

Logan Community
Advisory Committee
September 29, 2008

Noise Measurement
Results Report
Side by Side Sites



Program Overview - General

- 12 Massport noise monitor sites were selected for evaluation.
- A portable noise monitor was placed at each site for 4-hours of continuous measurements.
- The portable monitors met the Class 1 requirements of IEC 61672-1:2002 with recent certificates of calibration.
- Acoustical calibration checks were performed at the onset of the measurements at each site.
- The measurements at each site were attended by an observer who kept detailed logs of noise events



Program Overview – Data Collected

- Photographs of the portable monitor set-up were taken for each site.
- The portable monitors retained 1-second sound levels in A-weighted decibels for each measurement period.
- Noise data from the corresponding Massport noise monitors was acquired in the form of ½-second sound level in A-weighted decibels for each measurement period.

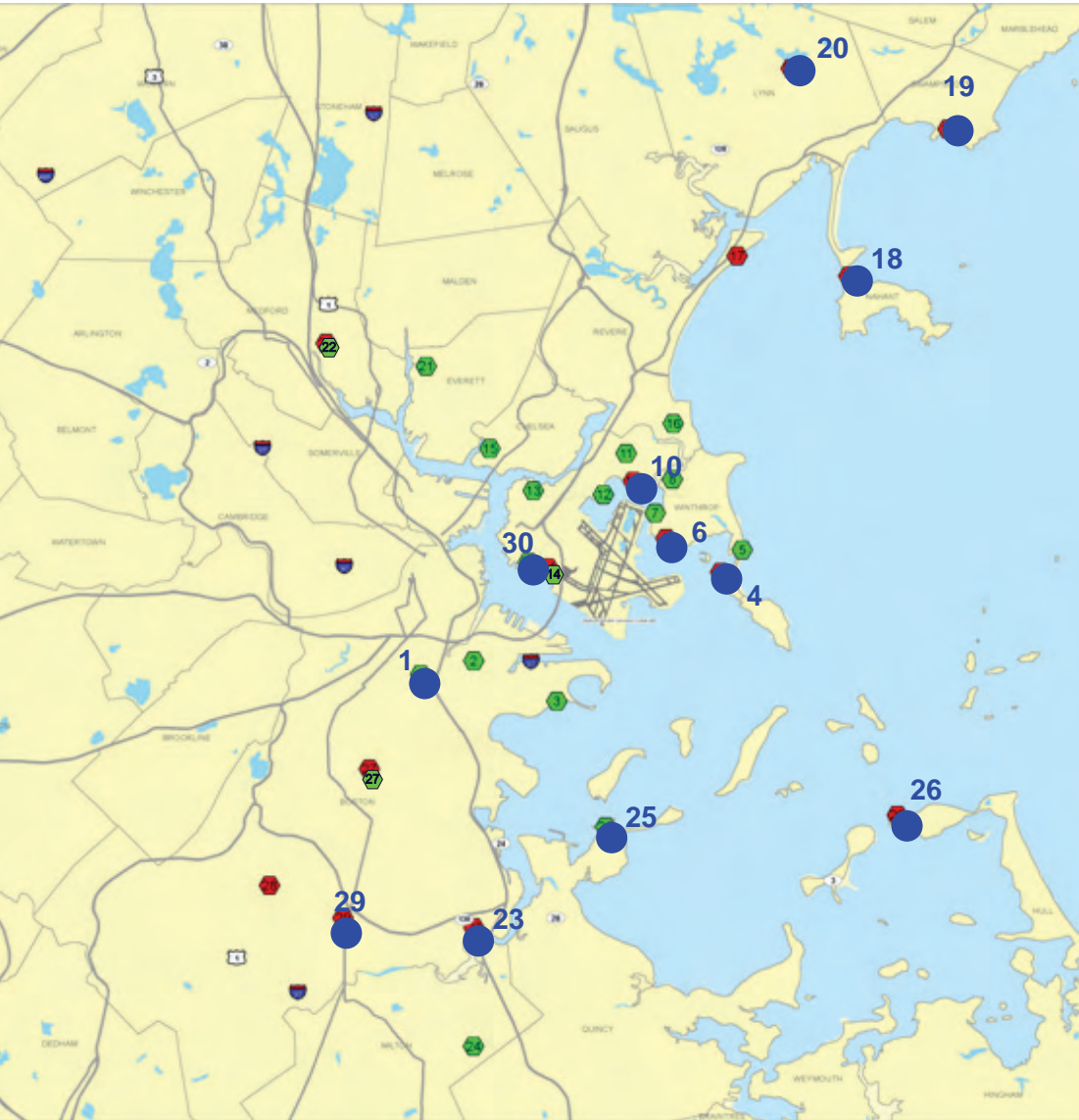


Program Overview – Data Collected

- Radar flight track data was provided from the Massport system for each measurement period.
- A listing of noise events correlated to aircraft flights by the Massport system was provided for each site.
- The observer logs contained noise event start and stop times as well as notes on the noise source. This data was input into spreadsheets for subsequent analysis.
- Weather data statistics from the BOS station were gathered for each measurement period.



Measurement Sites – Locations



Site #	Location
1	South End – Andrews Street
4	Winthrop – Bayview and Grandview
6	Winthrop – Somerset near Johnson
10	East Boston – Bayswater near Shawsheen
18	Nahant – U.S.C.G. Recreational Facility
19	Swampscott – Smith Lane
20	Lynn – Pond and Towns Court
23	Dorchester – Myrtlebank near Hilltop
25	Quincy – Squaw Rock Park
26	Hull – Hull High School near Channel Street
29	Mattapan – Lewenburg School
30	East Boston – Piers Park

Measurement Sites – Program Summary

Measurement Site	Measurement Date	Monitoring Times	Weather	Temperature Range (°F.)	Airport Mode
1	May 11, 2007	12:12pm - 4:12pm	Rain/Mist - Overcast	64 - 66	Dep 27 Arv 33L / Dep 22R Arv 27&22's
4	May 29, 2007	8:56am - 12:56pm	Pt. Cloudy/Clear	68 - 76	Dep 33L Arv 27
6	May 30, 2007	8:17am - 12:17pm	Clear	71 - 74	Dep 9&4's Arv 4's
10	May 29, 2007	1:59pm - 5:59pm	Pt. Cloudy/Clear	77 - 78	Dep 33L Arv 27&32
18	May 31, 2007	7:30am - 11:30pm	Trace Rain Cloudy	61 - 65	Dep 4's & 9 Arv 4's
19	May 31, 2007	11:49am - 1:49pm	Cloudy	60 - 63	Dep 9 Arv 4R
19	June 1, 2007	11:59am - 1:59pm	Sct. Clouds	65 - 80	Arv 22L / Dep 4's
20	June 1, 2007	7:33am - 11:33am	Sct. Clouds	70 - 75	Arv 22's & 27 Dep 22R
23	June 16, 2007	2:49pm - 6:49pm	Cloudy	72 - 75	Arv 4's Dep 4R
25	May 10, 2007	8:38am - 12:38pm	Pt. Cloudy - Cloudy	68 - 80	Dep 22's
26	May 9, 2007	9:43am - 1:43pm	Pt. Cloudy	69 - 85	Dep 22's Avl 27
29	June 23, 2007	5:55am - 9:55am	Fair - Clear	57 - 67	Dep 27 & 33L
30	June 16, 2007	9:30am - 1:30pm	Sct. Clouds	69 - 73	Dep 22R Arv 22L / Dep 4R Arv 4's



Measurement Data Analysis – Overview

- The Massport ½-sec data sets were converted into 1-sec averages for compatibility with the portable monitor data.
- The 1-sec. portable monitor data was compared to the Massport 1-sec data to check for anomalies.
- Hourly average noise levels (Leq) for total noise were computed for each site from the portable monitor 1-sec. data. Calibration tones were excluded.
- Hourly average noise levels (Leq) for total noise were also computed for each site from the Massport monitor 1/2-sec. data. Calibration tones were excluded.



Measurement Data Analysis – Overview

- Four-hour measurement period average noise levels for total noise were computed for each site from both the portable and Massport data sets.
- Aircraft flights were correlated to noise data from the portable monitors at each site using the Massport radar data.
- Hourly average aircraft noise (Leq's) was computed from the correlated events for the portable monitors.
- Hourly average aircraft Leq's were computed from the correlated events listing from the Massport system for the Massport monitors.



Measurement Data Analysis – Overview

- The listings of correlated events from each system were compared.
- The number of correlated events per hour were compared between the two systems for each site.
- Correlated events that matched between the two systems were tallied by hour for each site.
- The SEL noise values for each matching correlated event from each system were evaluated by hour to identify single event noise SEL capture differences.
- The results were summarized with notable issues identified and overall conclusions developed.



Noise Correlation Process – Overview

- Radar data, portable monitor 1-sec data, and observer log data were loaded into ADT's Noise Correlation (NCORR) tool for analysis.
- The data for each site was initially reviewed to identify the best event threshold settings for the initial automated event correlation.
- Event thresholds were floating thresholds consisting primarily of a minimum noise level (offset from background levels) and a minimum duration above the noise threshold.



Noise Correlation Process – Overview

- Background noise levels were identified as the L90 (level at which 90 % of the data is above) computed for a sliding time window (generally 15-30min.) in 5 minute increments.
- The minimum noise event threshold level is an offset value in dB from the computed moving L90 background noise levels for the given 5-minute time frame.

Initial NCORR Correlation Thresholds Summary

Measurement Site	Min. Noise Threshold (L90 + X dB)	Min. Duration Threshold (sec)	Max. Gap (sec)
1	5	15	5
4	5	15	5
6	12	8	1
10	10	11	5
18	5	15	5
19	10	20	5
19	8	20	5
20	5	20	5
23	6	10	7
25	6	10	4
26	6	17	2
29	6	20	5
30	5	10	6

Max Gap indicates the maximum time that the noise can be below the threshold level without ending the event.

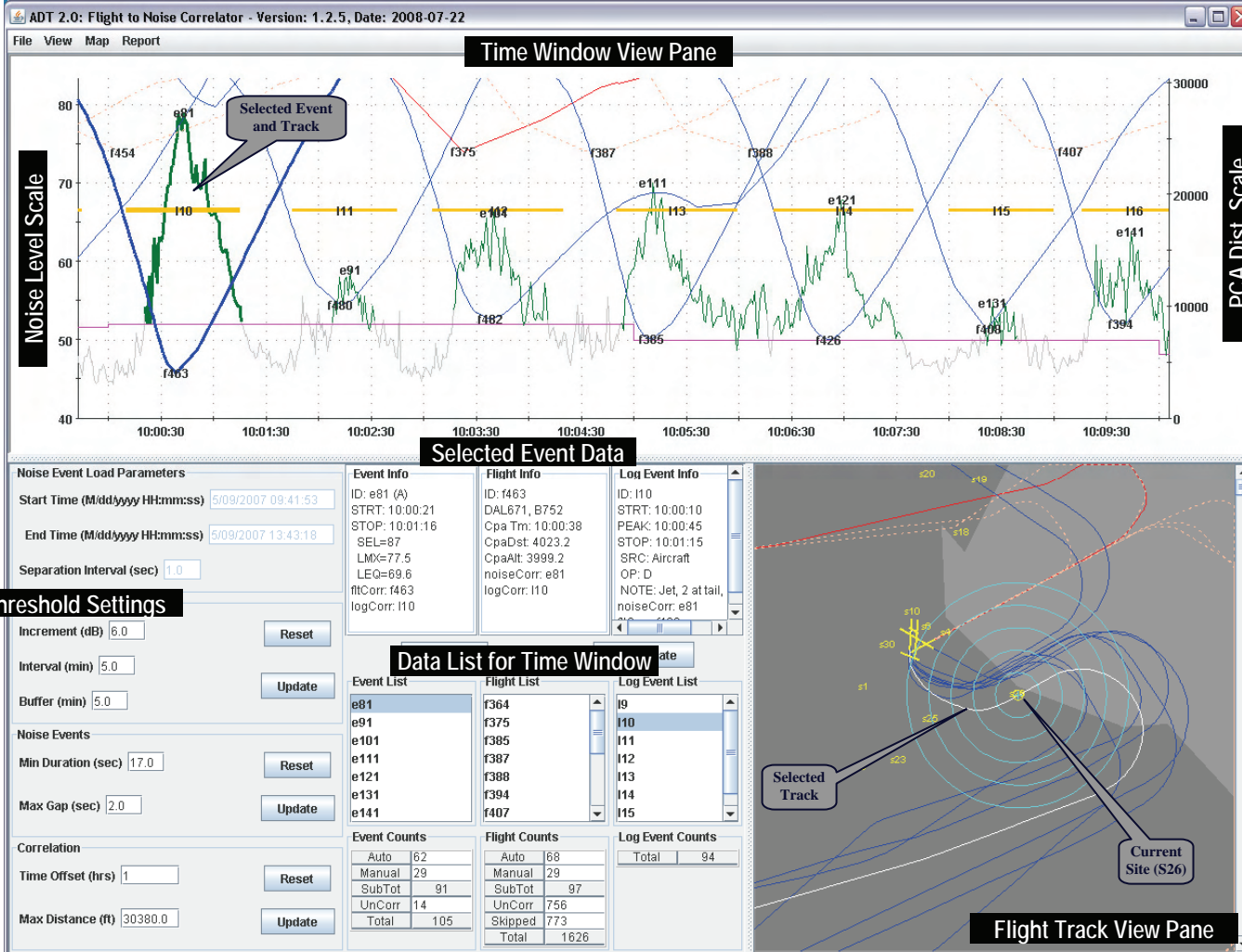


Noise Correlation Process – Overview

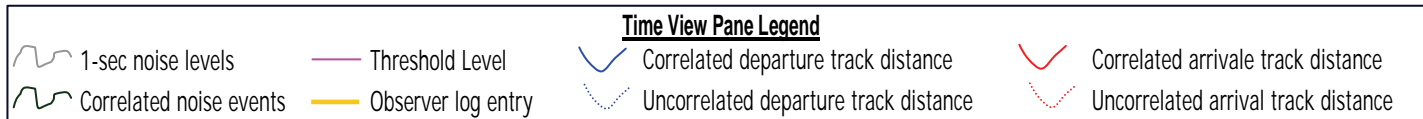
- The initial automated correlations were then reviewed manually in conjunction with observer log data to refine the correlations with manual adjustments, additions, and/or rejections.
- The final correlations were then exported from NCORR for summary analysis and comparison to the Massport system correlation.
- The initial automated correlation process identified noise events based on the threshold and then checked to see if there was a radar track who's point of closest approach (PCA) occurred during the event time. If so, an automatic correlation was made.



Noise Correlation Process – NCORR

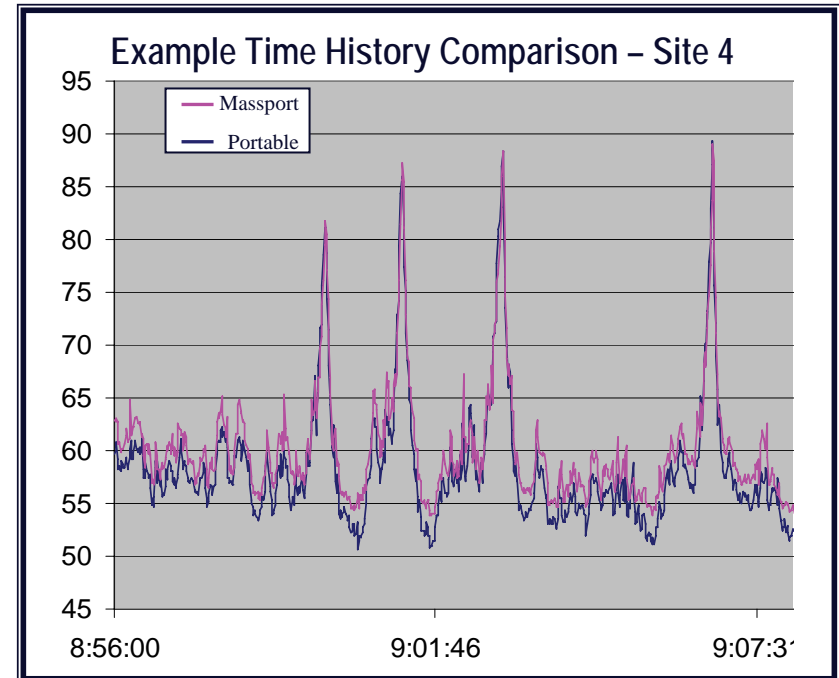


- NCORR allows the user to simultaneously visualize the noise data, flight tracks, track distance from site, log entries, and threshold levels on a continuous time scale.
- Relating these data elements in a single view by time allows for relatively easy noise to aircraft flight assignment and correlation refinement.
- Refinements included the manual creation of noise events and correlation based on the presence of log observations and radar data. Also, some automated events were modified based on contribution of other noise sources (log observations) or patterns of background noise etc.

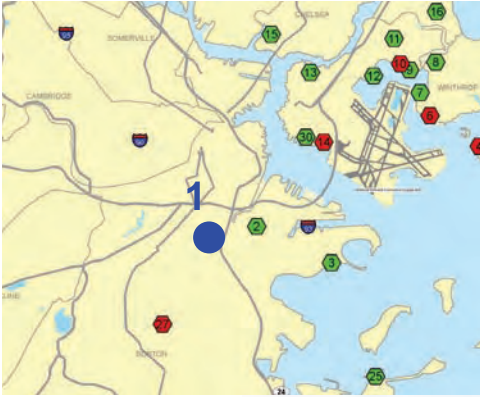


Results – Time History Comparisons

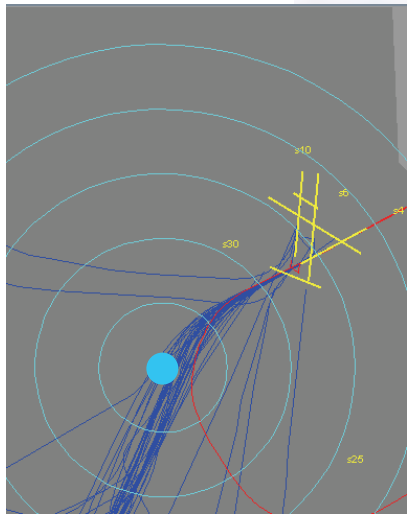
- Generally, the 1-sec time history data compared well between the two monitors at each site.
- Slight offsets were noted at some sites and were found to be reasonable. They were generally caused by differences in microphone proximity to nearby noise sources such as shoreline wave noise etc.



Site 1 – Overview



- Measured May 11, 2007 12:12pm through 4:12pm
- Weather was misty/rainy with overcast sky and temperatures ranging from 64 to 66° F.
- Airport was initially operating with departures on Rwy 27 and arrivals on Rwy 33L for first 2-hrs.
- Airport configuration changed to Departures on 22R and arrivals on 27 and the 22's for the latter part of the period.
- Notable aircraft events were primarily from departures on Runway 27.
- Background noise came from nearby construction, rain, occasional sirens, and local traffic.



Site 1 – Results

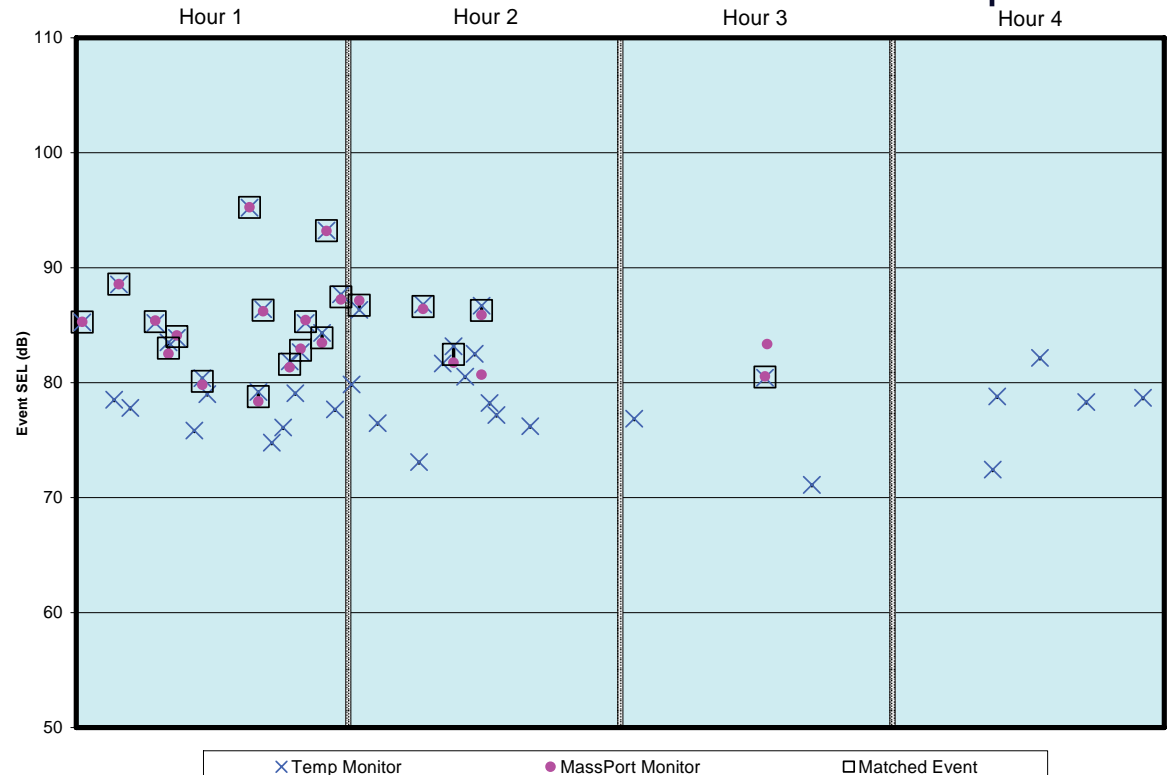
Analysis Hour	Cumulative Metrics						Correlated Aircraft Events					
	Overall Leq (dB)		Aircraft Leq (dB)		Time Above 65 dB (s)		Number of Aircraft Events		# of AC Event Matches	Avg Diff SEL (Temp - MassPort) (dB)	Avg Abs Diff SEL Temp - MassPort (dB)	
	Temp	MassPort	Temp	MassPort	Temp	MassPort	Temp	MassPort				
1	66.3	66.5	64.4	64.1	542	601	23	15	15	0.23	0.37	
2	65.1	67.5	58.1	56.5	358	497	13	5	5	1.40	1.72	
3	61.2	62.1	46.8	49.6	227	323	3	2	1	-0.13	0.13	
4	60.0	61.2	50.5	N/A	172	294	5	0	0	N/A	N/A	
Total	63.9	65.1	59.5	58.9	1299	1715	44	22	21	0.49	0.68	

Notes

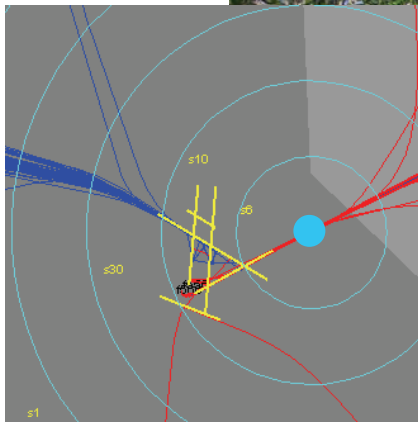
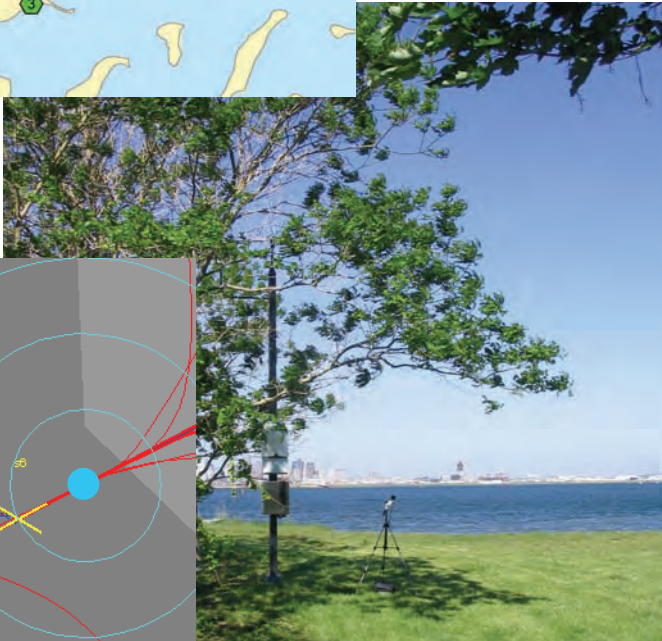
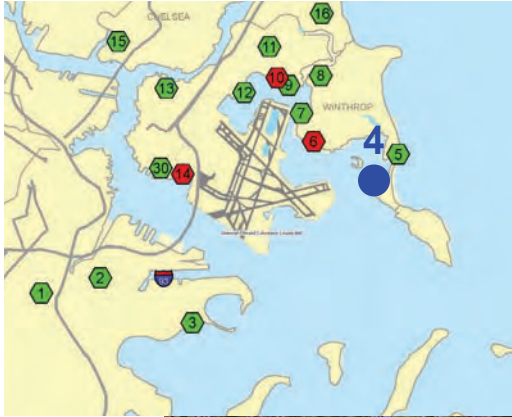
- Aircraft events mainly departures from RW 27.
- Massport's system identified louder events well, quieter events poorly.
- Massport cumulative Aircraft Leq fairly accurate.
- Massport number of aircraft events too low (missed approx 50% of the events).



Correlated Aircraft Events Graph



Site 4 – Overview



- Measured May 29, 2007 8:56am through 12:56pm
- Weather was partly cloudy with clearing sky and temperatures ranging from 68 to 76° F.
- Airport was operating with departures on Rwy 33L and arrivals on Rwy 27.
- Notable aircraft events were primarily from arrivals on Runway 27 with some sideline departure noise from Runway 33L activity.
- Background noise came from nearby lawn mowers, shoreline wave, and occasional local traffic.

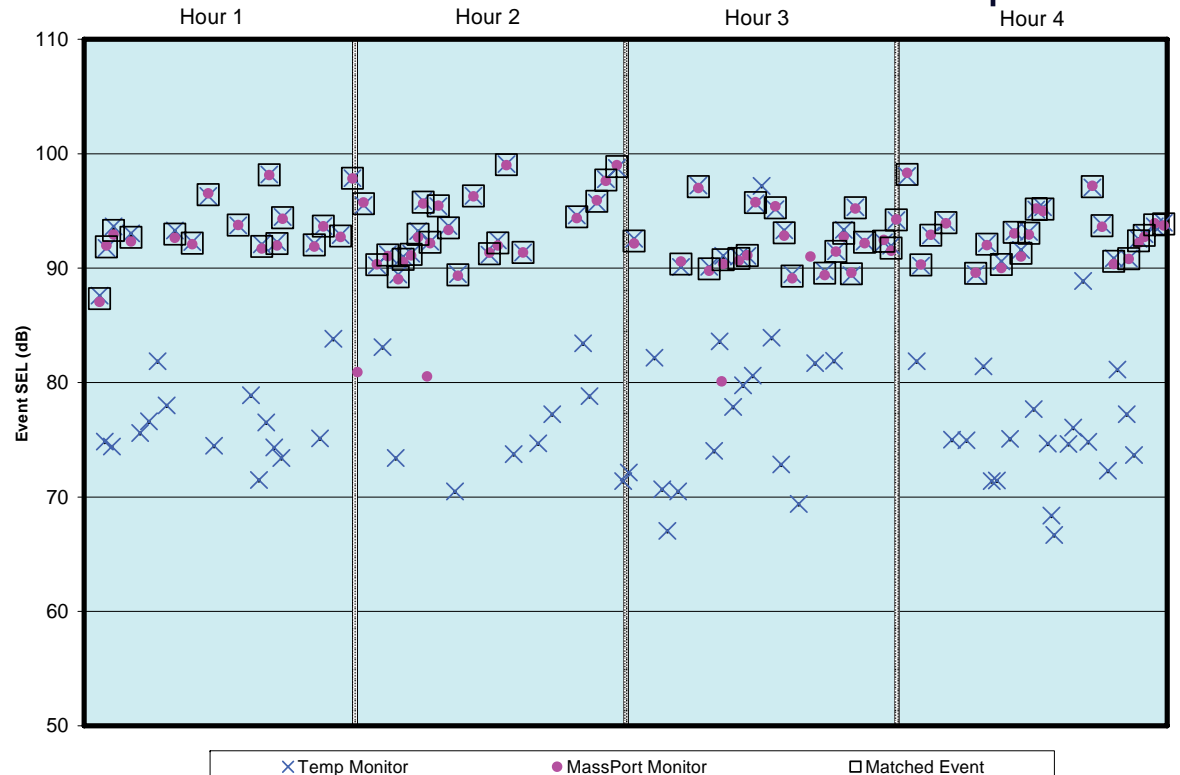
Site 4 – Results

Analysis Hour	Cumulative Metrics						Correlated Aircraft Events					
	Overall Leq (dB)		Aircraft Leq (dB)		Time Above 65 dB (s)		Number of Aircraft Events		# of AC Event Matches	Avg Diff SEL (Temp - MassPort) (dB)	Avg Abs Diff SEL Temp - MassPort (dB)	
	Temp	MassPort	Temp	MassPort	Temp	MassPort	Temp	MassPort				
1	70.8	71.1	70.7	70.5	332	393	30	16	16	0.24	0.30	
2	72.4	72.9	72.3	72.2	444	493	30	23	21	0.13	0.22	
3	71.0	71.3	71.0	70.1	473	534	36	21	19	0.18	0.31	
4	71.5	71.9	71.2	71.3	434	496	39	21	21	0.13	0.23	
Total	71.5	71.9	71.4	71.1	1683	1916	135	81	77	0.16	0.26	

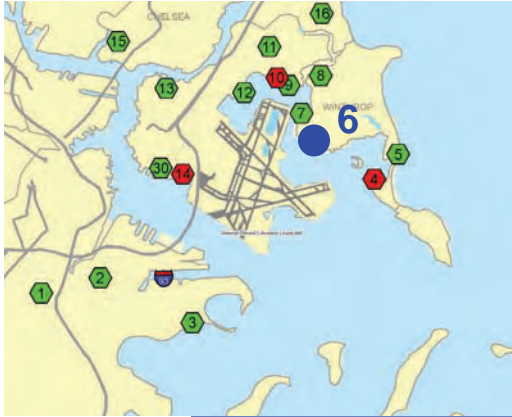
Notes

- Massport monitor captured louder aircraft events well - overhead arrivals RW 27.
- Massport's system identified quieter events poorly - sideline departures RW 33L.
- Massport cumulative Aircraft Leq fairly accurate.
- Massport number of aircraft events too low (missed approx 40% of the events).

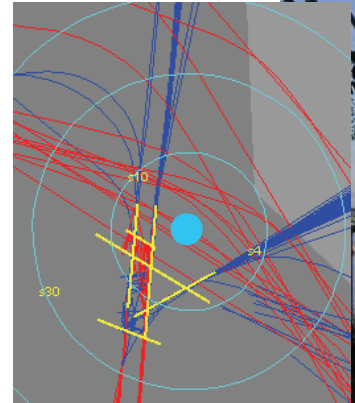
Correlated Aircraft Events Graph



Site 6 – Overview



- Measured May 30, 2007 8:17am through 12:17pm
- Weather was clear with temperatures ranging from 71 to 74° F.
- Airport was operating with departures on Rwy 9 and Rwy 4L/R and arrivals on Rwy 4L/R.
- Notable aircraft events were primarily from departures on Runways 9 and 4L/R with some occasional reverse thrust noise from arrivals on the 4's.
- Background noise came from nearby shoreline waves, and occasional local traffic.



Site 6 –Results

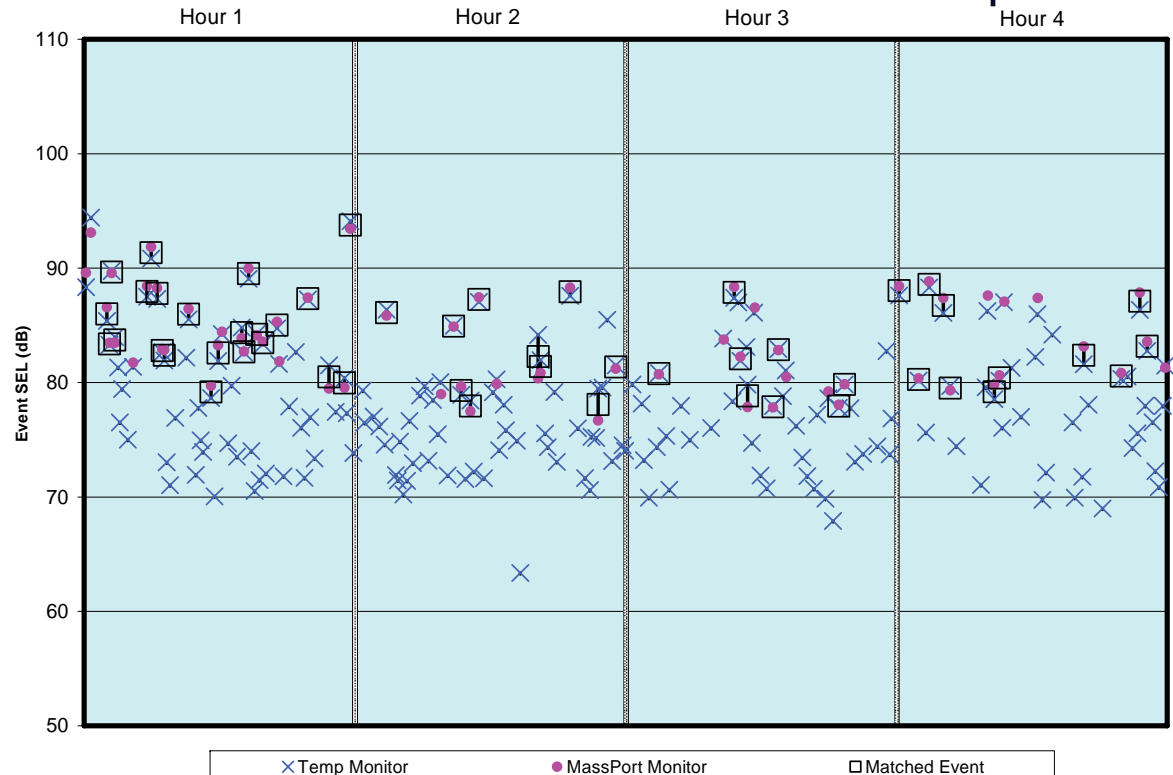
Analysis Hour	Cumulative Metrics						Correlated Aircraft Events					
	Overall Leq (dB)		Aircraft Leq (dB)		Time Above 65 dB (s)		Number of Aircraft Events		# of AC Event Matches	Avg Diff SEL (Temp - MassPort) (dB)	Avg Abs Diff SEL Temp - MassPort (dB)	
	Temp	MassPort	Temp	MassPort	Temp	MassPort	Temp	MassPort				
1	66.8	67.1	66.4	66.1	690	767	57	27	22	-0.25	0.73	
2	61.7	62.0	61.1	58.7	364	391	53	12	10	0.77	1.14	
3	61.1	62.0	60.5	58.1	308	395	43	12	8	0.09	0.48	
4	62.6	63.6	62.0	61.7	449	480	39	15	11	-0.77	0.84	
Total	63.7	64.2	63.2	62.4	1811	2033	192	66	51	-0.11	0.79	

Notes

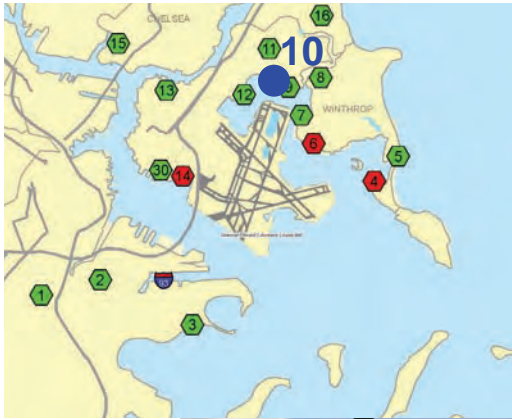
- Variety of aircraft events – arr/dep RW 4L/R, dep RW 9.
- Massport's system identified louder events well, quieter events poorly. Assigned wrong aircraft to multiple events.
- Massport cumulative Aircraft Leq fairly accurate.
- Massport number of aircraft events too low (missed approx 66% of the events).



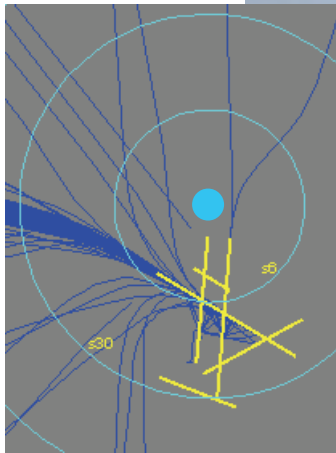
Correlated Aircraft Events Graph



Site 10 – Overview



- Measured May 29, 2007 1:59pm through 5:59pm
- Weather was partly cloudy to clear with temperatures ranging from 77 to 78° F.
- Airport was operating with departures on Rwy 33L and arrivals on Rwy's 27 & 32.
- Notable aircraft events were primarily from departures on Runway 33L.
- Background noise came from nearby shoreline waves, and occasional local traffic.



Site 10 – Results

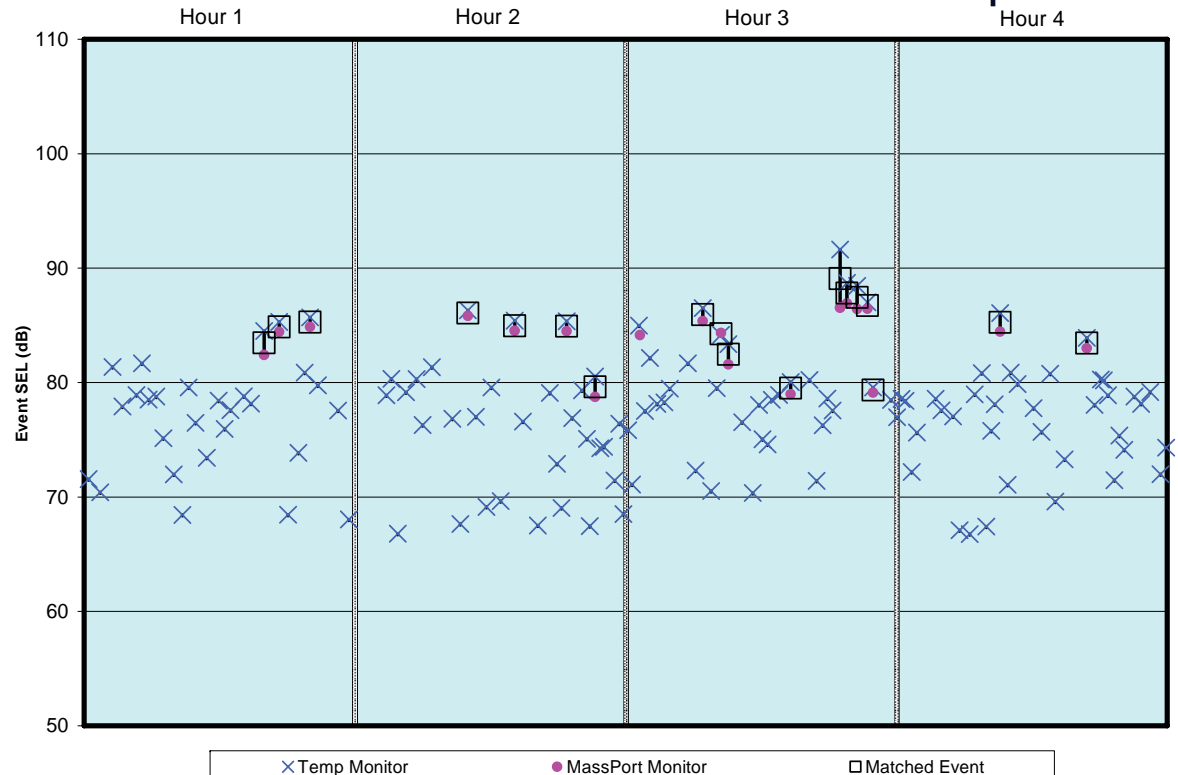
Analysis Hour	Cumulative Metrics						Correlated Aircraft Events					
	Overall Leq (dB)		Aircraft Leq (dB)		Time Above 65 dB (s)		Number of Aircraft Events		# of AC Event Matches	Avg Diff SEL (Temp - MassPort) (dB)	Avg Abs Diff SEL Temp - MassPort (dB)	
	Temp	MassPort	Temp	MassPort	Temp	MassPort	Temp	MassPort				
1	60.3	60.0	58.3	53.2	320	263	28	3	3	1.26	1.26	
2	60.9	60.3	58.3	54.5	372	288	31	4	4	1.00	1.00	
3	66.3	64.8	62.4	59.8	728	667	34	11	10	1.37	1.40	
4	61.4	60.9	58.5	51.2	423	346	37	2	2	1.26	1.26	
Total	63.0	62.0	59.8	56.0	1843	1564	130	20	19	1.26	1.28	

Notes

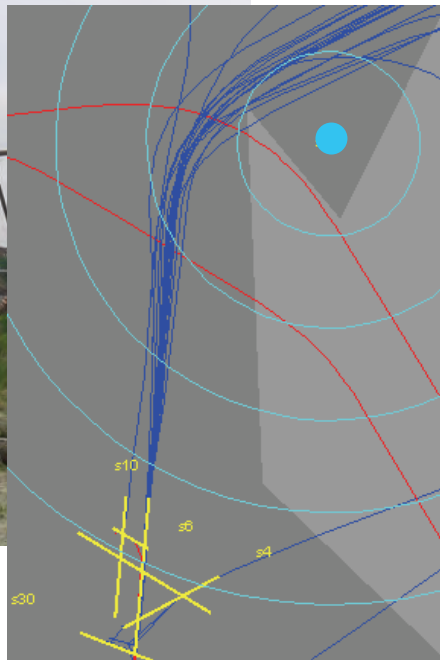
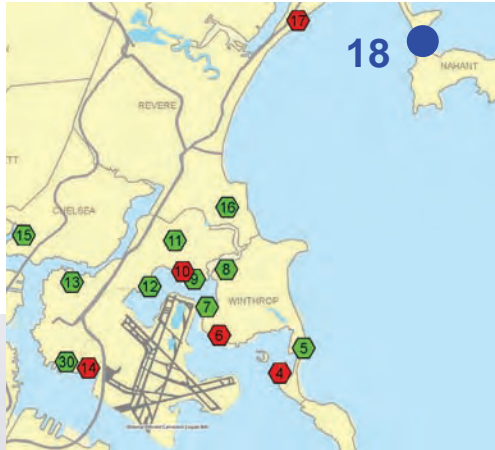
- Aircraft events nearly all departures RW 33L
- Massport's system identified louder events ok, quieter events poorly. SEL on some events too low.
- Massport cumulative Aircraft Leq too low (3.8 dB)
- Massport number of aircraft events too low (missed approx 85% of the events)



Correlated Aircraft Events Graph



Site 18 – Overview



- Measured May 31, 2007 7:30am through 11:30am
- Weather cloudy with a trace of rain and temperatures ranging from 61 to 65° F.
- Airport was operating with departures on Rwy 9 and 4L/R and arrivals on Rwy's 4L/R.
- Notable aircraft events were primarily from departures on Runways 4L/R with a few arrival overflights.
- Background noise came from nearby shoreline waves, and occasional local traffic.
- Portable monitor microphone placement was shielded somewhat from the wave action at the shoreline. Thus portable monitor values tended to be 2 to 3 dB less than Massport readings at the background noise levels.

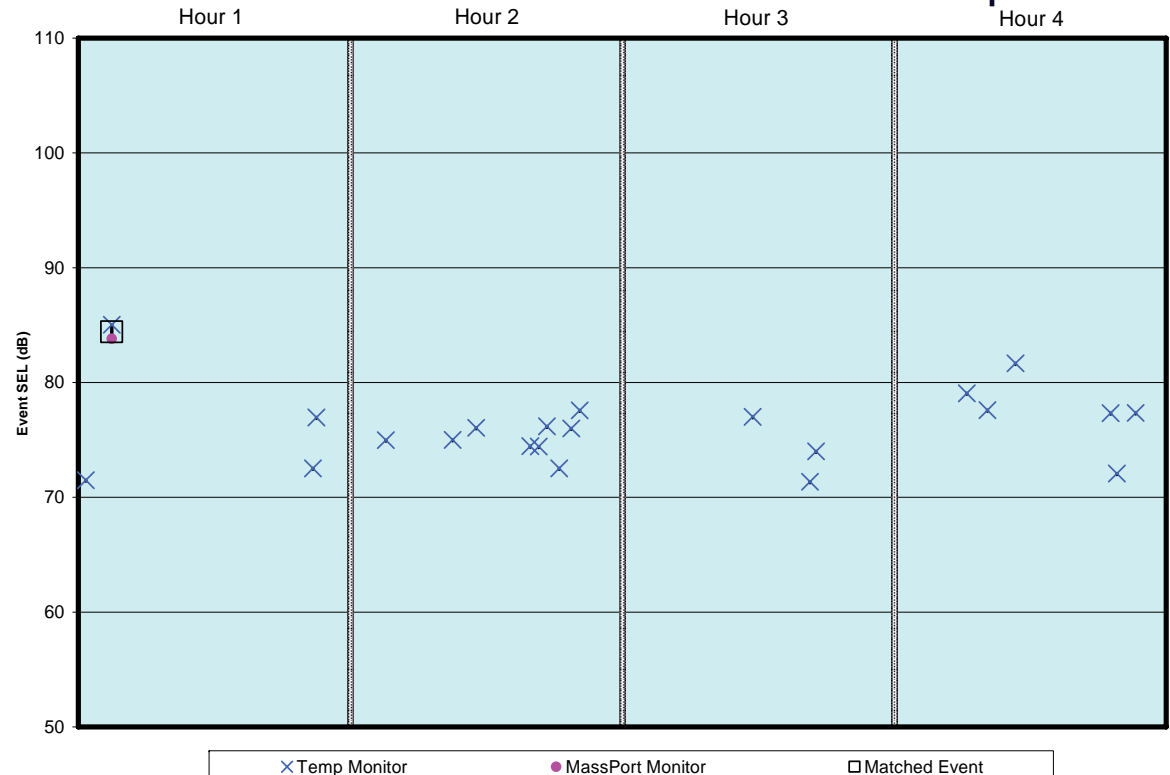
Site 18 – Results

Analysis Hour	Cumulative Metrics						Correlated Aircraft Events					
	Overall Leq (dB)		Aircraft Leq (dB)		Time Above 65 dB (s)		Number of Aircraft Events		# of AC Event Matches	Avg Diff SEL (Temp - MassPort) (dB)	Avg Abs Diff SEL Temp - MassPort (dB)	
	Temp	MassPort	Temp	MassPort	Temp	MassPort	Temp	MassPort				
1	55.8	58.1	50.5	48.2	38	44	4	1	1	1.22	1.22	
2	56.8	58.9	49.4	N/A	12	36	9	0	0	N/A	N/A	
3	56.5	59.3	43.9	N/A	6	35	3	0	0	N/A	N/A	
4	56.7	61.0	50.6	N/A	31	60	6	0	0	N/A	N/A	
Total	56.5	59.5	49.3	42.2	87	175	22	1	1	1.22	1.22	

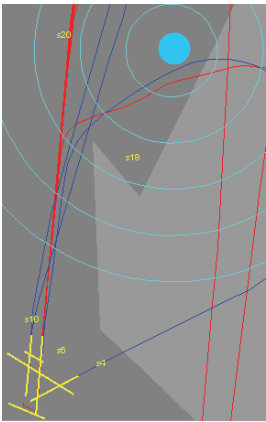
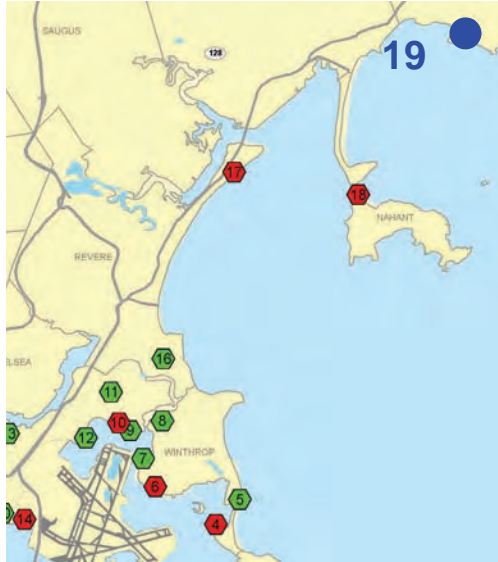
Notes

- Aircraft events mostly departures RW 4R/L
- Massport's system identified only one event – the loudest.
- Massport cumulative Aircraft Leq too low (7.1 dB).
- Massport number of aircraft events too low (missed 21 of 22 events).

Correlated Aircraft Events Graph



Site 19 – Overview



- Measured May 31, 2007 11:49am through 1:49pm and June 1, 2007, 11:59am through 1:59pm.
- Site was visited twice due to concern regarding radar data availability on first day.
- Weather cloudy to clearing with temperatures ranging from 60 to 63° F. on the first day and 65 to 80° F. on day two.
- Airport was operating with departures on Rwy 9 and arrivals on Rwy 4R on Day 1. On day two, arrivals were to Rwy 22L and departures on the 4's later in the period.
- Notable aircraft events were somewhat rare and primarily came from arrivals to 22L with a few departures from the 4's.
- Background noise came from nearby occasional local traffic.

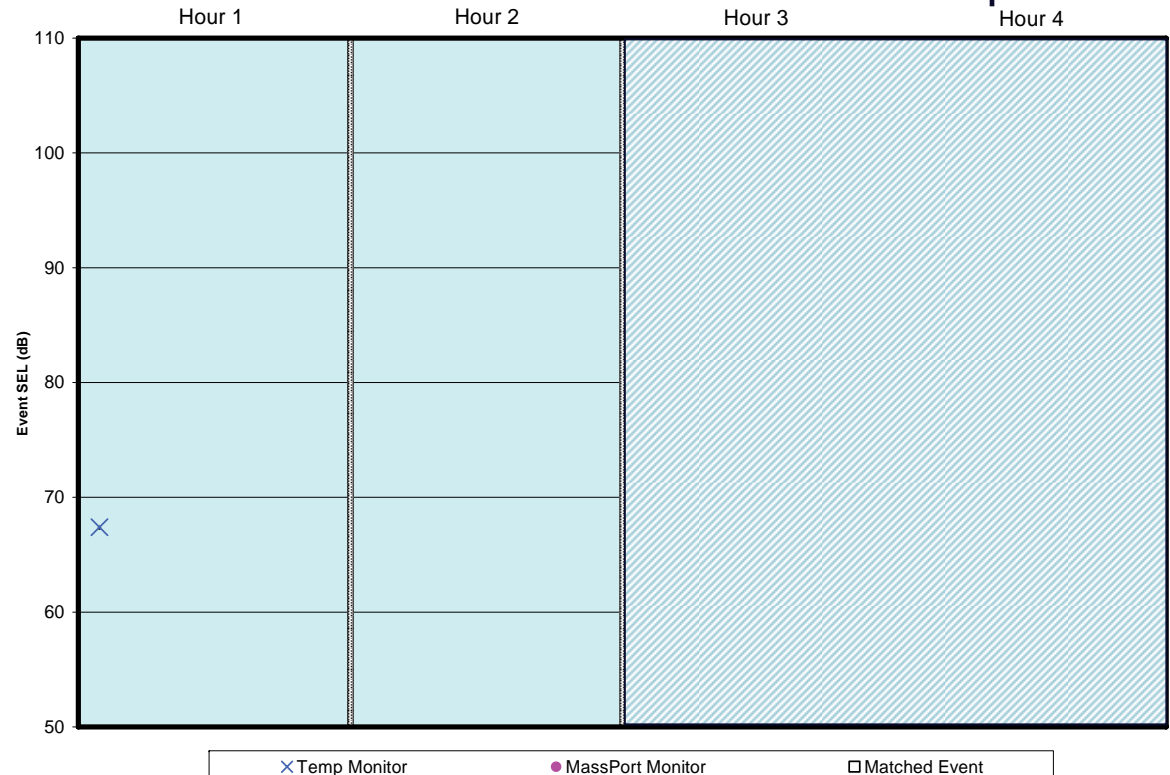
Site 19 (day-1) – Results

Analysis Hour	Cumulative Metrics						Correlated Aircraft Events					
	Overall Leq (dB)		Aircraft Leq (dB)		Time Above 65 dB (s)		Number of Aircraft Events		# of AC Event Matches	Avg Diff SEL (Temp - MassPort) (dB)	Avg Abs Diff SEL Temp - MassPort (dB)	
	Temp	MassPort	Temp	MassPort	Temp	MassPort	Temp	MassPort				
1	52.7	52.0	31.8	N/A	17	10	1	0	0	N/A	N/A	
2	49.8	50.1	N/A	N/A	6	2	0	0	0	N/A	N/A	
3												
4												
Total	51.5	51.2	25.8	N/A	23	12	1	0	0	N/A	N/A	

Notes

- Only 1 aircraft event during 2 measurement hours - Dep RW9.
- Event had low SEL - Massport monitor did not capture.
- Results not conclusive.

Correlated Aircraft Events Graph



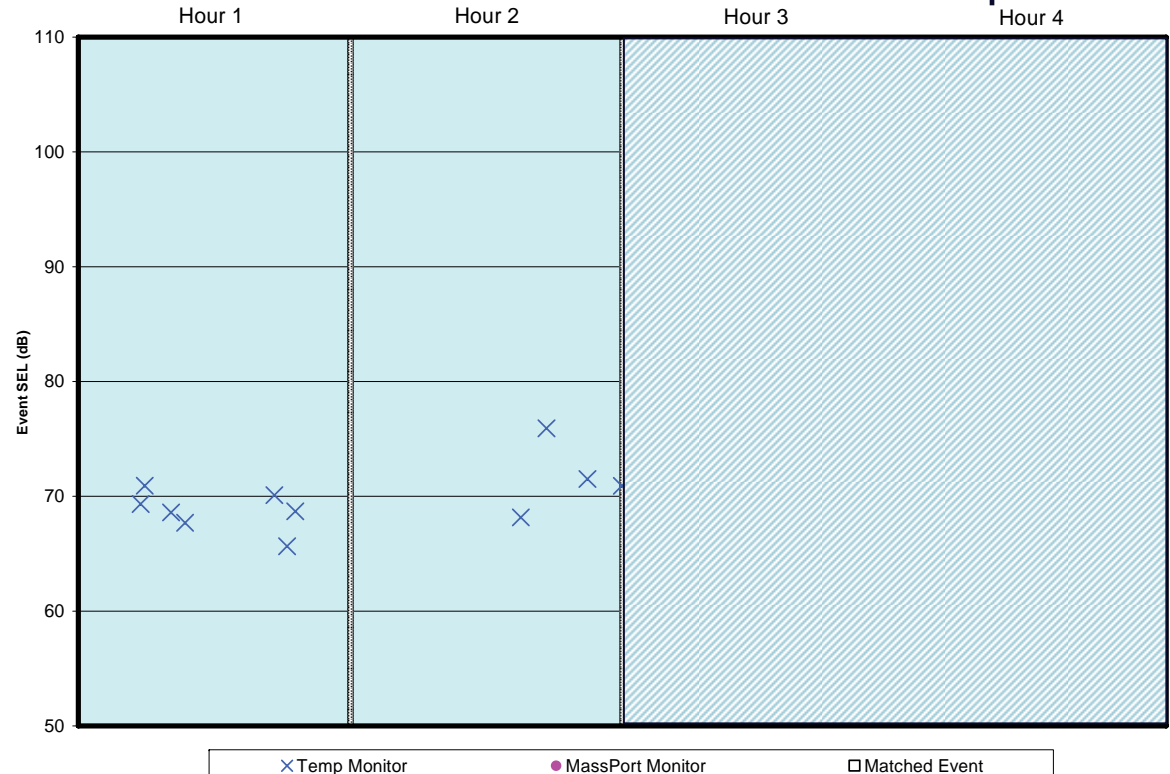
Site 19 (day-2) – Results

Analysis Hour	Cumulative Metrics						Correlated Aircraft Events					
	Overall Leq (dB)		Aircraft Leq (dB)		Time Above 65 dB (s)		Number of Aircraft Events		# of AC Event Matches	Avg Diff SEL (Temp - MassPort) (dB)	Avg Abs Diff SEL Temp - MassPort (dB)	
	Temp	MassPort	Temp	MassPort	Temp	MassPort	Temp	MassPort				
1	52.2	52.5	41.9	N/A	11	6	7	0	0	N/A	N/A	
2	54.1	55.1	43.0	N/A	33	46	4	0	0	N/A	N/A	
3												
4												
Total	53.3	54.0	39.5	N/A	44	52	11	0	0	N/A	N/A	

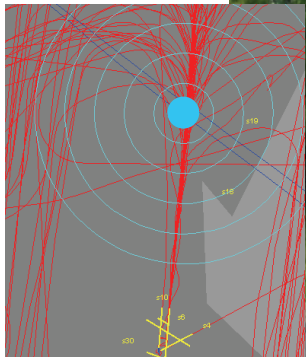
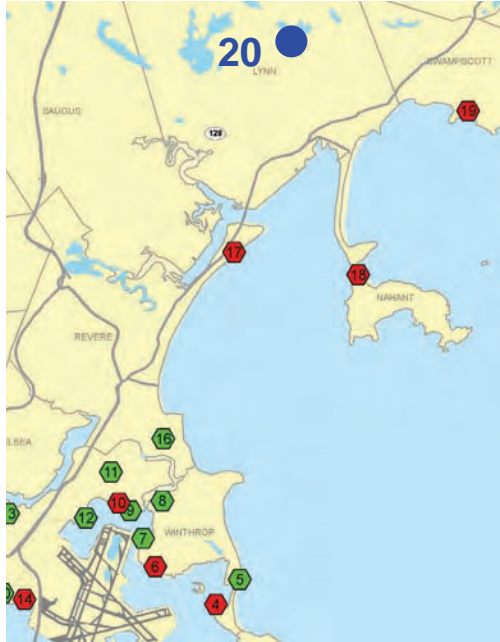
Notes

- 11 Relatively low SEL aircraft noise events at site. Hour 1 – arrivals RW 22R/L. Hour 2 – departures RW 04L/R.
- Massport's system identified none of the events.
- Massport Aircraft Leq and number of aircraft events too low.

Correlated Aircraft Events Graph



Site 20 – Overview



- Measured June 1, 2007 7:33am through 11:33pm.
- Weather scattered clouds with temperatures ranging from 70 to 75° F.
- Airport was operating with departures on Rwy 22R and arrivals on Rwy's 22L/R and 27.
- Notable aircraft events were nearly exclusively from arrivals to 22L with a few departures from the 4's.
- Background noise came from occasional local traffic.

Site 20 – Results

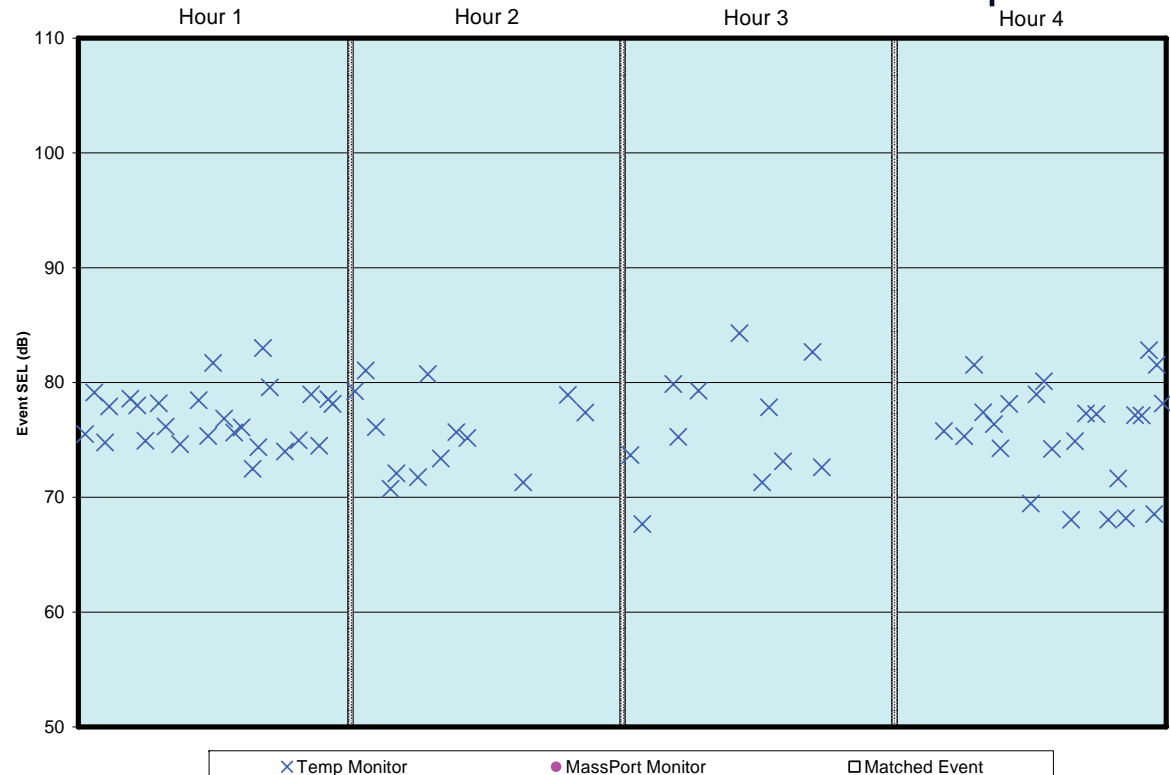
Analysis Hour	Cumulative Metrics						Correlated Aircraft Events					
	Overall Leq (dB)		Aircraft Leq (dB)		Time Above 65 dB (s)		Number of Aircraft Events		# of AC Event Matches	Avg Diff SEL (Temp - MassPort) (dB)	Avg Abs Diff SEL Temp - MassPort (dB)	
	Temp	MassPort	Temp	MassPort	Temp	MassPort	Temp	MassPort				
1	59.1	59.2	56.3	N/A	218	227	26	0	0	N/A	N/A	
2	54.4	55.0	52.6	N/A	37	50	13	0	0	N/A	N/A	
3	57.8	57.3	53.5	N/A	93	91	11	0	0	N/A	N/A	
4	59.1	58.6	55.6	N/A	119	129	24	0	0	N/A	N/A	
Total	58.0	57.8	54.7	N/A	467	497	74	0	0	N/A	N/A	

Notes

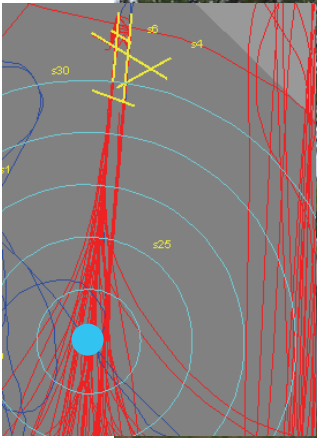
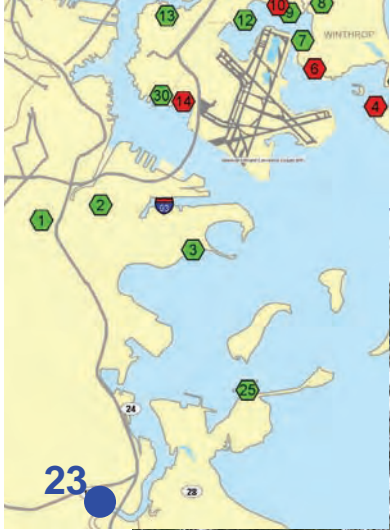
- 74 aircraft events nearly all arrivals RW 22L/R. Some medium level SEL events.
- Massport's system identified no aircraft events.
- Massport monitor grossly underestimated aircraft noise at this site.



Correlated Aircraft Events Graph



Site 23 – Overview



- Measured June 16, 2007 2:49pm through 6:49pm.
- Weather cloudy with temperatures ranging from 72 to 75° F.
- Airport was operating with arrivals on Rwy's 4L/R and departures on Rwy 4R.
- Notable aircraft events were nearly exclusively from arrivals to Runways 4L/R.
- Background noise came from children on the playground, nearby lawn mowers, sirens, and occasional local traffic.

Site 23 – Results

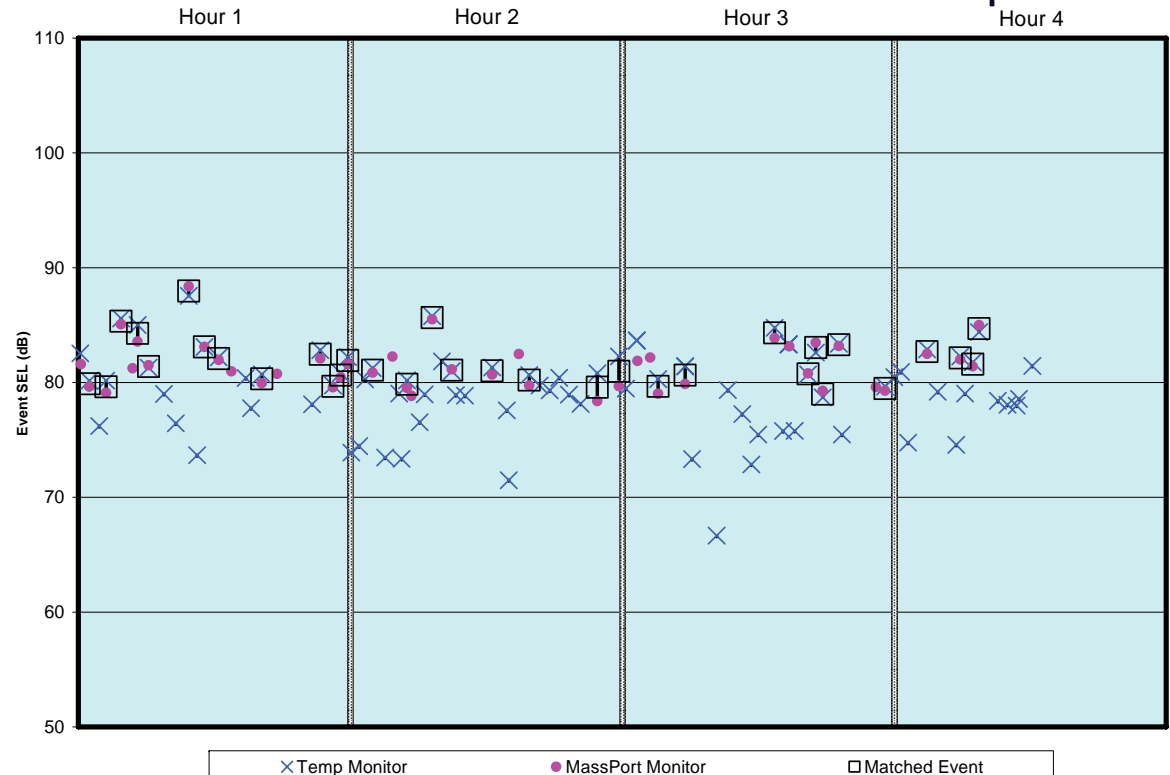
Analysis Hour	Cumulative Metrics						Correlated Aircraft Events					
	Overall Leq (dB)		Aircraft Leq (dB)		Time Above 65 dB (s)		Number of Aircraft Events		# of AC Event Matches	Avg Diff SEL (Temp - MassPort) (dB)	Avg Abs Diff SEL Temp - MassPort (dB)	
	Temp	MassPort	Temp	MassPort	Temp	MassPort	Temp	MassPort				
1	61.3	62.4	59.6	59.3	332	384	21	17	13	0.41	0.57	
2	60.3	61.4	58.4	56.2	317	337	26	11	8	0.97	1.01	
3	60.4	61.5	58.9	56.9	244	313	24	12	8	0.35	0.72	
4	60.6	62.3	56.3	53.4	189	299	14	4	4	0.11	0.41	
Total	60.7	61.9	58.5	56.9	1082	1333	85	44	33	0.49	0.69	

Notes

- Aircraft events mostly arrivals RW 4R/L.
- Massport's system identified louder events well, missing quieter events. Some events assigned to wrong aircraft.
- Massport cumulative Aircraft Leq slightly low (1.7 dB)
- Massport number of aircraft events too low (missed approx 48% of the events).



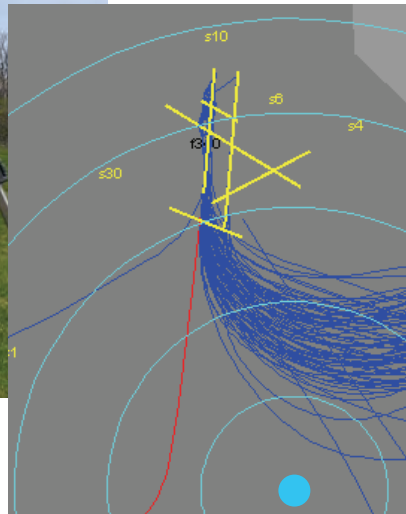
Correlated Aircraft Events Graph



Site 25 – Overview



- Measured May 10, 2007 8:38am through 12:38pm.
- Weather cloudy to partly cloudy with temperatures ranging from 68 to 80° F.
- Airport was operating with departures on Rwy's 22L/R.
- Notable aircraft events were nearly exclusively from departures on Runways 22L/R.
- Background noise came from dogs, church bells, air conditioner at nearby building, and occasional local traffic.



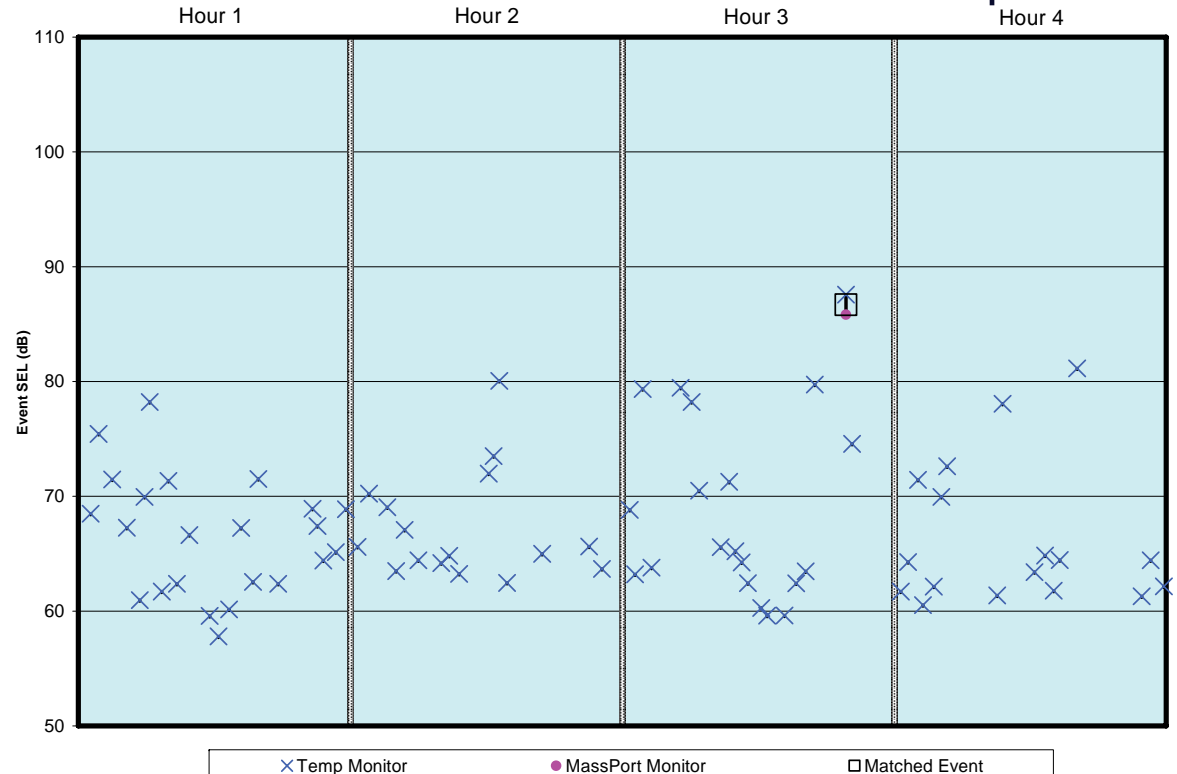
Site 25 – Results

Analysis Hour	Cumulative Metrics						Correlated Aircraft Events					
	Overall Leq (dB)		Aircraft Leq (dB)		Time Above 65 dB (s)		Number of Aircraft Events		# of AC Event Matches	Avg Diff SEL (Temp - MassPort) (dB)	Avg Abs Diff SEL Temp - MassPort (dB)	
	Temp	MassPort	Temp	MassPort	Temp	MassPort	Temp	MassPort				
1	50.2	51.6	47.7	N/A	15	13	23	0	0	N/A	N/A	
2	49.8	51.9	47.2	N/A	10	18	16	0	0	N/A	N/A	
3	54.9	55.2	54.4	50.3	56	60	20	1	1	1.75	1.75	
4	50.4	51.9	48.6	N/A	22	22	17	0	0	N/A	N/A	
Total	51.9	52.9	50.6	44.2	103	113	76	1	1	1.75	1.75	

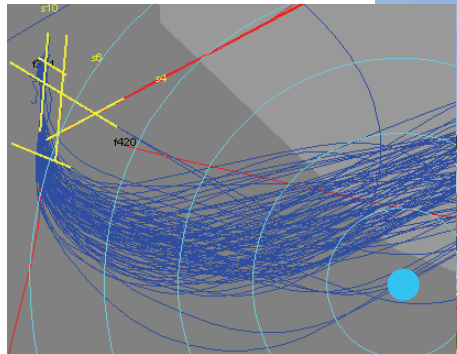
Notes

- Aircraft events nearly all departures RW 22L. SEL usually from 60 to 80 dB.
- Of 76 events, Massport's system identified only 1 – the loudest. Massport SEL for event was 1.75 dB low.
- Massport cumulative Aircraft Leq and number of events far too low.

Correlated Aircraft Events Graph



Site 26 – Overview



- Measured May 9, 2007 9:43am through 1:43pm.
- Weather partly cloudy with temperatures ranging from 69 to 85° F.
- Airport was operating with departures on Rwy's 22L/R and arrivals to Rwy 27.
- Notable aircraft events were nearly exclusively from departures on Runways 22L/R.
- Background noise came from cars in adjacent parking lot, motorboats, nearby wind turbine, and students at nearby school.

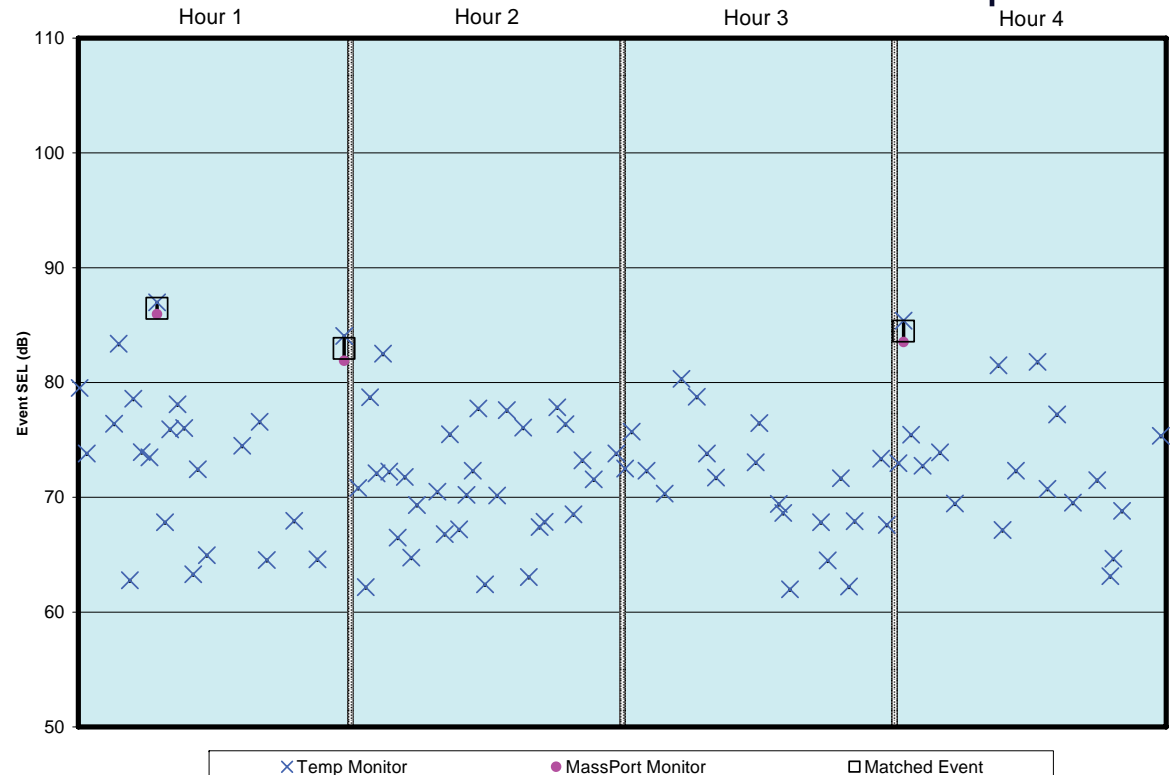
Site 26 – Results

Analysis Hour	Cumulative Metrics						Correlated Aircraft Events					
	Overall Leq (dB)		Aircraft Leq (dB)		Time Above 65 dB (s)		Number of Aircraft Events		# of AC Event Matches	Avg Diff SEL (Temp - MassPort) (dB)	Avg Abs Diff SEL Temp - MassPort (dB)	
	Temp	MassPort	Temp	MassPort	Temp	MassPort	Temp	MassPort				
1	56.7	56.3	56.2	51.8	95	79	22	2	2	1.60	1.60	
2	54.2	55.6	53.3	N/A	38	39	30	0	0	N/A	N/A	
3	55.5	57.3	50.9	N/A	45	73	20	0	0	N/A	N/A	
4	55.2	56.2	54.0	48.0	68	78	18	1	1	1.87	1.87	
Total	55.5	56.4	54.0	47.3	246	269	90	3	3	1.69	1.69	

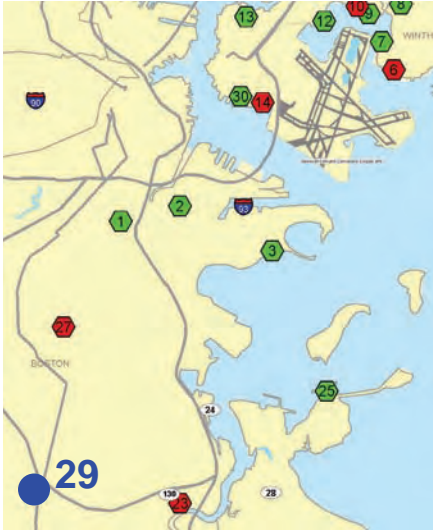
Notes

- Aircraft events nearly all departures RW 22L/R. SEL usually from 60 to 80 dB.
- Of 90 events, Massport's system identified only 3 – the loudest 3. Three Massport SEL's were average of 1.69 dB low.
- Massport cumulative Aircraft Leq and number of events far too low.

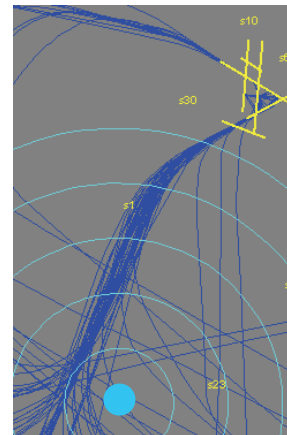
Correlated Aircraft Events Graph



Site 29 – Overview



- Measured June 23, 2007 5:55am through 9:45am.
- Weather clear with temperatures ranging from 57 to 67° F.
- Airport was operating with departures on Rwy's 27 and 33L.
- Notable aircraft events were nearly exclusively from departures on Runway 27.
- Background noise came from birds, wind in trees and local traffic.



Site 29 – Results

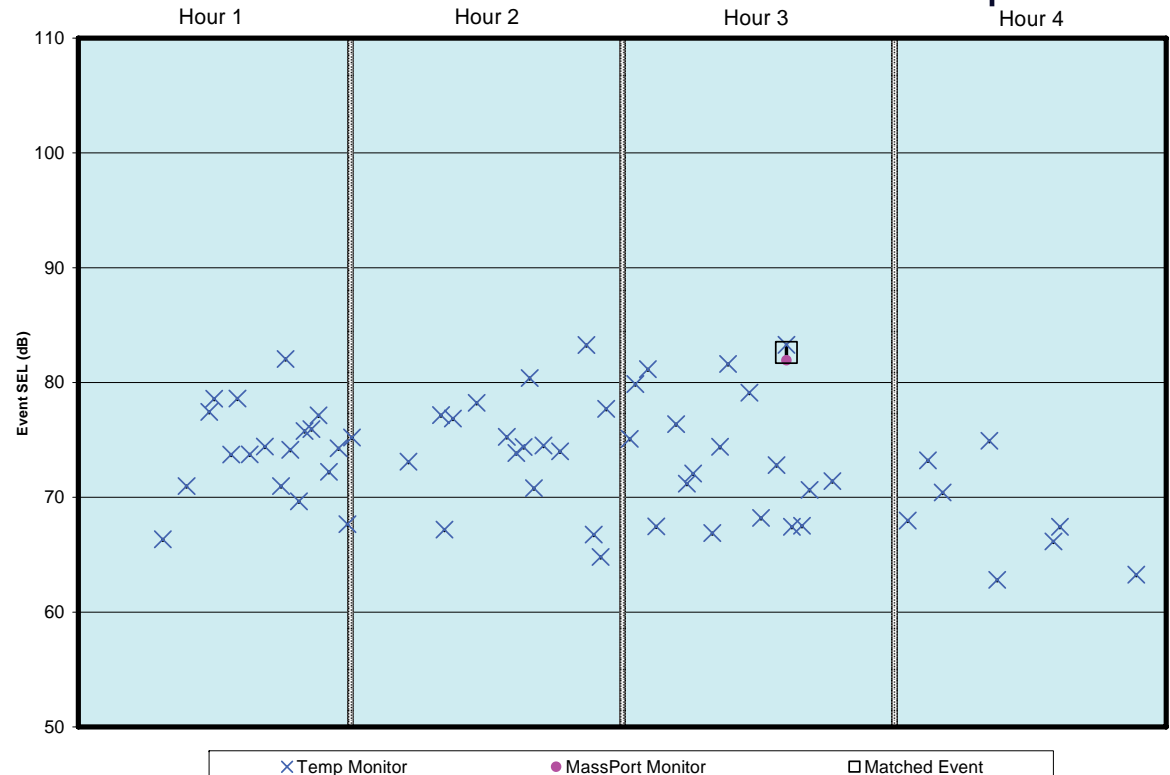
Analysis Hour	Cumulative Metrics						Correlated Aircraft Events					
	Overall Leq (dB)		Aircraft Leq (dB)		Time Above 65 dB (s)		Number of Aircraft Events		# of AC Event Matches	Avg Diff SEL (Temp - MassPort) (dB)	Avg Abs Diff SEL Temp - MassPort (dB)	
	Temp	MassPort	Temp	MassPort	Temp	MassPort	Temp	MassPort				
1	55.8	55.9	52.8	N/A	61	55	18	0	0	N/A	N/A	
2	55.5	55.7	53.3	N/A	80	75	17	0	0	N/A	N/A	
3	54.9	55.2	53.8	46.4	63	65	18	1	1	1.37	1.37	
4	51.8	52.5	43.6	N/A	18	21	8	0	0	N/A	N/A	
Total	54.7	55.0	52.2	40.3	222	216	61	1	1	1.37	1.37	

Notes

- Aircraft events mostly departures RW 27 and 33L. 33L departures generally quieter.
- Of 61 events, Massport's system identified only 1 – the second loudest.
- Massport cumulative Aircraft Leq and number of events far too low.



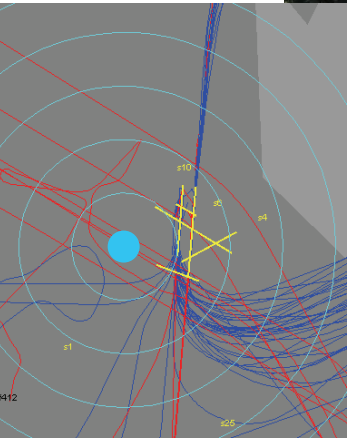
Correlated Aircraft Events Graph



Site 30 – Overview



- Measured June 16, 2007 9:30am through 1:30pm.
- Weather scattered clouds with temperatures ranging from 69 to 73° F.
- Airport was operating with departures on Rwy 22R and arrivals on 22L for the first hour to hour and a half. The remainder of the period had departures on Rwy 4R and arrivals on Rwy's 4L/R.
- Notable aircraft events were mostly from departures on Rwy 22R with occasional Rwy 4L/R departures and arrivals in the latter portion of the period..
- Background noise came from birds, local traffic, boats in harbor, nearby lawn mowers, and occasional helicopters.



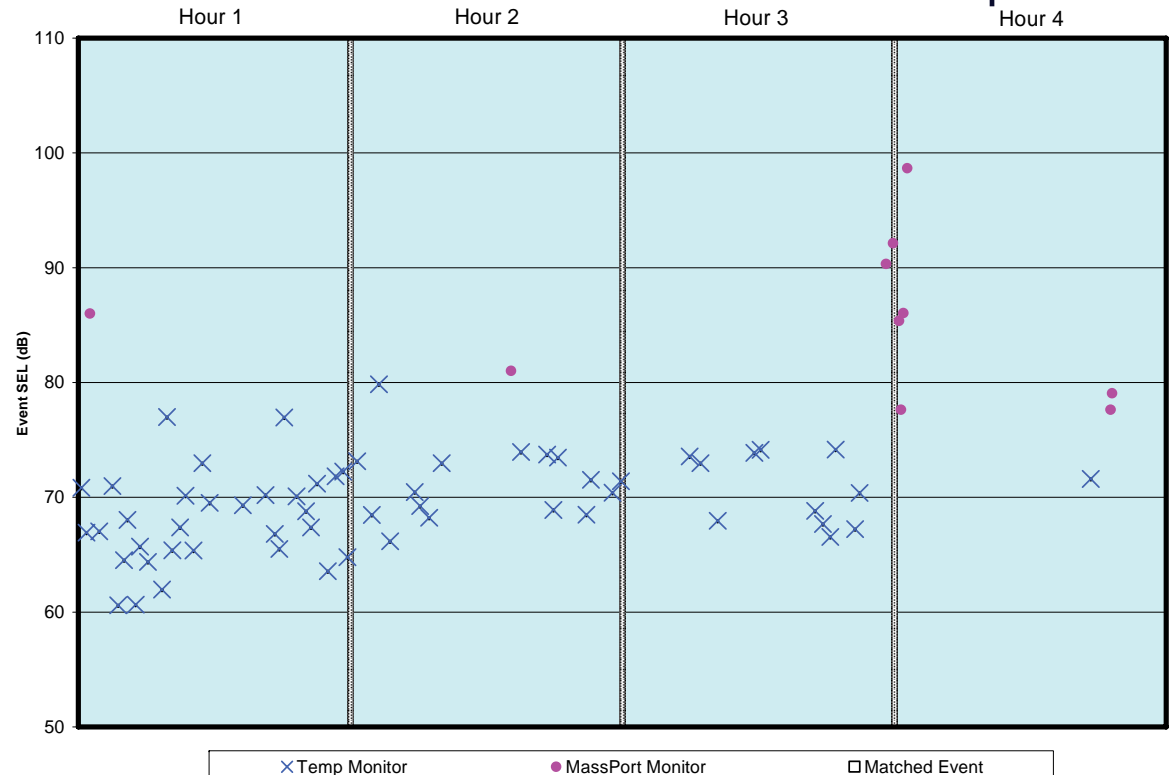
Site 30 – Results

Analysis Hour	Cumulative Metrics						Correlated Aircraft Events					
	Overall Leq (dB)		Aircraft Leq (dB)		Time Above 65 dB (s)		Number of Aircraft Events		# of AC Event Matches	Avg Diff SEL (Temp - MassPort) (dB)	Avg Abs Diff SEL Temp - MassPort (dB)	
	Temp	MassPort	Temp	MassPort	Temp	MassPort	Temp	MassPort				
1	57.1	58.3	49.3	50.4	35	46	31	1	0	N/A	N/A	
2	55.9	56.9	49.2	45.4	58	80	16	1	0	N/A	N/A	
3	56.6	59.3	46.5	58.8	69	105	11	2	0	N/A	N/A	
4	64.0	65.8	36.0	63.6	562	733	1	6	0	N/A	N/A	
Total	59.8	61.7	47.3	59.0	724	964	59	10	0	N/A	N/A	

Notes

- Aircraft events in first 2 hours are departures RW 22R. In last 2 hours, events are arr/dep to RW 4L/R.
- All 10 Massport events are incorrectly assigned to aircraft. High noise was from trucks or lawn mower (start of 4th hour).
- Massport system missed all 59 actual aircraft events. Massport Aircraft Leq is too high because of mis-assignment.

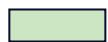
Correlated Aircraft Events Graph



Summary & Conclusions

Measurement Results Comparison by Site

Site	Cumulative Metrics						Correlated Aircraft Events					
	Overall Leq (dB)			Aircraft Leq (dB)			Number of Aircraft Events			# of AC Event Matches	Avg Diff SEL (Temp - MassPort) (dB)	Avg Abs Diff SEL Temp - MassPort (dB)
	Temp	MassPort	Difference	Temp	MassPort	Difference	Temp	MassPort	Difference			
1	63.9	65.1	1.2	59.5	58.9	-0.6	44	22	-22	21	0.49	0.68
4	71.5	71.9	0.4	71.4	71.1	-0.3	135	81	-54	77	0.16	0.26
6	63.7	64.2	0.5	63.2	62.4	-0.8	192	66	-126	51	-0.11	0.79
10	63.0	62.0	-1.0	59.8	56.0	-3.8	130	20	-110	19	1.26	1.28
18	56.5	59.5	3.0	49.3	42.2	-7.0	22	1	-21	1	1.22	1.22
19a	51.5	51.2	-0.3	25.8	N/A	N/A	1	0	-1	0	N/A	N/A
19b	53.3	54.0	0.7	39.5	N/A	N/A	11	0	-11	0	N/A	N/A
20	58.0	57.8	-0.2	54.7	N/A	N/A	74	0	-74	0	N/A	N/A
23	60.7	61.9	1.2	58.5	56.9	-1.5	85	44	-41	33	0.49	0.69
25	51.9	52.9	1.0	50.6	44.2	-6.4	76	1	-75	1	1.75	1.75
26	55.5	56.4	0.9	54.0	47.3	-6.7	90	3	-87	3	1.69	1.69
29	54.7	55.0	0.3	52.2	40.3	-11.9	61	1	-60	1	1.37	1.37
30	59.8	61.7	1.9	47.3	59.0	11.7	59	10	-49	0	N/A	N/A



Indicates good match between Massport result and Portable monitor result.



Indicates moderate match between Massport result and Portable monitor result.



Indicates poor match between Massport result and Portable monitor result.



Summary & Conclusions

- Overall, total noise levels measured by the Massport system are similar to those recorded by the portable monitors indicating no microphone or sound level meter bias.
- The analysis showed that using full-time on-site observers and full analytical review of measurement data can yield a high degree of aircraft event correlation; however, no approach can guarantee 100% aircraft event correlation.
- The Massport system appears to use fixed event thresholds of 65 dB or higher.
- The Massport system does miss notable numbers of aircraft events at all sites. Generally, the missed events tend to be at the lower noise levels.
- The Massport system was more effective at capturing enough of the higher level aircraft events leading to reasonable cumulative aircraft noise values at sites that were closer to the airport or sites that had a high degree of direct overflights.



Summary & Conclusions

- Aircraft event capture is generally a function of three key factors: rigorous data availability, signal to noise ratio (in this case the aircraft noise is the signal and the ambient and other noise sources are the noise), and correlation methodology.
- When the original Massport system was developed, Stage 2 aircraft dominated the fleet and were much louder than most of today's aircraft. Thus, the signal to noise ratio was much higher, even for sites further from the airport.
- Today's quieter fleet means a lower signal to noise ratio and more difficulty for an automated system to capture aircraft single events in the midst of other background sources.
- While is not practical for a permanent long-term monitoring system to use full-time observers and full manual analysis, following a rigorous threshold setting process and refining those thresholds periodically based on variations in ambient noise levels will help ensure that the system will identify a larger proportion of the aircraft events, particularly at lower single event noise levels.

