Appendix A

# Project Information, Forecast, and Other Related Materials

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Appendix A1

# Planning Information and Project Details

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# Appendix A1

# Planning Information and Project Details

## A1.0 Detailed Description of SDCRAA's Proposed Project

Components of the Proposed Project would include the airfield improvements (construction of parallel Taxiway A and relocation of a part of Taxiway B west of approximately Taxiway Connector B4); the new (replacement) terminal, including the associated relocation of the San Diego County Regional Airport Authority's (SDCRAA's) existing administrative offices (the former Commuter Terminal); landside/ground access improvements that include a parking structure adjacent to the replacement terminal and airport circulation and roadway improvements; expansion of the Central Utility Plant (CUP) and the Storm Water Capture and Reuse System; relocation of five Remain Overnight (RON) positions; and removal of two RONs; and relocation of three Federal Aviation Administration (FAA) Airport Surface Detection Equipment - Model X (ASDE-X) sensors. Various utility connections would also need to be constructed. **Figure A1-1** shows SDCRAA's Proposed Project. The phasing of the Proposed Project is discussed in Section A3.0 of this appendix including facilities that would be removed/demolished.

### A1.1 Taxiway Components

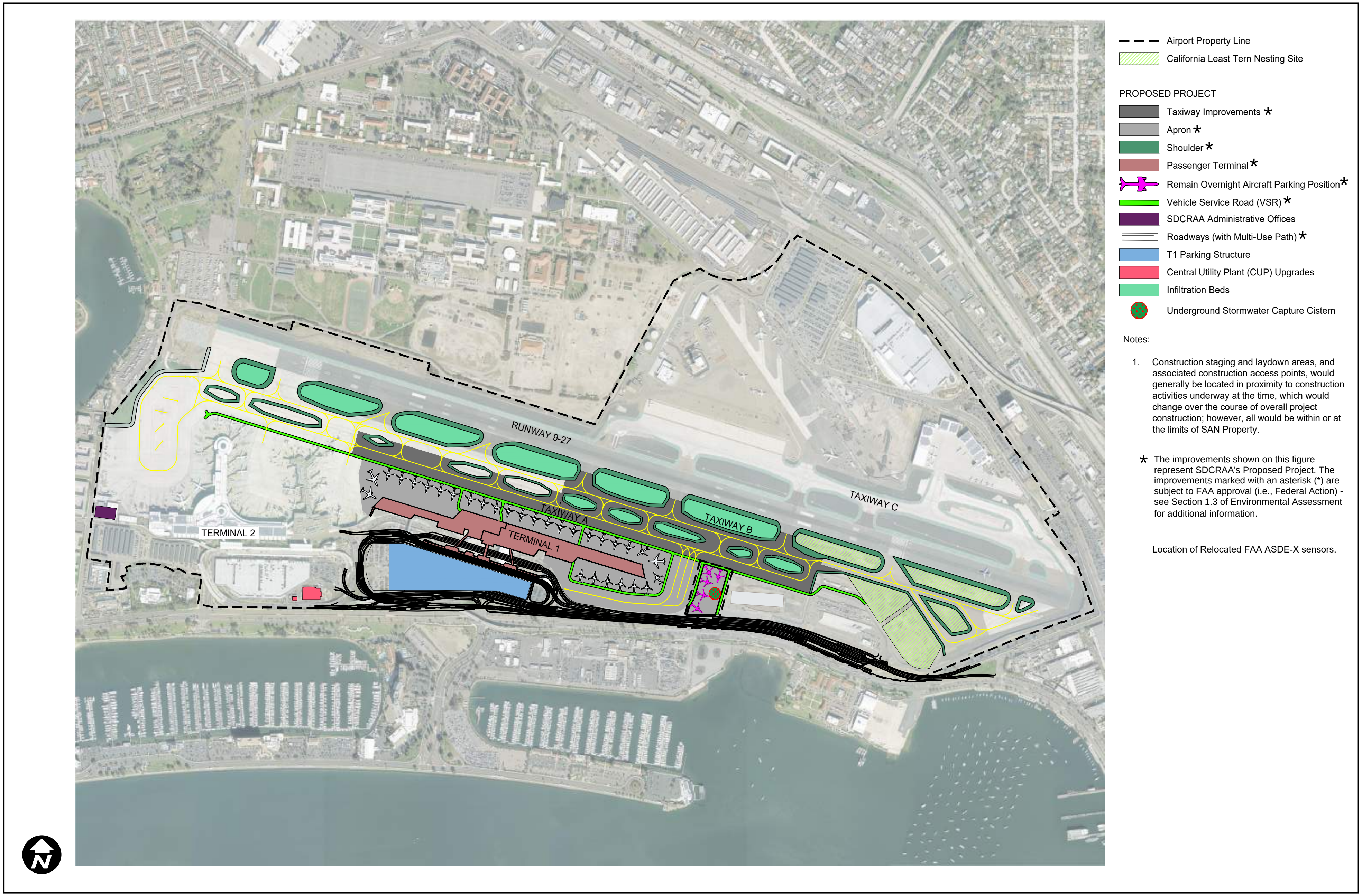
The Proposed Project would develop a new Taxiway A in the vicinity of the terminal complex from the very west end of Runway 9 up to Taxiway Connector B4.[1] The Proposed Project includes relocation of Taxiway B 37.5 feet south of its present location in this same area, which would address the runway separation "modification to standard" issue that currently exists in this area and repaving the Taxiway B asphalt portions between Taxiway Connectors B4 and B6 with concrete. The new Taxiway A would then be separated from a realigned Taxiway B by 219 feet to meet FAA design standards. The eastern portion of Taxiway B that lies near the California least tern (a federally listed endangered species) nesting habitat would not be relocated and would remain at its current spacing of 362.5 feet from the runway with a slight jog/curve to connect between Taxiway Connectors B4 and B3 and continue to avoid the California least tern habitat. The airfield components would require excavation of soils between four and 22 feet below surface grade, with the deepest being for the infiltration areas in some ovals.[2]

### A1.2 Replacement Terminal 1 and Associated Apron

Existing Terminal 1 would be demolished, as would the nearby SDCRAA's administrative offices building which would be relocated near the intersection of McCain Road and Airport Terminal Road; three FAA ASDE-X sensors would be relocated to the Airline Support Building as well; and a new linear Terminal 1 would be constructed. The replacement Terminal 1 would contain 30 gates and have approximately 1,210,000 square feet of floor space. Two of the gates would be able to accommodate Airplane Design Group (ADG)-V aircraft, while the rest of the gates would be sized for

[1] This taxiway would be constructed short of the entire length of the runway to avoid impacting the California least tern habitat to the east.

[2] Email from Husain Habib, San Diego County Regional Airport Authority to Kathleen Owston, CDM Smith dated September 22, 2020.




Source: Jacobsen | Daniels, 2021.

Figure A1-1



**PROPOSED PROJECT**

ADG-III aircraft.[3] The new Terminal 1, which would be constructed in two phases, would encompass the footprint of the existing Terminal 1 and the area to the southeast, displacing public parking and the administrative offices.

The replacement Terminal 1 would be a maximum of 90 feet in height at the terminal façade/ticketing lobby[4] and have three levels. Arrival services, including baggage claim, would be located on the first level. The arrivals level would also include the baggage make-up area, mechanical systems, apron and airline operations, ground support equipment, and loading dock functions. The second and third levels would serve both departing and arriving passengers and include ticketing/check-in, security screening checkpoint (SSCP) functions, and concessions. The third level would also include the concourses with components such as aircraft gates, seating areas, and associated passenger boarding bridges. The gates associated with the new Terminal 1 would be connected to SAN's hydrant fueling system. To construct the replacement terminal structure, pilings would be installed to a depth of 75 feet below surface grade. Other parts of the terminal building would require excavation ranging from 8 to 25 feet below surface.

The apron improvements that would surround the new Terminal 1 concourse would include a taxilane and an area for aircraft parking positions. With respect to the latter, five RON positions, sized for ADG-III aircraft (such as B737 and A320 aircraft), would be relocated to the east on a new apron. These would replace five of the seven RON positions eliminated by the new, replacement Terminal 1.

The new Terminal 1 would have a contemporary design that complements Terminal 2-West (also known as the "Green Build") and incorporates high-quality materials and public art. Also, like Terminal 2-West, the new Terminal 1 would incorporate high-performing, sustainable design and construction features consistent with the sustainability policies and goals adopted by SDCRAA, while also achieving third-party certification requirements such as Leadership in Energy and Environmental Design (LEED) Silver certification from the U.S. Green Building Council (USGBC).

The former 132,000-square-foot Commuter Terminal would be demolished, and a new 150,000-square-foot airport administration building would be constructed near the intersection of McCain Road and Airport Terminal Road. It too would be designed to achieve LEED-Silver certification. Parking for the new airport administration building would be at the existing surface lot located at the current Terminal 2 Parking Lot at McCain Road and Airport Terminal Road. The existing lot would be resurfaced and reconfigured.  The new SDCRAA administration building would be 84 feet tall. The new administrative building would have piles to a depth of 75 feet and site excavation ranging from 8 feet to 25 feet below grade.[5]

There are currently three FAA ASDE-X sensors located on the roof of the SDCRAA administrative offices. These three sensors would be relocated to a light pole at the existing Airline Support Building on the south side of the airfield, just north of N. Harbor Drive and east of the existing SDCRAA administrative offices.

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[3] Aircraft are grouped by the FAA based on wingspan or tail height ("Airplane Design Group").  ADG-III aircraft, such as the Boeing 737 and Airbus 320, have a wingspan from 79 feet up to 118 feet or tail height from 30 up to 45 feet.  ADG-V aircraft, such as the Boeing 787 and Airbus 340, have a wingspan from 171 feet up to 214 feet or tail height from 60 up to 66 feet.

[4] Only the Terminal 1 main roof/façade would be 90 feet; the top of the concessions roof would be 75 feet and the top of the concourse would be 61 feet.

[5] Email from Habib Husain, San Diego County Regional Airport Authority to Kathleen Owston, CDM Smith dated September 22, 2020.

## A1.3 Ground Access Components

A new on-airport entry roadway and on-airport vehicle circulation roads would connect the new replacement terminal to North Harbor Drive. This roadway circulation would also connect to the Terminal Link Road, allowing high-occupancy buses and shuttles to travel between the north and south sides of SAN while avoiding public streets. An accompanying parking structure would replace the existing public parking facilities providing a total of 5,500 parking spaces. Finally, SAN would improve the existing bicycle and pedestrian access to and along SAN.

- **On-Airport Vehicle Circulation:** SDCRAA's Proposed Project includes the following access/egress and circulation roadway development:
  - A three lane inbound on-airport road connecting to North Harbor Drive at Laurel Street;
  - On-airport circulation roadways and curbfronts connecting vehicle users and emergency responders to the terminals (arrivals and departures levels), parking, and transit stops; and,
  - Outbound airport circulation, including a connection to the Terminal Link Road that would be reserved for high-occupancy vehicles (i.e., shuttle buses) traveling between the terminals on the south side of SAN and facilities on SAN's north side, such as the Rental Car Center.
- **Inbound On-Airport Road**

  The Proposed Project would modify access to the SAN terminals for traffic approaching SAN from the east by constructing the new inbound on-airport road. The inbound on-airport road would connect with North Harbor Drive at approximately Laurel Street, allowing west-bound vehicles to access the SAN terminals without using public streets. The west-bound inbound on-airport road would begin as a right-turn lane on Laurel Street just outside the airport boundary and add approximately 0.9 mile of a three-lane road parallel to and north of North Harbor Drive. A west-bound two-lane road would connect the on-airport road to the existing Terminal 2 on-airport circulation roadways. The inbound on-airport road would eliminate intersections and crossing traffic, reducing congestion to the SAN terminals. This would require grade separation of the on-airport road west of the intersection at North Harbor Drive, where the existing Terminal Link Road access and the Taxi Hold Lot entrance occur.

  The Proposed Project would not modify access to the SAN terminals for those traveling east-bound on North Harbor Drive. Terminal 2 access from the west would remain at Spanish Landing. Terminal 1 access from the west would remain at Harbor Island Drive and then be provided grade-separated direct access to the terminal curbfront roadways.
- **Circulation Roadways and Curbfronts**

  The on-airport circulation roadways for Terminal 1 would connect to the inbound on-airport road, Harbor Island Drive access, the new parking structure, and the existing outbound airport circulation. The Terminal 1 curbfront roadways would include approximately 1,500 linear feet of private vehicle curbfront on-grade for arriving passengers, about 1,400 linear feet of private vehicle curbfront for departing passengers on an elevated structure, and approximately 2,400 linear feet of curbfront for commercial vehicles on-grade. The on-airport circulation roadways for Terminal 2 would remain substantially consistent with existing conditions. The on-airport circulation for Terminal 2 would connect to the new inbound on-airport road and the existing outbound airport circulation. Terminal 2 curbfronts would remain unchanged.

Transit buses accessing the SAN terminals would operate as they do. Buses would access the SAN terminals from the new inbound on-airport road, exit the limited access on-airport roadway for the Terminal 1 circulation road, pick-up and drop-off passengers at the Terminal 1 arrivals curbfront (directly adjacent to the terminal), access Terminal 2 from an at-grade convenience connection to Terminal 2 (similar to the existing connection), pick-up and drop-off passengers at the Terminal 2 arrivals curbfront, and exit SAN from the outbound airport circulation roadway system.

- **Outbound Roadways**

  The existing exit road from each terminal would be reconfigured to connect with the existing Harbor Island Drive intersection and the existing flyover to east-bound North Harbor Drive. Reconfiguration includes elevating traffic exiting Terminal 1 over traffic accessing Terminal 2 from Spanish Landing. East of the Harbor Island Drive intersection, approximately 0.8 to 0.9 mile of a one-lane east-bound on-airport road parallel to the west-bound on-airport road would be added to connect with the Terminal Link Road and the west-bound on-airport roadway.

  The Rental Car Center bus and Employee Parking Lot shuttle access to and egress from the SAN terminals would change by eliminating their partial circulation on North Harbor Drive. These buses/shuttles, dropping off passengers at the SAN terminals, would instead use the Terminal Link Road and then the direct on-ramp access to the west-bound on-airport roadway to access both SAN terminals. Rental Car Center buses and Employee Parking Lot shuttles returning to SAN's north side from the terminals would use the outbound airport circulation roadway and the new dedicated east-bound on-airport lane to connect with the Terminal Link Road; thereby no longer needing to access North Harbor Drive.

  Pilings would be required for part of the roadway system installed to a depth of 150 feet, whereas the remainder of the roadway construction would require excavation to 15 to 25 feet.

- **Parking Structure:** The Proposed Project includes a parking structure to the south of the new Terminal 1 (at the current site of the existing Terminal 1 surface parking). The parking structure would be up to five levels and 60 feet in height for the main roof deck. The elevator equipment bulkhead and lighting poles may extend another 24 feet. The structure would be a maximum of 2,250,000 square feet of parking space, providing approximately 5,500 parking spaces.

  The parking spaces provided by the new parking structure would offset the loss of other existing parking spaces that would occur with implementing the Proposed Project. The existing Harbor Drive surface parking lot would be eliminated in its existing location to accommodate the new Terminal 1 and parking structure, airfield components, and ground transportation components. Therefore, the new parking structure would provide a net increase of 650 parking spaces compared to existing conditions. These parking spaces are needed regardless of the proposed replacement terminal.

  The parking structure would have pilings at a depth of 150 feet with the oversite excavation from 8 feet to 15 feet.

- **Pedestrian and Bicycle Circulation:** The Proposed Project includes safe, recognizable, and continuous connections along North Harbor Drive and to the SAN terminals for bicycles and pedestrians. Existing pedestrian and bicycle connections would be retained, while new connections would be established. For westbound passengers accessing SAN, at the intersection of North Harbor Drive and Laurel Street, a pedestrian/bicycle crossing would be provided along the on-airport entry ramp. From the entry ramp, pedestrians and bicycles could travel on a multi-use path along the north side of the on-airport entry roadway. At the intersection of North Harbor Drive and Terminal Link Road, the multi-use path would cross under the on-airport entry road, where it would continue along the north side of North Harbor Drive. At the intersection of North Harbor Drive and Harbor Island Drive, there would be a crossing that connects to the Terminal 1 parking structure. From there, pedestrians and bicyclists could access all new Terminal 1 facilities.

## A1.4 Central Utility Plant, Stormwater Capture and Reuse, and Utilities

The following project components would be completed to ensure that the Proposed Project is serviced and capable of functioning as intended:

- **Central Utility Plant:** To support the terminal components, the existing CUP, located along Airport Terminal Road adjacent to the Terminal 2 Parking Plaza, would be expanded by 12,000 square feet at its existing location to increase its capacity for providing heated and chilled water for building heating and cooling. The heating and cooling capacity of the CUP would be expanded by replacing all of the aging boilers with four new boilers, addition of one new boiler and associated pumps and pipes, two new heat exchangers, four buffer tanks, installation of up to five new upsized chillers along with an additional cooling tower cell and two associated condenser pumps. These improvements would increase the capabilities of the CUP to approximately 5,000 tons of cooling and approximately 28.8 million British thermal units per hour (MMBh) of heating during peak demands.
- **Stormwater Capture and Reuse System:** The Proposed Project would expand the capture area of the Stormwater Capture and Reuse System. Currently, the system diverts runoff from approximately eight acres of the Terminal 2 Parking Plaza area, which is then treated by a series of high-rate media filters and ultraviolet light before being pumped to the airport's CUP, where it is used as make-up water. As part of the Proposed Project, the system would capture runoff from approximately 170 additional acres of the SDIA's 661-acre site. The Stormwater Capture and Reuse System components include the construction of an underground cistern tank with up to 3.4 million gallons of storage. The cistern's dimensions would be approximately 140 feet in diameter and 32 feet in height. The Stormwater Capture and Reuse System components would occur throughout much of the southern and eastern portions of the airport, encompassing the new Terminal 1 and the adjacent aircraft RON parking area, as well as the Taxiways A and B improvements area. Stormwater runoff from these areas is currently being treated using more traditional Best Management Practices, such as catch basin inlet filters.

  Development of the SAN Stormwater Capture and Reuse System would require excavation of approximately 44,100 cubic yards of soil to allow for construction of an up to 1.5-million-gallon underground storage tank, as well as subsurface infiltration areas. In addition to construction of the underground storage tank and infiltration areas, the proposed expansion of the Stormwater Capture and Reuse System would include trenching to reconfigure or install new storm drain line infrastructure. The system would require the installation of approximately 19,000 linear feet of gravity storm sewer pipe, the largest pipes being 66 inches in diameter, and 9,000 linear feet of pressure pipe. Installation of storm drainpipe would generally occur during the same periods as underground storage tank installation.

  **Underground Utilities:** Utilities required for the Proposed Project facilities include electric; natural gas; water; sanitary sewer; heating, ventilation, and air conditioning (HVAC); telecommunications; and stormwater. In conjunction with implementation of the SDCRAA's Proposed Project, improvements to existing utilities serving the project area would occur. The proposed components would require removing existing underground utility lines to accommodate the new and modified structures and installing new lines and new connections to connect the new and modified structures with the existing lines.

# A2.0 Proposed Project Needs and Supporting Material

## A2.1 SDCRAA Goals of the Proposed Project

Based upon the SDCRAA goals and objectives and a further understanding of the existing conditions, the SDCRAA's purpose (goals) of the Proposed Project is:

1. Address inefficient airfield circulation adjacent to the terminals that delay aircraft going to or departing from their gates.
2. Modernize the oldest terminal (Terminal 1) at SAN to meet the current California building code requirements, especially for seismic resiliency and energy efficiency, while improving the level of service to existing and projected future passengers and increasing the gate availability within the constraints of the existing airfield's runway capacity.
3. Alleviate congestion caused by airport traffic on Harbor Drive, increase parking availability, and improve connection to the terminal complex.

The following sections provide details concerning the needs (problems) identified that led to the Proposed Project.

## A2.2 Need for Airfield Improvements

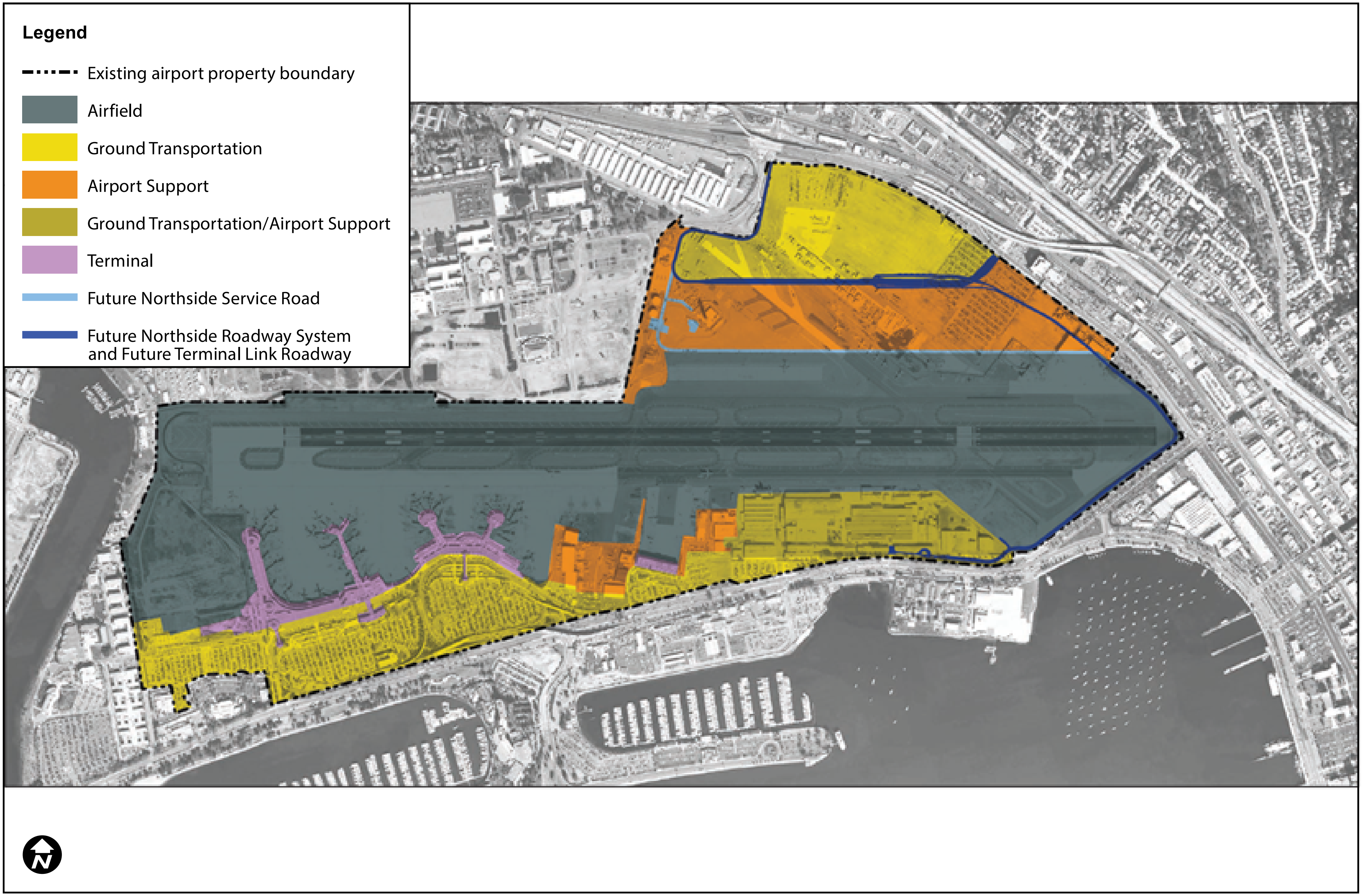
**Need**: The Taxiway System is Operationally Inefficient.

**Problem**: **Figure A1-2** shows the current taxiway layout. The current alignment of Taxiway B near the northern ends of the Terminal 1 and Terminal 2-East concourses requires aircraft to push back directly onto active Taxiway B. This reduces the overall airfield efficiency by:

- Creating a conflict with arriving flights needing to exit Runway 9-27 at Taxiway Connectors B7, B8, or B9;
- Impeding free flow taxi movements on Taxiway B; and
- Requiring FAA Air Traffic Control (ATC) intervention and increasing controller workload to ensure safety.

When aircraft leaving the terminals push back onto Taxiway B, the FAA Airport Traffic Control Tower (ATCT) must hold aircraft on apron taxilanes short of the runway exits (B7, B8, and B9). This further congests the already busy apron areas. These aircraft and aircraft already taxiing must hold, until arriving aircraft exit the runway, thus causing aircraft arrival and departure delays.

The single taxiway configuration along most of the terminal area also causes notable delays to aircraft flows by preventing two-way traffic movement. Without two-way movement, the ATCT must delay traffic to change traffic direction. Further, as RON aircraft are towed to/from the terminal complex from/to the north ramp or commuter ramp, the congestion and need for ATC intervention increases. The combination of RON aircraft transitioning to/from gates for boarding or temporary parking, the early nature of the large departure bank, and the early wave of arriving aircraft all work to complicate the single runway and single parallel taxiway configuration. The existing Taxilane A provides some relief for RON aircraft staging for Terminal 2-West gates and departing operations; however, as activity levels grow at SAN, lack of a dual parallel taxiway adjacent to the broader terminal complex are expected to further degrade on-time arrival and departure numbers.




Source: Jacobsen | Daniels, 2016

Figure A1-2

**EXISTING AIRPORT LAYOUT PLAN**

This need for bidirectional flow in the taxiway system is exacerbated when the runway use configuration switches from west flow to east flow. About 96% of the year, the airfield operates in a west flow (arrivals from the east, departures to the west). However, about 1.7 percent of the time winds require the operating configuration to be in east flow and about 1.5 percent there is a mixed flow (east and west flow).[6] This reversal in operations on a single runway and single parallel taxiway system requires bidirectional flow taxiways to avoid congestion and delay.

**Table A1-1** shows the operating times for forecast years 2024, 2026, and 2031, with **Table A1-2** providing a snapshot of the average anticipated ground delay without the proposed improvements during the hours of 0500 through 1300 in 2024.

**Table A1-1: Average Annual Operating Time (2024, 2026, and 2031)**

| Year | Annualized Travel Time - Average Annual Operating Time (minutes/operation) | | | | | | |
|---|---|---|---|---|---|---|---|
| | No Action Alternative | | | Proposed Project | | | Project Saving |
| | Air | Ground | Total | Air | Ground | Total | |
| 2024 | 37.3 | 22.2 | 59.5 | 35.9 | 21.0 | 56.9 | 2.6 |
| 2026 | 37.9 | 23.1 | 61.1 | 36.2 | 20.3 | 56.5 | 4.6 |
| 2031 | 39.7 | 25.7 | 65.5 | 37.5 | 22.3 | 59.8 | 5.7 |

Source: 2031 Airfield/Airspace Simulation Analysis PowerPoint by Ricondo & Associates, Inc, March 2020. (file KSAN_ADP SIMMOD Results and Assumptions -= 2031 DRAFT_20200323.pdf)
Notes: Air = Accumulated in airspace; Ground = Arrival and departure delay in minutes incurred from time an aircraft attempts to pushback from the gate until liftoff or from touchdown until it reaches the gate. Delay savings include both improvements with taxiway efficiency as well as increased gate availability.
Rounding of values may affect totals.

**Table A1-2: Average Morning and Early Afternoon (0500-1300) Departure Ground Delay for the No Action Alternative and the Proposed Project (2024)**

| Hour | No Action Alternative | | Proposed Project | | Delay Savings Average Day With Proposed Project (min per op/total min per day) |
|---|---|---|---|---|---|
| | Departure Operations | Ground Delay (min/op) | Departure Operations | Ground Delay (min/op) | |
| 0500-0600 | 0 | 0.0 | 0 | 0.0 | 0/0 |
| 0600-0700 | 32 | 3.4 | 32 | 3.1 | 0.3/9.6 |
| 0700-0800 | 30 | 6.5 | 32 | 3.2 | 3.3/105.6 |
| 0800-0900 | 27 | 13.2 | 26 | 8.3 | 4.9/127.4 |
| 0900-1000 | 18 | 3.7 | 17 | 2.5 | 1.2/37.4 |
| 1000-1100 | 20 | 3.7 | 21 | 3.0 | 0.7/14.7 |
| 1100-1200 | 29 | 5.4 | 27 | 4.9 | 0.5/13.5 |
| 1200-1300 | 29 | 5.4 | 27 | 4.9 | 0.5/13.5 |

Source: Ricondo & Associates, Inc., July 2019 (Average Ground Delay by Hour).
Note: The total delay in minutes incurred by an aircraft is from the time an aircraft attempts to pushback from the gate until takeoff and can be attributed to apron congestion, gate availability, general taxiway congestion, crossing an active runway, and/or waiting in a departure queue, including towing to/from remote parking.

[6] Leigh Fisher, April 4, 2021 based upon FAA Aviation System Performance Metrics (ASPM) data for 2012-2020.

## A2.3 Need for Terminal Improvements

**Need:** the planning process undertaken by SDCRAA noted three needs:

- Aging Terminal 1 does not meet current building codes;
- Insufficient passenger processing space in Terminal 1; and
- Insufficient gate availability.

**Problem:** Today, the SAN terminal complex is comprised of three buildings: Terminal 1, Terminal 2-East, and Terminal 2-West. These terminals include 51 gates and other facilities, serving the needs of commercial airline passengers.

Over the past few decades since Terminal 1 was constructed, substantial changes have occurred in the aviation industry affecting the design and layout of terminal space. These changes required retrofitting the existing terminals at SAN and have substantially influenced the planning and design of new construction at SAN. Key changes in the aviation industry include:

- Increased airport passenger security, increasing the need for security checkpoints, checkpoint staffing and technology, and baggage screening equipment. Passenger screening requirements did not exist when existing Terminal 1 was built. Passengers and the people dropping them off or picking them up (meeters and greeters) could access virtually all of SAN, including the gates, restaurants, and other facilities. A wide range of industry changes have occurred since Terminal 1 was built that have eaten into the space available to satisfy customer service quality. Most notably has been the need for increased passenger security processing.
- Substantial increases in luggage that passengers now check onto flights, as well as more carry-on bags/items. All baggage must be screened through security.
- Mechanical, electrical, and plumbing systems of Terminal 1 are operating beyond their useful lives and in need of continual repair. Replacement of aging infrastructure, including utilities (mechanical, electrical power, plumbing, water, sewer, etc.), often requires increase in system capacity to serve the substantially higher level of passenger demand.
- Increased demand for business services.
- Need to incorporate evolving technology, ranging from self-check-in, e-tickets, boarding pass printing, device electric charging stations, etc.

Today, Terminal 1 serves Allegiant Air, Jet Blue Airways, Spirit Airlines, Southwest Airlines, Sun Country Airlines, and Frontier Airlines. This terminal is serving nearly five times the volume of passengers (at 12 million annual passengers in 2018) than when it opened in 1967.

In 2016, SDCRAA commissioned a Facility Condition Assessment of Terminal 1.[7] The Assessment concluded that Terminal 1 was in poor condition due to exceeding its useful lifespan. While SDCRAA's maintenance department conducts regular maintenance of facility items to ensure passenger and employee safety, the following corrections were specifically identified as required over the next 10 years:

- Replacement of the carpet tiles and vinyl tiles;
- Replacement of the built-up roof system;

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[7] Faithful + Gould, Facility Condition Assessment Services, *Tier 2 Report of Facilities Condition Assessment for San Diego County Regional Airport Authority*, July 2016.

- Repainting of the interior wall and ceiling finishes, as well as exterior hollow metal doors;
- Replacement of certain mechanical systems: exhaust fans, several pumps, and the variable frequency drives that control the pumps, as well as replacement of numerous air handling units; and
- Replacement of certain electrical system elements, including the older switchboards and panelboards that have reached the end of their useful life and replacement of the older emergency generator, as well as the fire alarm systems.

The estimated cost of these replacements (in 2016 dollars) was approximately $23.3 million on a facility with an estimated value of $296 million. The largest cost items were associated with replacing the roof system and the air handling units, but this did not address code compliance issues.

SDCRAA staff noted that the extensive amount of non-insulated glass used throughout the terminal and the non-reflective roof systems does not meet modern “cool” roof requirements. As a result, this glass allows heat-gain in the summer and heat-loss in the winter, requiring increased energy use (i.e., mechanical heating and cooling) to compensate. Terminal 1’s outdated lighting systems also require increased energy. Ideally, Terminal 1 would feature automated lighting systems that turn-off during low-to-no occupancy nighttime hours, as well as during times of ample daylight.

Terminal 1 does not meet current City of San Diego and California Building Code (CBC) requirements. Since the construction of Terminal 1 over 50 years ago, the City and State building codes have been modified over a dozen times to improve life safety and building integrity issues associated with development, as well as to improve seismic resiliency, energy efficiency, permitting, and inspection/enforcement.[8]

Examples of current code requirements that Terminal 1 is not required to meet due to its age are:[9]

- Fire sprinklers requirements – only the newer concession areas in public space before entering security have fire sprinklers. Concessions post-security do not have sprinklers; and
- Seismic standards.

The proposed terminal improvements are also necessary to bring the building into compliance with the Americans with Disabilities Act of 1990 (ADA) (42 U.S.C. § 1210 et seq.). Currently, there are numerous non-compliant ADA elements within Terminal 1 and its adjacent short-term parking lot. These non-compliant ADA elements are allowable due to the year Terminal 1 was constructed; however, implementation of major modifications and expansion of these existing facilities would require that they be brought into compliance with current code requirements, including ADA compliance. In addition, as a recipient of FAA funds, the SDCRAA is required to keep track of and have a Transition Plan established to address noncompliance issues. Examples of non-compliance issues may include conditions created by narrow hallways that do not have ADA-required clearance areas at doors or corner turns. These conditions cannot be brought to compliance unless major remodeling is done to remove walls and alter the configuration of the terminal areas. Additionally, the surface slopes at the existing surface parking lot are non-ADA compliant and correction would require a major renovation to the parking lot to make the slopes compliant, while at the same time retaining slopes for stormwater run-off.

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[8] https://docs.sandiego.gov/municode_history/Chpt%2009%20History%20Tables.pdf.

[9] Per Ted Anasis, Manager, Airport Planning, SDCRAA, August 6, 2019.

Regarding the availability of space needed to improve the level and quality of service afforded to passengers, the SDCRAA has attempted to keep pace with and respond to the rapid changes in the airport industry, through minor renovations and improvements to Terminal 1 and the addition of Terminal 2 (east and west). Because Terminal 1 is several decades older than much of Terminal 2, SDCRAA has prioritized modernization of Terminal 1.

The SAN Airport Development Plan (ADP) planning work evaluated terminal area facility requirements associated with different Passenger Activity Levels (PALs), which are based on millions of enplaned passengers (for example, PAL 12 is equivalent to 12 million enplanements). The SDCRAA used industry accepted resources to identify its terminal spatial needs. Airport Cooperative Research Program (ACRP) Report 25: *Airport Passenger Terminal Planning and Design*, was used to identify the spatial needs based upon the forecast and design day flight schedules discussed in **Appendices A2** and **A3**. **Table A1-3** provides a summary of the facility requirements identified by the ADP planning process, with a focus on Terminal 1 needs. Terminal 1 has insufficient space for:

- Ticketing and check-in processing;
- Outbound Baggage processing;
- Security checkpoint screening areas;
- Retail and Food and Beverage Concessions space;
- Restrooms;
- Seating in the boarding areas;
- Inbound baggage processing and baggage claim;
- Adjacent auto parking (short-term parking); and
- Departures and arrivals curb length.

As noted earlier, SAN is a constrained airport due to its single runway and limited land area. Therefore, the ADP planning process was to identify the facility requirements associated with SAN's constrained level of activity. With its single runway, SAN's annual operating capability is expected to be limited to approximately 50 peak hour operations or roughly 292,000 annual aircraft operations.

Through that analysis, SDCRAA determined that a deficiency of about 835,100 square feet of terminal space would exist in serving passengers with an optimum level of service at PAL 18 (18 million enplaned passengers), estimated to occur in 2031.

**Table A1-3: Terminal Area Facility Requirements at Various Passenger Activity Levels (PALs)**

| Functional Area | PAL (Millions of Enplaned Passengers) | | | |
|---|---|---|---|---|
| | PAL 12 (2018) | PAL 14 | PAL 16 (Expected in 2026) | PAL 18 (Expected in 2031) |
| **Gates** | | | | |
| Number of Terminal 1 Gates | 19 | 19 | 30 | 30 |
| Turns per gate (Terminal 1) | 7.47 | 8.30 | 8.67 | 9.74 |
| Number of All Gates | 51 | 62 | 68 | 73 |
| Turns per gate (All Gates) | 7.12 | 8.10 | 8.27 | 8.69 |
| RON (Remain Overnight) Positions | 28 | 25 | 31 | 37 |
| All Gates + RON positions | 79 | 87 | 94 | 110 |
| | | | | |
| **Terminal 1 Space (sf)** | | | | |
| Check-In/Ticketing | 17,559 | 24,600 | 25,800 | 30,300 |
| Outbound Bag Screening and Make-up | 38,459 | 167,700 | 176,700 | 207,300 |
| Security Screening Checkpoint | 23,659 | 53,700 | 55,900 | 65,500 |
| Passenger Lounge/ Holdroom | 48,359 | 139,900 | 147,400 | 148,500 |
| Baggage Claim and Inbound Baggage Handling | 30,463 | 60,200 | 60,200 | 60,200 |
| Custom and Border Protection | 0 | 0 | 0 | 0 |
| Concessions | 25,700 | 121,000 | 155,500 | 174,000 |
| Restrooms | 6,900 | 44,300 | 45,900 | 53,500 |
| Secondary Function | 66,000 | 72,900 | 76,100 | 83,500 |
| All Other Areas | 27,200 | 233,900 | 244,100 | 266,700 |
| Total Terminal 1 Area | 284,300 | 918,200 | 987,600 | 1,089,500 |
| TOTAL Airport Terminal Space (Terminals 1 and 2) | 1,351,100 | 1,639,800 | 1,801,000 | 2,105,300 |
| | | | | |
| Total Airport Public On-Airport Parking Spaces | 8,550 | 8,550 | 9,700-11,000 | 9,700-11,000 |
| Terminal 1 Lot | 1,200 | 1,200 | 2,950-3,345 | 2,950-3,345 |
| Employee parking spaces | 1,800 | 2,000 | 2,150 | 2,150 |

Source: Leigh Fisher Technical Memorandum *NEPA Purpose & Need Support – Terminal Area Improvements*, August 7, 2019, using industry standard practices per ACRP Report 25: *Airport Passenger Terminal Planning and Design*.
Notes:
Totals may reflect rounding.
Other areas include building structure, vertical circulation (stairs, elevators), mechanical/electrical/utility, and allowance for design variations.
Without the Proposed Project, the turns per gate (with 19 gates at Terminal 1) would increase from 7.47 in 2018 to 10.42 in 2026.
Based on the FAA-approved forecast, SAN is estimated to reach PAL 16 in 2026 and PAL 18 in 2031.

As more passengers occupy the space noted for the existing condition in Table A1-3, stresses in the airport system would increase. The effects of this reduced level of service means the following:

- Longer lines would occur in the ticketing areas and at the security checkpoints as more passengers are processed in the limited 23,659 square foot security screening checkpoint space;
- Passengers would need to plan greater amounts of time to get from the terminal curbfront to their gate, and on a returning flight longer times to obtain baggage;
- Longer lines at the concessions/restaurants to obtain a seat, to be waited upon, to receive food orders, etc.;

- Larger demand for seating and other amenities in boarding areas, while passengers wait for flights (workspace, power for passenger electronic device charging);
- Longer lines and overcrowding at the restrooms;
- Extended queues at vertical circulation points (elevators, stairs, and escalators), creating potential life safety concerns; and
- Increased congestion at the departure and arrival curbs causing significant delays in passenger drop-off and pick-up and exacerbating air quality concerns, resulting from long lines and increased queue times.

Without additional gates, the existing Terminal 1 gates would be required to turn over flights more quickly and the existing RON positions would be used as “hardstands” to park aircraft that would normally be parked at a terminal jetway. In that situation, passengers would be bused to and from the remote hardstands/RON positions, further lowering passenger levels of service. Maximum gate use, or turns per gate, in the industry varies based on airline, airport, and specific operating parameters. Generally, airlines rarely schedule gates to be used more than 8 to 10 times (called a turn) per day as noted in ACRP Report 163: *Guidebook for Preparing and Using Airport Design Day Flight Schedules*. Based on the nature of current operations at Terminal 1, the gates are already being used at a high rate, and not providing for additional gates in the future would only exacerbate ramp operational delays, which would ripple throughout the entire airport operation over the course of the day.

SDCRAA identified the number of gates needed using several industry standard practices aligned with the methodology in ACRP Report 25: *Airport Passenger Terminal Planning and Design*, using gated flight schedules to serve the aviation forecast in **Appendix A2**. The gate/ramp charts for the No Action Alternative and SDCRAA’s Proposed Project are provided in **Appendix A3**. The forecasts were translated into a design day flight schedule (DDFS) for each of the forecast periods. Using these schedules, flights were assigned to the terminals and gates in accordance with a proportional change in activity and based upon airline and aircraft types/wingspans. Gate assignment and use tools were used to assess aircraft gate compatibility in terms of maximum wingspan and maximum length, as shown in **Appendix A3**; dependencies between adjacent gates; and operational parameters such as the amount of time required for on-gate operations, towing operations, and buffers to protect for early or late arrivals.

The evaluation indicated that at 14 million enplanements (PAL 14), SAN would require up to 62 total gates depending upon how gates are leased.[10] At 18 million enplanements (PAL 18), the airport would need 73 gates. Adjusting the analysis to account for all gates being common use versus preferential use gates, and gates available at other terminals, SDCRAA determined that the replacement terminal would require 30 gates, as a result of optimized use. SAN currently has 51 gates as noted in Table A1-3, and 28 RON positions. The gate use, translated into enplanements per gate, would increase from 237,804 to 326,876 in 2026 and 355,360 in 2031 at the present number of gates. Without additional gates in the future, the RON positions that are largely used at night today would become aircraft parking positions or hardstands during the daytime as activity levels increase. Thus, RON positions would enable SAN to serve the forecast constrained activity shown in Table A2-1 in

[10] The planning process noted that implementing a common-use strategy would result in a decrease in the total number of gates required to accommodate forecast demand. Requirements for both scenarios tested included “buffer gates” in addition to the gates strictly required to accommodate the flights scheduled to account for irregular operations, disruptions in airline flight schedules, and boarding bridges being out of service for maintenance/repair. The ADP process concluded that all international gates be swing gates (i.e., gates that can be used for both international and domestic operations) to increase flexibility and optimize facility use.

**Appendix A2** and, therefore, increasing the number of gates would not enable SAN to increase its ability to handle more aircraft operations than what it is limited now with the single runway.

## A2.4 Need for Ground Transportation Improvements

**Need**: Existing and Future Airport Surface Traffic Compounds Congestion on Harbor Drive.

**Problem and Background**: SAN is in the City of San Diego along North Harbor Drive, approximately two miles northwest of the downtown area. It is bounded to the north by the Marine Corps Recruit Depot (MCRD) San Diego, to the east by Pacific Highway and I-5, to the south by North Harbor Drive and San Diego Bay, and to the west by the Navy Boat Channel and Liberty Station mixed-use development. SAN is accessed by motorists via an arterial roadway system, which is also heavily used by local commuters and visitors to the San Diego Bay waterfront area. Unlike many large commercial service airports, there is no direct highway access to/from SAN. North Harbor Drive provides access to the regional highway system via connections with other local major thoroughfares and has intersections with the internal airport roadway system.

Laurel Street, Hawthorn Street, and Grape Street connect I-5 to North Harbor Drive east of SAN. Pacific Highway and Kettner Boulevard run parallel to I-5 and, together with North Harbor Drive, provide access to Downtown San Diego. Access from the west is provided by Rosecrans Street and Nimitz Boulevard, both of which connect I-8 to North Harbor Drive west of SAN. Washington Street provides public access to the north part of SAN.

Access to Terminal 1 from the east (I-5 and Downtown San Diego) is provided by a two-lane ramp from westbound North Harbor Drive. This access ramp leads to Terminal 1's curbside and Transit Plaza. A grade-separated, one-lane access ramp from North Harbor Drive leads directly to the Terminal 1 public parking lot. Traffic from the west (Point Loma) can access Terminal 1 via a signalized intersection at Harbor Island Drive.

Access to Terminal 2 from the east is provided by a separate, one-lane access ramp via westbound North Harbor Drive located west of Harbor Island Drive. This at-grade ramp leads to the Terminal 2 curbside, the transportation island (for commercial modes such as shuttles and taxis), and the public parking lot. Traffic from Harbor Island Drive can access Terminal 2 by turning left at the traffic signal on North Harbor Drive and using the Terminal 2 access ramp. Eastbound traffic accesses SAN's Terminal 2 via a signalized intersection at North Harbor Drive across from Spanish Landing.

Access to the SDCRAA Administration Building's curbside loop and parking lots from the east and west is provided by the signalized intersection at Winship Lane.

Traffic exiting Terminals 1 and 2 toward I-5 and Downtown San Diego use a grade-separated fly-over from the terminal loop road system, which merges with eastbound North Harbor Drive just before the intersection with Liberator Way. Other egress routes are via the signalized intersections at Harbor Island Drive and at Spanish Landing. These routes are primarily used by exiting traffic heading west and south towards Harbor Island Drive and Point Loma. Winship Lane serves as the primary egress point for the SDCRAA Administration Building.

SAN does not presently have a direct connection or station to a fixed-rail transit system, other than the City Bus Route 992 bus connection to light-rail (i.e., San Diego Metropolitan Transit System (MTS) Trolley) and heavy-rail (i.e., North County Transit District's COASTER and Amtrak) at the Santa Fe Depot. In addition to City Bus Route 992, City Bus Route 923 also serves SAN by providing airport access for neighborhoods directly west and northwest of SAN. Unlike Route 992, which comes into SAN and stops at Terminals 1 and 2, Route 923 does not enter the airport property, but it does pick up and drop off passengers along Harbor Drive near SAN. Finally, SAN passengers can utilize the Rental Car Center shuttles to connect between the south side terminal area and a north side on-airport shuttle stop, which is a block away from the MTS Middletown Trolley Station (Blue Line).

The planning process examined existing conditions along SAN's access roadways, including vehicular volumes using actual traffic counts and video surveillance, turning movements, and levels of service.[11] Over the decades that SAN has been in operation, traffic within the area has increased due to growth in passenger travel and new development in the downtown and surrounding areas. This growth has resulted in traffic congestion on roadways and intersections connecting SAN to the regional transportation system. Many roadways within the SAN area are currently carrying traffic volumes in excess of their design capacity. The following streets are operating at level-of-service (LOS) F conditions as is shown in **Appendix G** of this EA:

- North Harbor Drive (five segments);
- Hawthorn Street (four segments);
- Grape Street (two segments); and
- Sassafras Street (one segment).

## A2.5 Need for Passenger Parking

**Need**: Displaced Parking Must be Replaced and Additional Public Parking is Needed.

**Problem and Background**: Another element of passenger processing is providing short-term auto parking for passengers. **Table A1-4** lists the current parking at SAN. The current short-term surface parking lot at Terminal 1 provides 1,200 parking stalls. The replacement Terminal 1 would eliminate the existing lot. Since the completion of the most recent parking study, other projects independent of SDCRAA's Proposed Project have resulted in a loss of public parking/stalls. Independently, other passenger and employee parking lots on Harbor Drive are being displaced by separate airport capital projects. Therefore, new close-in parking is needed to meet current and future demand from passengers.

**Table A1-4: Existing Airport Parking**

| Location | Public Stalls | Employee Stalls |
|---|---|---|
| Terminal 1 | 1,200 | 0 |
| Terminal 2 Plaza | 2,900 | 0 |
| Terminal 2-West | 1,100 | 0 |
| Remote: Pacific Highway | 1,950 | 0 |
| Commuter Terminal | 0 | 200 |
| Harbor Drive | 1,400 | 1,550 |
| Airport Design & Construction Lot | 0 | 50 |
| **Total** | **8,550** | **1,800** |

Source: Ricondo & Associates, Inc., August 2019.

[11] Using the Transportation Research Board's *Highway Capacity Manual (HCM)*, 2016. LOS A represents free flow operations, LOS B is reasonable free-flow operations, LOS C is at or near free flow operations, LOS D is decreasing free flow operations, LOS E is operations at capacity, and LOS F is breakdown in vehicular flow.

SAN's Parking Study[12] noted that there was a latent demand in 2017 for an additional 217 stalls at Terminal 1. Latent demand for parking is "demand for parking that is not realized due to the customer being dissuaded from using the parking product in some way." In this case, latent demand is caused by insufficient parking capacity. The study also noted that in 2009, the base year of the parking study, the latent demand at Terminal 1 was for 493 stalls. As a result, recent planning has examined the effect that transportation network companies (TNCs), such as Uber and Lyft, have had on the need for parking. By 2030, SAN's daily demand for short-term parking at Terminal 1 could reach 1,582 stalls, depending on the adoption rate of TNC usage. The Parking Study noted that SAN would experience a need for 8,450 public parking stalls across all terminals.[13] The parking analysis suggested that 9,300 total airport stalls would enable SAN to meet its demand and provide sufficient contingency for activity fluctuations during construction or peak holiday season periods. Therefore, with an increase in parking demand coupled with the loss of parking stalls to complete various components of the Proposed Project, additional parking would be needed. With the addition of the proposed 5,500-stall Terminal 1 parking structure, SAN would have approximately 9,200 net public parking stalls across all terminals, in close alignment with the projected need of 9,300.

# A3.0 Construction Timeframe

SDCRAA's Proposed Project components would be implemented in two phases (Phases A and B), that would ensure that regular airport operations would be maintained at a sufficient level during construction.

## A3.1 Phase A

It is anticipated that Phase A of the Proposed Project Terminal 1 improvements could start in 2021 and be completed by the end of 2024.

As part of Phase A, the eastern portion of the replacement Terminal 1 would be constructed and include approximately 835,000 square feet of floor space, consisting of landside terminal space (passenger processing) and airside terminal space (concourse). Terminal 1 (Phase A) would be located immediately to the east of the existing Terminal 1. As shown in **Figure A1-3**, Terminal 1 (Phase A) would have a linear design and consist of 19 gates. Also occurring in Phase A would be the construction of the central and eastern portions of the new Taxiway A, relocation of the central portion of Taxiway B and replacement of its asphalt pavement sections, and a new (replacement) RON aircraft parking area on the east side of the new terminal.

Other components that would occur during Phase A include the new Terminal 1 access loop, on-airport entry roadway (including a multi-use pedestrian and bicycle path), and western portion of the Terminal 1 parking structure. Finally, Phase A would include the relocation of three FAA ASDE-X sensors from the current SDCRAA administration building to the existing Airline Support Building east of the new Terminal 1 area, installation of an underground cistern to expand the Storm Water Capture and Reuse System, and expansion of the existing CUP's heating and cooling capacity.

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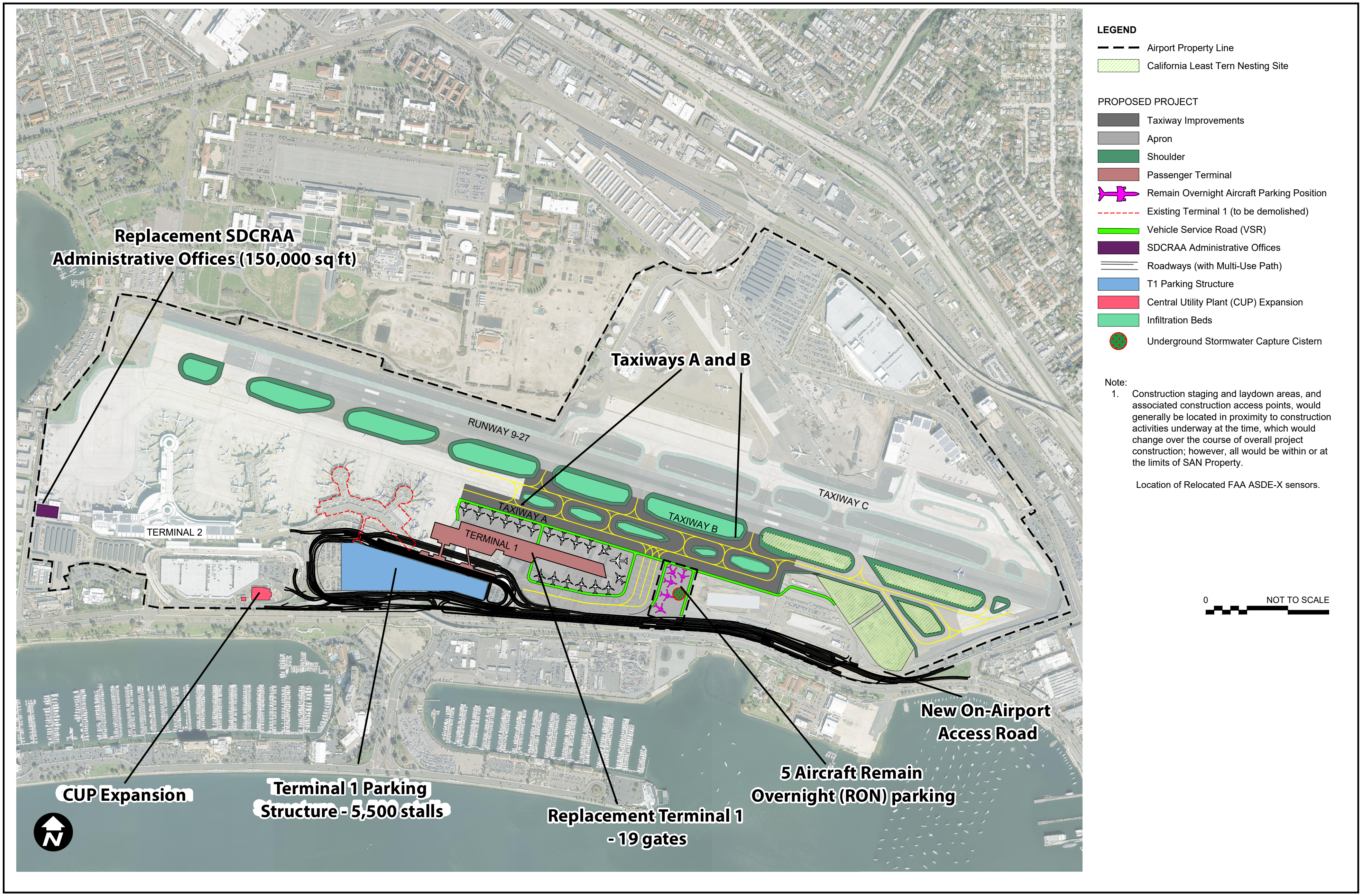
[12] Ricondo & Associates, Inc., *San Diego International Airport, Revised Draft Parking Demand Analysis Update,* May 2018; Ricondo & Associates, Inc., Technical Memorandum: "Estimating Demand for Passenger Parking at San Diego International Airport", August 22, 2019.

[13] Ricondo & Associates, Inc., Technical Memorandum: "Estimating Demand for Passenger Parking at San Diego International Airport", dated August 22, 2019.




Source: Jacobsen | Daniels, 2021.

Figure A1-3

**PROPOSED PROJECT (PHASE A)**

To accommodate the Phase A components, approximately 336,000 square feet of existing building floor space would be demolished, including a 36,000 square-foot portion of Terminal 1 (Gates 1, 1A, and 2) and the Commuter Terminal (132,000 square-feet). Additionally, approximately 4,793,000 square feet of surface space, including roadways, parking lots, access roads, aircraft apron, and Taxiway B would be demolished/removed for construction of Phase A building and surface element improvements. **Figure A1-4** shows the facilities to be removed.

During Phase A, the western portion of Terminal 1 would remain in operation. Upon completion of Phase A, most operations within the existing Terminal 1 would be moved to the new terminal facility, and the remaining operations that could not be accommodated would be consolidated within existing Terminal 2. As shown in **Table A1-5**, at completion of Phase A, the total number of gates operating at SAN would remain the same (51 gates).

**Table A1-5: Number of Aircraft Gates and RON Positions at SAN at End of Each Project Construction Phase**

| Terminal | Total Number of Gates at SAN | | |
|---|---|---|---|
| | Existing | Phase A | Phase B |
| Existing Terminal 1 | 19 | 0 | 0 |
| Replacement Terminal 1(a) | - | 19 | 19 |
| Replacement Terminal 1(b) | - | 0 | 11 |
| Existing Terminal 2-West* | 19 | 19 | 19 |
| Existing Terminal 2-East | 13 | 13 | 13 |
| **Total Gates** | **51** | **51** | **62** |
| RON positions | 28 | 26 | 26 |

Source: SDCRAA, March 2021. LeighFisher, 2019.

Note: *Four existing widebody positions at Terminal 2-West can operate as six narrow-body gate positions.

## A3.2 Phase B

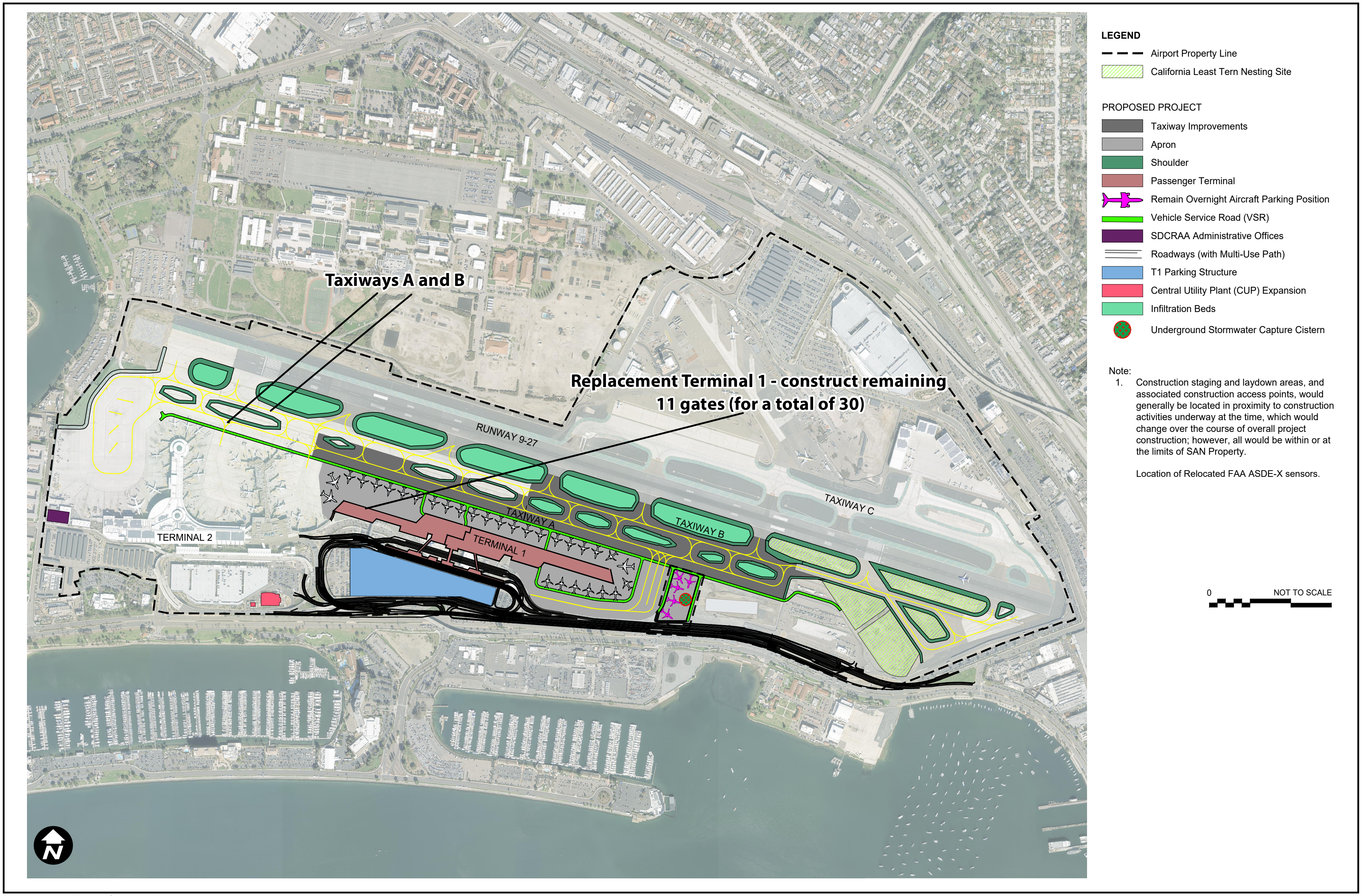
It is anticipated that Phase B would be completed by late 2026.

The existing Terminal 1 would be demolished to make way for completing the remaining portion of the new Terminal 1, by adding approximately 375,000 square feet, including 11 additional gates. The expanded Terminal 1 area would also include an additional bag claim carousel and bag claim support spaces, additional space for security screening lanes, and additional space for passenger check-in.

The concourse would include space for boarding, seating, and concessions area on levels 2 and 3 and bag make-up, operations, mechanical, and support space on the arrivals level. Phase B would include construction of a post-security corridor connection between the new Terminal 1 and the existing Terminal 2-East.

As shown in **Figure A1-4**, Phase B would also include the completion of the eastern portions of the Terminal 1 parking structure. Other components that would occur during Phase B include implementation of approximately 674,000 square feet of surface elements, including aircraft apron, portions of Taxiways A and B, and the access road. To accommodate the Phase B components, the remaining approximately 300,000 square-foot of existing Terminal 1 would be demolished as well as approximately 680,000 square feet of surface elements, including the Terminal 1 surface parking lot, employee parking lot, aircraft apron, and portion of Taxiway B.

As shown in **Table A1-5**, at completion of Phase B, there would be a net increase of 11 gates in the total number of gates at SAN (from 51 gates at the completion of Phase A to 62 gates at the completion of Phase B).




Source: Jacobsen | Daniels, 2021.

Figure A1-4

**PROPOSED PROJECT (PHASE B)**

**LEGEND**

Buildings

| | |
|---|---|
| A | Airport Administration Building |
| B | Terminal 1 |

Surface Elements

| | |
|---|---|
| C | On-Airport Roadway |
| D | Airport Administration Building Parking Lot and Access Roads |
| E | Taxiway B |
| F | Employee/Public Parking Lots |
| G | Terminal 1 Parking Lot |
| H | Airport Apron (including 5 RON Positions) |
| I | Airfield Ovals |

Buildings that have been, or will be, removed prior to construction, separate and independent from the Proposed Project

Source: SDCRAA 2021

Figure A1-5

**FACILITIES TO BE REMOVED**

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Appendix A2

# Aviation Forecast

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# Table of Contents



# List of Tables



# List of Attachments

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# Forecast Summary

## Introduction

An aviation forecast provides the basis of the aircraft movements and passenger numbers that, in turn, assists in defining the types and timing of airport improvements that may be required, as well as the basis for the analysis in determining certain environmental impacts (such as aircraft noise and air quality). The San Diego County Regional Airport Authority (SDCRAA) developed forecasts used in this Environmental Assessment (EA) and are summarized in **Table A2-1** below. The Federal Aviation Administration (FAA) approved the forecast in 2019; the prior approved forecasts prepared in 2013 are herein incorporated by reference.[1] The EA presents an assessment of conditions through year 2031, five years beyond completion of the Proposed Project. For purposes of the years assessed in this National Environmental Policy Act (NEPA) document, the FAA considers the period beyond 2031 as not reasonably foreseeable relative to predicting environmental impacts of the Proposed Project.

**Table A2-1: Constrained Aviation Activity Forecast Summary**

| | Historical 2018 | 2026 | 2031 |
|---|---|---|---|
| **Annual Aircraft Operations** | | | |
| Air Carrier | | | |
| Passenger Airlines | 197,244 | 239,400 | 252,600 |
| Cargo Airlines | 3,850 | 4,400 | 5,300 |
| Other | 372 | 400 | 600 |
| Total Air Carrier | 201,466 | 244,200 | 258,500 |
| Air Taxi | | | |
| Passenger Airlines | --- | --- | --- |
| Cargo Airlines | 2,530 | 2,900 | 3,100 |
| Other | 9,967 | 2,300 | 1,800 |
| Total Air Taxi | 12,497 | 5,200 | 4,900 |
| Total Commercial Aircraft Operations | 213,963 | 249,400 | 263,400 |
| General Aviation | 10,337 | 8,760 | 8,030 |
| Military | 758 | 640 | 650 |
| **TOTAL ANNUAL AIRCRAFT OPERATIONS** | 225,058 | 258,800 | 272,080 |
| | | | |
| **Annual Enplaned Passengers** | 12,125,938 | 16,238,000 | 18,360,000 |

Source: Leigh Fisher analysis, April 2021.
Note: Years 2026 and 2031 are interpolated from the Constrained Forecast based upon the Average Annual Design Day Flight Schedules prepared for the study. Historical 2018 data based upon SDCRAA records.

## Effect of Capacity Constraints

As part of the 2018 updated Airport Development Plan (ADP) forecast, a constrained demand scenario of SAN aviation activity was developed to recognize that a single runway is not able to meet the regions' air travel demand. The constrained demand scenario is defined by specific assumptions about the hourly processing capability of a single runway and the ability of the airlines serving SAN to operate in a constrained environment; the constrained demand scenario addresses the real-world limitations of SAN's single runway on maximum aviation activity at the airport.

[1] San Diego County Regional Airport Authority, *Technical Memorandum – Aviation Demand Forecasts, Airport Development Plan*, prepared by LeighFisher, March 2013.

The single runway at SAN can process a peak level of about 50 operations per hour. In theory, the airfield could process 438,000 operations (if all 50 operations per hour occurred, 24 hours a day, and 365 days). However, today, SAN's Airport Use Regulation restricts departures by any aircraft between the hours of 11:30 p.m. and 6:30 a.m. and gate departures between the hours of 11:15 p.m. and 6:15 a.m.; no departures are permitted during these periods, but arrivals are not restricted. Therefore, this theoretical capability would be reduced to 310,250 operations (if 50 operations occur during 17 hours per day, 365 days).

It is important to note that this peak 50 operations per hour on a single runway also cannot be sustained over multiple hours during the day, as it would not enable the system to recover from typical unforeseen circumstances (i.e., weather or operational issues). This led to examining the Annual Service Volume (ASV)[2] as the measure of the level of activity that could be processed. Prior evaluations of the airfield operating capability at SAN indicated an ASV of 292,000 operations on the high end or 262,000 operations on the low end. Therefore, as the demand increases over time, aircraft operations demand would not be met on a single runway once the ASV has been reached. Chapter 5 of the attached 2019 Forecast Update report discusses the constrained forecast as well as the ASV calculations.

The SDCRAA also considered the ability of the existing facilities to serve the constrained forecast. Gated flight schedules were prepared for both the No Action Alternative and the Proposed Project. By gating the activity, it showed that with the existing terminal complex and remain overnight (RON) positions (that would function as hardstands), the constrained level of activity could be served, although with a high degree of congestion and poor levels of service to passengers. In the case of use of existing RON as hardstands, aircraft upon landing would be directed to a hardstand to park, and passengers would then be bused from these remote positions to/from Terminal 1 for processing. The gated flight schedules are shown in in **Appendix A3**.

## Comparison to the FAA Terminal Area Forecast

In preparing this EA, the SDCRAA forecast scenarios discussed above were compared to the FAA's current Terminal Area Forecast (TAF). It is important to note that the FAA's TAF is prepared without consideration of constraints that may exist at an individual airport. **Table A2-2** shows the comparison of the constrained updated ADP forecast, which the FAA has approved for use in this NEPA process, with the FAA TAF (March 2019) and provides the differential between the two forecasts.

This environmental review document uses the SAN Aviation Activity Forecast that was approved by FAA in June 2019. The forecast is based on a 2018 baseline year, which represented the most recent complete year of operations at the time, and projected activity levels out to 2050. However, in 2020, the world experienced the COVID-19 pandemic (also known as the Coronavirus pandemic) which resulted in a significant reduction in aviation activity. Activity at SAN similarly decreased from its 2019 levels of 25.2 million passengers and 231,352 operations to 9.2 million passengers and 132,566 operations, respectively, in 2020. During 2021, nationwide aviation activity, including at SAN, has been slow to rebound pending the availability of a vaccine and a resumption of normal leisure and business activities. Various industry experts predict that activity may not rebound to 2019 levels

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[2] FAA Advisory Circular 150/5060-5 *Airport Capacity and Delay*, identifies the methodology to calculate ASV. This advisory circular defines ASV as "a reasonable estimate of an airport's annual capacity. It accounts for the differences in runway use, aircraft mix, weather conditions, etc., that would be encountered over a year's time." As activity levels reach ASV, delay levels increase exponentially.

until 2026 or 2027, while others suggest shorter or longer timeframes. The FAA's most recent TAF, which was released in May 2021[3] and incorporates COVID-19 impacts, predicts that aircraft operations and passenger levels at SAN will return to 2019 levels by 2025.

FAA guidance indicates that a forecast used in a NEPA document should be within 10 percent of the TAF for the 5-year analytical period and within 15 percent for the 10-year analytical period.[4] The FAA approved the Updated ADP Constrained Forecast scenario for purposes of preparing this EA in 2019, based upon the then current TAF.[5] As already described above, the nation faced a shutdown of economic activities in response to the COVID-19 pandemic outbreak that had a large effect on aviation activity during 2020 and early 2021.

**Table A2-2: Comparison of SAN Constrained Forecast to FAA TAF**

| Year | Annual Activity | | | |
|---|---|---|---|---|
| | Updated ADP Forecast (constrained) | FAA TAF (downloaded March 2019) | Difference between ADP and 2019 TAF | FAA TAF (May 2021) |
| **Enplaned Passengers** | | | | |
| 2018 (existing) | 12,125,938 | 12,001,009 | | 11,986,551 |
| 2026 (buildout) | 16,012,700 | 15,063,516 | ADP is 16.1% higher | 13,796,598 |
| 2031 (buildout + 5) | 18,322,760 | 16,781,748 | ADP is 15.9% higher | 15,807,145 |
| **Annual Aircraft Operations** | | | | |
| 2018 (existing) | 225,058 | 221,821 | | 221,821 |
| 2026 (buildout) | 258,785 | 271,616 | ADP is 2.5% higher | 252,480 |
| 2031 (buildout + 5) | 272,290 | 299,263 | ADP is 4.7% lower | 285,696 |

Source: LeighFisher, 2021.

[3] https://taf.faa.gov/.

[4] FAA Order 5050.4B, Paragraph 504 b. https://www.faa.gov/regulations_policies/orders_notices/index.cfm/go/document.information/documentID/14836.

[5] June 19, 2019 letter from Brenda Perez, FAA Community Planner to Ted Anasis, San Diego County Regional Airport Authority "San Diego International Airport (SAN) Aviation Activity Forecast Approval" (included in Attachment 1 of this appendix).

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## Attachment 1 – Approved Final Technical Memorandum Aviation Activity Forecast Update April 2019

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Leigh|Fisher

FINAL TECHNICAL MEMORANDUM

# AVIATION ACTIVITY FORECAST UPDATE

**San Diego International Airport**

Prepared for

San Diego County Regional Airport Authority
San Diego, California

April 2019

SAN DIEGO INTERNATIONAL AIRPORT
LET'S GO.

Leigh|Fisher

CONTENTS

## 1.0 INTRODUCTION

The Airport Development Plan (ADP) forecasts for San Diego International Airport (SDIA or the Airport) were prepared in 2012 using 2011 as the base year. Since then, actual passenger traffic at SDIA has exceeded the 2012 ADP forecasts, reflecting strong economic growth, decreases in domestic airfares, the use of larger capacity aircraft (in terms of the number of seats), higher load factors, and strong growth in both origin-destination (O&D) and connecting passengers. Given faster than forecast economic and passenger traffic growth, the San Diego County Regional Airport Authority (the Authority) asked LeighFisher to review the key industry issues and trends that drive aviation activity at SDIA and prepare updated aviation activity forecasts using 2018 as the base year.

The objective of this technical memorandum is to:

- Review recent aviation trends at SDIA for the period since the ADP forecasts were prepared (between 2011 and 2018) and the factors contributing to faster than forecast growth
- Refresh the methodology used in the 2012 ADP forecasts and update the key drivers of SDIA aviation demand*
- Prepare updated unconstrained forecasts of enplaned passengers, air cargo, and aircraft operations through 2050**
- Prepare a constrained demand scenario based on SDIA's single runway capacity
- Compare the updated unconstrained forecasts with the 2012 ADP forecasts, the FAA's published 2018 Terminal Area Forecast (TAF), the constrained demand scenario, and as required by the FAA, prepare forecast comparisons for FAA review and approval

The unconstrained forecasts presented in this memorandum do not include specific assumptions about physical, regulatory, environmental or other impediments to aviation activity growth. The constrained demand scenario was prepared based on the unconstrained forecasts and reflects the real-world limitations of SDIA's single runway on unconstrained forecast growth. This well-known and substantial limitation on the operational and passenger capacity of the airport must be considered in planning airport improvements and analyzing their reasonably foreseeable impacts. The constrained demand scenario presented in this memorandum analyses and anticipates these limitations and therefore the constrained demand scenario represents the "preferred" forecasts recommended for FAA approval and for airport planning.

Forecasts and demand scenarios are presented for enplaned passengers, air cargo, and aircraft operations, including operations for passenger and all-cargo airlines and general aviation and military aircraft. Using calendar year 2018 as the base year, annual forecasts and demand scenarios were prepared for four future demand years—2023, 2028, 2033, and 2050. In addition, high and low forecast scenarios were developed and are summarized in Appendix B. For reference, Appendix C includes the FAA Approval Letter of the draft Unconstrained Forecasts and the 2012 ADP forecast report.

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* San Diego International Airport, Airport Development Plan, Aviation Activity Forecasts, November 2012. Approved by the FAA in a letter dated May 7, 2013.

** The draft unconstrained forecasts were reviewed and approved by the FAA in a letter dated December 20, 2018. See Appendix C. The draft unconstrained forecasts reviewed by the FAA were based on the 10 months of actual 2018 activity statistics available at that time. This memorandum was updated to include the full year of actual 2018 activity statistics and the addition of the Constrained Demand Scenario for consideration by the FAA.

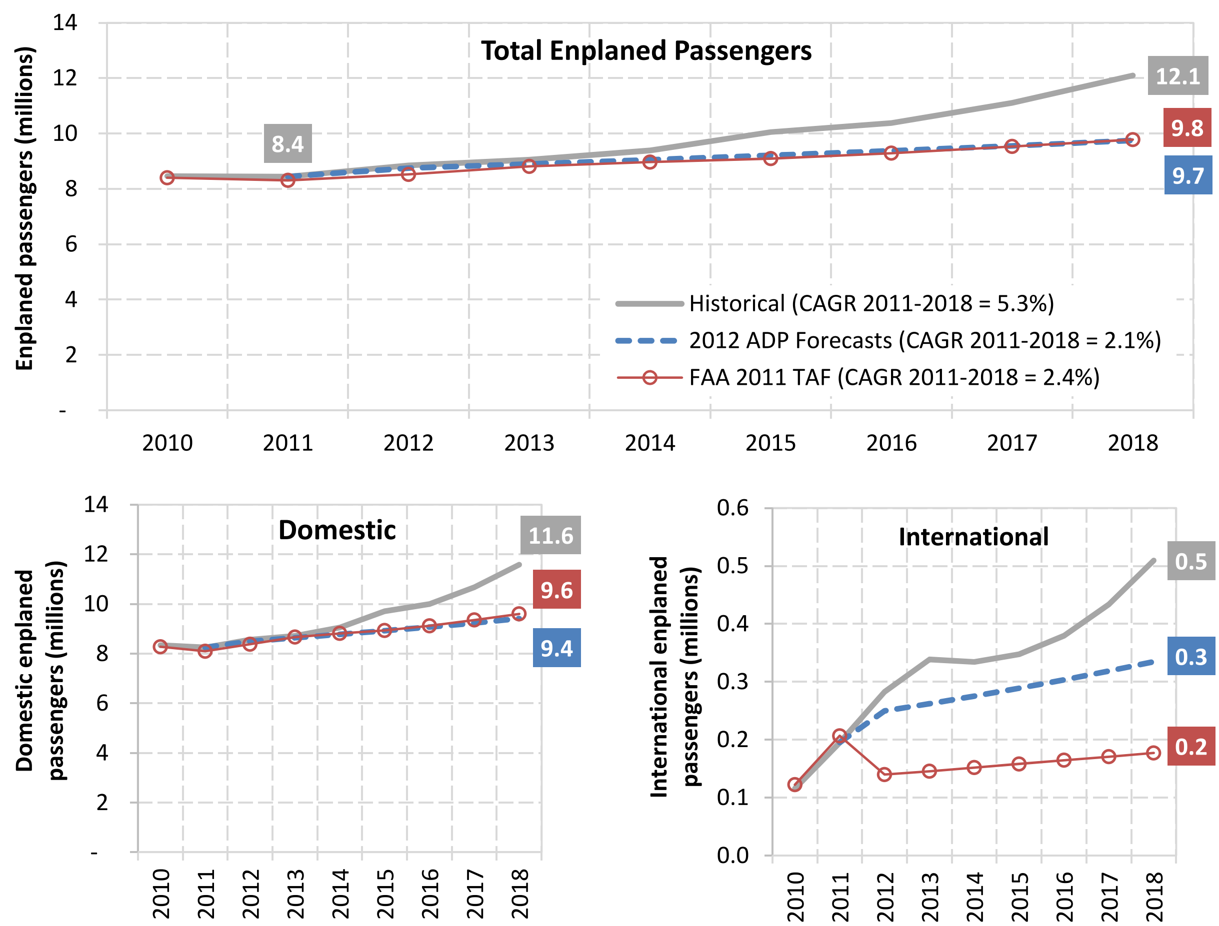
## 2.0 REVIEW OF RECENT AVIATION TRENDS

This section presents a review of actual and forecast aviation activity between 2011 and 2018 using the 2012 ADP forecasts and the FAA 2011 TAF as a basis for comparison. A summary of the factors contributing to faster than forecast growth since 2011 is also presented.

### 2.1 Enplaned Passengers

In 2018, the number of enplaned passengers totaled 12.1 million, approximately 2.4 million greater than the 2012 ADP forecast of 9.7 million (a difference of 24%), as shown on Figure 2-1. Domestic passengers at SDIA accounted for most of the increase between 2011 and 2018, although international passenger traffic more than doubled during this period.

Figure 2-1
**HISTORICAL AND FORECAST ENPLANED PASSENGERS: 2010-2018**
San Diego International Airport



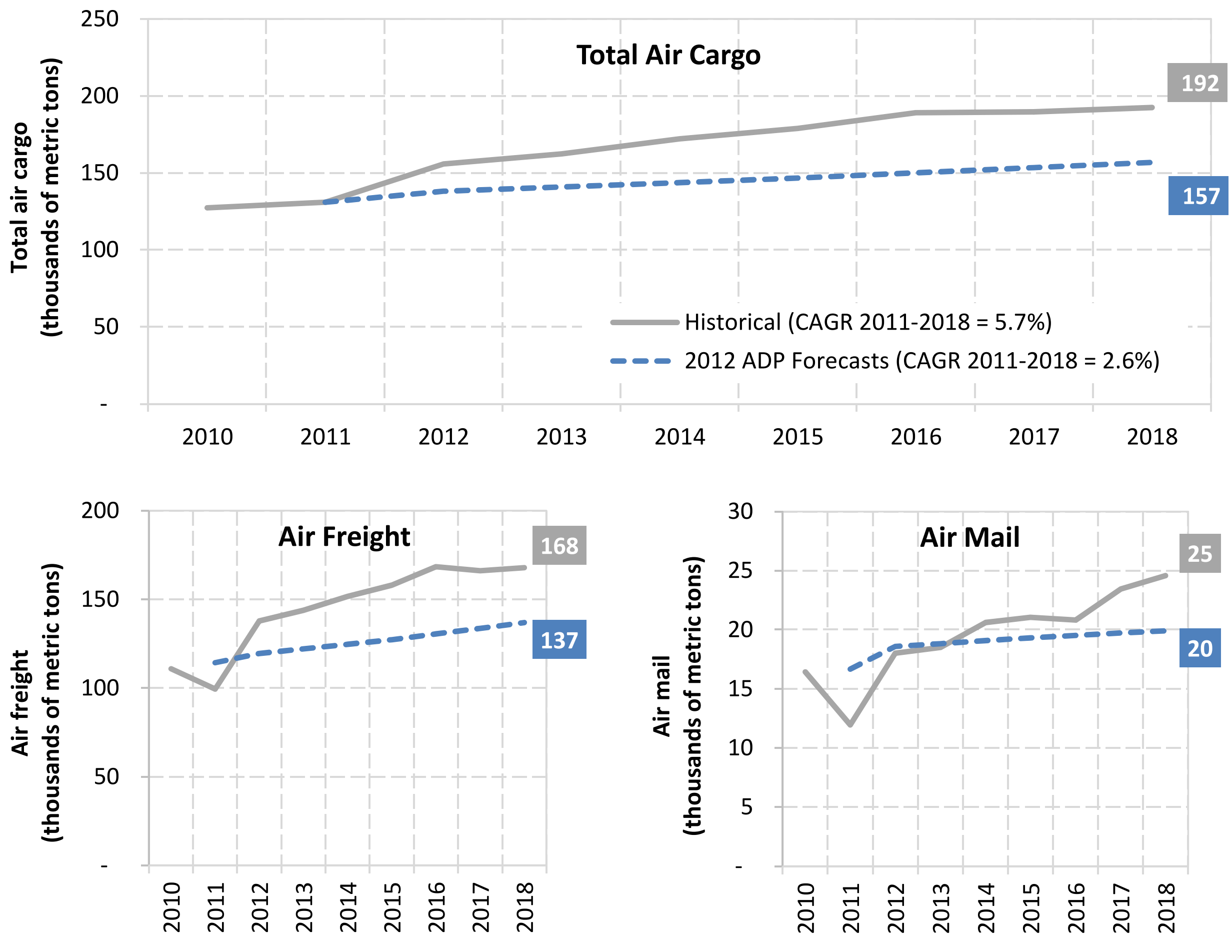

Note: Data are for domestic and international enplaned passengers.
Totals may not sum due to rounding.
The SDIA planning forecasts were prepared on a calendar year basis and the FAA 2011 TAF was prepared on a U.S. government fiscal year basis (October through September) and exclude nonrevenue passengers.

Sources: *Historical*— San Diego County Regional Airport Authority records. *Forecast*: LeighFisher, San Diego International Airport, Airport Development Plan, Aviation Activity Forecasts, November 2012. FAA 2011 Terminal Area Forecast, Federal Aviation Administration, www.faa.gov, accessed February 2012.

## 2.2 Air Cargo

In 2018, total air cargo (freight and mail) totaled 192,351 metric tons, approximately 35,000 metric tons greater than the 2012 ADP forecast of 157,000 (a difference of 23%), as shown on Figure 2-2. Air freight at SDIA accounted for most of the increase between 2011 and 2018, although air mail tonnage experienced strong growth (an average increase of 10.8% per year).

Figure 2-2
**HISTORICAL AND FORECAST TOTAL AIR CARGO: 2010-2018**
San Diego International Airport



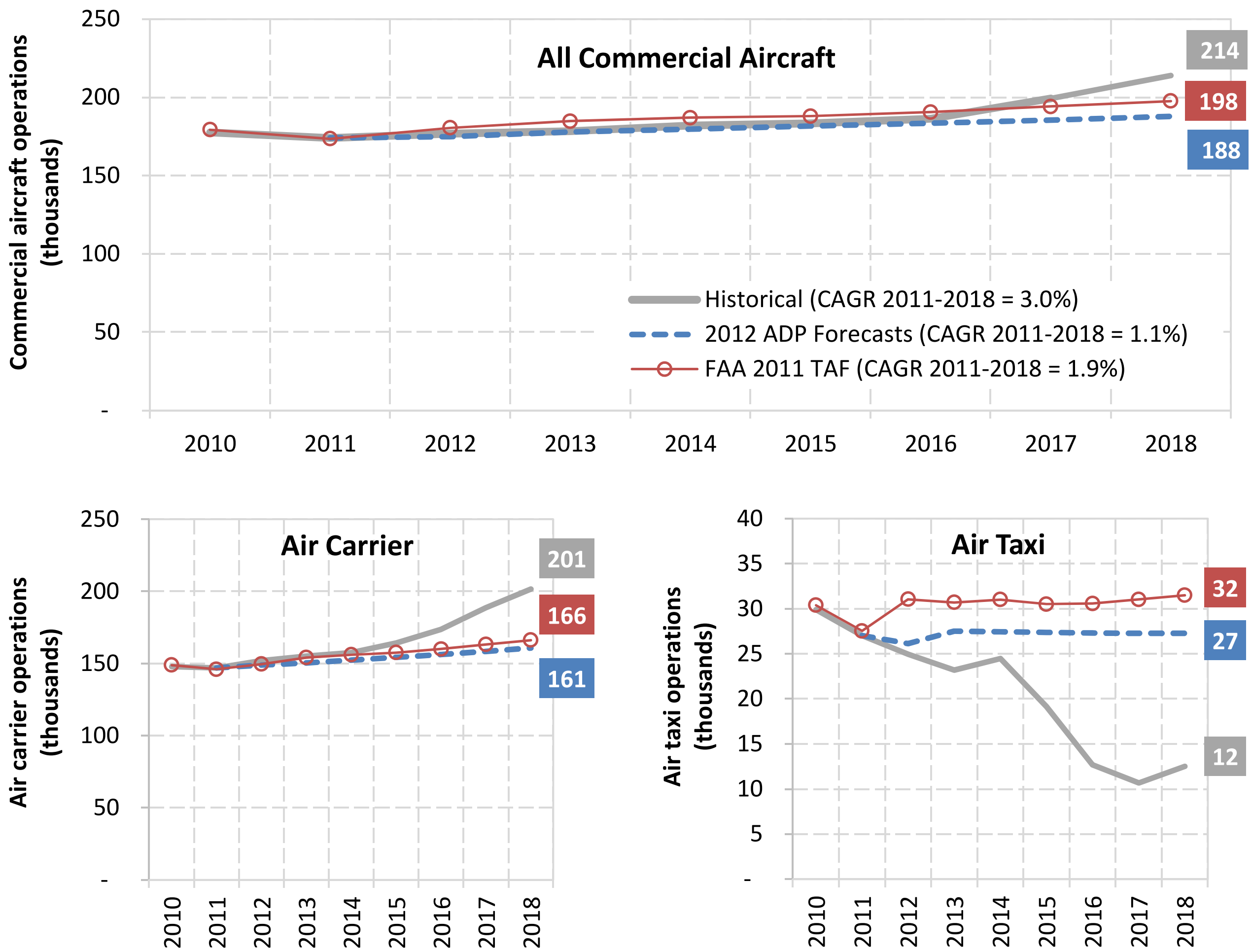

Note: Data include domestic and international enplaned and deplaned air cargo.
Totals may not sum due to rounding.

Sources: *Historical*— San Diego County Regional Airport Authority records. *Forecast*: LeighFisher, San Diego International Airport, Airport Development Plan, Aviation Activity Forecasts, November 2012.

## 2.3 Aircraft Operations

In 2018, the number of commercial aircraft operations totaled 213,963, approximately 26,000 operations greater than the 2012 ADP forecast of 188,000 (a difference of 14%), as shown on Figure 2-3. Air carrier operations at SDIA accounted for all of the increase between 2011 and 2018 and also offset the decrease in air taxi operations during this period.

Figure 2-3
**HISTORICAL AND FORECAST COMMERCIAL AIRCRAFT OPERATIONS: 2010-2018**
San Diego International Airport




Note: Data for commercial airline operations include air carrier and air taxi and commuters, including passenger and all-cargo airlines and unscheduled air taxis.
Totals may not sum due to rounding.

Sources: *Historical*— San Diego County Regional Airport Authority records. *Forecast*: LeighFisher, San Diego International Airport, Airport Development Plan, Aviation Activity Forecasts, November 2012. FAA 2011 Terminal Area Forecast, Federal Aviation Administration, www.faa.gov, accessed February 2012.

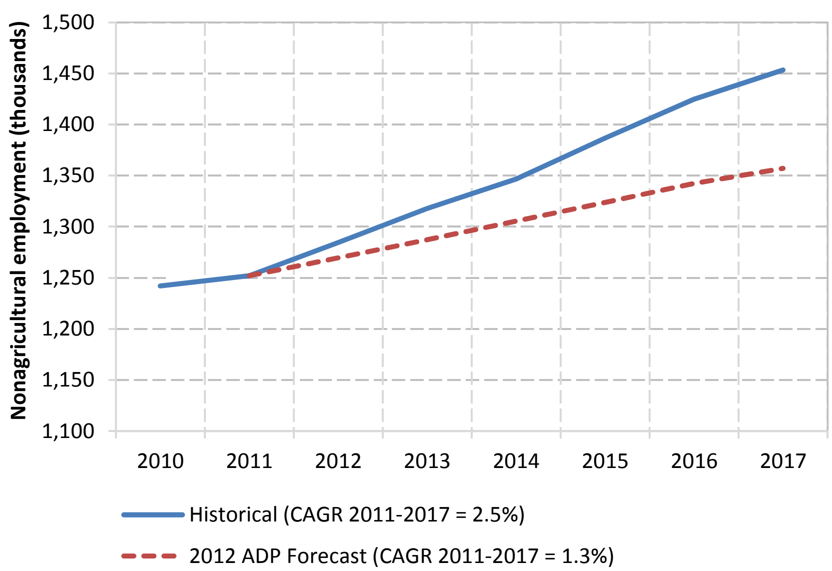
## 2.4 Factors Contributing to Faster than Forecast Aviation Activity Growth

A number of factors contributed to faster than forecast growth between 2011 and 2018, including strong economic growth, decreases in domestic airfares, the use of larger capacity aircraft (in terms of the number of seats), higher load factors, and strong growth in both origin-destination (O&D) and connecting passengers.

### 2.4.1 Economic Growth

Strong economic growth in San Diego County between 2011 and 2017 (the latest year available) is reflected in the data for nonagricultural employment and per capita personal income. As shown on Figure 2-4, nonagricultural employment in San Diego County increased an average of 2.5% per year between 2011 and 2017, faster than the 1.3% per year growth forecast by the San Diego Association of Governments (SANDAG) in its 2010 report used as a basis for the 2012 ADP forecasts. In comparison, nonagricultural employment in California and the United States increased an average increase of 2.6% and 1.8% per year, respectively, between 2011 and 2017.

Figure 2-4
**HISTORICAL AND FORECAST NONAGRICULTURAL EMPLOYMENT**
San Diego County




CAGR = Compound annual growth rate

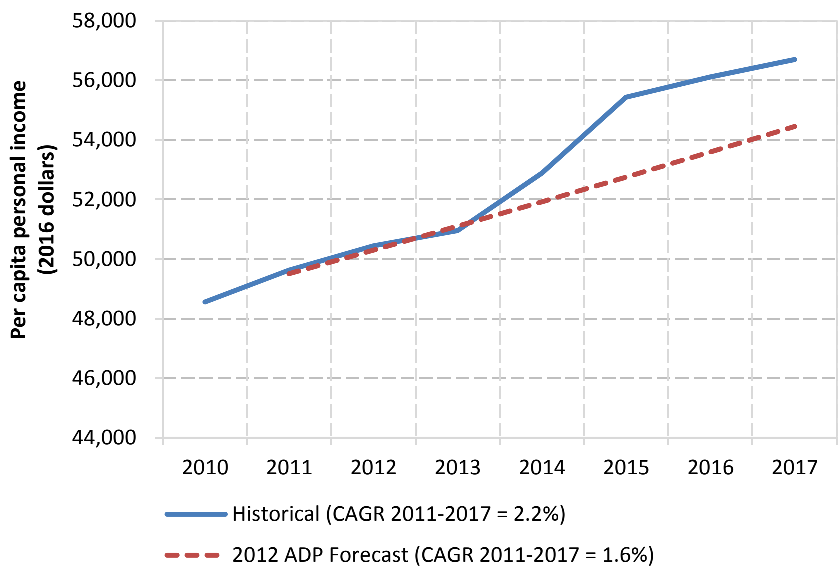
Sources: *Historical*—U.S. Department of Labor, Bureau of Labor Statistics, www.bls.gov, accessed November 2018. *Forecast*— San Diego Association of Governments (SANDAG), 2050 Regional Growth Forecast, published February 26, 2010; accessed May 2012.

Unemployment rates* in San Diego County also reflect strong economic growth since 2011, decreasing from 10.3% in 2011 to 4.0% in 2017. Unemployment rates in California and the United States also decreased considerably between 2011 and 2017—from 11.7% to 4.8% in California and from 8.9% to 4.4% in the nation as a whole.

*U.S. Department of Labor, Bureau of La Labor Statistics, www.bls.gov, accessed November 2018. Unemployment rates are not seasonally adjusted.

Per capita personal income in San Diego County, in 2016 dollars, increased an average of 2.2% per year between 2011 and 2017, faster than the 1.6% per year growth forecast by SANDAG in its 2010 report, as shown on Figure 2-5. Per capita personal income was one of the two variables used in the econometric analysis of domestic O&D passengers used as a basis for the 2012 ADP forecasts and is typically a key driver of passenger traffic at airports. In comparison, per capita personal income in California and the United States increased an average increase of 2.6% and 1.7% per year, respectively, between 2011 and 2017.

Figure 2-5
**HISTORICAL AND FORECAST PER CAPITA PERSONAL INCOME**
San Diego County




CAGR = Compound annual growth rate

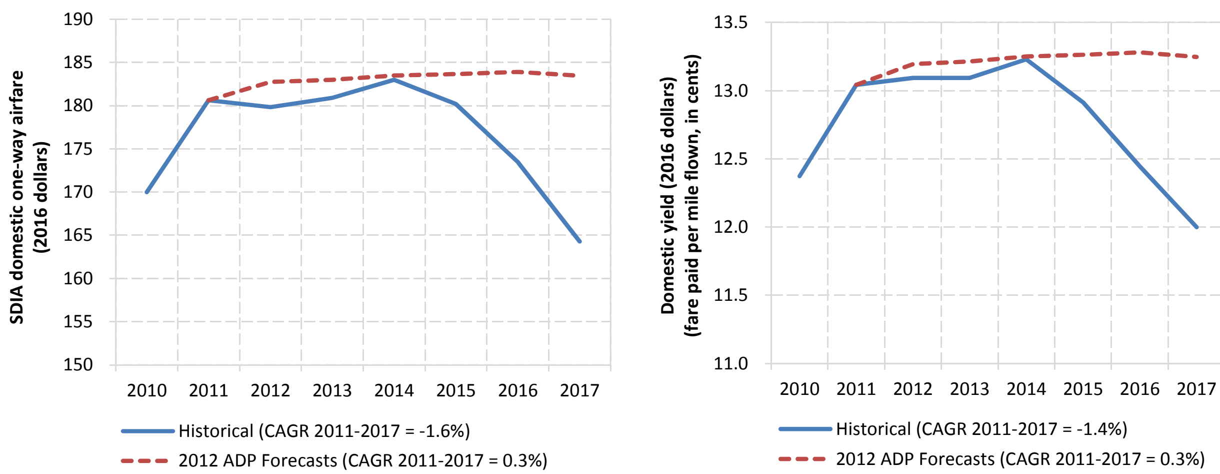
Sources: *Historical*— U.S. Department of Commerce, Bureau of Economic Analysis, Regional Accounts Data, www.bea.gov, accessed May 2012. Expressed in 2016 dollars using the consumer price index. *Forecast*— San Diego Association of Governments (SANDAG),, 2050 Regional Growth Forecast, published February 26, 2010; accessed May 2012.

### 2.4.2 Airfares and Airline Yield

The cost of travel for a passenger is typically represented by airfare and airline yield data published by the U.S. Department of Transportation from its Origin-Destination Survey of Airline Passenger Traffic.* The cost of travel at SDIA is represented by domestic one-way airfares and domestic airline yield, in 2016 dollars, for the Airport. As shown on Figure 2-6, SDIA domestic airfares and airline yield, in 2016 dollars, decreased an average of 1.6% and 1.4% per year, respectively, between 2011 and 2017, compared with a forecast increase of 0.3% per year based on the FAA's forecast increase in airline yield in its 2012 National Aerospace report. Passenger traffic and the cost of travel are inversely related; that is, passenger traffic typically decreases in response to an increase in airfares. The assumption that SDIA domestic airfares and yield would increase slightly between 2011 and 2017 dampened the growth in passengers forecast for the 2012 ADP.

*Represents a 10% sample of all tickets issued by U.S. airlines.

Figure 2-6
**HISTORICAL AND FORECAST DOMESTIC AIRFARES AND AIRLINE YIELD**
San Diego International Airport
In 2016 dollars




CAGR = Compound annual growth rate

Sources: *Historical*— U.S. Department of Transportation, Origin-Destination Survey of Airline Passenger Traffic, Domestic, online database, accessed November 2018. *Forecast*—Federal Aviation Administration, FAA Aerospace Forecasts, Federal Fiscal Years 2012-2032, March 2012, www.faa.gov.

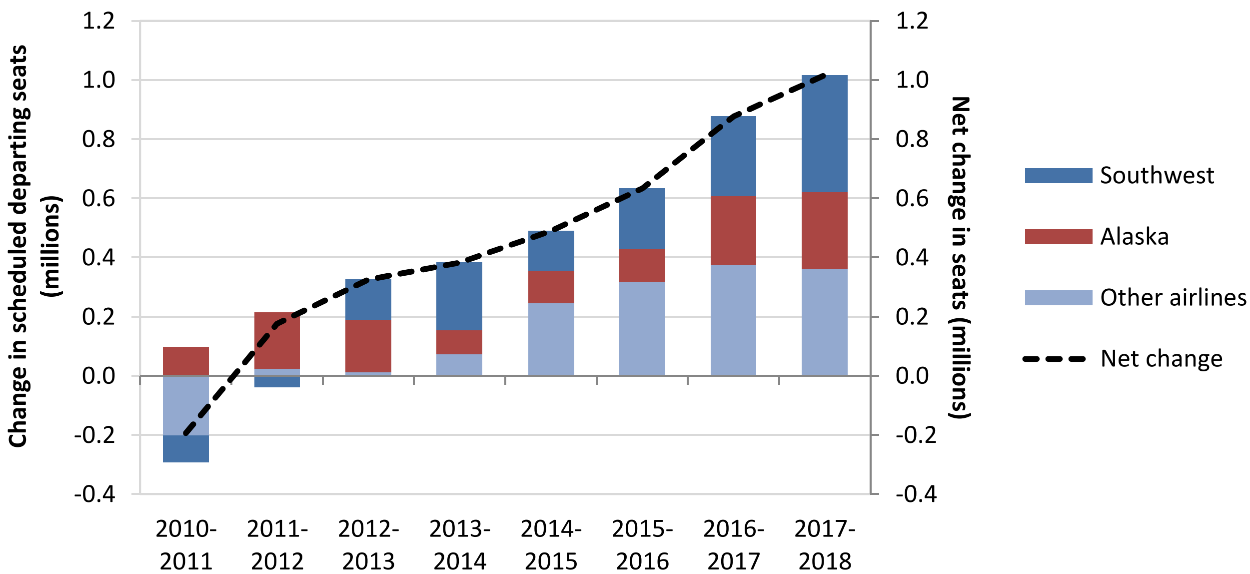
### 2.4.3 Seat Capacity

Between 2011 and 2018, total scheduled departing seats at the Airport increased an average of 4.7% per year, reflecting the development of SDIA as a focus city in Alaska Airlines' network and the competitive response by Southwest and the other existing airlines. As shown on Figure 2-7, the net change in seats at SDIA has increased steadily since 2011, with more than 1 million seats added in 2018. Between 2011 and 2018, Alaska's scheduled departing seats at the Airport increased an average of 13.8% per year, compared with an average increase of 3.8% per year in Southwest's seats. Strong growth in seat capacity at SDIA since 2011 contributed to faster than forecast growth in passenger traffic.

### 2.4.4 Aircraft Gauge

The average aircraft gauge at SDIA, the size of an aircraft in terms of the number of seats, increased an average of 1.7% per year between 2011 and 2018, compared with the 2012 ADP forecast growth of 0.5% per year, as shown on Figure 2-8. The increase in aircraft gauge since 2011 reflects the retirement of 50-seat regional jets, the densification of aircraft, and the delivery of new higher capacity fuel efficient aircraft.

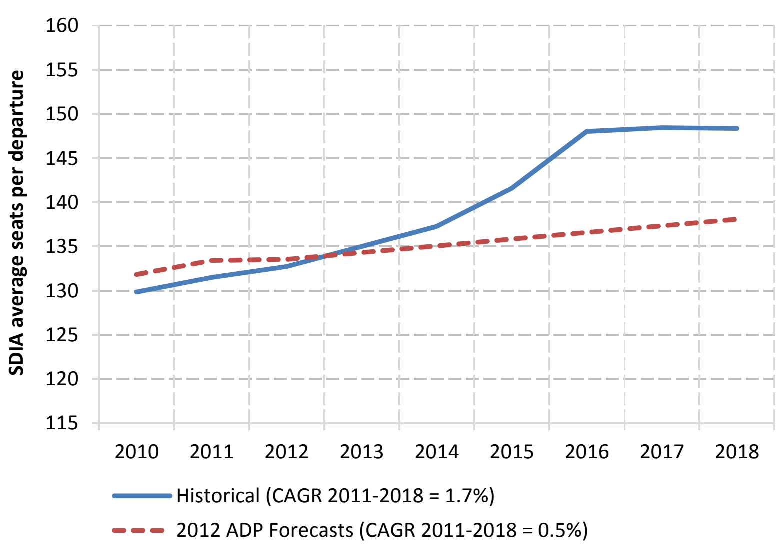
Figure 2-7
**NET CHANGE IN SCHEDULED DEPARTING SEATS**
San Diego International Airport




CAGR = Compound annual growth rate

Source: OAG Worldwide Aviation Ltd, Schedules Analyser, online database, accessed November 2018.

Figure 2-8
**HISTORICAL AND FORECAST AVERAGE SEATS PER DEPARTURE**
San Diego International Airport



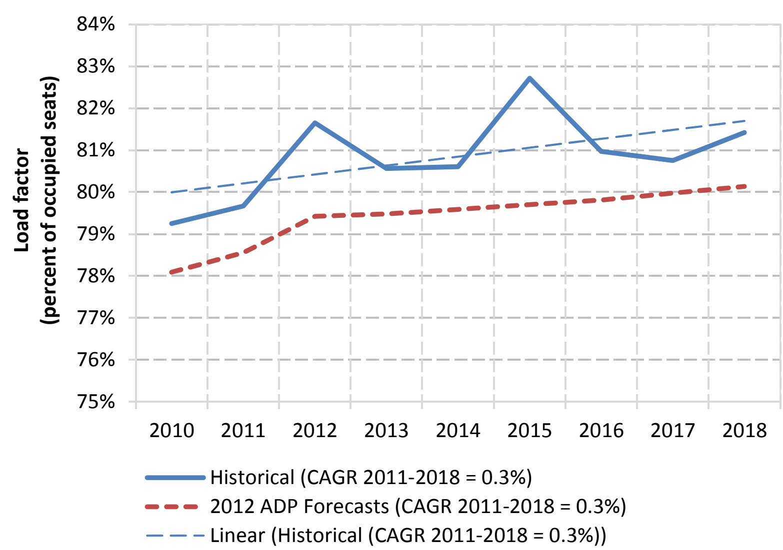

CAGR = Compound annual growth rate

Sources: *Historical*—OAG Worldwide Aviation Ltd, Schedules Analyser, online database, accessed November 2018. *Forecast*: LeighFisher, San Diego International Airport, Airport Development Plan, Aviation Activity Forecasts, November 2012.

### 2.4.5 Load Factor

Enplaned passenger load factors at SDIA, the percent of occupied seats on an aircraft, increased an average of 0.4% per year between 2011 and 2018, nearly equal to the 2012 ADP forecast growth rate of 0.3%, as shown on Figure 2-9. Differences in historical and 2012 ADP forecast load factors in 2010 and 2011 reflect revisions to published seat data for 2010 and 2011. Load factors at SDIA increased considerably in 2012 and 2015, preceding the addition of more seat capacity which resulted in decreased load factors in 2013 and 2016 compared with a linear trend line.

Figure 2-9
**HISTORICAL AND FORECAST ENPLANED PASSENGER LOAD FACTOR**
San Diego International Airport




CAGR = Compound annual growth rate

Note: Differences in historical and 2012 ADP forecast load factors in 2010 and 2011 reflect revisions to published seat data in 2010 and 2011.

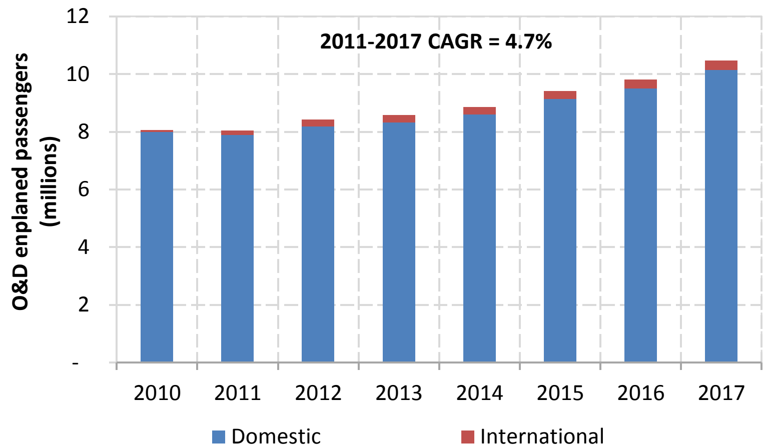
Sources: *Historical*— San Diego County Regional Airport Authority records. OAG Worldwide Aviation Ltd, Schedules Analyser, online database, accessed November 2018. *Forecast*: LeighFisher, San Diego International Airport, Airport Development Plan, Aviation Activity Forecasts, November 2012.

### 2.4.6 O&D and Connecting Passengers

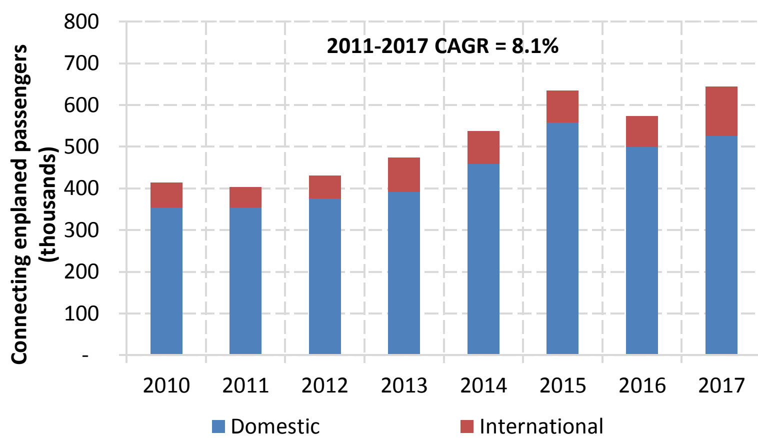
SDIA is primarily an O&D airport with nearly 95% of its passengers originating from or destined for San Diego. O&D passenger demand is affected by the demographics and economy of the region served by the airport as well as airline service and airfares. From 2011 to 2017, the number of domestic O&D passengers at SDIA increased an average of 4.7% per year, more than double the long-term historical rate of 2.2% per year between 1990 and 2011, as shown on Figure 2-10. Although connecting passengers at SDIA account for about 5% of total passengers, connecting passenger experience strong growth between 2011 and 2017—an average increase of 8.1% per year.

Figure 2-10
**O&D AND CONNECTING PASSENGERS**
San Diego International Airport

**Origin-Destination Enplaned Passengers**




**Connecting Enplaned Passengers**




CAGR = Compound annual growth rate

Source: U.S. Department of Transportation, Origin-Destination Survey of Airline Passenger Traffic, Domestic, online database, accessed November 2018

## 3.0 KEY DRIVERS OF AVIATION ACTIVITY

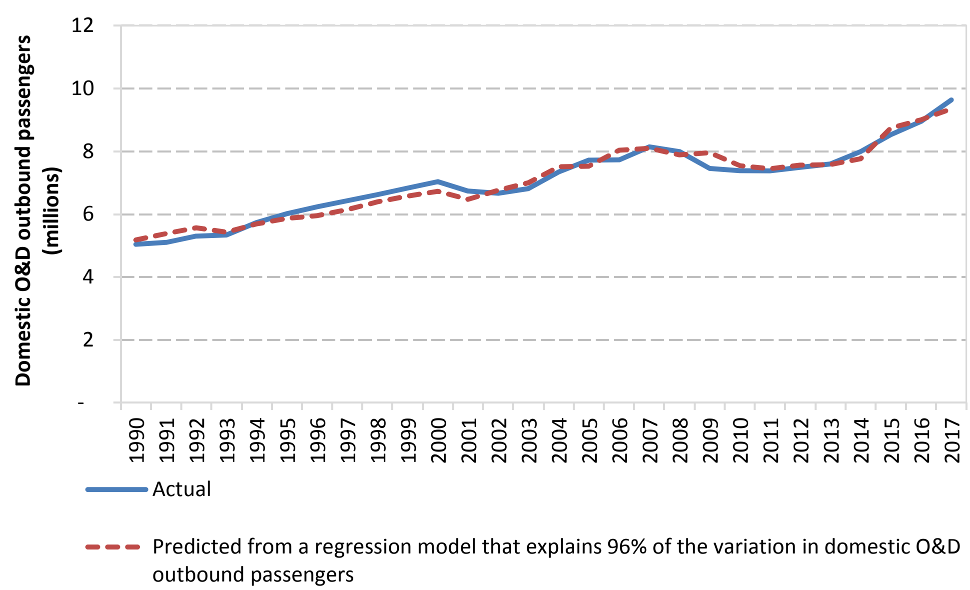
The 2012 ADP unconstrained forecasts were developed based on an analysis of the key drivers of aviation activity at SDIA. An updated analysis of the key drivers of aviation activity shows that:

- The historical trend in domestic O&D passengers at SDIA continues to be strongly related to per capita personal income in San Diego County, adjusted for inflation, and the cost of travel, represented by domestic airfares, adjusted for inflation, consistent with the 2012 ADP forecast analysis.

- As shown in Figure 3-1, a regression model including San Diego County per capita personal income and domestic airfares explained 96% of the historical variation in domestic originating passengers between 1990 and 2017. See Appendix A for regression statistics.

The forecasts of per capita personal income and domestic airfares were based on the analysis of historical trends discussed in Section 2 and available independent forecasts prepared by the California Department of Transportation, Woods & Poole, a national economic forecasting firm, and the Federal Aviation Administration.* SANDAG's most recent economic forecasts were prepared in 2013 and do not reflect the recent trends in economic growth. SANDAG expects to publish an updated economic forecast in 2019.

Figure 3-1
**REPRESENTATIVE MODEL**
**HISTORICAL AND PREDICTED DOMESTIC O&D PASSENGERS**
San Diego International Airport




Sources: *Actual*—U.S. Department of Transportation, Origin-Destination Survey of Airline Passenger Traffic, Domestic, online database, accessed December 2011. *Predicted*—LeighFisher, November 2018.

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*California Department of Transportation, *California County-Level Economic Forecast 2018-2050, The California Economic Forecast,* September 2018. Woods & Poole Economics Inc., 2018 MSA Profile, Metropolitan Area Projections to 2050, 2018. Federal Aviation Administration, *FAA Aerospace Forecasts, Fiscal Years 2018–2038*, March 2018, www.faa.gov.

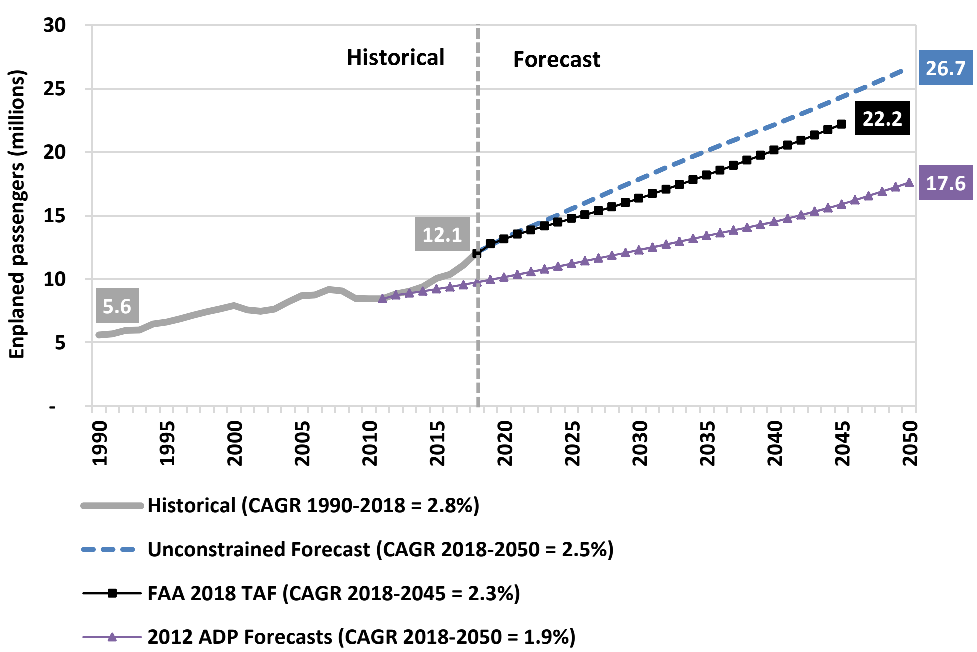
## 4.0 UPDATED UNCONSTRAINED AVIATION ACTIVITY FORECASTS

This section presents updated unconstrained forecasts of aviation activity at SDIA for 2023, 2028, 2033, 2038, 2043, and 2050, including enplaned passengers, air cargo, and aircraft operations and a summary of the underlying forecast assumptions. As discussed earlier, the unconstrained forecasts presented in this memorandum do not include specific assumptions about physical, regulatory, environmental, or other impediments to aviation activity growth. The constrained demand scenario in Section 5 of this memorandum addresses the real-world limitations of SDIA's runway on unconstrained forecast growth. This well-known and substantial limitation on the operational and passenger capacity of the airport must be considered in planning airport improvements and analyzing their reasonably foreseeable impacts. The constrained demand scenario presented in this memorandum analyses and anticipates these limitations and therefore the constrained demand scenario represents the "preferred" forecasts recommended for FAA approval and for airport planning.

### 4.1 Enplaned Passengers

As shown on Figure 4-1 and in Table 4-1, the number of passengers at the Airport is forecast to increase from 12.1 million passengers in 2018 to 26.7 million in 2050 in the unconstrained forecast, an average increase of 2.5% per year. The number of domestic passengers at the Airport is forecast to increase an average of 2.3% per year between 2018 and 2050, compared with an average increase of 5.5% per year in international passenger traffic.

Figure 4-1
**UNCONSTRAINED FORECAST OF ENPLANED PASSENGERS**
San Diego International Airport




CAGR = Compound annual growth rate

Note: The forecasts presented in this figure were prepared using the information and assumptions given in the accompanying text. Inevitably, some of the assumptions used to develop the forecasts will not be realized and unanticipated events and circumstances may occur. Therefore, there are likely to be differences between the forecast and actual results, and those differences may be material.

Sources: *Historical*—San Diego County Regional Airport Authority records. *Forecast*—LeighFisher, November 2018.

Table 4-1
**UNCONSTRAINED FORECAST OF ENPLANED PASSENGERS**
San Diego International Airport

| | Historical | | Unconstrained Forecast | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2017 | 2018 | 2023 | 2028 | 2033 | 2038 | 2043 | 2050 |
| Domestic | | | | | | | | |
| Mainline airline | 4,752,261 | 5,244,306 | 6,255,600 | 7,174,800 | 8,030,800 | 8,771,400 | 9,472,600 | 10,505,900 |
| Regional airline | 712,939 | 853,232 | 1,074,700 | 1,293,800 | 1,520,300 | 1,743,700 | 1,977,700 | 2,349,300 |
| Low cost carrier | 5,208,403 | 5,515,739 | 6,541,600 | 7,502,900 | 8,398,000 | 9,172,500 | 9,905,800 | 10,986,300 |
| Domestic total | 10,673,603 | 11,613,277 | 13,871,900 | 15,971,500 | 17,949,100 | 19,687,600 | 21,356,100 | 23,841,500 |
| International | 433,475 | 512,661 | 733,900 | 979,600 | 1,288,100 | 1,662,100 | 2,104,200 | 2,834,900 |
| Total Airport | 11,107,078 | 12,125,938 | 14,605,800 | 16,951,100 | 19,237,200 | 21,349,700 | 23,460,300 | 26,676,400 |
| O&D and connecting enplaned passengers | | | | | | | | |
| O&D | 10,462,985 | 11,422,762 | 13,758,800 | 15,968,000 | 18,121,800 | 20,111,700 | 22,099,800 | 25,129,300 |
| Connecting | 644,093 | 703,176 | 847,000 | 983,100 | 1,115,400 | 1,238,000 | 1,360,500 | 1,547,100 |
| Total Airport | 11,107,078 | 12,125,938 | 14,605,800 | 16,951,100 | 19,237,200 | 21,349,700 | 23,460,300 | 26,676,400 |
| Percent of total Airport | | | | | | | | |
| O&D | 94.2% | 94.2% | 94.2% | 94.2% | 94.2% | 94.2% | 94.2% | 94.2% |
| Connecting | 5.8% | 5.8% | 5.8% | 5.8% | 5.8% | 5.8% | 5.8% | 5.8% |

| | Percent change | Compound annual percent increase (decrease) | | | | | |
|---|---|---|---|---|---|---|---|
| | 2017-2018 | 2018-2023 | 2023-2028 | 2028-2033 | 2033-2038 | 2038-2043 | 2043-2050 |
| Domestic | | | | | | | |
| Mainline airline | 10.4% | 4.5% | 2.8% | 2.3% | 1.8% | 1.6% | 1.5% |
| Regional airline | 19.7 | 5.9 | 3.8 | 3.3 | 2.8 | 2.6 | 2.5 |
| Low cost carrier | 5.9 | 4.4 | 2.8 | 2.3 | 1.8 | 1.6 | 1.5 |
| Domestic total | 8.8 | 4.5 | 2.9 | 2.4 | 1.9 | 1.6 | 1.6 |
| International | 18.3 | 9.4 | 5.9 | 5.6 | 5.2 | 4.8 | 4.4 |
| Total Airport | 9.2 | 4.8 | 3.0 | 2.6 | 2.1 | 1.9 | 1.9 |

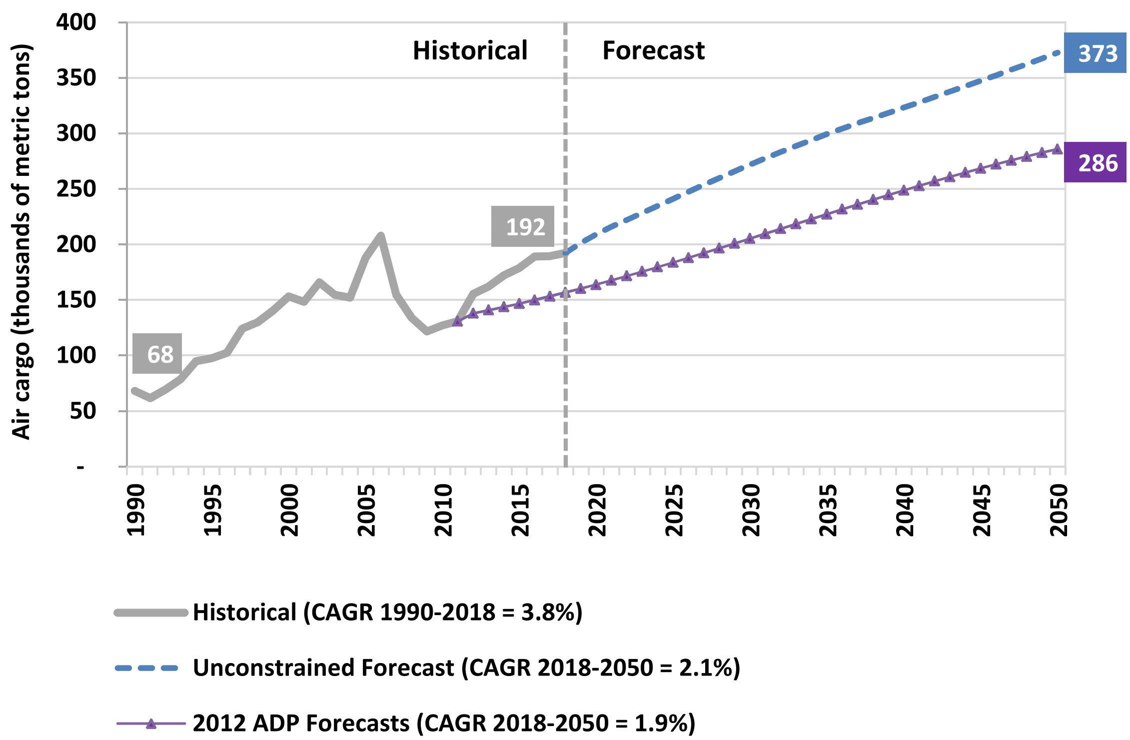
Note: The forecasts presented in this table were prepared using the information and assumptions given in the accompanying text. Inevitably, some of the assumptions used to develop the forecasts will not be realized and unanticipated events and circumstances may occur. Therefore, there are likely to be differences between the forecast and actual results, and those differences may be material.

Sources: *Historical*—San Diego County Regional Airport Authority records. *Forecast*—LeighFisher, November 2018.

## 4.2 Air Cargo

As shown on Figure 4-2 and in Table 4-2, total air cargo at the Airport is forecast to increase from 192,351 metric tons in 2018 to 372,700 metric tons in 2050 in the unconstrained forecast, an average increase of 2.1% per year. Air freight and air mail at the Airport are forecast to increase an average of 2.1% per year between 2018 and 2050.

Figure 4-2
**UNCONSTRAINED FORECAST OF AIR CARGO**
San Diego International Airport




CAGR = Compound annual growth rate

Note: The forecasts presented in this figure were prepared using the information and assumptions given in the accompanying text. Inevitably, some of the assumptions used to develop the forecasts will not be realized and unanticipated events and circumstances may occur. Therefore, there are likely to be differences between the forecast and actual results, and those differences may be material.

Sources: *Historical*—San Diego County Regional Airport Authority records. *Forecast*—LeighFisher, November 2018.

Table 4-2
**UNCONSTRAINED FORECAST OF AIR CARGO**
San Diego International Airport
In metric tons

| | Historical | | Unconstrained Forecast | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2017 | 2018 | 2023 | 2028 | 2033 | 2038 | 2043 | 2050 |
| Air freight | | | | | | | | |
| Enplaned | 75,097 | 72,960 | 86,030 | 97,800 | 108,690 | 118,070 | 126,980 | 140,090 |
| Deplaned | 91,038 | 94,826 | 113,040 | 128,530 | 142,880 | 155,270 | 167,050 | 184,400 |
| Air freight total | 166,135 | 167,786 | 199,070 | 226,330 | 251,570 | 273,340 | 294,030 | 324,490 |
| Mail | | | | | | | | |
| Enplaned | 17,691 | 17,987 | 21,330 | 24,280 | 27,020 | 29,410 | 31,680 | 35,050 |
| Deplaned | 5,741 | 6,578 | 8,070 | 9,180 | 10,200 | 11,080 | 11,930 | 13,160 |
| Mail total | 23,432 | 24,566 | 29,400 | 33,460 | 37,220 | 40,490 | 43,610 | 48,210 |
| Air cargo | | | | | | | | |
| Enplaned | 92,788 | 90,947 | 107,360 | 122,080 | 135,710 | 147,480 | 158,660 | 175,140 |
| Deplaned | 96,779 | 101,404 | 121,110 | 137,710 | 153,080 | 166,350 | 178,980 | 197,560 |
| Total air cargo | 189,567 | 192,351 | 228,470 | 259,790 | 288,790 | 313,830 | 337,640 | 372,700 |
| Percent of total | | | | | | | | |
| Enplaned | 48.9% | 47.3% | 47.0% | 47.0% | 47.0% | 47.0% | 47.0% | 47.0% |
| Deplaned | 51.1% | 52.7% | 53.0% | 53.0% | 53.0% | 53.0% | 53.0% | 53.0% |
| Enplaned air freight | | | | | | | | |
| Domestic | | | | | | | | |
| Cargo airline | 67,240 | 64,446 | 75,880 | 85,680 | 94,420 | 101,550 | 108,010 | 117,290 |
| Passenger airline | 5,738 | 5,763 | 6,480 | 7,310 | 8,060 | 8,670 | 9,220 | 10,010 |
| Domestic total | 72,979 | 70,209 | 82,360 | 92,990 | 102,480 | 110,220 | 117,230 | 127,300 |
| International | 2,118 | 2,751 | 3,670 | 4,810 | 6,200 | 7,850 | 9,750 | 12,790 |
| Air freight total | 75,097 | 72,960 | 86,030 | 97,800 | 108,680 | 118,070 | 126,980 | 140,090 |
| Enplaned mail | | | | | | | | |
| Cargo airline | 15,115 | 15,027 | 17,770 | 20,220 | 22,510 | 24,490 | 26,390 | 29,190 |
| Passenger airline | 2,575 | 2,961 | 3,560 | 4,050 | 4,510 | 4,910 | 5,290 | 5,850 |
| Mail total | 17,691 | 17,987 | 21,330 | 24,270 | 27,020 | 29,400 | 31,680 | 35,040 |
| Total enplaned air cargo | 92,788 | 90,947 | 107,360 | 122,070 | 135,700 | 147,470 | 158,660 | 175,130 |

Table 4-2 (page 2 of 2)

**UNCONSTRAINED FORECAST OF AIR CARGO**

San Diego International Airport

In metric tons

| | Percent change | Compound annual percent increase (decrease) | | | | | |
|---|---|---|---|---|---|---|---|
| | | Unconstrained Forecast | | | | | |
| | 2017-2018 | 2018-2023 | 2023-2028 | 2028-2033 | 2033-2038 | 2038-2043 | 2043-2050 |
| Total air cargo (enplaned and deplaned) | | | | | | | |
| Air freight | 1.0% | 4.4% | 2.6% | 2.1% | 1.7% | 1.5% | 1.4% |
| Mail | 4.8 | 4.6 | 2.6 | 2.2 | 1.7 | 1.5 | 1.4 |
| Total | 1.5 | 4.4 | 2.6 | 2.1 | 1.7 | 1.5 | 1.4 |
| Enplaned air freight | | | | | | | |
| Domestic | (3.8) | 4.1 | 2.5 | 2.0 | 1.5 | 1.2 | 1.2 |
| International | 29.9 | 7.5 | 5.6 | 5.2 | 4.8 | 4.4 | 4.0 |

Note: The forecasts presented in this table were prepared using the information and assumptions given in the accompanying text. Inevitably, some of the assumptions used to develop the forecasts will not be realized and unanticipated events and circumstances may occur. Therefore, there are likely to be differences between the forecast and actual results, and those differences may be material.

Sources: *Historical*—San Diego County Regional Airport Authority records. *Forecast*—LeighFisher, November 2018.

## 4.3 Aircraft Operations

This section summarizes the forecasts of total aircraft operations, including passenger airline, all-cargo airline, general aviation, and military operations.

### 4.3.1 Unconstrained Forecast Approach and Methodology

The forecasts of total aircraft operations are derived from the forecasts of passenger and cargo demand described previously and an evaluation of general aviation and military operations. In particular:

- The forecasts of passenger airline aircraft departures are based on the enplaned passenger forecasts and assumptions regarding average aircraft size and enplaned passenger load factor.

- The forecasts of all-cargo airline aircraft departures are based on the air cargo forecasts and assumptions regarding average cargo tonnage per operation and type of all-cargo service (integrated carrier or regional feeder).

- The forecasts of general aviation aircraft operations are based on historical trends, the number of aircraft based at the Airport, the average daily utilization of those aircraft, assumptions regarding aircraft utilization in the future, and industry forecasts of general aviation activity such as those prepared by the FAA.

- The forecasts of military aircraft operations are based on data for the base year of the forecasts and carried forward through the forecast period. Military operations typically increase and decrease with geopolitical trends and therefore this activity may vary in a given year.

### 4.3.2 Unconstrained Forecast Assumptions

Table 4-3 presents the forecast assumptions for passenger and cargo airline aircraft operations, including assumptions for the average enplaned passenger load factor, the average number of seats per departure, and average cargo tonnage per cargo airline operation.

### 4.3.3 Passenger Airline Aircraft Operations Forecasts

Passenger aircraft operations include total departures and arrivals performed by mainline and regional affiliate aircraft in the service of transporting passengers, as shown in Table 4-4. Passenger airline aircraft operations were calculated by dividing the enplaned passenger forecasts by sector (e.g., domestic and International) and category (e.g., mainline and regional affiliate carrier) by the estimated number of passengers enplaned per departure. In 2018, the average number of passengers enplaned per departure for the Airport as a whole was 121.1, derived by multiplying the load factor by the average seats per departure (e.g., 81.6% x 148.3 = 121.1). This number is expected to increase slowly over the forecast period based on an estimated increase in the average number of seats per aircraft and an estimated load factor, or percent of available seats filled with passengers. The average number of passengers enplaned per departure is expected to reach approximately 125.9 in 2050 in the unconstrained forecast. Dividing the enplaned passenger forecasts by the forecast number of passengers enplaned per departure yields passenger airline aircraft departures. The forecast departures were then multiplied by two to yield passenger airline aircraft operations for each category of activity.

Passenger airline air carrier aircraft operations at SDIA are forecast to increase from 197,244 in 2018 to 423,670 operations in 2050 in the unconstrained forecast, an average increase of 2.4% per year, as shown in Table 4-4.

Table 4-3
**ASSUMPTIONS FOR AIRCRAFT OPERATIONS UNCONSTRAINED FORECAST**
San Diego International Airport

| | Historical | | Unconstrained Forecast | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2017 | 2018 | 2023 | 2028 | 2033 | 2038 | 2043 | 2050 |
| Enplaned passengers per departure | | | | | | | | |
| Domestic | | | | | | | | |
| Mainline airline | 146.8 | 145.5 | 146.4 | 146.4 | 146.4 | 146.4 | 146.4 | 146.4 |
| Regional airline | 55.7 | 56.9 | 58.5 | 59.9 | 61.2 | 62.6 | 64.0 | 66.0 |
| Low cost carrier | 118.1 | 122.2 | 122.8 | 124.2 | 125.6 | 127.0 | 128.5 | 130.5 |
| Domestic total | 119.5 | 120.7 | 121.3 | 121.9 | 122.5 | 123.1 | 123.7 | 124.5 |
| International | 128.7 | 130.2 | 131.4 | 132.9 | 134.4 | 135.9 | 137.4 | 139.6 |
| Total Airport | 119.9 | 121.1 | 121.8 | 122.5 | 123.2 | 124.0 | 124.8 | 125.9 |
| Enplaned passenger load factor | | | | | | | | |
| Domestic | | | | | | | | |
| Mainline airline | 85.8% | 85.7% | 86.0% | 86.0% | 86.0% | 86.0% | 86.0% | 86.0% |
| Regional airline | 74.5% | 76.7% | 78.2% | 79.2% | 80.2% | 81.2% | 82.2% | 83.6% |
| Low cost carrier | 77.8% | 79.0% | 79.0% | 79.5% | 80.0% | 80.5% | 81.0% | 81.7% |
| Domestic total | 80.9% | 81.7% | 82.0% | 82.3% | 82.6% | 83.0% | 83.3% | 83.8% |
| International | 77.2% | 79.7% | 79.7% | 80.2% | 80.7% | 81.2% | 81.7% | 82.4% |
| Total Airport | 80.8% | 81.6% | 81.8% | 82.2% | 82.5% | 82.8% | 83.1% | 83.6% |
| Average seats per departure | | | | | | | | |
| Domestic | | | | | | | | |
| Mainline airline | 171.1 | 169.7 | 170.2 | 170.2 | 170.2 | 170.2 | 170.2 | 170.2 |
| Regional airline | 74.8 | 74.1 | 74.9 | 75.6 | 76.4 | 77.2 | 77.9 | 79.0 |
| Low cost carrier | 151.8 | 154.6 | 155.4 | 156.1 | 156.9 | 157.7 | 158.5 | 159.6 |
| Domestic total | 147.8 | 147.7 | 148.0 | 148.1 | 148.3 | 148.4 | 148.5 | 148.6 |
| International | 166.6 | 163.4 | 164.9 | 165.8 | 166.6 | 167.4 | 168.3 | 169.5 |
| Total Airport | 148.4 | 148.3 | 148.8 | 149.1 | 149.4 | 149.7 | 150.1 | 150.6 |
| Enplaned freight per operation (tons) | | | | | | | | |
| All-cargo airlines | 19.8 | 20.2 | 19.9 | 20.0 | 20.1 | 20.2 | 20.3 | 20.3 |

Note: The forecasts presented in this table were prepared using the information and assumptions given in the accompanying text. Inevitably, some of the assumptions used to develop the forecasts will not be realized and unanticipated events and circumstances may occur. Therefore, there are likely to be differences between the forecast and actual results, and those differences may be material.

Sources: *Historical*—San Diego County Regional Airport Authority records. *Forecast*—LeighFisher, November 2018.

#### 4.3.4 All-Cargo Airline Aircraft Operations Forecasts

Cargo airline operations at SDIA include the flight activity by airlines dedicated exclusively to the transportation of freight such as FedEx and by commuter/regional size aircraft. Air carrier size aircraft that perform all-cargo operations at the airport include widebody (e.g., Airbus A-300, Boeing 767, and MD-11) and narrowbody (e.g., Boeing 757) aircraft. Commuter or regional aircraft that perform all-cargo operations at the airport include small piston and turboprop aircraft such as the Beechcraft 99 and Swearingen Metroliner aircraft. In 2018, there were 6,380 cargo airline operations performed at the Airport.

The forecast of all-cargo operations was developed by first estimating the share of future cargo tonnage expected to be carried by air carrier and commuter aircraft. The cargo tonnage expected to be carried by all-cargo carriers was then divided by an estimated cargo tons per departure ratio to yield total air carrier cargo operations. The ratio of tons per operation is expected to average 20,000 pounds over the forecast period.*

Cargo airline aircraft operations at SDIA (air carrier and commuter) are forecast to increase an average of 1.9% per year from 6,380 in 2018 to 11,540 in 2050, as shown in Table 4-4.

#### 4.3.5 General Aviation Aircraft Operations Forecasts

General aviation (GA) activity includes all flight operations by aircraft other than scheduled or charter passenger and cargo aircraft and military aircraft. GA includes not only pilot training and recreational flights on small single engine or multi-engine propeller driven aircraft, but also operations on large business jet aircraft.

On a nationwide basis, the number of general aviation aircraft operations has been in slow decline due to factors such as increases in aircraft, fuel, and insurance costs, as well as increased avionic instrument requirements. The 2008-2009 economic recession and the financial credit crisis further reduced general aviation activity nationwide. In the future, the FAA expects general aviation traffic to recover slowly.

The flight operations of GA aircraft are categorized as local or itinerant operations. Local operations are flights that operate within visual range or close proximity of the airport. Itinerant operations typically include those flights that leave the airport destined for another airport and require the filing of flight plans with the local air traffic control authorities. Historically, itinerant operations have accounted for nearly all GA operations at the Airport. In 2018, a total of 10,337 itinerant GA operations were performed at the Airport (100% of GA operations), as shown in Table 4-4.

GA operations in the future are forecast to continue to be comprised of itinerant operations only. The total number of general aviation operations is forecast to increase an average of 0.5% per year from 2018 through 2050, compared with a forecast growth rate of 0.3% per between 2018 and 2038 for the nation as a whole.**

In 2018, a total of 9 jet aircraft were based at the Airport. The total number of based aircraft at the Airport is forecast to increase to 11 in 2050.

#### 4.3.6 Military Aircraft Operations Forecasts

The number of military operations at the Airport averaged approximately 700 operations per year between 2010 and 2018. In 2018, military operations totaled 758, slightly above the 9-year average. Military

*Includes air carrier and commuter operations. Air cargo data are not reported separately for commuters.

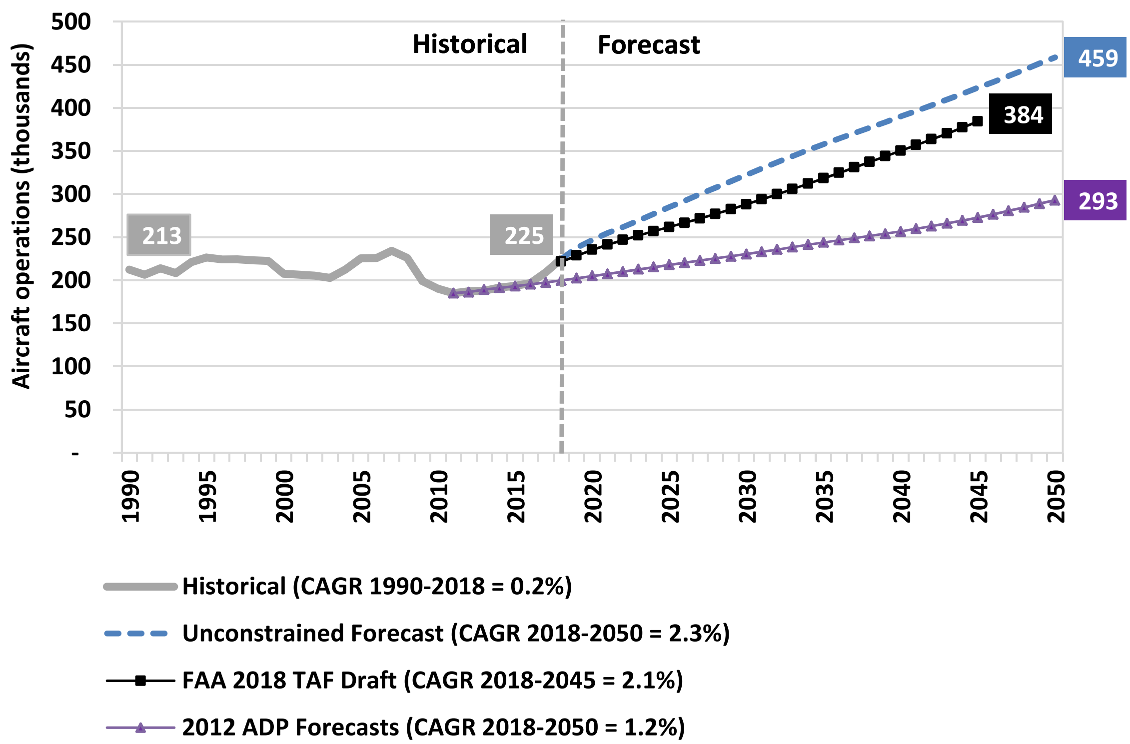
**U.S. Department of Transportation, Federal Aviation Administration, FAA National Aerospace Forecasts, Fiscal Years 2018-2038, www.faa.gov.

operations are expected remain at a level of about 700 operations from 2018 through 2050, as shown in Table 4-4.

### 4.3.7 Total Aircraft Operations Forecasts

As shown on Figure 4-3 and in Table 4-4, total aircraft operations at the Airport are forecast to increase from 225,058 in 2018 to 458,700 in 2050 in the unconstrained forecast, an average increase of 2.3% per year. Commercial aircraft operations at the Airport are forecast to increase an average of 2.3% per year between 2018 and 2050, while general aviation operations are forecast to increase an average of 0.5% per year and military operations are forecast to remain relatively unchanged.

Figure 4-3
**UNCONSTRAINED FORECAST OF TOTAL AIRCRAFT OPERATIONS**
San Diego International Airport




CAGR = Compound annual growth rate

Note: The forecasts presented in this figure were prepared using the information and assumptions given in the accompanying text. Inevitably, some of the assumptions used to develop the forecasts will not be realized and unanticipated events and circumstances may occur. Therefore, there are likely to be differences between the forecast and actual results, and those differences may be material.

Sources: *Historical*—San Diego County Regional Airport Authority records. *Forecast*—LeighFisher, November 2018.

Table 4-4

**UNCONSTRAINED FORECAST OF TOTAL AIRCRAFT OPERATIONS**

San Diego International Airport

| | Historical | | Unconstrained Forecast | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2017 | 2018 | 2023 | 2028 | 2033 | 2038 | 2043 | 2050 |
| Air Carrier | | | | | | | | |
| Passenger airlines | 182,712 | 197,244 | 239,870 | 276,770 | 312,230 | 344,370 | 376,010 | 423,670 |
| Cargo airlines | 4,082 | 3,850 | 4,640 | 5,220 | 5,720 | 6,130 | 6,490 | 7,020 |
| Other | 1,787 | 372 | 800 | 800 | 810 | 810 | 820 | 820 |
| Air Carrier total | 188,581 | 201,466 | 245,310 | 282,790 | 318,760 | 351,310 | 383,320 | 431,510 |
| Air Taxi | | | | | | | | |
| Cargo airlines | 2,716 | 2,530 | 2,980 | 3,360 | 3,680 | 3,940 | 4,170 | 4,520 |
| Other | 7,946 | 9,967 | 10,000 | 10,000 | 10,000 | 10,000 | 10,000 | 10,000 |
| Air Taxi total | 10,662 | 12,497 | 12,980 | 13,360 | 13,680 | 13,940 | 14,170 | 14,520 |
| General Aviation | | | | | | | | |
| Itinerant | 9,613 | 10,337 | 10,470 | 10,730 | 11,000 | 11,280 | 11,560 | 11,970 |
| Local | | | | | | | | |
| General Aviation total | 9,613 | 10,337 | 10,470 | 10,730 | 11,000 | 11,280 | 11,560 | 11,970 |
| Military | -- 707 | -- 758 | -- 700 | -- 700 | -- 700 | -- 700 | -- 700 | -- 700 |
| Total Airport | 209,563 | 225,058 | 269,460 | 307,580 | 344,140 | 377,230 | 409,750 | 458,700 |

| | Percent change | Compound annual percent increase (decrease) | | | | | |
|---|---|---|---|---|---|---|---|
| | 2017-2018 | 2018-2023 | 2023-2028 | 2028-2033 | 2033-2038 | 2038-2043 | 2043-2050 |
| Air Carrier | | | | | | | |
| Passenger airlines | 8.1% | 5.0% | 2.9% | 2.4% | 2.0% | 1.8% | 1.7% |
| Cargo airlines | (5.7) | 4.8 | 2.4 | 1.8 | 1.4 | 1.1 | 1.1 |
| Other | (82.1) | 21.1 | 0.0 | 0.2 | 0.0 | 0.2 | 0.0 |
| Air Carrier total | 6.8 | 5.0 | 2.9 | 2.4 | 2.0 | 1.8 | 1.7 |
| Air Taxi | | | | | | | |
| Cargo airlines | (6.8) | 4.2 | 2.4 | 1.8 | 1.4 | 1.1 | 1.2 |
| Other | 25.4 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Air Taxi total | 17.2 | 1.0 | 0.6 | 0.5 | 0.4 | 0.3 | 0.3 |
| General Aviation | 7.5 | 0.3 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| Military | 7.2 | (2.0) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Airport | 7.4 | 4.6 | 2.7 | 2.3 | 1.9 | 1.7 | 1.6 |

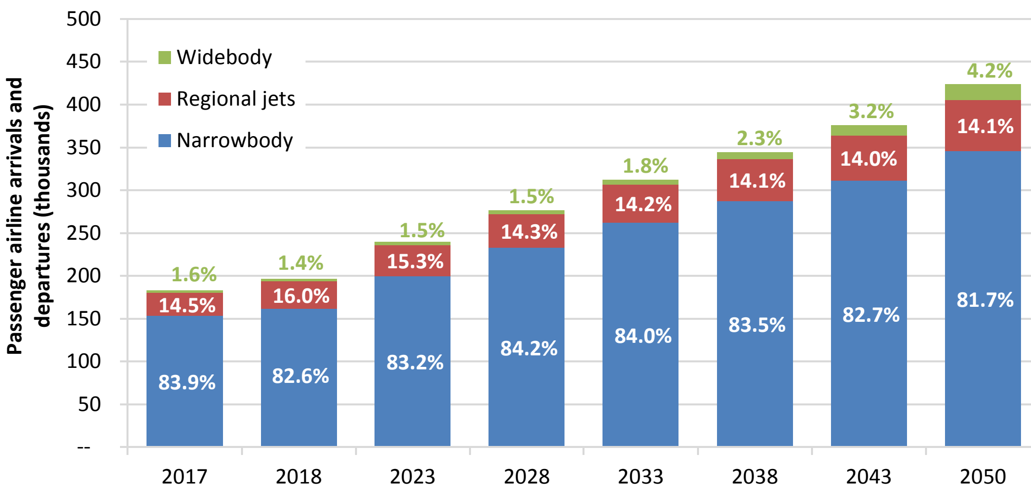
Note: The forecasts presented in this table were prepared using the information and assumptions given in the accompanying text. Inevitably, some of the assumptions used to develop the forecasts will not be realized and unanticipated events and circumstances may occur. Therefore, there are likely to be differences between the forecast and actual results, and those differences may be material.

Sources: *Historical*—San Diego County Regional Airport Authority records. *Forecast*—LeighFisher, November 2018.

## 4.4 Aircraft Fleet

Figure 4-4 and Table 4-5 present the passenger airline fleet mix at SDIA for 2017, 2018, and for the forecast years (2023, 2028, 2033, 2038, 2043, and 2050) in terms of the number and percentage of annual passenger airline aircraft operations.

Figure 4-4
**UNCONSTRAINED FORECAST OF PASSENGER AIRLINE AIRCRAFT OPERATIONS BY EQUIPMENT GROUP**
San Diego International Airport




Note: The forecasts presented in this figure were prepared using the information and assumptions given in the accompanying text. Inevitably, some of the assumptions used to develop the forecasts will not be realized and unanticipated events and circumstances may occur. Therefore, there are likely to be differences between the forecast and actual results, and those differences may be material.

Sources: *Historical*—San Diego County Regional Airport Authority records. OAG Worldwide Aviation Ltd, Schedules Analyser, online database, accessed November 2018. *Forecast*—LeighFisher, November 2018.

## 4.5 Critical Aircraft

In SDIA's Airport Development Plan, the B777 (D-V) was designated as the critical (or design) aircraft for activity levels of approximately 12 million enplaned passengers reached in 2018 and the B787-9 was designated as the future critical aircraft for activity levels of more than 12 million enplaned passengers.

Table 4-5 identifies the forecast fleet mix for the 2018 unconstrained forecast. Of the aircraft identified in the future fleet mix, the B787-9 is the most demanding (i.e., the aircraft with the largest tail heights, wingspans, approach speeds, and runway length requirements) and continues to be the critical aircraft used for airport planning based on the following:

- The choice of the B787-9 as the critical aircraft is consistent with FAA guidance for the 2012 ADP forecast as it continues to be the largest aircraft with more than 500 operations
- Table 4-5 presents a summary of annual operations by aircraft type for the 2018 unconstrained forecast and shows that the B787-9 remains the largest aircraft with 500 or more operations. (Although the A330-200 also has more than 500 operations and a slightly larger wingspan, the B787-9 has larger length, tail height, and Maximum Takeoff Weight or MTOW.)

Table 4-5
**UNCONSTRAINED FORECAST OF PASSENGER AIRLINE AIRCRAFT OPERATIONS BY AIRCRAFT TYPE**
San Diego International Airport

| | Arrivals and departures | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Historical | | Unconstrained Forecast | | | | | |
| Aircraft type | 2017 | 2018 | 2023 | 2028 | 2033 | 2038 | 2043 | 2050 |
| Domestic | | | | | | | | |
| Narrowbody | | | | | | | | |
| A318 | 499 | 3,020 | -- | -- | -- | -- | -- | -- |
| A319 | 6,328 | 4,801 | 4,879 | 4,522 | 3,852 | -- | -- | -- |
| A320 | 15,161 | 14,132 | 18,145 | 22,321 | 26,742 | 31,216 | 34,084 | 37,981 |
| A320neo | -- | -- | 2,399 | 4,152 | 6,245 | 9,298 | 16,920 | 30,081 |
| A321 | 12,354 | 17,699 | 22,484 | 27,326 | 32,389 | 38,133 | 43,517 | 51,151 |
| B717-200 | 406 | 1,531 | -- | -- | -- | -- | -- | -- |
| B737-300/400/500/600 | 312 | -- | -- | -- | -- | -- | -- | -- |
| B737-700 | 57,680 | 57,471 | 65,094 | 65,420 | 62,250 | 53,161 | 39,245 | 23,035 |
| B737-800 | 33,660 | 37,950 | 50,948 | 64,321 | 75,685 | 86,919 | 87,385 | 89,987 |
| B737-900 | 17,799 | 16,996 | 21,868 | 26,616 | 31,588 | 36,561 | 43,680 | 44,980 |
| B737 MAX | 329 | 1,493 | 3,015 | 4,863 | 7,047 | 10,527 | 18,263 | 31,593 |
| B757-200/300 | 3,733 | 3,680 | 2,796 | 1,842 | -- | -- | -- | -- |
| CS100 | -- | -- | 1,919 | 3,598 | 5,620 | 7,921 | 10,528 | 13,981 |
| MD-80 | 381 | 24 | -- | -- | -- | -- | -- | -- |
| MD-90 | 1,053 | 260 | 316 | | | | | |
| Subtotal-- narrowbody | 149,695 | 159,056 | 193,863 | 224,982 | 251,416 | 273,736 | 293,622 | 322,790 |
| Regional jets | | | | -- | -- | -- | -- | -- |
| CRJ-100/200 | 523 | 1,351 | -- | -- | -- | -- | -- | -- |
| CRJ-700 | 2,355 | 3,146 | 3,346 | 2,754 | 2,482 | 2,049 | 1,485 | 826 |
| CRJ-900 | 1,175 | 388 | 1,192 | 1,652 | 2,175 | 2,744 | 3,372 | 4,223 |
| ERJ-175 | 19,408 | 23,975 | 29,157 | 32,258 | 36,391 | 40,137 | 43,825 | 49,380 |
| Subtotal--regional jets | 23,461 | 28,861 | 33,694 | 36,663 | 41,048 | 44,930 | 48,682 | 54,428 |
| Turboprop | | | | | | | | |
| Q400 | 1,769 | 699 | 371 | -- | -- | -- | -- | -- |
| Widebody | | | | | | | | |
| A330-200 | 720 | 713 | 867 | 1,001 | 1,129 | 1,245 | 1,359 | 1,532 |
| B767-200/300 | 532 | 146 | -- | -- | -- | -- | -- | -- |
| B787-8 | | | 240 | 277 | 937 | 2,755 | 5,264 | 8,473 |
| Subtotal--widebody | 1,252 | 859 | 1,107 | 1,277 | 2,065 | 4,000 | 6,624 | 10,005 |
| **Subtotal-- Domestic** | **176,176** | **189,475** | **229,035** | **262,923** | **294,530** | **322,666** | **348,927** | **387,223** |

Table 4-5 (page 2 of 4)

**UNCONSTRAINED FORECAST OF PASSENGER AIRLINE AIRCRAFT OPERATIONS BY AIRCRAFT TYPE**

San Diego International Airport

| | Arrivals and departures | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Historical | | Unconstrained Forecast | | | | | |
| Aircraft type | 2017 | 2018 | 2023 | 2028 | 2033 | 2038 | 2043 | 2050 |
| International | | | | | | | | |
| Narrowbody | | | | | | | | |
| A319 | 122 | 49 | -- | -- | -- | -- | -- | -- |
| A320neo | -- | -- | 240 | 830 | 1,561 | 2,411 | 3,384 | 5,084 |
| A320 | 185 | 223 | 271 | 312 | 352 | 389 | 424 | 478 |
| A321 | 619 | 662 | 1,285 | 1,759 | 2,609 | 3,566 | 4,646 | 6,082 |
| B737-700 | 889 | 1,095 | 1,332 | 1,537 | 1,734 | 1,912 | 2,088 | 2,353 |
| B737-800 | 566 | 812 | 987 | 1,139 | 1,285 | 1,417 | 1,547 | 1,743 |
| B737-900 | 1,232 | 859 | 1,044 | 1,205 | 1,360 | 1,500 | 1,637 | 1,845 |
| B737 MAX | | | 480 | 1,107 | 1,873 | 2,755 | 3,760 | 5,508 |
| Subtotal-- narrowbody | 3,615 | 3,699 | 5,638 | 7,890 | 10,774 | 13,949 | 17,487 | 23,093 |
| Regional jets | -- | -- | | | | | | |
| CRJ-700 | 1,229 | 118 | -- | -- | -- | -- | -- | -- |
| CRJ-900 | -- | 1,694 | 2,060 | 1,824 | 1,433 | 892 | 221 | -- |
| ERJ-175 | 110 | 274 | 573 | 1,215 | 1,995 | 2,889 | 3,906 | 5,249 |
| Subtotal--regional jets | 1,339 | 2,086 | 2,633 | 3,038 | 3,427 | 3,780 | 4,127 | 5,249 |
| Widebody | | | | | | | | |
| A340-300 | 59 | 487 | 592 | 683 | 770 | -- | -- | -- |
| B747-400 | 282 | 286 | -- | -- | -- | -- | -- | -- |
| B767-200/300 | 112 | -- | -- | -- | -- | -- | -- | -- |
| B777 | 426 | 431 | 525 | 329 | 58 | 64 | 70 | 79 |
| B787-8 | 720 | 719 | 1,354 | 1,562 | 2,075 | 2,633 | 3,251 | 4,086 |
| B787-9 | | -- | | 277 | 624 | 1,377 | 2,256 | 3,813 |
| Subtotal-- widebody | 1,599 | 1,923 | 2,470 | 2,851 | 3,528 | 4,075 | 5,577 | 7,979 |
| **Subtotal-- International** | **-- 6,553** | **7,708** | **-10,742** | **13,778** | **17,729** | **21,804** | **27,191** | **36,320** |
| **Total--Passenger Airlines** | **182,712** | **197,244** | **239,870** | **276,770** | **312,230** | **344,370** | **376,010** | **423,670** |

Note: The forecasts presented in this table were prepared using the information and assumptions given in the accompanying text. Inevitably, some of the assumptions used to develop the forecasts will not be realized and unanticipated events and circumstances may occur. Therefore, there are likely to be differences between the forecast and actual results, and those differences may be material.
Totals may not add due to rounding.

Sources: *Historical*—San Diego County Regional Airport Authority records. *Forecast*—LeighFisher, November 2018.

Table 4-5 (page 3 of 4)

**UNCONSTRAINED FORECAST OF PASSENGER AIRLINE AIRCRAFT OPERATIONS BY AIRCRAFT TYPE**

San Diego International Airport

| | Percent of total | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Historical | | Unconstrained Forecast | | | | | |
| Aircraft type | 2017 | 2018 | 2023 | 2028 | 2033 | 2038 | 2043 | 2050 |
| Domestic | | | | | | | | |
| Narrowbody | | | | | | | | |
| A318 | 0.3% | 1.5% | --% | --% | --% | --% | --% | --% |
| A319 | 3.5 | 2.4% | 2.0 | 1.6 | 1.2 | -- | -- | -- |
| A320 | 8.3 | 7.2% | 7.6 | 8.1 | 8.6 | 9.1 | 9.1 | 9.0 |
| A320neo | 0.0 | 0.0% | 1.0 | 1.5 | 2.0 | 2.7 | 4.5 | 7.1 |
| A321 | 6.8 | 9.0% | 9.4 | 9.9 | 10.4 | 11.1 | 11.6 | 12.1 |
| B717-200 | 0.2 | 0.8% | -- | -- | -- | -- | -- | -- |
| B737-300/400/500/600 | 0.2 | 0.0% | -- | -- | -- | -- | -- | -- |
| B737-700 | 31.6 | 29.1% | 27.1 | 23.6 | 19.9 | 15.4 | 10.4 | 5.4 |
| B737-800 | 18.4 | 19.2% | 21.2 | 23.2 | 24.2 | 25.2 | 23.2 | 21.2 |
| B737-900 | 9.7 | 8.6% | 9.1 | 9.6 | 10.1 | 10.6 | 11.6 | 10.6 |
| B737 MAX | 0.2 | 0.8% | 1.3 | 1.8 | 2.3 | 3.1 | 4.9 | 7.5 |
| B757-200/300 | 2.0 | 1.9% | 1.2 | 0.7 | -- | -- | -- | -- |
| CS100 | -- | 0.0% | 0.8 | 1.3 | 1.8 | 2.3 | 2.8 | 3.3 |
| MD-80 | 0.2 | 0.0% | -- | -- | -- | -- | -- | -- |
| MD-90 | 0.6 | 0.1% | 0.1 | | | | | |
| Subtotal-- narrowbody | 81.9% | 80.6% | 80.8% | 81.3% | 80.5% | 79.5% | 78.1% | 76.2% |
| Regional jets | | | | | | | | |
| CRJ-100/200 | 0.3% | 0.7% | --% | --% | --% | --% | --% | --% |
| CRJ-700 | 1.3 | 1.6% | 1.4 | 1.0 | 0.8 | 0.6 | 0.4 | 0.2 |
| CRJ-900 | 0.6 | 0.2% | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 | 1.0 |
| ERJ-175 | 10.6 | 12.2% | 12.2 | 11.7 | 11.7 | 11.7 | 11.7 | 11.7 |
| Subtotal--regional jets | 12.8% | 14.7% | 14.0% | 13.2% | 13.1% | 13.0% | 12.9% | 12.8% |
| Turboprop | | | | | | | | |
| Q400 | 1.0% | 0.4% | 0.2% | --% | --% | --% | --% | --% |
| Widebody | | | | | | | | |
| A330-200 | 0.4% | 0.4% | 0.4% | 0.4% | 0.4% | 0.4% | 0.4% | 0.4% |
| B767-200/300 | 0.3 | 0.1 | -- | -- | -- | -- | -- | -- |
| B787-8 | 0.0 | 0.0 | 0.1 | 0.1 | 0.3 | 0.8 | 1.4 | 2.0 |
| Subtotal--widebody | 0.7 | 0.4 | 0.5 | 0.5 | 0.7 | 1.2 | 1.8 | 2.4 |
| **Subtotal-- Domestic** | **96.4%** | **96.1%** | **95.5%** | **95.0%** | **94.3%** | **93.7%** | **92.8%** | **91.4%** |

Table 4-5 (page 4 of 4)

**UNCONSTRAINED FORECAST OF PASSENGER AIRLINE AIRCRAFT OPERATIONS BY AIRCRAFT TYPE**

San Diego International Airport

| | Percent of total | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Historical | | Unconstrained Forecast | | | | | |
| Aircraft type | 2017 | 2018 | 2023 | 2028 | 2033 | 2038 | 2043 | 2050 |
| International | | | | | | | | |
| Narrowbody | | | | | | | | |
| A319 | 0.1% | --% | --% | --% | --% | --% | --% | --% |
| A320neo | 0.0 | 0.0 | 0.1 | 0.3 | 0.5 | 0.7 | 0.9 | 1.2 |
| A320 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| A321 | 0.3 | 0.3 | 0.5 | 0.6 | 0.8 | 1.0 | 1.2 | 1.4 |
| B737-700 | 0.5 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 |
| B737-800 | 0.3 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 |
| B737-900 | 0.7 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 |
| B737 MAX | | | 0.2 | 0.4 | 0.6 | 0.8 | 1.0 | 1.3 |
| Subtotal-- narrowbody | -- 2.0% | -- 1.9% | 2.4% | 2.9% | 3.5% | 4.1% | 4.7% | 5.5% |
| Regional jets | | | | | | | | |
| CRJ-700 | 0.7% | 0.1% | --% | --% | --% | --% | --% | --% |
| CRJ-900 | -- | 0.9 | 0.9 | 0.7 | 0.5 | 0.3 | 0.1 | 0.0 |
| ERJ-175 | 0.1 | 0.1 | 0.2 | 0.4 | 0.6 | 0.8 | 1.0 | 1.2 |
| Subtotal--regional jets | 0.7% | 1.1% | 1.1% | 1.1% | 1.1% | 1.1% | 1.1% | 1.2% |
| Widebody | | | | | | | | |
| A340-300 | --% | 0.2% | 0.2% | 0.2% | 0.2% | --% | --% | --% |
| B747-400 | 0.2 | 0.1 | -- | -- | -- | -- | -- | -- |
| B767-200/300 | 0.1 | 0.0 | -- | -- | -- | -- | -- | -- |
| B777 | 0.2 | 0.2 | 0.2 | 0.1 | -- | -- | -- | -- |
| B787-8 | 0.4 | 0.4 | 0.6 | 0.6 | 0.7 | 0.8 | 0.9 | 1.0 |
| B787-9 | | | | 0.1 | 0.2 | 0.4 | 0.6 | 0.9 |
| Subtotal-- widebody | -- 0.9 | -- 0.9 | 1.0 | 1.0% | 1.1% | 1.2% | 1.5% | 1.9% |
| **Subtotal-- International** | **3.6%** | **3.9%** | **4.5%** | **5.0%** | **5.7%** | **6.3%** | **7.2%** | **8.6%** |
| **Total--Passenger Airlines** | **100.0%** | **100.0%** | **100.0%** | **100.0%** | **100.0%** | **100.0%** | **100.0%** | **100.0%** |

Note: The forecasts presented in this table were prepared using the information and assumptions given in the accompanying text. Inevitably, some of the assumptions used to develop the forecasts will not be realized and unanticipated events and circumstances may occur. Therefore, there are likely to be differences between the forecast and actual results, and those differences may be material.
Totals may not add due to rounding.

Sources: *Historical*—San Diego County Regional Airport Authority records. *Forecast*—LeighFisher, November 2018.

Table 4-6 summarizes the number of forecast operations for the B787-9, B777, and B747-400 aircraft in the 2018 unconstrained forecast.

Table 4-6
**UNCONSTRAINED FORECAST OF CRITICAL AIRCRAFT OPERATIONS**
San Diego International Airport

| | Historical | | Unconstrained Forecast | | | | | |
|---|---|---|---|---|---|---|---|---|
| Parameter | 2017 | 2018 | 2023 | 2028 | 2033 | 2038 | 2043 | 2050 |
| Enplaned passengers (millions) | 11.1 | 12.1 | 14.6 | 17.0 | 19.2 | 21.3 | 23.5 | 26.7 |
| B747 operations | 282 | 286 | -- | -- | -- | -- | -- | -- |
| B777 operations | 426 | 431 | 525 | 329 | 58 | 64 | 70 | 79 |
| B787-9 operations | -- | -- | -- | 277 | 624 | 1,377 | 2,256 | 3,813 |
| Aircraft Approach Category (AAC) | D | D | D | D | D | D | D | D |
| Airplane Design Group (ADG) | V | V | V | V | V | V | V | V |

For the determination of the existing critical aircraft, it is noteworthy that the volume of B777 (D-V) operations alone do not surpass the 500 operations threshold. B777 aircraft are used by British Airways during the summer months and are replaced with B747-400 during the winter months. As the B747-400 and B777 have similar demands on airport infrastructure (wingspan, length, tail height, and MTOW), they may be viewed as a group for the purposes of defining the existing design aircraft. Together, the operations of this group exceed the 500 operations threshold. Therefore, the 2018 unconstrained forecast is consistent with defining the current critical aircraft as a group defined by the B777 (D-V) and B747-400.

# 5.0 CONSTRAINED DEMAND SCENARIO

This section presents a constrained demand scenario of SDIA aviation activity that was developed to evaluate the potential for a single runway to meet unconstrained forecast demand. In contrast to the unconstrained forecast presented in Section 4.0, the constrained demand scenario is defined by specific assumptions about the hourly capacity of a single runway and the ability of the airlines serving SDIA to operate efficiently in a constrained environment. The constrained demand scenario addresses the real-world limitations of SDIA's single runway on unconstrained forecast growth. This well-known and substantial limitation on the operational and passenger capacity of the airport must be considered in planning airport improvements and analyzing their reasonably foreseeable impacts. The constrained demand scenario presented in this memorandum analyses and anticipates these limitations and therefore the constrained demand scenario and represents the "preferred" forecasts recommended for FAA approval and for airport planning.

## 5.1 Approach

The constrained demand scenario was developed using a bottom-up approach based on the Design Day Flight Schedules (DDFSs) developed for the unconstrained forecast, as shown on Figure 5-1. The DDFSs include detailed data for an average day in the peak month (ADPM), including:

- Arrivals and departures
- Origin and destination
- Published carrier and operator
- Time of day
- Equipment type
- Seat configuration
- Scheduled arrival and departure date
- Stand time
- Estimated passenger load factors by origin and destination

### 5.1.1 Operation Constraints

To develop DDFSs for the constrained demand scenario, the unconstrained forecast DDFSs were evaluated in relation to operation constraints at SDIA, including:

- **Hourly Limit of 50 Operations.** The hourly profiles of the unconstrained forecast DDFS were evaluated in relation to a limit of 50 operations per hour, which was exceeded in certain hours starting in 2024, as shown on Figure 5-2. For the constrained demand scenario DDFS, selected flights in hours which exceeded the limit were shifted to other hours with fewer than 50 operations, provided that shifting the flight didn't duplicate a flight to the same market by the same airline. Appendix D presents information on the establishment of the limit.

- **Departure Hour Restrictions.** SDIA's Airport Use Regulation restricts departures by any aircraft between the hours of 11:30 pm and 6:30 am and gate departures between the hours of 11:15 pm and 6:15 am. There is no restriction on arrivals.* For the constrained demand scenario DDFS, the departure hour restrictions limit the ability of airlines to reschedule flights during a 16.5 hour period per day.

- **Annual Limit.** SDIA's annual limit on total aircraft operations (including passenger and cargo airlines, general aviation, military, and other unscheduled) is defined by an upper bound of 292,000

* San Diego County Regional Airport Codes, Section 9.40, Airport Use Regulation at San Diego International Airport, www.san.org.

operations and a lower bound of 262,000 operations and reflects the potential Annual Service Volume (ASV) for the Airport.

Figure 5-1
**CONSTRAINED DEMAND SCENARIO APPROACH AND ASSUMPTIONS**
San Diego International Airport

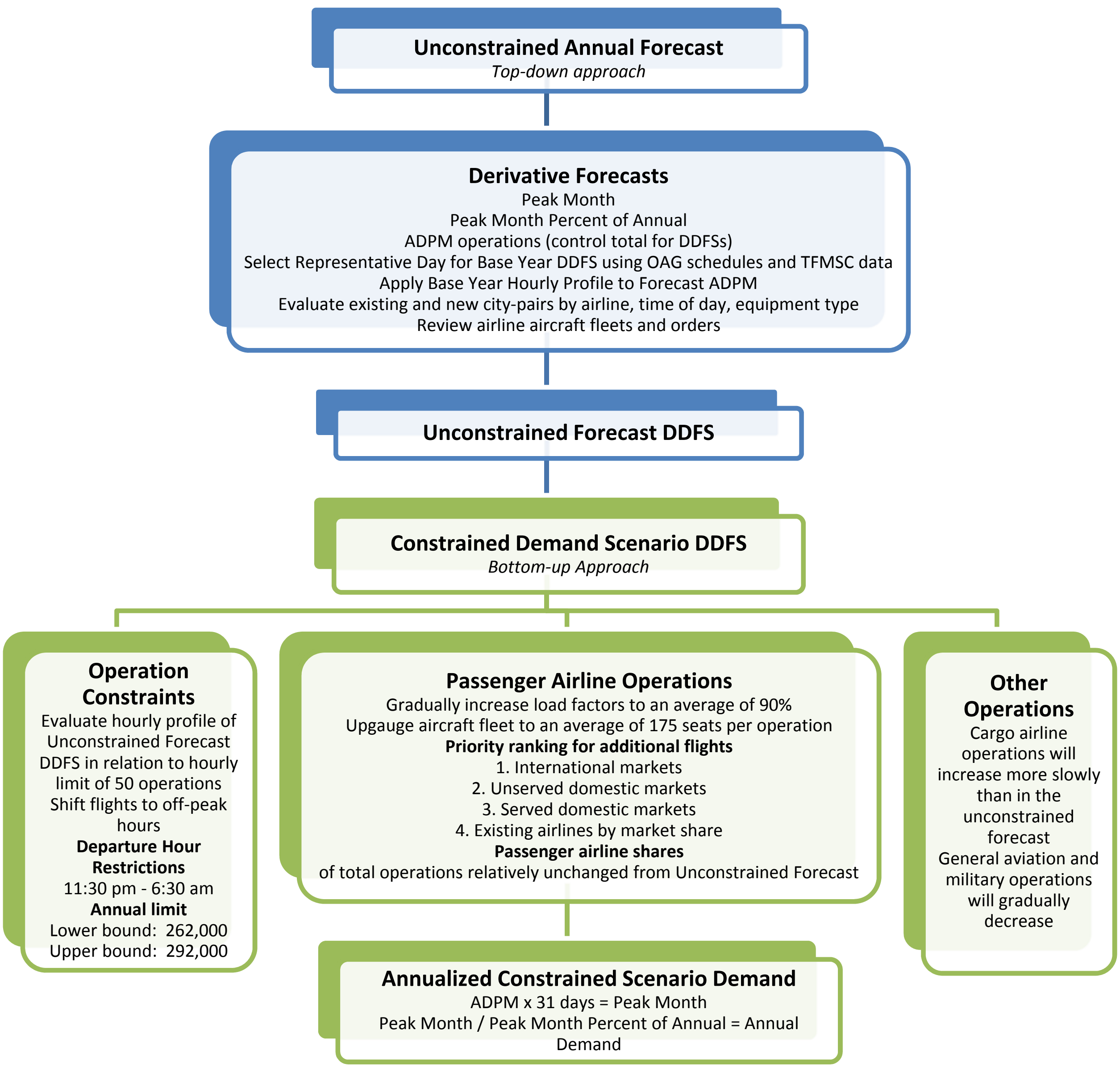
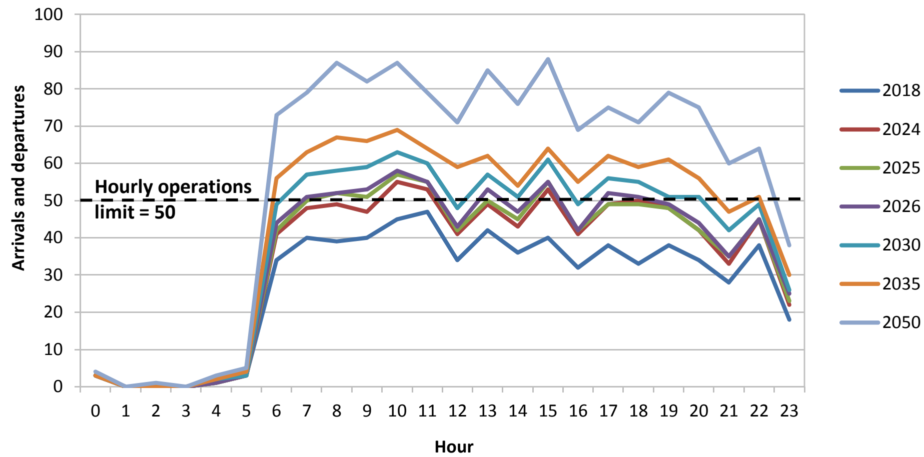


Figure 5-2
**ADPM TOTAL AIRCRAFT OPERATIONS BY HOUR FOR THE UNCONSTRAINED FORECAST DDFS**
San Diego International Airport




Note: Data include operations for passenger and cargo airlines, general aviation, and military.

Sources: *2018*—OAG Worldwide Aviation Ltd, online database and Federal Aviation Administration, Traffic Flow Management System Counts (TFMSC), www.aspm.faa.gov, both accessed January 2019. *Forecast*—LeighFisher, January 2019.

### 5.1.2 Passenger Airline Operations

In addition to the operation constraints, the constrained demand scenario DDFS was developed based on assumptions regarding the ability of the airlines serving SDIA to operate efficiently in a constrained environment. These assumptions included:

- **Load Factor.** In a constrained environment, it was assumed that passenger airlines would increase load factors (i.e., the percent of occupied seats on flights) to accommodate as much of the unconstrained forecast demand as possible. For the constrained demand scenario DDFSs, an average load factor of 90% was assumed, compared with an average of 86% in the unconstrained forecast.

- **Aircraft Gauge.** SDIA's aircraft gauge, or the average number of seats per operation, was assumed to reach an average of 175 seats per operation in the constrained demand scenario, compared with an average of 155 in the unconstrained forecast. It was assumed that passenger airlines would increase the average gauge of the primarily narrowbody fleet serving the Airport and that the gauge would be limited by the airlines' existing aircraft fleets and orders.

- **Priority Ranking for Additional Flights.** In the development of DDFSs, flights were added to the base year schedule in order to accommodate the unconstrained forecast demand. For the constrained demand scenario DDFSs, a priority ranking for the addition of flights was developed with guidance from SDIA's Airline Service Department. As shown in Figure 5-1, international markets were given first priority when deciding between flights to remain in the constrained demand scenario DDFS, followed by unserved domestic markets and served domestic markets. Existing airlines were given preference depending on their share of a certain market.

- **Passenger Airline Shares.** In the constrained demand scenario, it was assumed that the passenger airline shares of total operations would remain relatively unchanged from Unconstrained Forecast (subject to the priority ranking outlined above).

#### 5.1.3 Other Operations

In the constrained demand scenario, the operations of cargo airlines are assumed to increase more slowly than in the unconstrained forecast, reflecting an increase in the average tonnage per operation. In 2018, general aviation and military operations accounted for 5% of total aircraft operations at the Airport, down from 8% in 2000. It was assumed that the number of operations by general aviation and military aircraft at the Airport would gradually decrease to 3% of total operations in a constrained environment.

#### 5.1.4 Annualized Constrained Scenario Demand

ADPM operations and passengers represented in the constrained demand scenario DDFS were annualized based on derived values for the peak month (i.e., ADPM operations multiplied by 31 days = peak month operations) and the assumed peak month percent of annual operations (i.e., peak month operations divided by the peak month percent of annual = annual operations). It was assumed that the peak month percent of annual operations would continue to account for 9.1% of total aircraft operations through 2050. Similarly, it was assumed that the peak month percent of annual passengers would continue to account for 9.6% of total passengers through 2050. For example, in 2033:

- ADPM total aircraft operations from the constrained scenario DDFS totaled 816 which translates into 25,310 peak month operations (816 ADPM operations multiplied by 31 days = 25,310 peak month operations)

- The 25,310 peak month operations translates into 277,200 annual operations (25,310 peak month operations divided by 9.1% = annual operations)

### 5.2 Enplaned Passengers

As shown in Table 5-1 and on Figure 5-3, the number of enplaned passengers at the Airport is forecast to increase from 12.1 million enplaned passengers in 2018 to 20.3 million in 2050 in the constrained demand scenario, an average increase of 1.6% per year. The number of air carrier enplaned passengers at the Airport is forecast to increase an average of 1.8% per year between 2018 and 2050, compared with an average decrease of 3.4% per year in commuter passenger traffic.

### 5.3 Air Cargo

As shown in Table 5-1 and on Figure 5-4, total air cargo at the Airport is forecast to increase from 192,351 metric tons in 2018 to 335,400 metric tons in 2050 in the constrained demand scenario, an average increase of 1.8% per year.

### 5.4 Total Aircraft Operations

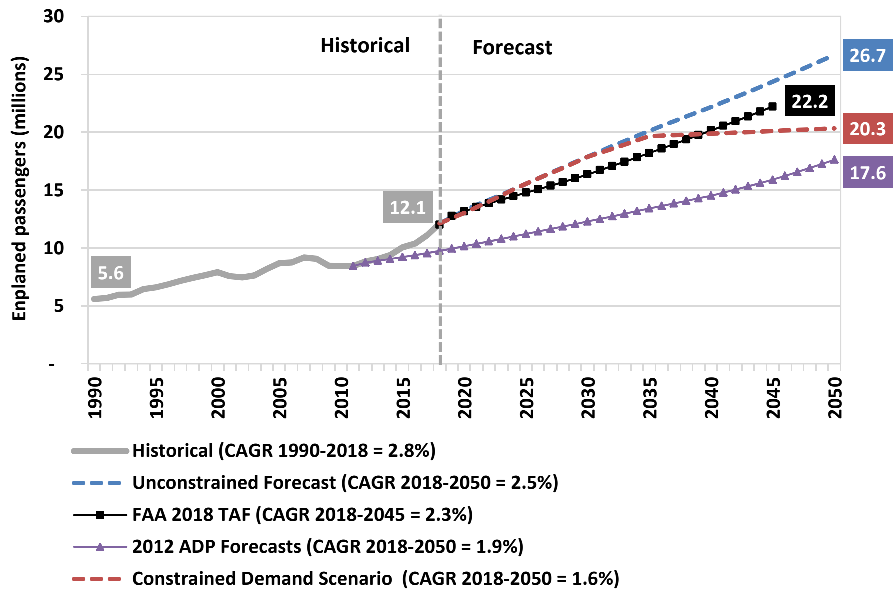
As shown in Table 5-1 and on Figure 5-5, total aircraft operations at the Airport are forecast to increase from 225,058 in 2018 to 290,100 in 2050 in the constrained demand scenario, an average increase of 0.8% per year. Commercial aircraft operations at the Airport are forecast to increase an average of 0.9% per year between 2018 and 2050, while general aviation and military operations are forecast to decrease an average of 2.1% and 1.7% per year, respectively.

Table 5-1
**CONSTRAINED DEMAND SCENARIO OF AVIATION ACTIVITY**
San Diego International Airport

| | Historical | Constrained Demand Scenario | | | |
|---|---|---|---|---|---|
| | 2018 | 2023 | 2028 | 2033 | 2050 |
| **Enplaned passengers** | | | | | |
| Air carrier | 11,272,706 | 13,798,000 | 16,576,000 | 18,618,000 | 20,036,232 |
| Commuter | 853,232 | 738,000 | 343,000 | 309,000 | 284,768 |
| Total enplaned passengers | 12,125,938 | 14,536,000 | 16,919,000 | 18,927,000 | 20,321,000 |
| **Total air cargo** | 192,351 | 230,000 | 257,400 | 279,800 | 335,400 |
| **Total aircraft operations** | | | | | |
| **Commercial aircraft operations** | | | | | |
| Air carrier | | | | | |
| Passenger airlines | 197,244 | 227,800 | 244,500 | 257,700 | 271,800 |
| Cargo airlines | 3,850 | 4,440 | 5,100 | 5,700 | 7,610 |
| Other | 372 | | 510 | 670 | 380 |
| Total air carrier | 201,466 | 232,240 | 250,110 | 264,070 | 279,790 |
| Air taxi | | -- | | | |
| Passenger airlines | -- | -- | -- | -- | -- |
| Cargo airlines | 2,530 | 2,760 | 3,000 | 3,100 | 3,290 |
| Other | 9,967 | 10,210 | 3,850 | 1,650 | 1,400 |
| Total air taxi | 12,497 | 12,970 | 6,850 | 4,750 | 4,690 |
| **Total commercial aircraft operations** | **213,963** | **245,210** | **256,960** | **268,820** | **284,480** |
| General aviation | 10,337 | 9,020 | 8,390 | 7,750 | 5,180 |
| Military | 758 | 630 | 650 | 660 | 440 |
| **Total aircraft operations** | **225,058** | **254,860** | **266,000** | **277,230** | **290,100** |
| **Forecast assumptions** | | | | | |
| Load factor | 85.4% | 87.0% | 89.1% | 89.9% | 90.0% |
| Average seats per operation | 151.0 | 153.3 | 163.6 | 172.2 | 175 |

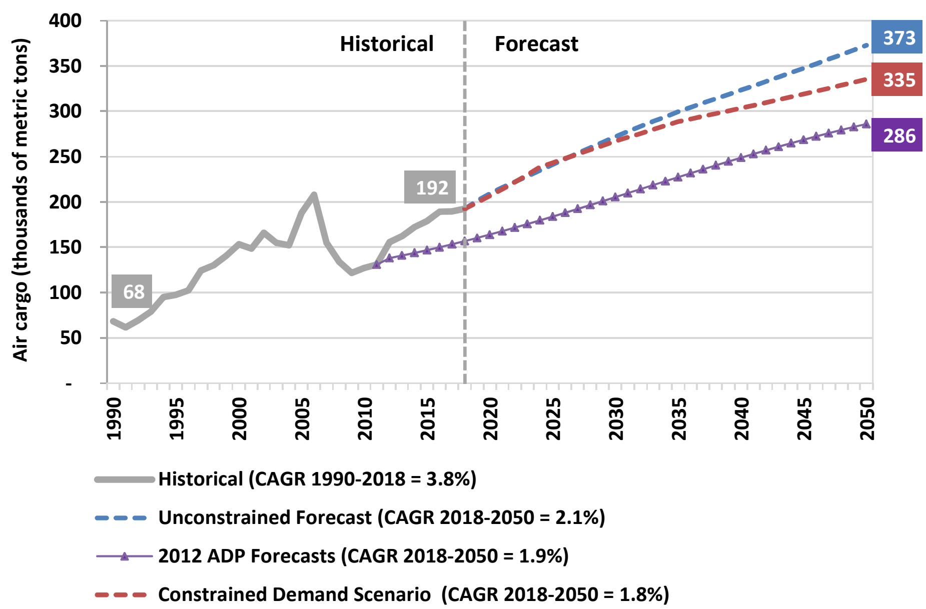
Sources: *Historical*—San Diego County Regional Airport Authority records. *Forecast*—LeighFisher, April 2019.

Figure 5-3
**CONSTRAINED DEMAND SCENARIO OF ENPLANED PASSENGERS**
San Diego International Airport



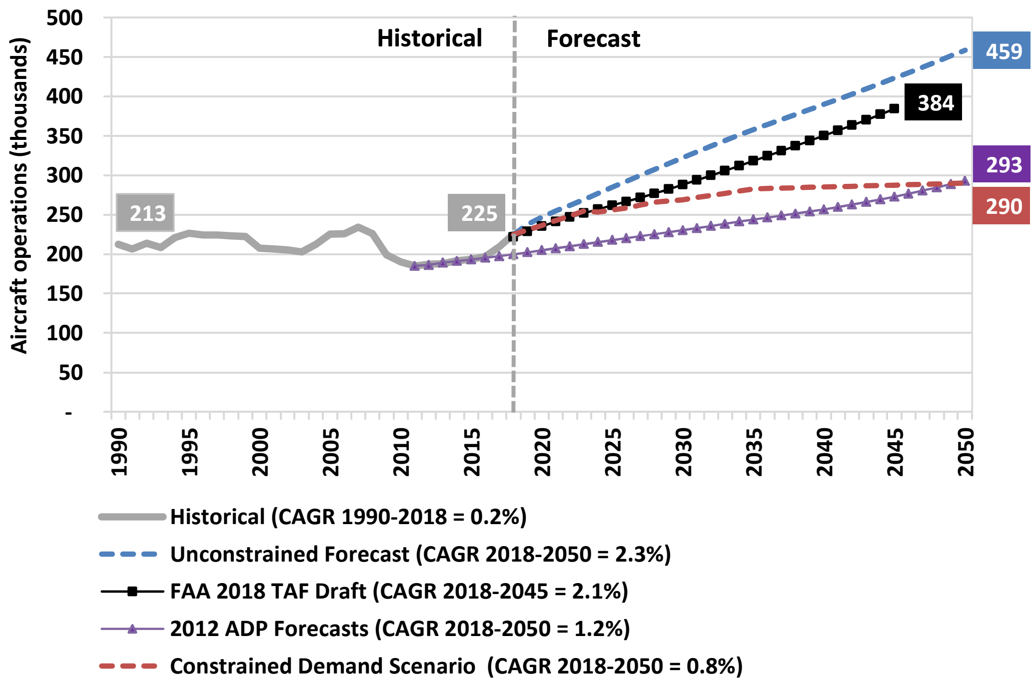

CAGR = Compound annual growth rate
Sources: *Historical*—San Diego County Regional Airport Authority records. *Forecast*—LeighFisher, April 2019.

Figure 5-4
**CONSTRAINED DEMAND SCENARIO OF AIR CARGO**
San Diego International Airport




CAGR = Compound annual growth rate
Sources: *Historical*—San Diego County Regional Airport Authority records. *Forecast*—LeighFisher, April 2019.

Figure 5-5
**CONSTRAINED DEMAND SCENARIO OF TOTAL AIRCRAFT OPERATIONS**
San Diego International Airport




CAGR = Compound annual growth rate
Sources: *Historical*—San Diego County Regional Airport Authority records. *Forecast*—LeighFisher, April 2019.

## 5.5 Aircraft Fleet

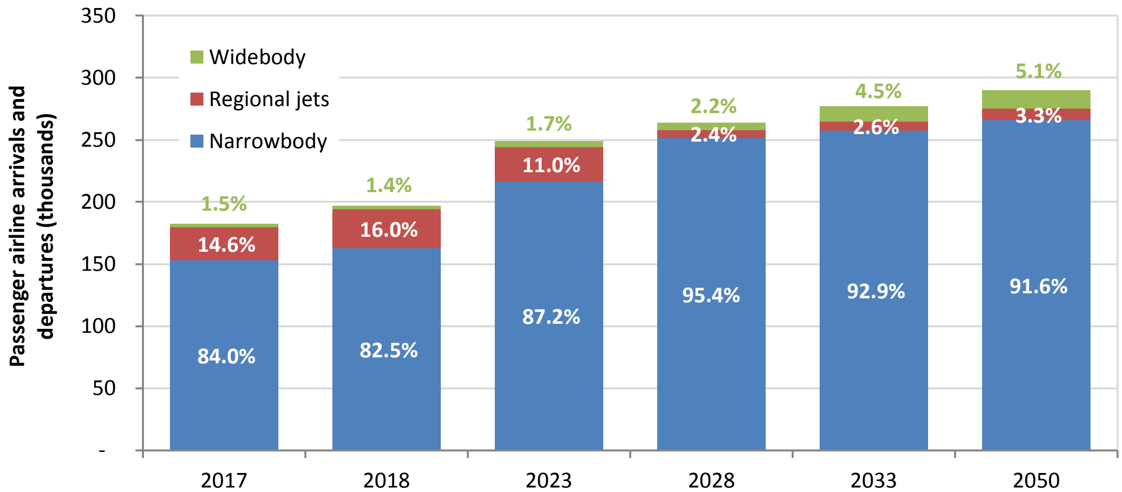
Table 5-2 and Figure 5-6 present the passenger airline fleet mix at SDIA for 2017, 2018, and for the constrained demand scenario years (2023, 2028, 2033, and 2050) in terms of the number and percentage of annual passenger airline aircraft operations.

## 5.6 Critical Aircraft

As discussed in Section 4.5, of the aircraft identified in the future fleet mix, the B787-9 is the most demanding (i.e., the aircraft with the largest tail heights, wingspans, approach speeds, and runway length requirements) and continues to be the critical aircraft used for airport planning based on the following:

- The choice of the B787-9 as the critical aircraft is consistent with FAA guidance for the 2012 ADP forecast as it continues to be the largest aircraft with more than 500 operations
- Table 5-2 presents a summary of annual operations by aircraft type for the constrained demand scenario and shows that the B787-9 remains the largest aircraft with 500 or more operations. (Although the A330-200 also has more than 500 operations and a slightly larger wingspan, the B787-9 has larger length, tail height, and MTOW.)

Figure 5-6
**CONSTRAINED DEMAND SCENARIO OF PASSENGER AIRLINE AIRCRAFT OPERATIONS BY EQUIPMENT GROUP**
San Diego International Airport




Sources: *Historical*—San Diego County Regional Airport Authority records. OAG Worldwide Aviation Ltd, Schedules Analyser, online database, accessed November 2018. *Forecast*—LeighFisher, April 2019.

Table 5-3 summarizes the number of critical aircraft forecast operations for the B787-9, B777, and B747-400 aircraft in the constrained demand scenario.

Table 5-3
**CONSTRAINED DEMAND SCENARIO OF CRITICAL AIRCRAFT OPERATIONS**
San Diego International Airport

| | Historical | | Constrained Demand Scenario | | | |
|---|---|---|---|---|---|---|
| Parameter | 2017 | 2018 | 2023 | 2028 | 2033 | 2050 |
| Enplaned passengers (millions) | 11.1 | 12.1 | 14.5 | 16.9 | 18.9 | 20.3 |
| B747 operations | 282 | 286 | -- | -- | -- | -- |
| B777 operations | 426 | 431 | 720 | 717 | 716 | 725 |
| B787-9 operations | -- | -- | 720 | 1,434 | 1,433 | 2,176 |
| Aircraft Approach Category (AAC) | D | D | D | D | D | D |
| Airplane Design Group (ADG) | V | V | V | V | V | V |

Table 5-2

**CONSTRAINED DEMAND SCENARIO OF PASSENGER AIRLINE AIRCRAFT OPERATIONS BY AIRCRAFT TYPE**

San Diego International Airport

| | Arrivals and departures | | | | | |
|---|---|---|---|---|---|---|
| | Historical | | Constrained Demand Scenario | | | |
| Aircraft type | 2017 | 2018 | 2023 | 2028 | 2033 | 2050 |
| *Domestic* | | | | | | |
| *Narrowbody* | | | | | | |
| *A318* | *499* | *3,020* | -- | -- | -- | -- |
| *A319* | *6,328* | *4,801* | *3,352* | -- | -- | -- |
| *A320* | *15,161* | *14,132* | *16,700* | *17,164* | *12,020* | *10,220* |
| *A320neo* | -- | -- | *3,352* | *4,380* | *4,380* | *4,380* |
| *A321* | *12,354* | *17,699* | *18,168* | *29,815* | *31,608* | *31,025* |
| *A321neo (a)* | -- | -- | *10,398* | *16,568* | *24,570* | *29,565* |
| *B717-200* | *406* | *1,531* | *1,515* | -- | -- | -- |
| *B737-300/400/500/600* | *312* | -- | -- | -- | -- | -- |
| *B737-700* | *57,680* | *57,471* | *64,556* | *48,303* | *18,898* | *6,570* |
| *B737-800* | *33,660* | *37,950* | *42,855* | *48,175* | *65,543* | *79,205* |
| *B737-900* | *17,799* | *16,996* | *20,423* | *38,654* | *44,819* | *45,990* |
| *B-737 Max 7 (a)* | -- | -- | -- | *7,200* | *12,410* | *15,330* |
| *B-737 Max 8 (a)* | *329* | *1,493* | *1,301* | *4,380* | *6,570* | *7,300* |
| *B757-200/300* | *3,733* | *3,680* | *4,980* | *1,736* | -- | -- |
| *A220-100 (a,b)* | -- | -- | *1,159* | *4,992* | *1,460* | *1,460* |
| *A220-300 (a,b)* | -- | -- | *1,460* | *1,979* | *7,300* | *6,570* |
| *MD-80* | *381* | *24* | -- | -- | -- | -- |
| *MD-90* | *1,053* | *260* | -- | -- | -- | -- |
| *Subtotal-- narrowbody* | *149,695* | *159,056* | *190,220* | *223,346* | *229,578* | *237,615* |
| *Regional jets* | | | | | | |
| *CRJ-100/200* | *523* | *1,351* | -- | -- | -- | -- |
| *CRJ-700* | *2,335* | *3,146* | *819* | -- | -- | -- |
| *CRJ-900* | *1,175* | *388* | -- | -- | -- | -- |
| *ERJ-175* | *19,408* | *23,975* | *23,201* | *4,193* | *2,920* | *5,110* |
| *Subtotal--regional jets* | *23,461* | *28,861* | *24,020* | *4,193* | *2,920* | *5,110* |
| *Turboprop* | | | | | | |
| *Q400* | *1,769* | *699* | -- | -- | -- | -- |
| *Widebody* | | | | | | |
| *A330-200* | *720* | *713* | *730* | *730* | *730* | *730* |
| *B767-200/300* | *532* | *146* | -- | -- | -- | -- |
| *B787-8* | -- | -- | -- | -- | *6,935* | *6,935* |
| *Subtotal--widebody* | *1,252* | *859* | *730* | *730* | *7,665* | *7,665* |
| ***Subtotal-- Domestic*** | ***176,176*** | ***189,475*** | ***214,970*** | ***228,269*** | ***240,163*** | ***250,390*** |

Table 5-2 (page 2 of 4)

**CONSTRAINED DEMAND SCENARIO OF PASSENGER AIRLINE AIRCRAFT OPERATIONS BY AIRCRAFT TYPE**

San Diego International Airport

| | Arrivals and departures | | | | | |
|---|---|---|---|---|---|---|
| | Historical | | Constrained Demand Scenario | | | |
| Aircraft type | 2017 | 2018 | 2023 | 2028 | 2033 | 2050 |
| *International* | | | | | | |
| *Narrowbody* | | | | | | |
| *A319* | *122* | *49* | *--* | *--* | *--* | *--* |
| *A320neo* | *--* | *--* | *730* | *730* | *730* | *730* |
| *A320* | *185* | *223* | *--* | *--* | *--* | *--* |
| *A321* | *619* | *662* | *730* | *730* | *730* | *730* |
| *B737-700* | *889* | *1,095* | *1,460* | *1,302* | *859* | *730* |
| *B737-800* | *566* | *812* | *2,219* | *3,085* | *3,061* | *2,920* |
| *B737-900* | *1,232* | *859* | *1,396* | *2,596* | *3,338* | *4,380* |
| *B-737 Max 7 (a)* | *--* | *--* | *--* | *--* | *730* | *730* |
| *B-737 Max 8 (a)* | *--* | *--* | *--* | *730* | *730* | *730* |
| *Subtotal-- narrowbody* | *3,615* | *3,699* | *6,534* | *9,173* | *10,178* | *10,950* |
| *Regional jets* | | | | | | |
| *CRJ-700* | *1,229* | *118* | *--* | *--* | *--* | *--* |
| *CRJ-900* | *--* | *1,694* | *2,047* | *730* | *--* | *--* |
| *ERJ-175* | *110* | *274* | *730* | *2,190* | *2,975* | *3,650* |
| *Subtotal--regional jets* | *1,339* | *2,086* | *2,777* | *2,920* | *2,975* | *3,650* |
| *Widebody* | | | | | | |
| *A340-300* | *59* | *487* | *--* | *--* | *--* | *730* |
| *B747-400* | *282* | *286* | *730* | *730* | *730* | *1,460* |
| *B767-200/300* | *112* | *--* | *--* | *--* | *--* | *--* |
| *B777* | *426* | *431* | *730* | *730* | *730* | *730* |
| *B787-8* | *720* | *719* | *1,301* | *1,460* | *1,460* | *1,460* |
| *B787-9* | *--* | *--* | *730* | *1,228* | *1,460* | *2,190* |
| *Subtotal-- widebody* | *1,599* | *1,923* | *3,491* | *4,148* | *4,380* | *6,570* |
| ***Subtotal-- International*** | ***6,553*** | ***7,708*** | ***12,802*** | ***16,241*** | ***17,533*** | ***21,170*** |
| ***Total--Passenger Airlines*** | ***182,712*** | ***197,244*** | ***227,772*** | ***244,510*** | ***257,696*** | ***271,560*** |

Table 5-2 (page 3 of 4)

**CONSTRAINED DEMAND SCENARIO OF PASSENGER AIRLINE AIRCRAFT OPERATIONS BY AIRCRAFT TYPE**

San Diego International Airport

| | Percent of total arrivals and departures | | | | | |
|---|---|---|---|---|---|---|
| | Historical | | Constrained Demand Scenario | | | |
| Aircraft type | 2017 | 2018 | 2023 | 2028 | 2033 | 2050 |
| *Domestic* | | | | | | |
| *Narrowbody* | | | | | | |
| *A318* | *0.3%* | *1.5%* | *--%* | *--%* | *--%* | *--%* |
| *A319* | *3.5* | *2.4* | *1.5* | *--* | *--* | *--* |
| *A320* | *8.3* | *7.2* | *7.3* | *7.0* | *4.7* | *3.8* |
| *A320neo* | *0.0* | *0.0* | *1.5* | *1.8* | *1.7* | *1.6* |
| *A321* | *6.8* | *9.0* | *8.0* | *12.2* | *12.3* | *11.4* |
| *A321neo (a)* | *--* | *--* | *4.6* | *6.8* | *9.5* | *10.9* |
| *B717-200* | *0.2* | *0.8* | *0.7* | *--* | *--* | *--* |
| *B737-300/400/500/600* | *0.2* | *--* | *--* | *--* | *--* | *--* |
| *B737-700* | *31.6* | *29.1* | *28.3* | *19.8* | *7.3* | *2.4* |
| *B737-800* | *18.4* | *19.2* | *18.8* | *19.7* | *25.4* | *29.2* |
| *B737-900* | *9.7* | *8.6* | *9.0* | *15.8* | *17.4* | *16.9* |
| *B-737 Max 7 (a)* | *--* | *--* | *--* | *2.9* | *4.8* | *5.6* |
| *B-737 Max 8 (a)* | *0.2* | *0.8* | *0.6* | *1.8* | *2.5* | *2.7* |
| *B757-200/300* | *2.0* | *1.9* | *2.2* | *0.7* | *--* | *--* |
| *A220-100 (a,b)* | *--* | *--* | *0.5* | *2.0* | *0.6* | *0.5* |
| *A220-300 (a,b)* | *--* | *--* | *0.6* | *0.8* | *2.8* | *2.4* |
| *MD-80* | *0.2* | *--* | *--* | *--* | *--* | *--* |
| *MD-90* | *0.6* | *0.1* | *--* | *--* | *--* | *--* |
| *Subtotal-- narrowbody* | *81.9%* | *80.6%* | *83.5%* | *91.3%* | *89.1%* | *87.5%* |
| *Regional jets* | | | | | | |
| *CRJ-100/200* | *0.3%* | *0.7%* | *--%* | *--%* | *--%* | *--%* |
| *CRJ-700* | *1.3* | *1.6* | *0.4* | *--* | *--* | *--* |
| *CRJ-900* | *0.6* | *0.2* | *--* | *--* | *--* | *--* |
| *ERJ-175* | *10.6* | *12.2* | *10.2* | *1.7* | *1.1* | *1.9* |
| *Subtotal--regional jets* | *12.8%* | *14.7%* | *10.5%* | *1.7%* | *1.1%* | *1.9%* |
| *Turboprop* | | | | | | |
| *Q400* | *1.0%* | *0.4%* | *--%* | *--%* | *--%* | *--%* |
| *Widebody* | | | | | | |
| *A330-200* | *0.4%* | *0.4%* | *0.3%* | *0.3%* | *0.3%* | *0.3%* |
| *B767-200/300* | *0.3* | *0.1* | *--* | *--* | *--* | *--* |
| *B787-8* | *--* | *--* | *--* | *--* | *2.7* | *2.6* |
| *Subtotal--widebody* | *0.7%* | *0.4%* | *0.3%* | *0.3%* | *3.0%* | *2.8%* |
| ***Subtotal-- Domestic*** | ***96.4%*** | ***96.1%*** | ***94.4%*** | ***93.4%*** | ***93.2%*** | ***92.2%*** |

Table 5-2 (page 4 of 4)

**CONSTRAINED DEMAND SCENARIO OF PASSENGER AIRLINE AIRCRAFT OPERATIONS BY AIRCRAFT TYPE**

San Diego International Airport

| | Percent of total arrivals and departures | | | | | |
|---|---|---|---|---|---|---|
| | Historical | | Constrained Demand Scenario | | | |
| Aircraft type | 2017 | 2018 | 2023 | 2028 | 2033 | 2050 |
| *International* | | | | | | |
| *Narrowbody* | | | | | | |
| *A319* | *0.1%* | *--%* | *--%* | *--%* | *--%* | *--%* |
| *A320neo* | *0.0* | *--* | *--* | *--* | *--* | *--* |
| *A320* | *0.1* | *0.1* | *0.3* | *0.3* | *0.3* | *0.3* |
| *A321* | *0.3* | *0.3* | *0.3* | *0.3* | *0.3* | *0.3* |
| *B737-700* | *0.5* | *0.6* | *0.6* | *0.5* | *0.3* | *0.3* |
| *B737-800* | *0.3* | *0.4* | *1.0* | *1.3* | *1.2* | *1.1* |
| *B737-900* | *0.7* | *0.4* | *0.6* | *1.1* | *1.3* | *1.6* |
| *B-737 Max 7 (a)* | *--* | *--* | *--* | *--* | *0.3* | *0.3* |
| *B-737 Max 8 (a)* | *--* | *--* | *--* | *0.3* | *0.3* | *0.3* |
| *Subtotal-- narrowbody* | *2.0%* | *1.9%* | *2.9%* | *3.8%* | *3.9%* | *4.0%* |
| *Regional jets* | | | | | | |
| *CRJ-700* | *0.7%* | *0.1%* | *--%* | *--%* | *--%* | *--%* |
| *CRJ-900* | *--* | *0.9* | *0.9* | *0.3* | *--* | *--* |
| *ERJ-175* | *0.1* | *0.1* | *0.3* | *0.9* | *1.2* | *1.3* |
| *Subtotal--regional jets* | *0.7%* | *1.1%* | *1.2%* | *1.2%* | *1.2%* | *1.3%* |
| *Widebody* | | | | | | |
| *A340-300* | *--%* | *0.2%* | *--%* | *--%* | *--%* | *0.3%* |
| *B747-400* | *0.2* | *0.1* | *0.3* | *0.3* | *0.3* | *0.5* |
| *B767-200/300* | *0.1* | *--* | *--* | *--* | *--* | *--* |
| *B777* | *0.2* | *0.2* | *0.3* | *0.3* | *0.3* | *0.3* |
| *B787-8* | *0.4* | *0.4* | *0.6* | *0.6* | *0.6* | *0.5* |
| *B787-9* | *--* | *--* | *0.3* | *0.5* | *0.6* | *0.8* |
| *Subtotal-- widebody* | *0.9%* | *0.9%* | *1.5%* | *1.7%* | *1.7%* | *2.4%* |
| ***Subtotal-- International*** | ***3.6%*** | ***3.9%*** | ***5.6%*** | ***6.6%*** | ***6.8%*** | ***7.8%*** |
| ***Total--Passenger Airlines*** | ***100.0%*** | ***100.0%*** | ***100.0%*** | ***100.0%*** | ***100.0%*** | ***100.0%*** |

*Note: Totals may not add due to rounding. Forecasts for 2023, 2028, and 2033 were interpolated from AAD DDFSs for 2018, 2024, 2030, and 2035.*

*(a) Equipment type not included in Table 4-5 for the unconstrained forecast.*

*(b) The CS100 aircraft shown in Table 4-5 was rebranded as the A220-100 in 2018 reflecting Airbus' majority stake in Bombardier's C Series program.*

*Sources: Historical—San Diego County Regional Airport Authority records and OAG Aviation Worldwide Ltd, online database, accessed April 2019. The percent distribution of OAG scheduled operations by equipment type were applied to Authority data for 2017 and 2018. Forecast—LeighFisher, April 2019.*

## 6.0 COMPARISON WITH THE FAA 2018 TAF

Table 6-1 presents a comparison of the unconstrained aviation demand forecasts and the constrained demand scenario prepared for San Diego International Airport with the FAA 2018 TAF for the Airport. The constrained demand scenario is the "preferred" forecasts recommended for FAA approval and is compared for the components of total enplaned passengers, commercial aircraft operations, and total aircraft operations.

The format of Table 6-1 is based on the template provided by the FAA for the comparison of airport planning forecasts and the FAA TAF.* As required, the results are presented for the base year of 2018 and forecast horizons years, which are equal to the base year plus 1, 5, 10, and 15 years (2019, 2023, 2028, and 2033). The SDIA unconstrained forecasts and constrained aviation demand scenario have been compared graphically with the FAA 2018 TAF in the figures presented in Sections 4 and 5 of this report.

The key findings of the comparison of the SDIA updated unconstrained aviation demand forecasts and the constrained demand scenario with the FAA 2018 TAF are summarized below:

- The unconstrained forecast and constrained demand scenario for enplaned passengers at SDIA are higher than the 2018 TAF in 2023 and 2028, as shown in Table 6-1.
  - In 2023, the unconstrained forecast variance is 3.0%, compared with 2.5% for the constrained demand scenario
  - In 2028, the unconstrained forecast variance is 8.0%, compared with 7.8% for the constrained demand scenario

- The unconstrained forecast of commercial operations for SDIA is greater than the 2018 TAF in 2023 and 2028, while commercial operations in the constrained demand scenario are less than the TAF:
  - The unconstrained forecast variance is 5.3% in 2023, compared with -2.7% for the constrained demand scenario
  - The unconstrained forecast variance is 9.5% in 2028, compared with -5.8% for the constrained demand scenario

- The unconstrained forecast of total aircraft operations for SDIA is greater than the 2018 TAF in 2023 and 2028, while total operations in the constrained demand scenario are less than the TAF:
  - The unconstrained forecast variance is 4.9% in 2023, compared with -3.2% for the constrained demand scenario
  - The unconstrained forecast variance is 9.0% in 2028, compared with -6.5% for the constrained demand scenario

- Overall, both the SDIA updated unconstrained forecasts and the constrained demand scenario are similar to the FAA 2018 TAF for the Airport and "differ by less than 10 percent in the 5-year forecast period, and 15 percent in the 10-year forecast period," as stipulated in the FAA forecast guidance.

Tables 6-2 and 6-3 present summaries of the SDIA updated unconstrained forecasts and constrained demand scenario using a second template provided by the FAA.

*U.S. Department of Transportation, Federal Aviation Administration, *Forecasting Aviation Activity by Airport*, July 2001, and *Review and Approval of Aviation Forecasts*, June 2008, http://www.faa.gov.

Table 6-1

**FAA TAF FORECAST COMPARISON** *(2018 – 2033)*

San Diego International Airport

| | Year *(a)* | SDIA Unconstrained Forecast | Constrained Demand Scenario | FAA 2018 TAF | Percent variance from 2018 TAF: SDIA Unconstrained Forecast | Percent variance from 2018 TAF: Constrained Demand Scenario |
|---|---|---|---|---|---|---|
| **Passenger enplanements** | | | | | | |
| Base yr. | 2018 | 12,125,938 | 12,125,938 | 12,001,009 | 1.0% | 1.0% |
| Base yr. + 5yrs. | 2023 | 14,605,800 | 14,536,000 | 14,176,358 | 3.0% | 2.5% |
| Base yr. + 10yrs. | 2028 | 16,951,100 | 16,919,000 | 15,689,066 | 8.0% | 7.8% |
| Base yr. + 15yrs. | 2033 | 19,237,200 | 18,927,000 | 17,443,744 | 10.3% | 8.5% |
| **Commercial operations** *(b)* | | | | | | |
| Base yr. | 2018 | 213,963 | 213,963 | 210,982 | 1.4% | 1.4% |
| Base yr. + 5yrs. | 2023 | 258,290 | 238,850 | 245,371 | 5.3% | -2.7% |
| Base yr. + 10yrs. | 2028 | 296,150 | 254,760 | 270,516 | 9.5% | -5.8% |
| Base yr. + 15yrs. | 2033 | 332,440 | 268,790 | 299,649 | 10.9% | -10.3% |
| **Total operations** *(c)* | | | | | | |
| Base yr. | 2018 | 225,058 | 225,058 | 221,821 | 1.5% | 1.5% |
| Base yr. + 5yrs. | 2023 | 269,460 | 248,500 | 256,771 | 4.9% | -3.2% |
| Base yr. + 10yrs. | 2028 | 307,580 | 263,800 | 282,076 | 9.0% | -6.5% |
| Base yr. + 15yrs. | 2033 | 344,140 | 277,200 | 311,370 | 10.5% | -11.0% |

*(a)* The SDIA Unconstrained Forecast and Constrained Demand Scenario were prepared on a calendar year basis; the FAA 2018 TAF were prepared on a U.S. government fiscal year basis (October through September).

*(b)* Commercial operations include operations by passenger airlines, all-cargo airlines, and air taxi operators.

*(c)* Total operations include commercial operations plus operations by general aviation and military.

Sources: Base year 2018 (actual)—San Diego County Regional Airport Authority records.
SDIA Unconstrained Forecast—LeighFisher, November 2018.
SDIA Constrained Demand Scenario—LeighFisher, April 2019.
FAA 2018 TAF for SDIA—U.S. Department of Transportation, Federal Aviation Administration, www.faa.gov, accessed March 2019.

Table 6-2
**SUMMARY OF SDIA UNCONSTRAINED FORECAST USING FAA TEMPLATE**
San Diego International Airport

| | | Unconstrained Forecast | | | | Average annual compound growth rates | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Base year 2018 | Base year + 1 year 2019 | Base year + 5 years 2023 | Base year + 10 years 2028 | Base year + 15 years 2033 | Base year to +1 year 2018 - 2019 | Base year to +5 years 2018 - 2023 | Base year to +10 years 2018 - 2028 | Base year to +15 years 2018 - 2033 |
| **Passenger enplanements** | | | | | | | | | |
| Air carrier *(a)* | 11,272,706 | 11,767,500 | 13,531,100 | 15,657,300 | 17,716,900 | 4.7% | 3.8% | 3.4% | 3.1% |
| Commuter *(b)* | 853,232 | 905,700 | 1,074,700 | 1,293,800 | 1,520,300 | 5.5% | 4.6% | 4.2% | 3.9% |
| Total | 12,125,938 | 12,673,200 | 14,605,800 | 16,951,100 | 19,237,200 | 4.8% | 3.8% | 3.4% | 3.1% |
| **Aircraft operations** | | | | | | | | | |
| Itinerant | | | | | | | | | |
| Air carrier | 201,466 | 214,360 | 245,310 | 282,790 | 318,760 | 6.7% | 4.1% | 3.5% | 3.1% |
| Commuter/air taxi | 12,497 | 12,660 | 12,980 | 13,360 | 13,680 | 1.8% | 0.9% | 0.7% | 0.6% |
| Total commercial operations | 213,963 | 227,020 | 258,290 | 296,150 | 332,440 | 6.4% | 3.9% | 3.3% | 3.0% |
| General aviation | 10,337 | 10,260 | 10,470 | 10,730 | 11,000 | 0.5% | 0.5% | 0.5% | 0.5% |
| Military | 758 | 700 | 700 | 700 | 700 | 0.0% | 0.0% | 0.0% | 0.0% |
| Local | | | | | | | | | |
| General aviation | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Military | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total operations | 225,058 | 237,980 | 269,460 | 307,580 | 344,140 | 6.1% | 3.7% | 3.2% | 2.9% |
| **Cargo/mail (enplaned + deplaned tons)** | 192,351 | 201,480 | 228,470 | 259,790 | 288,790 | 4.4% | 3.4% | 3.0% | 2.7% |
| **Based Aircraft** | | | | | | | | | |
| Single-engine (nonjet) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Multiengine (nonjet) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Jet engine | 9 | 9 | 9 | 11 | 11 | -- | -- | -- | -- |
| Helicopter | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Other | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total | 9 | 9 | 9 | 11 | 11 | -- | -- | -- | -- |
| **Operational factors** | | | | | | | | | |
| Average aircraft size (seats) | | | | | | | | | |
| Air Carrier *(a)* | 161.4 | 161.6 | 162.1 | 162.7 | 163.2 | | | | |
| Commuter *(b)* | 74.1 | 74.3 | 74.9 | 75.6 | 76.4 | | | | |
| Average enplaning load factor | | | | | | | | | |
| Air Carrier *(a)* | 81.8% | 81.9% | 82.2% | 82.4% | 82.7% | | | | |
| Commuter *(b)* | 77.2% | 77.4% | 78.2% | 79.2% | 80.2% | | | | |
| GA operations per based aircraft | 1,149 | 1,140 | 1,163 | 975 | 1,000 | | | | |

Note: The SDIA Unconstrained Forecast was prepared on a calendar year basis; the FAA 2018 TAF were prepared on a U.S. government fiscal year basis (October through September).

*(a)* Includes mainline and charter airline activity as summarized in the previous tables in this report.

*(b)* Includes regional affiliate airline activity, which includes flights using regional aircraft with more than 60 seats.

Sources: Base year 2018 (actual)—San Diego County Regional Airport Authority records. SDIA Unconstrained Forecast—LeighFisher, November 2018. FAA 2018 TAF for SDIA—U.S. Department of Transportation, Federal Aviation Administration, www.faa.gov, accessed March 2019.

Table 6-3
**SUMMARY OF SDIA CONSTRAINED DEMAND SCENARIO USING FAA TEMPLATE**
San Diego International Airport

| | | Constrained Demand Scenario | | | | Average annual compound growth rates | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Base year 2018 | Base year + 1 year 2019 | Base year + 5 years 2023 | Base year + 10 years 2028 | Base year + 15 years 2033 | Base year to +1 year 2018 - 2019 | Base year to +5 years 2018 - 2023 | Base year to +10 years 2018 - 2028 | Base year to +15 years 2018 - 2033 |
| **Passenger enplanements** | | | | | | | | | |
| Air carrier *(a)* | 11,272,706 | 11,738,000 | 13,798,000 | 16,670,000 | 18,753,000 | 4.1% | 4.1% | 4.0% | 3.5% |
| Commuter *(b)* | 853,232 | 836,000 | 738,000 | 249,000 | 174,000 | -2.0% | 2.9% | 11.6% | 10.1% |
| Total | 12,125,938 | 12,574,000 | 14,536,000 | 16,919,000 | 18,927,000 | 3.7% | 3.7% | 3.4% | 3.0% |
| **Aircraft operations** | | | | | | | | | |
| Itinerant | | | | | | | | | |
| Air carrier | 201,466 | 206,870 | 232,240 | 250,110 | 264,070 | 2.7% | 2.9% | 2.2% | 1.8% |
| Commuter/air taxi | 12,497 | 12,880 | 6,610 | 4,650 | 4,720 | 3.1% | 12.0% | 9.4% | 6.3% |
| Total commercial operations | 213,963 | 219,750 | 238,850 | 254,760 | 268,790 | 2.7% | 2.2% | 1.8% | 1.5% |
| General aviation | 10,337 | 9,270 | 9,020 | 8,390 | 7,750 | 10.3% | 2.7% | 2.1% | 1.9% |
| Military | 758 | 580 | 630 | 650 | 660 | 23.5% | 3.6% | 1.5% | 0.9% |
| Local | | | | | | | | | |
| General aviation | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Military | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total operations | 225,058 | 229,600 | 248,500 | 263,800 | 277,200 | 2.0% | 2.0% | 1.6% | 1.4% |
| **Cargo/mail (enplaned + deplaned tons)** | 192,351 | 201,480 | 228,470 | 259,790 | 288,790 | 4.7% | 3.5% | 3.1% | 2.7% |
| **Based Aircraft** | | | | | | | | | |
| Single-engine (nonjet) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Multiengine (nonjet) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Jet engine | 9 | 9 | 9 | 11 | 11 | -- | -- | -- | -- |
| Helicopter | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Other | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Total | 9 | 9 | 9 | 11 | 11 | -- | -- | -- | -- |
| **Operational factors** | | | | | | | | | |
| Average aircraft size (seats) | | | | | | | | | |
| Air Carrier *(a)* | 161.4 | 161.6 | 162.1 | 162.7 | 163.2 | | | | |
| Commuter *(b)* | 74.1 | 74.3 | 74.9 | 75.6 | 76.4 | | | | |
| Average enplaning load factor | | | | | | | | | |
| Air Carrier *(a)* | 81.8% | 81.9% | 82.2% | 82.4% | 82.7% | | | | |
| Commuter *(b)* | 77.2% | 77.4% | 78.2% | 79.2% | 80.2% | | | | |
| GA operations per based aircraft | 1,149 | 1,030 | 1,002 | 763 | 705 | | | | |

Note: The SDIA Constrained Demand Scenario was prepared on a calendar year basis; the FAA 2018 TAF were prepared on a U.S. government fiscal year basis (October through September).

*(a)* Includes mainline and charter airline activity as summarized in the previous tables in this report.

*(b)* Includes regional affiliate airline activity, which includes flights using regional aircraft with more than 60 seats.

Sources: Base year 2018 (actual)—San Diego County Regional Airport Authority records. SDIA Constrained Demand Scenario—LeighFisher, April 2019. FAA 2018 TAF for SDIA—U.S. Department of Transportation, Federal Aviation Administration, www.faa.gov, accessed March 2019.

# Appendix A

## UPDATED REGRESSION ANALYSIS

Regression analysis compares the historical relationship between a dependent variable, in this case, enplaned passengers, and an independent or "predictor" variable. The predictor variable is eventually used to project future levels of the dependent variable. In aviation demand forecasts, the predictor variable is typically represented by an economic or demographic metric such as population, employment, or personal income. Regression analyses produce a mathematical equation that identifies the strength or reliability of the historical correlation between the dependent variable (enplaned passengers) and predictor variables. The statistical reliability of this equation is typically measured by a regression statistic known as "R-squared." An R-squared of 1.0 would represent a perfect historical correlation between the dependent and predictor variable and suggest that the measurement of this historical relationship will be a reliable predictor of future results.

Table A-1 presents the key statistics for the updated domestic O&D passenger regression model based on data for 1990 through 2017.

Table A-1
**UPDATED REGRESSION MODEL FOR THE UNCONSTRAINED FORECAST**
San Diego International Airport

| | Coefficient | t-statistic | P-value |
|---|---|---|---|
| **Domestic originating passengers** | | | |
| Dependent variable = ln(SDIA domestic originating passengers) | | | |
| Independent variables | | | |
| ln(San Diego County per capita personal income, 2016 dollars) | 0.93 | 12.03 | 0.0000 |
| ln(SDIA domestic airfares, 2016 dollars) | -0.54 | -4.81 | 0.0001 |
| Dummy variable (2001-2005 downturn) | -0.08 | -4.16 | 0.0004 |
| Dummy variable (2015-2017 service expansion) | 0.07 | 2.62 | 0.0155 |
| Constant | 8.60 | 6.72 | 0.0000 |
| Observations | 27 | | |
| Adjusted R-squared | 0.96 | | |

Source: LeighFisher, November 2018.

# Appendix B

# ALTERNATIVE FORECAST SCENARIOS

This appendix summarizes alternative forecasts of enplaned passengers, air cargo, and total aircraft operations for SDIA. In addition to the unconstrained forecasts of aviation activity presented in Section 4 (referred to in this Appendix as "baseline"), "Updated Aviation Activity Forecasts", two alternative scenarios are prepared for planning purposes and to use as tools to manage uncertainty and anticipate the facility requirements associated with alternative levels of aviation activity compared with the baseline forecast.

## Scenario Assumptions

Two alternative forecast scenarios were developed based on the analysis of passenger and cargo activity presented in Section 4.

- The High Forecast Scenario is a fast growth scenario reflecting faster regional economic growth than the baseline forecasts, as measured by San Diego County per capita personal income, and continued gradual decreases in domestic airfares.

- The Low Scenario Forecast is a slow growth scenario reflecting slower regional economic growth than the baseline forecasts, as measured by San Diego County per capita personal income, and gradual increases in domestic airfares.

All other assumptions used in the alternative forecast scenarios are unchanged from the baseline forecast, including average load factors, average seats per departure, and cargo carried per operation.

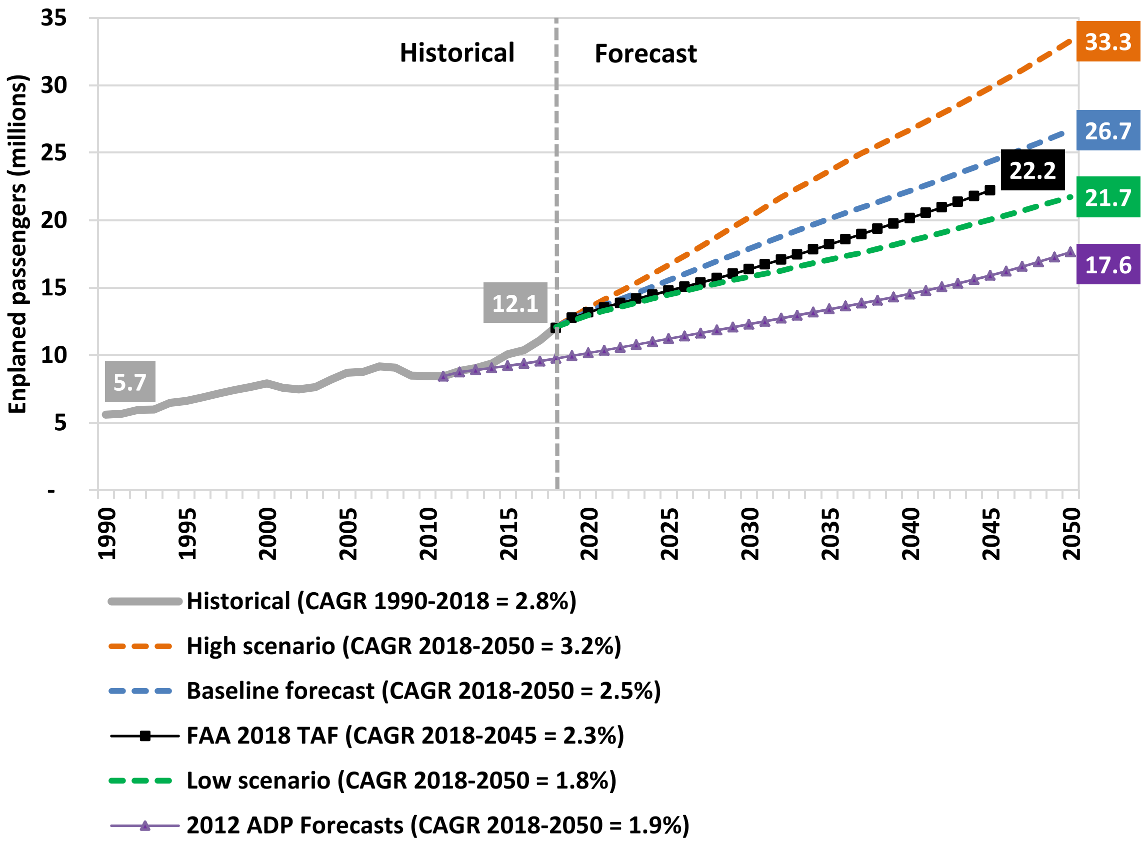
## Enplaned Passengers

Figure B-1 presents a comparison of the baseline forecast of enplaned passengers with the alternative forecast scenarios, the FAA 2018 TAF, and the 2012 ADP forecasts. Table B-1 (at the end of this section) presents the detailed alternative scenario forecasts of enplaned passengers.

- In the High Forecast Scenario, the number of passengers at the Airport is forecast to increase from 12.1 million passengers in 2018 to 33.3 million in 2050, an average increase of 3.2% per year. The number of domestic passengers at the Airport is forecast to increase an average of 2.8% per year between 2018 and 2050, compared with an average increase of 7.5% per year in international passenger traffic.

- In the Low Forecast Scenario, the number of passengers at the Airport is forecast to increase from 12.1 million passengers in 2018 to 21.7 million in 2050, an average increase of 1.8% per year. The number of domestic passengers at the Airport is forecast to increase an average of 1.7% per year between 2018 and 2050, compared with an average increase of 3.5% per year in international passenger traffic.

Figure B-1
**HISTORICAL AND FORECAST ENPLANED PASSENGERS**
San Diego International Airport




CAGR = Compound annual growth rate

Note: The forecasts presented in this figure were prepared using the information and assumptions given in the accompanying text. Inevitably, some of the assumptions used to develop the forecasts will not be realized and unanticipated events and circumstances may occur. Therefore, there are likely to be differences between the forecast and actual results, and those differences may be material.

Sources: *Historical*—San Diego County Regional Airport Authority records. *Forecast*—LeighFisher, November 2018.

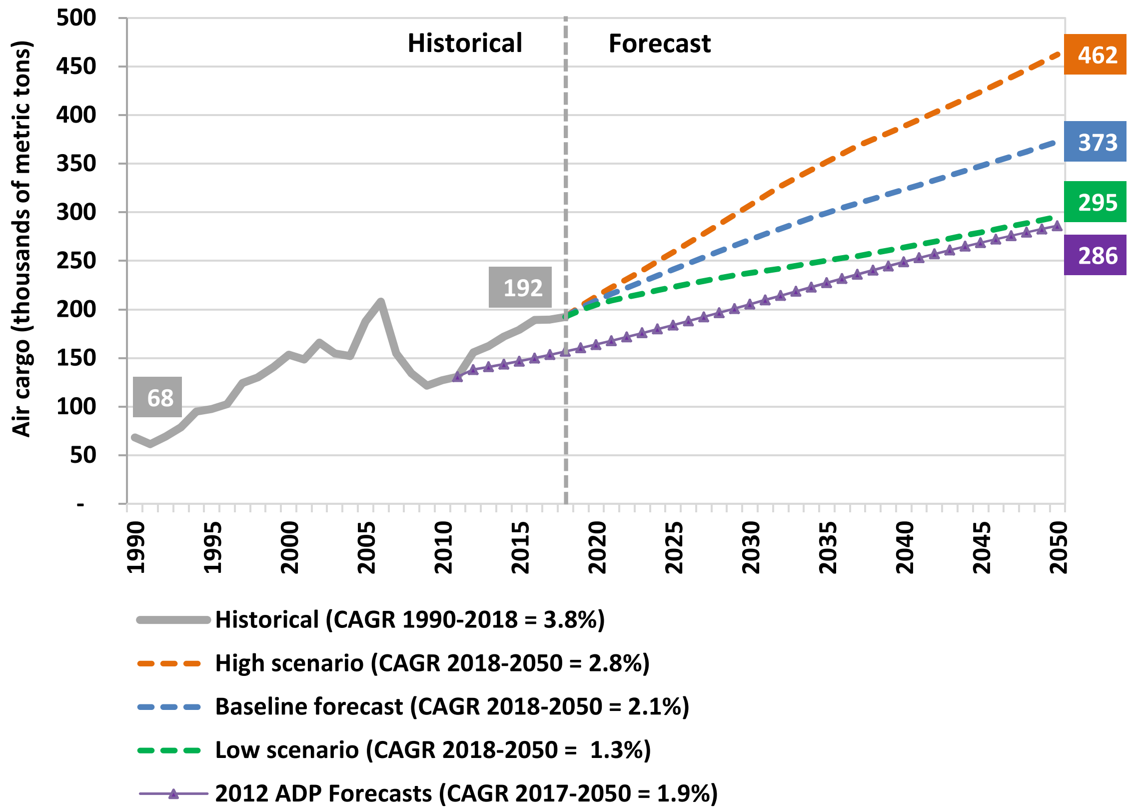
## Air Cargo

Figure B-2 presents a comparison of the baseline forecast of total air cargo with the alternative forecast scenarios and the 2012 ADP forecasts. (The FAA does not prepare air cargo forecasts.) Table B-2 (at the end of this section) presents the detailed alternative scenario forecasts of total air cargo.

- In the High Forecast Scenario, total air cargo at the Airport is forecast to increase from 192,351 metric tons in 2018 to 462,480 metric tons in 2050, an average increase of 2.8% per year. Air freight and air mail at the Airport are forecast to increase an average of 2.8% per year between 2018 and 2050.

- In the Low Forecast Scenario, total air cargo at the Airport is forecast to increase from 192,351 metric tons in 2018 to 295,250 metric tons in 2050, an average increase of 1.3% per year. Air freight and air mail at the Airport is forecast to increase an average of 1.3% per year between 2018 and 2050,

Figure B-2
**HISTORICAL AND FORECAST AIR CARGO**
San Diego International Airport




CAGR = Compound annual growth rate

Note: The forecasts presented in this figure were prepared using the information and assumptions given in the accompanying text. Inevitably, some of the assumptions used to develop the forecasts will not be realized and unanticipated events and circumstances may occur. Therefore, there are likely to be differences between the forecast and actual results, and those differences may be material.

Sources: *Historical*—San Diego County Regional Airport Authority records. *Forecast*—LeighFisher, November 2018.

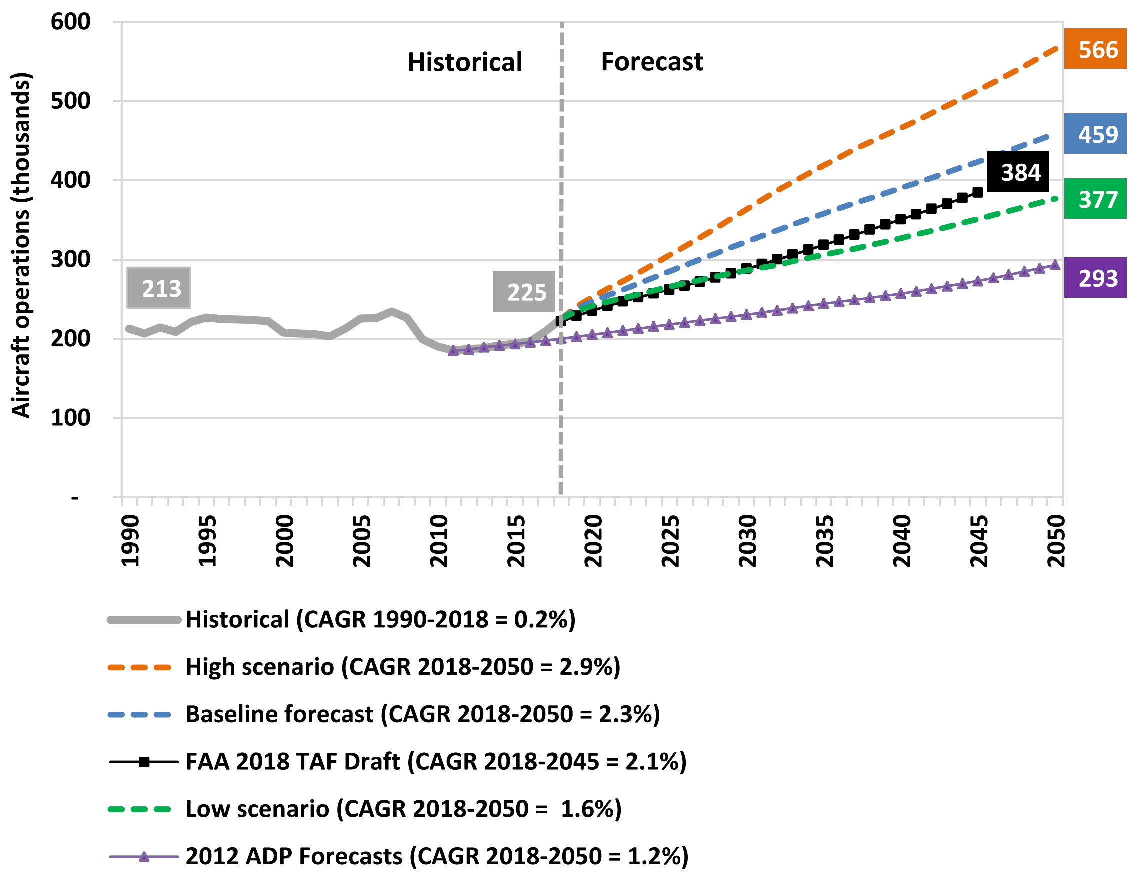
## Total Aircraft Operations

Figure B-3 presents a comparison of the baseline forecast of total aircraft operations with the alternative forecast scenarios, the FAA 2018 TAF, and the 2012 ADP forecasts. Table B-3 (at the end of this section) presents the detailed alternative scenario forecasts of total aircraft operations.

- In the High Forecast Scenario, total aircraft operations at the Airport are forecast to increase from 225,058 in 2018 to 565,820 in 2050, an average increase of 2.9% per year. Commercial aircraft operations at the Airport are forecast to increase an average of 3.0% per year between 2018 and 2050, while general aviation are forecast to increase an average of 1.0% per year and military operations are forecast to remain relatively unchanged.

- In the Low Forecast Scenario, total aircraft operations at the Airport are forecast to increase from 225,058 in 2018 to 376,680 in 2050, an average increase of 1.6% per year. Commercial aircraft operations at the Airport are forecast to increase an average of 1.7% per year between 2018 and 2050, while general aviation and military operations are forecast to remain relatively unchanged.

Figure B-3
**HISTORICAL AND FORECAST AIRCRAFT OPERATIONS**
San Diego International Airport




CAGR = Compound annual growth rate
Note: The forecasts presented in this figure were prepared using the information and assumptions given in the accompanying text. Inevitably, some of the assumptions used to develop the forecasts will not be realized and unanticipated events and circumstances may occur. Therefore, there are likely to be differences between the forecast and actual results, and those differences may be material.

Sources: *Historical*—San Diego County Regional Airport Authority records. *Forecast*—LeighFisher, November 2018.

Table B-1

**ENPLANED PASSENGER FORECASTS—ALTERNATIVE SCENARIOS**

San Diego International Airport

| | Historical | | High Forecast Scenario | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2017 | 2018 | 2023 | 2028 | 2033 | 2038 | 2043 | 2050 |
| Domestic | | | | | | | | |
| Mainline airline | 4,752,261 | 5,244,306 | 6,563,400 | 7,901,200 | 9,239,800 | 10,301,700 | 11,169,200 | 12,388,400 |
| Regional airline | 712,939 | 853,232 | 1,127,100 | 1,423,500 | 1,746,900 | 2,044,800 | 2,328,200 | 2,765,800 |
| Low cost carrier | 5,208,403 | 5,515,739 | 6,863,500 | 8,262,500 | 9,662,300 | 10,772,700 | 11,679,900 | 12,954,900 |
| Domestic total | 10,673,603 | 11,613,277 | 14,554,000 | 17,587,200 | 20,649,000 | 23,119,200 | 25,177,300 | 28,109,100 |
| International | 433,475 | 512,661 | 804,700 | 1,179,300 | 1,703,400 | 2,414,800 | 3,360,100 | 5,170,300 |
| Total Airport | 11,107,078 | 12,125,938 | 15,358,700 | 18,766,500 | 22,352,400 | 25,534,000 | 28,537,400 | 33,279,400 |
| O&D and connecting enplaned passengers | | | | | | | | |
| O&D | 10,462,985 | 11,422,762 | 14,468,000 | 17,678,300 | 21,056,100 | 24,053,400 | 26,882,600 | 31,349,500 |
| Connecting | 644,093 | 703,176 | 890,700 | 1,088,200 | 1,296,300 | 1,480,600 | 1,654,800 | 1,929,900 |
| Total Airport | 11,107,078 | 12,125,938 | 15,358,700 | 18,766,500 | 22,352,400 | 25,534,000 | 28,537,400 | 33,279,400 |
| Percent of total Airport | | | | | | | | |
| O&D | 94.2% | 94.2% | 94.2% | 94.2% | 94.2% | 94.2% | 94.2% | 94.2% |
| Connecting | 5.8% | 5.8% | 5.8% | 5.8% | 5.8% | 5.8% | 5.8% | 5.8% |

| | Percent change | Compound annual percent increase (decrease) | | | | | |
|---|---|---|---|---|---|---|---|
| | 2017-2018 | 2018-2023 | 2023-2028 | 2028-2033 | 2033-2038 | 2038-2043 | 2043-2050 |
| Domestic | | | | | | | |
| Mainline airline | 10.4% | 5.8% | 3.8% | 3.2% | 2.2% | 1.6% | 1.5% |
| Regional airline | 19.7% | 7.2% | 4.8 | 4.2 | 3.2 | 2.6 | 2.5 |
| Low cost carrier | 5.9% | 5.6% | 3.8 | 3.2 | 2.2 | 1.6 | 1.5 |
| Domestic total | 8.8% | 5.8% | 3.9 | 3.3 | 2.3 | 1.7 | 1.6 |
| International | 18.3% | 11.9% | 7.9 | 7.6 | 7.2 | 6.8 | 6.4 |
| Total Airport | 9.2% | 6.1% | 4.1 | 3.6 | 2.7 | 2.2 | 2.2 |

Note: The forecasts presented in this table were prepared using the information and assumptions given in the accompanying text. Inevitably, some of the assumptions used to develop the forecasts will not be realized and unanticipated events and circumstances may occur. Therefore, there are likely to be differences between the forecast and actual results, and those differences may be material.

Sources: *Historical*—San Diego County Regional Airport Authority records. *Forecast*—LeighFisher, November 2018.

Table B-1 (page 2 of 2)
**ENPLANED PASSENGER FORECASTS—ALTERNATIVE SCENARIOS**
San Diego International Airport

| | Historical | | Low Forecast Scenario | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2017 | 2018 | 2023 | 2028 | 2033 | 2038 | 2043 | 2050 |
| Domestic | | | | | | | | |
| Mainline airline | 4,752,261 | 5,244,306 | 5,959,400 | 6,509,000 | 6,970,700 | 7,457,700 | 8,022,100 | 8,896,600 |
| Regional airline | 712,939 | 853,232 | 1,024,300 | 1,174,800 | 1,321,400 | 1,484,900 | 1,677,600 | 1,992,600 |
| Low cost carrier | 5,208,403 | 5,515,739 | 6,231,900 | 6,806,600 | 7,289,400 | 7,798,700 | 8,388,900 | 9,303,400 |
| Domestic total | 10,673,603 | 11,613,277 | 13,215,600 | 14,490,400 | 15,581,500 | 16,741,300 | 18,088,600 | 20,192,600 |
| International | 433,475 | 512,661 | 668,100 | 810,800 | 969,000 | 1,135,900 | 1,306,000 | 1,536,600 |
| Total Airport | 11,107,078 | 12,125,938 | 13,883,700 | 15,301,200 | 16,550,500 | 17,877,200 | 19,394,600 | 21,729,200 |
| O&D and connecting enplaned passengers | | | | | | | | |
| O&D | 10,462,985 | 11,422,762 | 13,078,700 | 14,413,900 | 15,590,800 | 16,840,600 | 18,270,000 | 20,469,100 |
| Connecting | 644,093 | 703,176 | 805,000 | 887,300 | 959,700 | 1,036,600 | 1,124,600 | 1,260,100 |
| Total Airport | 11,107,078 | 12,125,938 | 13,883,700 | 15,301,200 | 16,550,500 | 17,877,200 | 19,394,600 | 21,729,200 |
| Percent of total Airport | | | | | | | | |
| O&D | 94.2% | 94.2% | 94.2% | 94.2% | 94.2% | 94.2% | 94.2% | 94.2% |
| Connecting | 5.8% | 5.8% | 5.8% | 5.8% | 5.8% | 5.8% | 5.8% | 5.8% |

| | Percent change | Compound annual percent increase (decrease) | | | | | |
|---|---|---|---|---|---|---|---|
| | 2017-2018 | 2018-2023 | 2023-2028 | 2028-2033 | 2033-2038 | 2038-2043 | 2043-2050 |
| Domestic | | | | | | | |
| Mainline airline | 10.4% | 3.2% | 1.8% | 1.4% | 1.4% | 1.5% | 1.5% |
| Regional airline | 19.7% | 4.7% | 2.8 | 2.4 | 2.4 | 2.5 | 2.5 |
| Low cost carrier | 5.9% | 3.1% | 1.8 | 1.4 | 1.4 | 1.5 | 1.5 |
| Domestic total | 8.8% | 3.3% | 1.9 | 1.5 | 1.4 | 1.6 | 1.6 |
| International | 18.3% | 6.8% | 3.9 | 3.6 | 3.2 | 2.8 | 2.4 |
| Total Airport | 9.2% | 3.4% | 2.0 | 1.6 | 1.6 | 1.6 | 1.6 |

Note: The forecasts presented in this table were prepared using the information and assumptions given in the accompanying text. Inevitably, some of the assumptions used to develop the forecasts will not be realized and unanticipated events and circumstances may occur. Therefore, there are likely to be differences between the forecast and actual results, and those differences may be material.

Sources: *Historical*—San Diego County Regional Airport Authority records. *Forecast*—LeighFisher, November 2018.

Table B-2
**AIR CARGO FORECASTS—ALTERNATIVE SCENARIOS**
San Diego International Airport
In metric tons

| | Historical | | High Forecast Scenario | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2017 | 2018 | 2023 | 2028 | 2033 | 2038 | 2043 | 2050 |
| Total air cargo | | | | | | | | |
| Air freight | | | | | | | | |
| Enplaned | 75,097 | 72,960 | 90,450 | 108,230 | 126,170 | 140,940 | 153,890 | 173,570 |
| Deplaned | 91,038 | 94,826 | 118,850 | 142,270 | 165,920 | 185,440 | 202,640 | 228,820 |
| Air freight total | 166,135 | 167,786 | 209,300 | 250,500 | 292,090 | 326,380 | 356,530 | 402,390 |
| Mail | | | | | | | | |
| Enplaned | 17,691 | 17,987 | 22,440 | 26,890 | 31,410 | 35,190 | 38,570 | 43,760 |
| Deplaned | 5,741 | 6,578 | 8,480 | 10,160 | 11,840 | 13,240 | 14,470 | 16,330 |
| Mail total | 23,432 | 24,566 | 30,920 | 37,050 | 43,250 | 48,430 | 53,040 | 60,090 |
| Total air cargo | | | | | | | | |
| Enplaned | 92,788 | 90,947 | 112,890 | 135,120 | 157,580 | 176,130 | 192,460 | 217,330 |
| Deplaned | 96,779 | 101,404 | 127,330 | 152,430 | 177,760 | 198,680 | 217,110 | 245,150 |
| Total air cargo | 189,567 | 192,351 | 240,220 | 287,550 | 335,340 | 374,810 | 409,570 | 462,480 |
| Percent of total | | | | | | | | |
| Enplaned | 48.9% | 47.3% | 47.0% | 47.0% | 47.0% | 47.0% | 47.0% | 47.0% |
| Deplaned | 51.1% | 52.7% | 53.0% | 53.0% | 53.0% | 53.0% | 53.0% | 53.0% |
| Enplaned air freight | | | | | | | | |
| Domestic | | | | | | | | |
| Cargo airline | 67,240 | 64,446 | 79,630 | 94,380 | 108,690 | 119,330 | 127,420 | 138,380 |
| Passenger airline | 5,738 | 5,763 | 6,790 | 8,050 | 9,270 | 10,180 | 10,870 | 11,810 |
| Domestic total | 72,979 | 70,209 | 86,420 | 102,430 | 117,960 | 129,510 | 138,290 | 150,190 |
| International | 2,118 | 2,751 | 4,030 | 5,790 | 8,210 | 11,430 | 15,600 | 23,380 |
| Air freight total | 75,097 | 72,960 | 90,450 | 108,220 | 126,170 | 140,940 | 153,890 | 173,570 |
| Enplaned mail | | | | | | | | |
| Cargo airline | 15,115 | 15,027 | 18,690 | 22,400 | 26,170 | 29,320 | 32,130 | 36,450 |
| Passenger airline | 2,575 | 2,961 | 3,750 | 4,490 | 5,250 | 5,880 | 6,440 | 7,310 |
| Mail total | 17,691 | 17,987 | 22,440 | 26,890 | 31,420 | 35,200 | 38,570 | 43,760 |
| Total enplaned air cargo | 92,788 | 90,947 | 112,890 | 135,110 | 157,590 | 176,140 | 192,460 | 217,330 |

Table B-2 (page 2 of 4)

**AIR CARGO FORECASTS—ALTERNATIVE SCENARIOS**

San Diego International Airport

In metric tons

| | Percent increase (decrease) | High Forecast Scenario | | | | | |
|---|---|---|---|---|---|---|---|
| | | Compound annual percent increase (decrease) | | | | | |
| | 2017-2018 | 2018-2023 | 2023-2028 | 2028-2033 | 2033-2038 | 2038-2043 | 2043-2050 |
| Total air cargo (enplaned and deplaned) | | | | | | | |
| Air freight | 1.0% | 5.7% | 3.7% | 3.1% | 2.2% | 1.8% | 1.7% |
| Mail | 4.% | 5.9% | 3.7 | 3.1 | 2.3 | 1.8 | 1.8 |
| Total | 1.% | 5.7% | 3.7 | 3.1 | 2.3 | 1.8 | 1.8 |
| Enplaned air freight | | | | | | | |
| Domestic | (3.8) | 5.3% | 3.5 | 2.9 | 1.9 | 1.3 | 1.2 |
| International | 29.9 | 10.0% | 7.5 | 7.2 | 6.8 | 6.4 | 6.0 |

Note: The forecasts presented in this table were prepared using the information and assumptions given in the accompanying text. Inevitably, some of the assumptions used to develop the forecasts will not be realized and unanticipated events and circumstances may occur. Therefore, there are likely to be differences between the forecast and actual results, and those differences may be material.

Sources: *Historical*—San Diego County Regional Airport Authority records. *Forecast*—LeighFisher, November 2018.

Table B-2 (page 3 of 4)

**AIR CARGO FORECASTS—ALTERNATIVE SCENARIOS**

San Diego International Airport

In metric tons

| | Historical | | Low Forecast Scenario | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2017 | 2018 | 2023 | 2028 | 2033 | 2038 | 2043 | 2050 |
| Total air cargo | | | | | | | | |
| Air freight | | | | | | | | |
| Enplaned | 75,097 | 72,960 | 81,390 | 87,450 | 92,210 | 97,090 | 102,710 | 111,100 |
| Deplaned | 91,038 | 94,826 | 106,930 | 114,920 | 121,180 | 127,630 | 135,020 | 146,080 |
| Air freight total | 166,135 | 167,786 | 188,320 | 202,370 | 213,390 | 224,720 | 237,730 | 257,180 |
| Mail | | | | | | | | |
| Enplaned | 17,691 | 17,987 | 20,170 | 21,690 | 22,890 | 24,130 | 25,540 | 27,640 |
| Deplaned | 5,741 | 6,578 | 7,630 | 8,200 | 8,650 | 9,110 | 9,640 | 10,430 |
| Mail total | 23,432 | 24,566 | 27,800 | 29,890 | 31,540 | 33,240 | 35,180 | 38,070 |
| Total air cargo | | | | | | | | |
| Enplaned | 92,788 | 90,947 | 101,560 | 109,140 | 115,100 | 121,220 | 128,250 | 138,740 |
| Deplaned | 96,779 | 101,404 | 114,560 | 123,120 | 129,830 | 136,740 | 144,660 | 156,510 |
| Total air cargo | 189,567 | 192,351 | 216,120 | 232,260 | 244,930 | 257,960 | 272,910 | 295,250 |
| Percent of total | | | | | | | | |
| Enplaned | 48.9% | 47.3% | 47.0% | 47.0% | 47.0% | 47.0% | 47.0% | 47.0% |
| Deplaned | 51.1% | 52.7% | 53.0% | 53.0% | 53.0% | 53.0% | 53.0% | 53.0% |
| Enplaned air freight | | | | | | | | |
| Domestic | | | | | | | | |
| Cargo airline | 67,240 | 64,446 | 71,930 | 76,950 | 80,720 | 84,610 | 89,200 | 96,190 |
| Passenger airline | 5,738 | 5,763 | 6,140 | 6,570 | 6,890 | 7,220 | 7,610 | 8,210 |
| Domestic total | 72,979 | 70,209 | 78,070 | 83,520 | 87,610 | 91,830 | 96,810 | 104,400 |
| International | 2,118 | 2,751 | 3,320 | 3,940 | 4,590 | 5,260 | 5,900 | 6,710 |
| Air freight total | 75,097 | 72,960 | 81,390 | 87,460 | 92,200 | 97,090 | 102,710 | 111,110 |
| Enplaned mail | | | | | | | | |
| Cargo airline | 15,115 | 15,027 | 16,800 | 18,070 | 19,070 | 20,100 | 21,270 | 23,020 |
| Passenger airline | 2,575 | 2,961 | 3,370 | 3,620 | 3,820 | 4,030 | 4,260 | 4,620 |
| Mail total | 17,691 | 17,987 | 20,170 | 21,690 | 22,890 | 24,130 | 25,530 | 27,640 |
| Total enplaned air cargo | 92,788 | 90,947 | 101,560 | 109,150 | 115,090 | 121,220 | 128,240 | 138,750 |

Table B-2 (page 4 of 4)

**AIR CARGO FORECASTS—ALTERNATIVE SCENARIOS**

San Diego International Airport

In metric tons

| | Percent increase (decrease) | Low Forecast Scenario | | | | | |
|---|---|---|---|---|---|---|---|
| | | Compound annual percent increase (decrease) | | | | | |
| | 2017-2018 | 2018-2023 | 2023-2028 | 2028-2033 | 2033-2038 | 2038-2043 | 2043-2050 |
| Total air cargo (enplaned and deplaned) | | | | | | | |
| Air freight | 1.0% | 2.9% | 1.4% | 1.1% | 1.0% | 1.1% | 1.1% |
| Mail | 4.8 | 3.1% | 1.5 | 1.1 | 1.1 | 1.1 | 1.1 |
| Total | 1.5 | 3.0% | 1.5 | 1.1 | 1.0 | 1.1 | 1.1 |
| Enplaned air freight | | | | | | | |
| Domestic | (3.8) | 2.7% | 1.4 | 1.0 | 0.9 | 1.1 | 1.1 |
| International | 29.9 | 4.8% | 3.5 | 3.1 | 2.8 | 2.3 | 1.9 |

Note: The forecasts presented in this table were prepared using the information and assumptions given in the accompanying text. Inevitably, some of the assumptions used to develop the forecasts will not be realized and unanticipated events and circumstances may occur. Therefore, there are likely to be differences between the forecast and actual results, and those differences may be material.

Sources: *Historical*—San Diego County Regional Airport Authority records. *Forecast*—LeighFisher, November 2018.

Table B-3
## AIRCRAFT OPERATIONS FORECASTS—ALTERNATIVE SCENARIOS
San Diego International Airport

| | Historical | | High Forecast Scenario | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2017 | 2018 | 2023 | 2028 | 2033 | 2038 | 2043 | 2050 |
| Air Carrier | | | | | | | | |
| Passenger airlines | 182,712 | 197,244 | 252,180 | 306,270 | 362,450 | 411,160 | 456,030 | 525,640 |
| Cargo airlines | 4,082 | 3,850 | 4,870 | 5,750 | 6,590 | 7,200 | 7,650 | 8,290 |
| Other | 1,787 | 372 | 800 | 800 | 810 | 810 | 820 | 820 |
| Air Carrier total | 188,581 | 201,466 | 257,850 | 312,820 | 369,850 | 419,170 | 464,500 | 534,750 |
| Air Taxi | | | | | | | | |
| Cargo airlines | 2,716 | 2,530 | 3,130 | 3,700 | 4,240 | 4,630 | 4,920 | 5,330 |
| Other | 7,946 | 9,967 | 11,000 | 11,000 | 11,000 | 11,000 | 11,000 | 11,000 |
| Air Taxi total | 10,662 | 12,497 | 14,130 | 14,700 | 15,240 | 15,630 | 15,920 | 16,330 |
| General Aviation | | | | | | | | |
| Itinerant | 9,613 | 10,337 | 10,730 | 11,280 | 11,850 | 12,460 | 13,090 | 14,040 |
| Local | | | | | | | | |
| General Aviation total | 9,613 | 10,337 | 10,730 | 11,280 | 11,850 | 12,460 | 13,090 | 14,040 |
| Military | -- 707 | -- 758 | -- 700 | -- 700 | -- 700 | -- 700 | -- 700 | -- 700 |
| Total Airport | 209,563 | 225,058 | 283,410 | 339,500 | 397,640 | 447,960 | 494,210 | 565,820 |

| | Percent increase (decrease) | High Forecast Scenario: Compound annual percent increase (decrease) | | | | | |
|---|---|---|---|---|---|---|---|
| | 2017-2018 | 2018-2023 | 2023-2028 | 2028-2033 | 2033-2038 | 2038-2043 | 2043-2050 |
| Air Carrier | | | | | | | |
| Passenger airlines | 8.1% | 6.3% | 4.0% | 3.4% | 2.6% | 2.1% | 2.1% |
| Cargo airlines | (5.7) | 6.1 | 3.4 | 2.8 | 1.8 | 1.2 | 1.2 |
| Other | (82.1) | 21.1 | 0.0 | 0.2 | 0.0 | 0.2 | 0.0 |
| Air Carrier total | 6.8 | 6.4 | 3.9 | 3.4 | 2.5 | 2.1 | 2.0 |
| Air Taxi | | | | | | | |
| Cargo airlines | (6.8) | 5.5 | 3.4 | 2.8 | 1.8 | 1.2 | 1.2 |
| Other | 25.4 | 2.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Air Taxi total | 17.2 | 3.1 | 0.8 | 0.7 | 0.5 | 0.4 | 0.4 |
| General Aviation | 7.5 | 0.9 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| Military | 7.2 | (2.0) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Airport | 7.4 | 5.9 | 3.7 | 3.2 | 2.4 | 2.0 | 2.0 |

Note: The forecasts presented in this table were prepared using the information and assumptions given in the accompanying text. Inevitably, some of the assumptions used to develop the forecasts will not be realized and unanticipated events and circumstances may occur. Therefore, there are likely to be differences between the forecast and actual results, and those differences may be material.

Sources: *Historical*—San Diego County Regional Airport Authority records. *Forecast*—LeighFisher, November 2018.

Table B-3 (page 2 of 2)

**AIRCRAFT OPERATIONS FORECASTS—ALTERNATIVE SCENARIOS**

San Diego International Airport

| | Historical | | Low Forecast Scenario | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2017 | 2018 | 2023 | 2028 | 2033 | 2038 | 2043 | 2050 |
| Air Carrier | | | | | | | | |
| Passenger airlines | 182,712 | 197,244 | 228,060 | 249,960 | 268,850 | 288,790 | 311,590 | 346,480 |
| Cargo airlines | 4,082 | 3,850 | 4,400 | 4,690 | 4,890 | 5,110 | 5,360 | 5,760 |
| Other | 1,787 | 372 | 800 | 800 | 810 | 810 | 820 | 820 |
| Air Carrier total | 188,581 | 201,466 | 233,260 | 255,450 | 274,550 | 294,710 | 317,770 | 353,060 |
| Air Taxi | | | | | | | | |
| Cargo airlines | 2,716 | 2,530 | 2,830 | 3,010 | 3,150 | 3,290 | 3,450 | 3,710 |
| Other | 7,946 | 9,967 | 9,000 | 9,000 | 9,000 | 9,000 | 9,000 | 9,000 |
| Air Taxi total | 10,662 | 12,497 | 11,830 | 12,010 | 12,150 | 12,290 | 12,450 | 12,710 |
| General Aviation | | | | | | | | |
| Itinerant | 9,613 | 10,337 | 10,210 | 10,210 | 10,210 | 10,210 | 10,210 | 10,210 |
| Local | | | | | | | | |
| General Aviation total | 9,613 | 10,337 | 10,210 | 10,210 | 10,210 | 10,210 | 10,210 | 10,210 |
| Military | 707 | 758 | 700 | 700 | 700 | 700 | 700 | 700 |
| Total Airport | 209,563 | 225,058 | 256,000 | 278,370 | 297,610 | 317,910 | 341,130 | 376,680 |

| | Percent increase (decrease) | Low Forecast Scenario — Compound annual percent increase (decrease) | | | | | |
|---|---|---|---|---|---|---|---|
| | 2017-2018 | 2018-2023 | 2023-2028 | 2028-2033 | 2033-2038 | 2038-2043 | 2043-2050 |
| Air Carrier | | | | | | | |
| Passenger airlines | 8.1% | 3.7% | 1.9% | 1.5% | 1.4% | 1.5% | 1.5% |
| Cargo airlines | (5.7) | 3.4 | 1.3 | 0.8 | 0.9 | 1.0 | 1.0 |
| Other | (82.1) | 21.1 | 0.0 | 0.2 | 0.0 | 0.2 | 0.0 |
| Air Carrier total | 6.8 | 3.7 | 1.8 | 1.5 | 1.4 | 1.5 | 1.5 |
| Air Taxi | | | | | | | |
| Cargo airlines | (6.8) | 2.8 | 1.2 | 0.9 | 0.9 | 1.0 | 1.0 |
| Other | 25.4 | (2.5) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Air Taxi total | 17.2 | (1.4) | 0.3 | 0.2 | 0.2 | 0.3 | 0.3 |
| General Aviation | 7.5 | (0.3) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Military | 7.2 | (2.0) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Airport | 7.4 | 3.3 | 1.7 | 1.3 | 1.3 | 1.4 | 1.4 |

Note: The forecasts presented in this table were prepared using the information and assumptions given in the accompanying text. Inevitably, some of the assumptions used to develop the forecasts will not be realized and unanticipated events and circumstances may occur. Therefore, there are likely to be differences between the forecast and actual results, and those differences may be material.

Sources: *Historical*—San Diego County Regional Airport Authority records. *Forecast*—LeighFisher, November 2018.

# Appendix C

# FAA Approval Letter for the Forecasts

U.S. Department of Transportation
**Federal Aviation Administration**

Western-Pacific Region
Airports Division
Los Angeles Airports District Office

777 S. Aviation Blvd, Suite 105
El Segundo, CA 90245

June 19, 2019

Ted Anasis, AICP
Manager—Planning and Environmental Affairs, SDCRAA
PO Box 82776
San Diego, CA 92138

**San Diego International Airport (SAN)**
**Aviation Activity Forecast Approval**

Dear Mr. Anasis,

The Federal Aviation Administration (FAA) has reviewed and approves the aviation forecast for the San Diego International Airport (SAN) dated May 17, 2019. This approval replaces the previous forecast approval from December 20, 2018 which presented unconstrained forecasts for SAN. As described in your letter (enclosed), SAN has since developed a constrained demand scenario which evaluated the limitation of SAN's single runway on unconstrained forecast growth.

Section 4.5 of the forecast analyzes the design aircraft and concludes that SAN's design aircraft is the Boeing 777. The most demanding group of aircraft that conducted at least 500 operations in 2017 had an Airport Reference Code of D-V, represented by a combination of the Boeing 777 (426 operations) and the Boeing 747-400 (282 operations). Based on FAA review of the Traffic Flow Management System Counts and FAA Advisory Circular 150/5000-17 *Critical Aircraft and Regular Use Determination*, the FAA agrees that SAN's design aircraft may change to Boeing 787-9 in the future.

It is important to note that the approval of this forecast does not guarantee future funding for capital improvements and will need to be further analyzed for Airport Improvement Program eligibility purposes.

If you have any questions about this forecast approval, please call me at 424-405-7276.

Sincerely,

Brenda Pérez
Community Planner

Enc. Request for Reapproval of Aviation Activity Forecasts for San Diego International Airport

SAN DIEGO INTERNATIONAL AIRPORT
LET'S GO.

May 17, 2019

Federal Aviation Administration
Western-Pacific Region Airports Division
Attn: Ms. Brenda Perez
777 South Aviation Blvd, Suite 150
El Segundo, California 90245

Re: Request for Reapproval of Aviation Activity Forecasts for San Diego International Airport

Dear Ms. Perez:

The San Diego County Regional Airport Authority (the Authority) is pleased to provide an updated technical memorandum of the Aviation Activity Forecast Update for San Diego International Airport (SDIA) for the FAA's review and approval. The memorandum is provided in draft form and will be finalized following the FAA's review and approval, incorporating the FAA's communication into the final form. <u>The Authority does not anticipate the need for or the preparation of additional forecasts or demand scenarios.</u>

In December 2018, the FAA reviewed and approved unconstrained forecasts for SDIA, which were updated to reflect a 2018 base year and the strong growth in passenger traffic that has occurred since the forecasts for the Airport Development Plan (ADP) were prepared in 2012 and approved by the FAA in its letter dated May 7, 2013. Similar to the FAA's Terminal Area Forecast (TAF), SDIA's December 2018 approved forecasts are demand driven based on local and national economic conditions and do not include specific assumptions about physical, regulatory, environmental or other impediments to aviation activity growth.

Since the FAA approved SDIA's baseline unconstrained forecasts as the "preferred" forecasts in December 2018, subsequent analyses were conducted, including the development of Design Day Future Schedules (DDFSs) derived from the approved unconstrained forecasts. (The development of unconstrained DDFSs is dependent on approved annual forecasts to provide the basis for the derivation of average day peak month (ADPM) activity which serves as the control totals for the DDFSs.) These analyses indicated that:

- The capacity of SDIA's single runway, an estimated 50 operations per hour, will be exceeded starting in 2024 based on the unconstrained forecast DDFSs
- SDIA's unconstrained demand could be met until approximately 2030, assuming that:
  - Load factors increase to an average of 90%, compared with 84% in the unconstrained forecast
  - Aircraft gauge, in terms of the average number of seats per operation, increases to an average of 175 seats per operation, compared with 151 in the unconstrained forecast

- Airline schedules are rebalanced to provide for the addition of new flights in off-peak hours
- Slower growth in the number of cargo airline operations occurs in a constrained environment, reflecting an increase in the average tonnage per operation
- The number and share of general aviation and military operations at SDIA gradually decrease, given the hourly operation limitations and increasing dominance of passenger airline operations

- The primarily narrowbody fleet of the airlines serving SDIA, accounting for 82.5% of passenger airline operations in 2018, as well as their orders for primarily narrowbody aircraft replacements, limit the ability of SDIA to meet unconstrained forecast demand
- In 2050, unmet demand, in term of enplaned passengers, is estimated to reach 6.4 million, i.e., 26.7 million enplaned passengers in the unconstrained forecast less 20.3 million passengers in the constrained demand scenario

In short, SDIA's unconstrained forecasts provided the necessary basis for the development of a constrained demand scenario which, in turn, allowed the Authority to evaluate the limitations of SDIA's single runway on unconstrained forecast growth. A description of the development of the constrained demand scenario is provided in Section 5.0 of the updated technical memorandum. At this time, the Authority is requesting the FAA's review and approval of the constrained demand scenario presented in this memorandum to represent the "preferred scenario", which will be used for airport planning, NEPA review, and Part 150/Noise analyses.

Per the FAA guidance, a comparison of the constrained demand scenario and the FAA 2018 Terminal Area Forecast (TAF) for SDIA is provided in the Technical Memorandum. The tables depicting the comparison can be found in in Section 6.0 (Page 40) and show that both the updated unconstrained forecast and constrained demand scenario are within the allowed variance of the 2018 TAF.

Should you have any questions or comments regarding the forecast or the San Diego International Airport Development Plan, please contact me at tanasis@san.org or (619) 400-2478. Thank you for your continued coordination and assistance.

Respectfully,

Ted Anasis

Ted Anasis, AICP
Manager – Planning & Environmental Affairs
San Diego County Regional Airport Authority

cc: Richard Dykas, FAA

# Appendix D
# CONSTRAINED DEMAND SCENARIO TECHNICAL APPENDIX

San Diego International Airport (SDIA) will not accommodate the unconstrained forecast level of demand for air service. The Airport's single runway does not provide enough capacity to serve the San Diego region's predicted growth in air operations as identified in Section 4 of this report. A Constrained Demand Scenario has been developed in response to the runway capacity limitations and the results are provided in Section 5 of this report.

The Airport's capacity limitations are well known and have been studied for more than three decades. The 2018 ADP Unconstrained Forecast Update of aviation demand for the San Diego region shows that within five to seven years, there will be more demand for air service than the Airport can accommodate. The San Diego County Regional Airport Authority (SDCRAA or Authority) asked Johnson Aviation to review the draft unconstrained forecasts update and analyze the facility constraints at SDIA. In collaboration with Leigh Fisher, Johnson Aviation developed the Constrained Demand Scenario in response to the growing aviation demand and limited airport capacity at SDIA. This Technical Appendix provides a summary of the information that was used in the analysis.

The following information is presented in this Technical Appendix:

- The operational capacity of San Diego International Airport's single runway; and
- How the constrained runway impacts future growth in operations and passengers.

The results of the constrained facilities assessment show that:

- The hourly sustained throughput capacity limit of SDIA's single runway is 50 operations per hour (landings and/or takeoffs);
- Airlines will attempt to serve as much of the passenger demand as possible with average load factors of up to 90 percent; and
- Airlines will further attempt to serve as much of the passenger demand as possible by replacing smaller regional jet aircraft in the fleet with narrow body aircraft, raising the average seats per operation to 175.

As shown in Section 5 of this report, growth in operations will begin to slow relative to the forecast of unconstrained demand as the Airport's capacity limit is reached and congestion increases. Therefore, it is necessary to prepare an analysis of *constrained* demand to predict activity levels that the Airport can realistically accommodate. This results in a *constrained aviation demand scenario* and in lower levels of predicted airplane operations and passenger enplanements in future years reflective of the Airport's actual capacity limitations.

## D.1 Purpose and Approach

The purpose of the constrained facilities analysis is to inform readers about San Diego International Airport's runway constraint and how it will impact future activity levels identified in the Constrained Demand Scenario.

The approach used to assess facility constraints was to review prior analyses of the Airport's runway capacity and delay, review updated air traffic control and aircraft fleet information, review airline operational and service trends, and identify the likely maximum sustained operations and passenger throughputs the Airport can accommodate.

The information provided in this chapter was used to prepare the constrained demand scenario of aviation activity which better reflects future operations and passenger levels. The constrained demand scenario of future activity levels will be used to prepare operations simulations and environmental impact analyses of reasonably foreseeable impacts documented in the Environmental Impact Report (EIR), prepared under the California Environmental Quality Act (CEQA), and Environmental Assessment, prepared under the National Environmental Policy Act (NEPA).

## D.2 Background

This section provides the background on constrained aviation activity analysis and the historical context of the constrained demand scenario at SDIA.

### D.2.1 Airport Development Plan Forecasts

The Airport Development Plan (ADP) was initiated by the Airport Authority in 2011 to plan for facility improvements at SDIA. One of the first steps in the ADP process was to prepare a forecast of aviation activity. The ADP forecast was completed in 2012 and was based on historical data through 2011 (See Appendix C). The 2012 forecast predicted that passenger levels would grow at an average annual rate of 1.9% between 2011 and 2050, while operations would grow at an average annual rate of 1.2% between 2011 and 2050. These rates of growth were relatively modest and did not predict that the Airport's capacity limitations would be reached until after 2040, which was beyond the ADP planning horizon. Therefore, there was no need to prepare a constrained facilities analysis and constrained demand scenario that would identify limitations in predicted levels of passenger and operations activity.

The ADP planning process continued, and the proposed ADP projects were documented in a Draft Environmental Impact Report (EIR) published in 2018. Between 2012 and 2018, SDIA experienced five consecutive years of record passenger and operations growth that exceeded the forecast rate of growth.

The Airport Authority initiated an update to the aviation activity forecast in 2018 to reflect recent growth and better inform the analysis of potential environmental impacts associated with the ADP. Sections 2, 3, and 4 of this report present these findings and updated forecasts. Like the 2012 forecast, the 2018 forecast update is unconstrained. A fundamental assumption of an unconstrained forecast is the availability of adequate capacity to accommodate the predicted demand. The updated draft unconstrained forecast was submitted to FAA for review and was approved by FAA in December 2018.

The 2018 Baseline forecast predicts that aircraft operations will exceed 260,000 annually by 2022 and 300,000 by 2026. Previous demand-capacity analysis of SDIA's single runway show that it would become severely congested at these levels of activity and that it would not accommodate activity beyond approximately 300,000 annual operations. Therefore, it is necessary to include a constrained demand scenario that better reflects the Airport's facility limitations on future growth.

### D.2.2 San Diego's Long History of Capacity Studies

The operational limit of SDIA's Runway 9/27 is not a new issue for the Airport Authority or the San Diego region. Recognition of the Airport's runway limitations date back to the 1950s and robust analysis of the Airport's capacity limits were reviewed with planning and forecasting studies in 1980, and again in the mid-1990s. Planning studies in 2001 and 2004 were conducted in response to continued growth with the intent to establish the limit of the Airport's runway capacity and the Airport's ability to accommodate passenger demand. The analyses culminated in the decision to consider relocation of the San Diego region's main commercial service airport in 2007 with a vote of San Diego County residents, who defeated a ballot measure that would have affirmed the recommendation to relocate the Airport. The voters' decision was made, and the region has moved forward with improvements at San Diego International Airport knowing that, at some future point, the Airport's operational limitations would curtail further growth in air service.

The Great Recession from 2008 to 2009 reduced aviation demand in the United States and in the San Diego region. When the previous forecast of aviation activity was completed for the ADP in 2011, it appeared that growth in air operations would not exceed the Airport's runway capacity until sometime between 2040 and 2050. However, since 2011, economic growth in the region combined with strong airfare competition at SDIA have resulted in five straight years of record growth. In 2018, SDIA accommodated more than 24 million passengers and 225,000 operations, the highest levels of activity in the Airport's history. The updated forecast, which considers the recent growth in activity, predicts that demand for air service will outstrip the Airport's capacity within the next five to seven years.

Studies going back to 1980 identified the constraints of SDIA's small land area, limited airport facilities, and single runway. As operations grew over time, these limitations became clearer. Economic downturns and air service changes over time have forestalled the operational limits of the single runway. Studies in the late 1970s by the San Diego Community Planning Organization and in the 1980 Port Master Plan by the Port District called out the small land area of Lindbergh Field and its downtown airport location adjacent to extensive urban development. These studies explored relocation alternatives and planned for an evaluation again in the mid-1990s.

The Airport Development Study in the late 1980s and the Immediate Action Plan in the mid-1990s studied constrained forecasts of passengers and operations based on the then average aircraft seating capacities and typical airline load factors. Each assessed growing passenger demand in San Diego County and the need for additional airport capacity to meet the long-term demand. Terminal improvements and additional aircraft gates were the immediate focus, while regional efforts were underway to study relocation of the Airport due to the limited capacity of the single runway.

In 2001, a Master Plan update for SDIA was completed but not adopted prior to the terrorist attacks of September 11, 2001. This Master Plan was based on demand forecasts prepared in 1998 and updated in 2001 during the middle and the end of the Dot-com and Telecom economic bubbles and subsequent economic fallout. The economic and travel downturn again reduced the immediate operational limitation of the single runway.

The most extensive previous forecast exercise for SDIA was completed in 2004 by SH&E, Inc. and was subsequently used to drive the planning and development of the Airport over the last decade. This was the first study prepared for the newly-created Airport Authority and it addressed both unconstrained demand forecasts and constrained activity forecasts. It informed the 2006 Site Selection Study and the 2008 Airport Master Plan.

### D.2.3 Runway Demand-Capacity Analysis

Airport planners have long studied runway demand and capacity as a fundamental driver of airport facility requirements. Runways, like roadways, have finite capacity. The capacity of a runway is measured in terms of hourly, daily, and annual aircraft operations at an acceptable level of delay. Much like a roadway, as demand (the number of landings and takeoffs) increases, congestion ("delay") increases.

Airport planning studies use demand-capacity analysis to determine the limitations of existing runway infrastructure and assess the timing for construction of new or improved runway facilities necessary to accommodate growing demand. When airport facilities are limited by physical constraints that cannot be removed or remedied, the same analytical techniques can be used to predict the airport's operational limits.

### D.2.4 FAA Capacity Analysis

The Federal Aviation Administration (FAA) studies airport capacity in the United States. Their goal is to "identify airports that are likely to need more capacity to accommodate anticipated growth in demand." These studies were conducted and documented by the Future Airport Capacity Task (FACT) reports. The results of the 2007 FAA FACT2 report state that SDIA will become constrained in approximately 2025 "even if all planned improvements are implemented;" and that "additional capacity enhancement is needed." The most recent report, FACT3, was published in 2015. The results of that study show that significant nationwide improvements in capacity have been made over the ten-year period from 2005 to 2015. These improvements were largely a result of the construction of 18 new runways and seven extended runways at 21 busy hub airports since 2000. However, SDIA is not one of the 21 airports with recent capacity improvements.

The FAA is also responsible for operating the United States airspace and air traffic control system and improvements have been made in the way air traffic is managed. These improvements are primarily based on the implementation of satellite-based air navigation to replace some functions of ground-based navigation. These improvements have enabled increased efficiency of arrivals and departures in and out of airports. Again, some technology and airspace improvements have helped to make SDIA operate more reliably relative to air traffic at other regional airports but these improvements have not increased the operational capacity of the single runway.

As part of the FACT3 process, FAA also published an Airport Capacity Profile for SDIA in May 2014 based on analysis completed by MITRE Corporation. The report states that SDIA's air traffic control (ATC) reported hourly rate of operations is 48, with a maximum model-estimated hourly throughput of 57 operations per hour during good "visual" weather. The higher model-estimated levels of traffic are rarely encountered and not sustained for more than a short period of time. This study also lacks an analysis of the congestion or delay level that flights would encounter at this level of operations to understand the real-world sustained throughput capacity of the runway. FAA's capacity profile for SDIA noted that these throughput rates are during visual conditions and that the lack of a full-length parallel taxiway on the north side of the runway could slightly reduce the reported capacity. When marginal or instrument weather conditions are present at SDIA, the model-estimated rate falls to 48 operations per hour, matching the ATC reported rate.

A key takeaway from the FAA's SDIA capacity profile is that ATC reports a maximum hourly throughput of 48 landings and takeoffs in all conditions. Further, the report does not anticipate that future enhancements in air traffic control and air navigation technology will improve these rates by more than approximately two percent. For SDIA to operate at a sustained rate of 48 to 50 operations per hour, one landing or takeoff would need to occur approximately every 72 to 75 seconds.

## D.3 Constrained Facilities

San Diego International Airport is comprised of 661 acres of land. It is the smallest major airport in the United States. Further, the Airport is bounded by water, major roadways, dense urban development, and military facilities that would be exceedingly difficult and expensive to move or acquire. The limited real estate prevents the Airport from adding runway capacity. This section provides a review of the airport facilities that accommodate aircraft operations and describes how they work as a system. Each part is critical to the capacity of the overall system and a constraint in one part can limit the capacity of the entire system.

### D.3.1 Runway

San Diego International Airport has one runway. Runway 9/27 is 9,401 feet long and is 200 feet wide. The single runway is the Airport's primary constraint.

There are a variety of variables that can affect the capacity of a runway. These variables include the runway length, width, pavement strength, orientation relative to prevailing winds, prevailing weather conditions, obstructions in the vicinity, and the fleet mix of aircraft using the airport.

Runway 9/27 is long enough, wide enough, and has enough strength to accommodate the fleet of aircraft serving US domestic air service and some limited long-haul international air service. The runway is oriented appropriately with the prevailing winds, and the region has excellent or marginal weather conditions more than 98% of the time, according to FAA's airport capacity profile report. San Diego International Airport is also served by a fleet of aircraft composed mostly of large, narrow body jet aircraft, which enables highly efficient use of the runway.

There is, however, a fundamental limitation to the number of landings and take-offs that can be accommodated in any given amount of time with a single runway. This limitation is primarily driven by the need to maintain in-trail separation between landing and departing airplanes.

FAA rules governing the separation of large jet aircraft dictate that large jet aircraft are separated by a minimum of three miles, when flying the final approach path to the Airport. The required separation results in a minimum time between operations of approximately 70 to 90 seconds. When the runway is operating at its maximum throughput rate, a plane lands or takes off every 72 seconds resulting in an hourly throughput limit of 50 operations.

It is very difficult to maintain this high level of ideal operational efficiency for more than 10 to 20 minutes at a time. It is not feasible to operate at the maximum throughput rate for extended periods of time for the following reasons:

- Aircraft are arriving at San Diego from all over the country and from other parts of the world. If flights are delayed at their originating airport, or enroute to San Diego, they will disrupt the timing of aircraft into the terminal airspace.
- This high degree of efficiency requires that aircraft land and quickly exit the runway to make room for the next plane to land. If a plane misses a runway exit and cannot efficiently leave the runway, the next landing aircraft may need to execute a missed approach to maintain safe separation. Missed approach procedures are conducted to ensure that that airport operations are conducted in a safe manner.
- Departing aircraft may be delayed at the gate for many reasons including late passengers, late cargo, or other complications with servicing.
- And, of course, once a plane is delayed, even if it is delayed at another airport, its schedule may be disrupted for the remainder of its flying day.

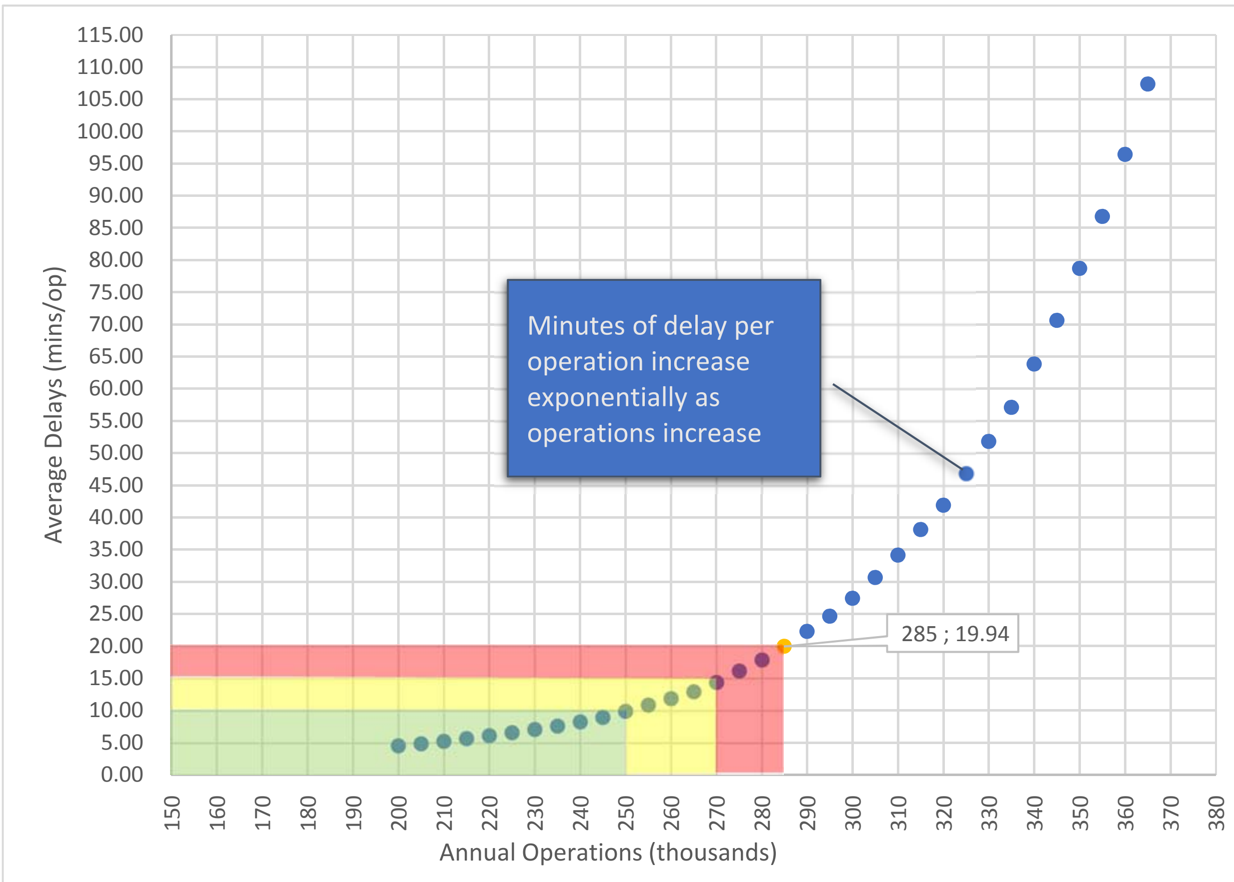
As noted earlier, the hourly throughput capacity of SDIA's single runway is approximately one landing or one take-off every 72 to 75 seconds. This is equivalent to about 50 operations per hour. Once there is a disruption introduced to the operation, delays will begin to accrue and continue building, until there is a break in the demand that allows operations to recover and return to normal flow.

The Authority contracted SH&E, Inc. in 2004 to conduct a capacity and delay analysis for SDIA as part of an aviation activity forecast analysis. SH&E used a two-phased modeling approach. According to their technical report; "one phase of the analysis used models initially developed at the Massachusetts Institute of Technology (MIT) to assess the capacity and delay impacts of the Airport's most limiting constraint, its single runway. The other phase of the analysis used a high-level-of-detail simulation, SIMMOD, to analyze airspace, runway, taxiway, and gate congestion." The analysis of SDIA's runway capacity completed in 2004 remains valid, today because the operational variables have changed only minimally.

The results of the modeling analysis completed in 2004 show that the Airport continues to operate with relatively moderate delay levels up to about 250,000 annual operations. Average annual all-weather delays exceed ten minutes per operation at 250,000 annual operations. Delays continue increasing rapidly reaching nearly 20 minutes per operation when demand reaches 285,000 annual operations. Figure D-1 depicts the relationship between growing annual operations at SDIA to the measured minutes per operation of average, all-weather delays**.

** "All-Weather" conditions refer to the weighted average percentage of time with cloud height and visibility conditions that dictate specific air traffic control operating rules at an airport. These conditions range from visual meteorological conditions (VMC or weather conditions that allow pilots to navigate by seeing and avoiding other air traffic and potential obstructions), marginal VMC (below visual conditions minima but better than instrument conditions) and instrument meteorological conditions (IMC or weather conditions that require exclusive use of instrument equipment and procedures for navigation).

Figure D-1
**ANNUAL RUNWAY-RELATED DELAYS UNDER ALL WEATHER CONDITIONS**
San Diego International Airport




Sources: SH&E, Inc., Final San Diego International Airport Aviation Activity Forecasts, San Diego County Regional Airport Authority, June 2004
Johnson Aviation, Inc. analysis, 2019

Figure D-1 demonstrates that once demand exceeds capacity, delays (as measured in minutes per operation) increase exponentially for each additional operation. The FAA has studied airport runway capacity for decades and has established policy guidance for planners to perform benefit cost analysis for construction of new runway infrastructure. While no new runway infrastructure is being contemplated at SDIA, it is helpful to review and consider FAA's policy guidance:

> Airports experiencing severe delay due to congestion will not be able to accommodate rising demand for air service. Average delay per operation of 10 minutes or more may be considered severe. At 20 minutes [of] average delay (approximately the highest recorded average delay per operation known to FAA at an airport in the U.S.), growth in operations at the airport will largely cease. Prior to reaching these levels, airlines would begin to use larger aircraft, adjust schedules, and cancel or consolidate flights during peak delay periods. Passengers would make use of alternative airports, seek other means of transportation (e.g., automobile or train), or simply avoid making some trips ††.

The following are findings from the 2004 SH&E, Inc. integrated modeling approach completed as part of the San Diego Aviation Activity Forecast and the extensive capacity and delay analysis performed as part of that study:

- Growth in good-weather and all-weather delays begins to accelerate rapidly as demand moves towards a level of 260,000 annual operations. Even prior to reaching this point, infrastructure improvements would be beneficial, particularly given the low-cost carrier presence at SDIA and their focus on maintaining efficient operations and high levels of aircraft utilization.

- As flight activity grows beyond 260,000 annual operations, runway-related delays average more than 10 minutes per flight across all weather conditions. During Instrument Flight Rules (IFR) weather conditions, which occur 29 percent of the time, runway-related delays will average more than 28 minutes per flight. This level of runway congestion and delay is expected to limit the Airport's ability to fully accommodate growth in underlying demand. At this point, additional runway capacity is required.

- At 300,000 annual operations, severe runway congestion will virtually eliminate further growth.

- The single runway is clearly the most limiting constraint at SDIA, and the most likely to have an impact on future growth in demand.

For preparing this constrained demand scenario, SDIA's hourly runway throughput is set at 50 operations. This ensures that the forecast of aviation activity reflects an activity level that may be achieved at SDIA albeit with potentially severe operational delays at these sustained activity levels. The hourly throughput limitation is established based on:

- The FAA guidance on preparation of benefit cost analysis for runway infrastructure projects;

- The integrated modeling analysis previously completed for SDIA and updated for current activity levels that demonstrates SDIA's delay levels exceeding 20 minutes at about 285,000 annual operations;

†† It should be noted that these are average delay savings per operation, and reflect the averaging of minimal delays in non-peak hours with very long delays at peak hours. Passengers and airlines will react first to the excess delays at peak hours. FAA Benefit-Cost Analysis Guidance, 1999, Update 2010.

- Interviews conducted with the SDIA Chief of Airport Operations and the FAA Air Traffic Control Tower Chief at SDIA; and

- Reviews of operations parameters including airfield layout, fleet mix, weather, and airspace.

### D.3.2 Taxiway System

Taxiways connect terminal, cargo, and aircraft servicing facilities to the runway system. SDIA has a full-length taxiway parallel to Runway 9/27 on the south side of the runway called Taxiway B. Taxiway B connects the passenger airline terminal facilities to Runway 9/27.

Taxiway C is located north of and parallel to Runway 9/27 but only extends along the eastern half of the runway. The lack of a full-length parallel taxiway on the north side of the runway presents an operational challenge. When cargo and general aviation aircraft land on Runway 27, they have about 3,350 feet of runway to slow down and exit the runway to the north on Taxiway C5. If these landing aircraft cannot slow down and exit at Taxiway C5 they must exit to the south toward Taxiway B and taxi back to the east to cross Runway 9/27 to reach the cargo and general aviation facilities. Each time one of these operations occurs, Air Traffic Control must provide enough separation between landing and takeoff operations to enable the taxing aircraft to cross the runway. This interruption to the flow of landings and takeoffs can result in additional operational delays.

There is no plan to extend Taxiway C due to a lack of available land.

### D.3.3 Terminal/Aircraft Gates

Aircraft gates are parking positions that are used while passengers enplane and deplane. SDIA currently has 51 gates with T1, T2 East, and T2 West having 19, 13, and 19 gates, respectively. Terminal 1 is the oldest existing terminal facility having opened in 1967 and needs replacement to provide a level of customer service equivalent to that provided at Terminal 2 West, SDIA’s newest terminal facility that was built in 1998 and expanded in 2014.

The Airport proposes to replace Terminal 1 with a new terminal that would replace the 19 existing Terminal 1 gates and provide eleven additional gates. The proposed terminal facilities will provide a higher-level of customer service, provide more efficient security screening facilities that meet current standards, provide additional concessions opportunities for passengers, and relocate aircraft gates south to provide more efficient taxing of aircraft near the new terminal facility.

## D.4 Market Responses

Passengers and airlines will likely respond to increased congestion through several mechanisms that will enable SDIA to accommodate growing passenger demand at an operationally limited facility. The mechanisms available to the airlines, to the Airport, and to the flying public are summarized below.

### D.4.1 Flight Scheduling Adjustments (De-peaking)

Airline schedules at most airports are peaked. This means that there are periods of the day with a lot of activity followed by periods of the day with lower levels of activity. This contrast is most obvious between day and night and reflect the desire of most people to fly during the day. Even within the course of the day, there are periods of high and low activity. At SDIA there is a very busy period of activity between about 9 AM and 11 AM. This period is busy, because it reflects a time of day that many people prefer to fly east to arrive at these airports before it is excessively late.

Even today, SDIA is operating near its maximum throughput rate between the hours of 9 AM and 11 AM. There is little available capacity for airlines to schedule additional departures during this period. Therefore, airlines will schedule additional activity during earlier or later periods, when activity levels at SDIA are not as congested.

This solution is available until SDIA is operating at or near its capacity for the duration of its operating day.

It is essential to note that SDIA has a curfew that prohibits departures between the hours of 11:30 PM and 6:30 AM. For this reason, SDIA has fewer "red-eye" flights to eastern airports than its west coast peer airports. It is assumed that SDIA's curfew will remain in effect in the future and that there will be no additional scheduled flights that depart the gate after 11:15 PM or before 6:15 AM or departing flights during the hours of 11:30 PM and 6:30 AM.

### D.4.2 Fleet Mix Adjustments

Airlines may choose to change the aircraft they use to serve SDIA to better serve demand. Most airlines fly a range of aircraft types that vary in size. As demand increases at SDIA, airlines may choose to use larger aircraft to serve selected markets in lieu of adding additional flights.

SDIA is already characterized by a homogeneous fleet of aircraft in that about 82% of flights are narrow-body jet aircraft in the Boeing 737 and 757 families and the Airbus A320 family.

Airlines are faced with some limitations in their ability to serve one airport with larger aircraft despite the full range of aircraft in their fleet. Limitations include the fact that most airlines serve domestic routes with exclusively narrow-body aircraft while wide-body aircraft are used almost exclusively on international routes. Further, airlines use aircraft for twenty years or more and generally do not purchase aircraft with the intent to serve a single market.

As demand and congestion increase and airlines still desire to add capacity during peak periods, they will substitute larger narrow-body aircraft to serve demand. For example, an airline that serves SDIA on a route with a Boeing 737-700 may use a Boeing 737-800 in the future. The 737-700 provides 143 seats in a single-class layout while the 737-800 provides 175 seats. Switching from an Airbus A320 with 150 seats to an Airbus A321 with 181 seats would provide 31 additional seats per flight.

The constrained demand scenario analysis anticipates that airlines will serve markets from SDIA with larger narrow-body aircraft and that average seats per departure will increase from about 155 seats to 175 seats as the Airport becomes increasingly constrained.

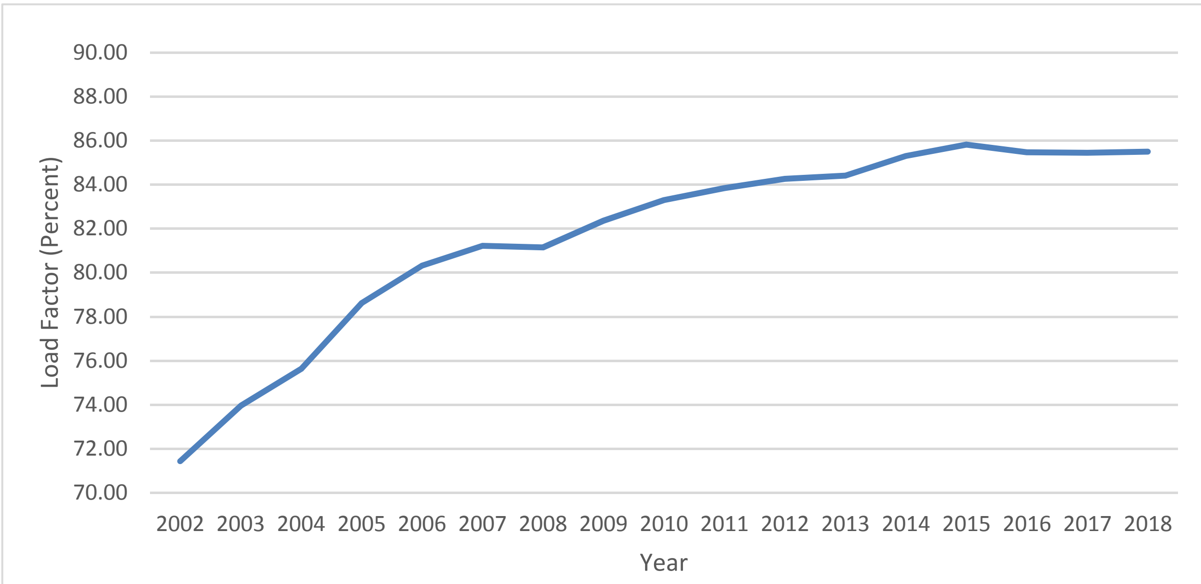
### D.4.3 Increasing Load Factor

Load factor is a measure of the percent of occupied seats relative to the percent of available seats. If an airplane departs with 100 available seats and 80 are occupied by passengers, the aircraft has a load factor of 80%.

As demand increases and airlines cannot add flights or increase aircraft size, more of the available seats will be occupied reflective of increased demand. As shown in Figure D-2, Airline load factors in the United States of steadily increased from about 72 percent in 2002 to nearly 86 percent in 2018. Since 2015, however, the rise in load factors has stabilized and plateaued reflecting the reality that is very difficult for every available seat to be occupied on every departing flight.

SDIA already has relatively high load factors compared to its peer airports. In 2017, SDIA's average load factors exceeded 86%. The constrained demand analysis estimates that SDIA's average load factors will increase to 90%.

Figure D-2
**US LARGE HUB AIRPORT DOMESTIC LOAD FACTOR**
CY 2002 to CY 2018




Sources: US Department of Transportation, Bureau of Transportation Statistics, 2019
Johnson Aviation, Inc. analysis, 2019

### D.4.4 Seat Pricing

Basic economic theory concludes that price is a product of supply and demand. As SDIA becomes increasingly congested the demand for air service will steadily outpace the supply of available seats. Airlines are likely to steadily increase fares as a result. This constrained facilities analysis and resulting constrained demand scenario does not evaluate the effect of rising prices on demand for air service at SDIA, but does acknowledge that higher fares are a likely result of increasing congestion at SDIA. The assumption is that airlines, as profit-motivated entities, will balance supply and demand over time to maintain pricing power and to maximize revenue per seat (yield).

### D.4.5 Policy

Federal and local agencies may also introduce policies to address an increase in demand that leads to severe congestion. FAA has the authority to and has implemented controls at highly congested airports in New York that limit the number of permitted scheduled operations in a given hour or 30-minute period. New York LaGuardia Airport is limited to 71 hourly operations. If delays at SDIA reached excessive levels as determined by FAA, it would have the right to impose operational and scheduling restrictions on flights to and from SDIA to combat excessive delays.

The San Diego County Regional Airport Authority (SDCRAA) has some limited discretion to enact policies that encourage airlines to schedule flights in a manner that avoids excessive delays. However, there are strict limitations to the SDCRAA's ability to unilaterally impose restrictions under FAA Grant Assurances for public use airports. The SDCRAA's policy approach would require coordination with the airlines, along with their approval, to enact scheduling policies that prevent excessive delays.

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Appendix A3

# Design Day Flight Schedule Ramp Charts

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# Appendix A3

# Design Day Flight Schedule Ramp Charts

For the project planning process, the San Diego County Regional Airport Authority (SDCRAA) prepared annual aircraft operations forecasts for various planning years. Those forecasts of scheduled passenger operations were then translated into design day flight schedules (DDFS) to better examine facility needs at San Diego International Airport (SAN) during a 24-hour representative day (average day, peak month) and to affirm that the existing facilities can accommodate 292,000 annual operations. SAN also used the DDFS to devise alternative ways of identifying its gate needs.

The forecast development process and results are documented in **Appendix A2**. The gated schedules only apply to the scheduled passenger operations that are forecast as those operations are the only operations that use the terminal gates. This gated DDFS material uses the terms "turn(s)," "turns per gate," and "turns per day." A "turn" is defined as an aircraft arriving and departing from a terminal gate. For flights that were "split" into separate arrival and departure operations with idle time between them, each of these operations is considered one-half turn. Therefore, if a flight arrives to one gate and then taxis to another gate to depart, one-half turn is attributed to each gate.

For the purposes of this exercise, turns were counted if any portion of an arrival, departure, or full turn operation occurred during the design day. For instance, if a flight arrived before the design day, but its arrival-only operation of 30 minutes extended into the early morning hours of the design day, then one-half turn was attributed to the gate during the design day. For this reason, the sum of turns across all gates during the design day is greater than or equal to the total number of scheduled operations divided by two.

The gated DDFS material provided in this appendix identify the following:

- **Table A3-1 – SAN Gated Flight Schedules – No Build Scenario, Turns-per-Gate,** provides comparative turns per gate, per day at each existing terminal gate for the forecast years. It adds two "Runway Capacity" cases to show the turns per gate, per day that represent approximately 292,000 annual operations. The "Base" case represents existing airline preferential gate use, and the "Balanced" case represents aircraft assigned to the first-available gate. These cases demonstrate the ability of the existing SAN gates to accommodate forecast scheduled passenger operations regardless of airline terminal locations. At the bottom of Table A3-1, the arithmetic mean (average) turns per gate, per day is also provided for each forecast year and Runway Capacity scenario to show that less than two (1.7) average turns per gate, per day increase is needed to accommodate the Runway Capacity.
- **No Build DDFS Ramp Charts**, provide visual illustrations by hour of the day of the aircraft/flights parked at each existing gate[1] for the Runway Capacity, Base and Balanced cases.

[1] SAN Gate 37A, identified in the No Build DDFS as an "existing" wide-body aircraft parking position, does not currently exist. To serve this wide-body aircraft, two existing narrow-body gates were used to create this one wide-body gate. It was "created" in the ramp charting tool for the Runway Capacity scenarios to accommodate forecast wide-body parking.

- **Table A3-2 – Comparison of Gate Utilization at SAN and Selected Southwest Airlines Airports**, provides context for the 2019 level of turns per gate, per day by Southwest Airlines at SAN and selected airports where Southwest Airlines has substantial operations.

Table A3-1
San Diego International Airport - ADP
Gated Flight Schedules - No Build Alternative
Turns per Gate, per Design Day

| | Scheduled Design Day Passenger Operations | | | | | | |
|---|---|---|---|---|---|---|---|
| | 2018 | 2024 | 2026 | 2030 | 2035 | 2050 | Runway Capacity |
| Arrivals | 305 | 345 | 352 | 368 | 387 | 400 | 403 |
| Departures | 305 | 345 | 352 | 368 | 387 | 400 | 403 |
| Total | 610 | 690 | 704 | 736 | 774 | 800 | 806 |

| Terminal | Gate | Dependent Gate(s) | Turns per Gate by Horizon Year | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | 2018 | 2024 | 2026 | 2030 | 2035 | 2050* | Runway Capacity | |
| | | | | | | | | | Base | Balanced |
| T1 East | 1A | | 6.5 | 8.0 | 9.5 | 9.5 | 10.5 | N/A | 11.5 | 9.5 |
| T1 East | 1 | | 9.0 | 9.5 | 11.5 | 8.5 | 9.0 | N/A | 10.0 | 9.0 |
| T1 East | 2 | | 9.0 | 10.0 | 12.0 | 10.5 | 10.5 | N/A | 11.5 | 8.5 |
| T1 East | 3 | | 7.0 | 9.0 | 11.5 | 11.0 | 11.0 | N/A | 12.0 | 8.5 |
| T1 East | 4 | | 9.0 | 10.5 | 10.0 | 10.0 | 11.5 | N/A | 11.5 | 9.5 |
| T1 East | 5 | | 8.0 | 8.0 | 11.5 | 10.0 | 9.5 | N/A | 12.0 | 9.0 |
| T1 East | 6 | | 8.0 | 10.0 | 11.0 | 9.0 | 11.0 | N/A | 11.0 | 8.0 |
| T1 East | 7 | | 9.0 | 10.0 | 10.5 | 8.5 | 9.0 | N/A | 12.0 | 9.0 |
| T1 East | 8 | | 7.5 | 8.0 | 11.0 | 8.0 | 11.0 | N/A | 11.5 | 9.0 |
| T1 East | 9 | | 9.0 | 8.0 | 10.5 | 12.0 | 11.0 | N/A | 12.0 | 9.0 |
| T1 East | 10 | | 7.0 | 13.0 | 10.0 | 9.0 | 10.0 | N/A | 11.0 | 9.0 |
| T1 West | 11 | | 10.0 | 10.0 | 12.0 | 11.0 | 8.0 | N/A | 9.0 | 9.0 |
| T1 West | 12 | | 8.0 | 11.0 | 6.0 | 12.0 | 11.0 | N/A | 10.5 | 8.5 |
| T1 West | 13 | | 7.0 | 4.0 | 6.0 | 10.0 | 11.0 | N/A | 11.5 | 9.5 |
| T1 West | 14 | | 0.0 | 5.0 | 4.0 | 5.0 | 6.0 | N/A | 10.0 | 9.0 |
| T1 West | 15 | | 6.0 | 5.0 | 6.0 | 7.0 | 8.5 | N/A | 10.0 | 9.0 |
| T1 West | 16 | | 3.5 | 4.5 | 7.5 | 5.0 | 6.0 | N/A | 10.0 | 9.0 |
| T1 West | 17 | | 2.5 | 6.5 | 5.5 | 5.0 | 4.0 | N/A | 10.0 | 9.0 |
| T1 West | 18 | | 2.0 | 8.5 | 6.5 | 3.5 | 5.0 | N/A | 12.0 | 9.0 |
| T2 East | 20 | | 7.0 | 7.0 | 5.5 | 8.0 | 9.0 | N/A | 11.5 | 9.5 |
| T2 East | 21 | | 7.0 | 3.5 | 9.0 | 8.0 | 7.5 | N/A | 10.0 | 9.0 |
| T2 East | 22 | | 5.5 | 4.5 | 5.5 | 5.5 | 8.0 | N/A | 7.5 | 8.5 |
| T2 East | 23 | | 3.0 | 8.5 | 4.0 | 8.5 | 7.0 | N/A | 6.5 | 8.5 |
| T2 East | 24 | | 6.5 | 6.5 | 6.0 | 7.5 | 8.5 | N/A | 6.5 | 8.5 |
| T2 East | 25 | | 6.0 | 6.5 | 3.0 | 6.5 | 5.5 | N/A | 6.5 | 7.5 |
| T2 East | 26 | | 8.5 | 6.0 | 6.0 | 7.0 | 9.0 | N/A | 6.0 | 8.0 |
| T2 East | 27 | | 7.0 | 6.0 | 5.5 | 7.5 | 6.0 | N/A | 6.0 | 8.0 |
| T2 East | 28 | | 10.5 | 6.5 | 8.5 | 6.5 | 8.5 | N/A | 5.5 | 8.5 |
| T2 East | 29 | | 4.0 | 6.0 | 5.0 | 6.0 | 8.0 | N/A | 6.5 | 8.5 |
| T2 East | 30 | | 6.5 | 5.5 | 8.5 | 9.0 | 7.5 | N/A | 6.0 | 8.0 |
| T2 East | 31 | | 4.5 | 3.5 | 4.0 | 6.5 | 6.0 | N/A | 5.5 | 8.5 |
| T2 East | 32 | | 6.5 | 7.5 | 6.5 | 7.5 | 7.5 | N/A | 6.5 | 8.5 |

Table A3-1
San Diego International Airport - ADP
Gated Flight Schedules - No Build Alternative
Turns per Gate, per Design Day

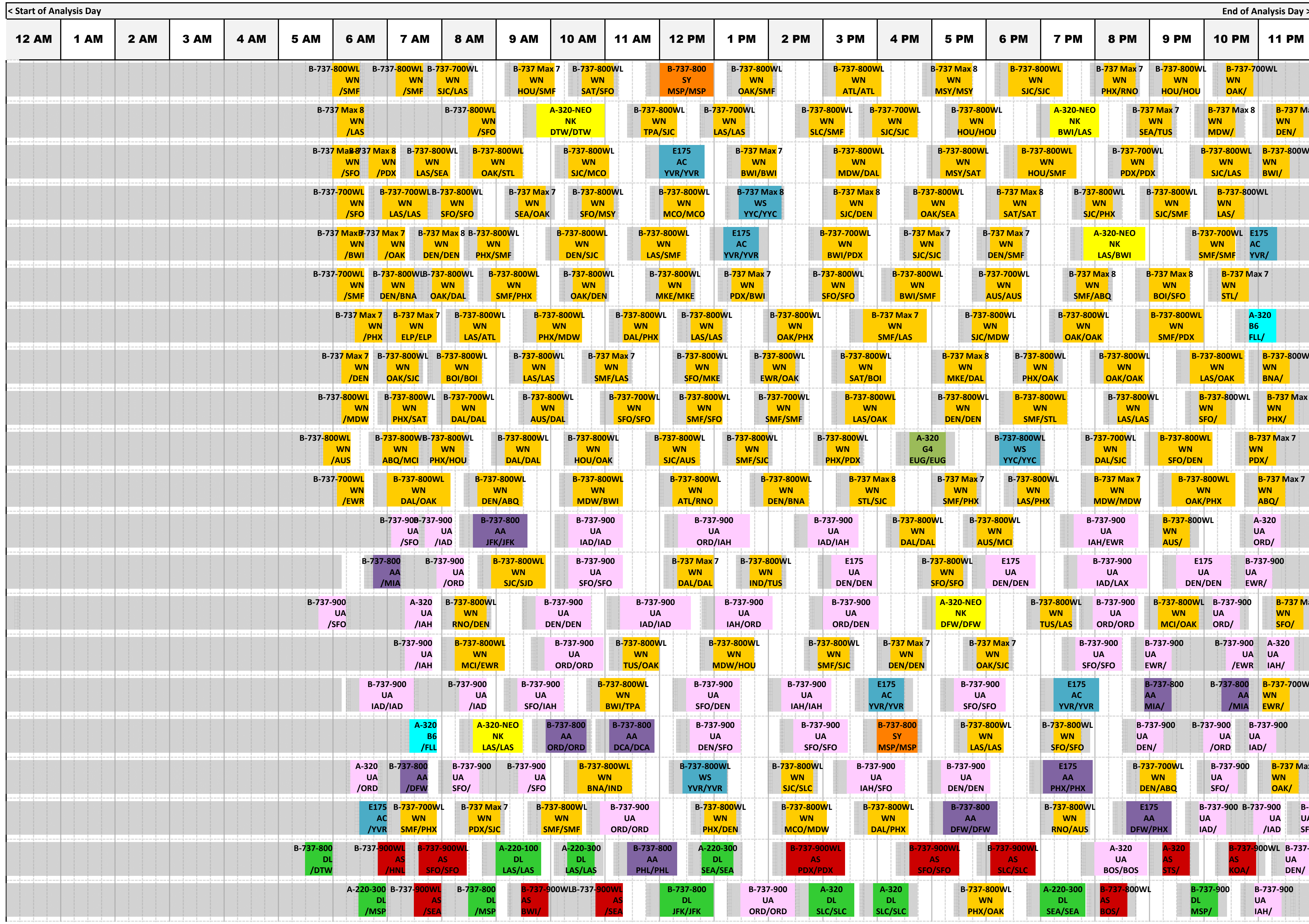
| | Scheduled Design Day Passenger Operations | | | | | | |
|---|---|---|---|---|---|---|---|
| | 2018 | 2024 | 2026 | 2030 | 2035 | 2050 | Runway Capacity |
| Arrivals | 305 | 345 | 352 | 368 | 387 | 400 | 403 |
| Departures | 305 | 345 | 352 | 368 | 387 | 400 | 403 |
| Total | 610 | 690 | 704 | 736 | 774 | 800 | 806 |

| Terminal | Gate | Dependent Gate(s) | Turns per Gate by Horizon Year | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2018 | 2024 | 2026 | 2030 | 2035 | 2050* | Runway Capacity | |
| | | | | | | | | | Base | Balanced |
| T2 West | 33 | | 2.0 | 5.0 | 7.5 | 7.0 | 7.0 | N/A | 7.0 | 8.0 |
| T2 West | 34 | | 4.0 | 8.0 | 7.0 | 8.0 | 6.5 | N/A | 5.5 | 9.0 |
| T2 West | 35 | | 6.5 | 11.5 | 7.5 | 8.0 | 8.0 | N/A | 5.5 | 7.5 |
| T2 West (IAF) | 36 | 37A | 8.5 | 5.5 | 6.5 | 7.5 | 9.0 | N/A | 2.5 | 5.5 |
| T2 West (IAF) | 37A | 36, 37 | N/A | N/A | N/A | N/A | N/A | N/A | 1.5 | 1.5 |
| T2 West (IAF) | 37 | 37A | 7.0 | 6.5 | 9.0 | 8.5 | 8.0 | N/A | 1.0 | 2.0 |
| T2 West | 38 | | 5.5 | 7.0 | 6.0 | 7.5 | 7.0 | N/A | 6.0 | 8.0 |
| T2 West | 39 | | 5.0 | 8.0 | 7.5 | 7.5 | 6.5 | N/A | 6.0 | 7.5 |
| T2 West | 40 | | 9.5 | 8.0 | 6.5 | 9.0 | 8.5 | N/A | 9.0 | 7.0 |
| T2 West | 41 | | 7.5 | 7.0 | 7.0 | 8.0 | 6.5 | N/A | 10.5 | 8.0 |
| T2 West | 42 | | 6.5 | 8.5 | 5.5 | 7.0 | 7.5 | N/A | 7.5 | 8.5 |
| T2 West | 43 | | 4.0 | 4.5 | 4.5 | 5.0 | 5.5 | N/A | 6.0 | 7.5 |
| T2 West | 44 | | 6.0 | 7.0 | 7.0 | 8.0 | 8.0 | N/A | 6.5 | 8.5 |
| T2 West (IAF) | 45 | 46A | 5.0 | 5.5 | 5.0 | 1.5 | 3.0 | N/A | 0.5 | 2.5 |
| T2 West (IAF) | 46A | 45, 46 | 0.0 | 0.0 | 0.0 | 2.5 | 3.0 | N/A | 3.5 | 3.5 |
| T2 West (IAF) | 46 | 46A, 47A | 6.0 | 4.5 | 0.0 | 1.5 | 0.5 | N/A | 0.0 | 2.0 |
| T2 West (IAF) | 47A | 46, 47 | 0.0 | 0.0 | 0.5 | 1.5 | 4.0 | N/A | 2.5 | 2.5 |
| T2 West (IAF) | 47 | 47A | 4.5 | 1.5 | 3.5 | 1.0 | 2.5 | N/A | 3.0 | 3.0 |
| T2 West (IAF) | 48 | | 3.0 | 2.0 | 2.0 | 4.0 | 3.5 | N/A | 5.5 | 5.5 |
| T2 West (IAF) | 49 | 50A | 2.0 | 4.0 | 4.0 | 1.0 | 1.0 | N/A | 4.0 | 5.0 |
| T2 West (IAF) | 50A | 49, 50 | 0.0 | 1.0 | 1.0 | 2.0 | 4.0 | N/A | 2.0 | 2.0 |
| T2 West (IAF) | 50 | 50A | 2.0 | 3.5 | 4.0 | 1.0 | 0.5 | N/A | 4.5 | 5.5 |
| T2 West (IAF) | 51 | | 2.0 | 3.0 | 3.0 | 4.5 | 6.5 | N/A | 6.0 | 6.0 |
| **TOTAL TURNS** | | | **307.0** | **347.5** | **354.0** | **370.0** | **388.0** | **N/A** | **405.5** | **405.5** |
| **Average Turns per Gate, per Day** | | | **5.7** | **6.4** | **6.6** | **6.9** | **7.2** | **N/A** | **7.4** | **7.4** |

* 2050 level of operations are effectively evaluated with the Runway Capacity scenarios.

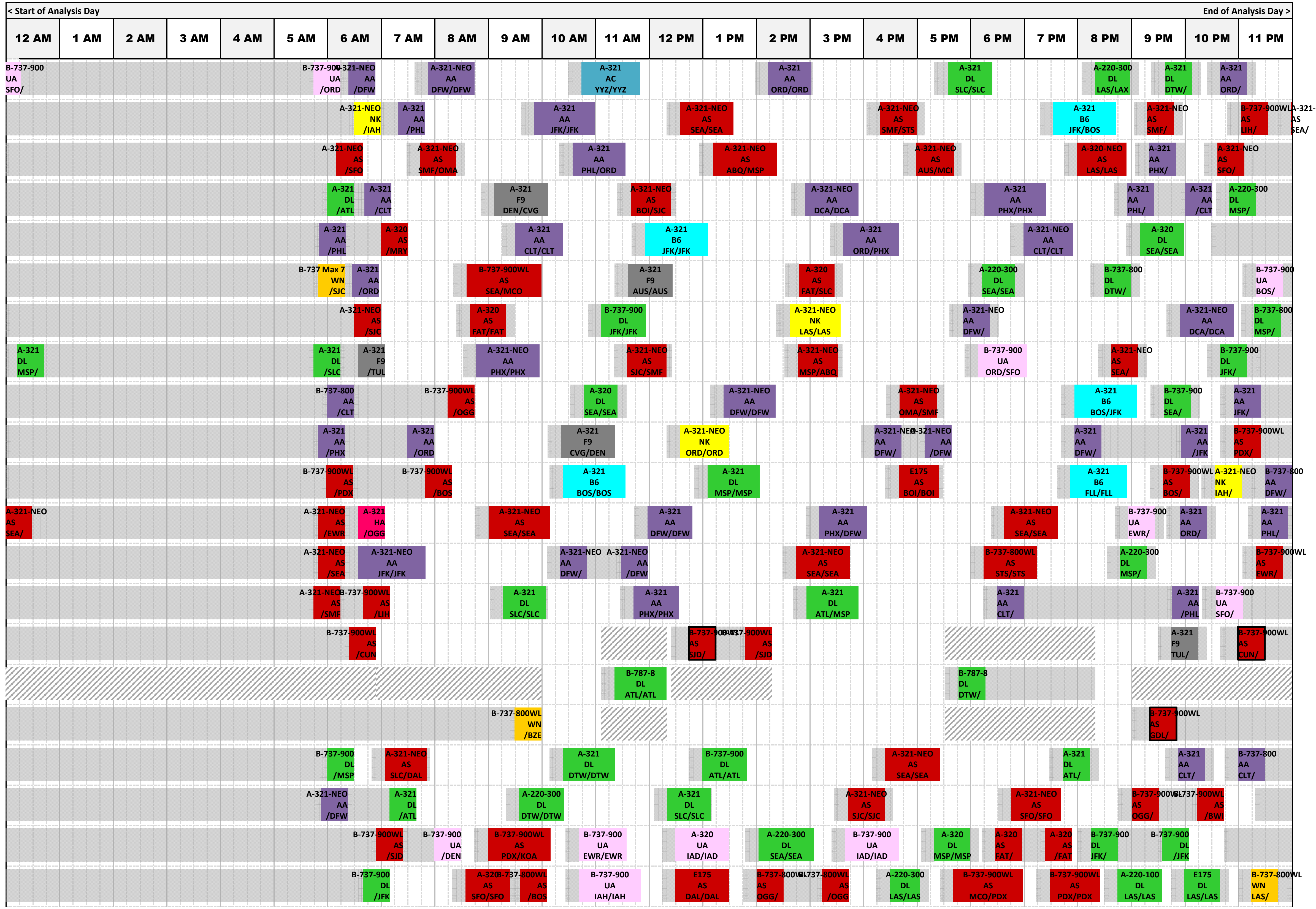
# San Diego International Airport
# Ramp Chart
# No Build at 292,000 Annual Operations - Runway Capacity Base Scenario Page 1 of 5

| Terminal | Position | Max Wingspan Acrft | Max Length Acrft | Turns in Design Day |
|---|---|---|---|---|
| 1 | 1A | B-737 Max 8 | B-737-Max9 | 11.5 |
| 1 | 1 | B-737 Max 8 | B-737-Max9 | 10 |
| 1 | 2 | B-737 Max 8 | B-737-Max9 | 11.5 |
| 1 | 3 | B-737 Max 8 | B-737-Max9 | 12 |
| 1 | 4 | B-737 Max 8 | B-737-Max9 | 11.5 |
| 1 | 5 | B-737 Max 8 | B-737-Max9 | 12 |
| 1 | 6 | B-737 Max 8 | B-737-Max9 | 11 |
| 1 | 7 | B-737 Max 8 | B-737-Max9 | 12 |
| 1 | 8 | B-737 Max 8 | B-737-Max9 | 11.5 |
| 1 | 9 | B-737 Max 8 | B-737-Max9 | 12 |
| 1 | 10 | B-737 Max 8 | B-737-Max9 | 11 |
| 1 | 11 | B-737 Max 8 | B-737-Max9 | 9 |
| 1 | 12 | B-737 Max 8 | B-737-Max9 | 10.5 |
| 1 | 13 | B-737 Max 8 | B-737-Max9 | 11.5 |
| 1 | 14 | B-737 Max 8 | B-737-Max9 | 10 |
| 1 | 15 | B-737 Max 8 | B-737-Max9 | 10 |
| 1 | 16 | B-737 Max 8 | B-737-Max9 | 10 |
| 1 | 17 | B-737 Max 8 | B-737-Max9 | 10 |
| 1 | 18 | B-737 Max 8 | B-737-Max9 | 12 |
| 2 | 20 | A-321-NEO | B-737-900WL | 11.5 |
| 2 | 21 | A-321-NEO | B-737-900WL | 10 |



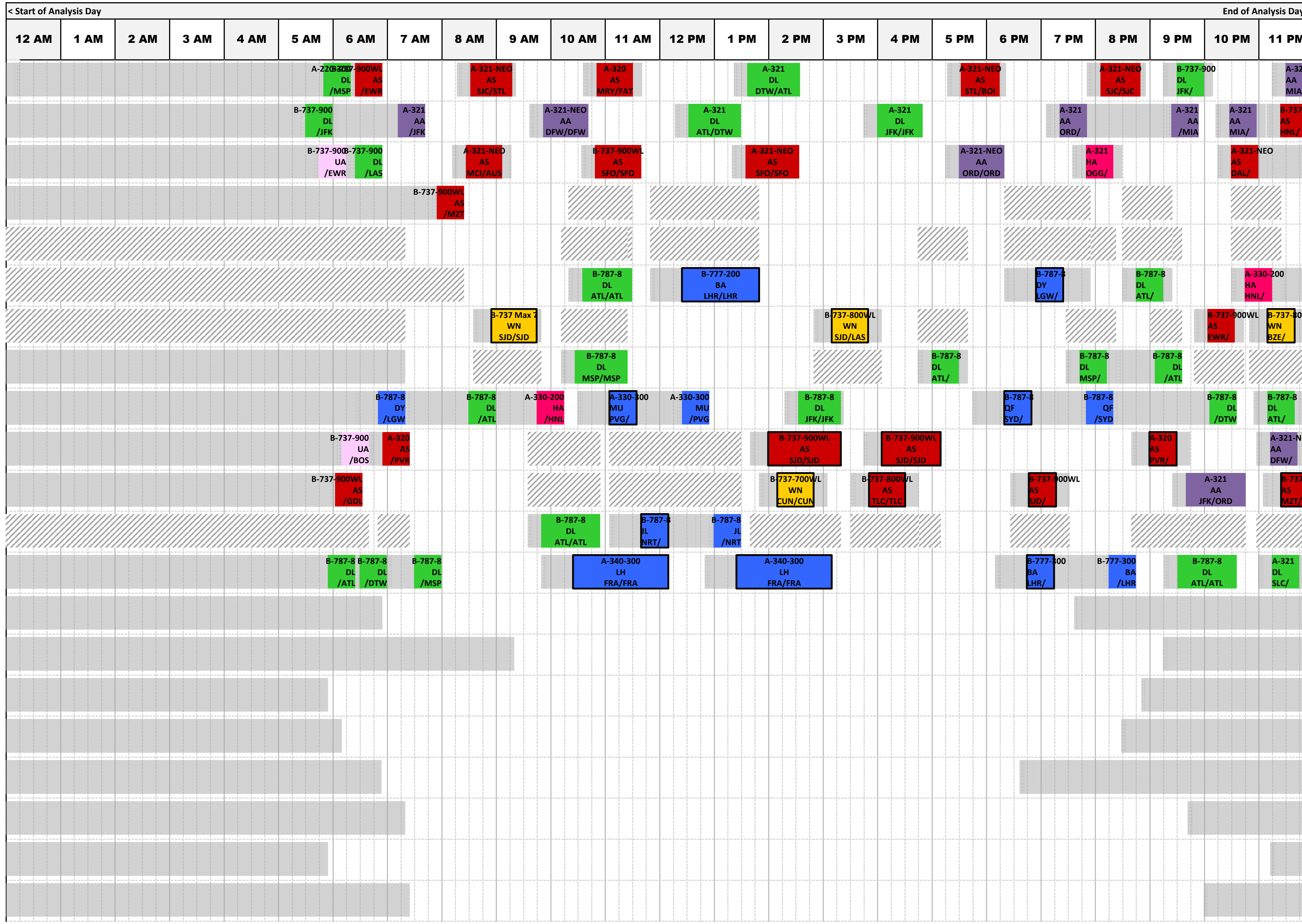
# San Diego International Airport
# Ramp Chart
# No Build at 292,000 Annual Operations - Runway Capacity Base Scenario Page 2 of 5

| Terminal | Position | Max Wingspan Acrft | Max Length Acrft | Turns in Design Day |
|---|---|---|---|---|
| 2 | 22 | DC-8-55 | B-747-400ER | 7.5 |
| 2 | 23 | B-757-200 | B-757-200 | 6.5 |
| 2 | 24 | B-767-300ERWL | B-787-9 | 6.5 |
| 2 | 25 | B-757-200 | B-757-200 | 6.5 |
| 2 | 26 | B-757-200 | B-757-200 | 6 |
| 2 | 27 | B-757-200 | B-757-200 | 6 |
| 2 | 28 | B-767-200 | B-767-200 | 5.5 |
| 2 | 29 | DC-10-40 | DC-10-40 | 6.5 |
| 2 | 30 | B-757-200 | B-757-200 | 6 |
| 2 | 31 | MD-11 | MD-11 | 5.5 |
| 2 | 32 | B-757-200 | B-757-200 | 6.5 |
| 2 | 33 | B-757-200 | B-757-200 | 7 |
| 2 | 34 | A-321-NEO | A-321 | 5.5 |
| 2 | 35 | B-757-200 | B-757-200 | 5.5 |
| 2 | 36 - IAF | B-737-Max9 | B-757-200 | 2.5 |
| 2 | 37A - IAF | B-747-400ER | B-777-200LR | 1.5 |
| 2 | 37 - IAF | B-757-200 | B-757-200 | 1 |
| 2 | 38 | B-757-200 | B-757-200 | 6 |
| 2 | 39 | B-757-200 | B-757-200 | 6 |
| 2 | 40 | A-321-NEO | B-737-900WL | 9 |
| 2 | 41 | A-321-NEO | B-737-900WL | 10.5 |



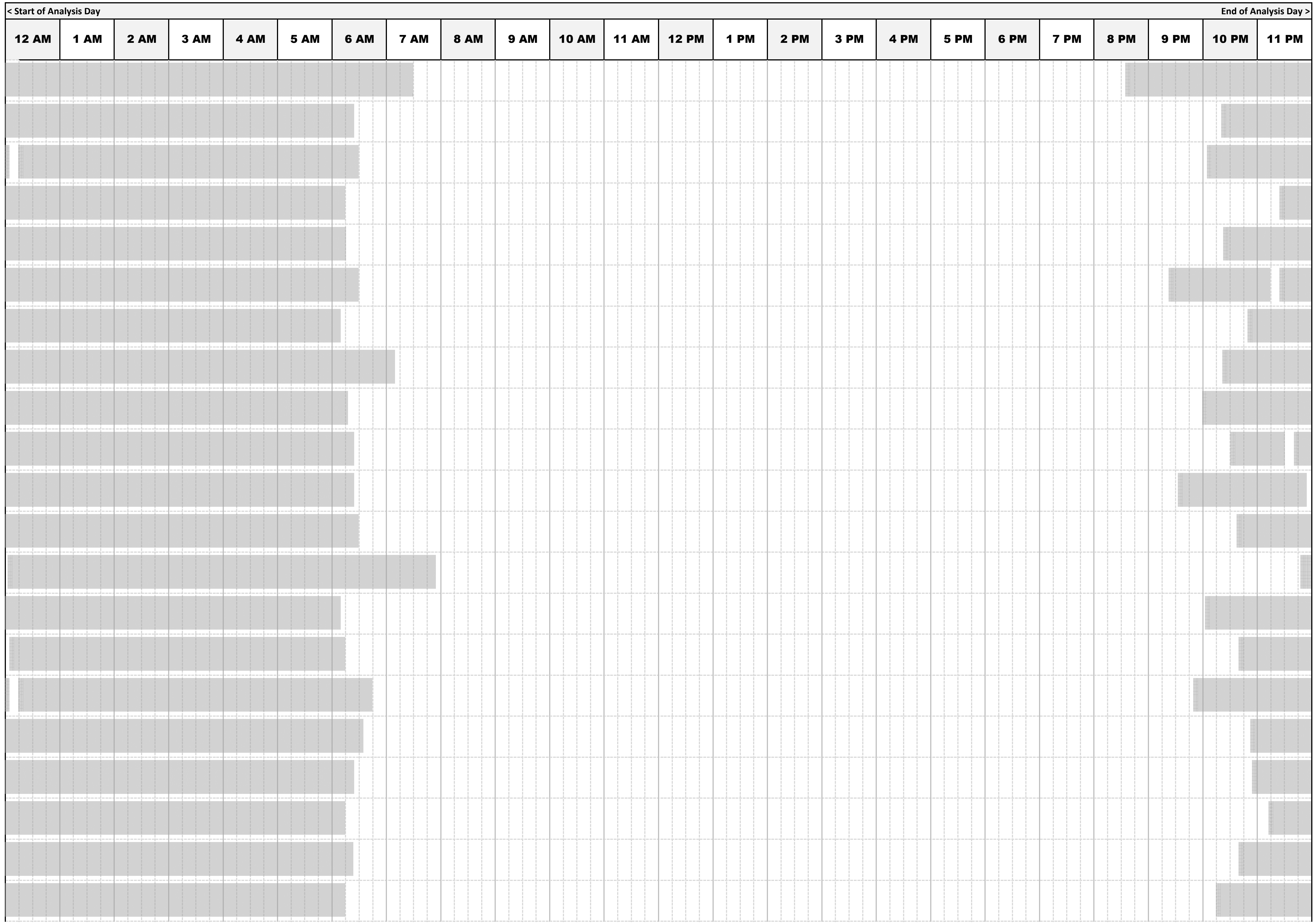
# San Diego International Airport
# Ramp Chart
# No Build at 292,000 Annual Operations - Runway Capacity Base Scenario Page 3 of 5

| Terminal | Position | Max Wingspan Acrft | Max Length Acrft | Turns in Design Day |
|---|---|---|---|---|
| 2 | 42 | B-757-200 | B-757-200 | 7.5 |
| 2 | 43 | B-767-300 | B-767-300 | 6 |
| 2 | 44 | B-757-200 | B-757-200 | 6.5 |
| 2 | 45 - IAF | B-757-200WL | B-757-300 | 0.5 |
| 2 | 46 - IAF | B-757-200WL | B-757-300 | 0 |
| 2 | 46A - IAF | B-747-400ER | B-777-300ER | 3.5 |
| 2 | 47 - IAF | B-757-200WL | B-757-300 | 3 |
| 2 | 47A - IAF | B-747-400ER | B-777-300ER | 2.5 |
| 2 | 48 - IAF | B-747-400ER | B-777-300ER | 5.5 |
| 2 | 49 - IAF | A-321-NEO | A-321 | 4 |
| 2 | 50 - IAF | A-321-NEO | A-321 | 4.5 |
| 2 | 50A - IAF | A-330-300 | A-330-300 | 2 |
| 2 | 51 - IAF | B-747-400ER | B-777-300ER | 6 |
| zRemote | R_01 | B-757-300 | B-757-300 | |
| zRemote | R_02 | B-757-300 | B-757-300 | |
| zRemote | R_03 | B-757-300 | B-757-300 | |
| zRemote | R_04 | B-757-300 | B-757-300 | |
| zRemote | R_05 | B-757-300 | B-757-300 | |
| zRemote | R_06 | B-757-300 | B-757-300 | |
| zRemote | R_07 | B-757-300 | B-757-300 | |
| zRemote | R_08 | B-757-300 | B-757-300 | |



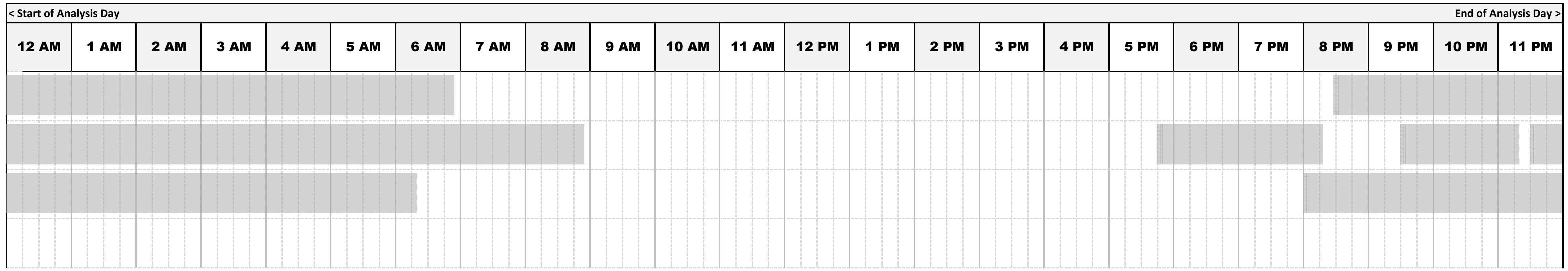
# San Diego International Airport
# Ramp Chart
# No Build at 292,000 Annual Operations - Runway Capacity Base Scenario Page 4 of 5

| Terminal | Position | Max Wingspan Acrft | Max Length Acrft | Turns in Design Day |
|---|---|---|---|---|
| zRemote | R_09 | B-757-300 | B-757-300 | |
| zRemote | R_10 | B-757-300 | B-757-300 | |
| zRemote | R_11 | B-757-300 | B-757-300 | |
| zRemote | R_12 | B-757-300 | B-757-300 | |
| zRemote | R_13 | B-757-300 | B-757-300 | |
| zRemote | R_14 | B-757-300 | B-757-300 | |
| zRemote | R_15 | B-757-300 | B-757-300 | |
| zRemote | R_16 | B-757-300 | B-757-300 | |
| zRemote | R_17 | B-757-300 | B-757-300 | |
| zRemote | R_18 | B-757-300 | B-757-300 | |
| zRemote | R_19 | B-757-300 | B-757-300 | |
| zRemote | R_20 | B-757-300 | B-757-300 | |
| zRemote | R_21 | B-757-300 | B-757-300 | |
| zRemote | R_22 | B-757-300 | B-757-300 | |
| zRemote | R_23 | B-757-300 | B-757-300 | |
| zRemote | R_24 | B-757-300 | B-757-300 | |
| zRemote | R_25 | B-757-300 | B-757-300 | |
| zRemote | R_26 | B-757-300 | B-757-300 | |
| zRemote | R_27 | B-757-300 | B-757-300 | |
| zRemote | R_28 | B-757-300 | B-757-300 | |
| zRemote | R_29 | B-757-300 | B-757-300 | |



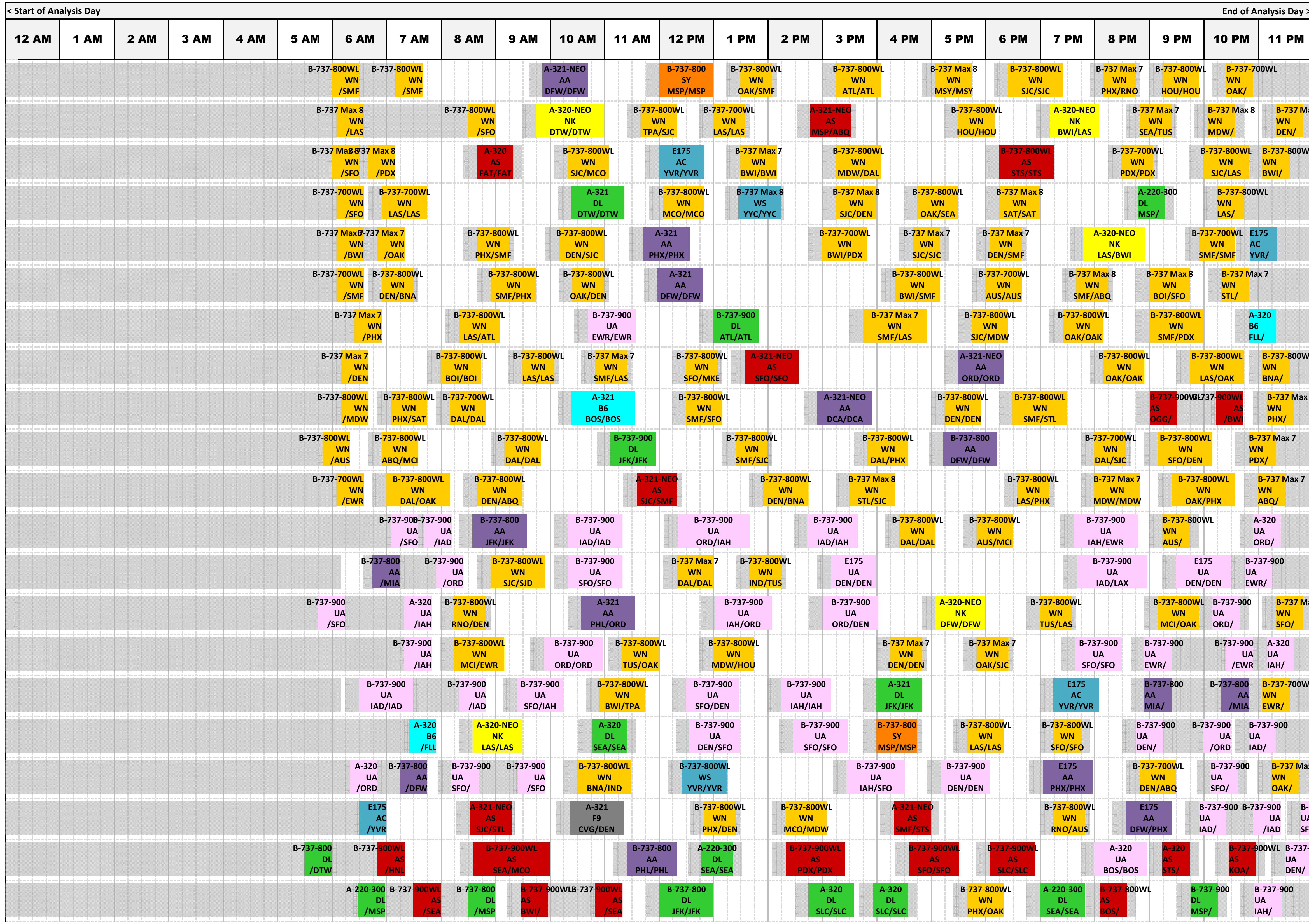
# San Diego International Airport
# Ramp Chart
# No Build at 292,000 Annual Operations - Runway Capacity Base Scenario Page 5 of 5

| Terminal | Position | Max Wingspan Acrft | Max Length Acrft | Turns in Design Day |
|---|---|---|---|---|
| zRemote | RWB_01 | A-330-300 | A-330-300 | |
| zRemote | RWB_02 | A-330-300 | A-330-300 | |
| zRemote | RWB_03 | A-330-300 | A-330-300 | |
| zRemote | RWB_04 | A-330-300 | A-330-300 | |



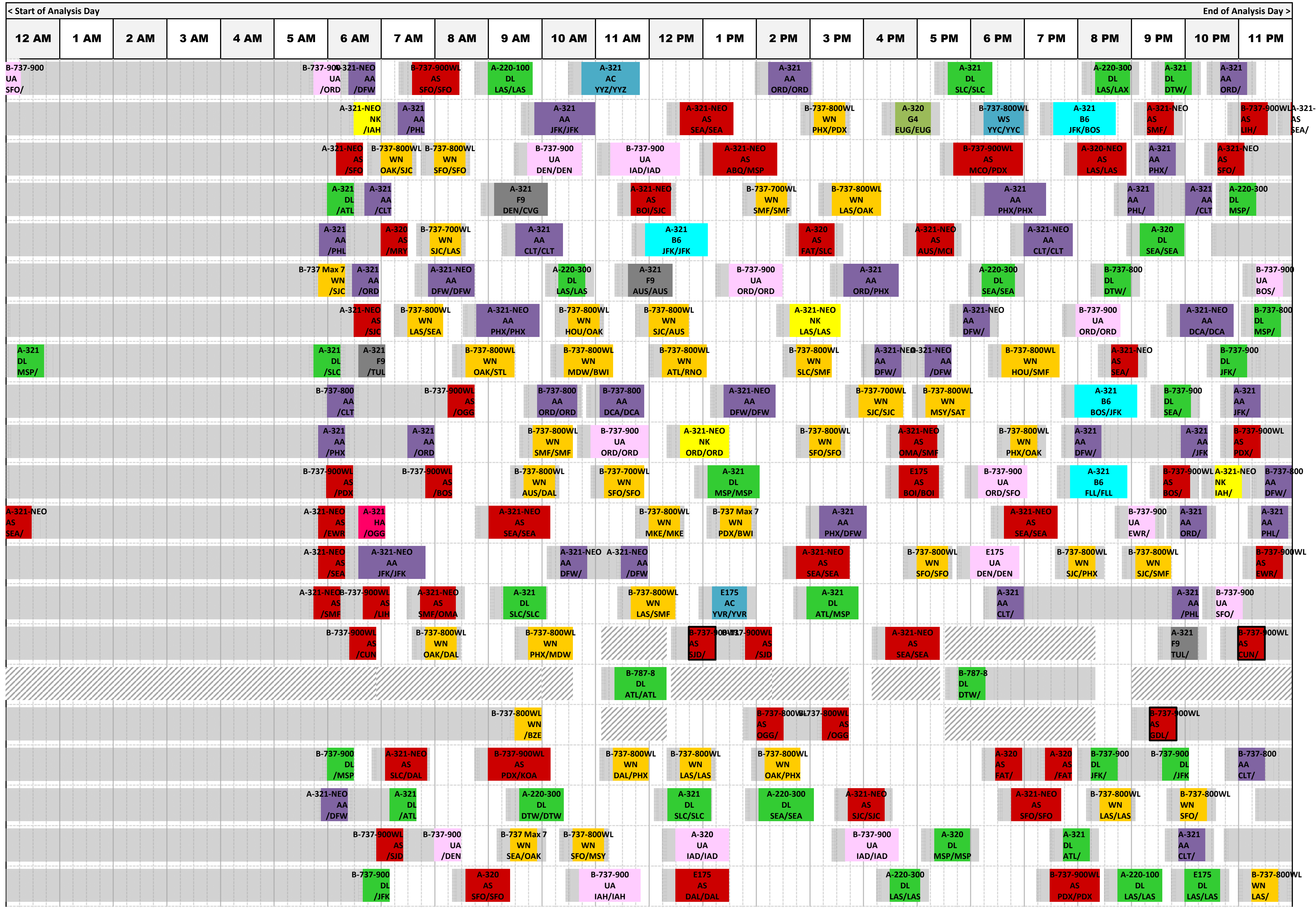
# San Diego International Airport
# Ramp Chart
# No Build at 292,000 Annual Operations - Runway Capacity Balanced Scenario Page 1 of 5

| Terminal | Position | Max Wingspan Acrft | Max Length Acrft | Turns in Design Day |
|---|---|---|---|---|
| 1 | 1A | B-737 Max 8 | B-737-Max9 | 9.5 |
| 1 | 1 | B-737 Max 8 | B-737-Max9 | 9 |
| 1 | 2 | B-737 Max 8 | B-737-Max9 | 8.5 |
| 1 | 3 | B-737 Max 8 | B-737-Max9 | 8.5 |
| 1 | 4 | B-737 Max 8 | B-737-Max9 | 9.5 |
| 1 | 5 | B-737 Max 8 | B-737-Max9 | 9 |
| 1 | 6 | B-737 Max 8 | B-737-Max9 | 8 |
| 1 | 7 | B-737 Max 8 | B-737-Max9 | 9 |
| 1 | 8 | B-737 Max 8 | B-737-Max9 | 9 |
| 1 | 9 | B-737 Max 8 | B-737-Max9 | 9 |
| 1 | 10 | B-737 Max 8 | B-737-Max9 | 9 |
| 1 | 11 | B-737 Max 8 | B-737-Max9 | 9 |
| 1 | 12 | B-737 Max 8 | B-737-Max9 | 8.5 |
| 1 | 13 | B-737 Max 8 | B-737-Max9 | 9.5 |
| 1 | 14 | B-737 Max 8 | B-737-Max9 | 9 |
| 1 | 15 | B-737 Max 8 | B-737-Max9 | 9 |
| 1 | 16 | B-737 Max 8 | B-737-Max9 | 9 |
| 1 | 17 | B-737 Max 8 | B-737-Max9 | 9 |
| 1 | 18 | B-737 Max 8 | B-737-Max9 | 9 |
| 2 | 20 | A-321-NEO | B-737-900WL | 9.5 |
| 2 | 21 | A-321-NEO | B-737-900WL | 9 |



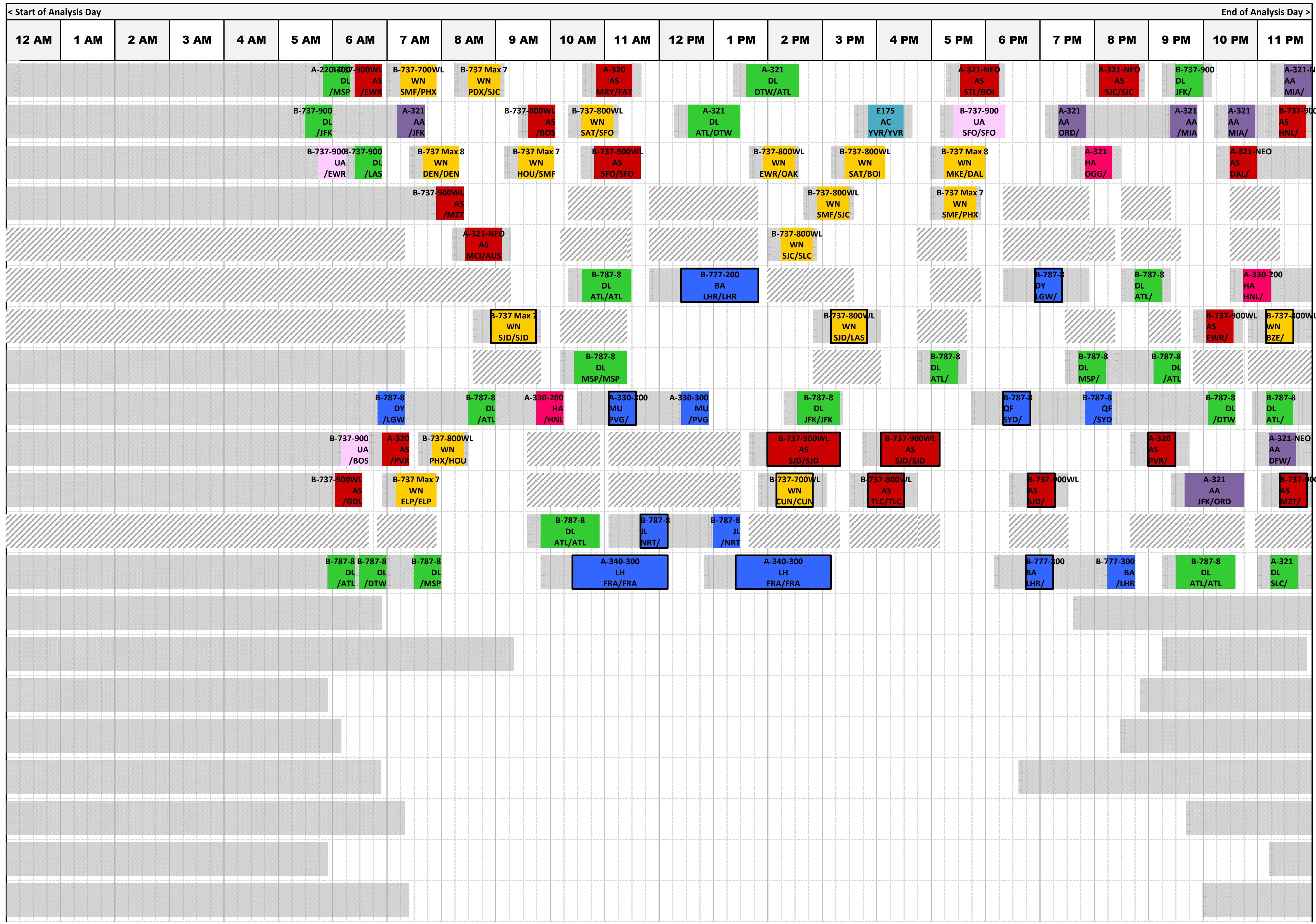
# San Diego International Airport
# Ramp Chart
# No Build at 292,000 Annual Operations - Runway Capacity Balanced Scenario


| Terminal | Position | Max Wingspan Acrft | Max Length Acrft | Turns in Design Day |
|---|---|---|---|---|
| 2 | 22 | DC-8-55 | B-747-400ER | 8.5 |
| 2 | 23 | B-757-200 | B-757-200 | 8.5 |
| 2 | 24 | B-767-300ERWL | B-787-9 | 8.5 |
| 2 | 25 | B-757-200 | B-757-200 | 7.5 |
| 2 | 26 | B-757-200 | B-757-200 | 8 |
| 2 | 27 | B-757-200 | B-757-200 | 8 |
| 2 | 28 | B-767-200 | B-767-200 | 8.5 |
| 2 | 29 | DC-10-40 | DC-10-40 | 8.5 |
| 2 | 30 | B-757-200 | B-757-200 | 8 |
| 2 | 31 | MD-11 | MD-11 | 8.5 |
| 2 | 32 | B-757-200 | B-757-200 | 8.5 |
| 2 | 33 | B-757-200 | B-757-200 | 8 |
| 2 | 34 | A-321-NEO | A-321 | 9 |
| 2 | 35 | B-757-200 | B-757-200 | 7.5 |
| 2 | 36 - IAF | B-737-Max9 | B-757-200 | 5.5 |
| 2 | 37A - IAF | B-747-400ER | B-777-200LR | 1.5 |
| 2 | 37 - IAF | B-757-200 | B-757-200 | 2 |
| 2 | 38 | B-757-200 | B-757-200 | 8 |
| 2 | 39 | B-757-200 | B-757-200 | 7.5 |
| 2 | 40 | A-321-NEO | B-737-900WL | 7 |
| 2 | 41 | A-321-NEO | B-737-900WL | 8 |



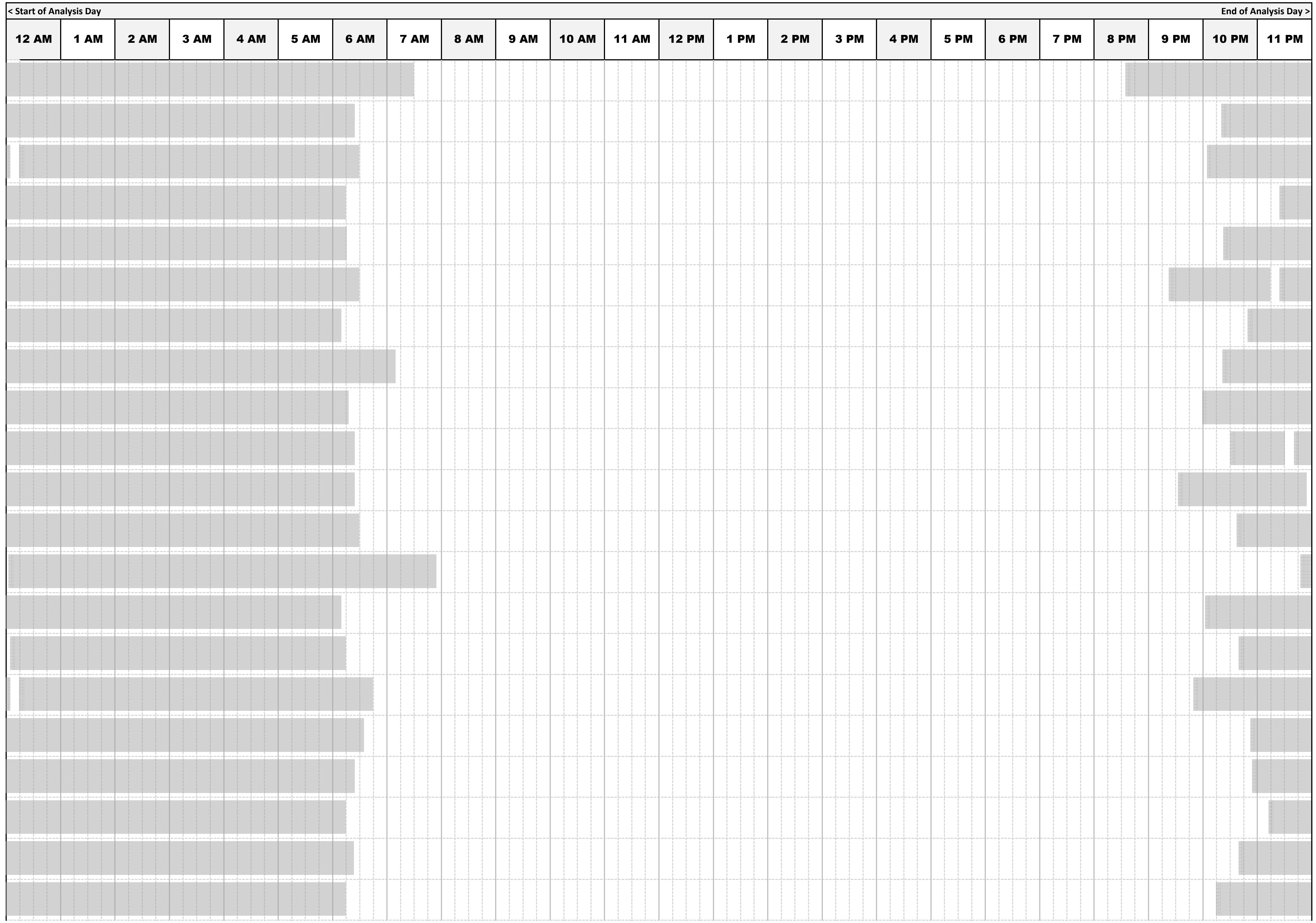
# San Diego International Airport
# Ramp Chart
# No Build at 292,000 Annual Operations - Runway Capacity Balanced Scenario Page 3 of 5

| Terminal | Position | Max Wingspan Acrft | Max Length Acrft | Turns in Design Day |
|---|---|---|---|---|
| 2 | 42 | B-757-200 | B-757-200 | 8.5 |
| 2 | 43 | B-767-300 | B-767-300 | 7.5 |
| 2 | 44 | B-757-200 | B-757-200 | 8.5 |
| 2 | 45 - IAF | B-757-200WL | B-757-300 | 2.5 |
| 2 | 46 - IAF | B-757-200WL | B-757-300 | 2 |
| 2 | 46A - IAF | B-747-400ER | B-777-300ER | 3.5 |
| 2 | 47 - IAF | B-757-200WL | B-757-300 | 3 |
| 2 | 47A - IAF | B-747-400ER | B-777-300ER | 2.5 |
| 2 | 48 - IAF | B-747-400ER | B-777-300ER | 5.5 |
| 2 | 49 - IAF | A-321-NEO | A-321 | 5 |
| 2 | 50 - IAF | A-321-NEO | A-321 | 5.5 |
| 2 | 50A - IAF | A-330-300 | A-330-300 | 2 |
| 2 | 51 - IAF | B-747-400ER | B-777-300ER | 6 |
| zRemote | R_01 | B-757-300 | B-757-300 | |
| zRemote | R_02 | B-757-300 | B-757-300 | |
| zRemote | R_03 | B-757-300 | B-757-300 | |
| zRemote | R_04 | B-757-300 | B-757-300 | |
| zRemote | R_05 | B-757-300 | B-757-300 | |
| zRemote | R_06 | B-757-300 | B-757-300 | |
| zRemote | R_07 | B-757-300 | B-757-300 | |
| zRemote | R_08 | B-757-300 | B-757-300 | |



# San Diego International Airport
# Ramp Chart
# No Build at 292,000 Annual Operations - Runway Capacity Balanced Scenario 

| Terminal | Position | Max Wingspan Acrft | Max Length Acrft | Turns in Design Day |
|---|---|---|---|---|
| zRemote | R_09 | B-757-300 | B-757-300 | |
| zRemote | R_10 | B-757-300 | B-757-300 | |
| zRemote | R_11 | B-757-300 | B-757-300 | |
| zRemote | R_12 | B-757-300 | B-757-300 | |
| zRemote | R_13 | B-757-300 | B-757-300 | |
| zRemote | R_14 | B-757-300 | B-757-300 | |
| zRemote | R_15 | B-757-300 | B-757-300 | |
| zRemote | R_16 | B-757-300 | B-757-300 | |
| zRemote | R_17 | B-757-300 | B-757-300 | |
| zRemote | R_18 | B-757-300 | B-757-300 | |
| zRemote | R_19 | B-757-300 | B-757-300 | |
| zRemote | R_20 | B-757-300 | B-757-300 | |
| zRemote | R_21 | B-757-300 | B-757-300 | |
| zRemote | R_22 | B-757-300 | B-757-300 | |
| zRemote | R_23 | B-757-300 | B-757-300 | |
| zRemote | R_24 | B-757-300 | B-757-300 | |
| zRemote | R_25 | B-757-300 | B-757-300 | |
| zRemote | R_26 | B-757-300 | B-757-300 | |
| zRemote | R_27 | B-757-300 | B-757-300 | |
| zRemote | R_28 | B-757-300 | B-757-300 | |
| zRemote | R_29 | B-757-300 | B-757-300 | |



# San Diego International Airport
# Ramp Chart
# No Build at 292,000 Annual Operations - Runway Capacity Balanced Scenario Page 5 of 5

| Terminal | Position | Max Wingspan Acrft | Max Length Acrft | Turns in Design Day |
|---|---|---|---|---|
| zRemote | RWB_01 | A-330-300 | A-330-300 | |
| zRemote | RWB_02 | A-330-300 | A-330-300 | |
| zRemote | RWB_03 | A-330-300 | A-330-300 | |
| zRemote | RWB_04 | A-330-300 | A-330-300 | |

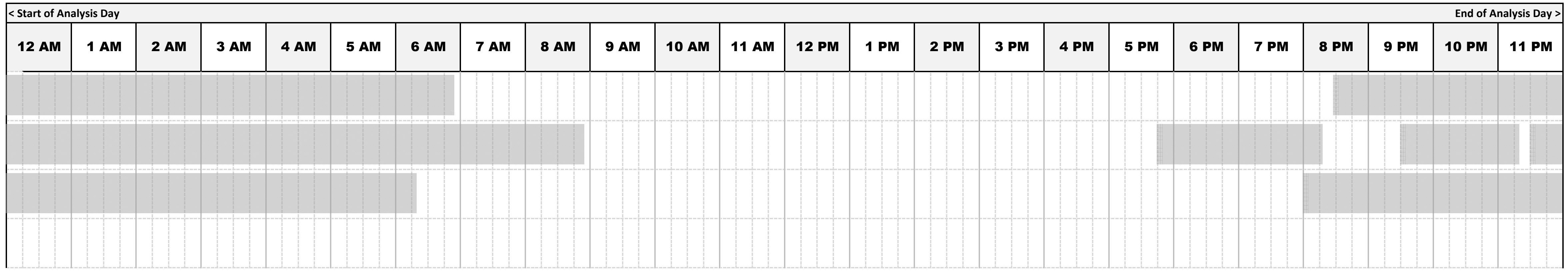


Table A3-2

**COMPARISON OF GATE UTILIZATION AT SAN DIEGO AND SELECTED SOUTHWEST AIRLINES AIRPORTS**

*Ranked by Southwest's daily turns per gate*

| City (airport code) | Number of gates | 2019 Scheduled departures | | Daily turns per gate | | Percent of departures |
|---|---|---|---|---|---|---|
| | | Annual | Peak month | Annual | Peak month | |
| **San Diego (SAN)** | | | | | | |
| **Southwest** | **11** | **41,195** | **3,642** | **10** | **11** | **40%** |
| **Other airlines** | **40** | **62,271** | **5,790** | **4** | **5** | **60%** |
| **Total** | **51** | **103,466** | **9,432** | **6** | **6** | **100%** |
| Los Angeles (LAX) | | | | | | |
| Southwest | 10 | 41,958 | 3,587 | 11 | 12 | 13% |
| Other airlines | 122 | 273,241 | 25,022 | 6 | 7 | 87% |
| Total | 132 | 315,199 | 28,609 | 7 | 7 | 100% |
| Dallas Love Field (DAL) | | | | | | |
| Southwest | 18 | 68,490 | 5,877 | 10 | 11 | 92% |
| Other airlines | 2 | 6,295 | 546 | 9 | 9 | 8% |
| Total | 20 | 74,785 | 6,423 | 10 | 10 | 100% |
| Oakland (OAK) | | | | | | |
| Southwest | 13 | 41,968 | 3,608 | 9 | 9 | 72% |
| Other airlines | 17 | 16,637 | 1,696 | 3 | 3 | 28% |
| Total | 30 | 58,605 | 5,304 | 5 | 6 | 100% |
| Baltimore (BWI) | | | | | | |
| Southwest | 25 | 72,757 | 6,517 | 8 | 8 | 63% |
| Other airlines | 45 | 42,761 | 3,942 | 3 | 3 | 37% |
| Total | 70 | 115,518 | 10,459 | 5 | 5 | 100% |
| Denver (DEN) | | | | | | |
| Southwest | 25 | 72,774 | 6,639 | 8 | 9 | 24% |
| Other airlines | 112 | 234,037 | 21,822 | 6 | 6 | 76% |
| Total | 137 | 306,811 | 28,461 | 6 | 7 | 100% |
| Chicago (MDW) | | | | | | |
| Southwest | 34 | 79,713 | 7,074 | 6 | 7 | 89% |
| Other airlines | 9 | 9,458 | 866 | 3 | 3 | 11% |
| Total | 43 | 89,171 | 7,940 | 6 | 6 | 100% |
| Phoenix (PHX) | | | | | | |
| Southwest | 26 | 61,373 | 5,749 | 6 | 7 | 32% |
| Other airlines | 90 | 128,270 | 11,984 | 4 | 4 | 68% |
| Total | 116 | 189,643 | 17,733 | 4 | 5 | 100% |
| Las Vegas (LAS) | | | | | | |
| Southwest | 33 | 70,901 | 6,255 | 6 | 6 | 38% |
| Other airlines | 59 | 114,329 | 10,053 | 5 | 5 | 62% |
| Total | 92 | 185,230 | 16,308 | 6 | 6 | 100% |
| Orlando (MCO) | | | | | | |
| Southwest | 30 | 41,363 | 4,113 | 4 | 4 | 25% |
| Other airlines | 99 | 126,865 | 11,628 | 4 | 4 | 75% |
| Total | 129 | 168,228 | 15,741 | 4 | 4 | 100% |

Note: Peak month data are for the airport as a whole.

Sources: Gates--Airline website terminal maps. Scheduled departures--OAG Worldwide Aviation Ltd, online database accessed March 2021.

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Appendix A4

# Project Design Features/Commitments

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# Table of Contents

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# Appendix A4

# Project Design Features/Commitments

The San Diego County Regional Airport Authority (SDCRAA) has included a number of project design features and measures as part of the Proposed Project to minimize environmental effects. The SDCRAA has committed to implementing these design features and measures. The following sections describe the project design features and commitments, organized by the subject environmental resource topic.

## A4.1 Air Quality and Climate Impact Minimization Project Design Features/ Commitments

- **Ground Support Equipment (GSE) Conversion**
  - All baggage tugs, belt loaders, lifts, pushback tractors, and utility carts at SAN that are owned and operated by airlines and their ground handling contractors to service aircraft, shall be transitioned to alternative fuels (i.e., electric, natural gas, renewable diesel, biodiesel) by 2024.
  - Additionally, by 2024, 50 percent of gasoline-fueled GSE that are light duty vehicles owned and operated by SDCRAA would be replaced with hybrid electric or alternative fuel vehicles and 100 percent of diesel-fueled GSE that are owned and operated by SDCRAA would be replaced with hybrid electric or alternative fuel vehicles.
- **Renewable Electricity**
  - Project-related buildings shall be powered by 100 percent renewable electricity by 2024 and continuing thereafter through on-site generation resources, grid-delivered purchases, and/or renewable energy certificates.
- **Ground Power and Preconditioned Air**
  - All new aircraft gates shall be equipped with ground power (400 hertz) and preconditioned air.
- **Cool Roof**
  - The Proposed Project shall include roofing materials with a minimum 3-year aged solar reflection and thermal emittance or solar reflection index equal to or greater than the values specified in the voluntary measures under 2016 California Green Building Standards Code.
- **LEED Silver Certification**
  - The Proposed Project shall demonstrate achievement of at least Leadership in Energy and Environmental Design (LEED) Silver certification (or equivalent green rating certification) for all new major facilities, including the replacement Terminal 1, the new parking structure, and the replacement SDCRAA administration building.

- **Clean Vehicle Parking**
  - The Proposed Project shall designate 10 percent of new parking stalls for a combination of low-emitting, fuel-efficient, and carpool/vanpool vehicles.
- **Electric Vehicle Chargers**
  - The Proposed Project shall install electric vehicle charging ports at three percent of new parking stalls and another three percent would be electric vehicle supply equipment-ready.
- **Ground Transportation Clean Vehicle Program**
  - In conjunction with the Proposed Project, SAN's current Commercial Ground Transportation Clean Vehicle Program shall be extended until 2030, to incentivize the commercial operator fleets to achieve an average GHG rating of 10 (0-204 $gCO_2$/mile) by 2030 as scored by fueleconomy.gov (or an equivalent program).
- **Electric On-Airport Shuttles**
  - In conjunction with the Proposed Project, on-airport shuttles serving passenger and employee parking lots, and inter-terminal transfers shall be transitioned to electric vehicles (all-electric or plug-in hybrid) by 2026. The buses serving the Rental Car Center shall be transitioned to electric vehicles by 2028.
- **Bicycle Facilities**
  - To facilitate active transportation commuting, the Proposed Project shall install shower stalls and lockers in the new SDCRAA administration building and in the new terminal building based on the number of employees and guidance provided in the City of San Diego's Climate Action Plan Consistency Checklist (estimated at 7 shower stalls and 25 lockers total). In addition, covered bicycle storage shall be installed for SDCRAA and tenant employees based on non-public square footage and guidance provided in the City of San Diego's Climate Action Plan Consistency Checklist (estimated at 50 bike spaces total).
- **Employee Parking Cash-Out Program**
  - SDCRAA shall implement a parking cash-out program for its employees.

## A4.2 Biological Resources Impact Minimization Project Design Features/ Commitments

- **California Least Tern: Construction Measures**
  - All project construction within 800 feet of the SAN least tern nesting area will occur from September 16 to March 31 to avoid the tern nesting season.
  - A tern biologist will monitor the tern during construction occurring between 800 feet to 1,200 feet of any nesting least tern area during the tern nesting season (April 1- September 15) and will immediately notify the Resident Engineer (RE; or acting RE) of any construction activity that may lead to, or likely result in, the disruption of the tern, its young, or its eggs. If the tern biologist determines that adverse effects to the tern have occurred, the RE will be notified and all project construction activities will cease

immediately, except those activities necessary to make SAN safe and operational. The tern biologist, in coordination with the RE, will contact the FAA and U.S. Fish and Wildlife Service (USFWS) immediately after stopping construction. Construction will not resume until approved by the FAA and USFWS. The tern biologist will submit daily field reports to the FAA and USFWS on the status of the nesting activity, any construction-related incidents that disrupted tern nesting, and any action taken by the RE to avoid further incidents, within 24 hours of each monitoring date. The tern biologist will also submit a final summary report of monitoring to the FAA and USFWS by October 1.

- Trash will be properly disposed of and workers will not feed potential tern predators in the area. The SDCRAA will require the contractor to provide trash dumpsters or other covered trash receptacles for use by construction personnel. All food items or containers that previously held food items obtained/handled/controlled by construction personnel will be immediately disposed of in these dumpsters or containers, so as not to attract avian or mammalian predators of the least tern.
- Construction personnel will not be permitted to feed cats, gulls, pigeons, ravens, or any other wildlife, as this may result in an increase in the numbers of these potential predators in the vicinity of tern chicks and eggs.
- Crane booms or similar equipment that have heights of 25 feet or greater located between 800 feet to 1,200 feet of any nesting least tern area during the tern nesting season (April 1- September 15) will be lowered at the close of each construction day, if possible.
- A pre-construction meeting will be held to make all contractor personnel that will be working between 800 feet to 1,200 feet of any nesting least tern area during the tern nesting season (April 1- September 15), including all construction staff, aware of the tern nesting issue and the specific conditions of construction. Project status meetings will be regularly held to remind all such personnel of the measures required to protect the tern as well as any modifications made to ensure their effectiveness. The USFWS will be notified of the date and time of the pre-construction and status meetings in order to attend, if needed or desired.
- Nighttime construction occurring between 800 feet to 1,200 feet of any nesting least tern area during the tern nesting season (April 1- September 15) will be limited to those activities that are necessary to maintain airfield operations during normal operational times. Should such nighttime construction be required, the tern biologist will be onsite and perform the duties specified above.
- Night lighting for project construction occurring between 800 feet to 1,200 feet from the SAN least tern nesting area will be kept to a minimum during the tern nesting season (April 1- September 15), and will not be used unless active construction or other essential work is occurring. Should such nighttime construction or other essential work be conducted, all lighting associated with the work will be shielded from or directed away from the least tern nesting area.
- Continued diligent maintenance of fencing around the perimeter of the ovals to shield the terns from lighting, predators, and unauthorized human access.

  - The new airport entry road to the south of the nesting ovals shall not rise above existing surface grade and shall not alter the elevation of roadway structures directly to the south of the nesting ovals.

- **California Least Tern: Operations Measures**
  - New facilities shall be designed to minimize potential perching locations; all structures taller than ten feet and within 200 feet of the nesting ovals, including light poles and sign structures, shall be required to use anti-perch treatments such as stainless steel bird spike barriers that can be applied to potential perch sites (e.g., Nixalite).
  - Any new landscaping shall be limited to plant species and materials not conducive to perching by birds.
  - Continued diligent maintenance of fencing around the perimeter of the ovals to shield the terns from lighting, predators, and unauthorized human access.
  - Continued habitat management within the ovals including application of herbicide and removal of vegetation.

## A4.3 Hazardous Materials Impact Minimization Project Design Features/ Commitments

- **Preparation of Hazardous Materials Management Plan (HMMP):** Prior to site excavation activities and/or construction-related dewatering at the project site, a Hazardous Materials Management Plan (HMMP) shall be prepared by the construction contractor and submitted to SDCRAA for verification, and include the following:
  - Delineation of roles and responsibilities, including those of the Contractor and those of SDCRAA;
  - Procedures for identification, initial screening, and notification, of contaminated soil and/or groundwater encountered during site excavation;
  - Procedures to secure/cordon-off area known to be or suspected of being contaminated;
  - Procedures for decontamination of personnel and equipment leaving the secured area known to be or suspected of being contaminated;
  - Procedure for assessing the nature and extent of contamination, and the approach to managing the contaminated soil/groundwater, including excavation/pumping, handling, storage, transport, and disposition (i.e., treatment/disposal); and
  - Site-specific Health and Safety Plan for the safety and protection of construction workers, airport employees, and the general public from exposure to impacted soil, dust, and groundwater during construction activities.
  - Site-specific Health and Safety Plans to address the following areas (as identified on Figures 3.9-2 through 6 of the EA) with management measures for segregation, containment, and disposal of impacted materials, as appropriate, for the specific issues of concern:

- *South Side of Building 2320*: Presence of impacted soil and groundwater by total petroleum hydrocarbons and metals in the vicinity of Soil Boring B30.
- *West Side of Building 2417, South Side of Building 2415, and North Side of Washdown Pad*: Elevated levels of volatile organic compounds in groundwater samples from these areas.
- *North of Terminal 1 East Rotunda*: Elevated levels of total petroleum hydrocarbons and semi-volatile organic compounds in groundwater and soil.

- **Existing Groundwater Monitoring Wells:** In conjunction with the demolition of Terminal 1, the following measure shall be completed:
  - The suspected location of monitoring well MW-3 shall be investigated to confirm the presence or absence of the well. All monitoring wells located within Proposed Project development areas or that could otherwise be disturbed by project construction would be properly destroyed in accordance with the requirements of, and be subject to permit approval by, the County Department of Environmental Health. Should any monitoring wells associated with an open case be disturbed, the lead agency overseeing the open case shall be notified and any requirements identified by the agency associated with well disturbance shall be adhered to.
- **Hazardous Building Materials Abatement:** Prior to building demolition, the following activities shall be implemented:
  - SDCRAA shall retain a State of California-licensed asbestos/lead abatement contractor to perform abatement of asbestos containing material (ACM), asbestos containing construction material (ACCM), lead-based paint (LBP), or lead-containing paint (LCP) that could potentially be disturbed.
  - Prior to the initiation of abatement or demolition work, the abatement or demolition contractor must complete the Notification of Demolition or Asbestos Removal form and submit it to the County of San Diego Air Pollution Control District (SDAPCD) in compliance with Rule 1206 at least 10 business days before the start of abatement or demolition. SDAPCD will return the form, with a "notification number" added, to the abatement or demolition contractor, depending on who submitted the form.
  - The asbestos/lead abatement contractor shall provide written notification to the local CalOSHA district office regarding its "Intent to Conduct Asbestos Related Work" and/or "Intent to Conduct Lead-Related Work." These notifications should be submitted at least 24 hours in advance of performing the respective asbestos-related or lead-related work.
  - Other potentially hazardous building materials, including mercury-containing equipment, polychlorinated biphenyl (PCB)-containing equipment, lead-containing batteries, chlorofluorocarbon (CFC)-containing equipment, and Universal Wastes (e.g., fluorescent light tubes) will require segregation and may require further testing and analysis to determine whether they meet the definition of a hazardous waste in California and can be managed under the Universal Waste Rules. Hazardous wastes would only be handled by properly trained workers.

  - Notification should be provided to contractor and subcontractor personnel as to the presence of ACMs, ACCMs, LBPs, LCPs, and other hazardous building materials at the site.

- **Vapor Intrusion Assessment:** In conjunction with building design of the new Terminal 1, the following measure shall be completed:
  - A soil vapor survey with accompanying human health risk assessment shall be prepared for the area proposed for the new Terminal 1 building. If found warranted by the results of that assessment, remediation, such as in-situ soil vapor extraction (SVE) or ex-situ excavation and treatment, shall be implemented to reduce levels to below site-specific risk-based concentrations (RBC), or a vapor intrusion mitigation system shall be incorporated into the design of the new Terminal 1 building to ensure that indoor air concentrations do not exceed regulatory thresholds. As part of that effort, the 2014 vapor intrusion investigation for the former Teledyne Ryan Facility site shall be reviewed as it pertains to future buildings within the subject area.

## A4.4 Archaeological and Cultural Resources Impact Minimization Project Design Features/Commitments

- **Unanticipated Discovery**
  - In the event of unanticipated discovery of significant subsurface archaeological resources, the SDCRAA will follow steps set forth in 36 CFR 800.13 Post Review Discovery.
- **Tribal Cultural Resources:**
  - In consultation with the Jamul Indian Village Tribe, the SDCRAA will provide the tribe with any cultural and geological reports that are either available or come available. In consultation with the Viejas Tribal Government, the SDCRAA has agreed to respect the cultural perspective of the Native American Community that the SAN property was part of the traditional use area for Native Americans during the prehistoric habitation of the bay area. Because of the Native American history in the area, the SDCRAA will accommodate the request by the Viejas Tribal Government that a Kumeyaay Cultural Monitor be present during excavation activities associated with implementation of the Proposed Project. This Excavation Monitoring will be limited to those areas of the construction project that are located beneath the modern dredge and fill soils that were imported to this location to create the airport. Monitoring the excavation of any soil associated with imported fill material will not be required. The Excavation Monitoring will be conducted in the area designated for the Proposed Project, which includes the replacement of Terminal 1, a new parking facility, and associated roadway and aircraft apron improvements that are within the planning jurisdiction of the SDCRAA. Native American monitoring will always be conducted in conjunction with archaeological monitoring, and a qualified archaeologist will be responsible for the determination of when appropriate soil horizons are encountered that would necessitate Native American and archaeological monitoring. The specifics of the Excavation Monitoring program, including identification of areas to be monitored, will be described in a Memorandum of Agreement, which will be prepared and agreed to by the SDCRAA and the Viejas Tribal Government.

## A4.5 Construction Traffic Impact Minimization Project Design Features/ Commitments

- **Establish a Construction Coordination Office within the Ground Transportation Department:** This office would operate during the life of the Proposed Project construction period to coordinate deliveries, monitor traffic conditions, advise motorists about detours, congested areas, and alternative parking areas, and monitor and enforce delivery times and routes. The SDCRAA will periodically analyze traffic conditions on designated routes during construction to evaluate and optimize the transportation system during the construction period.

  This office will undertake a variety of duties, including but not limited to:

  - Review traffic control plans that will be required as part of construction contracts in order to ensure that construction worker and truck trips are minimized during a.m. and p.m. peak hours and will not use residential streets to access SAN;
  - Inform motorists about detours, alternative parking, and congestion by use of static or changeable message signs, media announcements, airport website, airport information roadway radio station, etc.;
  - Work with police to enforce delivery times and routes, including specified truck routes;
  - Establish staging areas;
  - Coordinate with emergency response agencies to maintain emergency access and response times;
  - Coordinate Caltrans and city roadway projects with SAN projects, so as to minimize impacts to travel;
  - Monitor and coordinate deliveries, with emphasis on avoiding peak commute hours whenever possible;
  - Establish detour routes;
  - Work with transit agencies to minimize disturbances to bus routes/stops along Harbor Drive and on SAN;
  - Coordinate with the City of San Diego Development Services Department on construction activity proposed to occur in City right-of-way to obtain the necessary traffic control permits, and to accommodate pedestrian and bicycle access at all times during construction, as required;
  - Work with neighbors to address their concerns regarding construction activity traffic; and
  - Analyze traffic conditions to determine the need for additional traffic controls, communication, signal modifications, lane restriping, rerouting, etc.

- **Require Orientation for Construction Personnel:** All construction personnel will be required through contractual means to participate in a project-specific orientation that includes where to park, where staging areas are located, construction policies, delivery routes, detours, airport construction area driving protocol, etc., in addition to airport safety and security issues training. It should be noted that construction work hours would typically begin before 7:00 a.m. and end by 3:00 p.m. or 3:30 p.m., which serves to minimize, if not avoid, construction worker commute traffic occurring at the same time as typical morning and afternoon peak commute hours.

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