3 Alternatives

The alternatives analysis is prepared pursuant to Council on Environmental Quality (CEQ) regulations and Federal Aviation Administration (FAA) guidance provided in FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures* (FAA Order 1050.1F). This chapter discusses the following topics:

- Alternative Development Process
- Alternatives Overview
- Comparison of Alternatives
- Listing of Federal Laws and Regulations

The technical terms and concepts discussed in this Chapter are explained in Chapter 1, *Background*.

3.1 San Antonio Airspace Modernization Project Alternative Development

Developing alternatives for the San Antonio Airspace Modernization Project was a multi-step process that began with the request of instrument flight procedures (IFPs) to be improved in April of 2015. A preliminary PBN Design Team defined operational issues related to improving efficiency, reducing complexity, and improving predictability in the (then unnamed) San Antonio Airspace Modernization Project in March of 2016 and recommended conceptual designs for procedures that would address these issues.[23] The recommended procedures were reported to the PBN Design Team for further consideration and procedure development. The PBN Design Team designed individual procedures based on the evolving recommendations and captured input from regional stakeholders. Each procedure that the PBN Design Team designed had to meet several design criteria as well as the project's purpose and need. As discussed in Chapter 2, the purpose and need for the Proposed Action is to address existing inefficiencies with San Antonio Airspace Modernization Project aircraft instrument arrival and departure procedures. The FAA rejected individual procedures if, on their own merit, they did not meet the purpose and need of the project. Following the design process, the PBN Design Team held a series of public outreach meetings to introduce the eventual San Antonio Airspace Modernization Project to relevant organizations, communities, and officials via web based presentations to gather comments on the proposed designs (see Appendix B). The feedback received from this community involvement was instructive and considered in the alternative development process.

The Proposed Action alternative that this EA evaluates is a package of many individual, interrelated procedures combined into one alternative. These procedures were considered and evaluated individually and in combination with one another to determine whether the alternative would meet the project's purpose and need. The FAA considered multiple versions of each air traffic procedure. Several versions were not carried forward as they failed to meet the purpose of the project. More detail on the various iterations of each procedure can be found in Appendix G: *FAA PBN Design Team Briefing*.

The following sections describe the alternatives development process the FAA used to create and evaluate a series of procedures that, when employed together, would enhance the air traffic efficiency to the San Antonio region.

23 *KSAT Procedures, Intro, and Engagement Planning – Updated Jan31 (kka).pdf*, February 2022.

3.1.1 PBN Design Team

In August 2015, the San Antonio Airspace Modernization Project PBN Design Team began work to identify operational needs in the San Antonio Airspace Modernization Project and define potential solutions to those needs. The PBN Design Team included experts on the Air Traffic Control (ATC) system for the San Antonio region. The PBN Design Team's work was completed following a multi-step process that included: (1) working collaboratively with local aviation facilities and industry stakeholders to identify and characterize existing issues in the San Antonio Airspace Modernization Project, (2) proposing conceptual procedure designs and airspace changes to address these issues, and (3) identifying the expected benefits and potential risks associated with the conceptual designs.

During the first two steps above, the PBN Design Team held meetings with local FAA ATC facilities, industry representatives, and other stakeholders including the Department of Defense, business and general aviation interests, and airports.[24] These meetings were held to discuss potential needs for operating aircraft in the San Antonio Airspace Modernization Project, including identifying operational needs associated with existing procedures and potential solutions that would increase efficiency in the airspace. The PBN Design Team also worked to analyze the expected benefits of the potential solutions identified. Finally, the PBN Design Team engaged with specialized experts to help identify the benefits and risks associated with the conceptual procedure designs. The specialized experts were from various FAA lines of business, including environmental, safety, and airports.

The PBN Design Team identified several performance-based navigation (PBN) solutions expected to improve efficiency in the San Antonio Airspace Modernization Project. The modifications proposed were conceptual in nature, and did not include a detailed technical assessment to evaluate the feasibility of the procedures. A detailed technical assessment of the proposed solutions was reserved for the PBN Design Team to conduct.[25] The PBN Design Team issued its final presentation (Appendix G) in February 2022.

3.1.2 Key PBN Design Team Considerations

Following draft completion of the designs, the PBN Design Team engaged the public (i.e., local residents, the general public, and stakeholders) by holding a series of informational meetings on the San Antonio Airspace Modernization Project. In developing the proposed procedures, the PBN Design Team was responsible for following regulatory and technical guidance, as well as meeting criteria and standards in three general categories:

1. **Performance Based Navigation (PBN) Design Criteria and Air Traffic Control Regulatory Requirements** – Flight procedure design is subject to requirements found in several FAA Orders, including:
    a. FAA Order 8260.58B, *The United States Standard Performance Based Navigation (PBN) Instrument Procedure Design*
    b. FAA Order JO 7110.65Y, *Air Traffic Control*
    c. FAA Order 8260.3E, *United States Standards for Terminal Instrument Procedures (TERPS) including Change 1*
    d. FAA Order 7100.41A, *Performance Based Navigation Implementation Process*
    e. FAA Order 8260.19I, *Flight Procedures and Airspace*
    f. FAA Order 8260.46J, *Departure Procedure (DP) Program*

24 Id.
25 Id.

These FAA Orders collectively define the majority of processes, procedures, and methods for PBN flight procedure design, amendment, and implementation. Requirements governing air traffic control procedures, air traffic management, and appropriate technical terminology are additionally considered as integral process components

2. **Operational Criteria** – Operational criteria were consistent with the purpose and need for the project. This includes increasing efficiency and flexibility while decreasing complexity in air traffic management. These criteria were evaluated and validated that operations in the San Antonio Airspace Modernization Project would not be limited by the proposed procedures. The evaluation and validation helped ensure that aircraft could fly the proposed procedure as designed without any negative effects on efficiency (e.g., pilot workload).

3. **Safety Factors** – Proposed changes were evaluated using the FAA's Air Traffic Organization (ATO) Safety Management System (SMS).[26] The SMS is the system for assessing and managing the safety of ATC and navigation services in the National Airspace System (NAS). If a proposed change introduced a new hazard or increased the severity and/or likelihood of an existing hazard, the design was adjusted or mitigated to reduce the hazard to acceptable levels. In compliance with SMS requirements, the proposed changes were evaluated by a Safety Risk Management Panel (SRMP) following a five-step process: (1) system analysis, (2) identify hazards, (3) analyze safety risk, (4) assess safety risk, and (5) control safety risk.[27]

3.1.2.1 Community Involvement in Design Process

Following proposed mature designs, the PBN Design Team engaged in two virtual community involvement meetings. The goal was to educate and involve the participants, including the communities, about this project. During the different events, the PBN Design Team discussed the FAA's PBN deployment program on a national level. Specific information was provided about this project, including graphics containing current and notional future flight paths.[28]

3.1.2.2 Alternative Design Process

The San Antonio Airspace Modernization Project consists of airspace and air traffic control as noted in Sections 1.4 and 1.5. While the PBN Design Team focused on aircraft operations at SAT, they also evaluated operations at three satellite Study Airports as identified in Section 1.3.

Additionally, flight procedures for the following airports are being developed and are included in the EA but do not meet the FAA Order 1050.1F criteria[29] to be designated an EA Study Airport.

- Boerne Stage Field Airport (5C1)
- Castroville Municipal Airport (CVB)
- Stinson Municipal Airport (SSF)

26 U.S. Department of Transportation, Federal Aviation Administration, FAA Order JO 1000.37B, *Air Traffic Organization Safety Management System*, October 26, 2018.
27 U.S. Department of Transportation, Federal Aviation Administration, FAA Order 8040.4B, *Safety Risk Management Policy*, May 2, 2017.
28 More details on the PBN Design Team Community Involvement process can be found in Appendix G to this Draft EA and on the FAA's website at: https://www.faa.gov/nextgen/communityengagement/
29 Department of Transportation, Federal Aviation Administration, FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*, Appendix B. *Federal Aviation Administration Requirements for Assessing Impacts Related to Noise and Noise-Compatible Land Use and Section 4(f) of the Department of Transportation Act* (49 U.S.C. § 303), Para. B-1, Noise and Noise-Compatible Land Use. July 16, 2015.

- Pleasanton Municipal Airport (PEZ)

While the design of one procedure into one airport can be a fairly simple process, the PBN Design Team was charged with providing a more complete and integrated solution to air traffic complexities and inefficiencies over a large area. The PBN Design Team worked to design procedures that would remain laterally separated from each other to the extent feasible.

Arrival procedure designs that remain laterally separated are most efficient when they allow aircraft to descend at or near idle speed, unaffected by other procedures or obstructions. As aircraft arrive into and depart from congested airspace, interaction between procedures increases substantially. This increase in interactions among aircraft operating on different procedures reduces available design options.

Departure procedure designs are most efficient when they allow aircraft to climb unrestricted to cruising altitude. Although departures in the San Antonio Airspace Modernization Project will often accommodate unrestricted climbs, the procedure designs allow for complex interactions among arrivals and departures to SAT and the other airports in the General Study Area.

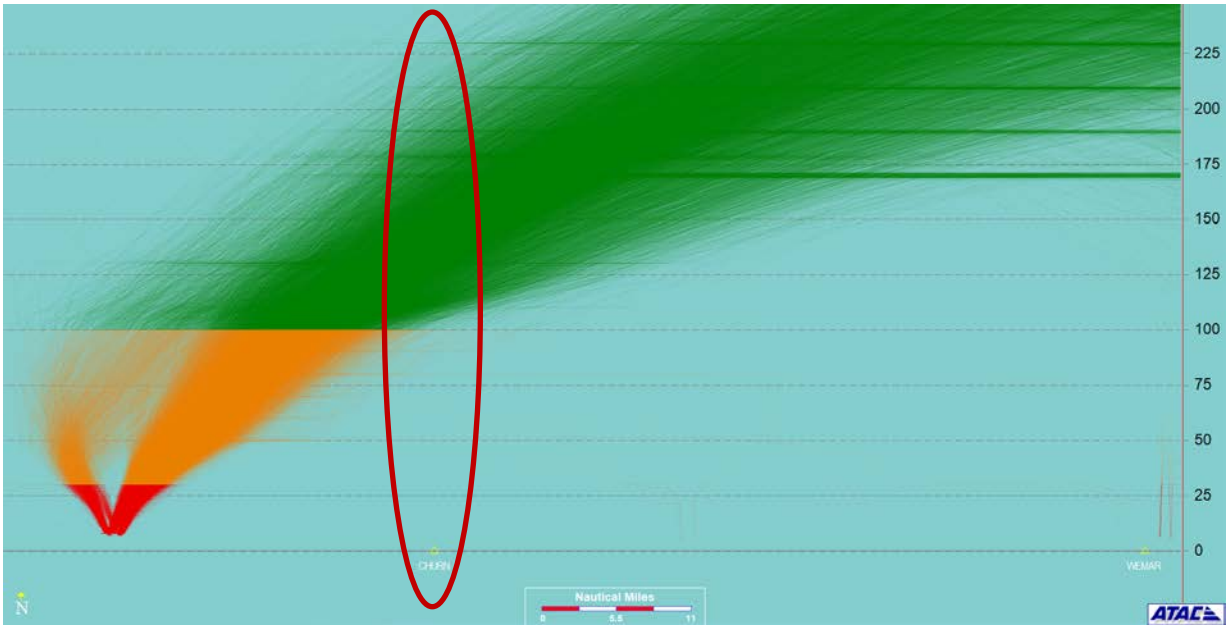
PBN procedure designs were developed with lateral routings, crossing points, and altitude restrictions that were as optimal as possible, considering the lateral and vertical constraints inherent in the San Antonio Airspace Modernization Project. The PBN Design Team considered a multitude of factors and continuously refined its designs based on design solution tools such as design and testing software, aircraft simulator results, human-in-the-loop controller simulations, and the criteria described above. The combined procedure designs in this Draft EA are the Proposed Action alternative. The following sections provide two examples of the process used to develop procedures carried forward as part of the designated Proposed Action.

SAT Eastbound SID SNIDR

The development of the proposed SAT SNIDR SID provides a good example of the alternative development process. The FAA developed and evaluated different versions of the proposed SAT SNIDR SID. The first version was the defined by the existing routing of aircraft departing the SAT airspace and combined those flows into a proposed SID to be evaluated. The second iteration was the PBN Design Team's procedure based on the additional recommendations that the SID be connected to corresponding arrival routes into the Houston Area. Finally, after several revisions, the PBN Design Team designed a final proposed version of the procedure.

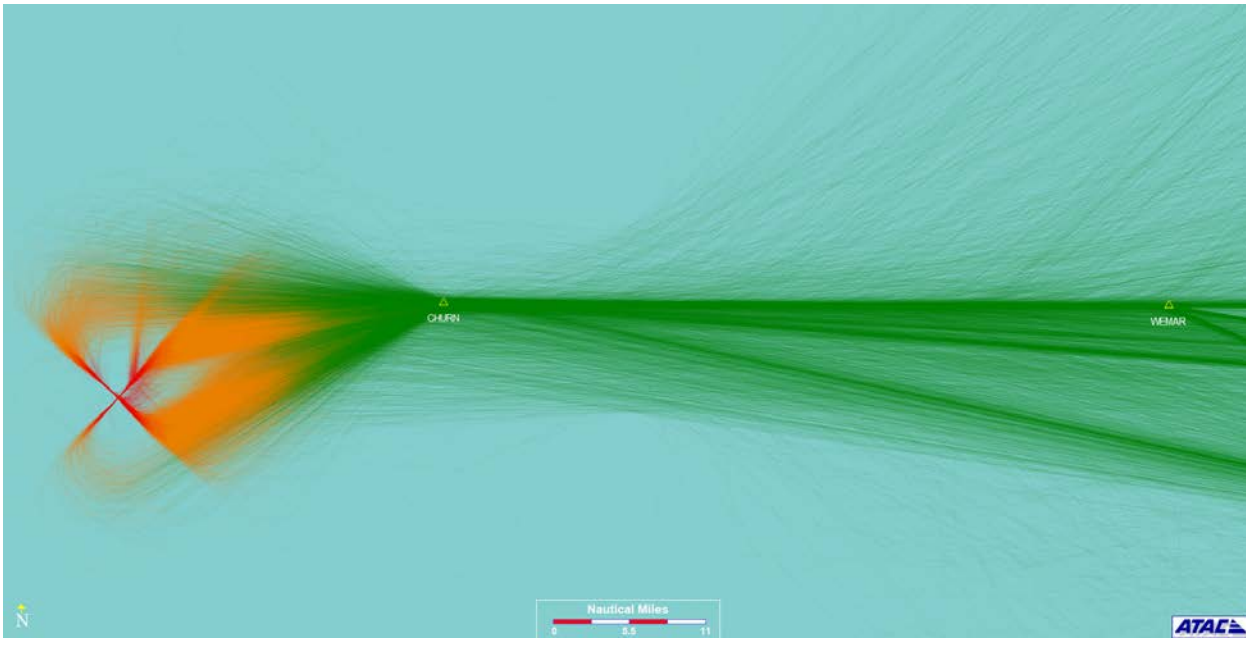
Departures from SAT to the east represent approximately 22 percent of all jet departures from the airport. Currently, SAT does not provide a published departure procedure to the east, relying on vector departures and preferred routing. The current routing requires aircraft to be manually directed to the CHURN, WEMAR, and GMANN waypoints. The PBN Design Team identified several issues resulting from these conditions, including additional communications between pilot and controller. The lack of a published procedure requires controllers to vector aircraft along the route, increasing pilot/controller task complexity. **Exhibit 3-1** depicts a selection of existing conditions flight tracks for aircraft departing to the east out of SAT. In the vertical profile, areas circled in red indicate where departures are crossing the CHURN waypoint. In part, due to different routing (vectoring) to the CHURN waypoint, aircraft arrive at the waypoint between 10,000 ft. MSL and 20,000+ ft. MSL. In the plan view in **Exhibit 3-2**, the flight tracks depict aircraft being vectored south of WEMAR off the route approximately 33 percent of the time, thereby reducing the repeatability and predictability of the route.

Exhibit 3-1 Current Eastbound SAT Departures (Vertical Profile)



Source: *San Antonio Airspace Modernization Project SME Consultations*, July 2022. ATAC Corporation, PDARS radar data, February 2022.
Prepared by: ATAC Corporation, September 2022.

Exhibit 3-2 Current Eastbound SAT Departures (Plan View)

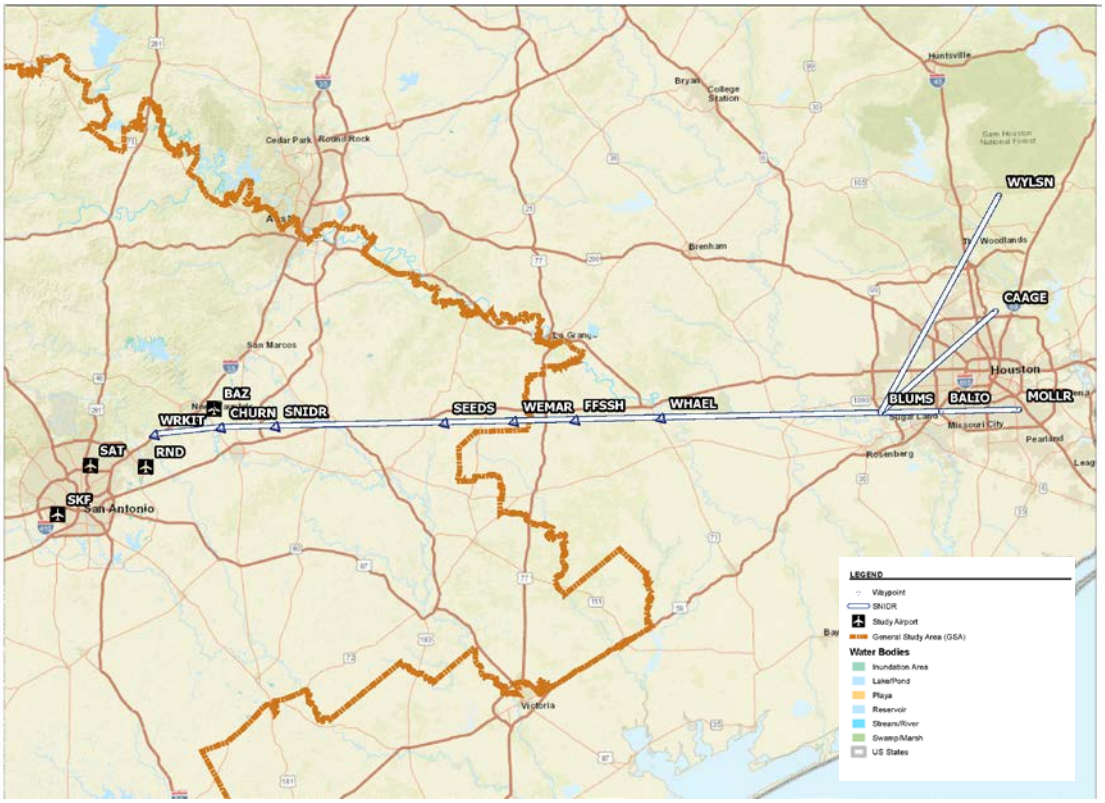


Source: *San Antonio Airspace Modernization Project SME Consultations*, July 2022. ATAC Corporation, PDARS radar data, February 2022.
Prepared by: ATAC Corporation, September 2022.

The PBN Design Team recommended the creation of an RNAV SID to address the issues identified with east departures at SAT. The PBN Design Team developed a new RNAV SID

named SNIDR. The PBN Design Team modified the SNIDR SID several times to increase the efficiency of the design and to ensure the procedure complied with current design criteria. **Exhibit 3-3** depicts the proposed design for the SNIDR SID.

Exhibit 3-3 PBN Design Team Proposed Procedure – SAT SNIDR SID



Sources: FAA, National Airspace System Resource, Airspace Boundaries. Esri, HERE, DeLorme, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MaymyIndia, NGCC, (c) OpenStreetMap contributors, and the GIS User Community. ESRI, US Water Boides.US Census Bureau, Incorporated Places, State Boundary. Federal Aviation Administration, Code of Instrument Flight Procedures, Study Airports, proposed SNIDR Route. ATAC, Study Area Boundaries.

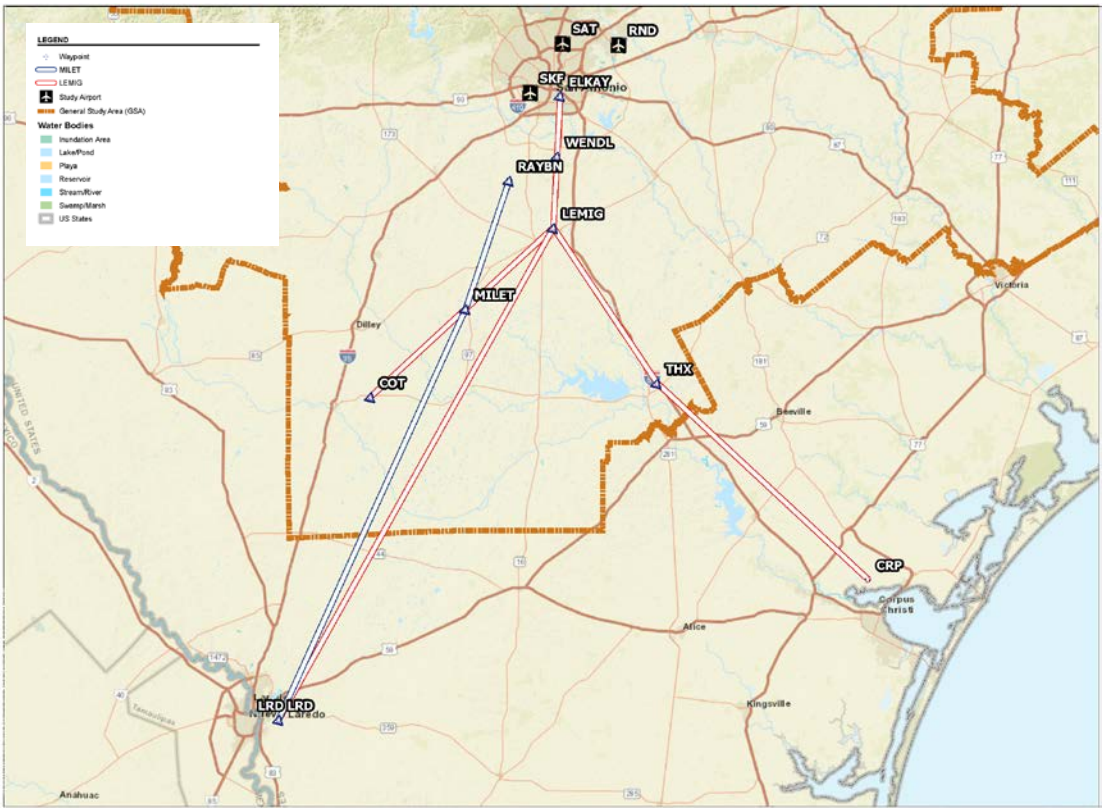
Prepared by: ATAC Corporation, September 2022.

SAT Southwest SID/STAR – TJANO SID/CRVZA STAR

The development of the proposed TJANO SID, which would replace the current MILET SID, is another good example of the alternative development process. The FAA developed and evaluated several versions of the proposed SID that would serve SAT to the southwest. The current MILET SID serves departures to the southwest but is not procedurally separated from aircraft arriving on the LEMIG STAR. Both the Cotulla-La Salle County Airport (COT) transition and the Laredo International Airport (LRD) transition on the LEMIG STAR intersect the MILET SID. Since both the MILET and LEMIG procedures use the LRD Very High Frequency Omni-Range (VOR) ground-based aircraft navigational aid, it requires extensive coordination between controllers and pilots. The stakeholders requested that a new procedure be developed that would procedurally separate these flows. The TJANO SID, after several revisions, created two transitions to the west of the proposed CRVZA STAR, while the two CRVZA transitions remain to the east of the proposed TJANO.

Exhibit 3-4 depicts the MILET SID and LEMIG STAR. The PBN Design Team identified numerous issues with the MILET SID, including a lack of connectivity with routes and neighboring procedures, and a lack of independent en route transitions. The LEMIG STAR issues included traffic conflicting with the MILET SID and a lack of vertical guidance on the procedure, increasing ATC task complexity.

Exhibit 3-4 Current Procedures MILET SID and LEMIG STAR



Source: FAA, National Airspace System Resource, Airspace Boundaries. Esri, HERE, DeLorme, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MaymyIndia, NGCC, (c) OpenStreetMap contributors, and the GIS User Community. ESRI, US Water Boides.US Census Bureau, Incorporated Places, State Boundary. Federal Aviation Administration, Code of Instrument Flight Procedures, Study Airports, existing MILET and LEMIG Routes. ATAC, Study Area Boundaries.

Prepared by: ATAC Corporation, September 2022.

The PBN Design Team made recommendations to address the issues identified with the MILET SID. Two of these recommendations were:

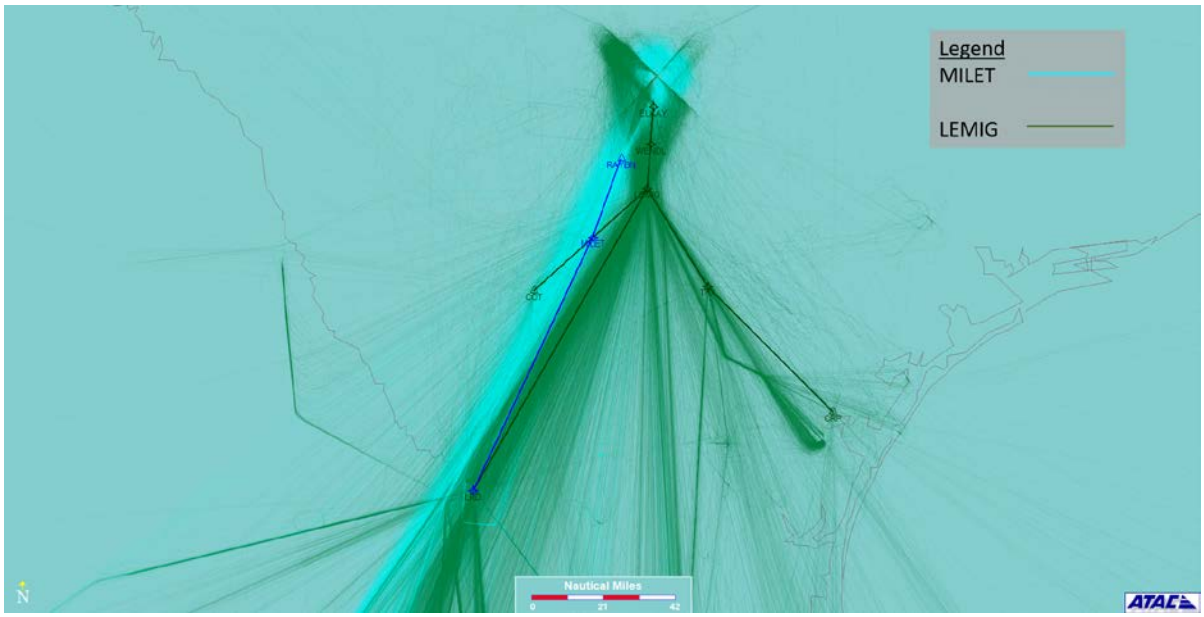
- Create an RNAV SID with multiple transitions to allow for better traffic management.
- Create an independent RNAV SID procedurally separated from arrival traffic in the area.

The PBN Design Team made recommendations for the LEMIG STAR to address the identified issues. Two of these recommendations were:

- Create a STAR with vertical guidance (altitude controls to separate traffic flows in congested airspace.
- Eliminate the conflicts of intersecting routes allowing for utilization of all transitions.

Exhibit 3-5 illustrates the existing flight tracks associated with the existing procedures. As depicted, the COT transition is rarely used and traffic from the west is often re-routed to the LRD transition. Traffic on the MILET SID are often vectored to the west of the route to avoid arriving traffic on the LEMIG LRD transition. Arriving traffic on the LEMIG are often required to level off at 10,000 ft. MSL. Lastly, arriving traffic on the LEMIG are often directed to the LEMIG waypoint, bypassing the en route transitions and reducing predictability and repeatability.

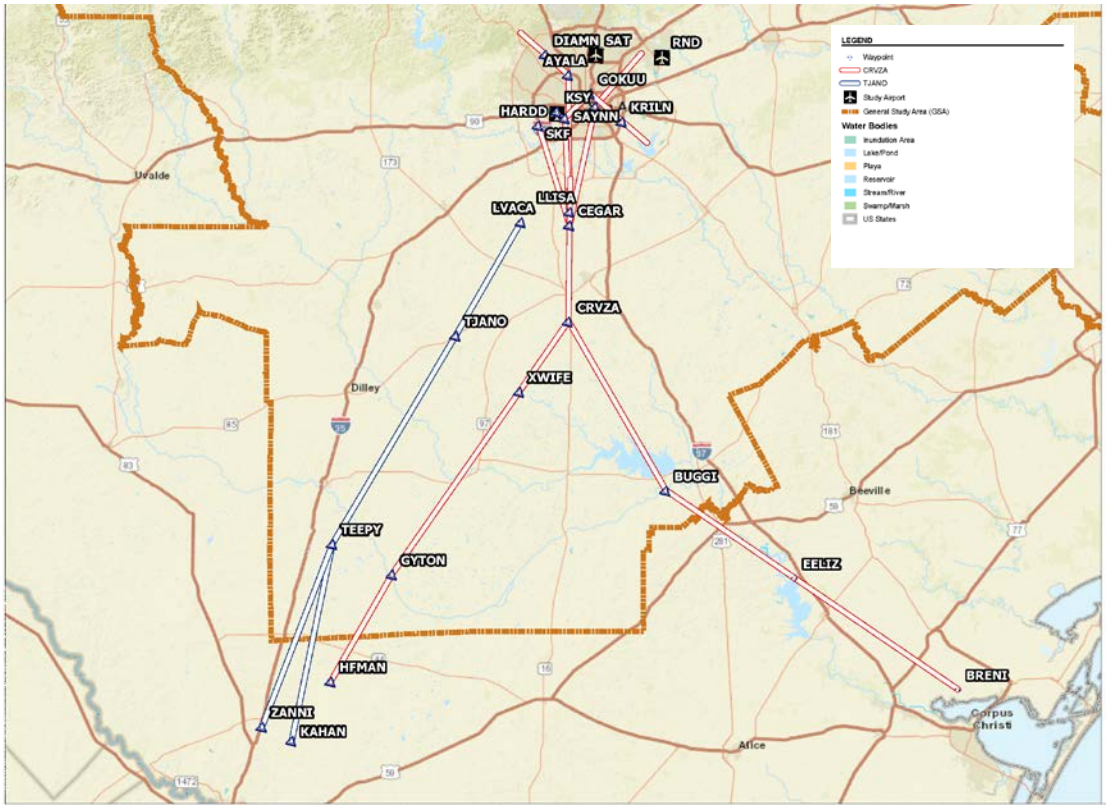
Exhibit 3-5 Existing Traffic – MILET SID and LEMIG STAR



Source: Federal Aviation Administration, 2018 Coded Instrument Flight Procedures (CIFP). ATAC Corporation, 2021/2022, (PDARS Data) (General Study Area boundary).
Prepared by: ATAC Corporation, September 2022.

In further refining the proposed designs, the PBN Design Team added an en route transition allowing for two points of entry (ZANNI and KAHAN). The PBN Design Team also eliminated the COT en route transition as it was unused and conflicted with the proposed TJANO SID. The elimination of conventional ground based navigational aids was also proposed as some of the currently utilized ground based navaids are scheduled to be decommissioned in the future. **Exhibit 3-6** depicts the proposed TJANO SID and CRVZA STAR.

Exhibit 3-6 Proposed Design – TJANO SID and CRVZA STAR



Source: FAA, National Airspace System Resource, Airspace Boundaries. Esri, HERE, DeLorme, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MaymyIndia, NGCC, (c) OpenStreetMap contributors, and the GIS User Community. ESRI, US Water Boides.US Census Bureau, Incorporated Places, State Boundary. Federal Aviation Administration, Code of Instrument Flight Procedures, Study Airports, proposed TJANO and CRVZA Routes. ATAC, Study Area Boundaries.

Prepared by: ATAC Corporation, September 2022.

3.2 Alternatives Overview

The following sections discuss the No Action Alternative and the Proposed Action, which are the two alternatives carried forward for analysis in the EA.

3.2.1 No Action Alternative

Under the No Action Alternative, the FAA would maintain existing arrival/departure procedures. The related routes and air traffic flow in use for the 2021/2022 period would remain largely the same under the No Action Alternative. Some procedure modifications and/or cancellations independent of those recommended as part of the San Antonio Airspace Modernization Project would be anticipated to be implemented prior to the Proposed Action to address specific issues separate from this Project. Existing procedures with expected modifications are listed on the FAA's Instrument Flight Procedure Gateway website. Details related to changes to procedures were collected and defined for purposes of the No Action Alternative.

In addition, work is underway on the FAA's VOR-MON program, which involves gradual reduction of the current VOR network to a minimum level necessary to provide a conventional navigation

backup as the NAS transitions to PBN navigation. The FAA has conducted and plans to continue conducting the program in two phases. Phase 1 was between 2016 and 2020, and Phase 2 is between 2021 and 2025. However, there are no forecasted procedure changes and/or cancellations related to Phase 1 and Phase 2 VORs located within the San Antonio Study Area.

The No Action Alternative accounts for current airport runway and facility modifications under construction or those to be implemented during the planning horizon of the EA (2025). These changes are taken into account in the analyses of impacts associated with the No Action Alternative (see Chapter 5, *Environmental Consequences*).

3.2.1.1 No Action Alternative Procedures

The No Action Alternative includes 14 procedures: 7 conventional procedures (procedures that use conventional NAVAIDs), and 7 RNAV procedures. **Table 3-1** lists the names of the No Action Alternative procedures, the procedure type (i.e., SID or STAR), the basis of design, and the number of runway and en route transitions for each procedure.

Table 3-1 No Action Alternative SIDs and STARS

No Action Alternative Procedure	Procedure Type	Basis of Design	Transitions (en route/ runway)[1]	Airports Served
BELLR	STAR	RNAV	5/4	HOU
BRAUN	STAR	RNAV	6/4	SAT, RND, SKF
CENTERPOINT	STAR	Conventional	2/0	SAT, RND, SKF
HTOWN	STAR	RNAV	6/0	IAH
LEMIG	STAR	Conventional	4/0	SAT, RND, SKF
MARCS	STAR	Conventional	5/0	SAT, RND, SKF
STONEWALL	STAR	Conventional	3/0	SAT, RND, SKF
TEJAS	STAR	RNAV	3/6	IAH
ALAMO	SID	Conventional	4/0	SAT
ALISS	SID	RNAV	2/0	SAT
BOWIE	SID	Conventional	2/0	SAT
LEJON	SID	Conventional	1/0	SAT
MILET	SID	RNAV	1/0	SAT
THREE RIVERS	SID	RNAV	1/0	SAT

Notes:
1\ A runway transition is counted if there is at least one waypoint or fix beyond (or prior to) the common route to create a defined segment between the runway and common route (i.e. a defined route between two fixes or waypoints).
N/A = Not Applicable *STAR = Standard Terminal Arrival* *SID = Standard Instrument Departure* *RNAV = Area Navigation*
SAT – San Antonio International Airport; SKF – Kelly Field; BAZ – New Braunfels National Airport; RND – Randolph Air Force Base Airfield

Sources: National Flight Data Center National Airspace System Resources Database, accessed July 2022; Department of Transportation, FAA Operational Procedure Files, July 2022.
Prepared by: ATAC Corporation, September 2022

3.2.1.2 Airspace Control Structure under the No Action Alternative

When aircraft depart from or arrive to the San Antonio Area on an assigned route or SID/STAR, transfer of control occurs between multiple air traffic facilities. Under the No Action Alternative, the transfer areas would remain unchanged from existing conditions. For purposes of this EA, the areas where transfers occur are defined based on entry and exit gates/points. The gates/points are purposely located to segregate arrivals and departures where possible.

SAT has independent operating configurations that are based on weather and wind (refer to Section 1.3.1). Airport traffic flows can interact with other airport traffic flows in different runway operating configurations. Therefore, the PBN Design Team was required to consider all possible combinations of the various runway operating configurations.

Appendix AA: *No Action and Proposed Action Procedures and Flight Corridors* illustrates all arrival and departure flows to the Study Airports associated with the No Action Alternative. Corridors are grouped by procedure type (conventional or RNAV), operation (arrival or departure), and airport. Depending on specific airport traffic flows, the interaction between specific flows changes.

3.2.2 Proposed Action Alternative

As discussed in Section 3.1, the Proposed Action includes the proposed mature designs for all procedures the PBN Design Team developed, plus existing procedures that would continue to be used. This alternative will increase efficiency in the San Antonio Airspace Modernization Project airspace by improving flexibility in transitioning aircraft, segregating arrivals and departures, and improving the predictability of air traffic flows.

The Proposed Action includes 19 procedures:

- 5 new/amended RNAV SIDs
- 7 new/amended RNAV STARs
- 3 existing conventional SIDs
- 4 existing conventional STARs

The Proposed Action maintains seven existing conventional procedures.

The Draft EA also includes actions related to existing procedures with planned modifications that are carried forward as part of the Proposed Action, and any reasonably foreseeable projects that would alter/affect airspace procedures.

Appendix AA: *No Action and Proposed Action Procedures and Flight Corridors* illustrates all arrival and departure flows to the Study Airports associated with the Proposed Action Alternative. Corridors are grouped by procedure type (conventional or RNAV), operation (arrival or departure), and airport. Depending on specific airport traffic flows, the interaction between specific flows changes.

Table 3-2 lists the Proposed Action alternative procedures, the No Action Alternative procedure that the Proposed Action alternative would replace (if applicable), the procedure type, and the basis of design. The table also shows the airports that the Proposed Action procedures serve, and the number of runway and en route transitions for each procedure. Finally, the table lists the objectives each procedure design achieves.

Table 3-2 Proposed Action SIDs and STARs

Proposed Action Procedure	No Action Procedure	Procedure Type	Basis of Design	Airports Served	Transitions (en route/ runway)[2]	Objectives
BELLR[1]	BELLR[1]	STAR	RNAV	HOU	5/4	Predictability/ Repeatability/ Complexity
DNKIN	CENTERPOINT	STAR	RNAV	SAT, RND, SKF	2/4	Predictability/ Repeatability/ Complexity
	N/A			BAZ		
CENTERPOINT	CENTERPOINT	STAR	Conventional	SAT, RND, SKF	2/0	N/A
HTOWN[1]	HTOWN[1]	STAR	RNAV	IAH	6/0	Predictability/ Repeatability/ Complexity
CRVZA	LEMIG	STAR	RNAV	SAT, RND, SKF	5/4	Predictability/ Repeatability
	N/A			BAZ		
LEMIG	LEMIG	STAR	Conventional	SAT	4/0	N/A
POPPO	STONEWALL	STAR	RNAV	SAT, RND, SKF	4/4	Predictability/ Repeatability
STONEWALL	STONEWALL	STAR	Conventional	SAT, RND, SKF	3/0	N/A
TEJAS[1]	TEJAS[1]	STAR	RNAV	IAH	6/3	Predictability/ Repeatability/ Complexity
QERVO	BRAUN	STAR	RNAV	SAT, RND, SKF	6/4	Flexibility/ Complexity
MARCS	MARCS	STAR	Conventional	SAT, RND, SKF	5/0	N/A
ALAMO	ALAMO	SID	Conventional	SAT	4/0	N/A
ALISS	ALISS	SID	RNAV	SAT	1/0	Flexibility/ Complexity
	N/A			SKF, BAZ, RND		
BOWIE	BOWIE	SID	Conventional	SAT	2/0	N/A
LEJON	LEJON	SID	Conventional	SAT	1/0	N/A
SLENA	THREE RIVERS	SID	RNAV	SAT	1/0	Complexity
	N/A			SKF, BAZ, RND		
SNIDR	N/A	SID	RNAV	SAT, RND, SKF, BAZ	8/0	Predictability/ Repeatability/ Complexity

Proposed Action Procedure	No Action Procedure	Procedure Type	Basis of Design	Airports Served	Transitions (en route/ runway)[2]	Objectives
TJANO	MILET	SID	RNAV	SAT	3/0	Flexibility/ Complexity
	N/A			SKF, BAZ, RND		
YODUH	ALAMO	SID	RNAV	SAT	2/0	Predictability/ Repeatability
	N/A			SKF, BAZ, RND		

Notes:
1\These procedures have independent utility, were examined using FAA Order 7400.2N screening methods, and are part of the proposed action for Section 4(f), Section 106 historic, and cultural resource, and •Biological Resources – Wildlife sub-category only examination only due to a portion of the procedures being below 18,000' but above 10,000'. These procedures are the basis for the SNIDR Supplemental Study Area formed by a polygon connecting waypoints with a line drawn from SMAKR to WEMAR to GMANN to BELLR and closing back to SMAKR.
2\ A runway transition is counted if there is at least one waypoint or fix beyond (or prior to) the common route to create a defined segment between the runway and common route (i.e. a defined route between two fixes or waypoints).
N/A = Not Applicable STAR = Standard Terminal Arrival SID = Standard Instrument Departure RNAV = Area Navigation
SAT – San Antonio International Airport; SKF – Kelly Field; BAZ – New Braunfels National Airport; RND – Randolph Air Force Base Airfield

Sources: San Antonio Airspace Modernization Project PBN Design Team 100% Design TARGETS File, May 2022. National Flight Data Center National Airspace System Resources Database, accessed July 2022; Department of Transportation, FAA Operational Procedure Files, July 2022.
Prepared by: ATAC Corporation, September 2022

In addition to 16 SID and STARs, the San Antonio Airspace Modernization Project incorporates 12 new RNAV/ILS approaches. **Table 3-3** lists the new or revised RNP/RNAV GPS approaches, as well as the type of procedure and the airports served.

Table 3-3 Proposed Action RNAV/ILS Procedures

Proposed Action Procedure	Procedure Type	Design	Airport Served
RNAV (RNP) Z Rwy 4	RNP	RNAV	SAT
RNAV (RNP) X RWY 22	RNP	RNAV	SAT
RNAV (RNP) Z RWY 22	RNP	RNAV	SAT
RNAV (RNP) RWY 13R	RNP	RNAV	SAT
RNAV (RNP) RWY 31L	RNP	RNAV	SAT
KSAT ILS OR LOC RWY 4	ILS	ILS	SAT
KSAT ILS OR LOC RWY 13R	ILS	ILS	SAT
KSAT ILS OR LOC RWY 31L	ILS	ILS	SAT
KSAT RNAV (GPS) RWY 4	GPS	RNAV	SAT
KSAT RNAV (GPS) RWY 13R	GPS	RNAV	SAT
KSAT RNAV (GPS) RWY 22	GPS	RNAV	SAT
KSAT RNAV (GPS) RWY 31L	GPS	RNAV	SAT

Sources: San Antonio Airspace Modernization Project D&I Team 100% Design TARGETS File, May 2022. National Flight Data Center National Airspace System Resources Database, accessed July 2022; Department of Transportation, FAA Operational Procedure Files, July 2022.
Prepared by: ATAC Corporation, September 2022.

The Study Airports all have independent operating configurations dependent upon weather and wind. Airport traffic flows can interact with other airport traffic flows in different runway operating configurations. Therefore, the PBN Design Team was required to take into consideration all possible runway operating configurations or combinations thereof. Appendix AA: *No Action and Proposed Action Procedures and Flight Corridors* illustrates all arrival and departure flows to the

Study Airports associated with the Proposed Action. Corridors are grouped by procedure type (conventional or RNAV), operation (arrival or departure), and airport. Dependent upon specific airport flows, the interaction between specific flows changes.

3.3 Summary Comparison of the Proposed Action and No Action Alternative

This section provides a comparative summary between the Proposed Action and No Action Alternative based on the objectives defined in Section 2.2:

- Improve the flexibility in transitioning traffic between en route and terminal area airspace and between terminal area airspace and the runways
- Improve the segregation of arrivals and departures in terminal area and en route airspace
- Improve the predictability in transitioning traffic between en route and terminal area airspace and between terminal area airspace area and the runways

3.3.1 Improve the Flexibility in Transitioning Aircraft

Section 2.2.1 includes two criteria established to measure the objective to increase the flexibility in transitioning aircraft between the terminal and en route airspace:

- Where possible, increase the number of available transitions compared with the No Action Alternative (measured by number of exit/entry points)
- Where possible, increase the number of RNAV STARs and SIDs compared with the No Action Alternative (measured by total count of RNAV STARs and RNAV SIDs for each of the Study Airports)

Table 3-4 provides a summary comparison of the Proposed Action and No Action Alternative based on the criteria defined above. Under the No Action Alternative, there are four Instrument Flight Rules (IFR) entry transfer control points into the San Antonio Airspace Modernization Project airspace and four exit transfer control points. Under the Proposed Action, the number of IFR entry transfer control points remain at four, while the IFR exit transfer control points increases to five. The increase allows for more efficient use of the airspace.

Under the No Action Alternative, there are 45 en route transitions and 14 runway transitions. Under the Proposed Action the number of en route transitions increases to 70, and the number of runway transitions increases to 23. The additional en route transitions result from more procedures being designed to tie into both existing and proposed entry and exit points, allowing for more flexibility within the airspace. The additional runway transitions allow controllers to assign aircraft to routes that were not available previously.

Table 3-4 Alternatives Evaluation: Improve Flexibility in Transitioning Aircraft

Criteria	Alternative	
	No Action	Proposed Action
Total Entry Points	4	4
Total Exit Points	4	5
Total En Route Transitions	45	70
Total Runway Transitions	14	23

Sources: National Flight Data Center National Airspace System Resources Database, accessed July 2022; Department of Transportation, FAA Operational Procedure Files, July 2022.
Prepared by: ATAC Corporation, September 2022

3.3.2 Segregate Arrival and Departure Flows

Section 2.2.2 includes one criterion to measure the objective to increase flexibility in transitioning aircraft between the terminal and en route airspace:

- Segregate arrival and departure traffic (measured by number of RNAV STARs and/or SIDs that can be used independently to/from Study Airports)

Table 3-5 provides a summary comparison of the Proposed Action and No Action Alternative based on the criteria defined above. Under the No Action Alternative, there are six RNAV procedures/airport combinations. The Proposed Action alternative has 31 RNAV procedures/airport combinations. The greater number of RNAV routes serving the study airports and better usability allows for greater segregation of arrival and departure flows.

Table 3-5 Alternatives Evaluation: Segregate Arrival and Departure Flows

Criteria	Alternative	
	No Action	**Proposed Action**
Number of Independent RNAV Procedures		
SAT	4	8
SKF	1	8
BAZ	0	7
RND	1	8

Sources: National Flight Data Center National Airspace System Resources Database, accessed July 2022; Department of Transportation, FAA Operational Procedure Files, July 2022.
Prepared by: ATAC Corporation, September 2022

3.3.3 Improve Predictability of Air Traffic Flow

Section 2.2.3 includes two criteria to measure the objective to increase flexibility in transitioning aircraft between the terminal and en route airspace:

- RNAV procedures with altitude controls intended to optimize descent or climb patterns (measured by count of procedures with altitude controls)
- Ensure that the majority of STARs and SIDs to and from the Study Airports are based on RNAV technology (measured by count of RNAV STARs and SIDs for an individual Study Airport)

Under the No Action Alternative, three procedures include altitude controls. In comparison, the Proposed Action includes 9 procedures with altitude controls. **Table 3-6** provides a summary comparison of the Proposed Action and No Action Alternative based on the criteria defined above. The total number of RNAV procedures/airport combinations with altitude controls serving the study airports increases from 3 under the No Action Alternative to 34 under the Proposed Action. The No Action alternative has seven published conventional/radar vector procedures, and the Proposed Action alternative maintains those seven conventional procedures.

Table 3-6 Alternatives Evaluation: Improve Predictability of Air Traffic Flow

Criteria	Alternative	
	No Action	Proposed Action
SAT	3	9
SKF	0	9
BAZ	0	7
RND	0	9

Source: Department of Transportation, Federal Aviation Administration, *PBN Design Team Final Design TARGETS file San Antonio Airspace Modernization Project*, July 2022.
Prepared by: ATAC Corporation, September 2022

3.4 Preferred Alternative Determination

Of the two alternatives carried forward for analysis, only the Proposed Action would meet the Purpose and Need for the San Antonio Airspace Modernization Project based on the criteria discussed above. Therefore, the Proposed Action is the Preferred Alternative. Although it would not meet the Purpose and Need, the No Action Alternative was carried forward, as required by Council on Environmental Quality (CEQ) regulations, to establish a norm against which decision makers can measure the environmental effects of undertaking the Proposed Action.

3.5 Listing of Federal Laws and Regulations Considered

Table 3-7 lists the relevant federal laws and statutes, Executive Orders, and regulations applicable to the Proposed Action and the No Action Alternative and considered in preparation of this EA.

Table 3-7 List of Federal Laws and Regulations Considered

Federal Laws and Statutes	Citation
National Environmental Policy Act of 1969	42 U.S.C. § 4321 *et seq.*
Clean Air Act of 1970, as amended	42 U.S.C. § 7401 *et seq.*
American Indian Religious Freedom Act of 1978	42 U.S.C. § 1996
Department of Transportation Act of 1966, Section 4(f)	49 U.S.C. § 303(c)
Aviation Safety and Noise Abatement Act of 1979	49 U.S.C. § 47501 et seq.
Federal Aviation Act of 1958, as amended	49 U.S.C. § 40101 et seq.
Endangered Species Act of 1973	16 U.S.C. § 1531 *et seq*.
Fish and Wildlife Coordination Act of 1958	16 U.S.C. § 661 *et seq*.
The Bald and Golden Eagle Protection Act of 1940	16 U.S.C. § 668 *et seq*.
Lacey Act of 1900	16 U.S.C. § 3371 *et seq*.
Migratory Bird Treaty Act of 1918	16 U.S.C. § 703 *et seq.*
National Historic Preservation Act of 1966, as amended	16 U.S.C. § 470
The Wilderness Act of 1964	16 U.S.C. § 1131-1136
Archaeological and Historic Preservation Act of 1974, as amended	16 U.S.C. § 469 *et seq*.

Executive Orders	Citation
11593, Protection and Enhancement of the Cultural Environment	36 Federal Register (FR) 8921
12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations	59 FR 7629
13045, Protection of Children from Environmental Health Risks and Safety Risks	62 FR 19885
13423, Strengthening Federal Environmental, Energy, and Transportation Management	72 FR 3919
13990, Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis	86 FR 10252

Table 3-7 List of Federal Laws and Regulations Considered

Federal Regulations	Citation
Council for Environmental Quality Regulations	40 C.F.R. Part 1500 to Part 1508
General Conformity Regulations	40 C.F.R. Part 93 Subpart B
Protection of Historic Properties Regulations	36 C.F.R. 800
Airport Noise Compatibility Planning Regulations	14 C.F.R. Part 150
Federal Aviation Regulations (FAR) Part 71: Designation of Class A, Class B, Class C, Class D, and Class E Airspace Areas; Airways; Routes; and Reporting Points, December 17, 1991.	14 C.F.R. Part 71

FAA/U.S. Department of Transportation Orders

U.S. DOT Order 5610.2a: Final Order to Address Environmental Justice in Low-Income and Minority Populations, May, 2012.
FAA Order 8260.58B, *The United States Standard Performance Based Navigation (PBN) Instrument Procedure Design*, August 23, 2020.
FAA Order 8260.43C, *Flight Procedures Management Program*, April 8, 2019.
FAA Order JO 7110.65Z, *Air Traffic Control*, May 4, 2021.
FAA Order 1050.1F: *Environmental Impacts: Policies and Procedures*, June 16, 2015.
FAA Order 7100.41A, *Performance Based Navigation Implementation Process*, April 27, 2016.
FAA Order JO 7400.2N, *Procedures for Handling Airspace Matters*, May 12, 2021.
FAA Order 8260.3E, *United States Standard for Terminal Instrument Procedures (TERPS)*, September 16, 2020.
FAA Order 8040.4B, *Safety Risk Management Policy*, May 01, 2017
FAA Order JO 1000.37C, *Air Traffic Organization Safety Management System*, September 30, 2021.
FAA Order 8260.19I, *Flight Procedures and Airspace*, June 28, 2020.
FAA Order 8260.46J, *Departure Procedure (DP) Program*, July 11, 2022.

FAA Advisory Circulars

FAA Advisory Circular 150/5020-1: *Noise Control and Compatibility Planning for Airports*, August 5, 1983.
FAA Advisory Circular 150/5200-33C: *Hazardous Wildlife Attractants on or near Airports*, February 20, 2022.
FAA Advisory Circular 36-3H: *Estimated Airplane Noise Levels in A-Weighted Decibels*, April 24, 2002.

Source: ATAC Corporation, September 2022
Prepared by: ATAC Corporation, September 2022

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