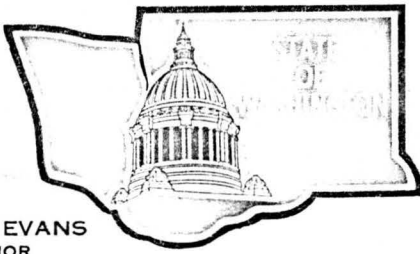


AIRCRAFT NOISE STUDY

SEA-TAC AIRPORT
ZONE THREE

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Department of Social and Health Services

June 1972



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June 14, 1972

TO: Zone Three Committee
Mr. Harold R. MacIsaac, Chairman
P.O. Box 98476
Des Moines, Washington 98016

FROM: Larry D. Ikenberry
Noise Consultant

SUBJECT: NOISE SURVEY, ZONE THREE, SEA-TAC AIRPORT

PURPOSE

At the request of citizens in Zone Three, (representing 2,184 residences in Zone Three) a noise survey was conducted at twelve locations near residences and schools in the Zone. The purpose was to determine the range and significance of noise exposures to residences and schools from low-flying jet aircraft, while on a landing approach or just after take-off. The jet aircraft measured in this report include the 707, 727, 737, 747, and DC-8.

This investigation was conducted in conjunction with Mr. John Moran and Robert Pekich of Environmental Management, Seattle-King County Health Department.

METHOD AND EQUIPMENT

Sound level measurements were recorded at the following locations:

(See Zone 3 map).

South 192 St. & Des Moines Way
South 160 St. & 14 Ave. S.
South 212 St. & 21 Ave. S.
South 140 St. & 19 Ave. S. (front of Sunset Junior
South 146 & 6 Ave. S. High School)
South 227 St. & 24 Ave. S. (front of Pacific Junior
High School)

- South 208 St. & 20 Place S.
- South 128 St. & 18 Ave. S. (Boulevard Park Elem. School)
- South 200 St. & 13 Ave. S. (Maywood Elementary School)
- 19215 28 Ave. S. (Angle Lake Elem. School)
- South 140 St. & 20 Ave. S. (East of Sunset Jr. High)
- South 200 St. & 26 Ave. S.

A-scale sound level measurements of maximum peak levels during flyover were recorded with a Brüel and Kjaer Precision Sound Level Meter, Model 2203. A tripod mounted condenser microphone on a 10 foot remote cable was used in conjunction with the sound level meter. Aircraft noise levels were recorded on magnetic tape with a Uher 4000 Report-L for further frequency analysis. All measurements were recorded outdoors on clear, sunny days unless noted differently.

Calibration was accomplished with a Brüel and Kjaer Pistonphone, Type 4220.

RESULTS

All noise levels recorded were over 80dBA with a maximum level reaching 107dBA (see TABLE I). The evaluation of aircraft noise in terms of the response of individuals to its general noisiness has prompted the application of a PERCEIVED NOISE LEVEL (PNL) system where noise is measured in units of perceived noise decibels (PNdB). An A-scale reading (as used in this report) is an approximation of a perceived noise level, when 13dB is added to the dBA level.¹ This system applies specifically to jet, fixed wing aircraft. (See figure I, page 4).

TABLE I

ZONE 3
NOISE LEVELS
(Schools and Residences)

<u>LOCATION</u>	AIRCRAFT MANEUVERS	PEAK NOISE LEVEL RANGE (dBA)	MEDIAN (dBA)
1. South 128 St. & 18 Ave. S. Boulevard Park Elem. School	Southbound Landing approach	84 - 100	92
2. South 140 St. & 19 Ave. S. Sunset Jr. High School	Northbound Take-Off	90 - 96	95
3. South 140 St. & 20 Ave. S. Sunset Jr. High School	Southbound Landing approach	98 - 107	102
4. South 146 St. & 6 Ave. S.	Northbound Take-Off	80 - 90	83
5. South 160 St. & 14 Ave. S.	Northbound Take-Off	80 - 95	91
6. South 192 St. & DesMoines Way	Southbound Take-Off	90 - 98	94
7. South 192 St. & 28 Ave. S. Angle Lake Elem. School	Southbound Take-Off	82 - 95	86
8. South 200 St. & 26 Ave. S.	Southbound Take-Off	85 - 96	88
9. South 200 St. & 13 Ave. S. Maywood Elem. School	Southbound Take-Off	88 - 100	94
10. South 208 St. & 20 Place S.	Northbound Landing approach	94 - 106	98
11. South 212 St. & 21 Ave. S.	Southbound Take-Off	90 - 98	94
11. South 212 St. & 21 Ave. S.	Northbound Landing approach	80 - 103	95
12. South 227 St. & 24 Ave. S. Pacific Jr. High School	Northbound Landing approach	84 - 90	86

FIGURE I

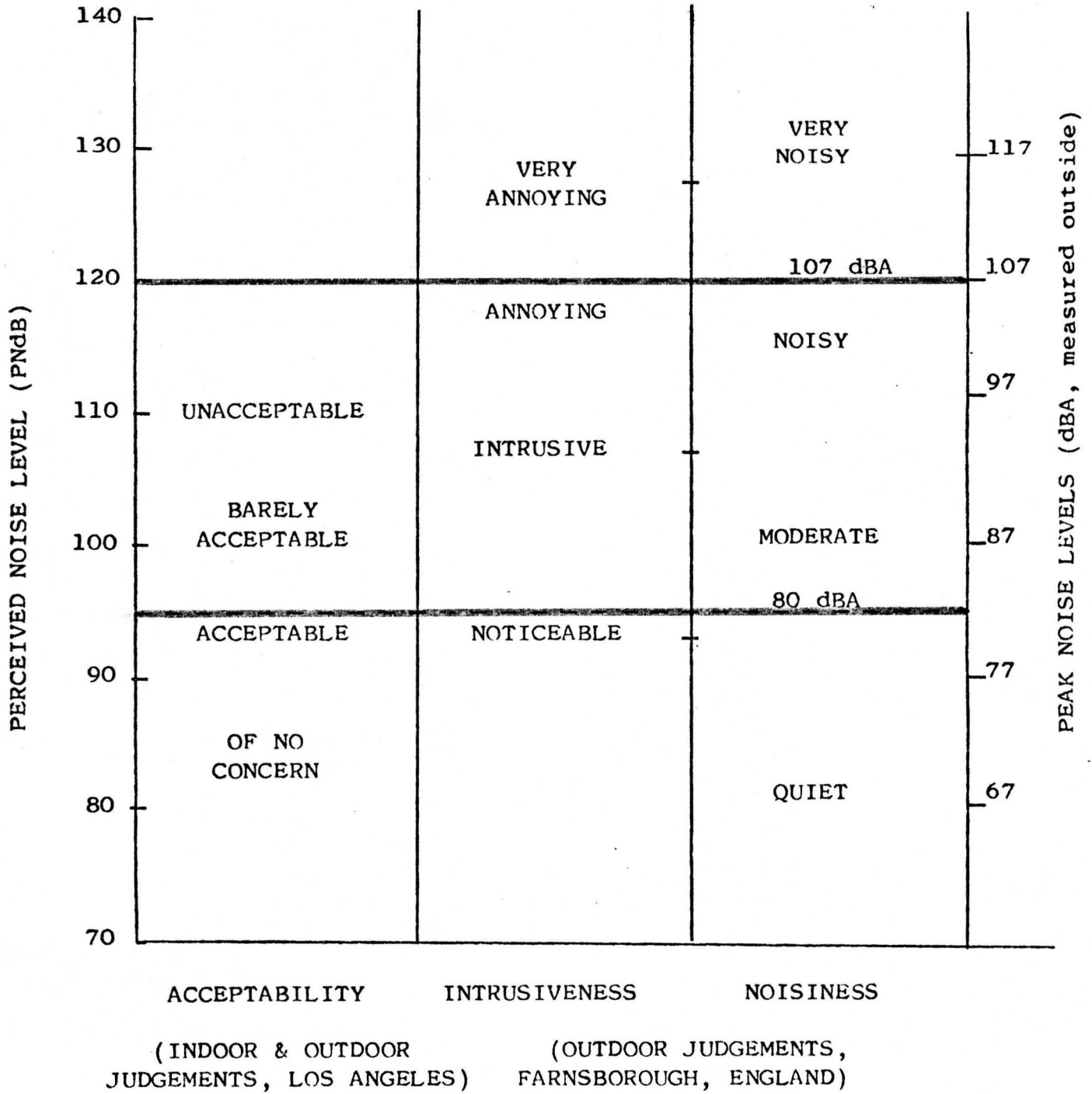


FIG.I. Calculated perceived noise level of aircraft flyovers & corresponding scales of judged acceptability, intrusiveness, and noisiness. (FROM 2)

Noise Level Range, Zone 3: 80dBA to 107dBA.

CONCLUSIONS

The majority of the area of Zone Three is subjected to repeated, excessive levels of aircraft noise. These noise levels, created by low flying aircraft, are generally considered to cause: interference with speech communication, annoyance, tension, and inefficiency; They are excessive and contribute to a degradation of the quality of living when compared with existing noise levels in other cities and residential areas.

Noise can cause a very real and adverse effect on a person's well being, both physically and mentally. It has been shown medically that the pupils of the eye dilate, the blood pressure rises, and oxygen consumption in the body increases when a person is exposed to excessive noise.

The aircraft noise levels measured within Zone Three varied from 80dBA (decibels, A-scale) to 107dBA. The median noise level of this range is 93dBA. The medians of the measured noise levels at the 12 locations varied from 83dBA to 102dBA.

Research has shown that there will be an appreciable disruption of contextual speech when noise at the peak of an aircraft flyover exceeds 76dBA.³ It has also been shown that over an extended period, people become less, rather than more, tolerant of continued exposures to aircraft noise.⁴ Also, it appears there is dissatisfaction with aircraft noise during the daytime, whenever the average value of the peak noise levels during flyover exceeds 97dBA (approximate 110 PNdB), assuming there are 20 to 40 flyovers each day during daytime hours.

Studies also show that a significant degree of discomfort occurs when the noise exceeds 87dBA (approximate 100 PNdB) at night (10 P.M.- 7 A.M.).⁵

Community noise ordinances for residential areas generally recommend 50dBA for a daytime limit and 45dBA for a nighttime limit. The median peak noise level measured within Zone 3 exceeds these limits with a relative intensity of over 10,000 times.

Noise due to aircraft flyovers does not cause any significant auditory fatigue because of the brief durations followed by longer periods of relative quiet.

Studies have shown that noise levels within the classroom exceeding 60dBA will cause lost classroom time, (time during which the student cannot hear the teacher). Noise levels as high as 98dBA have been recorded inside Sunset Junior High School.⁶ The recommended maximum background noise level for school classrooms is 45dBA.⁷

It can be seen from TABLE I & FIGURE I that the noise levels encountered within Zone 3 meet and significantly exceed several of the previously mentioned criteria. In terms of noise acceptability (see figure I) noise levels in Zone Three are either UNACCEPTABLE or BARELY ACCEPTABLE. In terms of intrusiveness, the levels are INTRUSIVE AND ANNOYING. And in terms of noisiness, it's noisy!

Based on the measured findings of this study, aircraft noise levels in Zone Three are excessive and detrimental to beneficial living, both mentally and physically.

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ZONE 3
(approximate)

Seattle-Tacoma International
Airport
NOISE MEASUREMENT
LOCATIONS AT YELLOW CIRCLES

MIDWAY

KENT

(181)

APPENDIX A

AIRCRAFT NOISE LEVELS - ZONE 3 - SEA-TAC AIRPORT

LOCATION NO. 1: South 128 St. & 18 Ave. S.

NORTHBOUND LANDING APPROACH

PEAK NOISE LEVEL RANGE: 84-100dBA

(MEDIAN: 92dBA)

DATE: June 9, 1972

WEATHER: Overcast

TEMP: 65 F

<u>AIRCRAFT NO.</u>	<u>TIME</u>	<u>PEAK NOISE LEVEL (dBA)</u>
1	2:33	100
2	2:34	92
3	2:36	91
4	2:37	96
5	2:52	84
6	3:07	92
7	3:17	91
8	3:19	98
9	3:22	89
10	3:33	90
11	3:34	95
12	3:36	95

LOCATION NO. 2: South 140 St. & 19 Ave. S.

NORTHBOUND TAKE-OFF

PEAK NOISE LEVEL RANGE: 90-96dBA

(MEDIAN: 95dBA)

DATE: June 2, 1972

WEATHER: Sunny-Clear

TEMP: 69 F

<u>AIRCRAFT NO.</u>	<u>TIME</u>	<u>PEAK NOISE LEVEL (dBA)</u>
1	1:30 pm	96
2	1:37	94
3	1:40	96
4	1:42	90

LOCATION NO. 5: South 160 St. & 14 Ave. S.

NORTHBOUND TAKE-OFF

PEAK NOISE LEVEL RANGE: 80-95dBA

(MEDIAN: 91dBA)

DATE: November 29, 1971

WEATHER: Overcast

TEMP: 50 F

<u>AIRCRAFT NO.</u>	<u>TIME</u>	<u>PEAK NOISE LEVEL (dBA)</u>
1	2:00 pm	95
2	2:05	90
3	2:20	94
4	2:27	92
5	2:28	94
6	2:30	88
7	2:32	90
8	2:35	90
9	2:36	80
10	2:38	92
11	2:43	94
12	2:50	82

LOCATION NO. 6: South 192 St. & Des Moines Way

SOUTHBOUND TAKE-OFF

PEAK NOISE LEVEL RANGE: 90-98dBA

(MEDIAN: 94dBA)

DATE: June 12, 1972

WEATHER: Overcast

TEMP: 56 F

<u>AIRCRAFT NO.</u>	<u>TIME</u>	<u>PEAK NOISE LEVEL (dBA)</u>
1	11:49 am	94
2	11:53	93
3	11:57	91
4	11:58	90
5	12:00	98
6	12:02	95

LOCATION NO. 7: South 192 St. & 28 Ave. S.

SOUTHBOUND TAKE-OFF

PEAK NOISE LEVEL RANGE: 82-95dBA

(MEDIAN: 86dBA)

DATE: June 9, 1972

WEATHER: Overcast

TEMP: 65 F

<u>AIRCRAFT NO.</u>	<u>TIME</u>	<u>PEAK NOISE LEVEL (dBA)</u>
1	12:26	93
2	12:28	87
3	12:41	84
4	12:42	82
5	12:50	84
6	12:52	87
7	12:54	84
8	12:55	92
9	12:56	85
10	12:57	95

LOCATION NO. 8: South 200 St. & 26 Ave. S.

SOUTHBOUND TAKE-OFF

PEAK NOISE LEVEL RANGE: 85-96dBA

(MEDIAN: 88dBA)

DATE: June 12, 1972

WEATHER: Overcast

TEMP: 56 F

<u>AIRCRAFT NO.</u>	<u>TIME</u>	<u>PEAK NOISE LEVEL (dBA)</u>
1	10:13	96
2	10:38	88
3	10:40	85
4	10:51	88
5	10:54	86
6	11:06	92
7	11:08	88
8	11:10	88
9	11:12	87

LOCATION NO. 9: South 200 St. & 13 Ave. S.

SOUTHBOUND TAKE-OFF

PEAK NOISE LEVEL RANGE: 88-100dBA

(MEDIAN: 94dBA)

DATE: June 9, 1972

WEATHER: Overcast

TEMP: 65 F

<u>AIRCRAFT NO.</u>	<u>TIME</u>	<u>PEAK NOISE LEVEL (dBA)</u>
1	1:24 pm	100
2	1:25	94
3	1:27	95
4	1:34	94
5	1:36	95
6	1:37	92
7	1:43	91
8	1:54	88
9	1:58	97

LOCATION NO. 10: South 208 St. & 20 Place S.

NORTHBOUND LANDING APPROACH

PEAK NOISE LEVEL RANGE: 94-106dBA

(MEDIAN: 98dBA)

DATE: June 6, 1972

WEATHER: Sunny-Clear

TEMP: 72 F

<u>AIRCRAFT NO.</u>	<u>TIME</u>	<u>PEAK NOISE LEVEL (dBA)</u>
1	2:12 pm	100+
2	2:18	100
3	2:21	94
4	2:23	106
5	2:30	98
6	2:35	101
7	2:37	98
8	2:57	96
9	3:08	94
10	3:15	98
11	3:21	97

LOCATION NO. 11: South 212 St. & 21 Ave. S.

SOUTHBOUND TAKE-OFF

PEAK NOISE LEVEL RANGE: 90-98dBA

(MEDIAN: 94dBA)

DATE: June 9, 1972

WEATHER: Overcast

TEMP: 65 F

<u>AIRCRAFT NO.</u>	<u>TIME</u>	<u>PEAK NOISE LEVEL (dBA)</u>
1	11:47 am	98
2	11:51	94
3	11:53	92
4	11:57	91
5	12:00	96
6	12:02	97
7	12:04	90
8	12:06	93

LOCATION NO. 11: South 212 St. & 21 Ave. S.

NORTHBOUND LANDING APPROACH

PEAK NOISE LEVEL RANGE: 80-103dBA

(MEDIAN: 95dBA)

DATE: June 2, 1972

WEATHER: Sunny-Clear

TEMP: 69 F

<u>AIRCRAFT NO.</u>	<u>TIME</u>	<u>PEAK NOISE LEVEL (dBA)</u>
1	10:25 am	100
2	10:45	96
3	10:46	94
4	10:48	98
5	10:57	96
6	11:00	93
7	11:02	100+
8	11:03	94
9	11:05	82
10	11:06	90
11	11:24	94
12	11:27	93
13	11:33	94
14	11:37	97
15	11:39	94
16	11:40	100+
17	11:42	84
18	11:45	100
19	11:49	94
20	11:57	80
21	12:07	95
22	12:13	95
23	12:21	97
24	12:23	103

LOCATION NO. 12: South 227 St. & 24 Ave. S.

NORTHEBOUND LANDING APPROACH

PEAK NOISE LEVEL RANGE: 84-90dBA

(MEDIAN: 86dBA)

DATE: June 6, 1972

WEATHER: Sunny-Clear

TEMP: 72 F

<u>AIRCRAFT NO.</u>	<u>TIME</u>	<u>PEAK NOISE LEVEL (dBA)</u>
1	1:12 pm	86
2	1:15	86
3	1:19	86
4	1:29	86
5	1:34	88
6	1:46	90
7	1:53	84
8	1:56	89
9	2:04	84