

St. Paul Downtown Airport (STP) Annual Aircraft Noise Study

May 9-15, 2018



Metropolitan Airports Commission
Noise Program Office
6040 28th Avenue South
Minneapolis, MN 55450

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1.0 Introduction

The purpose of the St. Paul Downtown Airport (STP) Annual Aircraft Noise Study (study) is to evaluate STP aircraft noise events occurring in neighborhoods that surround the airport. This report evaluates data collected during the study period beginning May 9 at 12:00 a.m. and ending on May 15, 2018 at 11:59 p.m. The dates for this study period and the data collection locations were determined by the St. Paul Downtown Airport Advisory Council (DAAC) members during the group's meeting held on October 24, 2017.

The data collected includes STP aircraft operations, noise recordings, complaints, and weather.

The study examines data related to STP aircraft activity only. Section 2 of this study shares the findings of the analysis and compares those data with historical data. It is important to note that aircraft activity occurs throughout the twin cities area airspace as flights travel to and from a variety of airports; however, because this study focuses on STP activity, aircraft noise events that are not associated with STP are not included in the aircraft noise analysis in this study.

The data collection and analysis were conducted by Metropolitan Airports Commission (MAC) Noise Program Office staff.

1.1 Instrumentation

Each noise data collection site consists of laboratory-quality noise monitoring instrumentation manufactured by Larson Davis Incorporated (LD) and PCB Piezotronics. The main components of each site consisted of a Type-1 noise analyzer (LD 831), a preamplifier (LD PRM831), and a microphone (LD 377B02). These instruments are certified by an independent accredited laboratory and traceable to National Institute of Standards and Technology (NIST).

1.2 Analysis Parameters

Noise data analyzers were stationed at six different monitoring locations. Each site operated continuously utilizing slow response with A-weighting (dBA), as federally-prescribed by standards for collecting aircraft noise in the Federal Aviation Administration's 14 CFR Part 150. Events were recorded when the site analyzer detected a noise event with a sound pressure level (SPL) threshold of 65 dBA and remained at or above 63 dBA for four seconds or longer. These parameters are consistent with those used for each of the STP Annual Noise Studies conducted since 2007.

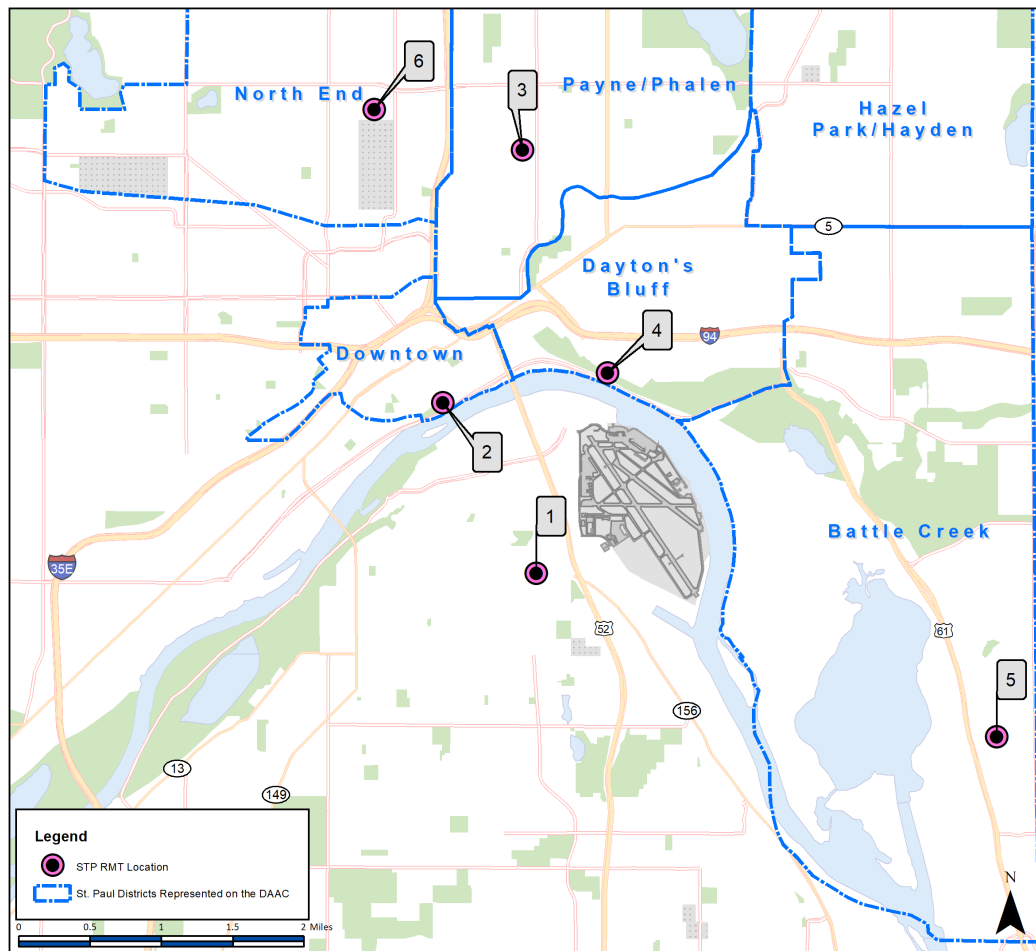
Recorded events were correlated with flight track data collected by MAC's Noise and Operations Monitoring System (MACNOMS). Parameters used to correlate noise events and radar flight tracks included range, altitude and time.

Sources of noises that were unable to be correlated with STP flight tracks are reflected in this report as community events.

1.3 Noise Data Collection Locations

Noise data collection equipment was set-up to record events simultaneously from six different locations. One data collection site was located in each of the St. Paul community districts adjacent to STP. Representatives from each of these districts make up the community membership on the DAAC. **Figure 1** depicts a map of the district council areas and locations for all six data collection sites used during the 2018 study period.

Figure 1: Noise Data Collection Locations
5/9/2018-5/15/2018

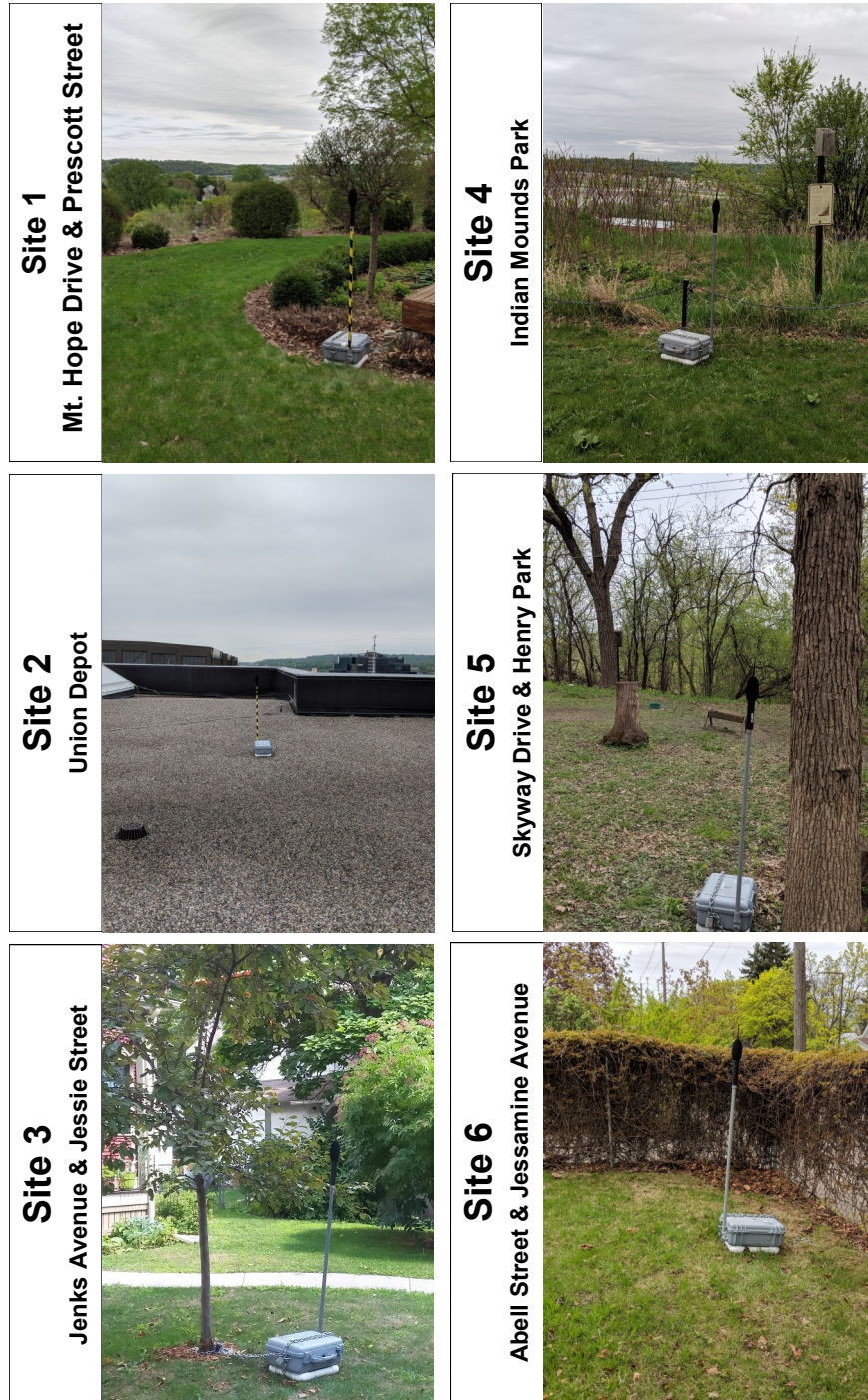


Four of the data collection sites were placed in the same location that were used for data collection during the 2016 study period. Two sites were adjusted slightly, as follows:

- Site 2 moved to improve data quality and for more protection of the equipment. The new Site 2 location is on the rooftop of Union Depot, about a 1/2 mile east of the Kellogg Park location used previously.
- Site 6 moved due to property owner request. The new Site 6 location is across the street from the original location.

Photos of each noise data collection site are provided in **Figure 2**. All sites were inspected before the data collection was initiated. Each site was found to be acceptable and able to meet the project objectives.

Figure 2: Noise Data Collection Location Photos
5/9/2018-5/15/2018



1.4 Weather Data Collection

Weather conditions (e.g.; temperature, precipitation, wind, etc.) affect the way sounds are heard and recorded, as well as runway use decisions and performance of aircraft. For these reasons, weather data are documented during the study period. Weather conditions reported by Weather Underground during the study period are summarized in **Figure 3**.

Figure 3: Weather Observations

May 2018	Temperature (°F)			Dew Point (°F)			Humidity (%)		Sea Level Pressure (in)		Wind Speed (mph)		Precipitation	
	high	avg	low	high	avg	low	high	low	high	low	high	low	inches	notes
Wednesday May 9	63	59	55	56	53	49	89	67	29.81	29.68	18	0	0.1	Rain
Thursday May 10	59	51	45	49	32	25	86	30	30.09	29.85	15	0	0	Mostly Sunny
Friday May 11	53	49	46	41	33	22	68	35	30.09	30.02	15	4	0	Partly Sunny
Saturday May 12	61	53	45	45	38	32	80	35	30.18	30.08	13	0	0	Rain
Sunday May 13	70	57	44	55	48	40	89	57	30.11	29.9	9	0	0	Mostly Sunny
Monday May 14	75	64	53	60	57	52	97	50	29.94	29.85	13	0	0.15	Rain
Tuesday May 15	77	64	53	58	48	35	100	24	30.07	29.91	9	0	0	Hazy

Source: <https://www.wunderground.com/history/monthly/us/mn/st.-paul/KSTP/date/2018-5>

2.0 Summary of Findings

The following information summarizes the findings of the 2018 STP Annual Aircraft Noise Study.

2.1 Sound Data Collection Site Inspections and Condition

During the study period of May 9-15, 2018, MAC staff inspected the condition of each site periodically to ensure the equipment was operating properly and continuing to record data. An initial sound calibration was performed on system deployment, and system checks were made throughout the study period to ensure system was operating and within tolerances.

2.2 Aircraft Operations

STP flight activity was observed during the study period and flight tracking data were used to establish runway use patterns. There were 683 total operations at STP during the study period. This level is 11% lower than what occurred during the previous study period, which took place in August 2017. Forty STP operations occurred during the 2018 study period nighttime hours (10 p.m. –7 a.m.)— 54% fewer nighttime operations than the level reported in the 2017 study period.

The primary use runway at STP for arrivals and departures is Runway 14/32: Runway 14 was used for 51% of the arrivals and 49% of the departures during the study period. Runway 32 was used for 43% of arrivals and 43% of departures. The highest level of STP aircraft activity occurred on Thursday May 10 with 160 operations: 81 arrivals and 79 departures. **Chart 1** below displays the aircraft operations count during each day of the 2018 study period.

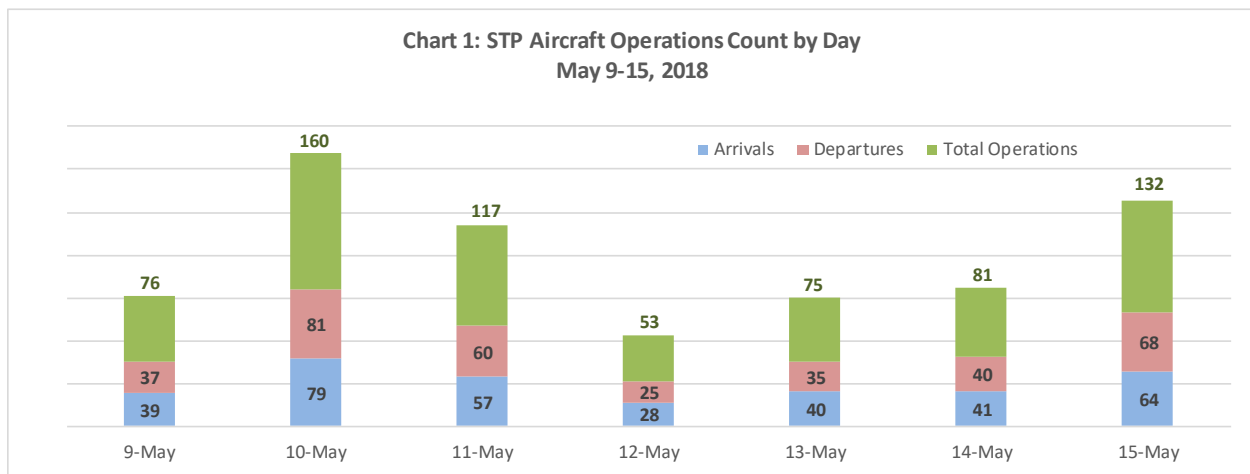
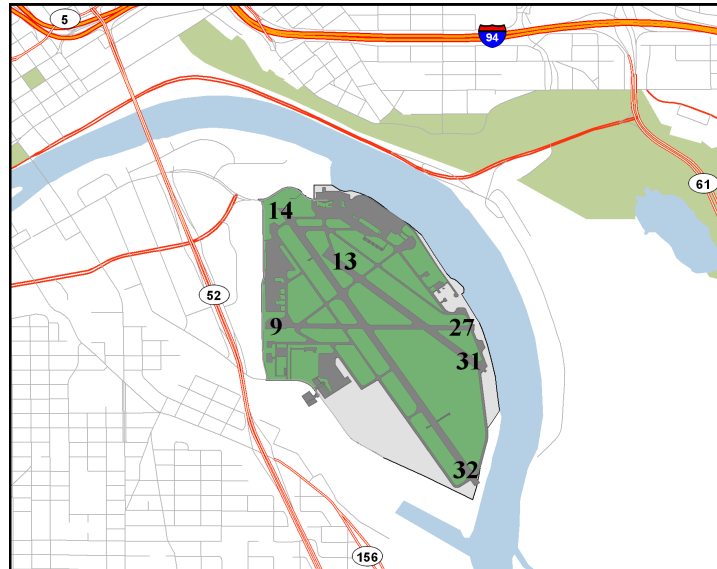


Figure 4 below shows the detailed runway use counts for STP aircraft operations during the 2018 study period.

Figure 4: Runway Use
5/9/2018-5/15/2018



Operations (24 Hour Days)		
Arrivals		
Runway	Count	Percent
9	1	0.3%
13	8	2.3%
14	177	50.9%
27	3	0.9%
31	9	2.6%
32	148	42.5%
Unknown	2	0.6%
Total	348	100.0%
Departures		
9	1	0.3%
13	13	3.9%
14	163	48.7%
27	6	1.8%
31	6	1.8%
32	145	43.3%
Unknown	1	0.3%
Total	335	100.0%

Nighttime Operations (10 p.m. - 7:00 a.m.)		
Nighttime Arrivals		
Runway	Count	Percent
9	0	0.0%
13	1	5.0%
14	9	45.0%
27	0	0.0%
31	0	0.0%
32	9	45.0%
Unknown	1	5.0%
Total	20	100%
Nighttime Departures		
9	1	5.0%
13	0	0.0%
14	9	45.0%
27	0	0.0%
31	1	5.0%
32	9	45.0%
Unknown	0	0.0%
Total	20	100.0%

Total Operations 683

Total Nighttime Operations 40

Note: Sum of runway use % may not equal 100% due to rounding.

The hours that netted the highest volume of aircraft operating at STP during the study period were 1 p.m. and 2 p.m. The hourly operation details are shown below in **Chart 2**.

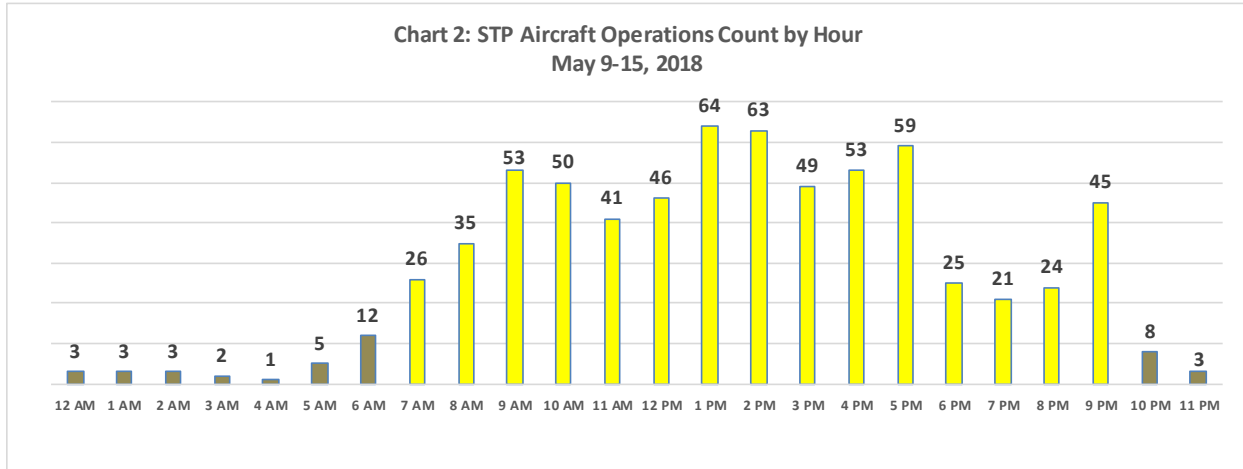


Figure 5 on page 11 shows the flight tracks associated with the STP during the study period: one map shows the STP flights occurring during daytime hours (7 a.m.– 10 p.m.), and the other map shows the STP flights occurring during nighttime hours (10 p.m.-7 a.m.).

2.3 Noise Events

During the 2018 study period there were a total of 260 aircraft noise events recorded above 65 dBA: 71 arrival noise events, and 189 departure noise events. This level is 24% lower than the number of aircraft noise events recorded during the 2017 study period. **Chart 3** below provides a comparison of events recorded in the 2018 Noise Study compared with studies conducted since 2007.

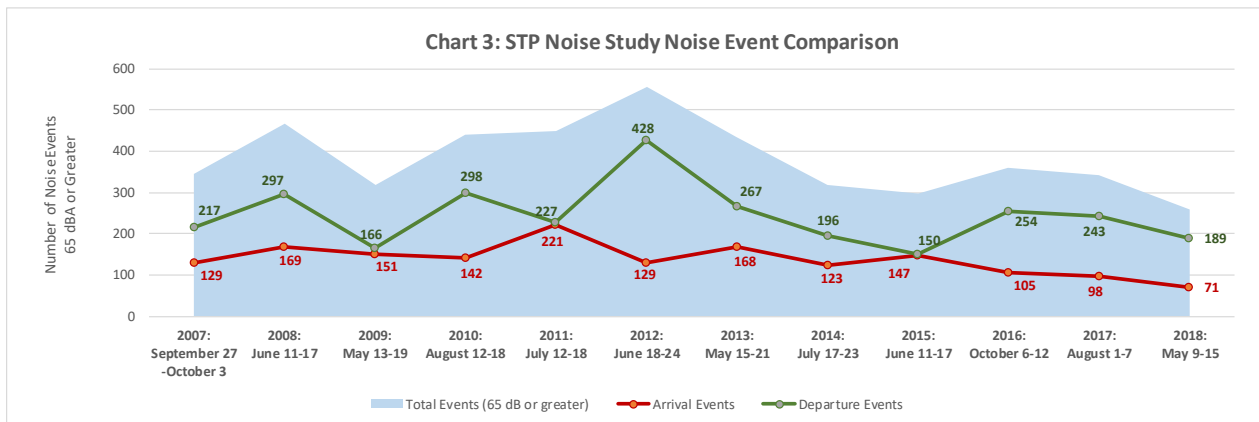


Figure 6 details the number of aircraft noise events that exceeded 65 dBA, 80 dBA, 90 dBA, and 100 dBA. The highest number of arrival noise events was recorded at Site 6 with a total of 47. The highest number of departure noise events was recorded at Site 4, with a total of 91. These sites also recorded the highest number of arrival and departure noise events respectively during the 2017 study period.

Figure 7 provides a list of the top ten loudest aircraft noise events recorded at each site.

Figures 8-10 summarize aircraft and community noise data collected during the study period. The Day-Night Average Noise Level (DNL) calculations for Aircraft DNL in **Figure 8** reflect aircraft noise and community DNL. The community DNL in **Figure 8** reflects all non-STP aircraft noises recorded during the study period. **Figure 9** summarizes the background sound levels, and **Figure 10** contains the hourly distribution of all sounds recorded during the study period.

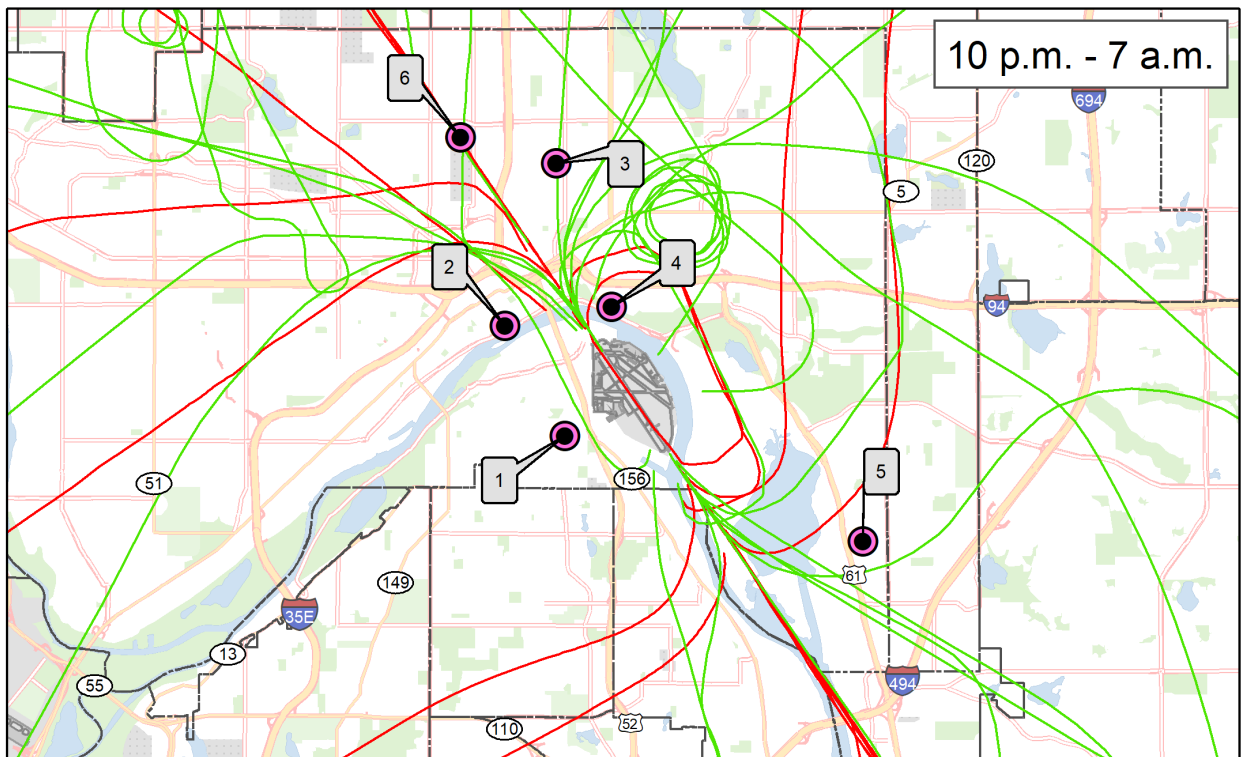
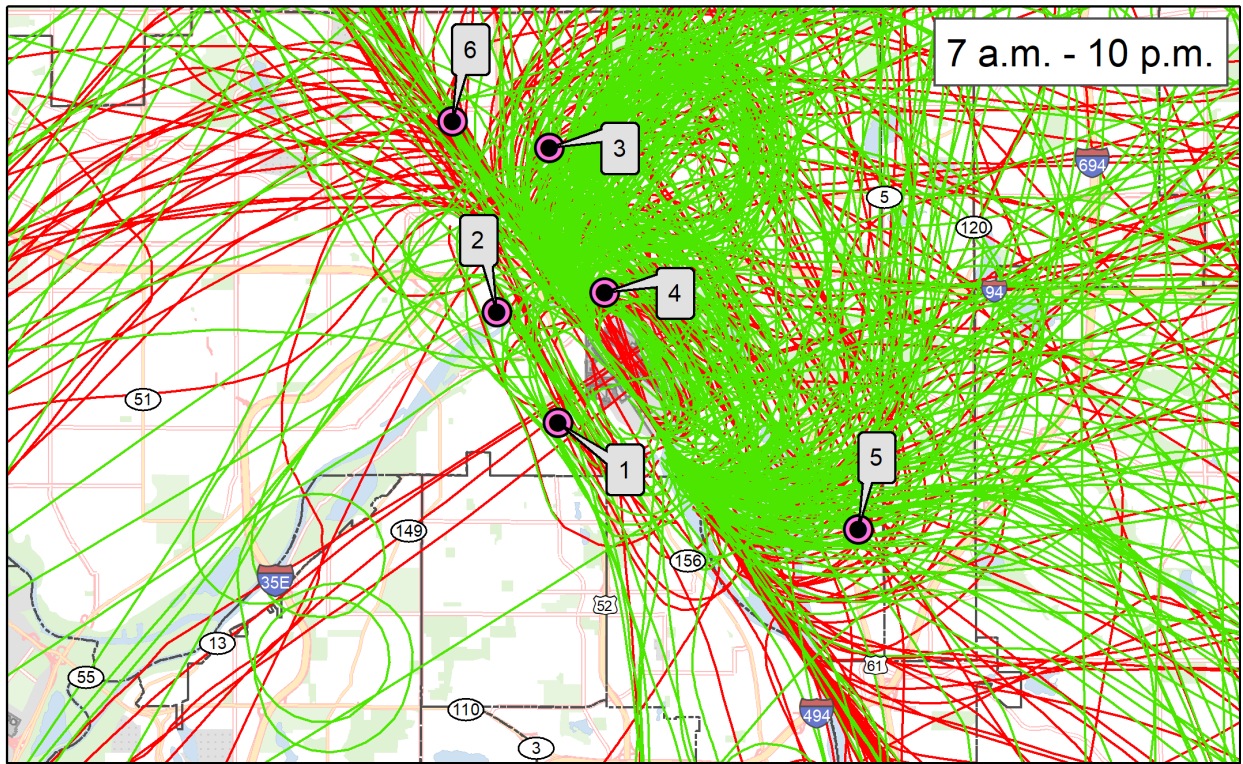
Based on data collected during the 2018 noise study period, daily average aircraft noise levels from operations associated with STP do not meet the Federal Aviation Administration's (FAA) criteria of significance for noise-sensitive land uses. However, it is important to note that single events may at times be considered significant by individuals based on the intrusiveness of events and varying individual tolerance levels.

DNL noise contours are not part of this annual noise study; however, noise contours are generated with the software developed by the FAA and calculated using historical aircraft operations data as a normal process within the STP Long Term Comprehensive Planning (LTCP) Update. Preparation of the next STP LTCP Update is anticipated to begin in 2019.




2.4 Aircraft Noise Complaints

There were five aircraft STP noise complaints from three households documented during the 2018 study period. Three of these complaints were correlated with STP aircraft activity; one was correlated to a commercial airline departure from Minneapolis-St. Paul International Airport; one complaint was not correlated with an aircraft and therefore related to an unknown noise event. **Figure 11** shows the locations and detail related to all five complaints.

Figure 5: STP Flight Tracks for Daytime (7 a.m.-10 p.m.) and Nighttime (10 p.m.—7 a.m.) Hours during Study Period



Legend

-  STP RMT Location
- STP Flight Tracks (694)**
-  Departures
-  Arrivals

STP Flight Activity
During Study Period
May 9-15, 2018



Figure 6: Aircraft Noise Events

5/9/2018-5/15/2018

Arrival-Related Events

Site	Location	>=65dBA	>=80dBA	>=90dBA	>=100dBA
		LA _{max}	LA _{max}	LA _{max}	LA _{max}
1	Mt. Hope Drive and Prescott Street	2	0	0	0
2	Union Depot	4	1	0	0
3	Jenks Avenue and Jessie Street	8	0	0	0
4	Indian Mounds Park	3	0	0	0
5	Skyway Drive and Henry Park	7	0	0	0
6	Abell Street and Jessamine Avenue	47	1	0	0
Total Arrival Noise Events		71	2	0	0

Departure-Related Events

Site	Location	>=65dBA	>=80dBA	>=90dBA	>=100dBA
		LA _{max}	LA _{max}	LA _{max}	LA _{max}
1	Mt. Hope Drive and Prescott Street	7	0	0	0
2	Union Depot	9	1	0	0
3	Jenks Avenue and Jessie Street	38	1	0	0
4	Indian Mounds Park	91	1	0	0
5	Skyway Drive and Henry Park	32	0	0	0
6	Abell Street and Jessamine Avenue	12	0	0	0
Total Departure Noise Events		189	3	0	0

Figure 7: Top 10 Loudest Aircraft Noise Events

Site 1 - Mt. Hope Drive & Prescott Street

Date/Time	Flight ID	Aircraft Type	Arr./Dep.	Runway	LAm _{ax} (dBA)	Duration (seconds)
5/14/2018 12:54	N115SP	SR22	D	14	76.6	11
5/10/2018 9:16	Unknown	UKN	D	32	73.5	13
5/10/2018 2:01	Unknown	UKN	D	32	72.8	20
5/10/2018 15:56	Unknown	UKN	D	32	71	5
5/10/2018 8:17	Unknown	UKN	D	32	70.7	23
5/10/2018 10:15	Unknown	UKN	D	31	69.5	18
5/11/2018 13:19	Unknown	UKN	A	9	69.2	10

Site 2 - Union Depot

Date/Time	Flight ID	Aircraft Type	Arr./Dep.	Runway	LAm _{ax} (dBA)	Duration (seconds)
5/10/2018 15:40	Unknown	UKN	A	32	81.5	19
5/13/2018 12:29	Unknown	B407	D	14	81.5	35
5/14/2018 12:07	Unknown	B407	D	14	78.2	35
5/10/2018 8:16	Unknown	UKN	D	32	75.7	21
5/9/2018 2:36	LN412CU	PC12	A	13	75.4	16
5/10/2018 20:31	Unknown	UKN	D	32	71.2	12
5/10/2018 2:01	Unknown	UKN	D	32	70.2	20
5/9/2018 11:59	Unknown	UKN	A	32	69.4	15
5/10/2018 15:55	Unknown	UKN	D	32	67.3	5

Site 3 - Jenks Avenue & Jessie Street

Date/Time	Flight ID	Aircraft Type	Arr./Dep.	Runway	LAm _{ax} (dBA)	Duration (seconds)
5/9/2018 9:49	COL767	F900	D	27	82.6	20
5/10/2018 14:12	N686CP	H25B	D	32	78.8	23
5/11/2018 12:09	N72DF	SR22	A	14	76	8
5/14/2018 13:15	N560TV	C560	D	14	75.8	12
5/10/2018 15:26	N40ME	C421	D	32	75	18
5/10/2018 10:36	Unknown	UKN	D	31	74.8	20
5/14/2018 17:29	N57UH	GLF5	D	32	74.8	20
5/9/2018 8:39	N569CG	C680	D	32	74.1	18
5/10/2018 16:24	N370EL	CL30	D	32	74	13
5/12/2018 20:23	N904SH	BE20	D	32	73.9	9

Figure 7: Top 10 Loudest Aircraft Noise Events — Cont'd

Site 4 - Indian Mounds Park

Date/Time	Flight ID	Aircraft Type	Arr./Dep.	Runway	LAm _{ax} (dBA)	Duration (seconds)
5/10/2018 10:46	N3220J	BE36	D	32	82.5	28
5/10/2018 7:18	N14MN	BE36	D	32	79.6	29
5/9/2018 14:54	N8111Y	PA30	D	32	78.3	25
5/10/2018 6:50	N598DR	BE40	D	32	77.7	27
5/10/2018 12:06	GJE1021	GLF4	D	32	76.3	19
5/9/2018 11:08	N14MN	BE36	D	32	76.1	18
5/9/2018 10:25	N115SP	SR22	D	32	75.9	19
5/10/2018 10:05	Unknown	UKN	D	32	75.8	17
5/9/2018 14:06	N115SP	SR22	D	32	75.3	23
5/10/2018 9:19	N16MN	BE36	D	32	75.2	20

Site 5 - Skyway Drive & Henry Park

Date/Time	Flight ID	Aircraft Type	Arr./Dep.	Runway	LAm _{ax} (dBA)	Duration (seconds)
5/9/2018 19:20	GJE1021	GLF4	A	32	76.9	14
5/14/2018 8:09	MWT620	BE9L	D	14	76.3	11
5/14/2018 10:36	N560TV	C560	D	14	75.2	10
5/10/2018 11:19	N83M	GLF5	A	32	75.1	12
5/13/2018 13:11	N512PS	COL4	D	14	74.5	16
5/10/2018 9:03	N83M	GLF5	A	32	74.5	11
5/14/2018 8:15	N215HC	BE20	D	14	74.1	14
5/13/2018 14:21	N46WD	B350	A	14	73.6	11
5/10/2018 10:36	Unknown	UKN	D	32	73.3	9
5/11/2018 16:33	COL767	F900	D	14	73	17

Site 6 - Abell Street & Jessamine Avenue

Date/Time	Flight ID	Aircraft Type	Arr./Dep.	Runway	LAm _{ax} (dBA)	Duration (seconds)
5/13/2018 17:20	N9131X	PA46	A	14	80.1	10
5/12/2018 18:45	LN904SH	BE20	A	14	78.4	14
5/14/2018 16:20	N55MN	BE9L	A	14	77.2	9
5/11/2018 14:28	N581SF	G150	A	14	76.3	11
5/11/2018 9:32	N816JW	GALX	A	14	76	11
5/11/2018 14:51	N138DM	CL60	A	14	75.9	14
5/11/2018 14:49	N901SH	BE20	A	14	75.8	15
5/14/2018 10:40	N516CC	G280	A	14	75.6	11
5/12/2018 22:45	N925CM	S22T	A	14	75.3	9
5/13/2018 13:05	N473CW	GLF4	A	14	75.2	12

Figure 8: Aircraft and Community DNL by Site

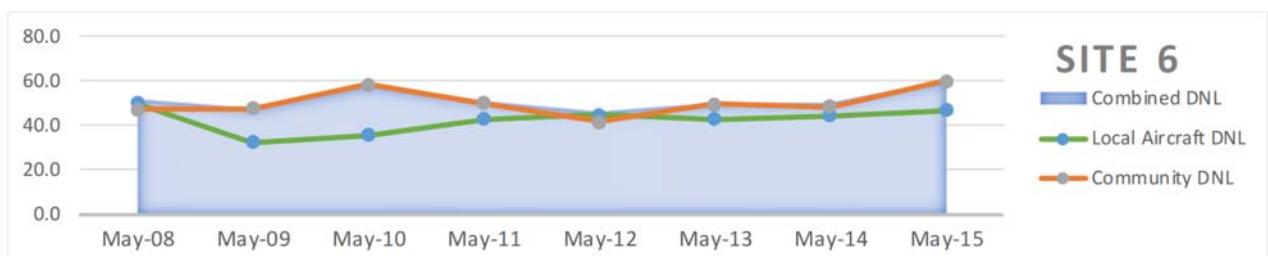
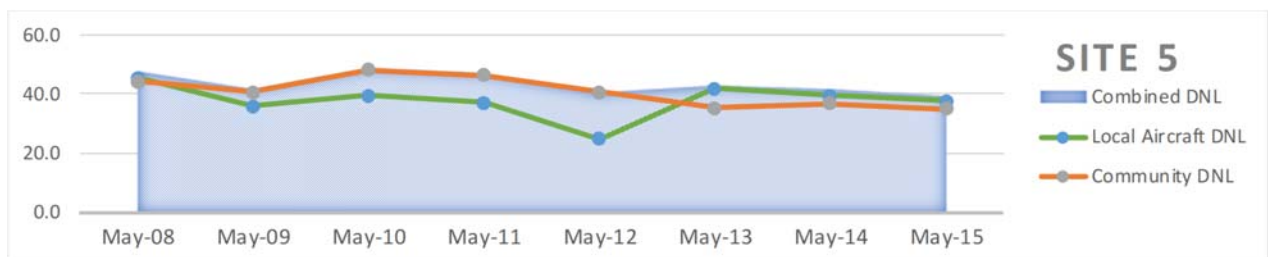
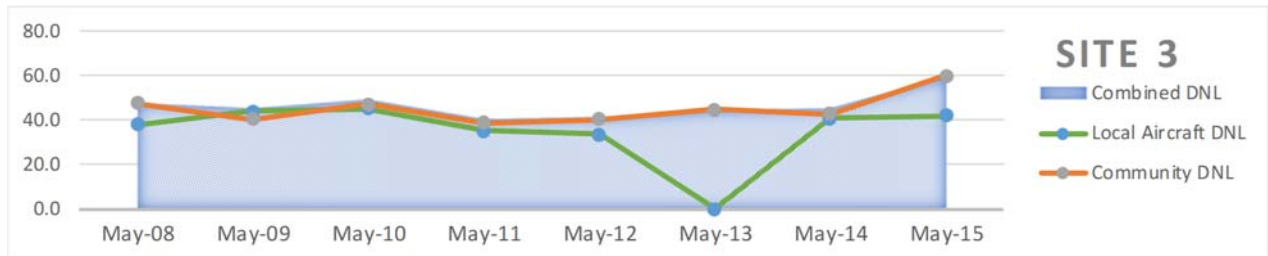
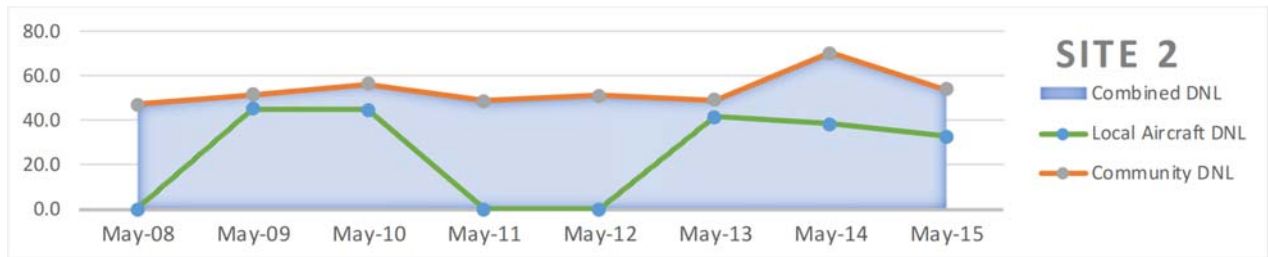
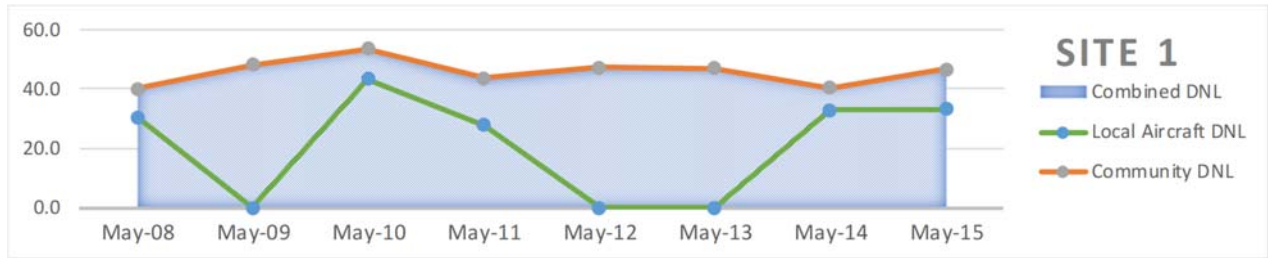


Figure 9: Average Background Sound Levels (LA₉₀)

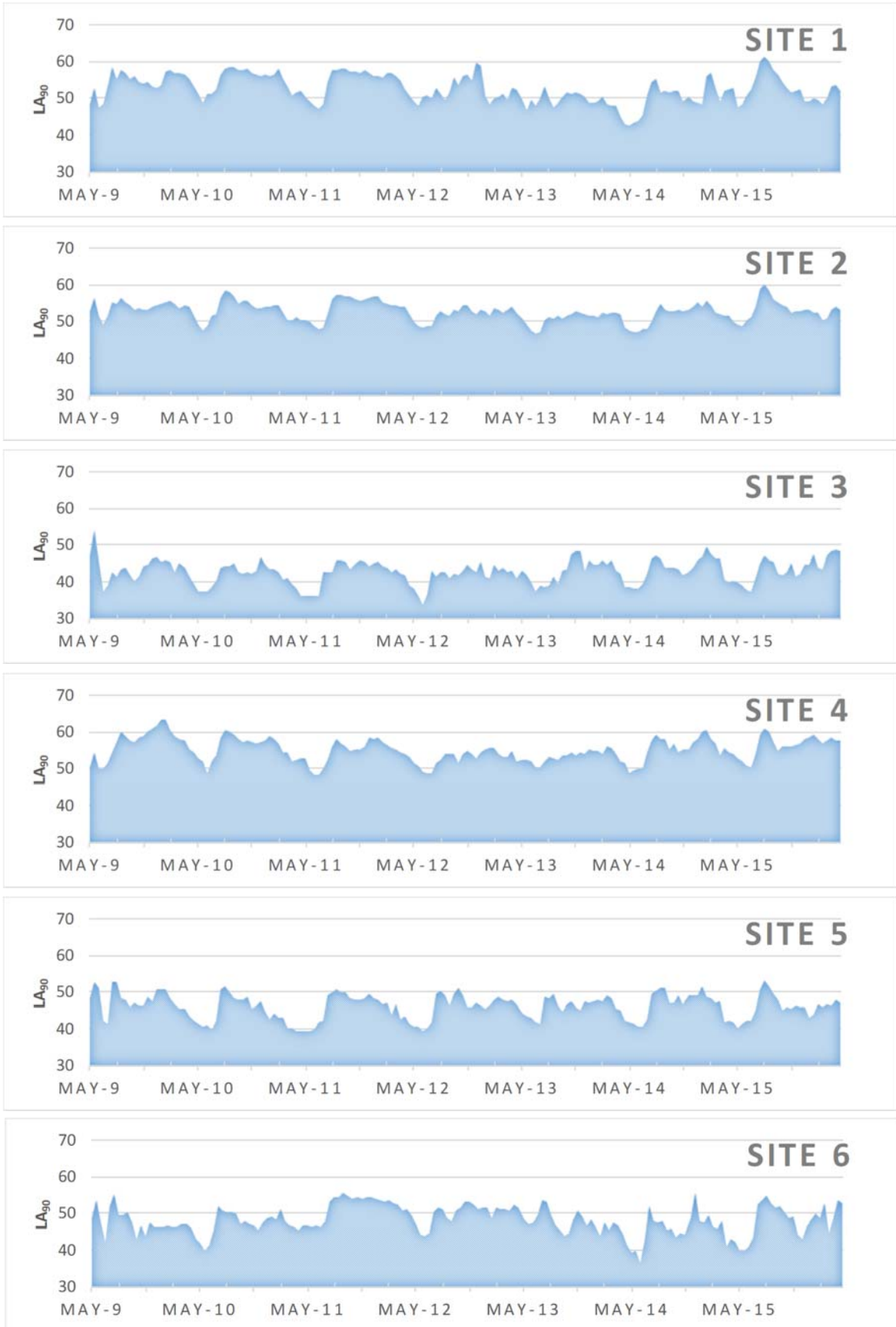


Figure 10: Hourly Distribution of Noise Events (SEL)

5/9/2018 - 8/7/2017

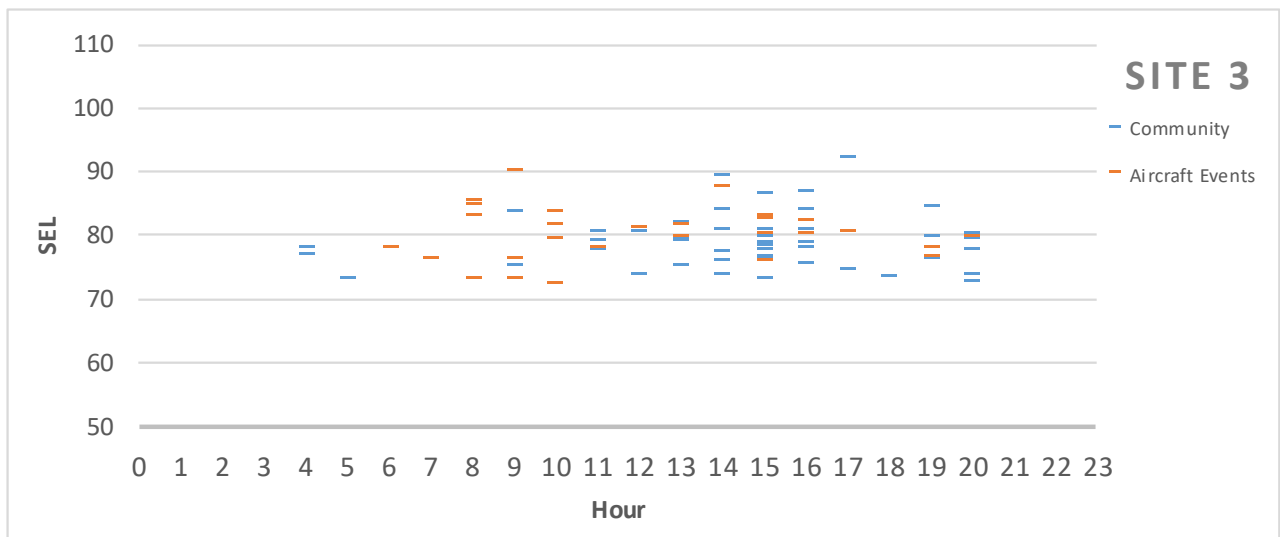
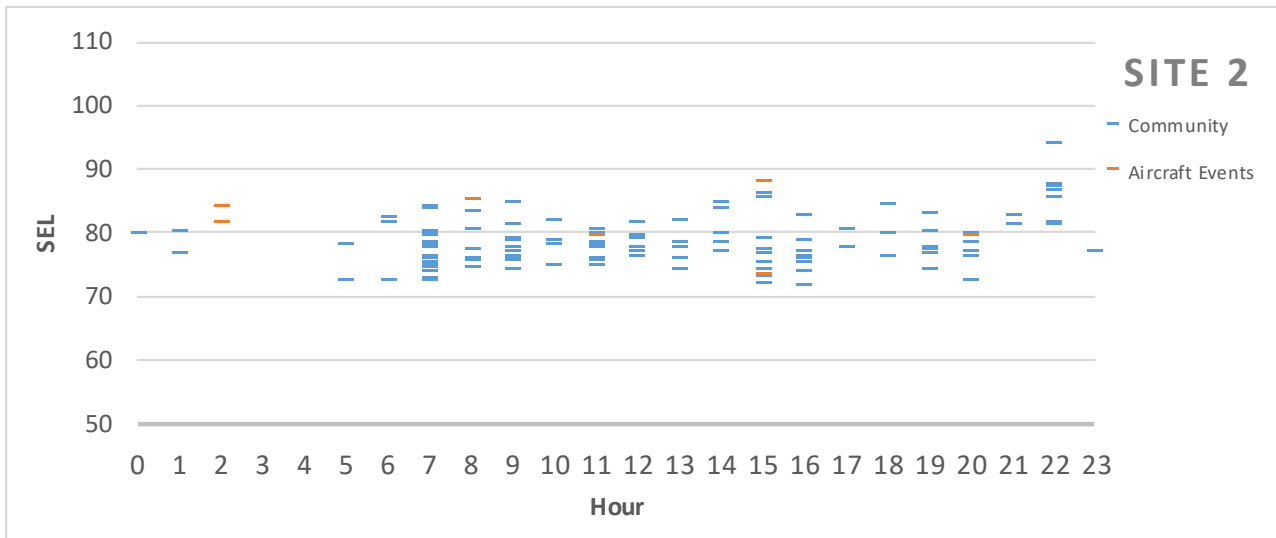
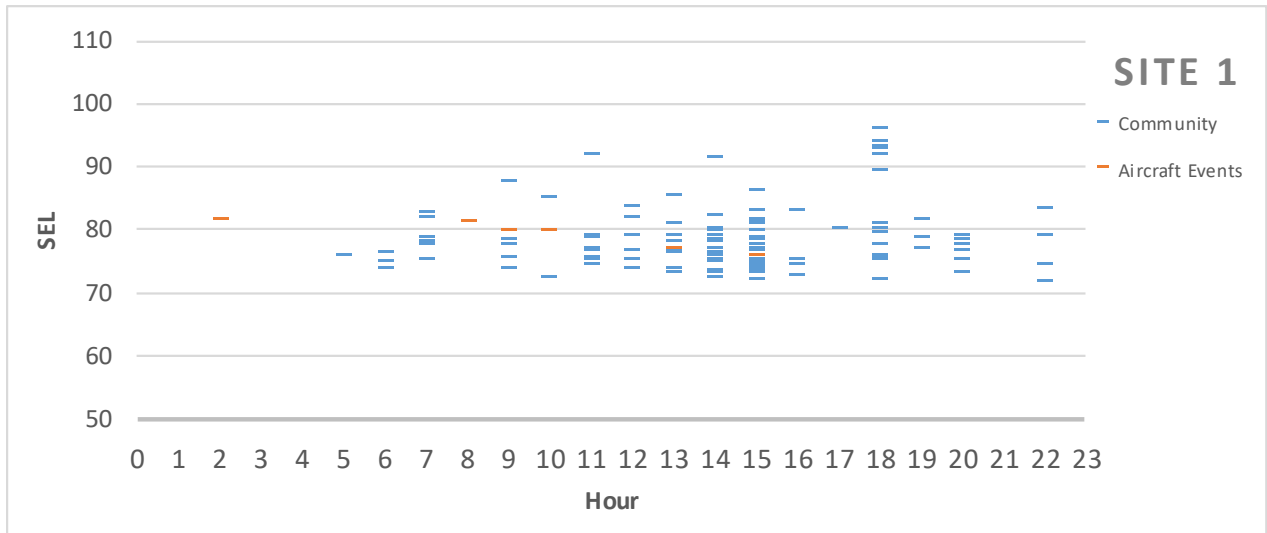


Figure 10: Hourly Distribution of Noise Events (SEL) — Cont'd
5/9/2018 - 5/15/2018

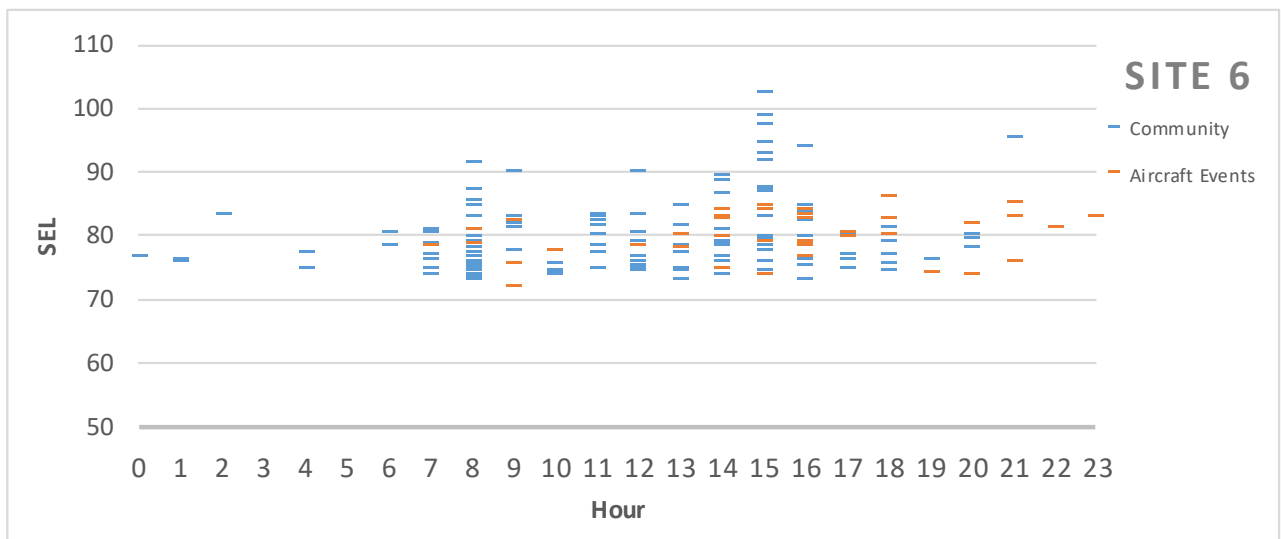
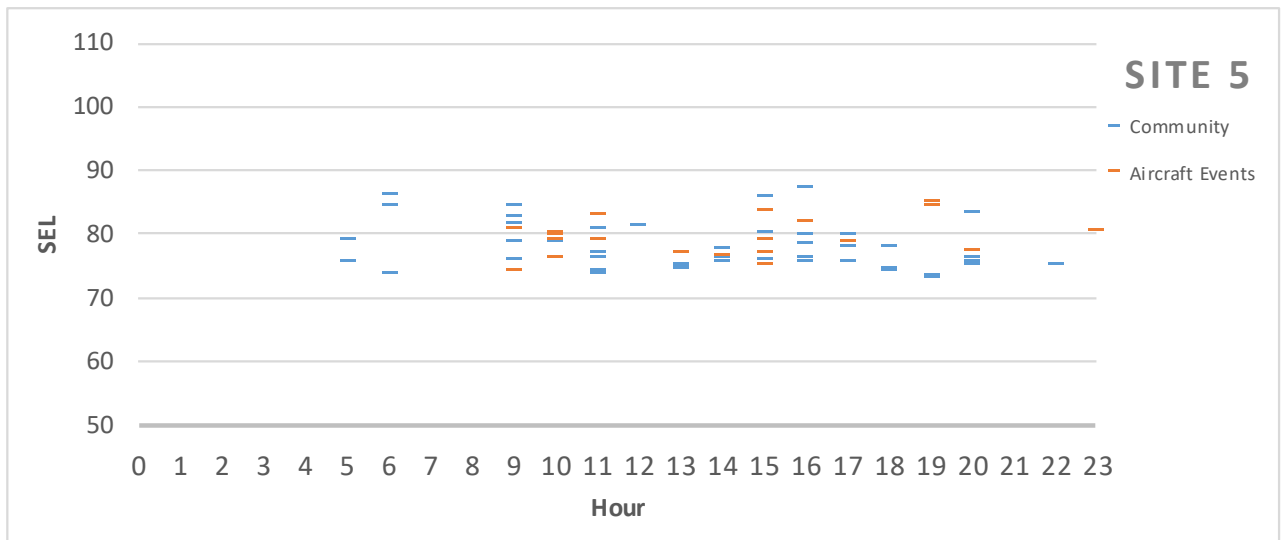
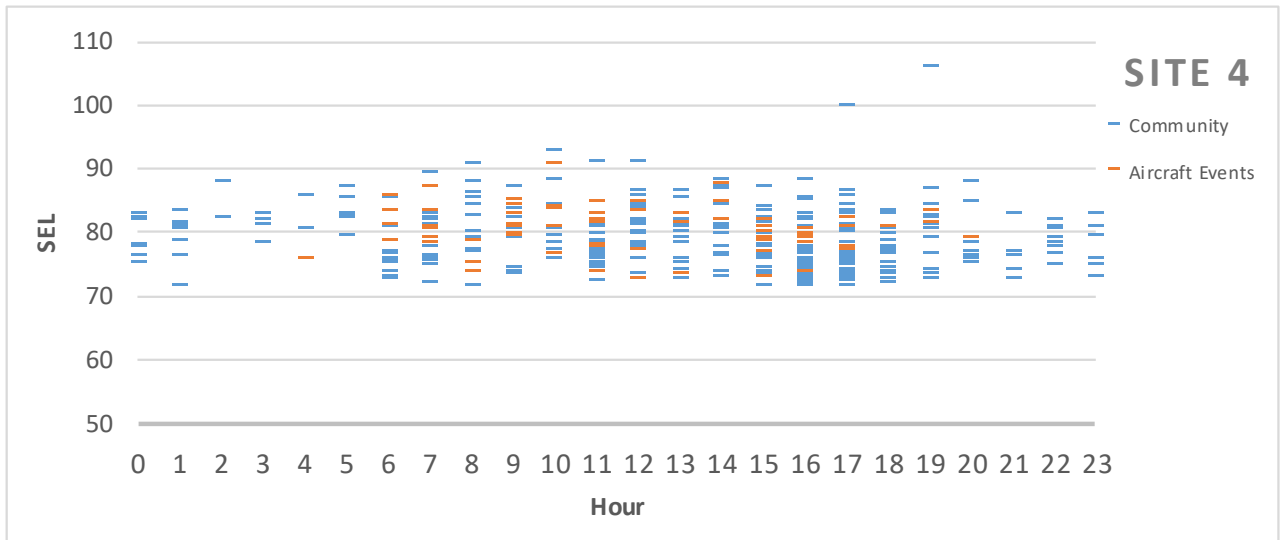
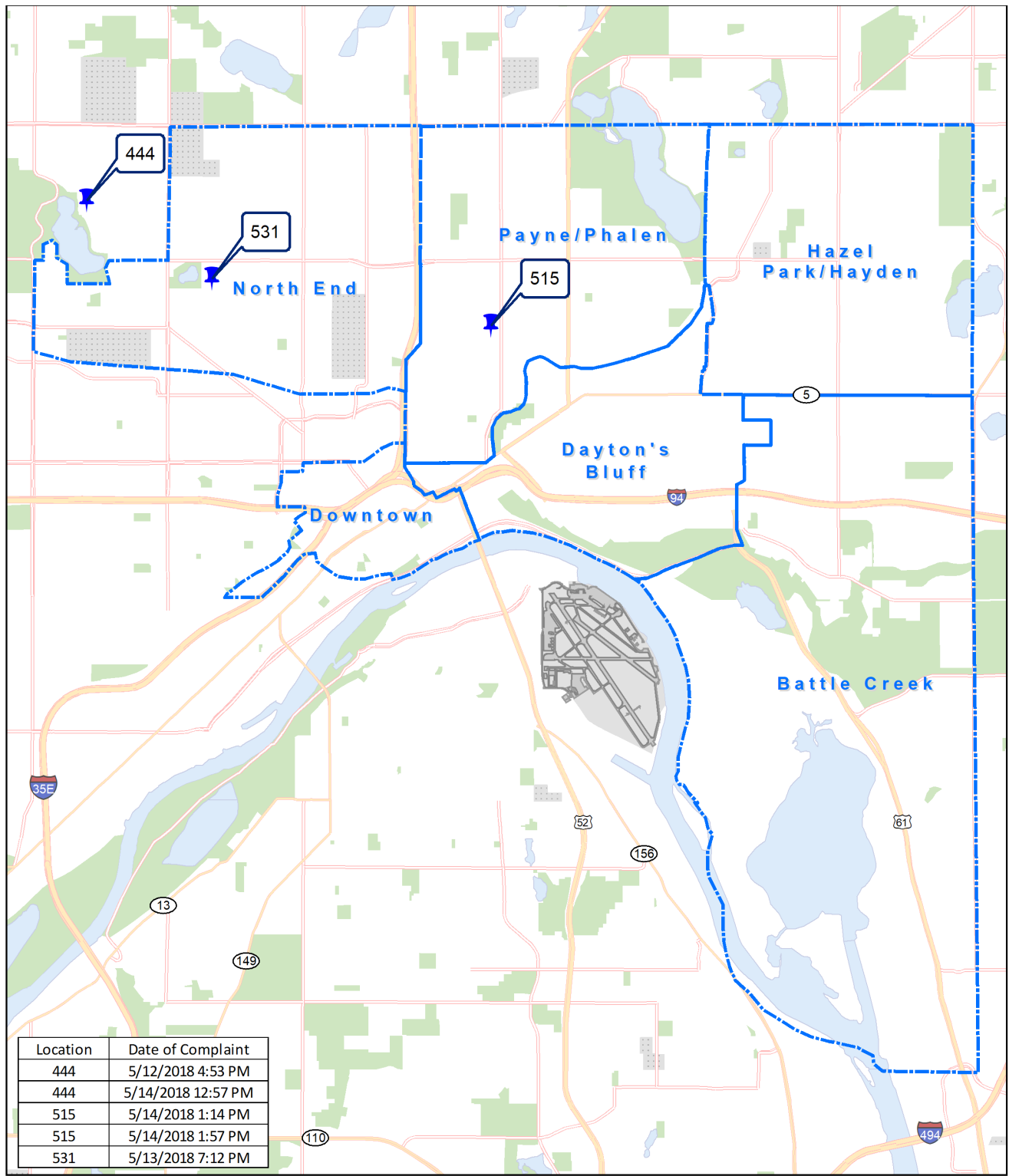




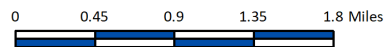
Figure 11: STP Aircraft Noise Complaint Locations during STP Study Period



Legend

-  STP Complaint Location
-  St. Paul Districts Represented on the DAAC

**STP Aircraft Noise Complaint Locations
During Study Period
May 9-15, 2018**



3.0 Glossary of Terms

A-weighted Noise level

The noise level obtained by the use of A-weighting. Unit: dB. Unit symbol: dBA. A-weighting significantly de-emphasizes noise at low and high frequencies and is most commonly used when evaluating environmental noise to account for human sensitivity.

Background Sound Level

Background sound level is a metric used to express a baseline sound level for any given location excluding extraneous sound events. We are using the L90 statistical method to estimate the background sound level.

Decibel (dB)

Decibel is a unit of measurement for sound and noise. dBA is used when noises and sounds are measured using an A-weighted scale (see A-weighted noise level definition above).

DNL (Day-Night Average Noise Level)

Day-night average noise level, used to describe the cumulative or total noise exposure during a period of time. DNL is an energy level averaged over a 24-hour period, with a 10 dBA penalty for noise events occurring between 10:00 p.m. and 7:00 a.m.

- **Aircraft DNL** - DNL for aircraft sound and noise events only
- **Community DNL** - DNL for community sounds and noises only (everything but aircraft events)

FAA (Federal Aviation Administration)

The federal agency that is responsible for the safe and efficient movement of aircraft through the National Airspace System. The FAA has broad legislative authority to create and enforce Federal Aviation Regulations.

FAR Part 150

Federal Aviation Regulations 14 CFR Part 150, Airport Noise Compatibility Planning.

LA_{eq} (Equivalent Noise Level)

Equivalent noise level, the representation of a time-varying noise as an equivalent steady-state A-weighted noise level for the period or interval of interest.

LD 824 Noise Analyzer

A sound monitoring instrument manufactured by Larson Davis that is used for the measurement of specific decibel levels, with standard frequency weighting and standard exponentially-weighted time averaging. A general purpose microphone (LD 2541) and preamplifier (PRM 902) operate with the noise analyzer to measure levels over wide temperature and humidity ranges.

LA_{max} (Maximum Sound Level on A-weighted Scale)

Maximum sound level on an A-weighted scale. Also known as the peak or maximum level (dBA) during a particular noise event.

LA₉₀ (Noise Level Exceeded 90 Percent of the Time)

The noise level exceeded 90 percent of the time. Values of LA₉₀ are often used to represent the background noise, or levels of sound that are present most of the time.

SEL (Noise Exposure Level)

Noise Exposure Level is the total noise level someone would experience if all of the noise energy occurred in one second. This allows for the comparison of noise events that have different durations.

SPL (Noise Pressure Level)

Noise Pressure Level is a measure of the noise pressure of a given noise source relative to a standard reference value (typically the quietest noise that a young person with good hearing can detect).

STP (St. Paul Downtown Airport)

The aeronautical abbreviation for Holman Field, which is also known as St. Paul Downtown Airport is STP. The abbreviation may also be shown as KSTP, which denotes that the airport is located in the United States.