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TECHNICAL MEMORANDUM

Harris Miller Miller & Hanson Inc. (HMMH) as a subconsultant to Mead & Hunt is assisting The Truckee-Tahoe Airports District with the aircraft noise modeling element of the Truckee-Tahoe Airport (TRK) Runway Feasibility Study. The purpose of this technical memorandum is to summarize aircraft noise modeling inputs, and to seek concurrence from TRK with the noise modeling of the existing and alternative conditions as provided and described herein.

HMMH used the Federal Aviation Administration (FAA) Aviation Environmental Design Tool (AEDT), Version 3d, to generate the existing condition aircraft noise exposure contours. A baseline scenario (representing the period from June 1, 2020 through May 31, 2021) was modeled, along with four airfield configuration alternatives representing the same time period. The subsequent sections describe the AEDT noise modeling inputs for all scenarios, which include:

- Physical description of the airport layout
- Aircraft operations
- Aircraft noise and performance characteristics
- Runway utilization
- Flight track geometry and use
- Meteorological conditions
- Terrain data

1.0 Physical Description of the Airport Layout

TRK is located approximately two miles southeast of downtown Truckee in Nevada and Placer Counties, California. The airport layout is comprised of two runways, Runway 11/29 and Runway 2/20. A proposed Runway 16/34 was modeled for two of the alternatives, along with a widened and extended Runway 2/20, and modified Runway 11 with a displaced arrival threshold. Table 1 provides the runway specifications used in modeling the existing condition and the four alternatives and Figure 1 shows the current airport diagram.

The number used to designate each runway end reflects, with the addition of a trailing “0”, the magnetic heading of the runway to the nearest 10 degrees from the perspective of the pilot. Runway 11/29 is oriented along approximate magnetic headings of 106° and 286° and is 7,001 feet long by 100 feet wide. The existing Runway 2/20 is oriented along approximate magnetic headings of 16° and 196° and is 4,654 feet long by 75 feet wide, and the proposed alternative Runway 2/20 is 5,055 feet long. The proposed Runway 16/34 is oriented along approximate magnetic headings of 160° and 340° and is 5,900 feet long.

Runway length, runway width, instrumentation, and declared distances affect which runway an aircraft will use and under what conditions, and therefore, will assist in determining the rate of utilization of a runway relative to the other runways at the airport under each alternative/model scenario.

Table 1. Runway Specifications

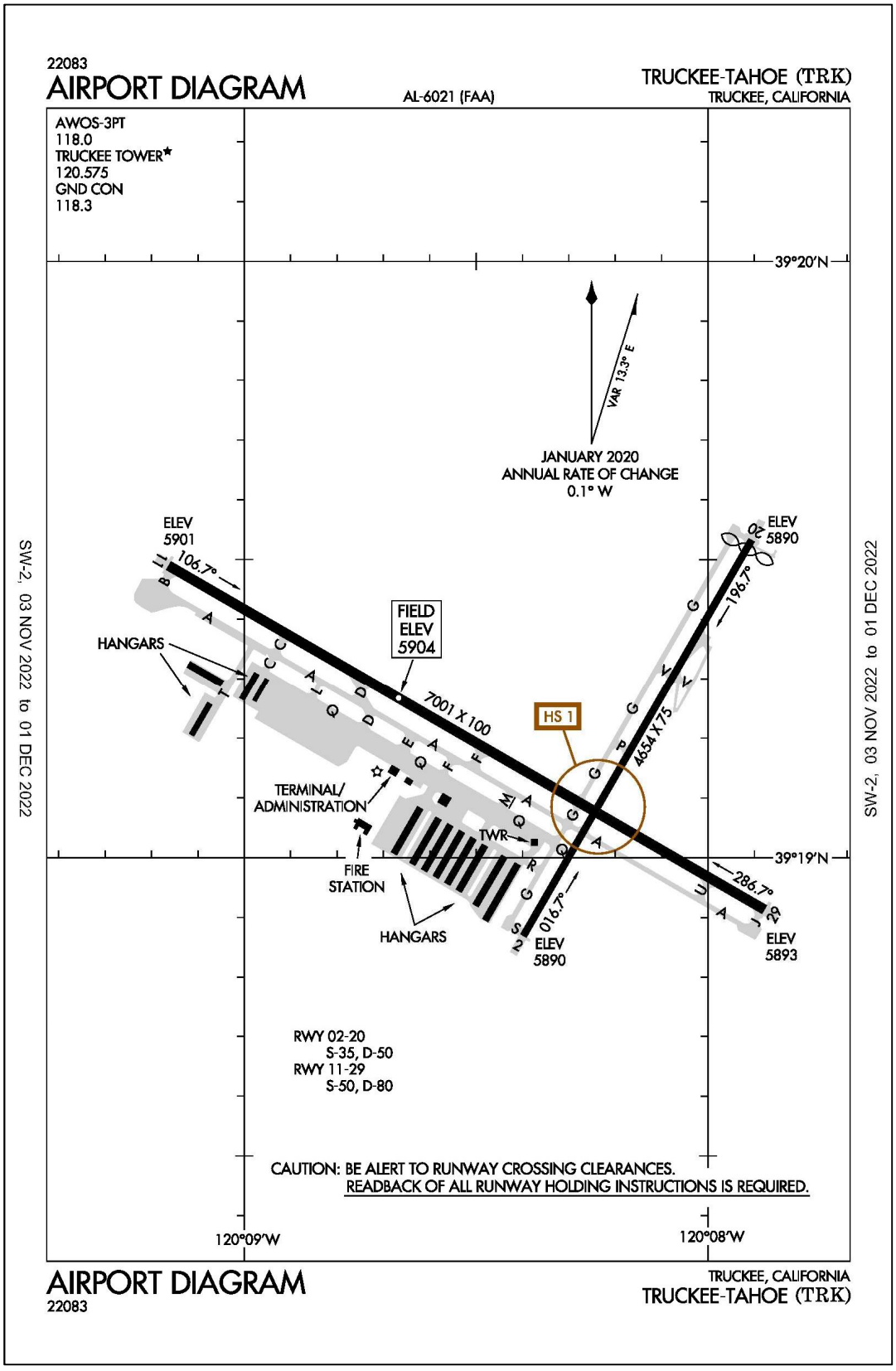
Source: Mead & Hunt, HMMH 2022, FAA 5010 Data

Runway End	Latitude	Longitude	Elevation (ft. MSL)	Length (ft.)	Approach Angle (degrees)	Threshold Crossing Height (ft)	Displaced Thresholds (ft)
2	N 39° 18' 52.28"	W 120° 08' 23.96"	5,890.2	4,654	3.0	N/A	N/A
20	N 39° 19' 32.11"	W 120° 08' 23.96"	5,890.3	4,654	3.5	25	115
2X*	N 39° 18' 48.23"	W 120° 08' 26.78"	5,890.2	5,055	3.0	0	611
20X*	N 39° 19' 31.51"	W 120° 07' 54.63"	5,890.3	5,055	3.0	25	51
11	N 39° 19' 29.45"	W 120° 09' 09.87"	5,901.3	7,001	3.0	N/A	N/A
11D**	N 39° 19' 29.45"	W 120° 09' 09.87"	5,901.3	7,001	3.0	40	1,000
29	N 39° 18' 54.87"	W 120° 07' 52.74"	5,892.6	7,001	3.0	N/A	0/485***
16	N 39° 19' 29.83"	W 120° 07' 47.02"	5,880.0	5,900	3.0	50	N/A
34	N 39° 18' 31.61"	W 120° 07' 42.89"	5,895.0	5,900	3.0	50	3,550

**2X and 20X designate the proposed widened and extended Runway 2/20*
***11D designates the proposed Runway 11 with the modified displaced threshold*
**** Displaced thresholds on Runway 29 are applicable to Alternatives 1 and 4*

Figure 1. Airport Diagram

Source: FAA. Accessed on November 10, 2022



2.0 Aircraft Noise and Performance Characteristics

AEDT requires the use of specific noise and performance data for each aircraft type operating at the airport. Noise data is in the form of Sound Exposure Level (SEL) at a range of distances (from 200 feet to 25,000 feet) from a particular aircraft with engines at a range of thrust levels. Performance data include thrust, speed and altitude profiles for takeoff and landing operations. The AEDT database contains standard noise and performance data for over 300 different fixed-wing aircraft types, most of which are civilian aircraft. As many aircraft have similar noise profiles, one AEDT aircraft type may be used to represent many different aircraft. As an example, the AEDT type CNA172 is used to represent the Cessna 172 Skyhawk, Lancair 360, and Aviat Husky A1B, among other similar aircraft.

Aside from identifying the aircraft type in the database, AEDT has STANDARD and International Civil Aviation Organization (ICAO) aircraft flight profiles for takeoffs, landings, and flight patterns or touch-and-go operations. HMMH used STANDARD profiles for all civilian aircraft types in the existing condition.

3.0 Airport Operations

HMMH obtained flight track and aircraft identification data from Vector for the period of June 1, 2020 through May 31, 2021 that represented aircraft operations at TRK. This data was used to develop the existing fleet mix and day/night and modeled flight tracks. The operations described below comprise the existing and alternative conditions for the TRK Runway Feasibility Study. The aircraft operations data entered into AEDT includes the number of day, evening, and night arrivals, departures, and pattern (circuit) operations.

Pattern (circuit) operations are local pattern operations modeled on closed-circuit flight paths, which are flight tracks that depart and turn into a downwind pattern before landing back on the same runway. It should be noted that a “local” operation departs and lands at TRK rather than going to or arriving from another airport, but a local operation is not necessarily a closed-circuit flight path. Any aircraft that arrives and departs from the same airport but uses a different runway end or flies a different path than a unidirectional turn would be considered a “local” operation, but not a closed-circuit flight path. At TRK, these non-circuit operations are most commonly done by training flights that primarily perform maneuvers north of Prosser Creek Reservoir, and gliders. For the purposes of this analysis, all closed-circuit flight path operations are modeled as circuits, and the non-closed-circuit local operations are split into arrival and departure segments. Table lists the modeled circuit operations by aircraft type. As the number and type of operations remain the same between all scenarios, these tables apply to all four alternatives as well as the existing condition.

Table 2. Modeled Local Operations

Source: HMMH, Vector, Mead & Hunt

AEDT Aircraft Type	Day	Evening	Night	Total
CNA172	2,670	221	32	**2,923**
CNA182	693	139	-	**832**
CNA206	22	-	-	**22**
COMSEP	1,155	109	9	**1,274**
DC6	-	13	-	**13**
GASEPF	362	-	-	**362**
GASEPV	566	13	-	**578**
SF340	209	-	-	**209**
Total	**5,677**	**495**	**42**	**6,213**
Note: Totals may not match exactly due to rounding				

4.0 Alternatives Runway Utilization

The primary factor affecting runway use at airports is weather; specifically, the wind direction and wind speed. An additional factor that may affect runway use includes the position of the facility or ramp relative to the runway.

HMMH utilized the flight tracking data obtained from Vector to compile runway use tables and categorized this information by arrival, departure, or circuits, as well as day, evening, and night. As the four alternatives all involve changes to the airfield layout, the modeling consisted of redistributing operations from the existing runways to the proposed alternative runways.

Alternative 1 modeled the addition of a hypothetical Runway 16/34 on the east side of the airport. To preserve the existing operations and fleet mix, operations were moved from the four existing runway ends to the new proposed runways. A total of 2,430 operations were moved to Runway 16 and an additional 2,985 were moved to Runway 34. Table 2 presents the operations shifted in order to model the aircraft noise contours for Alternative 1.

Alternative 2 modeled the widening and extension of Runway 2/20. As in Alternative 1, operations were moved from Runway 11/29 to the proposed extended Runway 2/20. A total of 2,877 operations were moved to Runway 2 and an additional 2,875 were moved to Runway 20.

Table presents the operations shifted in order to model the aircraft noise contours for Alternative 2.

The third alternative modeled the addition of a displaced arrival threshold on Runway 11, 1,000 feet from the end of the runway. A total of 28 operations were moved from the other three runways to Runway 29. Table presents the operations shifted in order to model aircraft noise contours for Alternative 3.

Alternative 4 modeled the combined conditions of the first and third alternatives, namely the addition of a hypothetical Runway 16/34 on the east side of the airport and the addition of a 1,000 foot displaced arrival threshold on Runway 11. As in the previous alternatives, operations were redistributed from the four existing runway ends to the new proposed runway and Runway 29. A total of 2,430 operations were moved to Runway 16, an additional 2,984 operations were moved to Runway 34, and 28 operations were moved to Runway 29. Table presents the operations shifted in order to model the aircraft noise contours for Alternative 4.

Table 2. Shifted Operations for Alternative 1

Source: HMMH, Vector, Mead & Hunt

AEDT Aircraft Type	Runways		Arrivals				Departures				Total
	Moved From	Moved To	Day	Evening	Night	Total	Day	Evening	Night	Total	
BD-700-1A10	11	16	1			1					1
	29	16	6			6					6
		34					8			8	8
BEC58P	2	16	1			1					1
		34					7			7	7
	11	16	3	1		4					4
		34					5			5	5
	20	16	8	1		9					9
		34					1			1	1
	29	16	46	4		50					50
		34					71	5	2	78	78
CIT3	20	16	1			1					1
	29	16	2			2					2
		34					3			3	3
CL600	2	16	1			1					1
	11	16	13		1	14					14
	20	16	1	1		2					2
	29	16	33			33					33
		34					55	1		56	56
CL601	11	16	6			6					6
	29	16	7			7					7
		34					14			14	14
CNA172	2	16	24			24					24
		34					158	1	1	160	160
	11	16	12		1	13					13
		34					5			5	5
	20	16	72	1		73					73
		34					10	1		11	11
	29	16	114	12	2	128					128
		34					106	4	1	111	111
CNA182	2	16	15			15					15
		34					139	3	1	139	143
	11	16	15	6	1	22					22
		34					19			19	19
	20	16	76	2		78					78
		34					77			77	77
	29	16	95	5		100					100
		34					161	2		163	163
CNA206	2	16	1			1					1
		34					24			24	24
	11	16	4	1		5					5
		34					3			3	3
	20	16	7			7					7
		34					2			2	2
	29	16	21	1		22					22
		34					17	1		18	18
CNA208	2	16	4			4					4
		34					34			34	34
	11	16	22	1		23					23
		34					52		6	58	58
	20	16	55	3	1	59					59
		34					5			5	5
	29	16	213	16	2	231					231
		34					265	11	5	281	281
CNA441	2	34					4		1	5	5
	11	16	4			4					4
		34					2			2	2
	20	16	1			1					1

	29	16	9			9					**9**
		34					8			8	**8**
CNA500	**29**	16	1			1					**1**
		34					2			2	**2**
CNA510	**2**	34					2			2	**2**
	11	16	1			1					**1**
	20	16	6			6					**6**
		34					1			1	**1**
	29	16	17	1	1	19					**19**
		34					20	1		21	**21**
CNA525C	**2**	34					2			2	**2**
	11	16	8			8					**8**
	20	16	8			8					**8**
	29	16	50		1	51					**51**
		34					56	1		57	**57**
CNA55B	**2**	34					4			4	**4**
	11	16	10			10					**10**
		34					25		1	26	**26**
	20	16	8	1		9					**9**
	29	16	69	5		74					**74**
		34					55	1	1	57	**57**
CNA560U	**11**	16	1			1					**1**
	20	16	1			1					**1**
	29	16	9	1		10					**10**
		34					12			12	**12**
CNA560XL	**11**	16	6			6					**6**
	20	16	1	2		3					**3**
	29	16	25	1		26					**26**
		34					31			31	**31**
CNA680	**29**	16	1			1					**1**
		34					1			1	**1**
CNA750	**11**	16	8			8					**8**
	29	16	37	1		38					**38**
		34					33			33	**33**
COMSEP	**2**	16	14			14					**14**
		34					204		3	207	**207**
	11	16	27	5	2	34					**34**
		34					31		2	33	**33**
	20	16	68	4	3	75					**75**
		34					13	1	4	18	**18**
	29	16	215	15	2	232					**232**
		34					208	7	2	217	**217**
DC3	**29**	34					3			3	**3**
DHC6	**2**	34					5			5	**5**
	11	16	18	2	1	21					**21**
		34					3			3	**3**
	20	16	20		1	21					**21**
		34					1			1	**1**
	29	16	113	4		117					**117**
		34					120	2		122	**122**
DO228	**29**	34					1			1	**1**
ECLIPSE500	**20**	16	3			3					**3**
	29	16	5			5					**5**
		34					5			5	**5**
EMB145	**29**	34					2			2	**2**
F10062	**20**	34					1			1	**1**
FAL900EX	**2**	34					2			2	**2**
	11	16		1		1					**1**
	29	16	12			12					**12**
		34					12			12	**12**
G650ER	**11**	16	1			1					**1**
	29	16	1		1	2					**2**
		34					4		1	5	**5**
GASEPF	**2**	16	43	1		44					**44**
		34					77		1	78	**78**
	11	16	8			8					**8**

		34					9		2	11	**11**
	20	16	37			37					**37**
		34					42		1	43	**43**
	29	16	65			65					**65**
		34					37		1	38	**38**
GASEPV	**2**	16	17			17					**17**
		34					182	2	7	191	**191**
	11	16	20			20					**20**
		34					39			39	**39**
	20	16	52	1		53					**53**
		34					18			18	**18**
	29	16	240	10	1	251					**251**
		34					209	7	1	217	**217**
GIIB	**29**	34					1			1	**1**
GIV	**11**	16	9			9					**9**
	29	16	16			16					**16**
		34					12			12	**12**
GV	**11**	16	4			4					**4**
	29	16	2			2					**2**
		34					5			5	**5**
HS748A	**2**	34					1			1	**1**
IA1125	**11**	16	1			1					**1**
	29	16	8			8					**8**
		34					6			6	**6**
LEAR35	**11**	16	11			11					**11**
	20	16	3			3					**3**
		34					4			4	**4**
	29	16	19		1	20					**20**
		34					31	1		32	**32**
MU3001	**11**	16	1			1					**1**
	20	16	1			1					**1**
	29	16	9			9					**9**
		34					7			7	**7**
OV10A	**29**	16	1			1					**1**
PA28	**2**	16	1			1					**1**
		34					30			30	**30**
	11	16	3			3					**3**
		34					1			1	**1**
	20	16	8			8					**8**
		34					1			1	**1**
	29	16	28	1		29					**29**
		34					31	1		32	**32**
PA30	**2**	34					2			2	**2**
	11	16	1	1		2					**2**
	29	16	8			8					**8**
		34					8			8	**8**
SF340	**2**	34					1			1	**1**
	20	16	13			13					**13**
		34					16			16	**16**
T34	**2**	34					1			1	**1**
	29	16	1			1					**1**
		34					2			2	**2**
T37B	**2**	16	3			3					**3**
		34					3			3	**3**
	11	16	2			2					**2**
	20	16	2			2					**2**
	29	16	2			2					**2**

Table 4. Shifted Operations for Alternative 2

Source: HMMH, Vector, Mead & Hunt

AEDT Aircraft Type	Runways		Arrivals				Departures				Total
	Moved From	Moved To	Day	Evening	Night	Total	Day	Evening	Night	Total	
BD-700-1A10	29	02X					1			1	**1**
		20X	1			1	1			1	**2**
BD-700-1A11	29	20X	1			1					**1**
BEC58P	11	02X	2		1	3	3			3	**6**
		20X	3	1		4	4			4	**8**
	29	02X	48	6		54	80	3	2	85	**139**
		20X	61	5		66	51	3	2	56	**122**
CIT3	29	02X					2			2	**2**
		20X	6			6					**6**
CL600	11	20X	1			1					**1**
	29	02X	1			1	3			3	**4**
		20X	12			12	6			6	**18**
CL601	11	20X	2			2					**2**
	29	02X	1			1	4			4	**5**
		20X	1			1	2			2	**3**
CNA172	11	02X	3			3	4			4	**7**
		20X	6		2	8	4			4	**12**
	29	02X	118	6	2	126	114	7		121	**247**
		20X	120	10	1	131	85	7		92	**223**
CNA182	11	02X	8			8	21			21	**29**
		20X	8	4		12	6		1	7	**19**
	29	02X	99	2		101	115	3	1	119	**220**
		20X	110	2		112	65	1	1	67	**179**
CNA206	11	02X		1		1	1			1	**2**
	29	02X	25			25	18			18	**43**
		20X	26	1		27	16			16	**43**
CNA208	11	02X	6	1		7	32		4	36	**43**
		20X	15	2	1	18	26		3	29	**47**
	29	02X	162	4	1	167	251	10	2	263	**430**
		20X	201	14	3	218	186	5	3	194	**412**
CNA441	11	02X	1			1	2			2	**3**
	29	02X	10			10	9			9	**19**
		20X	12			12	13			13	**25**
CNA510	29	02X	2			2	15		1	16	**18**
		20X	10			10	6			6	**16**
CNA525C	11	02X	2			2	1			1	**3**
		20X	7		1	8					**8**
	29	02X	6		1	7	55	1		56	**63**
		20X	52			52	17			17	**69**
CNA55B	11	02X	1			1	17		1	18	**19**
		20X	9	1		10	7			7	**17**
	29	02X	12			12	44	1		45	**57**
		20X	50	3		53	22			22	**75**
CNA560U	11	20X	4			4					**4**
	29	02X	5			5	5			5	**10**
		20X	13			13	6			6	**19**
CNA560XL	11	02X	1			1					**1**
		20X	2			2					**2**
	29	02X	9	1		10	17			17	**27**
		20X	26			26	13			13	**39**
CNA680	29	20X	2			2	1			1	**3**
CNA750	11	20X	4			4					**4**
	29	02X	1			1	7			7	**8**
		20X	8			8	8			8	**16**
COMSEP	11	02X	12	6	1	19	29		2	31	**50**
		20X	21	3	1	25	33		2	35	**60**
	29	02X	215	16	3	234	218	6	4	228	**462**
		20X	230	26	4	260	166	2	3	171	**431**
DC3	29	02X					3			3	**3**

		20X	1			1	1			1	**2**
DC93LW	**29**	**20X**					1			1	**1**
DHC6	**11**	**02X**	5	1		6	4			4	**10**
		20X	15			15	2			2	**17**
	29	**02X**	85	2		87	104	3	1	108	**195**
		20X	109	4		113	101	2		103	**216**
DO228	**29**	**20X**	1			1	1			1	**2**
ECLIPSE500	**11**	**20X**	1			1					**1**
	29	**02X**	1			1	7			7	**8**
		20X	1			1	3			3	**4**
FAL900EX	**11**	**20X**	2			2					**2**
	29	**02X**					2			2	**2**
		20X	1			1					**1**
G650ER	**29**	**20X**					1			1	**1**
GASEPF	**11**	**02X**	3			3	13		2	15	**18**
		20X	4			4	10		1	11	**15**
	29	**02X**	41			41	39			39	**80**
		20X	66	1		67	18			18	**85**
GASEPV	**11**	**02X**	11			11	44	1		45	**56**
		20X	15			15	25			25	**40**
	29	**02X**	228	8	1	237	224	4	1	229	**466**
		20X	274	13		287	163	6	1	170	**457**
GIV	**29**	**02X**	1			1	3			3	**4**
		20X	4			4	4			4	**8**
GV	**11**	**20X**	1			1					**1**
	29	**02X**					1			1	**1**
		20X	2			2	2			2	**4**
HS748A	**29**	**20X**	2			2					**2**
IA1125	**29**	**02X**					2			2	**2**
LEAR35	**11**	**02X**					1			1	**1**
		20X	7			7					**7**
	29	**02X**	1			1	15	1		16	**17**
		20X	15			15	9			9	**24**
MU3001	**11**	**20X**	2			2					**2**
	29	**02X**	1			1	13			13	**14**
		20X	9			9	7			7	**16**
OV10A	**29**	**02X**					1			1	**1**
		20X	1			1					**1**
PA28	**11**	**02X**	1			1	1			1	**2**
		20X	3			3	1			1	**4**
	29	**02X**	28			28	28			28	**56**
		20X	43			43	18			18	**61**
PA30	**11**	**02X**					1			1	**1**
		20X		1		1					**1**
	29	**02X**	8			8	7			7	**15**
		20X	8			8	5			5	**13**
T34	**29**	**02X**	1			1	1			1	**2**
T37B	**29**	**02X**	3			3	2			2	**5**
		20X	1			1					**1**

Table 5. Shifted Operations for Alternative 3

Source: HMMH, Vector, Mead & Hunt

AEDT Aircraft Type	Runways		Arrivals				Departures				Total
	Moved From	Moved To	Day	Evening	Night	Total	Day	Evening	Night	Total	
CL601	**20**	**29**					1			1	**1**
CNA172	**11**	**29**		1		1					**1**
CNA182	**2**	**29**	2			2					**2**
	20	**29**	2			2	3			3	**5**
CNA441	**20**	**29**	1			1					**1**
CNA55B	**20**	**29**					1			1	**1**
COMSEP	**11**	**29**	1			1					**1**
	20	**29**	2			2					**2**
DHC6	**20**	**29**	1			1					**1**
GASEPF	**20**	**29**	4			4	2			2	**6**
GASEPV	**2**	**29**					1			1	**1**
	11	**29**					1			1	**1**
	20	**29**	1			1					**1**
PA28	**20**	**29**	1			1					**1**
SF340	**20**	**29**					3			3	**3**

Table 6. Shifted Operations for Alternative 4

Source: HMMH, Vector, Mead & Hunt

AEDT Aircraft Type	Runways		Arrivals				Departures				Total
	Moved From	Moved To	Day	Evening	Night	Total	Day	Evening	Night	Total	
BD-700-1A10	11	16	1			1					1
	29	16	6			6					6
		34					8			8	8
BEC58P	2	16	1			1					1
		34					7			7	7
	11	16	3	1		4					4
		34					5			5	5
	20	16	8	1		9					9
		34					1			1	1
	29	16	46	4		50					50
		34					71	5	2	78	78
CIT3	20	16	1			1					1
	29	16	2			2					2
		34					3			3	3
CL600	2	16	1			1					1
	11	16	13		1	14					14
	20	16	1	1		2					2
	29	16	33			33					33
		34					55	1		56	56
CL601	11	16	6			6					6
	20	29					1			1	1
	29	16	7			7					7
		34					14			14	14
CNA172	2	16	24			24					24
		34					158	1	1	160	160
	11	16	12		1	13					13
		29		1		1					1
		34					5			5	5
	20	16	72	1		73					73
		34					10	1		11	11
	29	16	114	12	2	128					128
		34					106	4	1	111	111
CNA182	2	16	15			15					15
		29	2			2					2
		34					139	3	1	143	143
	11	16	15	6	1	22					22
		34					19			19	19
	20	16	76	2		78					78
		29	2			2	3			3	5
		34					77			77	77
	29	16	95	5		100					100
		34					161	2		163	163
CNA206	2	16	1			1					1
		34					24			24	24
	11	16	4	1		5					5
		34					3			3	3
	20	16	7			7					7
		34					2			2	2
	29	16	21	1		22					22
		34					17	1		18	18
CNA208	2	16	4			4					4
		34					34			34	34
	11	16	22	1		23					23
		34					52		6	58	58
	20	16	55	3	1	59					59
		34					5			5	5
	29	16	213	16	2	231					231
		34					265	11	5	281	281

CNA441	**2**	**34**					4		1	5	**5**
	11	**16**	4			4					**4**
		34					2			2	**2**
	20	**16**	1			1					**1**
		29	1			1					**1**
	29	**16**	9			9					**9**
		34					8			8	**8**
CNA500	**29**	**16**	1			1					**1**
		34					2			2	**2**
CNA510	**2**	**34**					2			2	**2**
	11	**16**	1			1					**1**
	20	**16**	6			6					**6**
		34					1			1	**1**
	29	**16**	17	1	1	19					**19**
		34					20	1		21	**21**
CNA525C	**2**	**34**					2			2	**2**
	11	**16**	8			8					**8**
	20	**16**	8			8					**8**
	29	**16**	50		1	51					**51**
		34					56	1		57	**57**
CNA55B	**2**	**34**					4			4	**4**
	11	**16**	10			10					**10**
		34					25		1	26	**26**
	20	**16**	8	1		9					**9**
		29					1			1	**1**
	29	**16**	69	5		74					**74**
		34					55	1	1	57	**57**
CNA560U	**11**	**16**	1			1					**1**
	20	**16**	1			1					**1**
	29	**16**	9	1		10					**10**
		34					12			12	**12**
CNA560XL	**11**	**16**	6			6					**6**
	20	**16**	1	2		3					**3**
	29	**16**	25	1		26					**26**
		34					30			30	**30**
CNA680	**29**	**16**	1			1					**1**
		34					1			1	**1**
CNA750	**11**	**16**	8			8					**8**
	29	**16**	37	1		38					**38**
		34					33			33	**33**
COMSEP	**2**	**16**	14			14					**14**
		34					204		3	207	**207**
	11	**16**	27	5	2	34					**34**
		29	1			1					**1**
		34					31		2	33	**33**
	20	**16**	68	4	3	75					**75**
		29	2			2					**2**
		34					13	1	4	18	**18**
	29	**16**	215	15	2	232					**232**
		34					208	7	2	217	**217**
DC3	**29**	**34**					3			3	**3**
DHC6	**2**	**34**					5			5	**5**
	11	**16**	18	2	1	21					**21**
		34					3			3	**3**
	20	**16**	20		1	21					**21**
		29	1			1					**1**
		34					1			1	**1**
	29	**16**	113	4		117					**117**
		34					120	2		122	**122**
DO228	**29**	**34**					1			1	**1**
ECLIPSE500	**20**	**16**	3			3					**3**
	29	**16**	5			5					**5**
		34					5			5	**5**
EMB145	**29**	**34**					2			2	**2**
F10062	**20**	**34**					1			1	**1**
FAL900EX	**2**	**34**					2			2	**2**

	11	**16**		1		1					**1**
	29	**16**	12			12					**12**
		34					12			12	**12**
G650ER	**11**	**16**	1			1					**1**
	29	**16**	1		1	2					**2**
		34					4		1	5	**5**
GASEPF	**2**	**16**	43	1		44					**44**
		34					77		1	78	**78**
	11	**16**	8			8					**8**
		34					9		2	11	**11**
	20	**16**	37			37					**37**
		29	4			4	2			2	**6**
		34					42		1	43	**43**
	29	**16**	65			65					**65**
		34					37		1	38	**38**
GASEPV	**2**	**16**	17			17					**17**
		29					1			1	**1**
		34					182	2	7	191	**191**
	11	**16**	20			20					**20**
		29					1			1	**1**
		34					39			39	**39**
	20	**16**	52	1		53					**53**
		29	1			1					**1**
		34					18			18	**18**
	29	**16**	240	10	1	251					**251**
		34					209	7	1	217	**217**
GIIB	**29**	**34**					1			1	**1**
GIV	**11**	**16**	9			9					**9**
	29	**16**	16			16					**16**
		34					12			12	**12**
GV	**11**	**16**	4			4					**4**
	29	**16**	2			2					**2**
		34					5			5	**5**
HS748A	**2**	**34**					1			1	**1**
IA1125	**11**	**16**	1			1					**1**
	29	**16**	8			8					**8**
		34					5			5	**5**
LEAR35	**11**	**16**	11			11					**11**
	20	**16**	3			3					**3**
		34					4			4	**4**
	29	**16**	19		1	20					**20**
		34					30	1		31	**31**
MU3001	**11**	**16**	1			1					**1**
	20	**16**	1			1					**1**
	29	**16**	9			9					**9**
		34					7			7	**7**
OV10A	**29**	**16**	1			1					**1**
PA28	**2**	**16**	1			1					**1**
		34					30			30	**30**
	11	**16**	3			3					**3**
		34					1			1	**1**
	20	**16**	8			8					**8**
		29	1			1					**1**
		34					1			1	**1**
	29	**16**	28	1		29					**29**
		34					31	1		32	**32**
PA30	**2**	**34**					2			2	**2**
	11	**16**	1	1		2					**2**
	29	**16**	8			8					**8**
		34					8			8	**8**
SF340	**2**	**34**					1			1	**1**
	20	**16**	13			13					**13**
		29					3			3	**3**
		34					16			16	**16**
T34	**2**	**34**					1			1	**1**
	29	**16**	1			1					**1**

		34					2			2	**2**
T37B	**2**	**16**	3			3					**3**
		34					3			3	**3**
	11	**16**	2			2					**2**
	20	**16**	2			2					**2**
	29	**16**	2			2					**2**

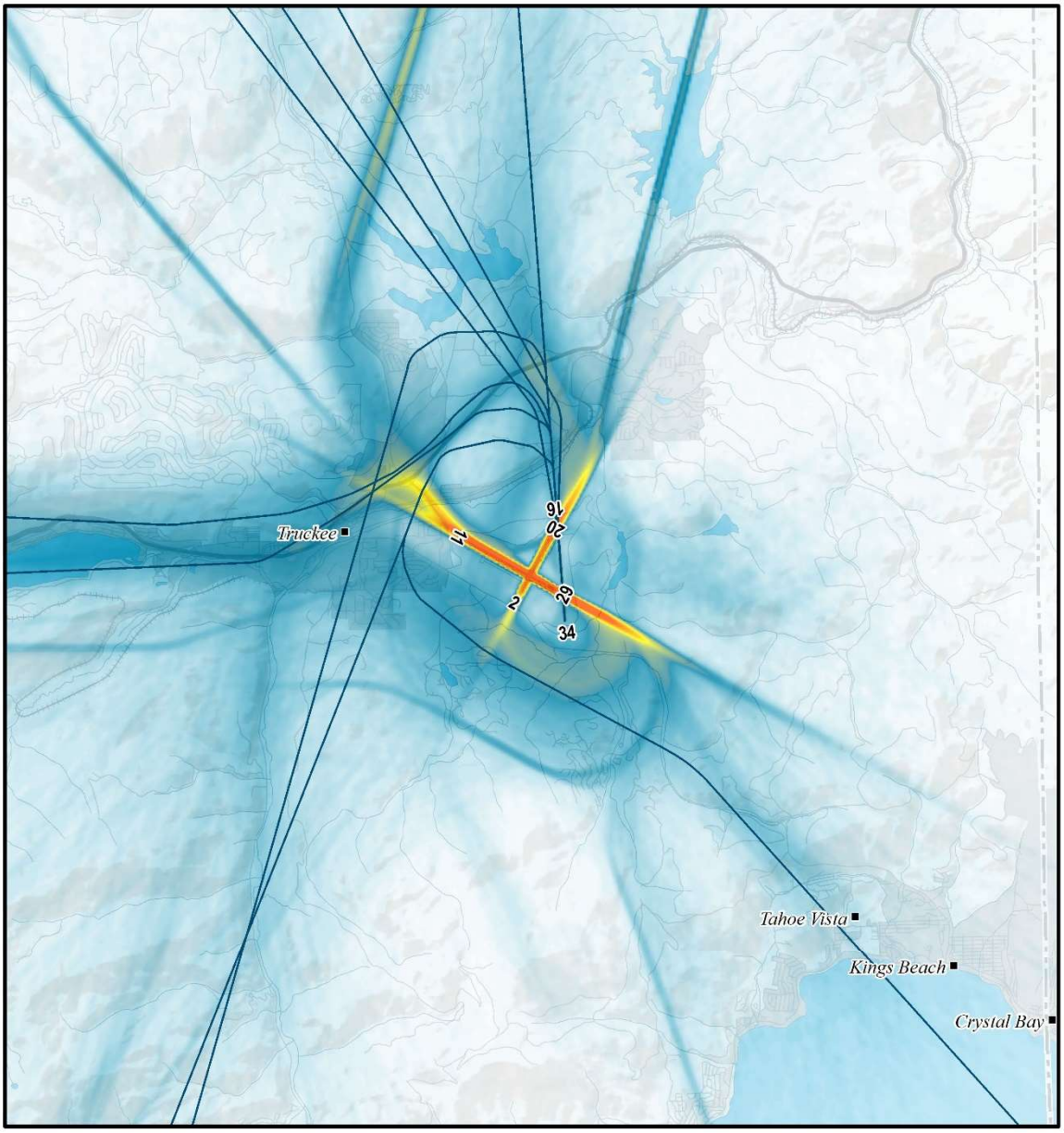
5.0 Flight Track Geometry and Use

HMMH employs a proprietary pre-processor that prepares large quantities of daily flight track and aircraft identification data for processing by AEDT. Standard AEDT analyses (without the pre-processor) rely on assigning all operations to a limited number of prototypical or representative tracks, apply a generalized distribution for runway usage and day/evening/night split, and rely on other aggregated data for choice of modeled aircraft type and flight profile. Use of the AEDT pre-processor improves the precision of modeling by:

- Automating the production of noise contours directly from each individual flight track as obtained in the Vector data set. For this modeling effort, 44,617 tracks were collected and 27,815 retained enough information (including sufficient numbers of track points, aircraft assignments, runway assignments, etc.) to be converted by the pre-processor into AEDT flight tracks. Each flight track was converted to a model track, ensuring that the lateral dispersion of radar tracks was retained in the modeling.
- Providing greater detail than standard AEDT analyses through the use of individual flight tracks taken directly from the actual flight track and aircraft identification data rather than relying on consolidated, representative flight tracks data.
- Modeling each operation for the actual time of day and on the specific runway that it actually used, rather than applying a generalized distribution to broad ranges of aircraft types.
- Selecting the specific airframe and engine combination to model, on an operation by operation basis, based on the aircraft registration or a published composition of the fleets of the specific airlines operating at Truckee-Tahoe Airport.
- Using each flight's origin and destination to select the proper stage length.

Flight track density plots for each alternative are shown on the following pages.

HMMH
700 District Avenue, Suite 800
Burlington, MA 01803
781.229.0707



Service Layer Credits: Sources: Esri, USGS, NOAA

Flight Track Density - 26,637 Flight Tracks

Low Medium High

Proposed Alternative Flight Tracks

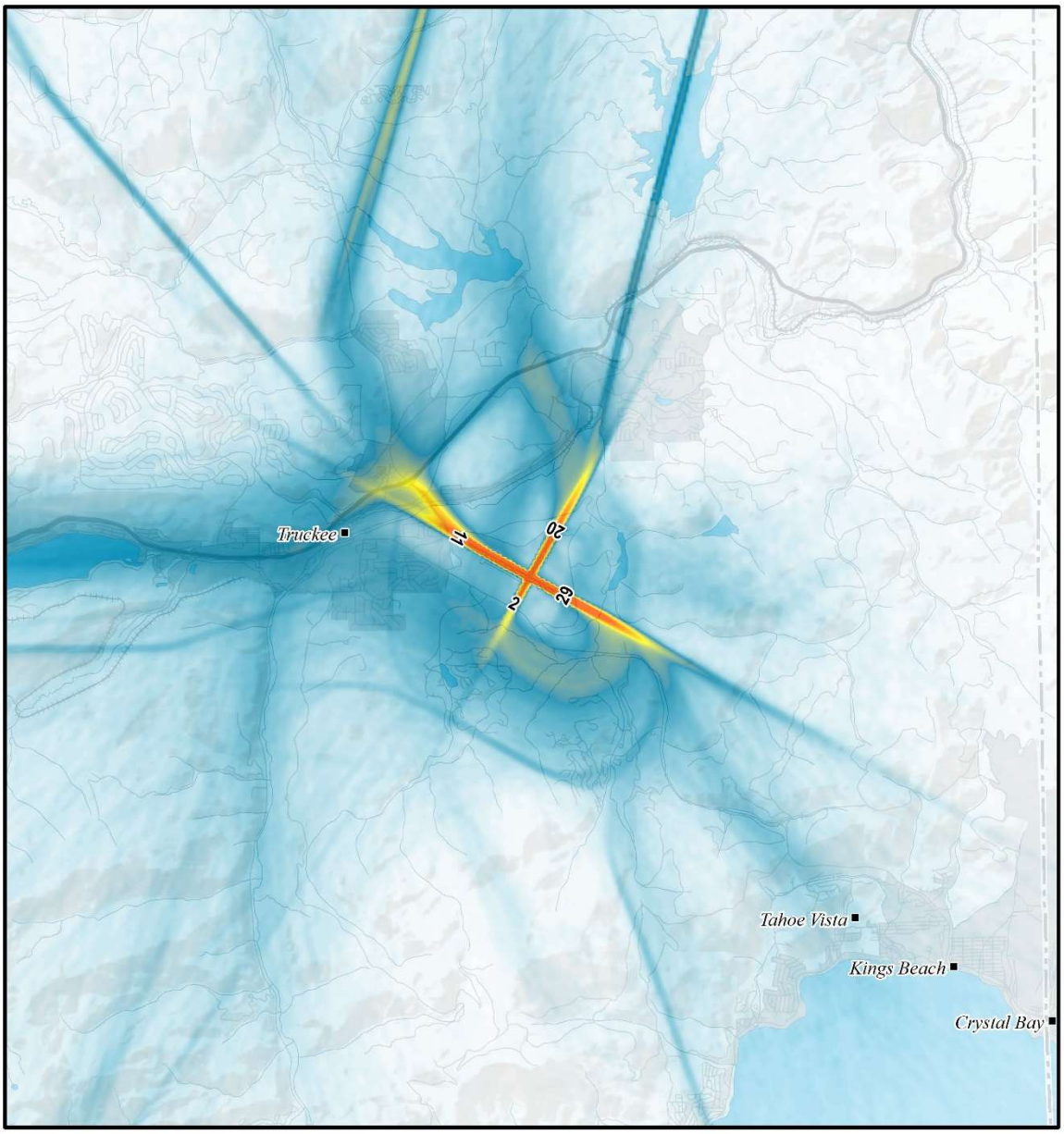
0 10,000 20,000 Feet

TRUCKEE TAHOE AIRPORT

Truckee Tahoe Airport

Truckee, California

Alternative 1 Track Density Plot
All Operations



Service Layer Credits: Sources: Esri, USGS, NOAA

Flight Track Density - 26,405 Flight Tracks

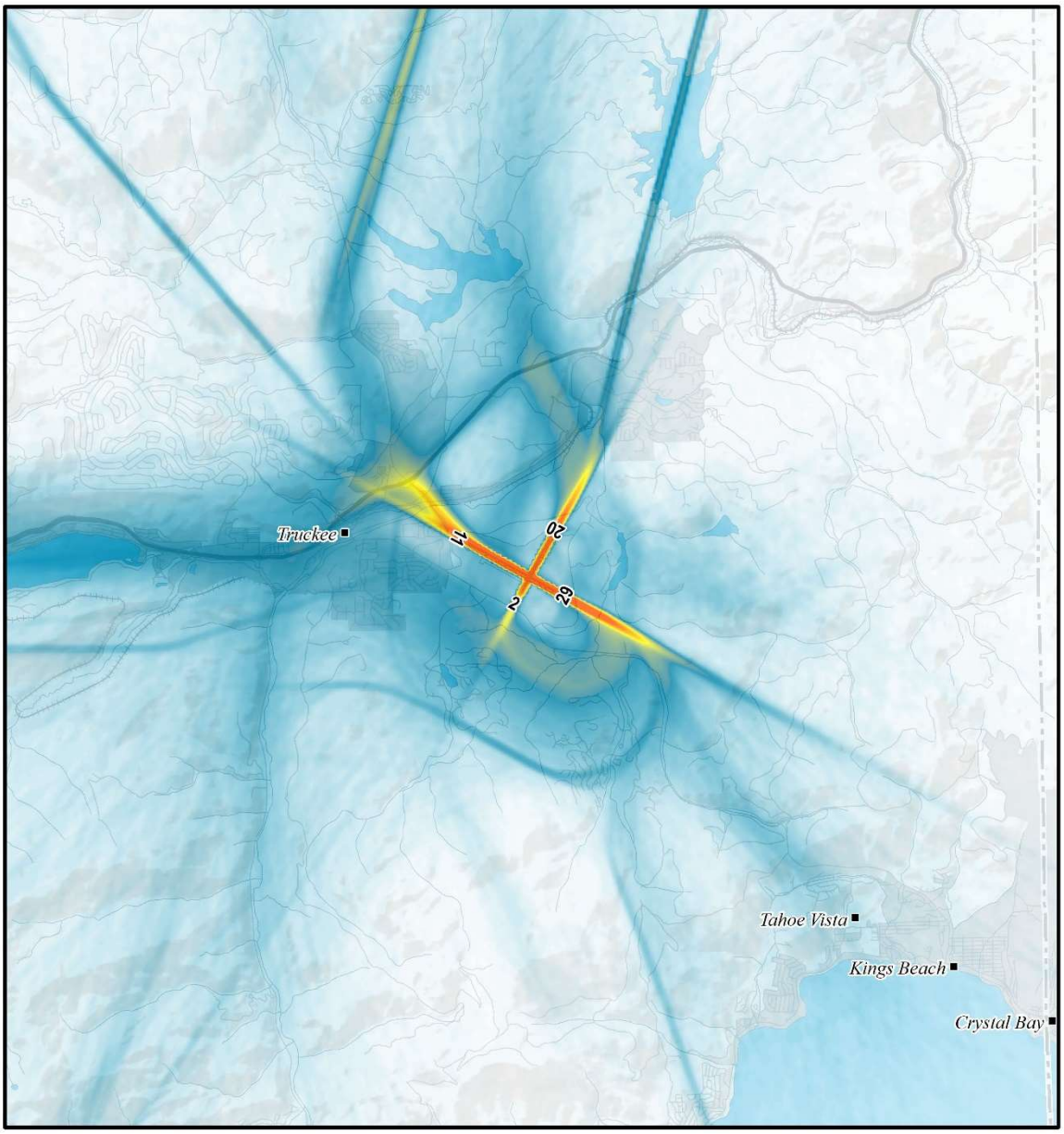
Low Medium High

0 10,000 20,000 Feet

Truckee Tahoe Airport

Truckee, California

Alternative 2 Track Density Plot
All Operations



Service Layer Credits: Sources: Esri, USGS, NOAA

Flight Track Density - 26,630 Flight Tracks

Low Medium High

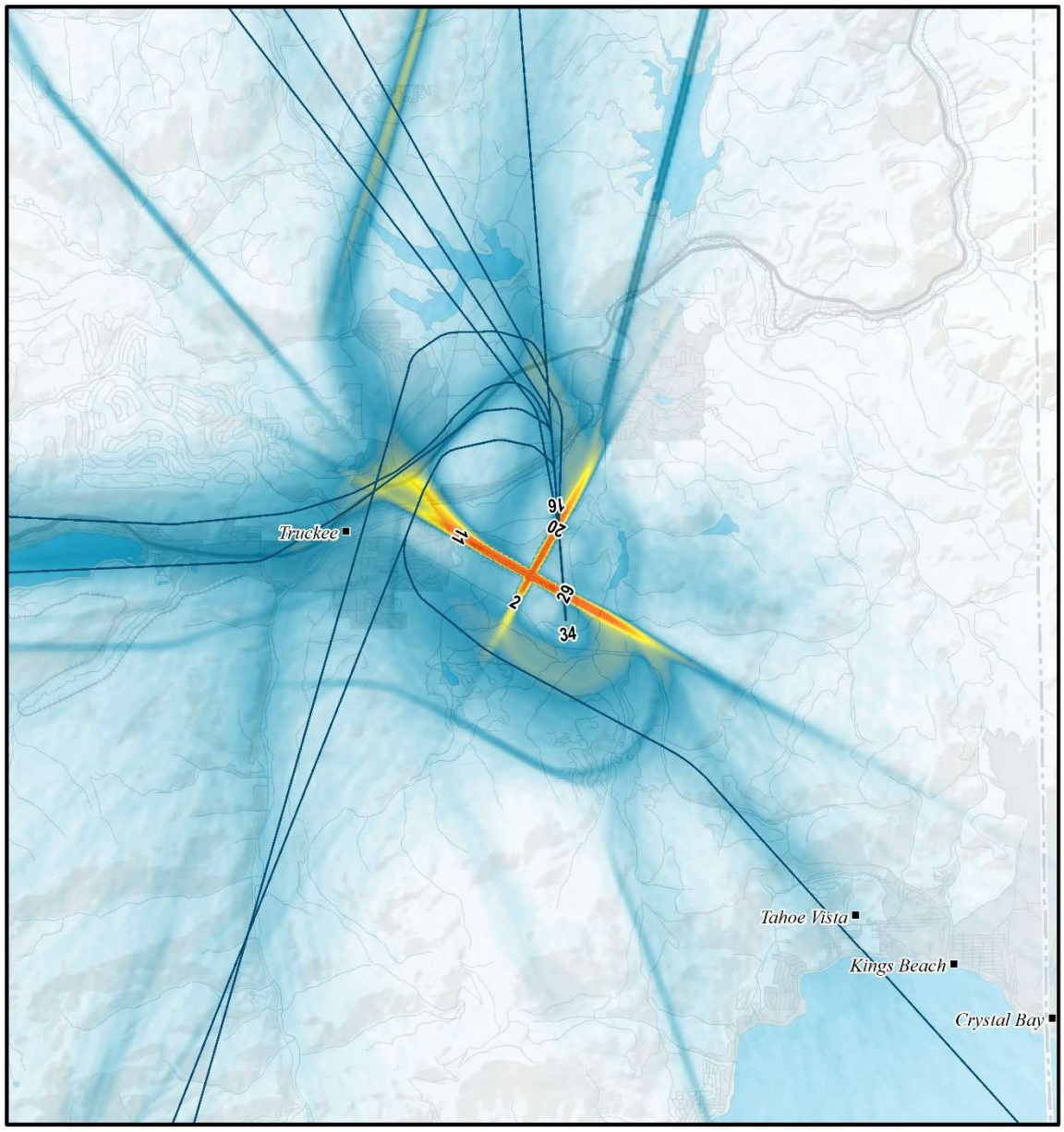
TRUCKEE TAHOE AIRPORT

Truckee Tahoe Airport

Truckee, California

Alternative 3 Track Density Plot
All Operations

0 10,000 20,000 Feet



Service Layer Credits: Sources: Esri, USGS, NOAA

Flight Track Density - 26,637 Flight Tracks

Low Medium High

Proposed Alternative Flight Tracks

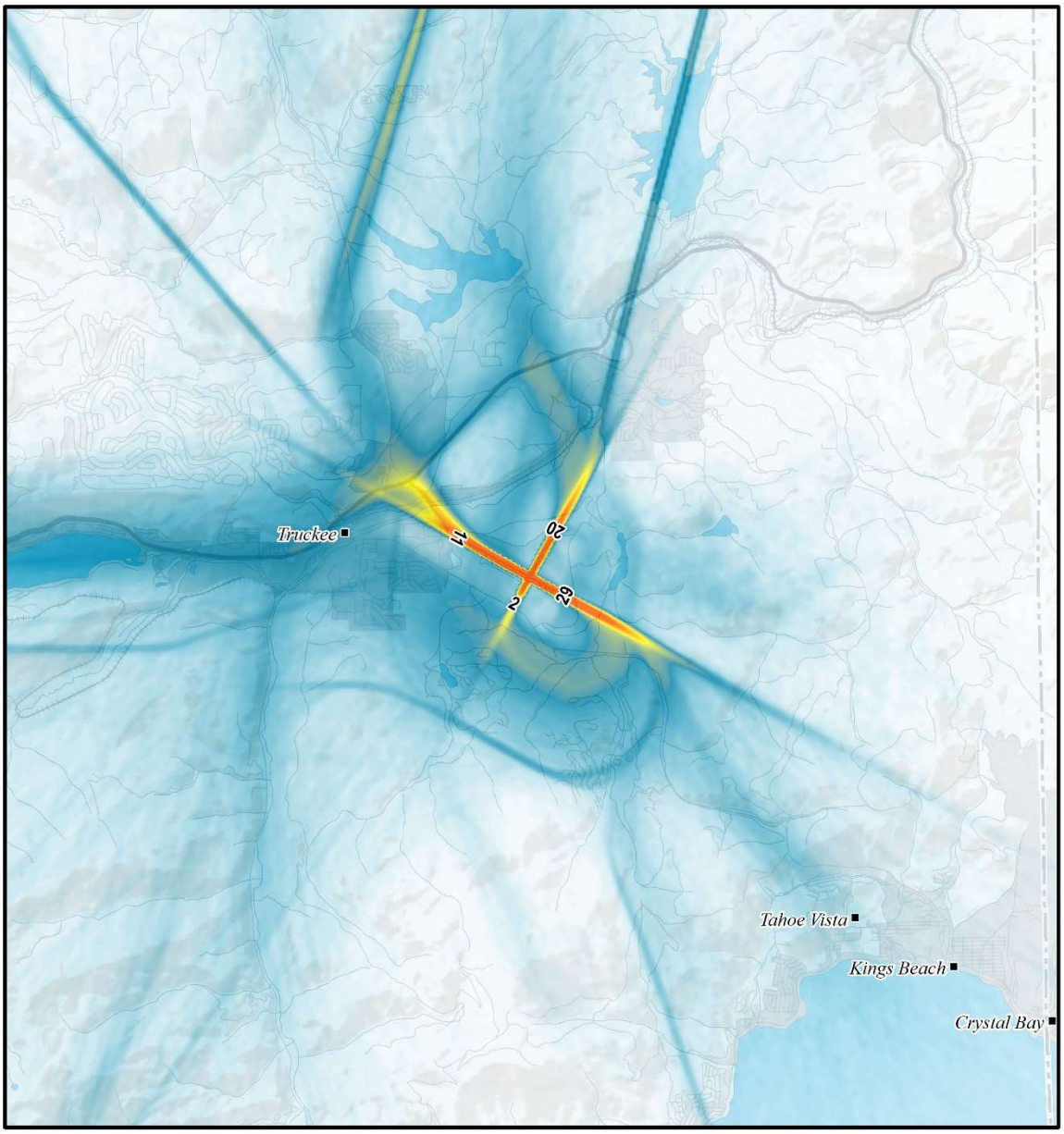
0 10,000 20,000 Feet

TRUCKEE TAHOE AIRPORT

Truckee Tahoe Airport

Truckee, California

Alternative 4 Track Density Plot
All Operations



Service Layer Credits: Sources: Esri, USGS, NOAA

Flight Track Density - 26,630 Flight Tracks

Low Medium High

TRUCKEE TAHOE AIRPORT

Truckee Tahoe Airport

Truckee, California

Alternative 5 Track Density Plot
All Operations

0 10,000 20,000 Feet

6.0 Meteorological Conditions

The AEDT has several settings that affect aircraft performance profiles and sound propagation based on meteorological data. Meteorological settings include average annual temperature, barometric pressure, and relative humidity at the airport. The AEDT holds the following default values for annual average weather conditions at TRK and these values were used for all modeling:

- Temperature: 40.36° F
- Pressure: 821.27 millibars
- Relative Humidity 61.31%
- Dew Point: 28.08° F
- Wind Speed: 3.36 Knots

7.0 Terrain Data

Terrain data describes the elevation of the ground surrounding the airport and on airport property. The AEDT uses terrain data to adjust the ground level under the flight paths. The terrain data does not change the aircraft's performance or noise levels but alters the vertical distance between the aircraft and a "receiver" on the ground. This affects assumptions about how noise propagates over ground. HMMH obtained the terrain data from the United States Geological Survey (USGS) National Elevation Dataset with one-third arc second (approximately 33 feet) resolution. Terrain data was utilized in conjunction with the terrain features of the AEDT to generate the noise contours for all scenarios.

8.0 Number Above Analysis

HMMH analyzed the number of aircraft events exceeding a maximum noise level of 70 dB (NA70) occurring during an annual average day using a ten-by-twelve nautical mile receptor grid. An average annual day represents a year's worth of operations averaged to a single day, and is used to eliminate the effect of seasonal operation patterns. Table 3 presents the population exposure for six discrete bands of NA70 exposure, along with the change in population exposure from the existing conditions scenario. Table 4 and Table 5 present similar data for housing exposure and land area (in square miles), respectively.

In order to estimate the number of people residing within the noise grid, 2020 US Census Block boundaries (which depict the smallest Census enumeration unit) were used in conjunction with residential land use. These "Residential Census" data polygons were created by combining Census blocks with the residential land use, concentrating population and housing unit values into the residential portion of the census block where people actually live. For example, the population is concentrated along roads rather than over several square miles of open or undeveloped land covered by the census block.

Using Geographic Information Systems (GIS) tools, the NA70 Grid cells were intersected with the Residential Census data for each alternative. The resultant wholly or partially encompassed Residential/Census grid cells were then identified; the proportion of total area within the grid cell was then calculated to determine the estimated residential population and housing unit counts and ascribed to that NA70 level.

HMMH
700 District Avenue, Suite 800
Burlington, MA 01803
781.229.0707

Table 3. Average Number of Daily Aircraft Noise Events Above 70 dB Population Exposure

Source: HMMH, Census 2020

N70	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
>50	0	0	0	0	0
20-50	87	65	204	87	214
10-20	1,196	1,152	1,332	1,196	1,322
5-10	978	1,059	851	977	851
2-5	2,425	2,790	2,664	2,383	2,712
1-2	3,815	3,618	3,811	3,847	3,776
Change From Existing					
>50	0	0	0	0	N/A
20-50	-127	-149	-10	-127	N/A
10-20	-126	-170	10	-126	N/A
5-10	127	208	0	126	N/A
2-5	-287	78	-48	-329	N/A
1-2	39	-158	35	71	N/A

Table 4. Average Number of Daily Aircraft Noise Events Above 70 dB Housing Units Exposure

Source: HMMH, Census 2020

N70	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
>50	0	0	0	0	0
20-50	39	30	85	39	90
10-20	471	452	525	471	520
5-10	531	659	640	530	635
2-5	2,275	2,693	2,723	2,262	2,750
1-2	3,441	3,306	3,297	3,448	3,298
Change From Existing					
>50	0	0	0	0	N/A
20-50	-51	-60	-5	-51	N/A
10-20	-49	-68	5	-49	N/A
5-10	-104	24	5	-105	N/A
2-5	-475	-57	-27	-488	N/A
1-2	143	8	-1	150	N/A

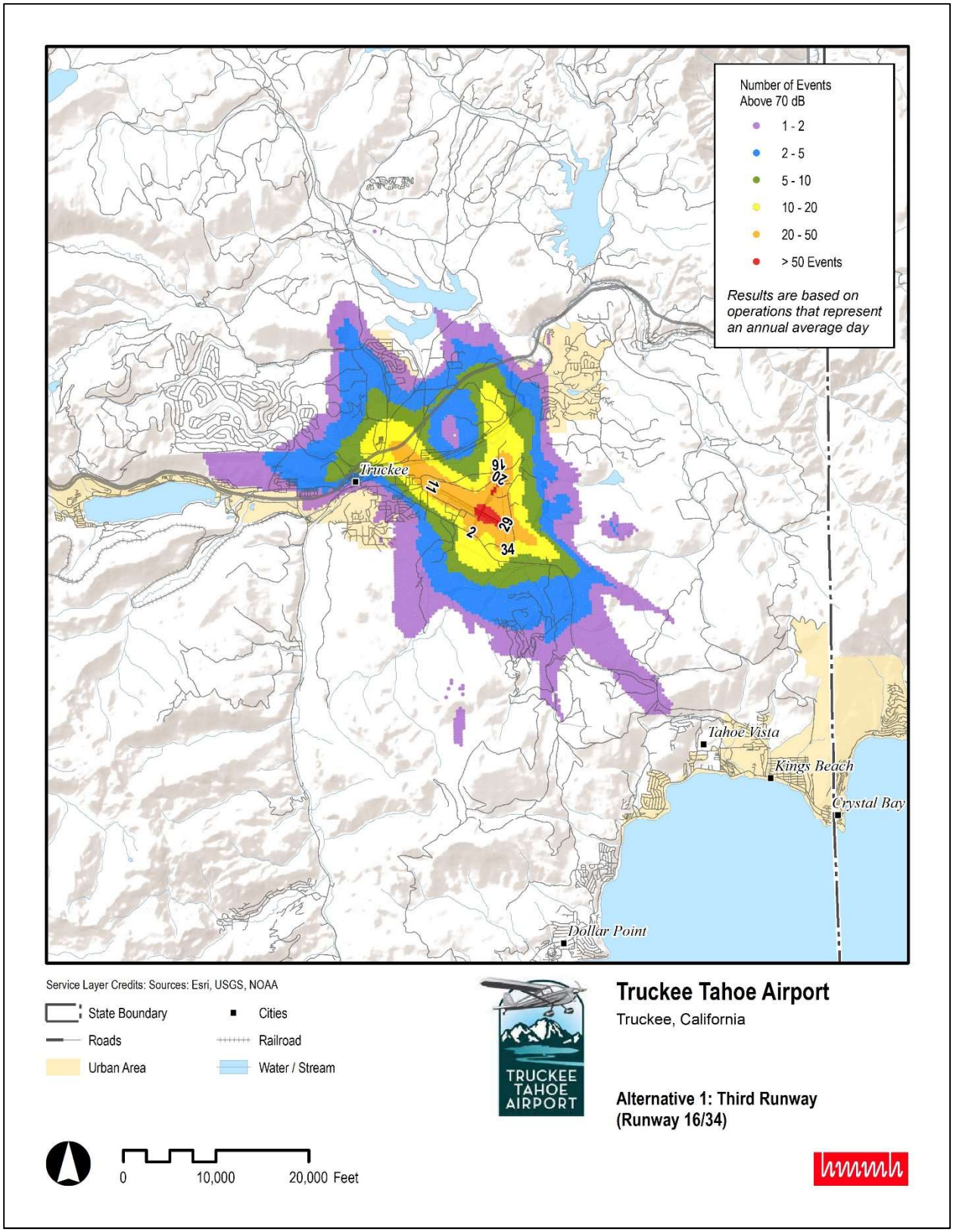
Table 5. Average Number of Daily Aircraft Noise Events Above 70 dB Area Exposure (sq. Miles)

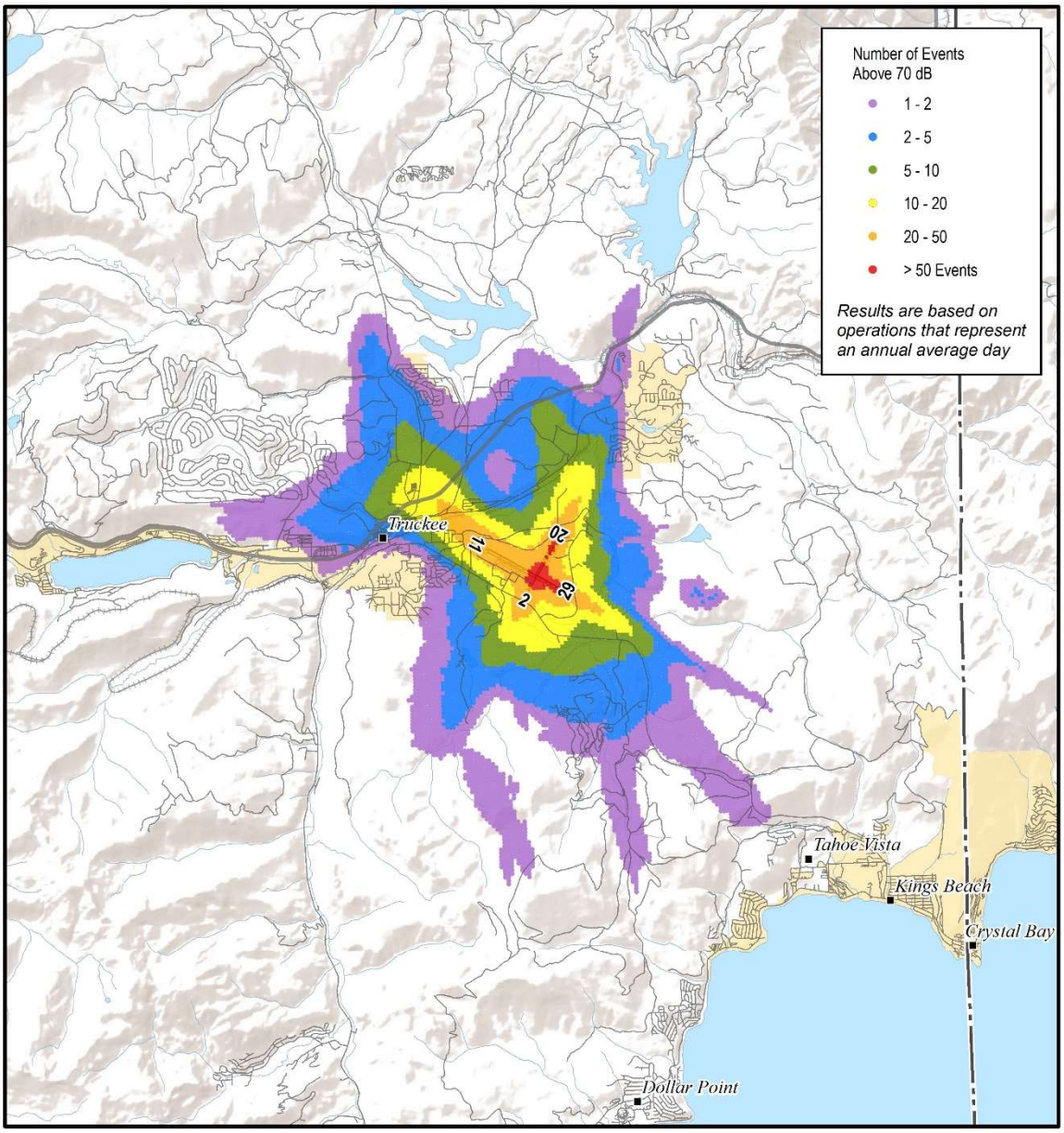
Source: HMMH, Census 2020

N70	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
>50	0.20	0.22	0.21	0.21	0.21
20-50	2.16	1.88	2.09	2.15	2.09
10-20	3.56	3.51	3.17	3.56	3.17
5-10	4.92	5.09	5.14	4.91	5.14
2-5	9.61	10.98	10.35	9.60	10.37
1-2	11.03	13.68	13.52	11.04	13.58
Change From Existing					
>50	-0.01	0.01	0.00	0.00	N/A
20-50	0.07	-0.21	0.00	0.06	N/A
10-20	0.39	0.34	0.00	0.39	N/A
5-10	-0.22	-0.05	0.00	-0.24	N/A
2-5	-0.76	0.61	-0.02	-0.77	N/A
1-2	-2.55	0.10	-0.07	-2.55	N/A

As shown in the tables, the greatest reduction in population and housing units exposed to aircraft noise events above 70 dB as compared to the existing condition is seen in Alternative 4, the proposed new Runway 16/34 and the 1,000-foot displaced arrival threshold on Runway 11. Alternative 1 (the proposed new Runway 16/34) also shows substantial reductions, while Alternatives 2 and 3, the widening and

extension of runway 2/20 and the 1,000-foot displaced arrival threshold on Runway 11, show comparatively little change from the existing conditions. The following pages present the grid point analysis used in preparing the above table.


Number of Events
Above 70 dB
1 - 2
2 - 5
5 - 10
10 - 20
20 - 50
> 50 Events
Results are based on operations that represent an annual average day
Truckee
16
20
11
2
34
Tahoe Vista
Kings Beach
Crystal Bay
Dollar Point
Service Layer Credits: Sources: Esri, USGS, NOAA
State Boundary
Cities
Roads
Railroad
Urban Area
Water / Stream
TRUCKEE TAHOE AIRPORT
Truckee Tahoe Airport
Truckee, California
Alternative 1: Third Runway (Runway 16/34)
0
10,000
20,000 Feet



Service Layer Credits: Sources: Esri, USGS, NOAA

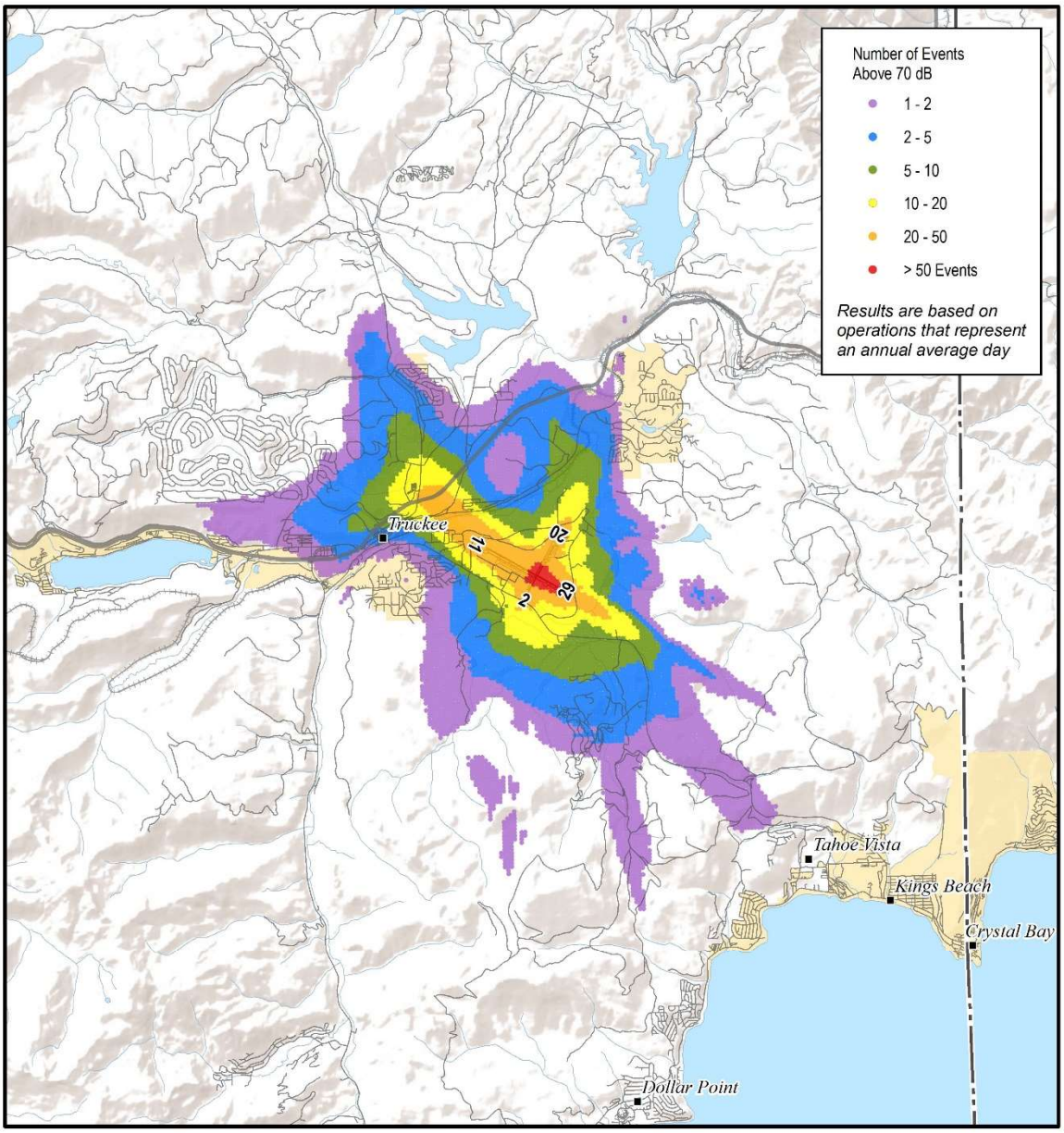
State Boundary
Cities
Roads
Railroad
Urban Area
Water / Stream

TRUCKEE TAHOE AIRPORT

Truckee Tahoe Airport
Truckee, California

Alternative 2: Runway 02/20 Extension and Widening

0 10,000 20,000 Feet



Service Layer Credits: Sources: Esri, USGS, NOAA

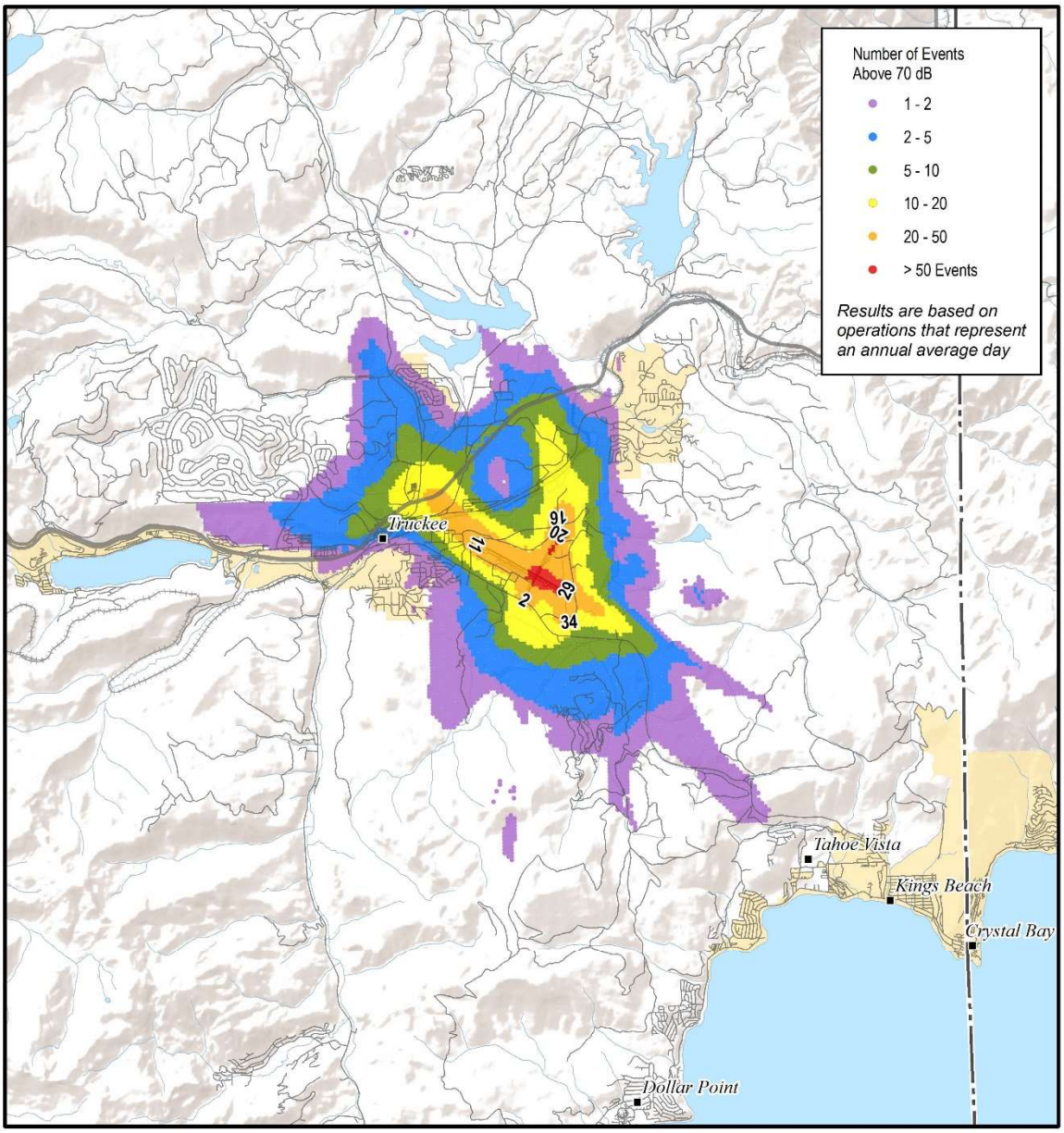
State Boundary
Cities
Roads
Railroad
Urban Area
Water / Stream

TRUCKEE TAHOE AIRPORT

Truckee Tahoe Airport
Truckee, California

Alternative 3: Runway 11 Displaced Threshold

0 10,000 20,000 Feet



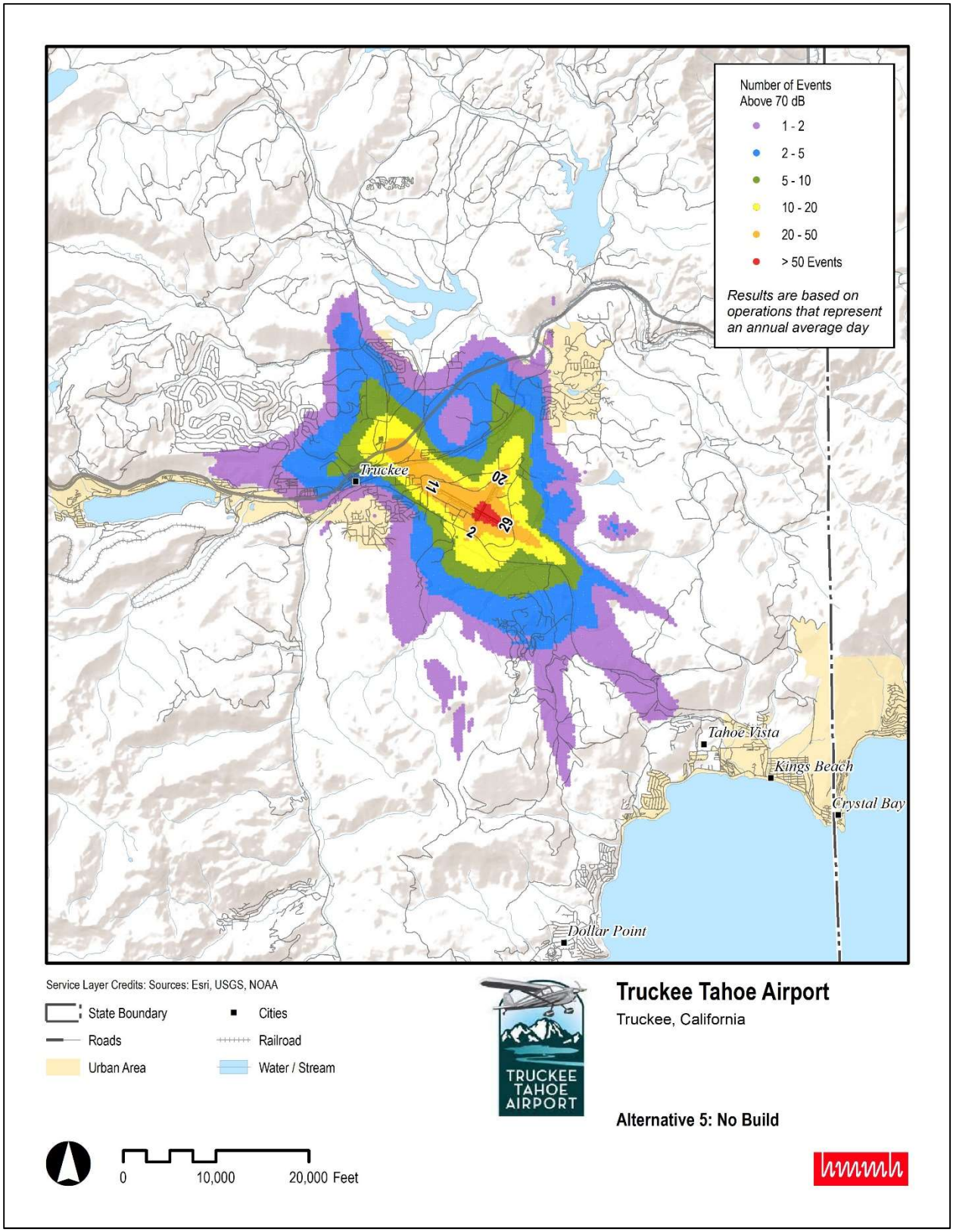
Service Layer Credits: Sources: Esri, USGS, NOAA

State Boundary
Cities
Roads
Railroad
Urban Area
Water / Stream

0 10,000 20,000 Feet

Truckee Tahoe Airport
Truckee, California

Alternative 4: Third Runway and Runway 11 Displaced Threshold



Truckee Tahoe Airport

Truckee, California

Alternative 5: No Build