities near the airport. Airport contributions could be identified based on the fidelity of the monitors.
- Based on data collected during a monitoring study around VNY and SMO, the following were found (SCAQMD 2010):
  - The daily average TSP lead concentrations at airport sites were 2–9 times higher than corresponding South Coast Basin levels and mostly below the NAAQS. But 24-hour concentrations at SMO near the tarmac were found to be above the NAAQS on more than one occasion.
  - The highest VOC concentrations at the airport sites were comparable to levels found at urban monitoring sites.
  - $PM_{2.5}$ concentration levels, as well as those of organic carbon (OC) and elemental carbon (EC), were found to be similar or below the corresponding South Coast Basin averages.
  - Ultrafine particle numbers measured near a runway were found to be up to 600 times that of background air.
  - Diurnal profiles suggest that CO concentrations may be mostly due to motor vehicles from surrounding roadways rather than the airport.
- From ambient measurements taken at the San Leandro Marina (Wood 2008), the average HCHO concentration in a time series is 1.3 ppb while the interpolated background value is approximately 0.8 (similar to the background value observed on the OAK airport grounds).
- On a national level, a system-level health risk assessment study (Levy 2012) using CMAQ and appropriate concentration response functions (CRF) to model baseline and future scenarios determined that national population health impacts would increase by a factor of 6.1 from 2005 to 2025. This was based on a notional "what if" aviation growth scenario and corresponding emissions assumptions. The factor of 6.1 increase was decomposed into the following contributing factors:
  - Emissions: 2.1;
  - Population factors (growth and aging): 1.3; and
  - Changing non-aviation concentrations, enhancing $PM_{2.5}$ formation: 2.3.
- A study analyzing HAP emissions from ORD and related health risks (ENVIRON 2000) showed that HAPs concentrations measured at the airport fence area may result in about 5 times higher cancer risks than those associated with background air. The most significant contributing HAPs such as aldehydes, benzene, and naphthalene are included in aircraft emissions.
- Based on a health impact study of U.K. airport expansions, especially LHR (i.e., third runway), the following results were estimated (Barrett et al. 2012 and Yim 2013):
  - Approximately 110 people in the United Kingdom die early each year due to airport emissions today. Of these deaths, approximately 50 are due to emissions from London Heathrow.
  - By 2030, without airport capacity expansion, the number of early deaths per year caused by U.K. airport emissions is projected to increase to 250.
- For an airport occupational exposure study (Tunnicliffe et al. 1999) conducted at Birmingham International Airport, U.K., it was found that the results appear to support an association between high occupational exposures to aviation fuel or jet stream exhaust and excess upper and lower respiratory tract symptoms for airport male workers. However, it is acknowledged that there could have been some bias effects such as residual confounding due to smoking.

These example findings illustrate the types of quantitative and investigative studies that have been conducted on airport air quality health impacts. They also illustrate that airport concentration contributions and health impact statistics are closely related. Although the types and scope of these studies vary, they help to form a picture of the current understanding of airport health impacts.

5.2.2 Summaries and Conclusions

In summary, it should be noted that all pollutants emitted from airports have some level of toxicity with the potential to cause health effects. Again, each airport is different and can have significantly different emissions, weather patterns, geography, etc., from each other, resulting in different air quality contributions. With that in mind, the existing body of research appears to suggest the following for each pollutant (or category of pollutants):

- Most criteria gases (CO, NO_2, and SO_2)—In most situations, airport contributions of these pollutants appear to be such that resulting ambient community or urban concentrations are generally below the NAAQS. Depending on the pollutant and distances to the affected communities, airport contributions of these pollutants may be relatively small. However, as studies have pointed out, the contributions can still be apportioned at relatively far distances (a few miles).

  While much of the health impact focus has been placed on PM and HAPs, it is worth remembering that gaseous criteria pollutants can cause damage to the respiratory system. But the evidence supporting quantitative health risk assessment is more limited for CO, NO_2, and SO_2, relative to ozone and fine particulate matter.

Although variability exists among airports, past studies seem to indicate that airport contributions of criteria gases generally tend to be small (or at least in most cases, not contributing to the point where the vicinity of an airport exceeds the NAAQS).

- In general, most studies suggest that ozone levels in the vicinity of airports will tend to be lower than background levels due to the chemistry with NO_x. Because airports emit large quantities of NO_x emissions, health assessments indicate the risks associated with airport indirect ozone contributions to *local* air quality are relatively small. However, the airport contributions to *regional* ozone can be greater and can contribute significantly to the overall health impacts of airport emissions.
- Lead has been an emerging source of concern due to its toxicity and use at GA airports. Modeling and measurement efforts have shown that lead emissions from GA airports can persist up to 900 m downwind and may be above the background and the NAAQS.

Unlike criteria gases, $PM_{2.5}$ concentrations in and around airports seem to vary significantly.

Although health impacts of $PM_{2.5}$ have been found to be higher than others, further research is necessary on the influence of PM chemical composition and size distribution.

- $PM_{2.5}$ or fine particles are a serious concern for health impacts as they dominate air quality health risks (e.g., by orders of magnitude over HAPs). The levels found in airport measurement studies vary, ranging from relatively low levels to those that are close to the NAAQS, and in some cases exceeding the standards.

  In addition to the variability of $PM_{2.5}$ contributions, the various components and types of PM including black carbon, nitrates, sulfates, volatiles, etc., need to be recognized as well.

Modeling studies suggest that some of the PM (secondary PM) may form much farther downstream (many miles). As such, the total health impacts from airport-emitted PM and PM precursors requires regional-scale atmospheric modeling. Also, although the general health effects of PM regarding both morbidity and mortality are established, there is greater uncertainty regarding the influence of chemical composition and size distribution of PM on health outcomes.

PM_{10} is also a health concern, but because coarse particles ($PM_{10\text{-}2.5}$) are filtered to a greater extent by the upper respiratory tract in humans, there is less focus on its impacts.

- Ultrafine PM is a suspected major health concern but there is little data available on both particle concentrations and resulting health effects. However, existing studies indicate that ultrafine particle concentrations are highly elevated at an airport (i.e., near a runway) with particle counts that may be orders of magnitude higher than background with some persistence many meters downstream (e.g., 600 m).

Although ultrafine PM is a suspected major health concern, there is little data currently—more research is necessary. But from existing studies, ultrafine levels have been found to be elevated (above background levels) in the vicinity of airports.

- While HAPs or air toxics have less risk than $PM_{2.5}$, they still pose a health concern, in part due to the potential for cancer and premature death endpoints. Measurement studies indicate that concentration levels can vary significantly from one airport to another. Although some studies suggest monitored concentrations may be comparable to background levels (depending on where the measurements were conducted), there is also enough evidence to suggest that airport contributions are not negligible.

As with other pollutants, more studies are necessary to measure concentration levels of HAPs near airports. Although some studies indicate that HAP emissions from airports may be negligible (i.e., resulting in concentrations comparable to background levels), there appears to be enough evidence that suggests otherwise.

CHAPTER 6

Conclusions

Since all airports are different, it is very difficult to make general statements about airport air quality contributions and health impacts. Airport contributions to air quality can depend on many different factors including, but not limited to, airport source types (e.g., aircraft fleet mixes), airport layout and location, geography, and meteorology. Contributions to population health impacts depend on these factors as well as population patterns and vulnerability attributes.

Although there have been increasing amounts of research on airport contributions to local air quality health impacts, more research is necessary. Although the current state of research allows one to "paint a picture" of current understanding in this area, it should be considered as a snapshot in time since future research may provide further details. The current research efforts appear to be aligned with the prioritization of pollutant health risks. Based on the relative number of studies and the recent focus, available resources appear to be correctly being applied to PM and HAPs research, with consideration of ozone for regional-scale analyses.

Regarding airport contributions to local air quality, studies have shown that airport emissions and resulting concentration contributions can be well correlated to airport operations (e.g., aircraft usage) as part of source identification and apportionment work. The more pertinent issue is in quantifying the contributions. The current research efforts appear to be aligned with the need for further measurements and an understanding of health impacts.

Risk assessments have shown that fine PM ($PM_{2.5}$) dominates the overall health risks posed by airport emissions. The risk for fine particles is orders of magnitude higher than that for the closest HAP, formaldehyde, although the ability to quantify the non-cancer health effects of HAPs is limited. $PM_{2.5}$ levels have been found to vary significantly at different airports. Although PM_{10} is a health concern, the fact that much of the coarser portion is filtered out by the upper respiratory tract in human beings makes it of less concern than the finer particles.

Studies appear to indicate that most criteria gases (e.g., CO, NO_2, and SO_2) generated from airports generally tend to result in similar concentrations to background (or urban) levels in surrounding communities, although with appreciable contributions closer to the emission sources and variable conclusions depending on background levels. Although health effects of criteria gases are well defined, quantitative health risk assessments for these gases are relatively limited in comparison to ozone and PM.

Because of the nature of ozone chemistry, ozone levels around airports tend to be lower than background levels (i.e., airports tend to be a sink for ozone). Although ozone levels in the vicinity of an airport may be depressed, airports can contribute to the formation of ozone on a larger regional level, thus resulting in increased health impacts.

Lead is a concern at GA airports and will continue to be an issue as AvGas continues to be used. Current studies indicate that lead emissions can noticeably persist at distances close to

1,000 meters downwind of an airport. As such, studies indicate that lead contributions near GA airports may not be negligible.

Studies indicate that secondary PM may form at significant distances downstream from an airport (many miles), adding to health impacts thus, requiring large-scale (e.g., regional) modeling to determine overall PM health impacts. In addition, the impacts of different PM components including black carbon, nitrates, and sulfates need to be taken into account as well as PM size distributions.

In addition to the suspected health concerns of ultrafine PM (along the lines of the current understanding of $PM_{2.5}$), measurement studies have shown that ultrafine concentrations tend to be highly elevated near an airport (near runways) with persistence above background levels at distances of 600 meters downwind of an airport. As such, ultrafine PM generated by airports is suspected of having a broader impact than that generated by roadway vehicles.

Concentrations of HAPs at airports seem to vary. Although some studies suggest that HAP concentrations near airports may be similar to background levels, there appears to be enough evidence suggesting otherwise, however, there are noticeable uncertainties concerning the actual concentration levels.

Health assessments involving a system-level scope (i.e., involving many airports) appear to provide useful statistics on both total and average airport risks with the understanding that individual airport studies also need to be conducted, the results of which may differ significantly.

CHAPTER 7

Recommendations for Future Research

The following provides a summary of the existing knowledge gaps and recommended future research to help advance the understanding of airport air quality contributions and public health impacts.

- In general, more health-related research is necessary to gain a better understanding of airport air quality contributions and health impacts. This includes more airport air quality monitoring programs and additional health risk assessments that should involve both airport and system levels. Understanding the health risks attributable to an individual airport requires atmospheric modeling and health risk assessment specific to the individual airport, and these efforts should be prioritized to provide insight to individual airport operators.
- Since, from recent risk assessments, PM seems to pose the greatest risk to human health, more specific characterization studies of fine particles ($PM_{2.5}$), ultrafines, PM components, and size distributions are necessary. Health effects and risks of ultrafines and PM components (e.g., nitrates, sulfates, etc.) are not well understood. More characterizations are necessary to determine what further differences may exist between primary PM directly emitted from aircraft versus secondary PM formed in the atmosphere, as well as emitted from other sources (e.g., roadway vehicles).
- Although PM and HAPs are the priority, gaseous criteria pollutants need further research to better understand their health risks (i.e., in addition to current understanding of their health effects).
- More research on the overall risks posed by lead emissions from GA aircraft is necessary. This should include more measurements as well.
- Modeling uncertainties need to be better understood so that health risk assessments can be made more reliable with clearer (or smaller) error bands. This includes uncertainties in emissions inventories, atmospheric dispersion models, and in the underlying health evidence.
- With the importance of $PM_{2.5}$ health impacts, the PM emissions data, as well as emissions of particle precursors (VOCs, NO_x, SO_2), need to be as accurate as possible. More mass and size-based PM measurements of aircraft engines should be conducted to develop a more accurate set of emission factors (emissions indices).
- Research needs to be conducted on interactions with the following other health impacts:
  - Multi-pollutant epidemiological investigations should be conducted to assess potential synergies and interactions of different pollutants on health effects.
  - Similarly, risks associated with air pollution and noise combined should be assessed to determine what interactions may exist.
- Although some source apportionment methods such as the Chemical Mass Balance (CMB) have been used, some guidance or clarification of the methods would be helpful.
- In addition to risks placed on the public, more assessments should be conducted on airport workers (e.g., GSE operators) since they are much closer to the sources. Also, more studies should be conducted (with measurements) on the risks to passengers.

- Further research is needed to determine aircraft power setting (and operations) influences on emitted PM characteristics, including size and chemical characteristics.
- Research should be conducted to improve aircraft taxiing/idle and engine start emissions modeling. These transient conditions tend to have different emissions characteristics than steady-state conditions.
- In addition to dispersion modeling, local atmospheric chemistry modeling should be further investigated/improved since AERMOD generally does not have chemistry modeling capabilities (beyond the use of decay rates and simplified NO_x chemistry). Although CMAQ has a large set of chemistry mechanisms, it uses larger grid sizes that make finer spatial resolution assessments difficult. Nested modeling capabilities can be applied, but require greater resources, and there remains the need to use ambient monitoring to validate dispersion modeling outputs.
- Rather than using the typical 1-hour or coarser concentrations from models like AERMOD, time-varying models should be investigated to provide more robust modeling environments to conduct health risk assessments.

Acronyms

AEDT	Aviation Environmental Design Tool
AMTIC	Ambient Monitoring Technology Information Center
APEX	Aircraft Particle Emissions eXperiments
AQSAS	Air Quality Source Apportionment Study
ATL	Atlanta Hartsfield-Jackson International Airport
ATOFMS	Aerosol Time-of-Flight Mass Spectrometer
AvGas	aviation gasoline
BC	black carbon
BOS	Boston Logan International Airport
CAA	Clean Air Act
CAAA	Clean Air Act Amendments
CAEP	Committee on Aviation Environmental Protection
CFR	Code of Federal Regulations
CMAQ	Community Multiscale Air Quality
CNG	compressed natural gas
CO	carbon monoxide
EC	elemental carbon
EDMS	Emissions and Dispersion Modeling System
EF	emission factor
EI	Emissions Index
EIS	Environmental Impact Statement
GA	general aviation
GAV	ground access vehicle
GSE	ground support equipment
HAP	hazardous air pollutant
HC	hydrocarbon
HCHO	formaldehyde
ICAO	International Civil Aviation Organization
LAX	Los Angeles International Airport
LHR	London-Heathrow International Airport
LNG	liquefied natural gas
MOUDI	Micro-Orifice Uniform Deposit Impactor
NAA	nonattainment area
NAAQS	National Ambient Air Quality Standards
NEI	National Emission Inventory
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants
NIOSH	National Institute for Occupational Safety and Health

NO	nitrogen oxide
NO_2	nitrogen dioxide
NO_x	nitrogen oxides
NSR	New Source Review
OC	organic carbon
OG	organic gases
ORD	Chicago O'Hare International Airport
OSHA	Occupational Safety & Health Administration
PAH	polycyclic aromatic hydrocarbon
PARTNER	Partnership for AiR Transportation Noise & Emissions Reduction
Pb	lead
PEL	permissible exposure limit
PFC	Passenger Facility Charge
PM	particulate matter
PM_{10}	particulate matter with aerodynamic diameter of 10 μm or less
$PM_{2.5}$	particulate matter with aerodynamic diameter of 2.5 μm or less
ppb	parts per billion
ppm	parts per million
PSD	prevention of significant deterioration
PVD	T. F. Green Airport
REL	recommended exposure limit
RfC	reference concentration
SIP	State Implementation Plan
SMO	Santa Monica Municipal Airport
SMPS	Scanning Mobility Particle Sizer
SO_2	sulfur dioxide
SO_x	sulfur oxides
TEB	Teterboro Airport
TIM	time in mode
TOG	total organic gases
TSP	total suspended particulate matter
UFP	ultrafine particle
VALE	Voluntary Airport Low Emission
VNY	Van Nuys Airport
VOC	volatile organic compound

APPENDIX A

Literature Review Summary and References

		General and Overviews			Modeling		Measurements		Health Impacts					Pollutants					Sources							Airport Size			Miscellaneous		
Citation	**Summary**	**Overviews and Policies**	**Standards and Guidance**	**Methodology and/or Reviews**	**General Emissions and Dispersion**	**Fate and Transport**	**Emissions**	**Ambient**	**Epidemiological Studies**	**Risk Assessment/Health Impact Assessment**	**Pollutant Contributions and Toxicities**	**Monetization**	**Correlations to Airport Activity, Meteorology, etc.**	**Criteria Gases (e.g., NO_2)**	**Lead (Pb)**	**Particulate Matter (PM)**	**VOCs and HAPs**	**Secondary Pollutants**	**All Airport Sources**	**Aircraft Main Engines Only**	**APU and Ground Power**	**GSE and/or GAVs**	**Stationary Sources**	**Other Airport Sources**	**Non-Airport Sources (e.g., Surrounding Highways)**	**Large/International**	**Medium/Regional**	**Small/GA**	**Airport Surrounding Geography**	**Airport Seasonality**	**Yearly Trends**
ACI EUROPE (2010) "Effects of Air Traffic on Air Quality in the Vicinity of European Airports, Local Air Quality Assessments at and around European Airports Based on the Airspace Closure in Europe during the Volcano Eruption in Iceland in April 2010," ACI EUROPE Environmental Strategy Committee, Brussels, Belgium.	During the Icelandic volcano eruption in April 2010, European airspace was closed for a number of consecutive days. The report produces graphs for 13 major European airports showing aircraft movements before, during, and after the closure, alongside air pollutant concentrations at monitoring stations close to the airports. The report highlights the limitations of the approach taken but concludes, "reduction of flight activity did not significantly affect air quality concentrations of NO_2, confirming that the contribution of air traffic to local air quality in the vicinity of airports is very small."							X						X																	
Adamkiewicz G., Hsu H.H., Vallarino J., Melly S.J., Spengler J.D., Levy J.I. "Nitrogen Dioxide Concentrations in Neighborhoods Adjacent to a Commercial Airport: A Land Use Regression Modeling Study," *Environ Health* 9:73 (2010).	Saturation sampling for nitrogen dioxide was conducted in neighborhoods surrounding TF Green Airport (PVD) in 2007–2008. Land-use regression techniques were used to determine predictors associated with airport and traffic.				x			x						x					x						x		x			x	

Advanced Decision Systems (2005) "Evaluatie Schipholbeleid: Schonere Lucht, Schonere Vliegtuigen, Meer Uitstoot Luchtverkeer," Dutch Ministry of Transport and Works, ed. J. Lammers, Phoenixstraat 49c, 2611 AL Delft.	This was a report prepared for the ministry of public works. Air quality around Schiphol is improving, but not fast enough to meet Dutch norms. Most of the pollution comes from the generality of sources—industry, road transport, etc., and in particular from the motorway. The small contribution of air transport to NO_2 will double between 2004 and 2008. Aircraft may individually be cleaner; but there are more of them. The document reports detailed modeling of NO_2, PM_{10}, CO, and benzene in the Schiphol area for 2004 and for a business-as-usual 2008. This permits the contributions from the motorways and airport to be estimated.	X			X									X		X	X			X	X				X	X					X
Aeroporti di Roma (2006) "Environmental Report 2005," Aeroporti di Roma, Via del'Aeroporto di Fiumicino 320–00050 Fiumicino, Italy.	A general environmental report published by the airport for public consumption. From p 67 it outlines air quality measurements at the two airports (Fiumincino and Ciampino). A mobile laboratory was used, being placed airside for periods of 1–3 years at what were deemed to be the most critical locations within the airports. Species measured were O_3, CO, NO_2, SO_2, and PM_{10}, with annual means for 2001–2005 and monthly means for 2005 being shown. Concentrations were generally moderate, in large part because of the frequent sea breeze.	X						X						X		X							X			X				X	X
Aeroporti di Roma (2007) "Environmental Report 2006," Aeroporti di Roma, Via del'Aeroporto di Fiumicino 320–00050 Fiumicino, Italy.	A general environmental report published by the airport for public consumption. From p 39 and p 80 it lists air quality measurements at Fiumincino. Mean NO_2 concentrations in 2005 and 2006 were 25.8 and 14.5 μg m-3 respectively. (It is not clear that the measurements are strictly comparable, since the mobile laboratory may have been moved—PM_{10} concentrations also dropped very sharply over the few years of measurements.) Benzene and other hydrocarbons were now being measured in addition to the species measured previously—though their values were not reported.							X						X		X							X			X				X	
Aeroporti di Roma (2008) "Environmental Report 2007," Aeroporti di Roma, Via del'Aeroporto di Fiumicino 320–00050 Fiumicino, Italy.	A general environmental report published by the airport for public consumption. Ambient concentrations at Fiumincino for the year are quoted on p 44. There are many missing data, but it appears that concentrations are generally modest. ADR had commissioned an external body (Istituto sull'Inquinamento Atmosferico del CNR) to make air quality measurements at a fixed site at Ciampino from 2006. The results seemed similar to those for the city of Rome, characterized by the large number of motor vehicles. The contribution of aviation activities thus seems to be rather modest.							X						X		X							X			X				X	

(continued on next page)

Aeroporti di Roma (2009) "Environmental Report 2008," Aeroporti di Roma, Via del'Aeroporto di Fiumicino 320–00050 Fiumicino, Italy.	A general environmental report published by the airport for public consumption. Monthly concentrations at Fiumincino for the year are quoted on p 43; values for NO_2 are quoted for 10 months—the highest value was 40.1 µg m-3in October.						X	X						X		X	X						X			X				X	
Aeroporti di Roma (2010) "Environmental Report 2009," Aeroporti di Roma, Via del'Aeroporto di Fiumicino 320–00050 Fiumicino, Italy.	A general environmental report published by the airport for public consumption. Monthly concentrations at Fiumincino for the year are quoted on p 45; the annual mean for NO_2 was 25.8 µg m-3. Additional measurements were also made by the IIA-CNR in the second half of the year at 8 sites around Fiumicino and 6 sites around Ciampino. Species measured were benzene, toluene, ethyl benzene, xylene, NO, NO_2, O_3, SO_2 and NH_3. Some of the hydrocarbon concentrations seemed quite high—at Fiumicino the average toluene concentration was 64.2 µg m-3 airside and 185.2 µg m-3 landside, while that for benzene was 1.2 µg m-3 airside and 1.1 µg m-3. Apparently these values are within regulatory limits (albeit that they only cover summer and autumn).						X	X						X		X	X						X			X				X	
Aeroports de Paris (2007) "Emission Assessment and Air Quality Monitoring at Paris Airports."	Powerpoint presentation describing monitoring activities being carried out at the three Paris airports: two routine sites at CDG, one at Orly. There was also some specialized emissions testing for particulates and VOCs carried out in October 2005 and June/July 2005.						X	X						X		X	X			X					X	X					
Aeroports de Paris (2012) "Paris-Orly et Paris-Charles de Gaulle. Blian Mensuel de la Surveillance de la Qualité de l'air sur les Platformes Aéroportuaires. Octobre 2012." Paris-Orly and Paris-CDG, "Monthly Summary of Airside Air Quality Monitoring," Oct 2012.	This is a monthly report of monitored air pollution concentrations around the two main Paris airports. Monitoring takes places at two stations at each airport and also at several nearby landside sites operated by Airparif. Pollutants monitored are NO, NO_2, PM_{10}, $PM_{2.5}$ and O_3.							X						X		X										X					
Air Force Civil Engineer Center (AFCEC) (2009) *Air Emissions Factor Guide to Air Force Stationary Sources, Methods for Estimating Emissions of Air Pollutants for Stationary Sources at U.S. Air Force Installations.* AFCEC Environmental Consulting Division. Dec.	Standard Air Force guidance that provides methods and emission factors for various stationary sources and aircraft. Information for criteria pollutants including Pb and PM as well as HAPs species.	X	X				X							X	X	X	X						X								
Air Force Civil Engineer Center (AFCEC) (2013) *Air Emissions Guide for Air Force Mobile Sources, Methods for Estimating Emissions of Air Pollutants for Mobile Sources at U.S. Air Force Installations.* AFCEC Compliance Technical Support Branch. Jan.	Standard Air Force guidance that provides methods and emission factors for mobile sources including on-road vehicles, non-road equipment, and aircraft. Criteria pollutants including Pb and PM as well as HAPs. Includes APUs, GSEs, and GAVs. Also, covers aircraft operations and mixing heights.	X	X				X							X	X	X	X			X		X									

AIRPARIF (2009) "Campagne de Mesure Autour de L'Aéroport de Paris Charles de Gaulle," Airparif, Pôle Etudes 7, rue Crillon, 75004 Paris, France.	Study of air quality around Paris CDG airport. In the course of an 8-week survey between December 2007 and February 2008, diffusion tubes were used to monitor NO_2 concentrations at 120 sites around Paris-CDG airport. These measurements were supplemented by three mobile laboratories, which reported concentrations of NOx, PM_{10} and $PM_{2.5}$ on an hourly basis. Concentrations of NO_2 were dominated by the generality of urban emissions, in particular near major roads. The mobile laboratories could detect the impact of the airport (with an unfavorable wind direction, NO_2 concentrations near the airport could be up to 40% greater than those in central Paris), but not of individual ATMs. The limit value of 40 µg NO_2 m-3 is exceeded within the conurbation, close to major roads, and close to the airport (perhaps within a few hundred m of the perimeter); but the influence of the airport is not detectable beyond a range of 3.5 km. Such long-term exceedences would cover 28% of the population living within the study zone. Baseline concentrations of $PM_{2.5}$ are marginal in respect of international norms, but are dominated by road traffic.							X						X		X			X						X	X					X
AIRPARIF (2012) "Rapport D'Activité & Bilan de La Qualité de L'Air, Année 2011," Airparif, Pôle Etudes 7, rue Crillon, 75004 Paris, France.	AIRPARIF is an organization responsible for monitoring the air quality in the Paris agglomeration. AIRPARIF monitors the air quality and contributes to the assessment of health risks and environmental impacts. This is their (very substantial) annual report for monitoring in 2011.	X		X	X			X						X	X	X	X								X						X
Arunachalam S., Wang B., Davis N., Baek B.H., Levy J.I. "Effect of Chemistry-Transport Model Scale and Resolution on Population Exposure to $PM_{2.5}$ from Aircraft Emissions during Landing and Takeoff," *Atmos Environ* 45:3294–3300 (2011).	LTO concentration contributions from three airports (Atlanta, Chicago O'Hare, and T.F. Green) were predicted with CMAQ. As expected, populations nearest the airport captured most of the effects of $PM_{2.5}$, but populations farther away resulted in most of the health risks due to secondary pollutants (e.g., ammonium sulfate and nitrates).				X					X						X		X	X							X	X				
Arunachalam, S., A. Valencia, D. Yang, N. Davis, B.H. Baek, R. Dodson, E.A. Houseman, and J.I. Levy (2011). "Comparing Monitoring-Based and Modeling-Based Approaches for Evaluating Black Carbon Contributions from a U.S. Airport," D.G. Steyn and S.T. Castelli (eds.), *Air Pollution Modeling and its Application XXI,* NATO Science for Peace and Security Series C: Environmental Security 4, DOI 10.1007/978-94-007-1359-8-102, Springer, The Netherlands, 2011.	Three methods/models were compared to estimate aviation contributions to BC concentrations: (1) a statistical method, (2) AERMOD, and (3) CMAQ. The statistical method seems to imply much higher contributions from aviation than AERMOD or CMAQ.			X	X											X											X				

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Arunachalam, S., B.H. Baek, H.-H. Hsu, B. Wang, N. Davis, and J.I. Levy (2010). "The Influence of Chemistry Transport Model Scale and Resolution on Population Exposure due to Aircraft Emissions from Three Airports in the United States," *Air Pollution Modeling and Its Application XX*, D.G. Steyn; Rao, S.T. (eds.) 2010, XLVII, 592 pp, ISBN 978-90-481-3810-4, Springer, The Netherlands, 2010.	CMAQ was used to predict air quality impacts (HAPs and PM) from three airports (Atlanta, Chicago O'Hare, and T.F. Green) using different grid resolutions.				X											X	X		X							X	X				
Arunachalam, S., M. Woody, B.H. Baek, U. Shankar, and J.I. Levy, (2011). "An Investigation of the Impacts of Aviation Emissions on Future Air Quality and Health," D.G. Steyn and S.T. Castelli (eds.), *Air Pollution Modeling and its Application XXI*, NATO Science for Peace and Security Series C: Environmental Security 4, DOI 10.1007/978-94-007-1359-8-108, Springer, The Netherlands, 2011.	CMAQ was used to conduct a health risk study for aviation operations in 2025. Includes the effects of various PM components including secondary sulfate and nitrate particles. The health risk assessments included the use of the EPA's SMAT.				X	X				X						X		X	X						X						
Athens International Airport (2008) "Air Quality Management at the Athens International Airport," presentation by Michael O'Connor.	Microsoft PowerPoint presentation on local air quality management and carbon at Athens International Airport. Provides a summary of the Airport's approach, monitoring and other initiatives.							X						X	X	X	X			X	X	X	X	X		X					
Athens International Airport (2009) "Atmosphere," in English and Greek.	Air quality monitoring results for 2008 at Athens International Airport.							X						X			X									X					X
Banatvala J. (2004) "Unhealthy Airports," *The Lancet*, 364, 646–648.	A general article offering observation and commentary on the health impacts for local communities of aircraft noise and airport air emissions. It makes the statement that health impact assessments (HIAs) should be carried out for significant airport developments and at the pre-planning stage.	X																													X
Barrett S.R.H., Yim S.H.L., Stettler M.E.J., and Eastham S. (2012) "Air Quality Impacts of U.K. Airport Capacity Expansion," A Report by the Laboratory for Aviation and the Environment at the Massachusetts Institute of Technology (MIT) in Collaboration with the Energy Efficient Cities Initiative at Cambridge University.	A 4-page non-technical report that summarizes the results of two peer-reviewed papers published in the U.K.-based scientific journal *Atmospheric Environment* (Stettle et al. 2011 and Yim et al. 2012) on the topic of emissions from U.K. airports, their impacts on public health today and in the future, and viable near-term mitigation approaches. Particular attention is paid to the potential for either expanding Heathrow or building a new hub airport in the Thames Estuary.	X														X			X												
Barrett S.R.H., Britter R.E., Waitz I.A. "Global Mortality Attributable to Aircraft Cruise Emissions," *Environ Sci Technol* 44:7736–7742 (2010).	Bottom-up modeling exercise using AEDT for emissions and GEOS-Chem for fate and transport globally, with application of PM concentration-response functions as derived from WHO.				x	x				x	x					x		x		x											

Bennett M. and Hoolhorst A. *Assessment and Integration Report: Control of Local Air Quality at European Airports*. ECATS-R-2010-01 report. 2010.	The authors review best practice air quality assessment and mitigation at European airports. There is a focus on NO_2 and $PM_{2.5}$, the main pollutants of concern at major European airports.	X		X				X	X		X			X		X			X						X	X	X				
Bennett M., Graham A. and Sinclair P. (2010) "A Statistical Study of the Impact on Local Air Quality of the Shutdown of European Airspace in April 2010," Manchester Metropolitan University, Manchester, U.K.	Air quality data have been compiled for monitoring sites near five European airports over the period 16–19 April 2010, when much of European airspace was shut as a result of the eruption of the Eyjafjalljökull volcano. These observations were compared with data for previous years and wind roses. At most sites, it is quite difficult to discern a significant decrease in local pollution as a result of the closure of the airport. Possible exceptions are Heathrow and Schiphol, where several monitoring sites lie essentially on the airport boundary and wind directions during the episode were suitable for demonstrating the resultant absence of NO_x emissions. PM_{10} concentrations at most sites were rather high and the implication is that the observed dust was in fact the volcanic ash.							X						X		X									X	X					
Bennett, M. and D. Raper, "Impact of Airports on Local Air Quality," Chapter EAE350, *Encyclopedia of Aerospace Engineering*, John Wiley & Sons, Ltd, 2010.	This chapter provides a good overview of the air quality practices at airports and provides additional details on the European experience. A monitoring overview is particularly important.	X		X	X			X	X		X			X		X			X						X	X	X				
Bennett, M. and D. Raper, "Impact of Airports on Local Air Quality," Chapter EAE350, *Encyclopedia of Aerospace Engineering,* John Wiley & Sons, Ltd, 2010.	This chapter provides a good overview of the air quality practices at airports and provides additional details on the European experience. A monitoring overview is particularly important.	X	X	X				X						X					X							X	X				

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Bennett M., Christie S.M., Graham A., Garry K.P., Velikov S., Poll D.I., Smith M.G., Mead M.I., Popoola O.A.M, Stewart G.B., and Jones R.L. "Abatement of an Aircraft Exhaust Plume Using Aerodynamic Baffles." Accepted for publication *Environ Sci Tech* 2013.	This paper demonstrates the effectiveness of a possible means of abating the impact of the exhaust emissions of commercial aircraft on the local community. Most substantial industrial emissions to atmosphere are via a tall stack; this is not feasible for the exhaust jet from an aircraft. It is not even practicable to install a blast wall to direct the emissions upward, since this would pose an unacceptable hazard to aircraft over-flying it. The paper points out, however, that the aerodynamic drag and lift delivered by a blast wall can be spread out quite effectively over a succession of modest baffles of light-weight construction. These then suck the momentum out of the jet, allowing its buoyancy to dominate more quickly. By setting the baffles at a suitable angle, they can also deliver significant aerodynamic lift to the exhaust jet. In effect, the array forms a "virtual chimney." A suitable design was arrived at using theoretical and wind tunnel modeling. It was then tested with a 124 kN exhaust jet, using point samplers and a scanning LIDAR to monitor the dispersion of the jet downstream. From theory and experiment, it was then clear that, if the array was placed suitably close to the source, the jet could be made to leave the surface quite rapidly (i.e., practically by the back row of the array). The array also provided effective shelter against jet blast (it halved the centerline jet velocity) and gave some modest reduction in the engine noise downstream.				X			X												X											
Blumenthal D.L., W.S Keifer, and J.A. McDonald, "Aircraft Measurements of Pollutants and Meteorological Parameters during the Sulfate Regional Experiment (SURE) Program," Electric Power Research Institute, Report EA-1909, Research Project 862-3, Apr 1981.	Data was collected for model validation of sulfur compounds. Two aircraft were operated for six 2-week intensive studies over various seasons. Measurements, methodologies, and results are described in detail. This document provides historic background.			X			X									X		X		X										x	
Boyle K.A. *Air Quality in Newport Beach, CA: Field Measurements of Ambient Particulates and Associated Trace Elements and Hydrocarbons.* Prepared for City of Newport Beach, Sept 2010.	Field measurements of ambient $PM_{2.5}$ were made at six locations in varying proximity to high-volume freeways and John Wayne Airport. Concentrations of particle-associated metals, trace elements, and hydrocarbons were measured and compared to determine if the relative contributions of airport vs. automotive emissions could be assessed for different sampling sites.				x			x								x	x		x						x		x				

Brunelle-Yeung, Elza and Ian Waitz (2008). "Impact of Subsonic Aviation on Nonmelanoma Skin Cancer Incidence due to Atmospheric Ozone Variation." Submitted to the Fourth Annual Joseph A. Hartman Student Paper Competition. Jan 31.	Paper suggests that an increase in ozone concentration due to aircraft NOx emissions may have contributed to decreased cases of nonmelanoma skin cancer. Aircraft ozone increases were obtained from the IPCC Aviation and the Global Atmosphere report and cancer data were obtained from various sources including the American Cancer Society.								X	X				X				X		X											
Buonanno G., Bernabei M., Avino P., and Stabile L. (2012) "Occupational Exposure to Airborne Particles and Other Pollutants in an Aviation Base," *Environ Pollut* 170, 78–87.	The authors monitored occupational exposure of a crew chief and hangar operator to airborne particles at Los Angeles Airport, USA. Monitoring was carried out downwind of the receptor site, close to the runway and personal monitoring. Various characteristics of airborne particles were measured and reported.							X						X		X			X									X			
Callahan, Colleen (2010). "The Plane Truth, Air Quality Impacts of Airport Operations and Strategies for Sustainability: A Case Study of the Los Angeles World Airports." The Coalition for Clean Air and Environment Now. June.	Provides overviews of the air quality contributions from various airports but mainly focuses on the LAWA airports. Provides recommendations for airports to reduce emissions such as the creation of a clean air action plan, banning leaded gas usage by General Aviation, and implementation of solar panels.	X												X		X	X		X							X	X	X	X		
Carr E., Lee M., Marin K., Holder C., Pedde M., Cook R., Touma J. "Development and Evaluation of an Air Quality Modeling Approach to Assess Near-Field Impacts of Lead Emissions from Piston-Engine Aircraft Operating on Leaded Aviation Gasoline." *Atmos Environ* 45:5795–5804 (2011).	Air quality modeling using AERMOD linked to comprehensive Pb emissions inventory, applied to ambient Pb near Santa Monica Airport. Monitoring data were used for comparison/calibration.				x	x		x							x				x						x			x	x		
Carslaw D.C., Ropkins K., Laxen D., Moorcroft S., Marner B. and Williams M.L. (2008) "Near-Field Commercial Aircraft Contribution to Nitrogen Oxides by Engine, Aircraft Type and Airline by Individual Plume Sampling," *Environ Sci Technol* 42, 1871–1876.	The researchers monitored NO_x concentrations in the plume of departing aircraft at Heathrow Airport. Monitored were 5618 plumes and, using aircraft movement and FDR data, plumes were correlated to aircraft type, engine type, and thrust setting. The study showed a good relationship between the monitored NO_x concentrations and the ICAO databank and a high impact on concentrations from varying takeoff weights and thrust settings.			X			X						X						X							X					
Carslaw D.C., Beevers S.D., Ropkins K., Bell M.C. "Detecting and Quantifying Aircraft and Other On-Airport Contributions to Ambient Nitrogen Oxides in the Vicinity of a Large International Airport." *Atmos Environ* 40 (2006) 5424–5434.	Study of NO_x concentrations near Heathrow. Used multiple approaches to isolate airport contributions using seven measurement sites near the airport.				x			x						x					x						x	x					

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Carslaw, D.C., Williams M.L. and Barratt B. (2012). "A Short-Term Intervention Study—Impact of Airport Closure due to the Eruption of Eyjafjallajökull on Near-Field Air Quality." *Atmos Environ* 54, 328–336, 2012.	During the Icelandic volcano eruption in April 2010, European airspace was closed for 6 days. In this study the authors quantified the impact of the airspace closure on concentrations of NO_x and NO_2 at measurement sites close to London Heathrow Airport. They found a clear effect on NO_x and NO_2 concentrations close to the airport. They also estimated the annual impact airport emissions have on mean concentrations of NO_x and NO_2 for different years and compared these estimates with a detailed dispersion modeling study and previous work that was based on the analysis of monitoring site data. For the receptor most affected by the flight-ban approximately 200 m south of the airport, the airport contributes about 13.5 mg m-3 NO_x, which is similar to dispersion modeling estimates of 12.0 mg m-3, but approximately twice that of other estimates based on the analysis of ambient measurements. Other measurement sites showed more mixed results.							X						X					X								X					
Castro, Adrian. "Santa Monica Airport Health Impact Assessment (HIA): A Health-Directed Summary of the Issues Facing the Community near the Santa Monica Airport." Feb 2010. University of California, Los Angeles, Community Health and Advocacy Training Program.	This study conducted a Health Impact Assessment (HIA) to provide decisionmakers with information to guide the future of the role of Santa Monica Airport. Investigators found significantly higher levels of total suspended particulate lead due to level of operations by piston-powered aircraft. Within and around takeoff runway end, lead levels were up to 25 times higher than the background levels. Takeoffs and landings are contributing to elevated levels of black carbon; elevated levels of ultrafine particles (UFP); and elevated levels of polycyclic aromatic hydrocarbons (PAH). Investigators recommended a "buffer zone" of at least 660 meters between the takeoff area and residents and installation of high-efficiency particle absorbing (HEPA) filters in surrounding schools and homes.							X		X			X		X	X	X			X								X				
CATE (2004). "Quotes on Air Pollution from the Aviation White Paper," Summary prepared by the Centre for Aviation, Transport and the Environment (CATE), Manchester Metropolitan University, Manchester, U.K.	A collection of quotations taken directly from the U.K. "The Future of Air Transport" white paper published in 2003. The extracted quotes relate to air quality, highlight how this is a key issue for airport expansion in the U.K., and how airports must monitor and manage their emissions.	X												X																	
CDM, et al. (2012). *ACRP Report 78: Airport Ground Support Equipment (GSE): Emission Reduction Strategies, Inventory, and Tutorial.* Transportation Research Board.	A comprehensive review document of ground support equipment at airports and the practicalities of assessing their impact in terms of emissions and the opportunities for emissions reductions.			X																		X									

DEFRA (2007). "The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (Volume 1)," Department for the Environment, Food and Rural Affairs, London, U.K., Cm 7169.	The Environment Act 1995 requires the U.K. government to produce a national air quality strategy containing standards, objectives, and measures for improving ambient air quality and to keep these policies under review. This document is the third and latest Air Quality Strategy; previous ones have established the framework for achieving improvements in ambient air quality in the U.K. The strategy describes the history and scope of U.K. air quality legislation, objectives, and pollutants covered; current policies and new measures; and a longer-term view.	X	X																													
DEFRA (2010) "Air Pollution: Action in a Changing Climate," Department for the Environment, Food and Rural Affairs, London, U.K., PB13378.	This U.K. government report sets out the U.K.'s commitments on improving local air quality and its low carbon transition plan. Significantly, it explores the interrelationships of the two areas and highlights benefits of integrating policies.	X																														
DfT (2003) "The Future of Air Transport—Summary," Department for Transport, 76 Marsham Street, London SW1P 4DR, U.K.	This U.K. white paper provides a national strategic framework for the future development of airport capacity in the U.K., looking forward 30 years. One reason given for this was the requirement to address the environmental impacts that air travel generates. This document is a summary—the full report runs to many documents and pages. The white paper noted the "severe environmental disadvantages" of Heathrow and the government would only support a third runway once it could be confident that the key condition relating to compliance with air quality limits can be met—annual mean concentrations of NO_2 must not exceed 40 μg/m3. The government's support is also conditional on measures to prevent deterioration of the noise climate and improve public transport access.	X																														

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DfT (2006A) "Project for the Sustainable Development of Heathrow—Report of the Air Quality Technical Panels," Department for Transport, 76 Marsham Street, London SW1P 4DR, U.K.	This major study was commissioned in 2004 by the U.K. government's Department for Transport, as a result of a recommendation made in the U.K. Future of Air Transport white paper, and reported in July 2006. It reported in the following areas: 1. Synthesis of key issues and findings including recommendations made to the DfT for what tools should be used to assess air quality at Heathrow Airport. 2. Establish what constitutes best practice for monitoring and measurement for model development, and its applicability, at Heathrow. 3. Identifying emission sources and calculating emissions, in the form of a detailed "bottom-up" emissions inventory, as an input for dispersion modeling. 4. Dispersion modeling of airport and local emissions. This included an assessment of 5 dispersion models and concluded that the most appropriate model for use at U.K. airports was ADMS-Airport (model developer: Cambridge Environmental Research Consultants http://www.cerc.co.uk/index.php). The whole study was subject to a peer review panel and the final report included their commentary. Although now a dated study, it arguably defined best practice airport air quality assessment at the time. Overall, the panels found that the key pollutants were nitrogen dioxide (NO_2), nitrogen oxides (NO_x), and particulate matter (PM_{10}). The study found that the statutory annual mean NO_2 objective (40 µg/m3) was exceeded at some locations around Heathrow. The study found no breaches of any statutory PM_{10} objectives.			X										X		X			X							X					
DfT (2006B) "Project for the Sustainable Development of Heathrow—Report of the Air Quality Technical Panels. Appendices 1–11," Department for Transport, 76 Marsham Street, London SW1P 4DR, U.K.	The appendices to the full report (DfT, 2006A).			X										X		X			X							X					
Diez D.M., Dominici F., Zarubiak D., Levy J.I. "Statistical Approaches for Identifying Air Pollutant Mixtures Associated with Aircraft Departures at Los Angeles International Airport," *Environ Sci Technol* 46:8229−8235 (2012).	This study examined concentrations of continuously monitored air pollutants measured in 2008 near a departure runway at LAX, considering single-pollutant associations with landing and takeoff (LTO) as well as multipollutant predictors of binary LTO activity.				x			x						x						x						x					

Dodson R.E., Houseman E.A., Morin B., Levy J.I. "An Analysis of Continuous Black Carbon Concentrations in Proximity to an Airport and Major Roadways," *Atmos Environ* 43:3764–3773 (2009).	BC was measured at 5 monitoring sites on grounds of T.F. Green Airport from 2005–2006. Statistical analysis approaches included smoothed functions of wind speed and direction to determine likely source contributions, and regression models predicting concentrations as function of real-time flight activity and meteorological data.				x			x								x			x						x		x			x	
Duchene N., E. Flueti, I. Fuller, P. Hofmann, U. Janicke, and C. Talerico, "Comparison of Measured and Modeled NO_2 Values at Zurich Airport, Sensitivity of Aircraft NO_X Emissions Inventory and NO_2 Dispersion Parameters: Proceedings of the 11th International Conference on Harmonisation within Atmospheric Dispersion Modeling for Regulatory Purposes," pp. 367–371.	Measurements at 21 locations near and around the Zurich Airport are described using passive NO_2 sampling tubes and a standard analyzer at one location. A sensitivity study of the impact, as well as comparison to modeling, is included.		X	X				X						X					X						X	X			X		
Düsseldorf International Airport (2004) "Umweltreport," Flughafen Düsseldorf, Germany.	A general environmental report published by the airport for public consumption. It describes (among other things) how air quality is monitored near the runways. Annual mean NO_2 concentrations in 2003 were marginally below 40 μg m-3 at both ends of both runways.							X						X													X				
Düsseldorf International Airport (2009) "Luftqualitätsmessungen, September 2009," Flughafen Düsseldorf, Germany.	Air quality measurements, September 2009. A monthly summary of air quality measurements at the airport. Oddly, this seemed to be the only one immediately available. NO_2, O_3, SO_2, benzene, toluene, and PM_{10} were reported, together with a summary of basic meteorological statistics.							X						X		X	X										X				X	
ECAC (2011) "Recommendation ECAC//27-4 NO_x Emission Classification Scheme," European Civil Aviation Conference, 3, bis Villa Emile Bergerat, 92522 Neuilly sur Seine Cedex, France.	The standardized approach to the calculation of an aircraft engine emissions factor for airline charging purposes to be used at any EU airport that wishes to adopt differential charging based on local air quality emissions.			X										X			X														
Ellermann T. and Massling A. (2010) "Measurement of Ultrafine Particles at the Apron of Copenhagen Airport, Kastrup in Relation to Work Environment," Danmarks iljøundersøgelser ved Aarhus Universitet (Denmarks Environmental Investigations, University of Aarhus), Aarhus, Denmark.	This report presents the results of measurements of number and size-distribution of ultrafine particles at the apron of Copenhagen Airport, Kastrup. In the measuring period, the average number of particles was about 4.4 times higher at the apron (43.000 particles/cm3) than at H.C. Andersens Boulevard (9.800 particles/cm3), which is estimated to be one of the most air polluted streets in Copenhagen. Measurements of the particles' size-distribution showed that about 90% of the particles at the apron are in the size-fraction from 6–40nm. About 8% of the particles are in the size-fraction from 40–110 nm, and only 2% lie in the size-fraction from 110–700 nm.						X	X					X			X											X	X				

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ENVIRON (2000). *Preliminary Study and Analysis of Toxic Air Pollutants from O'Hare International Airport and the Resulting Health Risks Created by These Toxic Emissions in Surrounding Residential Communities.* Park Ridge, IL.	A study was conducted due to concerns of potential impacts from toxic air pollutants emitted from the airport. Health risk assessments were conducted of the fence line concentrations and the impacts to surrounding residential communities.				X		X	X		X	X					X	X	X	X					X		X			X		
ENVIRON (2008). *Teterboro Airport, Detailed Air Quality Evaluation*. Prepared for the New Jersey Department of Environmental Protection (NJDEP), Trenton, New Jersey. ENVIRON International Corportation, Groton, Massachusetts, Newark, New Jersey. Project #08-14189A, Final Report. February 11.	Funded by the New Jersey Department of Environmental Protection (NJDEP), the study assessed local air quality contributions from Teterboro Airport including potential health impacts and emissions mitigation measures.			X	X	X	X	X		X				X	X	X	X	X	X					X				X			
EPA Office of Air and Radiation. Sep 2004. *Guidance on Airport Emission Reduction Credits for Early Measures through Voluntary Airport Low Emission Programs.* Available from the FAA at http://www.faa.gov/airports/environmental/vale	This document provides guidance on the Voluntary Airport Low Emission (VALE) program. VALE allows airport managers to reduce emissions accounted for under the General Conformity and New Source Review (NSR) programs. VALE is intended to reduce criteria pollutants and precursors, improve regional air quality, and accelerate the use of new and cleaner technology before an EA or EIS is prepared, and establishes a program to obtain emission "credits."	X		X															X												
EU (2008) "Directive 2008/50/EC of the European Parliament and of the Council on Ambient Air Quality and Cleaner Air for Europe," *Official Journal of the European Union*, European Commission, Brussels, Belgium.	From 1/1/2010, two EU limit values for NO_2 entered into force: 200 µg/m3 over 1 hour averaging period with 18 permitted exceedences each year and 40 µg/m3 over a 1-year period. From 1/1/2005, two limit values for PM_{10} entered into force: 50 µg/m3 over 24 hours averaging period with 35 permitted exceedences each year and 40 µg/m3 over a 1-year period. From 1/1/2015 there will be a limit value for $PM_{2.5}$ coming into force: 25 µg/m3 over a 1-year averaging period. Prior to the limit value entering force, there is a target value that entered into force from 1/1/2010 of 25 µg/m3 over a 1-year averaging period, the same as the limit value. The Directive also sets out limit or target values for SO_2, lead, CO, ozone, arsenic, cadmium, nickel, and polycyclic aromatic hydrocarbons. An average exposure indicator (AEI) will be introduced for $PM_{2.5}$ in 2015: 20 µg/m3 based on a 3-year average (so in 2015 this will be 2013, 2014, 2015). It is the $PM_{2.5}$ concentration averaged over the selected monitoring stations in agglomerations and larger urban areas, set in urban background locations to best assess the $PM_{2.5}$ exposure of the general population. An "exposure reduction target" to be set on AEI in 2010, is to be achieved in 2020. Limit and target values have historically been based on the work of the Air Pollution and Clean Air for Europe (CAFÉ) initiative.	X	X											X	X	X	X	X													

Eurocontrol (2005A) "Airport Local Air Quality Studies (ALAQS) Concept Document," Eurocontrol, Brussels, Belgium.	This report outlines the background, objectives, and approach of a Eurocontrol and ICAO project called Airport Local Air Quality Studies (ALAQS), now completed. It aimed to (1) promote best practice methods for airport LAQ analysis concerning issues such as emissions inventory, dispersion, and the data required for the calculations, including emission factors, operational data, and aircraft landing and takeoff profiles; (2) raise the awareness of LAQ issues among airport authorities, focusing on the practical issues of an LAQ study at an airport: data collection, pollutants, methods for inventory, and dispersion; and (3) develop an ALAQS-AV toolset—a geographical information system-based (GIS-based) research tool. This is a test bed that can be used to investigate the sensitivity of different inventory and dispersion methodologies. The choice of a GIS as a test bench simplifies the process of defining the various airport elements (runways, taxiways, buildings, etc.) and allows the spatial distribution of emissions to be visualized. The ALAQS project approach was based on delivering case study reports, guidance material, a database of default parameters for European LAQ, and the ALAQS-AV toolset.			X	X																										
Eurocontrol (2005B) "ALAQS Chopin Airport Case Study, Part 1: Emission Inventory," Eurocontrol, Brussels, Belgium.	This report describes an emissions inventory that was completed for Chopin Airport, Warsaw, Poland. It was one of four airport emissions inventories case studies completed as part of ALAQS. The second phase of this case study was a dispersion modeling study.			X	X																										
Federal Aviation Administration. 2005. *O'Hare Modernization Environmental Impact Statement*. Federal Aviation Administration. Great Lakes Region FAA	EIS for the modernization of the Chicago O'Hare International Airport. Provides a comprehensive modeling and measurement assessment of emissions and air quality impacts for both criteria and hazardous air pollutants (HAPs).				X			X						X	X	X	X	X	X					X	X	X			X	X	
FAA, "Fact Sheet – Voluntary Airport Low Emission Program," Oct 9, 2012. Available from the FAA at http://www.faa.gov/airports/environmental/vale	Provides the latest information about the VALE Program and an overview of FY2012 VALE grants.	X																	X												
FAA, VALE Program grant summary FY 2005-FY 2012. 2013. Available from the FAA at http://www.faa.gov/airports/environmental/vale	This Microsoft EXCEL spreadsheet lists all the VALE program grants, amounts, project descriptions, and sponsors.	X																	X												
FAA, "Voluntary Airport Low Emissions (VALE) Program Brochure," 2013. Available from the FAA at http://www.faa.gov/airports/environmental/vale	The brochure provides an overview of the VALE program, a list and description of eligible project types, and case studies of selected completed VALE projects.	X																	X												

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Fanning E., Yu R.C., Lu R., Froines J. "Monitoring and Modeling of Ultrafine Particles and Black Carbon at the Los Angeles International Airport: Final Report," ARB Contract #04-325, 2007.	Three field studies were performed in and around LAX in 2005 and 2006.				x	x		x								x	x		x						x	x					
Fanning, E. et al. (2007) "Monitoring and Modeling of Ultrafine Particles and Black Carbon at the Los Angeles International Airport: Final Report," ACB Contract #04-325. California Air Resources Board, June 20.	Study involved a measurement campaign to characterize LAX contributions of PM to surrounding communities. The UFP max spike was seen to occur at 15 nm and the average at 14 nm—these were detectable up to 600 m from the airport. While particle numbers were noticeable in community areas, mass-based concentrations (e.g., $PM_{2.5}$) were not above background levels.							X								X			X							X					
Fine, P., A. Polidori, S. Teffera (2010) "General Aviation Airport Air Monitoring Study, Final Report," South Coast Air Quality Management District, Aug 2010.	This study was part of a Community-Scale Air Toxics Ambient Monitoring Grant and characterizes the ambient levels of several air toxics adjacent to the Van Nuys and Santa Monica Airports. These are very busy GA airports with Van Nuys having about 450,000 annual LTOs. The document describes the monitoring and provides key findings of concentrations of lead, VOCs, PM, and CO.							X			X			X	X	X	X		X										X			
Fraport (2004A) "Lufthygenische Kurzbericht," Fraport AG, APF-US, 60547 Frankfurt, 22/1/2004.	A short report on air quality. This single page report introduces the SOMMI 1 (Self Operating Measuring and Monitoring Installation) in the E corner of Frankfurt International Airport (i.e., between the airfield and a motorway), and reports annual concentrations for the period 1/7/2002 to 30/6/2003. Pollutants measured were CO, NO, NO_2, SO_2, O^3, benzene, and PM_{10}. In subsequent years, toluene, xylene, and ethyl benzene were added to this list.							X						X		X	X									X					
Fraport (2004B) "Lufthygienischer Jahresbericht 2003," Fraport AG, FBA-RU, 60547 Frankfurt.	Annual report on air quality, 2003. This is the first of a series of annual air quality reports by Fraport. Following Fraport 2004A, it describes the commissioning of a mobile monitoring station, SOMMI 2. This was located at two places, both within the airport boundary, over the course of the year. It was noted that 2003 was an exceptional year meteorologically. Mean NO_2 concentration at SOMMI 1 over the year was 50 μg m-3. Pollution rose analysis showed that most of this came from the neighboring motorway. Typically, these reports state relevant statistics of the monitored pollutants, adding some helpful technical commentary.							X						X		X	X								X	X					

Fraport (2005) "Lufthygienischer Jahresbericht 2004," Fraport AG, FBA-RU, 60547 Frankfurt.	Annual report on air quality, 2004. Another warm year, though not as hot as 2003. The report includes some discussion of the legal implications of pollution limit values. Since these require air quality in residential areas (rather than within the airfield) to be protected, a special measurement program was commissioned close to the nearby town of Kelsterbach, starting in June 2004. Mean NO_2 concentration at SOMMI 1 over the year was 42 µg m-3.	X						X						X		X	X									X					
Fraport (2006) "Lufthygienischer Jahresbericht 2005," Fraport AG, FBA-RU, 60547 Frankfurt.	Annual report on air quality, 2005. Mean NO_2 concentration at SOMMI 1 over the year was 46 µg m-3, that at SOMMI 2 on the apron was 57 µg m-3, and that at Kelsterbach 32 µg m-3.							X						X		X	X									X					
Fraport (2007) "Lufthygienischer Jahresbericht 2006," Fraport AG, FBA-RU, 60547 Frankfurt.	Annual report on air quality, 2006. Mean NO_2 concentration at SOMMI 1 over the year was 47 µg m-3, that at SOMMI 2 at the center of the airfield was 39 µg m-3, and that at Kelsterbach 32 µg m-3. Note that the SOMMI 2 value quoted here was between 1/5/2006 and 30/4/2007, since thunderstorms delayed the preparation of its new site. Time series now show that pollutant concentrations (other than those of CO) had all dropped following the exceptional year of 2003. The report discusses an episode of high PM_{10} concentrations in March 2007: hourly concentrations at SOMMI 1 peaked at >150 µg m-3. This seemed to be a regional phenomenon, but its source was unclear. Such episodes are not unusual.							X						X		X	X								X	X					X
Fraport (2008) "Lufthygienischer Jahresbericht 2007," Fraport AG, FBA-RU, 60547 Frankfurt.	Annual report on air quality, 2007. Mean NO_2 concentration at SOMMI 1 over the year was 42 µg m-3, that at SOMMI 2 at the center of the airfield was 39 µg m-3, and that at Kelsterbach 28 µg m-3. It may be noted that NO concentrations are much more differentiated, viz. 43, 23, and 16 µg m-3 respectively. These are much more closely related to the primary emissions, as could be seen from the pollution roses. The principal local source is the motorway immediately to the E of the airport. By the time this report was prepared, the source of the dust episode in March 2007 had been identified—it was apparently from a dust storm in the Ukraine, following a drought.							X						X		X	X								X	X				X	X
Fraport (2009A) "Lufthygienischer Jahresbericht 2008," Fraport AG, FBA-RU, 60547 Frankfurt.	Annual report on air quality, 2008. Because of construction work, SOMMI 1 had to be suspended at the end of September 2008. The mean NO_2 concentration at SOMMI 2 at the center of the airfield was 40 µg m-3, and that at Kelsterbach (now labeled SOMMI 3) 29 µg m-3. The September–September mean value at SOMMI 1 was 48 µg m-3. Through the use of a hi-vol sampler, BaP, As, Pb, Cd, and Ni were also measured at SOMMI 1, with mean concentrations of 0.2, 0.8, 7.2, 0.2, and 3.5 ng m-3 respectively—all well within regulatory limits.							X						X	X	X	X									X					X

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Fraport (2009B) "Verkurzte Umwelterklärung 2009 für den Standort Flughafen Frankfurt. Fortschreibung der Umwelterklärung 2008," Fraport AG, FBA-RU, 60547 Frankfurt.	Short report on the progress of Fraport toward its environmental goals up to 2008.	X						X						X		X	X		X						X	X					X
Fraport (2010) "Lufthygienischer Jahresbericht 2009," Fraport AG, FBA-RU, 60547 Frankfurt.	Annual report on air quality, 2009. SOMMI 1 restarted operations at a position 400 m SW of its original position, and some 200 m farther from the motorway, on 1/4/2008. The network was extended to monitor the fourth runway, now under construction, with SOMMI 4 between the new runway and the NW corner of the original airfield and SOMMI 5 S of Kelsterbach. The mean NO_2 concentration at SOMMI 2 was 41 µg m-3, and that at SOMMI 3 was 31 µg m-3. An attempt was made to correct the measured SOMMI 1 value (48 µg m-3) for the missing first quarter of data by interpolation from the SOMMI 2 values. A corrected mean of 48 µg m-3 was obtained. PM_{10} measurements were commissioned at SOMMI 3-5 to monitor dust from the construction works. It appeared that this was well controlled (on-site speed limits, water sprays on construction roads, etc.).							X						X	X	X	X								X	X					X
Fraport (2011) "Lufthygienischer Jahresbericht 2010," Fraport AG, FBA-RU, 60547 Frankfurt.	Annual report on air quality, 2010. The mean NO_2 concentration at SOMMI 1 over the year was estimated as 45 µg m-3 (from 1/11/2010, it was moved to another site further N), that at SOMMI 2 was 39 µg m-3, and that at SOMMI 3 was 31 µg m-3. A long-term decline in primary NO concentrations was attributed to diminishing emissions from motor vehicles. Airport operations in April of this year were greatly impacted by the eruption of Eyjafjallajökull, but modeling and measurements showed that this had only a modest effect on NO_2 concentrations at SOMMI 1-3. This was the general experience at European airports, as reported in "Effects of Air Traffic on Air Quality in the Vicinity of European Airports," published by ACI Europe. There was also some discussion of PM_{10} from construction activity. At SOMMI 4, beside the construction site of the new runway, this marginally exceeded the regulatory limit, but since the site was within the airport boundary, this was not a legal concern.				X			X						X	X	X	X								X	X					X

Fraport (2012) "Lufthygienischer Jahresbericht 2011," Fraport AG, FBA-RU, 60547 Frankfurt.	Annual report on air quality, 2011. This is a somewhat more substantial annual report than the previous ones, since topical issues required discussion of several additional themes. The new NW runway was in operation from 21/10/2011. Mean NO_2 concentrations at SOMMI 1-3 were 46 µg m-3, 36 µg m-3, and 31 µg m-3, respectively, though SOMMI 3 was decommissioned at the end of the year. Detailed dispersion modeling of NO_2 concentrations was carried out both for the base case of 2005 and for a 2020 planning scenario. Generally, off-site concentrations should be reduced as a result of reductions in road vehicle emissions; on-site concentrations may, however, increase with the growth in ATMs: concentrations on the aprons may exceed 60 µg m-3. There will also be an impact from Terminal 3, which will become operational in 2016. Close to the sources, agreement between the model and the 2005 monitored data is quite good; farther away, the model overestimates monitored concentrations. There is some discussion of the use of the Romberg formula to model the conversion of the primary NO_x emission to the regulated NO_2 concentration. The report also comments that the bulk (at least ⅔) of the local AQ impact from an aircraft in takeoff run originates from before the aircraft has left the ground. There is also some discussion of the modeling of odor nuisance from kerosene.	X			X			X						X	X	X	X								X	X					X
Fraport (2012) "Environmental Statement 2011 Including the Environmental Program until 2014, for the Organizations Fraport AG, N*ICE and FCS at Frankfurt Airport," published by Fraport AG, Frankfurt Airport Services Worldwide, Sustainability Management and Corporate Compliance 60547 Frankfurt am Main, Germany.	An annual environmental report for Fraport activities at Frankfurt Airport in Germany. The report is in English and data is up to and including 2010. A summary of air quality data is presented.	X					X	X						X		X	X									X					
Gatwick Airport Ltd (2013) "Gatwick Airport: Conditions of Use 2013/14 Including Airport Charges Effective 1st April 2013," Gatwick Airport Ltd, 5th Floor, Destination Place, South Terminal, Gatwick Airport, West Sussex, RH6 0NP, U.K.	Information issued by Gatwick Airport in the U.K., which includes details of its aircraft emissions charging scheme and charges.													X			X														

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German Federal Government (2012) "Gesundheitsgefährdung durch Schadstoffemissionen des Luftverkehrs. Antwort der Bundesregierung auf die Kleine Anfrage der Abgeordneten Sabine Stüber u.a. Bundestagsdrucksache 17/9630." ("Risks to Health from Toxic Emissions Arising from Air Transport. Reply of the Federal Government to the Short Questionnaire from the MPs Sabine Stüber et al., Federal Parliamentary Press, 17/9630").	A useful, brief, and clearly written response for non-technical readers. It stresses the importance of fine particulate as a delivery mechanism of toxins to the human body. Regarding toxicity, it refers to research work by DLR (Deutscher Luft- und Raumfahrt) and EASA (the European Aviation Safety Agency), without citing individual reports. There are some questions regarding fuel dumping, de-icing fluids, and CO emissions, which the government considers to be of minor relevance, though there may be environmental problems with benzotriazole in de-icing fluid. The response also references some studies of the external costs of air transport in Europe: the great bulk of this comes from climate change with only (supposedly) 1.58% from air pollution. The final question dealt with occupational disease among airport workers. Unsurprisingly, this mostly involved hearing impairment (59.5%), though skin diseases were also frequent (22.9%), and diseases related to asbestos exposure, sadly, still very common (10.9%). A list of AQ monitoring stations near German airports is provided.	X									X	X				X									X								
Graham A. and Raper D. (2003) "Air Quality in Airport Approaches: Impact of Emissions Entrained by Vortices in Aircraft Wakes," Manchester Metropolitan University, Manchester, U.K.	Exhaust from aeroplanes is entrained within a pair of wingtip vortices trailing in their wake. An aeroplane exerts a downward force on the air, and so the wake must descend. Exhaust pollutants may thus be conveyed to the ground close to airports far more effectively than through ambient atmospheric dispersion alone. A kinematic model of vortex-mediated pollutant transport has therefore been developed, harnessing results from dynamic models in the literature to estimate the size of the neglected term in ground-level concentrations. Model runs show that in (10 m) winds of 2–4 m s−1, nitrogen oxides (NO_x) in the vortex wakes of narrow-body turbofan aeroplanes may contribute 2 μg m−3 or more to mean diurnal ground-level concentrations, up to 2 km downwind of a busy runway.			X	X									X													X			X		
Graham, A., R. Jones, V. Tsanev, I. Mead, M. Bennett, S. Christie, M. Hilton, M. Walsh, D. Grainger, D. Peters, C. Ansell, R. Jones, and J. Lee, "Final Report: Aviation Emissions and their Impact on Air Quality," Omega Report, Manchester University, Feb 2009.	This document describes measurements at U.K. airports. While NO_x is the primary pollutant of concern, O_x, CO and CO_2 also are measured as well as meteorological parameters. Novel ideals of LIDAR and optical absorption spectroscopy are included.						X			X		X	X					X							X						

HAL (2011) "Heathrow Air Quality Strategy 2011–2020," Heathrow Airport Limited, London, U.K.	Describes the air quality situation at Heathrow, compliance with legal requirements and the airport strategy. An action plan is included for reducing emissions of NO_x and particulates. The document states that Heathrow Airport Ltd (HAL) recognizes that NO_2 concentrations are above EU limit values in some areas but it points out that HAL operations are not the only contributor to this. HAL says that it will work with other organizations to reduce emissions arising from road traffic and aircraft. There is a repeated message by HAL that poor air quality at Heathrow has a lot to do with non-airport-related road traffic and the general high level of local emissions. Also, that HAL is only directly responsible for some airport-related emissions, the others (e.g., road traffic and aircraft) are the direct responsibility of others and it can guide and influence these. HAL uses compliance, or not, with the EU limit values to decide if there is a public health impact. The focus is clearly on meeting the limits, which are not described in the strategy in terms of public health impacts.	X												X		X			X							X					
HAL (2013) "Heathrow Airport Limited Conditions of Use 2013/14 Including Airport Charges from 1 April 2013," Heathrow Airport Limited, The Compass Centre, Nelson Road, Hounslow, Middlesex TW6 2GW, U.K.	Information issued by Heathrow Airport in the U.K., which includes details of its aircraft emissions charging scheme and charges.													X			X														
Helmis C.G., Sgouros G., Flocas H., Schäfer K., Jahn C., Hoffman M., Heyder C.H., Kurtenbach R., Niedojadlo A., Wiesen P., O'Connor M., and Anamaterou E. (2009) "The role of Meteorology on the Background Air Quality at Athens International Airport," *Atmos Environ* 45, 5561–5571.	The authors undertook measurements of wind, mixing height, and air quality using remote sensing and surface-based single-point instrumentation. They found that under low background wind conditions, the development of local flows (sea and land breeze cells) over the greater area preserves high concentrations of air pollutants, which are mainly attributed to airport emissions, local activities and traffic. When the background flow is strong, the diurnal cycle of all concentrations was significantly reduced by more than 50%, due to advection and the subsequent mixing of the lower atmosphere. The calculated Hilbert spectra of the main pollutants showed that meteorology plays a prescriptive role on the evolution of air pollutants, determining the influence of local-scale characteristics at each monitoring station.							X						X		X		X								X			X		
Herndon, Scott, et al. (2012) *ACRP Report 63: Measurement of Gaseous HAP Emissions from Idling Aircraft as a Function of Engine and Ambient Conditions,* Transportation Research Board (TRB).	Discusses the work conducted in measuring aircraft emissions during idling conditions (lower than the standard ICAO 7% power). Provides a method to predict emissions indices based on fuel flow and ambient temperature for a representative engine.						X										X			X											

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Hoolhorst A., Beukenhorst O., and Brok P. (2009) "Options to Reduce Aircraft Emissions Impact in the Airport Environment," ECATS deliverable D5.c.31.	The authors assessed a range of options to reduce local air quality pollutants from aircraft and related emissions. Road traffic emissions are excluded. Technical, operational, and policy measures are included.													X		X	X			X	X	X									
Hoolhorst A., Erbrink J.J., and Scholten R.D.A. (2007) "Luchtkwaliteit rond luchthaven Schiphol Voor het MER korte termijn 'Verder werken aan de toekomst van Schiphol en de regio," National Aerospace Laboratory report no. NLR-CR-2007-361.	Annex B.2. Air quality around Schiphol airport. For the short-term environmental impact assessment: "Further Work on the Future of Schiphol and the Region." Extensive air quality modeling for the Schiphol area is reported. The authors use the KEMA STACKS model for a 2007 reference scenario and for two scenarios in 2010 allowing for passenger growth from 437 kPax to 493 kPax. In no scenario are the Dutch norms for PM_{10} or benzene exceeded. There could well be exceedences of the norm for NO_2, however, and this would partly arise from airport activities. A sensitivity analysis is carried out to investigate the effects of 10 possible measures to reduce the airport's impact; it appears that these could jointly be sufficiently effective. The most effective interventions seem to be (p. 38) the use of external sources of electricity and cabin air at the aircraft parking points (i.e., instead of using auxiliary power units) and the deployment of electrically powered service vehicles on the apron.				X									X		X	X		X	X	X	X	X	X	X	X						
Hoolhorst A., Erbrink J.J., Kokmeijer E., and Scholten R.D.A. (2008) "Luchtkwaliteit rond luchthaven Schiphol Verfijningsberekeningen voor het MER korte termijn 'Verder werken aan de toekomst van Schiphol en de regio," National Aerospace Laboratory report no. NLR-CR-2008-241.	Air quality around Schiphol airport. More detailed calculations for the short-term environmental impact assessment: "Further Work on the Future of Schiphol and the Region." This report describes more detailed concentrations than carried out by Hoolhorst et al. (2007). It also describes the model parameters in some detail. The two scenarios modeled assumed 447 kPax and 485 kPax. Potential layouts of ground source power were investigated. These calculations confirm the effectiveness of ground source power in reducing NO_2 concentrations on Schiphol Plaza.				X									X		X	X		X	X	X	X	X	X	X	X						
Hsu H.H., Adamkiewicz G., Houseman E.A., Vallarino J., Melly S.J., Wayson R.L., Spengler J.D., Levy J.I. "The Relationship between Aviation Activities and Ultrafine Particulate Matter Concentrations near a Mid-Sized Airport," *Atmos Environ* 50:328–337 (2012).	Monitored UFP data near T.F. Green Airport were used to develop regression models. The results showed relatively small contributions from the airport, mainly because of relatively low aircraft operations.			X				X								X			X								X				

Hsu H.H., Adamkiewicz G., Houseman E.A., Vallarino J., Melly S.J., Wayson R.L., Spengler J.D., Levy J.I. "The Relationship between Aviation Activities and Ultrafine Particulate Matter Concentrations near a Mid-Sized Airport," *Atmos Environ* 50: 328–337 (2012).	UFP concentrations were monitored with 1-minute resolution at 4 monitoring sites surrounding T.F. Green Airport in 2007 and 2008. Regression models were developed to predict concentrations as a function of LTO activity, meteorology, and other factors. To better pinpoint the timing in the LTO cycle most contributing to elevated concentrations, a lag model used considered terms between 5 minutes before and 5 minutes after the departure or arrival.				x			x								x				x							x				
Hsu H.H., Adamkiewicz G., Houseman E.A., Zarubiak D., Spengler J.D., Levy J.I. "Contributions of Aircraft Arrivals and Departures to Ultrafine Particle Counts Near Los Angeles International Airport," *Sci Tot Environ* 444:347–355 (2013).	Aircraft flight activity and near-field continuous UFP concentrations (≥ 6 nm) were measured at five monitoring sites over a 42-day field campaign at Los Angeles International Airport (LAX).				x			x								x				x							x				
Hsu H.H., Adamkiewicz G., Houseman E.A., Zarubiak D., Spengler J.D., Levy J.I. Contributions of Aircraft Arrivals and Departures to Ultrafine Particle Counts Near Los Angeles International Airport," *Sci Tot Environ* 444:347–355 (2013).	Monitored UFP data were regressed with aircraft activities at LAX. The results showed significant correlation and indicate significant contributions from aircraft.			X		X		X								X				X							X				
Hu S., Fruin S., Kozawa K., Mara S., Winer A.M., and Paulson S.E. (2009) "Aircraft Emission Impacts in a Neighborhood Adjacent to a General Aviation Airport in Southern California," *Environ Sci Technol* 43, 8039–8045.	The authors measured a range of air pollutants near a general aviation airport (Santa Monica Airport, CA) for private planes and corporate jets in the spring and summer of 2008. They found that emissions of ultrafine particles were significantly elevated when compared to background pollution levels. Levels of these pollutants were up to 10 times higher at a downwind distance from the airport equal to about one football field and as much as 2.5 times higher at distance equal to about six football fields. The study suggests that, "current land-use practices of reduced buffer areas around local airports may be insufficient."							X								X												X			
Hubbell, Bryan. 2001. *Evaluating the Health Benefits of Air Pollution Reductions: Recent Developments at the U.S. EPA*. U.S. EPA, Office of Air Quality Planning and Standards, Innovative Strategies and Economics Group.	An overview-type paper that describes the general monetization of air quality impacts from various industries, especially highway and stationary sources. Discusses the importance of epidemiologists and economists to work together in monetizing the benefits of air pollution regulation.								X	X		X				X	X													

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ICAO (2011) "Air Quality Guidance Manual." International Civil Aviation Organization, Montreal, Canada.	The industry guidance document for local air quality management at airports covers the preparation of an emissions inventory, dispersion modeling, measurements and mitigation options. Interestingly, the guidance sets out what would be required to produce an emissions inventory under different approaches—simple, advanced, and sophisticated. The report also sets the context for the guidance given, such as giving information on regulatory drivers and why an airport may choose to manage air quality.		X	X	X														X												
ICAO, "Airport Air Quality Manual," Doc. 9889, International Civil Aviation Organization, 2011.	Best practices for air quality measurements at airports are discussed in Chapter 6 of this report. Three appendices also discuss methods and references.	X		X				X						X		X			X							X					
Ionel I., Nicolae D., Popescu F., Talianu C., Belegante L., and Apostol G. (2009) "Measuring Air Pollutants in an International Romania Airport with Point and Open Path Instruments," *Rom Journ Phys* 56, 507–519.	Monitoring results for VOCs, SO_2, NO_x, NO_2, PM_{10}, $PM_{2.5}$, CO and O_3 over a 3-day period are reported in this paper.						X	X						X		X	X	X								X					
Ionel, I., D. Nicolae, F. Popescu, C. Talianu, L. Belegante, and G. Aposol, "Measuring Air Pollutants in an International Romania Airport with Point and Open Path Instruments," *Rom Journ Phys*, Vol 56, Nos. 3–4, pp. 507–519, Bucharest, 2011.	Two monitoring stations were used near the apron to monitor VOCs, fine particulate matter ($PM_{2.5}$ and PM_{10}), NO, NO_2 and NO_x, CO, O_3, SO_2, and other gases for a 3-day continuous measurement project. Meteorology was also reported.		X	X				X						X		X	X		X									X				
Jamin Koo, Qiqi Wang, Daven K. Henze, Ian A. Waitz, Steven R.H. Barrett, 2013. "Spatial Sensitivities of Human Health Risk to Aircraft Emissions," *Atmos Environ* 71 (2013) 140–147. DOI: 10.1016/j.atmosenv.2013.01.025.	The GEOS-Chem global chemistry model was used to conduct a study to assess premature death from exposure to various pollutants emitted from aircraft. The study is global and provides sensitivities to pollutants by location.				X					X				X		X	X			X											
Jefferson T. and Ferroni E. (2009) "The Spanish Flu through the BMJ's Eyes: Observations and Unanswered Questions," *British Medical Journal*, 339, 1397–1399.	Included in this literature review as an example of the caution that should be applied in interpreting limit values for individual pollutants because humans compete for survival in a complex ecology. At the time of the Spanish flu epidemic, it was noted that exposure of workers to NO_2 appeared to reduce their susceptibility to influenza. NO_2 is certainly toxic to humans, but perhaps it is even more toxic to airborne viruses. (Gregor 1919, quoted by Jefferson and Ferroni 2009.)										X			X																		
Kim, Brian, et al. (2012). *ACRP Report 71: Guidance for Quantifying the Contribution of Airport Emissions to Local Air Quality*. Transportation Research Board (TRB).	Provides an overview of previous airport air quality studies. Presents a framework to include measurements with modeling to comprehensively understand airport contributions to local air quality. The measurement work provides indications of ambient concentration contributions from the airport as well as daily and seasonal trends.			X	X			X					X	X		X	X	X	X						X	X			X	X	

Kinsey, John S., et al. (2010). Physical Characterization of the Fine Particle Emissions from Commercial Aircraft Engines during the Aircraft Particle Emissions eXperiement (APEX) 1-3. *Atmos Environ* 44 (2010) 2137–2156.	Describes the work conducted during the three APEX 1-3 measurement campaigns to collect PM data, and their derivation of EI values. The size distributions of the primary modes were lognormal with minor accumulation modes at high power.						X									X				X											
Klapmeyer M.E. and Marr L.C. (2012). CO_2, NO_x, and particle emissions from aircraft and support activities at a regional airport, *Environmental Science and Technology* 46(20), 10974–10981.	CO_2, NO_x, and PM ambient measurements were performed next to an airport. Results showed meteorological factors affecting CO_2 and NO_x while PM was mainly affected by aircraft operations.							X						X		X			X									X			
KM Chng Environmental, Inc. 1999. *Findings Regarding Source Contribution to Soot Deposition, O'Hare International Airport and Surrounding Communities.* Burlington, MA.	Due to concerns from the local community, a study was conducted to determine the soot (PM) contributions from O'Hare International Airport. Using chemical fingerprinting techniques, samples from several sites around the airport showed that the soot did not resemble characteristics of jet exhaust but rather those of other urban sources including motor vehicles.					X	X	X								X				X					X	X					
Langridge J.M., Gustafsson R.J., Griffiths P.T., Cox R.A., Lambert R.M., and Jones R.L. (2009) "Solar Driven Nitrous Acid Formation on Building Material Surfaces Containing Titanium Dioxide: A Concern for Air Quality in Urban Areas?" *Atmos Environ* 43, 5128–5131.	The use of external building surfaces coated with titanium dioxide has been put forward as a method for removing NO_2 from the ambient air. It has been proposed at several European airports. This paper, while accepting that this occurs, challenges the concept because of the commensurate formation of gaseous nitrous acid.													X																	
Lee G. (2012) "Development of Techniques for Rapidly Assessing the Local Air Quality Impacts of Airports," Submitted to the Department of Aeronautics and Astronautics in Partial Fulfillment of the Requirements for the Degree of Master of Science in Aeronautics and Astronautics at the Massachusetts Institute of Technology, USA.	A M.Sc. thesis. In summary, it tests a methodology for carrying out dispersion modeling of $PM_{2.5}$ emissions for aircraft at a large number of airports. The approach taken using RDMS was found to over-predict AERMOD produced concentrations by ~5% but reduces modeling time by ~95%. The study also estimated early deaths as a result of the airport emissions.			X	X						X		X			X				X											
Levy J.I., Woody M., Baek B.H., Shankar U., Arunachalam S. "Current and Future Particulate Matter-Related Mortality Risks in the United States from Aviation Emissions During Landing and Takeoff. *Risk Anal* 32: 237–249 (2012).	Bottom-up model linking CMAQ with concentration-response functions for PM mortality in the U.S. Emphasis on emissions in 2005 and 2025 from 99 airports around the U.S., considering separately influence of emissions, population growth and aging, and changing non-aviation concentrations on the trajectory of health risks.				x	x				x	x					x		x		x											

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Levy, Jonathan, et al. (Oct 2008) "High-Priority Compounds Associated with Aircraft Emissions," PARTNER Project 11, final report on subtask: Health Risk Prioritization of Aircraft Emissions Related Air Pollutants.	Report correctly points out that previous, similar papers have reported high-priority compounds based on emissions and toxicity alone without taking into account fate and transport (population exposure). Focused on total population health risk rather than individual health risk. Consideration for the spatial domain and differences in airports (e.g., different locations, seasons, etc.) also were taken into account. AERMOD and CMAQ were used for the dispersion modeling. Several criteria pollutants and HAPs species were selected as a starting point. The toxicity determinations of each pollutant are presented. Ultrafine PM risks outweigh those from HAPs, but there are high uncertainties. Among HAPs risks, Formaldehyde dominates. Although HAPs risk is less than PM, respiratory impacts from HAPs are a concern, especially with relatively higher exposure to acrolein.				X	X				X	X					X	X		X													
Lobo, Prem et al. (Jul 2011) SAE E31 Methodology Development and Associated PM Emissions Characteristics of Aircraft APUs Burning Conventional and Alternative Aviation Fuels. PARTNER Project 34 final report.	The purpose of the project was to test the SAE E31 measurement methodology and to gather further APU emissions data. Measurements were conducted at the University of Sheffield using a mounted APU. PM size distributions and non-volatile fractions were obtained. Emissions from biodiesel were found to be higher than those for Jet A and natural gas derived Fisher Tropsch fuel.						X									X					X											
Lobo, Prem, et al. (Oct 31, 2007). "The Development of Exhaust Speciation Profiles for Commercial Jet Engines." Final Report. JETS APEX2. California Air Resources Board and the California Environmental Protection Agency.	The report presents aircraft emissions data collected from a measurement campaign conducted at Oakland International Airport. The pollutants measured included criteria pollutants, CO, and hydrocarbon species at various power settings. The development of the speciation profiles was the primary goal. PM size distributions were found to be lognormal. Gas-to-particle conversion was observed with increasing distance from the exhaust exit plane.						X							X		X	X			X												
Lobo, Prem et al. (2008). Delta-Atlanta Hartsfield (UNA-UNA) Study. PARTNER Report No. PARTNER COE-2008-002.	Describes the engine emissions measurements conducted at Atlanta Hartsfield-Jackson International Airport (previously known as UNA-UNA study). Various sensitivities and trends are discussed (e.g., emissions by engine type and power setting). Mainly focused on better understanding emissions by engine type.						X									X					X						X					

London Assembly (2012) "Plane Speaking, Air and Noise Pollution around a Growing Heathrow Airport," London Assembly Environment Committee. Published by Greater London Authority, City Hall, London, U.K.	The Committee comprises a small number of cross-party MPs. The report doesn't contain any new work but does provide a commentary on the air quality impacts of Heathrow Airport and makes recommendations. The report isn't concerned with the debate about a third runway but about Heathrow as it grows from a current passenger throughput of 69 million per year to a potential 90–95 million once the current terminal developments are completed. This is without a new runway and any significant increase in ATMs, as Heathrow is near its movement capacity limit, but is a result of larger aircraft. Recommendations include Heathrow Airport Limited increasing the number of greener, quieter aircraft; ensuring on-site vehicles meet the latest EU emissions standards; and reducing airport-related road traffic. The report highlights a range of issues that will need to be tackled to improve surface access to the airport and to encourage passengers and employees to use public transport more for their journeys to and from the airport.	X																								X					
London City Airport (2012) "Air Quality Action Plan 2012–2015," London City Airport, City Aviation House, Royal Docks, London, U.K.	This action plan sets out 19 specific mitigation measures to reduce airport-related air quality emissions. The document also sets out the broader context to these measures and includes information on the Airport's air quality measurement program. The number of odor complaints since 2000 is reported.	X																									X				
London Gatwick Airport (2006) "Gatwick Emission Inventory 2002/3 (Public Access Version)," London Gatwick Airport, 5th Floor, Destination Place, South Terminal, Gatwick Airport, West Sussex, RH6 0NP, U.K.	An airport emissions inventory for Gatwick Airport.				X									X		X			X							X					
MA (2012) "Air Quality Community Information Sheet," Manchester Airport plc, Manchester, U.K.	Several page, non-technical description of the air quality issue surrounding Manchester Airport. Monitored concentrations of NO_2 are presented for the last 15 years. Background information on odors and fuel jettisoning is also given.	X												X		X										X					X
Maurice, L. and David S. Lee (2007). *Assessing Current Scientific Knowledge, Uncertainties, and Gaps in Quantifying Climate Change, Noise, and Air Quality Aviation Impacts.* Final Report of the International Civil Aviation Organization (ICAO) Committee on Aviation and Environmental Protection (CAEP) Workshop. Montreal, Canada. Oct 29–Nov 2.	Provides an overview of the views on emissions/air quality (as well as other environmental concerns) by members of ICAO/CAEP—thus providing an overall international view. The paper acknowledges weaknesses in current understanding of PM and HAPs species emissions. Also, emissions inventories by themselves may satisfy certain regulatory requirements, but they need to be tied to dispersion modeling to provide a direct link to health assessments.	X	X	X										X		X	X														

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McGulley, Frick and Gilman, Inc. 1995. *Final Report: Air Quality Survey, Seattle-Tacoma International Airport.* Port of Seattle, WA.	An air quality measurement study was conducted in the vicinity of Seattle-Tacoma International (Sea-Tac) Airport. Ambient levels of various toxic organic compounds and carbon monoxide were measured. Comparisons to other urban areas were made and the resulting concentrations were found not to be similar.							X						X			X		X					X		X			X		
Milieu- en Natuurplanbureau (2006) "De luchtkwaliteit rond Schiphol. MNP-bevindingen over het onderzoek naar de uitstoot van het vliegverkeer en de luchtkwaliteit rond Schiphol door ADECS Airinfra BV in het kader van de Evaluatie Schipholbeleid," Report No. 500133001/2006, Milieu- en Natuurplanbureau, PB 303, 3720 AH Bilthoven, Netherlands.	Air quality around Schiphol. MNP's interpretation of the investigation by ADECS Airinfra BV of the emissions of air transport and of air quality around Schiphol within the framework of policy evaluation for Schiphol). This document criticizes ADS (2005). It reckons it is too optimistic. The document includes some interesting sensitivity analyses of NO_2 concentrations on the effective emissions height (raising this from 5 m to 15 m halves the modeled concentrations) and on the division between modes (~55% comes from take-off and most of the rest from idling). It complains that the ADS report does not list these sensitive parameters.	X		X	X									X		X	X			X						X	X					
Mitchell, Kenneth L. (2006). "Airports and Air Toxics," Airport Noise & Air Quality Symposium. University of California, Berkeley. Palm Springs, CA.	An overview presentation that provides coverage of airport contributions to air quality, especially focusing on PM and HAPs. Indicates the need for better measured data and better quantification methods/models.	X		X												X	X															
MNPCA, "Update on Air Monitoring Near the Minneapolis-St. Paul International Airport," Minnesota Pollution Control Agency, May 2006.	Starting in 2005, the Minnesota Pollution Control Agency (MPCA) added air toxic and fine particulate air monitoring sites in residential neighborhoods near the Minneapolis-St. Paul International Airport (MSP). This document reports the MPCA analysis of the first six months of air toxics and fine particulate data at the sites. The resulting air toxics concentrations were compared to other Twin Cities' monitoring locations as well as inhalation health benchmarks provided by the Environmental Protection Agency and the Minnesota Department of Health. The results of four locations are reported for $PM_{2.5}$, BC, and five HAPs.			X				X	X		X		X				X		X								X				X	X
Municipality of Anchorage, *Ted Stevens Anchorage International Airport Air Toxics Monitoring Study,* Environmental Services Division, Municipality of Anchorage, Apr 2003.	Ten monitoring stations were used to characterize the HAPs around the airport. While 34 compounds were attempted to be measured, only 8 were above reporting limits and included (benzene, toluene, ethylbenzene, m,p-xylene, o-xylene, CO, ethane, and ethyne). Results and methodology is included in the report.			X				X			X			X			X	X	X									X		X	X	

NASA (2006) "Aircraft Particle Emissions Experiment (APEX)."	This study ran an aircraft engine at a range of power settings and with different sulphur content fuels. Measurements were taken of non-volatile and volatile particles at varying distances from the engine exhaust. Gaseous pollutants, NO_x and NO_2 and hydrocarbons also were measured. The purpose of the measurements was to inform future emissions indices.						X									X				X											
NETCEN (2006) "Air Quality Modelling for Gatwick Airport 2002/03," National Environmental Technology Centre, AEA, Harwell, U.K.	A dispersion modeling study carried out for using a previously produced emissions inventory for Gatwick Airport. Contour maps are presented for NO_2 and also for total emissions and airport only emissions for NOx and PM_{10}.				X									X		X			X							X					
Onasch, T.B., J.T. Jayne, S. Herndon, D.R. Worsnop, R.C. Miake-Lye, I.P. Mortimer, and B.E. Anderson (2009). *Chemical Properties of Aircraft Engine Particulate Exhaust Emissions. Journal of Propulsion and Power*, 25(5): 1121–37.	The chemical properties of the particulate exhaust emissions from an in-use commercial aircraft engine were measured and characterized in April 2004, as part of the Aircraft Particle Emissions eXperiment (APEX) using a suite of instruments. The test engine was a CFM56-2-C1 and was sampled at 11 different throttle settings, using 3 fuel compositions, and at 3 sample distances. The differences in particulate matter emission number, size, mass, and chemical composition are reported.																															
Owen B. and Paling C. (2005) "Air Quality Assessment 2004 and 2019 Bristol International Airport." Report prepared by Centre for Aviation, Transport and the Environment, Manchester Metropolitan University, Manchester, U.K.	This study looks at the local air quality impacts of operations at Bristol International Airport. The emissions of key pollutants to the air have been estimated and then the dispersion of these pollutants has been plotted to determine the resultant ground level pollutant concentrations. Emission estimates (inventories) for Bristol International Airport have been constructed for the years 2004 and 2019. This report presents the methods and data sources used and the results of the air quality impacts. Aircraft represent the single largest source of emissions of NO_x, CO, HCs and PM_{10} at the airport. There were no major sources of SO_2 at the airport, with emissions from aircraft being low. All estimated air pollution concentrations indicate that there are no expected exceedences of air quality standards within the local airport area for 2004 for nitrogen dioxide or particulate matter. However, for 2019 exceedences of the annual average nitrogen dioxide standard are predicted for a small area within the airport boundary. Levels of nitrogen dioxide are predicted to be well below the annual average standard outside the airport perimeter and at any residential properties.				X									X		X	X		X									X				

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Passchier, W., Knottnerus, A., Albering, H., and Walda, I. Public Health Impact of Large Airports. *Reviews on Environmental Health*, 2000, Vol 15, No. 1-2, pp 83–96, Health Council of the Netherlands.	This study is a discussion of the probable influences on public health in the vicinity of airports. There are more factors to consider in addition to air pollution from aircraft, "An airport can operate only with an infrastructure of roads and railways, and with related business for freight handling lodging, catering, and so on, nearby." The dominant environmental factors are air pollution, noise, accidents, soil and water pollution, and the appearance of the environment. Thus, the environmental factors in an airport operations system affect the population cumulatively.	X								X															X							
Penn, S.L., S. Arunachalam, and J.I. Levy, 2012. "The Effects of Airport Activity on Black Carbon Concentrations Near Runways at Los Angeles International Airport." Presented at the 22nd Annual Meeting of Exposure Science, Seattle, WA, Oct 28–Nov 1, 2012.	Black carbon (BC) monitors were used to determine BC concentrations at various locations around a runway. The monitored data were regressed based on location and aircraft activities. Significant correlation with aircraft departures were found.			X				X								X				X						X						
Peters D., Grainger D., and Smith A. (2009) "Local Air Quality Characterising Near Surface Aircraft PM." Authors from University of Oxford, published by OMEGA project, Manchester Metropolitan University, Manchester, U.K.	The authors describe how they have created "SPARCLE," an instrument suitable for deployment in an airport environment that is capable of discriminating different types of particulate matter pollution—a "fingerprint." They show how this new instrument has been tested and shown to have the ability to distinguish between steel brake particles and tire particles, over the $PM_{2.5}$ and PM_{10} range. They state that such a tool will be very useful for air quality assessments at airports.			X				X								X																	
Petzold A., Hotes A., and Radig A. (2008) "Measurement of Soot Particles with State-of-the-Art Methods as a Basis for a New Certification Approach," Deutsches Zentrum für Luft- und Raumfahrt Institut für Physik der Atmosphäre Oberpfaffenhofen 82234 Wessling, Germany and AVISTRA GmbH Reinhardtstr. 58 10117 Berlin, Germany.	The authors have carried out a literature review and desk-based study to investigate the concept of a limit value for aircraft engines at certification, along the lines of those for other pollutants. They draw a number of conclusions about how this may be done, such as, limit value would have to be related to the rated thrust in order to match the concept of limiting values for gaseous emissions from aircraft engines, agreement is required whether any limiting value has to take fuel composition (sulphur content, bio fuels) into account since fuel properties may influence engine emission properties, and whether the limit value applies to mass and/or number of particles. Combining the effects of fuel efficiency improvement and increase in air traffic numbers, any limiting value for particulate matter emissions has to aim at a reduction of particle emissions growth to less than 65% over the next 20 years; otherwise this limiting value will be without impact.		X	X												X				X													

Pope III C.A. and Dockery D.W. (2006) "Health Effects of Fine Particulate Air Pollution: Lines that Connect," *J Air & Waste Manage Assoc* 56, 709–742.	This paper is a review that focuses on six substantial lines of research that have been pursued since 1997 that have helped elucidate the understanding about the effects of PM on human health. The review is long and contains a substantial amount of information on particulate matter and public health.	X									X					X																
Public Health Impact of Large Airports—Report. Health Council of the Netherlands: Committee on the Health Impact of Large Airports. The Hague: Health Council of the Netherlands (1999) 1999/14E. ISBN:90-5549-279-5.	A comprehensive report (1999) written in response to a request from the Dutch Government's Minister of Health, Minister of Transport, and Minister of the Environment. The report focuses directly on the public health impact of local changes in environmental factors including quality of life close to airports at distances up to 10 km and includes activities of businesses attracted to the airport region. The health impact of several factors are considered: (1) air pollution, (2) noise, (3) accidents, (4) soil and water pollution at the airport, (5) importation of infectious diseases, (6) appearance of the environment, (7) occupational health risks at the airport. The conclusion is that airport operations have the potential to cause clinically observable disease in the long-term although definitive assessments are lacking. The committee recommends that airport developments should be assessed on their public health consequences in an integrated manner. Over 280 references are cited. The report recognizes that contributions from aircraft, airport operations, and road traffic are intricately mixed, and air pollutant levels around large airports are similar to those in urbanized areas and are to a large extent determined by road traffic emissions. At such concentrations public health effects are to be expected. Also, there is evidence that episodes of air pollution can cause short-term effects like an increased mortality rate and an increased frequency of hospital admissions due to acute respiratory and cardiovascular morbidity. Although it is plausible that air pollutants contribute in a modest way to cancer incidence, there is no evidence for specific contributions from local sources in an airport operations system. Sufficient evidence exists for odor-induced annoyance. The study summarizes the health effects and assesses how good the evidence is on a three-point scale.	X											X																				

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Puente-Lelievre (2009) "La Qualité de l'air en Milieu Aéroportuaire: étude sur l'aéroport Paris-Charles-De-Gaulle," Thèse de Doctorat, Université de Paris XII.	Air quality in an airport environment: study of Paris-CDG airport. This is a modeling and monitoring study of NO_x, O_3 and hydrocarbons around Paris-CDG airport. The model was used to simulate the regional impact of the airport on a summer O_3 event and a winter NO_2 event: it struggled with the latter since the spatial resolution was rather coarse and the winds were light. At a downwind site, the airport perhaps contributes 15–20 µg m-3 to short-term NO_x concentrations. Measured airside concentrations of HCs showed concentrations of saturated HCs at 5–7 µg m-3 and of aromatics at 10–15 µg m-3. This is similar to what is seen as urban background. Being a doctoral thesis, the document includes an extensive bibliography of air quality around airports, but associated with measuring and modeling air quality, rather than with health effects.				X		X	X						X			X		X	X	X	X	X	X	X	X				X	
Ratliff, Gayle, et al. (2009) "Aircraft Impacts on Local and Regional Air Quality in the United States," PARTNER Project 15, final report. Oct.	A system-level analysis of U.S. airports was conducted using the top 325 airports for nonattainment areas. Emissions from non-aviation sources were obtained from the EPA's National Emissions Inventory, and CMAQ was used for the dispersion modeling work. The overall results generally showed less than 1% concentration.				X					X				X		X				X						X	X	X			
RIDEM, "Characterization of Ambient Air Toxics in Neighborhoods Abutting T.F. Green Airport and Comparison Sites: Final Report," Rhode Island Department of Environmental Management, Apr 2008.	This report describes sampling methods and results performed between April 2005 and August 2006 by RIDEM. HAPs, associated with aircraft operations were monitored and concentrations reported. Toxics reported to be elevated in local neighborhoods were benzene, 1,3-butadiene, toluene, naphthalene, formaldehyde, acetaldehyde, acrolein, polycyclic aromatic hydrocarbons (PAHs), diesel particulate and fine particles (PM2.5). Due to methodological limitations, PAHs, acrolein and naphthalene were not measured in this study. Thirty different volatile organic compounds (VOC) associated with mobile and stationary sources were successfully monitored.	X						X									X	X	X									X			X	X
SAL (2010) "Creating an Atmosphere for Change, Stansted Air Quality Strategy 2010–2015," Stansted Airport Limited, Essex, U.K.	An air quality strategy document for London Stansted Airport for the period 2010–2015. It is typical of such documents and sets out the context for the strategy—about Stansted Airport and its development, the regulatory context, existing air quality measurements data and the results of an emissions inventory and dispersion modeling exercise. It then goes on to describe the broader strategy before giving the specific actions and timescales. Performance indicators are also presented.	X																	X								X					

SCAQMD, "General Aviation Airport Air Monitoring Study: Follow-Up Monitoring Campaign at the Santa Monica Airport, Final Report," South Coast Air Quality Management District, Apr 2011.	Between April 2006 and March 2007, the South Coast Air Quality Management District (AQMD) conducted a field study at the Santa Monica Municipal Airport (SMO) to characterize the impact of aircraft emissions and airport activities on the surrounding communities. Ambient concentrations of total suspended particulate lead (from the leaded fuel used in piston-driven aircraft) and ultrafine particles (UFP) were measured. This report took advantage of a temporary suspension of all airport activities due to construction and measured the ambient concentrations of combustion-related pollutants including UFP, black carbon (BC) and volatile organic compounds (VOC) before, during, and after curtailment of aircraft activities. Methods and results are presented.							X			X		X	X		X	X		X					X			X				X
Schlenker W., Walker W.R. "Airports, Air Pollution, and Contemporaneous Health," NBER Working Papers Series, Working Paper 17684 http://www.nber.org/papers/w17684, Dec 2011.	An econometric investigation that attempts to exploit the fact that network delays originating from large airports on the East Coast can increase runway congestion in California, with corresponding influence on local air pollution, without significant confounding from other local events.				x				x					x					x												
Schurmann G., Schafer K., Jahn C., Hoffmann H., Bauerfeind M., Fleuti E., and Rappengluck B. (2007) "The Impact of NO_x, CO, and VOC Emissions on the Air Quality of Zurich Airport," *Atmos. Environ* 41, 103–118, 2007.	Measurements of NO, NO_2, CO, and CO_2 were conducted with open path devices at Zurich Airport, Switzerland, to determine real in-use emission indices of aircraft during idling. Additionally, air samples were taken to analyze the mixing ratios of volatile organic compounds (VOC). Temporal variations of VOC mixing ratios on the airport were investigated, while other air samples were taken in the plume of an aircraft during engine ignition. A number of conclusions were drawn from the study. The authors also noted differences from emission indices published in the emission database of the International Civil Aviation Organization with their measurements.						X	X						X			X									X					
Sequeira C.J. (2008). "Relationships between Emissions-Related Aviation Regulations and Human Health." Presented at the 10th PARTNER Advisory Board Meeting. Ottawa, CA. Mar 15.	A study was conducted using 325 U.S. airports to determine potential stringency strategies to reduce health impacts. Emissions were modeled using EDMS and obtained from the EPA's NEI. Dispersion modeling was accomplished using CMAQ. Health cost-benefits were valued using BenMap. Reductions in NO_x emissions and fuel sulfur would help to reduce U.S.-wide premature mortality by 40%.				X					X				X		X	X														

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Sivertsen B (2003) "Air Pollution Impact Assessment for Sharm El-Sheikh Airport," report prepared by the Engineering Consultants Group (ECG) for the Ministry of State for Environmental Affairs, Egypt and Norwegian Institute for Air Research.	Part of an Environmental Impact Assessment (EIA) related to air pollution emitted from the different sources at the proposed Sharm El-Sheikh International Airport. Based on measurements and modeling of ground-level concentrations due to emissions from road traffic and aircraft operations. The study found that concentrations are normally well below the air quality limit values given in Law No. 4 of Egypt and by the World Health Organization guideline values. The most "critical" case is the maximum 1-hour average NO_2 concentration in the unloading and parking zone at the terminal building. The maximum concentration may reach 75% of the air quality limit for Egypt, and is higher than the WHO guideline. The main air pollution problem in the background atmosphere is suspended particles originating mainly from natural wind-blown dust.				X									X		X	X			X					X			X			
Society of Automotive Engineers (SAE) (2009). "Procedures for the Calculation of Aircraft Emissions." SAE AIR 5715. July.	Provides guidance on modeling aircraft emissions and performance. Emissions models include the ICAO standard method, BFFM2, P3T3, the DLR Method, FOA, etc. Some uncertainty assessments showing potential errors and comparisons of the methods are presented.			X	X									X		X	X			X										
South Coast Air Quality Management District (SCAQMD) (2010). *General Aviation Airport Air Monitoring Study, Final Report.* USEPA. Aug.	Measurement study to characterize concentration levels around VNY and SMO. These are very busy GA airports with Van Nuys having about 450,000 annual LTOs. The document describes the monitoring and provides key findings of concentrations of lead, VOCs, PM, and CO. Lead concentrations were 2 to 9 times higher than background, but generally lower than the 150 ng/m3 standard. Lead build-up on nearby soil is a concern. $PM_{2.5}$, EC, and OC were similar or below those of background. UFP levels were significantly higher than background (600 times). CO from airport was not shown to be significant. HAPs were higher in the winter than in the summer.						X							X	X	X	X											X			

Stettler M.E.J, Eastham S., Barrett S.R.H. (2011) "Air Quality and Public Health Impacts of U.K. Airports. Part I: Emissions," *Atmos. Environ.* 45, 5415–5424. 2011	This study is an emissions inventory of U.K. airports (95% of U.K. passengers) for the local air quality pollutants (NO_2, CO, SO_2, HC, $PM_{2.5}$) and CO_2 for the year 2005. The authors have calculated emissions from three sources at each airport: (1) aircraft landing and takeoff (LTO) operations, (2) APUs, and (3) airside support equipment (or GSE). Uncertainties are quantified, based on an analysis of data from aircraft emissions measurement campaigns and analyses of aircraft operations. The authors have reviewed previous methodologies and emissions measurement studies to inform their calculations, e.g., the First-Order Approximation (FOA3) method, currently the standard approach used to estimate particulate matter emissions from aircraft, was found to be over an order of magnitude different compared to measurements. Modified methods to approximate organic carbon emissions, arising from incomplete combustion and lubrication oil, and black carbon are used. The study makes assumptions on times in mode for each airfield. The calculated emissions from this study are used as the basis for Part II of this work (Yim et al., 2013).				X									X		X	X			X						X	X	X			
Steve H.L. Yim, S.H.L.; Barrett, S.R.H., "Public Health Impacts of Combustion Emissions in the United Kingdom," *Environ Sci Tech* 46, 4291−4296. 2012.	This study quantifies the number of early deaths per year in the U.K. from $PM_{2.5}$ exposure from combustion emissions. Included within combustion emissions is aviation within a category of "other transport." The same research team at the Massachusetts Institute of Technology (MIT) has completed two other studies that look specifically at U.K. aviation emissions (Stettler 2011 and Yim 2013).				X						X					X															
SUVA (2011) "Grenzwerte am Arbeitsplatz, 2011," Schweizerische Unfallversicherungsanstalt. "Limit Values at the Workplace," 2011, Swiss Accident Insurance Institute.	This does what it says on the tin, being a list of short-term and long-term occupational exposure limits for a wide range of chemicals. In format, it is very similar to the equivalent British EH40. Besides the quantitative limit values, the document includes useful explanatory material regarding aspects of toxicity and other hazards to health.		X								X			X	X	X	X														
Tarrasón L., Jonson J.E., Berntsen T.K., Rypdal K. *Study on Air Quality Impacts of Non-LTO Emissions from Aviation*, final report to the European Commission under contract B4-3040/2002/343093/MAR/C1. 2004.	Literature review and modeling study to determine the contribution of LTO emissions vs. cruise emissions to air quality in Europe.				x	x								x		x	x	x		x											

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Tesseraux I. (2004) "Risk factors of Jet Fuel Combustion Products." *Toxicology Letters,* 149, 295–300.	A publication looking at the speciation of HC emissions in jet engine exhausts and comparing them with what is typically seen in diesel engine emissions. Nothing distinctive was found in the jet engine exhausts. By implication, there was "no air pollution–derived health risk indicator for urban emissions other than the ones present in urban air." Note, however, that the author makes no discussion of the physical state of the HC: there is nothing regarding particulate matter.				X												X			X											
Tesseraux I. (2006) Ausbau Flughafen Frankfurt Main. "Unterlagen zum Planfeststellungsverfahren. Gutachten G14: Humantoxikologie. Karlsruhe," 17.12.2006. "Extension to Frankfurt Airport. Basis for the Planning Process, Deliverable G14: Human toxicology."	A highly relevant document, containing an excellent review and bibliography. The author recognizes (p 38) that morbidity and mortality from air pollution are especially dominated by ultrafine particulate matter. There may also be synergistic effects, e.g., between VOCs and NO_2 or fine particles—or even noise! The author reviews limit values and estimated quantitative health impacts published by WHO, the EU and the Bundesrepublik. It is noted (p 52) that NO_2 concentrations in the neighborhood of the airport exceed the EU limit value of 40 µg m-3, particularly at heavily trafficked locations. Dispersion calculations for the current (2005) situation and for a base case and a planning case in 2020 are made for a range of toxicologically relevant pollutants. The toxicological analysis then amounts to comparing calculated concentrations with limit values and guide values. Calculated concentrations for 2005 agree well with the monitored values (p 67). Limits are exceeded for some pollutants (NO_2, soot, BaP), but there are generally only small differences between the three modeled cases. There seems to be no evidence that emissions specifically from an airport are any more toxic than those in a conventional urban environment. Emission estimates in other deliverables are referenced.	X	X	X	X		X	X	X		X			X	X	X	X	X		X	X	X	X	X	X	X						

Tesseraux, I. "Risk Factors of Jet Fuel Combustion Products," *Toxicology Letters*, 2004. 149: pp 295–300. Proceedings of EUROTOX 2003. Science for Safety.	Authors found aircraft emissions vary with engine type, engine load, and fuel. Among jet aircrafts there are differences between civil and military jet engines and their fuels. Combustion of jet fuel results in CO_2, H_2O, CO, C, NO_x, particles, and a great number of organic compounds. Among the emitted hydrocarbons (HCs), no compound (indicator) characteristic for jet engines could be detected so far. Jet engines do not seem to be a source of halogenated compounds or heavy metals. They contain, however, various toxicologically relevant compounds including carcinogenic substances. A comparison between organic compounds in the emissions of jet engines and diesel vehicle engines revealed no major differences in the composition. Risk factors of jet engine fuel exhaust can only be named in the context of exposure data. Using available monitoring data, the possibilities and limitations for a risk assessment approach for the population living around large airports are presented. The analysis of such data shows that there is an impact on the air quality of the adjacent communities, but this impact does not result in levels higher than those in a typical urban environment.							X		X				X		X	X									X					
Tetra Tech, Inc. (2013). LAX Air Quality and Source Apportionment Study, Volume 1. Executive Summary. Final Report. June 18.	One of the largest and most comprehensive airport measurement (including some modeling) studies was conducted to assess airport contributions of air pollutants to local air quality. The study showed that while most criteria gas concentrations around the airport were below the NAAQS, PM2.5 levels were close to the NAAQS with less than 20% contributed by the airport. The smaller-sized ultrafine particulate (UFP) matter were found to originate from jet exhaust while the larger UFP were found to be from motor vehicles. Further studies on UFP health effects are necessary.				X	X	X	X						X	X	X	X	X	X	X				X	X	X			X	X	
The Danish Ecocouncil (2012) "Air Pollution in Airports. Ultrafine Particles, Solutions, and Successful Cooperation," the Danish Ecocouncil, Copenhagen, Denmark.	This study was carried out by a number of partner organizations at Copenhagen Airport. Pollutant measurements were made and a comparison was made to occupational exposure standards as set out in the Danish "Health and Safety at Work Act." The authors conclude employee exposure to ultrafine exhaust particles from aircraft and diesel engines in airports is an urgent and overlooked work-related challenge potentially affecting the health of millions of people. The report makes a number of recommendations to be adopted by ICAO and another set of recommendations for every airport.						X									X			X							X					

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Thiemens, M.H., *Isotopic Measurement and Analysis Approach to Uniquely Relate Aircraft Emissions to Changes in Ambient Air Quality, Final Report*, PARTNER-COE, Project 33, Nov 2010. (need final pub details)	The isotopic measurement approach was used during the AAFEX (Alternative Aviation Fuels Emissions Experiment) campaign to measure the isotopic fractionation in secondary sulfate and nitrate particulate matter (PM) formed due to gaseous precursors released during aircraft engine combustion. This PM isotopic fractionation was measured as a function of distance and fuel type. The isotopic enrichments in these aircraft-related particulate matter were found to be highly distinctive. This unique isotopic fingerprint in aircraft-related PM is caused by a combination of chemical processes during combustion under high temperature and pressures. Uniqueness of this fingerprint in aircraft-related PM makes the isotopic a possible approach in linking aircraft emissions to airport community-scale variability in air quality.			X	X		X									X		X		X											
Thiemens M.H. (2011) *Use of Isotopic Measurement and Analysis Approach to Uniquely Relate Aircraft Emissions to Changes in Ambient Air Quality.* PARTNER Project 33 Final Report. June.	The study was conducted based on the premise that isotopes of sulfate particles from aircraft could be uniquely identified apart from particles from other sources. The study found that the relatively high humidity in the Los Angeles area may have diluted the ability to identify the isotopes. Also, the lower-than-expected concentrations caused issues in properly identifying isotopes. It is recommended that future research in this area be conducted in lower humidity areas.			X				X						X		X				X											
Tunnicliffe W.S., O'Hickey S.P., Fletcher T.J., Miles J.F., Burge P.S., Ayres J.G., "Pulmonary Function and Respiratory Symptoms in a Population of Airport Workers," *Occup Environ Med* 1999; 56:118–123.	Cross-sectional epidemiological investigation of workers at Birmingham International Airport (U.K.) to determine if exposure to aircraft fuel or jet exhaust might be associated with respiratory symptoms or abnormal lung function.				x				x										x							x					
Underwood B.Y. (2007) "Revised Emissions Methodology for Heathrow: Base Year 2002." AEA Energy & Environment, Birchwood Park, Warrington, U.K. 2007.	This inventory applies the PSDH recommendations to a previous emissions inventory that was completed to inform the U.K. Future of Air Transport White Paper.			X	X									X		X			X							X					
Underwood B.Y., Walker C.T., and Peirce M.J. (2010) "Heathrow Airport Air Quality Modelling for 2008/9: Results and Model Evaluation." AEA Energy & Environment, Birchwood Park, Warrington, U.K. 2007.	This report, produced by AEA for BAA, presents the results of an emissions inventory and dispersion modeling study carried out for Heathrow Airport for the year 2008/09. Aviation emissions sources and local major roads are included in the inventory. The authors also report on a model validation exercise. This report is the third of a series, the other two being the emissions inventory study and the dispersion modeling work. NO_x, NO_2, PM_{10}, and $PM_{2.5}$ pollutants are included in the study. Contour plots are provided for these pollutants. This study has formed the basis of the Heathrow Air Quality Strategy (HAL 2011).			X	X									X		X			X							X					

Unique (2005) "Airport APU Emissions at Zurich Airport," Unique (Flughafen Zürich AG), P.O. Box, CH-8058 Zurich.	The scope of this study is to present a methodology and emission factors for the emissions calculation of auxiliary power units (APU).				X									X			X				X					X					
United States Environmental Protection Agency (USEPA) (1999). *Evaluation of Air Pollutant Emissions from Subsonic Commercial Jet Aircraft.* USEPA, Air and Radiation. EPA420-R-99-013. April.	The EPA conducted an emissions inventory–based study of 10 U.S. airports to determine the contribution of airports to local air quality (no dispersion modeling was conducted). The comparison years were 1990 and 2010. The 1990 aircraft component of the regional mobile emissions ranged from 0.6–3.6% while the 2010 emissions ranged from 1.9–10.4%.				X									X					X						X						
URS Corp. 2003. *Select Resource Materials and Annotated Bibliography on the Topic of Hazardous Air Pollutants (HAPs) Associated with Aircraft, Airports, and Aviation,* Federal Aviation Administration.	Provides a summary of the knowledge base on airport/aircraft hazardous air pollutant (HAP) emissions, including a rank order of HAP species.			X						X				X	X	X	X	X		X						X					
USEPA (2006). *Expanding and Understanding the Master List of Compounds Emitted by Mobile Sources—Phase III. Final Report.* Assessment and Standards Division, Office of Transportation and Air Quality. USEPA. EPA420-R-06-005.	Provides a review of literature summarizing all of the chemical species emitted from mobile sources (including aircraft) in order to expand/update the EPA full report.	X												X	X	X	X		X						X						
USEPA (2006). *Master List of Compounds Emitted by Mobile Sources*. Assessment and Standards Division, Office of Transportation and Air Quality. USEPA. EPA420-B-06-002.	EPA's master list of compounds emitted from mobile sources including aircraft.	X												X	X	X	X		X						X						
Vanderbilt P. and Lowe J. (2002) "Health Risk Assessment of Air Toxics from Airports: The State of the Science & Strategies for the Future," presented at the Dreams of Flight Airport Air Quality Symposium, 28 Feb 2002 by Pamela Vanderbilt, CH2M HILL, 2485 Natomas Park Drive, Suite 600, Sacramento, USA and John Lowe, CH2M HILL, 1 South Main Street, Suite 1100, Dayton, USA.	PowerPoint presentation that describes an overview of the airport air quality situation. It covers regulatory requirements and current understanding of health impacts at the time—note that this was in 2002, and is dated now.			X										X		X	X														
Vennam L.P., Vizuete W., and Arunachalam S. (2011) "An Assessment of Aviation-Related Hazardous Air Pollutants from a U.S. airport using CMAQ," in Proceedings of the 10th Annual Models-3 CMAS Users Conference, Chapel Hill, NC, Oct 2011.	CMAQ was used to model contributions of HAPs contributions from T.F. Green Airport. Includes the impacts of seasons and spatial variability.				X												X		X								X				

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Verkehrs-Club der Schweiz (2012) 'Testparcours für die Messung der Feinstaubbelastung in acht Schweizer Städten'.	Test profiles for monitoring fine particulate concentrations in eight Swiss towns. A joint action of the Swiss Travel Club and the Doctors for the Environment Society. The study describes mobile measurements of fine particulate in eight Swiss cities in January and February 2012. Instruments used were (1) a 'miniDiSC' developed by Martin Fierz, (http://www.fierz.ch/minidisc/) that monitored both the particle number concentration in the range 103–106 cm-3 and the mean particle diameter in the range 10–300 nm with a 3 s sampling time; and (2) a Personal Dust Monitor (http://www.conteng.it/Bollettini/PersonalDustMonit_En.pdf) that measured gravimetric concentrations divided between PM_1, $PM_{2.5}$, and PM_{10} with a 1 minute sampling time. Though unrepresentative, measured concentrations of fine particulate seem high enough to be of concern. The report includes a modest discussion and bibliography of the health effects of such particulate.			X			X	X			X					X									X								
Wahl C., Rindlisbacher T., and Kapernaum M. (2009) "Online Determination of Aircraft Engine Nanoparticle Emission Indices at Zürich Airport," ECATS Progress Meeting Schliersee, Sept 2009.	PowerPoint presentation made at an ECATS meeting of the results of a study at Zurich Airport, Switzerland. The authors measured particle mass and number per kg fuel burnt (approx. 4% maximum thrust) for 11 aircraft taxi movements (10 different engine variants). They calculated the total particle mass using the ICAO CAEP First Order Approximation (FOA3) method and correlated these results with their measurements. They found a good correlation.						X									X				X						X						
Wayson R.L., Fleming G.G., and Kim B., *Final Report: The Use of LIDAR to Characterize Aircraft Initial Plume Characteristics*, FAA-AEE-04-01, DTS-34-FA34T-LR3, Federal Aviation Administration, Feb 2004.	LIDAR (LIght Detection And Ranging) equipment was chosen as the measurement technique to characterize aircraft plumes operating at LAX airport. By scanning with the LIDAR in a defined direction over a period of time with many LIDAR pulses, the distribution of particles over the region of the sweep (e.g., a vertical plane or plume cross section) can be determined and the plume characterized. Cross-sections of the plume were measured at a variety of distances behind the aircraft during takeoff roll. This final study report is based on an analysis of 4,138 LIDAR sweeps, or cross sections, collected at LAX. Methodology and results are included in the report. This report represents the first use of this technique for this source in the United States.			X	X			X								X				X						X						

Wayson, R.L., G.G. Fleming, G. Noel, J. MacDonald, W.L. Eberhard, B. McCarty, R. Marchbanks, S. Sandberg, J. George, and R. Iovinelli, *LIDAR Measurement of Exhaust Plume Characteristics from Commercial Jet Turbine Aircraft at the Denver International Airport*, FAA-AEE-08-02, DOT-VNTSC-FAA-08-05, Federal Aviation Administration, Apr 2008.	This is the third in a series of measurements on this topic with the first two conducted at Los Angeles International Airport (LAX) and Atlanta's Hartsfield-Jackson International Airport (ATL). This study was done at the Denver International Airport (DEN). A major goal in all three studies has been to measure the initial plume characteristics of jet exhaust in support of obtaining increased accuracy in air quality dispersion modeling efforts. All three studies have resulted in cross sections of the plume that can be quantified and visualized giving initial plume characteristics including plume rise, horizontal plume standard deviation, and vertical plume standard deviation. In addition, some local sampling was conducted on the airfield.			X	X			X								X				X						X					
Wayson, R., et al. (2009). "Methodology to Estimate Particulate Matter Emissions from Certified Commercial Aircraft Engines." Air & Waste Management Associated (A&WMA) 59:91–100, Jan.	Presents the First Order Approximation (FOA) used to derive PM EIs from Smoke Numbers, taking into account the sulfate and volatile (fuel organics).			X												X															
Webb S., et al. (2008). *ACRP Report 6: Research Needs Associated with Particulate Emissions at Airports.* Transportation Research Board (TRB).	Provides primer on aircraft particle emissions including composition. Recognizes lack of PM data and provides knowledge gaps. "The present understanding of particle properties is insufficient to evaluate the health and environmental effects from exposure to various types and sizes of PM." Aircraft PM emissions are primarily in the ultrafine range.						X									X															
Westerdahl D., Fruin S.A., Fine P.L., Sioutas C., "The Los Angeles International Airport as a Source of Ultrafine Particles and Other Pollutants to Nearby Communities," *Atmos Environ* 42 (2008) 3143–3155.	Air monitoring was performed in the vicinity of LAX during the spring of 2003, to determine the spatial extent of influence of airport emissions on downwind residential populations.				x			x						x		x	x		x						x	x					
Whitefield, P. et al (2008) *ACRP Report 9: Summarizing and Interpreting Aircraft Gaseous and Particulate Emissions Data.* Transportation Research Board (TRB).	Provides primer on better understanding aircraft PM emissions and their characteristics. Reviews and describes PM data from various measurement campaigns including APEX1, JETS-APEX2, Delta/Atlanta, and APEX3.			X			X									X															

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WHO (2003) "Health Aspects of Air Pollution with Particulate Matter, Ozone and Nitrogen Dioxide," Report on a WHO Working Group, Bonn, Germany, 13–15 Jan 2003.	This report presents the findings of a review undertaken by a World Health Organization working group. The review looks at scientific evidence on the adverse health effects of particulate matter (PM), ozone (O_3) and nitrogen dioxide (NO_2) since the second edition of WHO's Air Quality Guidelines (AQG) for Europe in 1996. The working group recommends the use of fine particulate matter, ($PM_{2.5}$), as the indicator for health effects induced by particulate pollution such as increased risk of mortality in Europe, to supplement the commonly used PM_{10}. It also acknowledged the evidence that ozone produces short-term effects on mortality and respiratory morbidity, even at the low ozone concentrations experienced in many cities in Europe. Based on these findings, the group recommended that WHO should update exposure-response relationships for the most severe health outcomes induced by particulate matter and ozone presented by Air Quality Guidelines. The group also concluded that an update of the current WHO AQG for nitrogen dioxide was not warranted.	X	X											X		X		X														
WHO (2006) "Air quality guidelines. Global update 2005. Particulate matter, ozone, nitrogen dioxide and sulfur dioxide." World Health Organization for Europe, Copenhagen, Denmark.	WHO produced air quality guidelines for Europe in 1987 and 1997. This report is an update produced in 2005 for four pollutants. Guidelines for other pollutants are as described in the 2nd edition (1997). This report is a review of the scientific literature and a consideration of its implications. Revised guidelines are set out.	X	X											X		X		X														
WHO (2006) "Health Risks of Particulate Matter from Long-Range Transboundary Air Pollution," World Health Organization for Europe, Copenhagen, Denmark.	Particulate matter is a type of air pollution that is generated by a variety of human activities, can travel long distances in the atmosphere, and causes a wide range of diseases and a significant reduction of life expectancy in most of the population of Europe. This report summarizes the evidence on transboundary PM pollution. It highlights its effects, as well as the sources of particulate matter, its transport in the atmosphere, measured and modeled levels of pollution in ambient air, and population exposure. It shows that long-range transport of particulate matter contributes significantly to exposure and to health effects. The authors conclude that international action must accompany local and national efforts to cut PM emissions.	X		X							X					X																

Wood E.C., Herndon S.C., Timko M.T., Yelvington P.E., and Miake-Lye R.C. (2008) "Speciation and Chemical Evolution of Nitrogen Oxides in Aircraft Exhaust Near Airports," *Environ Sci Technol*, 42, 1884–1891.	This study utilizes a chemical kinetics combustion model to better understand the previously observed measurements of the mix of NO and NO_2 from aircraft engine exhausts. Experimental evidence is presented of rapid conversion of NO to NO_2 in the exhaust plume from engines at low thrust. The rapid conversion and the high NO_2/NOx emission ratios observed are unrelated to ozone chemistry. NO_2 emissions from a CFM56-3B1 engine account for approximately 25% of the NO_x emitted below 3000 feet (916 m) and 50% of NO_x emitted below 500 feet (153 m) during a standard ICAO landing and takeoff cycle. Nitrous acid (HONO) accounts for 0.5% to 7% of NOy emissions from aircraft exhaust depending on thrust and engine type. Implications for photochemistry near airports resulting from aircraft emissions are discussed.				X		X							X						X												
Wood E., et al. (2008) *ACRP Report 7: Aircraft and Airport-Related Hazardous Air Pollutants: Research Needs and Analysis*. Transportation Research Board (TRB).	Provides a prioritization of HAPs species based on toxicity and emission rates. Discusses sources and potential risks, but does not significantly include discussion of atmospheric concentrations.			X						X	X						X		X												
Woody, et al. (2011) "An Enhanced Sub-Grid Scale Approach to Characterize Air Quality Impacts of Aircraft Emissions at the Hartsfield-Jackson Atlanta International Airport," 10th Annual CMAS User's Conference, Chapel Hill, NC.	The Puff-in-Grid (PinG) capability within AMSTERDAM/CMAQ was used to model PM concentrations and compared to the non PinG approach. The puff approach showed noticeably higher airport contributions from ATL airport.				X											X			X							X					
Woody M., Arunachalam S., West J.J., and Shankar U. (2010) "A Comparison of CMAQ Predicted Contributions to $PM_{2.5}$ from Aircraft Emissions to CMAQ Results Post-Processed Using the Speciated Modeled Attainment Test," in Proceedings of the 9th Annual Models-3 CMAS Users Conference, Chapel Hill, NC, Oct 2010.	The EPA's SMAT is used with CMAQ to determine the potential for use of SMAT. The results indicate that the use of SMAT produces results similar to those from CMAQ alone and are not unexpected.				X											X			X												
Woody, M. (2010) "The Impacts of Aviation Emissions on Current and Future Particulate Matter: The Effects of the Speciated Model Attainment Test on the Community Multiscale Air Quality Model Results," paper submitted to the PARTNER Joseph A. Hartman Student Paper Competition, Feb 7.	Aviation contributions to U.S. air quality were modeled for 2005 (0.037 ug/m3) and 2025 (0.0127 ug/m3). The CMAQ results were post-processed through SMAT. "The combination of higher amounts of aircraft emissions and lower background emissions in the future lead to the increased absolute contributions of $PM_{2.5}$ from aircraft."				X					X						X				X												

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Woody M. (2012) "Aircraft Emissions' Contributions to Organic Aerosols in a Regional Air Quality Model using the Volatility Basis Set," paper submitted to the PARTNER Joseph A. Hartman Student Paper Competition, Jan 31.	The volatility basis set (VBS) was used within CMAQ to predict organic aerosol concentration contributions from aircraft emissions. The starting aircraft emissions were predicted using the FOA3 method. The CMAQ-VBS modeling work appeared to produce better predictions of $PM_{2.5}$ and total carbon.				X					X						X				X											
Yim S.H.L., Stettler M.E.J., and Barrett S.R.H. (2013) "Air Quality and Public Health Impacts of U.K. Airports, Part II: Impacts and Policy Assessment," *Atmos Environ* 67, 184–192, 2013	Using the emission estimates made in Part I of this study (Stettler et al. 2011), the authors assess current (2005) and future (2030) aviation impacts on U.K. air quality and public health using a multi-scale air quality modeling approach under three scenarios: (1) no capacity increase; (2) unconstrained growth with a third runway at Heathrow Airport; and (3) unconstrained growth with Heathrow replaced by a new Thames Estuary hub airport. Options for mitigating both present-day and future impacts: (1) desulphurizing jet fuel; (2) electrifying GSE; (3) widespread use of single engine taxiing; and (4) use of fixed ground electrical power so as to avoid use of aircraft APUs. LTO, APU, and GSE emissions are spatially apportioned and industry-derived approach and climb-out angles are used. Regional and local-scale dispersion models are used to derive $PM_{2.5}$ concentrations. The two model outputs are combined. A concentration-response function is then applied to estimate the increase in early deaths due to aviation-related emissions and the associated $PM_{2.5}$ exposure, using population data. The authors document how they have projected data for 2030. The authors estimate that 110 early deaths occur in the U.K. each year due to U.K. airport emissions (2005 data). They estimate that up to 65% of the health impacts of U.K. airports could be mitigated by desulphurizing jet fuel, electrifying GSE, avoiding use of APUs and use of single-engine taxiing (caution needs to be applied because of the assumptions made here). Two plans for the expansion of U.K. airport capacity are examined—expansion of London Heathrow and new hub airport in the Thames Estuary. The authors report on the relative changes in attributable early deaths due to $PM_{2.5}$ exposure of aviation-related emissions.				X									X		X	X			X						X	X	X			

Yu, K.N., Cheung Y.P., Cheung T., and Henry R.C. (2004) "Identifying the Impact of Large Urban Airports on Local Air Quality by Nonparametric Regression," *Atmos Environ* 38, 4501–4507.	This study examined hourly concentrations of CO, NO_x, SO_2, and respirable suspended particles (RSP) taken in the vicinity of Hong Kong International Airport (HKIA) and Los Angeles International Airport (LAX). The average concentration as a function of wind speed and direction was estimated by a mathematical technique called nonparametric regression. Their results show that SO_2 can be used to identify wind speeds and directions associated with emissions from aircraft. Using this assumption and the nonparametric regression plots for the other pollutants the authors say that you can identify the impact of aircraft on local air quality. At LAX, CO and NO_x are dominated by emissions from ground vehicles going in and out of the airport. However, near HKIA, aircraft are an important contributor to CO and RSP.			X				X						X		X											X					
Zhu, Y., et al. (2011) "Aircraft Emissions and Local Air Quality Impacts from Takeoff Activities at a Large International Airport," *Atmos Environ* 43, 6526–6533.	Study involved the use of SMPS next to LAX to count particles by size ranges to develop distributions. The highest counts were correlated with aircraft takeoff events, and highest size counts were around 14 nm. The mean particle size seemed to slightly increase with aircraft weight. Concentrations of UFP were found to be elevated at 600 m downwind as opposed to UFP from freeways that seem to dissipate to background levels after 300 m.							X								X			X													

APPENDIX B

Frequently Asked Questions

Question: What types of health impacts can airport emissions cause?

Answer: In general, both gaseous and particulate matter emissions from airports can cause harm to the human respiratory and cardiovascular systems. Effects can range from minor exacerbations of existing conditions to increased risk of hospitalization and premature death. Exposure to certain pollutants also can cause skin irritations and other physical effects, especially in sensitive individuals.

Question: What are the main air pollutants of concern?

Answer: As with other transportation sources, airport sources can emit all of the criteria pollutants (CO, NO_x, VOC, SO_x, Pb, PM_{10}, and $PM_{2.5}$) including the precursors that form O_3 and other secondary pollutants including various PM species. Also, HAPs such as formaldehyde, acrolein, acetaldehyde, etc., can be emitted from various sources. However, the main pollutant from a local health risk potential is $PM_{2.5}$, with important effects of ozone at longer range and increasing concern about ultrafine particles in the near field. Formaldehyde tends to have the most cancer risk among HAPs species. Important non-cancer effects of HAPs may exist but are challenging to quantify.

Question: What are the differences between ambient standards, exposure thresholds, and cancer risk indicators?

Answer: Ambient standards, such as the National Ambient Air Quality Standards (NAAQS) are outdoor air pollutant concentration levels maintained by the EPA to monitor air pollution levels in different regions of the country. These are generally intended to be adequately protective of sensitive subpopulations. Exposure thresholds for air pollutants generally refer to concentration levels where below those levels, human beings are not considered to be at health risk. More specifically, exposure threshold levels and limits have been used by various organizations such as OSHA, NIOSH, and ACGIH to define and recommend levels/limits for workplaces to protect workers from harmful exposure. Cancer risk factors for air pollution are factors that may directly or indirectly cause or support the formation of cancer due to pollutant exposure. These factors may include a person's age, sex, family cancer history, etc., and can serve to help determine the probability (the risk) of developing cancer.

Question: Besides pollutant type, what other factors affect public health?

Answer: Besides pollutant type, emission rates, toxicity, individual and population exposure, and vulnerability attributes are important factors that can affect public health. Indeed, all of these factors are important components in properly assessing the health risk of each pollutant. Individual exposure encompasses the pathway from the source to human activity locations (e.g., homes, workplaces, etc.) as well as how long a person is exposed to the pollutants. Population exposure integrates across individual exposures to provide measures relevant to the entire population. In addition, a person's background and condition also can play a significant role in affecting his/her

health. Factors such as age, gender, pre-existing disease status, and co-exposures to other risk factors can all affect susceptibility to air pollutants.

Question: What are the significant sources of pollutants at an airport?

Answer: The significant sources of pollutants at an airport generally arise from the combustion of fuels—for example from an aircraft engine, ground support equipment (GSE), etc. The highest contributing emissions sources tend to be aircraft, GSE, and ground access vehicles (GAVs). Aircraft engines are significant sources of emissions in all phases of their operation, such as approach, landing, idling/taxiing, takeoff, and climb out, but the significance for each pollutant depends on the mode (or phase) of aircraft operation.

Question: What emissions mitigation measures have airports implemented?

Answer: Airports have implemented mitigation measures to address the key pollutants and the most significant sources. To mitigate aircraft emissions, airports have implemented measures to reduce taxiing and runway holding times, electrified gates to provide preconditioned air and power, etc. The use of electric GSE and alternative fuels (e.g., CNG) also has helped reduce emissions in gate areas. For mitigating road traffic emissions, airports are dependent on influencing individuals and other organizations to change their behavior or practices. Many airports have promoted public transport use, especially where this involves low-emitting vehicles, and have invested in consolidating certain activities, such as rental car facilities, into one location.

Question: What are the differences between criteria pollutants and HAPs?

Answer: In the 1970 Clean Air Act Amendments, the EPA established criteria, or ambient air concentrations, that define the maximum acceptable level for each of the six criteria pollutants that affect public health and the environment. The concentrations are referred to as the National Ambient Air Quality Standards (NAAQS), and the criteria pollutants include carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), ozone (O_3), lead (Pb), and particulate matter (PM) in two forms, inhalable (coarse) particulate matter (PM_{10}), and fine particulate matter ($PM_{2.5}$), which are very small particles with a diameter 2.5 micrometers or less.

The U.S. Environmental Protection Agency (EPA) identified 187 hazardous air pollutants (HAPs) that cause other more serious health effects, and are known to, or suspected of, causing cancer in humans. Hazardous air pollutants also are referred to as toxic air pollutants (or air toxics), and the terms can be used interchangeably. Most HAPs are emitted from anthropogenic (manmade) sources such as exhaust from aircraft engines powered by fossil fuels and from stationary sources such as boilers and power plants. Examples of HAPs (and their sources) include formaldehyde (aircraft), benzene (gasoline), perchloroethylene (dry cleaning), and methylene chloride (paint stripper).

Question: What are the differences between primary and secondary pollutants?

Answer: Primary air pollutants are emitted directly from a source such as aircraft and GSE engines containing pollutants such as CO, NO_x, SO_x, $PM_{2.5}$, HAPs, etc. However, some pollutants are not emitted directly and form only as a result of complex chemical reactions in the atmosphere involving precursor pollutants. These formed pollutants are referred to as secondary pollutants. For example, ozone is generally not emitted directly from a source but is formed through the photochemical reaction of naturally occurring oxygen in the atmosphere, together with emissions of nitrogen oxides (NO_x) and volatile organic compounds (VOCs) in the presence of sunlight. Fine particulate matter ($PM_{2.5}$), a pollutant that has been associated with increased mortality and morbidity in areas where concentrations of the pollutant are elevated, also has significant contributions from secondary formation. Although $PM_{2.5}$ can be emitted directly, the pollutant also can be formed through chemical reactions involving NO_x, SO_2, and VOCs, leading to formation of sulfate, nitrate, and organic aerosol particles.

Primary and secondary pollutants are not to be confused with the primary and secondary standards established for the National Ambient Air Quality Standards (NAAQS). The NAAQS establish the maximum allowable concentrations of the criteria air pollutants for the protection of public health (primary standards) and protection of the environment (secondary standards).

Question: What health-related airport air quality studies have been conducted?

Answer: Although the overall literature on this topic is relatively small compared to studies that have been conducted for roadway sources and other industries, the breadth and depth of research in this area has been growing. Sections 5.1 and 5.2 provide reviews of selected airport air quality and health studies. Appendix A, Literature Review Summary and References, provides a larger list of studies reviewed under this project. The studies range from specific airport health research to more general airport air quality and health studies for other industries.

Abbreviations and acronyms used without definitions in TRB publications:

A4A	Airlines for America
AAAE	American Association of Airport Executives
AASHO	American Association of State Highway Officials
AASHTO	American Association of State Highway and Transportation Officials
ACI–NA	Airports Council International–North America
ACRP	Airport Cooperative Research Program
ADA	Americans with Disabilities Act
APTA	American Public Transportation Association
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATA	American Trucking Associations
CTAA	Community Transportation Association of America
CTBSSP	Commercial Truck and Bus Safety Synthesis Program
DHS	Department of Homeland Security
DOE	Department of Energy
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
FMCSA	Federal Motor Carrier Safety Administration
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
HMCRP	Hazardous Materials Cooperative Research Program
IEEE	Institute of Electrical and Electronics Engineers
ISTEA	Intermodal Surface Transportation Efficiency Act of 1991
ITE	Institute of Transportation Engineers
MAP-21	Moving Ahead for Progress in the 21st Century Act (2012)
NASA	National Aeronautics and Space Administration
NASAO	National Association of State Aviation Officials
NCFRP	National Cooperative Freight Research Program
NCHRP	National Cooperative Highway Research Program
NHTSA	National Highway Traffic Safety Administration
NTSB	National Transportation Safety Board
PHMSA	Pipeline and Hazardous Materials Safety Administration
RITA	Research and Innovative Technology Administration
SAE	Society of Automotive Engineers
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (2005)
TCRP	Transit Cooperative Research Program
TEA-21	Transportation Equity Act for the 21st Century (1998)
TRB	Transportation Research Board
TSA	Transportation Security Administration
U.S.DOT	United States Department of Transportation

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Gmail

Lee Andrews Group <lgbfiscomments@gmail.com>

Airport study

1 message

[redacted] Tue, Apr 19, 2016 at 5:48 PM

To: LGBFIScomments@gmail.com

I live in the neighborhood on Locust Avenue, and have a service guide dog. My neighborhood is filled with family pets. The noise is already loud with so many different flights running through. I believe the noise increase will impact the value of my properties in this area along with the loud noise for our animal friendly neighborhood.
- flights have been increased based on a noise study without consideration of the noise of flights held by Jet Blue is not currently being used.
- is a new study going to be performed prior to allowing Jet Blue to implement the flights currently not creating noise.
- this noise will increase which will decrease the value of my properties. Is there going to be consideration of property values going to be included as part of this study? Is the study going to include the impact on my Service Animal hearing of potential negative impacts?
Thanks and appreciate a response of some sort.
Varena

Airport FIS Study Meeting - April 20th
The 2nd Airport "Internationalization" Study meeting will be held at the Long Beach Gas and Oil Auditorium, 2400 E. Spring Street - Wednesday, April 20th @ 6pm. This is likely the last public meeting held by the consultants. If you want to submit a question or comment to the consultants for the report (not the meeting), use e-mail: LGBFIScomments@gmail.com

Gmail

Lee Andrews Group <lgbfiscomments@gmail.com>

international status for LGB

1 message

[redacted] Wed, Apr 20, 2016 at 3:04 PM

To: LGBFIScomments@gmail.com

To whom it may concern: As I am unable to attend tonight's meeting, I would like to submit my concerns regarding the granting to Jet Blue of a Customs facility. It is a well known fact that Jet Blue has been spreading around money around town to influence the powers that be, to grant their desire to establish international flights. If this were to happen, it would open the door to all the other carriers flying out of LGB to establish their own international routes. This would create another major airport sandwiched between John Wayne and LAX, which would in turn generate more noise and air pollution, as well as more traffic on our streets, the end result being a decrease in property values and a negative impact on our lives. I urge you to NOT grant Jet Blue's request. They are looking to increase their profits at the expense of our neighborhood.

Sincerely,

[redacted]

Long Beach CA 90807

[redacted]

Gmail

Lee Andrews Group <lgbfiscomments@gmail.com>

Parsons follow-on contract

1 message

[redacted] Wed, Apr 20, 2016 at 4:36 PM

To: LGBFIScomments@gmail.com

Will the Parsons Corporation be considered for any follow on FIS contracting activity after completion of the $350,000 FIS study?

Regards,

[redacted]

Long Beach, CA 90807

[redacted]

Gmail

Lee Andrews Group <lgbfiscomments@gmail.com>

Hourly rate for FIS contract

1 message

[redacted] Wed, Apr 20, 2016 at 4:39 PM

To: LGBFIScomments@gmail.com

What is the hourly consulting rate for Parsons Corporation personnel engaged in the $350,000 FIS study?

Regards,

[redacted]

Long Beach, CA 90807

[redacted]

Gmail

Lee Andrews Group <lgbfiscomments@gmail.com>

Feasibility Study comments

1 message

[redacted] Thu, Apr 21, 2016 at 11:33 AM

To: LGBFIScomments@gmail.com

Questions that should be asked / addressed / answered in the study

Economic Impact (local should mean Long Beach resident companies, residents (local employment, not employment for those who drive into Long Beach or don't reside here)

- Benefits to Long Beach residents in terms of employment, resident businesses
- Added demands on Long Beach Airport neighborhoods in terms of traffic related congestion and which times of day (passenger, support vehicles, employment based, ect)

Noise Ordinance

- projected increase in curfew violations due to late arrivals (resulting from ATC, weather, late departures, ect)
- can fines be increased to put teeth into them, to make it economically significant to violators
- Can Federal agencies like the Immigration/Customs services being in Long Beach, increase airline/corporate lobbyist pressure on politicians to increase flights and frequencies

Environmental

- Risk of invasive species (insects, vermin, ect) being brought in inadvertently by aircraft coming in directly from Central or South America, which species, and impact to Long Beach eco-system
- When is the last time air quality was measured in neighborhoods in the flight path of landings and take-offs during peak take off and landing periods?

Airport Scope and Capability

- Is there an upper limit on how many operations LGB can undertake during official hours?
- How much does that exceed current legistlated limits ?
- Does the LGB airport need to continue to grow or can it be sustainable within its current operational limits?
- What is the LGB airport mission? Is it to continue to grow and improve it's P&L and revenues? Is it to create a quality, sustainable operation within its current operational limits?
- Can the former C-17 facilities/ramp area that the city has been provided a grant to seek uses be set up for international arrivals and departures zone separate from the main airport, thus utilizing different egress and access roads for such operations?

thanks,

[redacted]

Gmail

Lee Andrews Group <lgbfiscomments@gmail.com>

LB Airport meeting

1 message

[redacted] Thu, Apr 21, 2016 at 9:55 PM

Bcc: lgbfiscomments@gmail.com

LB4D UPDATE

connecting East Long Beach's neighborhoods and businesses

New posts appear on the

Long Beach 4th District BLOG:

Huge turnout for 2nd Public Airport Meeting

Over 170 attend second public meeting on LB Airport International Terminal Study

to view the posts *click on*:

http://longbeach4d.blogspot.com/2016/04/huge-crowd-at-2nd-airport-meeting.html

Check back with the LB4D Blog often...not all postings are announced

[redacted]

Gmail

Lee Andrews Group <lgbfiscomments@gmail.com>

Question?

1 message

[redacted] Fri, Apr 22, 2016 at 1:21 PM

To: LGBFIScomments@gmail.com

After all is said and done, will the people of Long Beach be voting on this issue? Or, is this issue only approved or rejected by the City Council members?

Gmail

Lee Andrews Group <lgbfiscomments@gmail.com>

The Future of LGB

1 message

[redacted] Tue, Apr 26, 2016 at 2:28 PM

To: LGBFIScomments@gmail.com

To Whom It May Concern:

Having been part of, and enjoying every aspect of, aviation for all my life, I would like to add a few points to be included in your feasibility study.

- The Noise Ordinance in effect at LGB has been in place for many years, and has allowed a successful partnership between the airport and the community (with the exception of the few nay-sayers).
- Adding a Federal Inspection Facility at the airport will not change the number of flights allowed in the airport's contract with the community of Long Beach.
- As far as I have experienced in community outreach events, the residents of Long Beach treasure their historic airport, and want to see it shine in the future as it has in the past.
- I defy any of the nay-sayers to identify where an aircraft is going to, or coming from, when it takes off, or lands.
- The addition of a Federal Inspection Facility would most likely increase revenue for the city and the business of Long Beach in the years to come.

Thank you for your time and attention,

[redacted]

- Signal Hill Resident
- Former Pan Am Employee
- LGB Volunteer

Gmail

Lee Andrews Group <lgbfiscomments@gmail.com>

International Airport discussions

1 message

[redacted] Tue, Apr 26, 2016 at 2:28 PM

To: "LGBFIScomments@gmail.com" <LGBFIScomments@gmail.com>

Our neighborhood is concerned because we own property right on the flight path and we fear that with an international airport our property values will drop dramatically as has happened in neighborhoods of airports that have increased flights. We are also tremendously concerned with the noise. It is not comforting to be sleeping and after 10pm hear planes taking off above your home. Has anyone done reports on crime in adjoining neighborhoods when a small airport goes international? These are all valid concerns.

We keep hearing that flights won't be increased but we have been around from the beginning when the airport was just to be used for Douglas and small aircraft and nothing more. Then another change, and another, and another and now another. So it is very hard to put any faith into Long Beach regarding airport information or promises that have continually been broken. It seems, from watching the news in Long Beach and attending meetings, that Jet Blue is able to "buy" their way into anything they want.

Sincerely,

[redacted]

Gmail

Lee Andrews Group <lgbfiscomments@gmail.com>

Comments for FIS Facility Feasibility Study

1 message

[redacted]

Wed, Apr 27, 2016 at 9:44 PM

To: LGBFIScomments@gmail.com
Cc: Celina Luna <Celina.Luna@longbeach.gov>, Council District7 <district7@longbeach.gov>, district8@longbeach.gov, Heather.Morrison@longbeach.gov

Hello,

Attached are our comments for consideration for the FIS Facility Feasibility Study at LGB.

Thank you,

[redacted]

FeasibilityCommentLtr_2016-04-27.pdf
187K

April 27, 2016

Re: Comments on the Feasibility Study for a Federal Inspection Service Facility at Long Beach Airport

Below are the comments from the California Heights Neighborhood Association (CHNA) on the Federal Inspection Service (FIS) Feasibility Study at Long Beach Airport (LGB). Consisting of approximately 1,500 properties, California Heights is the largest historic district in the City of Long Beach. Our neighborhood is roughly bounded by Cherry Avenue on the east, Wardlow Road on the south, Bixby Road on the north, and Atlantic Avenue on the west. Many homes within our neighborhood are directly under the flight path of runway 25R. As such, we cautiously review and comment as necessary on any improvements at LGB. With that said, we appreciate your due diligence and expertise on this Feasibility Study and implore your report to not include any particular agenda or bias.

Comment No. 1: Our association understands that your scope includes the assumption that the noise ordinance will remain in place. However, if the City Attorney's assessment determines that there could be an impact to the noise ordinance, this Feasibility Study will be worthless from an impact perspective and the City may need to authorize a second study to adequately determine the impacts. We ask the Jacob's team to briefly provide a description of the environmental process should the City Attorney determine that a FIS Facility could be a threat to the Noise Ordinance.

Comment No. 2: Mario Rodriguez, the former Long Beach Airport Director prepared a memo regarding the Federal Inspection Facility on November 13, 2013. In this memo, he states that "[f]uture revenues from [a FIS Facility] will only serve to mitigate the cost of the facility and not further enhance the Airport's financial position." Should Jacob's conclusion differ from the former Airport Director's, could you please include a description as to why Mr. Rodriguez's assumptions were incorrect or if he neglected to include a significant component in his analysis.

Comment No. 3: Our association is concerned about the possible location and operation of the FIS Facility. We know that you will look into the facility location. However, could you describe if the FIS Facility could also serve international cargo from the Port of Long Beach? If the FIS Facility could inspect cargo from the Port of Long Beach, could you describe the likely frequency of inspection of Port goods and shipping routes from the Port to the FIS Facility?

Comment No. 4: Our association is very concerned about the types of airplanes that would likely use the FIS Facility. If you could estimate the number of flights per aircraft type, it would be greatly appreciated. Furthermore, if you could mention which runways these aircrafts would use for arrivals/departures, that would also help our review of the Feasibility Study. Lastly, if you could mention if these aircraft types that use the FIS facility would have different noise levels than those that currently arrive/depart LGB.

Comment No. 5: Please indicate if any runway closures would be necessary for the construction or operation of the FIS Facility. Also, please indicate if runway closures due to general maintenance would increase or remain the same as a result of the FIS Facility. As indicated in the LGB Capacity Profile from the FAA, in the event that the main runway (12/30) is closed, Runway 25R is available for air carriers. Our association would be concerned if Runway 25R would accommodate a higher percentage of flights as a result of the FIS facility.

Comment No. 6: We request the Airport Staff, City Manager and the Long Beach City Council to have a Study Session at least two (2) weeks prior to any action occurring as a result of this study. This will allow a reasonable amount of time for our association to review and assess the contents of the Feasibility Study.

Sincerely,

[redacted]
Board Members, California Heights Neighborhood Association

Cc: Councilman Roberto Uranga
Councilman Al Austin

Gmail

Lee Andrews Group <lgbfiscomments@gmail.com>

Public Comments and Questions on FIS

1 message

[redacted] Mon, May 30, 2016 at 11:02 PM

To: LGBFIScomments@gmail.com

1. If the number of flights or the noise bucket is filled, and afterward it was exceeded after legally adding commercial flights, would some flights be removed?

2. How does the city benefit and residents benefit financially from the construction of a Federal Overseas Terminal airport do this?

3. I understand that there are two different types of inspection facilities -- fee for boarding and port of entry. Which designation would LGB use? If it is a fee for boarding -- or a per passenger fee, how are cargo flights charged? How would small, independent flights be charged? Would they use the same system?

4. Would this facility do a health screening? Some customs facilities perform temperature checks and other health screenings. If a passenger had a high fever, diptheria, cholera, typus, Zika virus, where would they be treated? Does this facility accommodate treatment? How much would this treatment cost? Is this a federal or a LGB expense? (Some airports inspect for fever and require passengers who have fever at a certain level that is deemed unhealthful and may indicate that they are carrying disease to be contained in a special facility for further evaluation.) Will this health assessment be conducted for passengers at LGB and will a facility be constructed?

5. If becomes international, would jetaway boarding be required versus stairway, self boarding? The ability to board and deplane using stairs in two sections of the plane is something people really enjoy about LGB and Jet Blue -- easy on and off. Would this system be changed?

6. How would neighborhoods in Long Beach be impacted as a result of the international status going through if the FAA's efforts to replace traditional, ground-based air traffic procedures with satellite-based technology were applied here as they are doing in Orange County? LGB is currently a ground based air traffic control airport. Would the installation of a FIS require the adoption of satellite-based technology?

7. Can the cap of flights be increased if the noise bucket is not topped out or jeopardized?

8. How about an increase or decrease in the amount of air pollution? Is that being analyzed in light of future flight changes if the FIS is approved?

9. How many documents (including memorandum, reports, and studies) will result from this effort, when do they expect to be finalized (September?). When will they be available to the public for comment and how? Will there be adequate time for the public to analyze the reports and prepare input before the Council votes on it?

10. Will crew and vendors (such as concession trucks and food suppliers) be inspected at the same level of vigilance as the public? Recent incidents at LAX and other international airports would suggest this should be the case. Will additional security inpsection capability be required for third parties, such as catering trucks and fuel?

11. Will the city have any input on changes in route structure on Jet Blue's schedule? Is it likely we will see fewer flights serving the local commuting traveler and more focus on the vacationing traveler who lives outside the area?

12. Is there a possibility that JetBlue intentionally reduced the number of flights in 2015, making the airport seem less profitable, so that they could push for and justify the expansion effort and route structure change?

Thank you for entering these questions and their answers into the public record.