AMES AERODYNAMICS
TESTING

NASA AMES AERODYNAMICS TESTING PROGRAM

FINAL ENVIRONMENTAL IMPACT STATEMENT

OCTOBER 1998

National Aeronautics and
Space Administration

Ames Research Center
Moffett Field, California 94035-1000

ARC 275 (Feb 95)

NASA Ames
Aerodynamics Testing Program
Final Environmental Impact Statement

ADDENDUM
March 19, 1999

Since the printing of the document entitled NASA Ames Aerodynamics Testing Program Final Environmental Impact Statement - October 1998 (FEIS), there have been a few factual developments and corrections, necessitating the following changes and updates to the FEIS:

1. The correct date for the *NASA Strategic Plan* that is referenced in the FEIS is September 30, 1997.

2. The "Aeronautics Enterprise" that is mentioned on page 9 and elsewhere in the FEIS has been renamed as the "Aero-Space Technology Enterprise".

3. Based on the most current information available to NASA, the most likely transferee of the Onizuka Air Station Annex housing and associated facilities is the U.S. Department of the Army. In the event this housing and associated facilities are transferred to the U.S. Army, NASA will carry out its mitigation commitments by interacting and coordinating with the U.S. Army in the same manner as if the U.S. Air Force still controlled the property. If, for whatever reason, the housing and associated facilities were to be transferred to NASA Ames Research Center rather than the U.S. Army, NASA will implement mitigation as presented in the FEIS and accompanying Mitigation Implementation Plan.

All other information and analysis presented in the FEIS remains current and accurate as of the date of this Addendum.

NASA AMES AERODYNAMICS TESTING PROGRAM

FINAL ENVIRONMENTAL IMPACT STATEMENT

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OCTOBER 1998

FINAL ENVIRONMENTAL IMPACT STATEMENT
for the
NASA AMES AERODYNAMICS TESTING PROGRAM

NASA Ames Research Center
Moffett Field, California

October 1998

Lead Agency:

National Aeronautics and Space Administration (NASA)
NASA Ames Research Center
Moffett Field, California 94035-1000

Summary:

This document is an Environmental Impact Statement (EIS) prepared pursuant to the National Environmental Policy Act of 1969, as amended (NEPA) (42 U.S.C. 4321 *et seq.*), the Council on Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of NEPA (40 CFR Parts 1500-1508), and NASA's policy and procedures (14 CFR Subpart 1216.3), for the NASA Ames Research Center Aerodynamics Testing Program. This EIS analyzes the potential impacts associated with the proposed wind tunnel testing of high performance aircraft powered by engines with supersonic jet exhaust and powered-lift systems in the National Full-Scale Aerodynamics Complex (NFAC) at NASA Ames Research Center, Moffett Field, California.

The Aerodynamics Testing Program will define the envelope of future wind tunnel testing in the NFAC at NASA Ames Research Center. The program outlines parameters for testing at two facilities at Ames Research Center: the 40- by 80-Foot Wind Tunnel and the 80- by 120-Foot Wind Tunnel.

This EIS examines the environmental effects of implementation of different alternatives for the proposed Aerodynamics Testing Program. NEPA regulations require that a range of reasonable alternatives to a proposed action, that could feasibly attain the objectives of the action, be described and comparatively evaluated. This EIS analyzes in detail three Aerodynamics Testing Program alternatives and the No Action Alternative. As detailed in this EIS, significant impacts of the proposed action are principally related to an increase in noise and vibration. Further detail on expected environmental impacts and proposed mitigation measures to mitigate such impacts are also detailed in this document.

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NASA AMES AERODYNAMICS TESTING PROGRAM
Final Environmental Impact Statement (EIS)

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List of Abbreviations and Acronyms

AAL	Ames Aeronautical Laboratory
ABAG	Association of Bay Area Governments
AICUZ	Air Installation Compatible Use Zones
ANN	Artificial neuron network
ANSI	American National Standard Institute
ARPA	Advanced Research Project Agency
AST	Advanced Subsonics Technology
BAAQMD	Bay Area Air Quality Management District
BCDC	Bay Conservation and Development Commission
C2	Federal listing may be warranted
CALF	Common Affordable Lightweight Fighter
CANG	California Air National Guard
CAP	Clean Air Plan
CARB	California Air Resources Board
CDFG	California Department of Fish and Game
CEQ	Council on Environmental Quality
CFP	California Protected
CFR	Code of Federal Regulations
CHABA	Committee on Hearing, Bioacoustics and Biomechanics
CNDD	California Natural Diversity Database
CNEL	Community Noise Equivalent Level
CO	Carbon Monoxide
CSC	California Species of Special Concern
CTOL	Conventional Takeoff and Landing
CUP	Comprehensive Use Plan
dB	Decibel
dBA	A-Weighted Sound Level (in decibels)
DNL	Day-night average noise level
DOD	United States Department of Defense
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
FAA	Federal Aviation Administration

FAR	Federal Aviation Regulations
FE	Federally Endangered
FICON	Federal Interagency Committee on Urban Noise
FICUN	Federal Interagency Committee on Noise
FIP	Federal Implementation Plan
FT	Federally Threatened
HNL	Hourly Noise Levels
HSCT	High Speed Civil Transport
HSR	High Speed Research
Hz	Hertz
HUD	United States Department of Housing and Urban Development
JAST	Joint Advanced Strike Technology
JSF	Joint Strike Fighter
L_{dn}	Day-night average noise level
L_{eq}	Equivalent noise level
LTS	Less than significant
MMP	Mitigation Monitoring Plan
MSL	Mean Sea Level
MWR	Morale, Welfare and Recreation
NAAQS	National ambient air quality standard
NAS	Naval Air Station
NACA	National Advisory Committee for Aeronautics
NASA	National Aeronautics and Space Administration
NCA	Noise Control Act
NEPA	National Environmental Policy Act
NFAC	National Full-Scale Aerodynamics Complex
NHS/IS	NASA Health Standard on Hearing Conservation
NIHL	Noise Induced Hearing Loss
NNI	Noise and Number Index
NOA	Notice of Availability
NOC	Notice of Completion
NOD	Notice of Determination
NOI	Notice of Intent
NOP	Notice of Preparation
NOx	Nitrogen Oxides

O_3	Ozone
OARF	Outdoor Aerodynamics Research Facility
OPR	California Governor's Office of Planning and Research
OSHA	Occupational Safety and Health Administration
PM_{10}	Suspended particulate material less than 10 μm in diameter
PNL	Perceived noise level
PPB	Parts per billion
PPM	Parts per million
ROG	Reactive organic gases
RSD	Recreational Services Department
S	Significant
SE	California (State) Endangered
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
SO_2	Sulfur Dioxide
SOx	Sulfur Oxides
STOVL	Short takeoff and vertical landing
SU	Significant and unavoidable
TAC	Toxic Air Contaminant
UBC	Uniform Building Code
$\mu g/m^3$	Micrograms per Cubic Meter
UK	United Kingdom
US	United States
USAF	United States Air Force
USFWS	United States Fish and Wildlife Service
VSTOL	Vertical and short takeoff and landing
VTOL	Vertical takeoff and landing

SUMMARY

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This Programmatic Environmental Impact Statement (EIS) has been prepared pursuant to the National Environmental Policy Act of 1969, as amended (NEPA) (42 U.S.C. 4321 *et seq.*), the Council on Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of NEPA (40 CFR Parts 1500-1508), and NASA's policy and procedures (14 CFR Subpart 1216.3), to evaluate the environmental effects of the proposed NASA Ames Aerodynamics Testing Program. The proposed Aerodynamics Testing Program has been developed by the National Aeronautics and Space Administration (NASA) to address the unique needs of future aerodynamics testing of the next generation of aircraft. The proposed Aerodynamics Testing Program will define the noise envelope of future wind tunnel testing at the National Full-Scale Aerodynamics Complex (NFAC) at NASA Ames Research Center, Moffett Field, California. The program outlines parameters for testing at two facilities of the NFAC at NASA Ames Research Center: the 40- by 80-Foot Wind Tunnel and the 80- by 120-Foot Wind Tunnel.

A. NASA Ames Aerodynamics Testing Program Alternatives

The CEQ regulations for Implementing the Procedural Provisions of NEPA require that a range of reasonable alternatives to a proposed action, that could feasibly attain the objectives of the action, be described and comparatively evaluated. Chapter 5: Environmental Impacts and Mitigation Measures, analyzes in detail three Aerodynamics Testing Program alternatives and the No Action Alternative, as follows:

- *Alternative 1: 800 Annual Hours.* In this program alternative, full-scale aerodynamic testing of high performance and vertical lift aircraft could occur during various testing windows for limited periods of time at both NFAC wind tunnel facilities. This alternative establishes certain testing parameters and places limits on noise generated by testing operations, without significantly disabling NASA's aerodynamic testing abilities. This alternative allows for significantly more evening and nighttime testing when compared to the other two program alternatives, allowing flexibility in NASA's staffing and operations at the wind tunnels.

- *Alternative 2: 600 Annual Hours.* Like Alternative 1, aerodynamics testing could occur during various testing windows for limited periods of time at each facility. Higher noise testing would only be allowed during the daytime and evening hours (between 7:00 a.m. and 10:00 p.m.), allowing some flexibility in NASA's staffing and operations at the wind tunnels, without as much nighttime impact as Alternative 1.
    - In addition, NASA has identified a slight modification to Alternative 2 as their preferred alternative. This process and the specific parameters of the modification are further detailed in Section E of this Summary (beginning on page S-17). For environmental review purposes, the preferred alternative can be considered approximately equal to Alternative 2; however, noise impacts of the preferred alternative would be less extensive than those of Alternative 2.
- *Alternative 3: 400 Annual Hours.* Aerodynamics testing would be allowed for lesser periods of time, when compared to the other program alternatives. Additionally, testing at the higher noise levels would only be allowed during the daytime hours (between 7:00 a.m. to 7:00 p.m.). In general, this alternative would not allow staffing flexibilities, such as swing shifts, but would result in the least impacts of the three alternatives.
- *No Action Alternative.* Under the No Action Alternative, none of the three aerodynamic testing programs would be administered. Aerodynamic testing beyond programs currently administered through existing policies at NASA Ames Research Center would not be implemented. Aerodynamic research of aircraft or propulsion systems that required full-scale wind tunnel testing that would create impacts and noise beyond existing operations at NASA Ames would not be allowed. Existing operations at the NFAC would continue, but could not be expanded to conduct noisier testing of supersonic jet airplanes and advanced technologies in vertical lift aircraft.

B. Comparison of Alternatives

The principal characteristics, adverse impacts and benefits of the three proposed Aerodynamics Testing Programs and the No Action Alternative are summarized on the following pages. The characteristics, impacts, and fulfillment of purpose and need of the proposed action and alternatives are all summarized in Table S-1. Impacts are referenced in this summary table as they appear throughout this EIS. For more detail, please refer to the applicable sections of this document.

Table S-1
PROPOSED NASA AMES AERODYNAMICS TESTING PROGRAM ALTERNATIVES
COMPARISON OF MAJOR PROGRAM CHARACTERISTICS

Description	Impact Reference[a]	Alternative 1	Alternative 2 (and Preferred Alternative)[b]	Alternative 3	No Action Alternative (Existing Conditions)
NFAC Wind Tunnel Testing Characteristics					
Maximum Noise Levels at benchmark from NFAC wind tunnel facilities[c] (dB)		85	85	85	58
Testing Envelope[d] (>65 dB[e])		7:00 a.m to 7:00 a.m. (24 hours)	7:00 a.m to 10:00 p.m.	7:00 a.m to 7:00 p.m.	None permitted
Testing Envelope[d] (>80 dB[e])		7:00 a.m to 7:00 p.m.	7:00 a.m to 7:00 p.m.	7:00 a.m to 7:00 p.m.	None permitted
Adverse Impacts Resulting from the Action					
Areas exposed to hazardous noise levels (>85 dB)	NOISE-1 NOISE-2	NASA Ames/Moffett Field Onizuka Air Station Annex Housing (132 units)[f] Onizuka Child Development Center Onizuka Youth and Teen Facility Stevens Creek Regional Trail (Reach 1)	Same as Alternative 1	Same as Alternative 1	Noise hazards would occur at NASA Ames and Moffett Field, but noise levels would not be as high and are existing.

[a] Please refer to Table S-2 (page S-11) for a detailed description of each impact as identified in this table.
[b] Please refer to page S-17 for more information regarding the Preferred Alternative.
[c] Please refer to Figure 3 (page 23) for the benchmark location.
[d] For a further description of testing envelopes and specific project parameters, please refer to pages 27 to 33 of Chapter 3: Proposed Action and Alternatives Description.
[e] When measured at the benchmark.
[f] As shown on Figure 20, 132 Onizuka Air Station Annex housing units would be within the 85 dB noise level contour. However, it is estimated that 182 housing units would be vacated during testing to ensure that individuals are not exposed to hazardous noise levels.

Note: All noise levels and noise exposure levels throughout this document are A-weighted in accordance with appropriate standards and criteria. All such values are in units of decibels, whose symbol is "dB" in conformance with American National Standard ANSI/ASME Y10.11-1984. The unit symbol "dBA" is not the standard symbol used under ANSI Y10.11. All numerical noise values in this document symbolized "dB," are numerically identical to those using the symbol "dBA," often found in other references.

Table S-1
PROPOSED NASA AMES AERODYNAMICS TESTING PROGRAM ALTERNATIVES
COMPARISON OF MAJOR PROJECT CHARACTERISTICS *continued*

Description	Impact Reference[a]	Alternative 1	Alternative 2 (and Preferred Alternative)[b]	Alternative 3	No Action Alternative (Existing Conditions)
Adverse Impacts Resulting from the Action *continued*					
Air Force facilities exposed to incompatible exterior CNEL noise exposure (>75 dB)	NOISE-3 NOISE-4	Onizuka Child Development Center Onizuka Youth and Teen Facility Air Force Housing	Same as Alternative 1, but generally less noise exposure	Same as Alternative 1 and 2, but generally less noise exposure	Noise from NFAC wind tunnel facilities would not increase, therefore no direct impacts would result from the No Action Alternative. However, noise from Moffett Field sources would continue to result in incompatible conditions.
Civilian residential land subject to incompatible exterior CNEL noise exposure (>65 dB)	POLICY-2 NOISE-5	Santiago Villa (358 units)	Santiago Villa (approximately 250 units)	Santiago Villa (approximately 150 units)	Noise from NFAC wind tunnel facilities would not increase, therefore no direct impacts would result from the No Action Alternative. However, noise from Moffett Field sources would continue to result in incompatible conditions.
Acres of commercial/industrial park land subject to incompatible exterior CNEL noise exposure (>70 dB)	POLICY-2 NOISE-5	25 hectares (61 acres)	11 hectares (28 acres)	7 hectares (16 acres)	None

[a] Please refer to Table S-2 (page S-11) for a detailed description of each impact as identified in this table.
[b] Please refer to page S-17 for more information regarding the Preferred Alternative.

Note: All noise levels and noise exposure levels throughout this document are A-weighted in accordance with appropriate standards and criteria. All such values are in units of decibels, whose symbol is "dB" in conformance with American National Standard ANSI/ASME Y10.11-1984. The unit symbol "dBA" is not the standard symbol used under ANSI Y10.11. All numerical noise values in this document symbolized "dB," are numerically identical to those using the symbol "dBA," often found in other references.

Table S-1
PROPOSED NASA AMES AERODYNAMICS TESTING PROGRAM ALTERNATIVES
COMPARISON OF MAJOR PROJECT CHARACTERISTICS *continued*

Description	Impact Reference[a]	Alternative 1	Alternative 2 (and Preferred Alternative)[b]	Alternative 3	No Action Alternative (Existing Conditions)
Adverse Impacts Resulting from the Action *continued*					
Special status biological species that could be subject to noise impacts	F&F-1	burrowing owls	burrowing owls	burrowing owls	No additional impacts
Recreational facilities that would be subject to incompatible exterior CNEL noise exposure[g]	REC-1 REC-2 REC-3	Federal recreation facilities at Onizuka Air Station and NASA Ames Research Center Public and private recreation facilities in the City of Mountain View	Federal recreation facilities at Onizuka Air Station and NASA Ames Research Center Public and private recreation facilities in the City of Mountain View	Federal recreation facilities at Onizuka Air Station and NASA Ames Research Center Public and private recreation facilities in the City of Mountain View	Noise from NFAC wind tunnel facilities would not increase, therefore no direct impacts would result from the No Action Alternative. However, noise from Moffett Field sources would continue to result in incompatible conditions.
Increase in air emissions	AIR-1	CO = 70.2 tons/year (max.) ROG = 5.1 tons/year (max.) NOx = 122.4 tons/year (max.)	CO = 51.9 tons/year (max.) ROG = 3.6 tons/year (max.) NOx = 85.1 tons/year (max.)	CO = 33.6 tons/year (max.) ROG = 2.1 tons/year (max.) NO_x = 47.7 tons/year (max.)	No increase
Property that could be subject to a value decrease	ECON-1	Santiago Villa Mobile Home Park	Santiago Villa Mobile Home Park	Santiago Villa Mobile Home Park	None
Fulfillment of Purpose and Need		Yes	Yes, but to a lesser degree than Alternative 1	Yes, but to a lesser degree than either Alternative 1 or 2	No

[a] Please refer to Table S-2 (page S-11) for a detailed description of each impact as identified in this table.

[b] Please refer to page S-17 for more information regarding the Preferred Alternative.

[g] In most cases, incompatible exterior noise exposure for recreational facilities is directly related to a penalty for nighttime testing, which is required in the CNEL noise environment descriptor. However, it is assumed that these impacts would generally not occur to recreational facilities since they are usually not used at night.

Note: All noise levels and noise exposure levels throughout this document are A-weighted in accordance with appropriate standards and criteria. All such values are in units of decibels, whose unit symbol is "dB" in conformance with American National Standard ANSI/ASME Y10.11-1984. The unit symbol "dBA" is not the standard symbol used under ANSI Y10.11. All numerical noise values in this document symbolized "dB," are numerically identical to those using "dBA," often found in other references.

1. Alternative 1: 800 Annual Hours

a. Adverse Impacts. The impacts described below are the significant impacts of Alternative 1, which would require mitigation, or which are considered unavoidable:

- Alternative 1 would subject areas of NASA Ames, Onizuka Air Station Annex, and Reach 1 of the Stevens Creek Trail to noise levels that are potentially hazardous.
- Alternative 1 would subject the Onizuka Air Force Child Development Center, the Onizuka Air Force Youth and Teen Facility, and some Air Force housing units to incompatible exterior noise exposure.
- The Santiago Villa Mobile Home Park, which includes 358 mobile home units, would be subjected to incompatible exterior noise exposure.
- Approximately 25 hectares (61 acres) of commercial and industrial park land would be subjected to incompatible exterior noise exposure.
- Recreation facilities would be subjected to incompatible noise exposure.
- Annual emissions of ozone precursors and carbon monoxide would increase.

b. Benefits. The major benefit is that Alternative 1 allows full-scale wind tunnel testing of advanced aircraft technologies; in particular those with vertical flight capabilities. At this time, NASA Ames Research Center is the only feasible location for this type of aerodynamics testing. Thus, this preferred alternative would meet the purpose and need for the program. Since a typical high noise testing project would require 200 hours of testing above 58 dB, when measured at the benchmark location, Alternative 1 would allow for approximately four advanced aircraft testing projects per year. It is anticipated that this alternative would address all the aerodynamics testing demands in support of the goals of the proposed NASA Ames Aerodynamics Testing Program. Additionally, Alternative 1 fulfills the purpose and need of the program best out of the alternatives analyzed since fewer program constraints would exist and the technological benefits derived from the use of these national facilities located at NASA Ames Research Center would be maximized. Alternative 1 would result in the continued support and timely advancement of U.S. aerospace industry military and commercial products, which is essential for success in the modern competitive global markets.

2. Alternative 2: 600 Annual Hours

a. Adverse Impacts. The impacts described below are the significant impacts of Alternative 2, which would require mitigation, or which are considered unavoidable:

- Alternative 2 would subject areas of NASA Ames, Onizuka Air Station Annex, and Reach 1 of the Stevens Creek Trail to noise levels that are potentially hazardous.
- Alternative 2 would subject the Onizuka Air Force Child Development Center, the Onizuka Air Force Youth and Teen Facility, and Air Force housing units to incompatible exterior noise exposure.
- Approximately 250 mobile home units at the Santiago Villa Mobile Home Park would be subjected to incompatible exterior noise exposure.
- Approximately 11 hectares (28 acres) of commercial and industrial park land would be subjected to incompatible exterior noise exposure.
- Recreation facilities would be subjected to incompatible noise exposure.
- Annual emissions of ozone precursors and carbon monoxide would increase.

b. Benefits. The major benefit is that Alternative 2 allows full-scale wind tunnel testing of advanced aircraft technologies; in particular those with vertical flight capabilities. Alternative 2 would limit the highest noise aerodynamics testing to the daytime and evening hours (between 7:00 a.m. and 10:00 p.m.), excluding testing during the nighttime, when most people sleep. Because of this program constraint, and less allocated testing time when compared to Alternative 1, Alternative 2 would allow for approximately three high noise testing projects per year. Alternative 2 would allow for the implementation of the most critical aerodynamics testing projects required to support to goals of the proposed NASA Ames Aerodynamics Testing Program. Additionally, Alternative 2 would result in the continued support and timely advancement of U.S. aerospace industry commercial and military products, which is essential for success in the modern competitive global markets

3. Alternative 3: 400 Annual Hours

a. Adverse Impacts. The impacts described below are significant impacts of Alternative 3, which would require mitigation, or which are considered unavoidable:

- Alternative 3 would subject areas of NASA Ames, Onizuka Air Station Annex, and Reach 1 of the Stevens Creek Trail to noise levels that are potentially hazardous.

- Alternative 3 would subject the Onizuka Air Force Child Development Center, the Onizuka Air Force Youth and Teen Facility, and Air Force housing units to incompatible exterior noise exposure.
- Approximately 150 mobile home units at the Santiago Villa Mobile Home Park would be subjected to incompatible exterior noise exposure.
- Approximately 7 hectares (16 acres) of commercial and industrial park land would be subjected to incompatible exterior noise exposure.
- Recreation facilities would be subjected to incompatible noise exposure.
- Annual emissions of ozone precursors and carbon monoxide would increase.

b. Benefits. The major benefit is that Alternative 3 allows full-scale wind tunnel testing of advanced aircraft technologies; in particular those with vertical flight capabilities. Alternative 3 would limit the majority of testing to daytime hours which limits the utilization of facilities, thus reducing efficiency and increasing costs primarily because the cost of electricity is much higher during the day. Alternative 3 is less beneficial in this respect when compared to the first two alternatives due to limited test flexibility. It is anticipated that Alternative 3 would allow for approximately two high noise testing projects per year. This alternative would allow for the implementation of the minimum number of aerodynamics testing projects that would support the goals of the proposed NASA Ames Aerodynamics Testing Program, and would still provide for the aerodynamics testing needs of high performance and powered-lift aircraft.

4. No Action Alternative

a. Adverse Impacts. There would be no significant adverse environmental impacts resulting from the No Action Alternative.

b. Benefits. The major benefit of the No Action Alternative is that noise exposure and noise impacts would not significantly increase, since existing aerodynamics testing capabilities would not be expanded. However, this alternative would not meet the purpose and need of the proposed action.

C. Environmentally Preferable Alternative

All three proposed NASA Ames Aerodynamics Program alternatives would create the same maximum noise levels. Noise exposure impacts are slightly less in Alternative 3, since aerodynamics testing would be restricted to slightly shorter periods of time and would principally occur during the day, when compared to the other program alternatives. Alternative 3 differs from the other two program alternatives since the highest noise aerodynamics testing would occur during the daytime (7:00 a.m. to 7:00 p.m.). For these reasons, Alternative 3 is the most environmentally preferable of the proposed NASA Ames Aerodynamics Testing Program alternatives, and is therefore the most environmentally preferable of the alternatives which meet the purpose and need of the proposed action.

The environmentally preferable alternative of all the alternatives is the No Action Alternative, since increased noise impacts would not occur. However, this alternative would not meet the program purpose of providing for the aerodynamics testing needs of high performance jet and powered-lift aircraft, since full-scale wind tunnel testing of high performance jet aircraft and advanced technologies of vertical lift aircraft could not take place. However, this alternative would not meet the purpose and need of the proposed action.

D. Summary of Significant Environmental Impacts

The significant environmental impacts discussed in detail in this EIS are all directly attributable to an increase in noise. The program is a proposed change in the parameters of existing aerodynamics testing in the wind tunnel facilities of the NFAC. The proposed NASA Ames Aerodynamics Testing Program does not include an increase in wind tunnel operation hours. The fact that the proposed action and its alternatives do not include any new construction, employees, traffic generation, or increased utility usage is the primary reason that impacts are not expected in many environmental categories.

Table S-2, which follows, summarizes the environmental impacts of the proposed NASA Ames Aerodynamics Testing Program alternatives addressed in this EIS. Since impacts of each alternative are generally the same, this table applies to all three program alternatives. Information in Table S-2 has been ordered to correspond with environmental issues discussed in Chapter 4: Affected Environment, and Chapter 5: Environmental Impacts and Mitigation Measures. For a more detailed comparison of the alternatives, please refer to Table S-1.

Table S-2 is arranged in six columns:

(1) Impacts
(2) Page Number Reference
(3) Significance without Mitigation
(4) Mitigation Measures for Significant Impacts
(5) Estimated Mitigation Cost
(6) Significance with Mitigation

A series of mitigation measures is noted where more than one measure may be required to achieve a less-than-significant impact.

For a complete description of potential impacts and recommended mitigation measures for the proposed NASA Ames Aerodynamics Testing Program, please refer to Chapter 5.

Table S-2
PROPOSED NASA AMES AERODYNAMICS TESTING PROGRAM SUMMARY TABLE
(Impacts are Common to All Three Program Alternatives)

Impacts	EIS Page Number Reference	Significance Without Mitigation	Mitigation Measures for Significant Impacts	Estimated Mitigation Cost	Significance With Mitigation
LAND USE					
No impacts are expected to land use other than those related to noise. Please see Chapter 5C: Noise.					
PUBLIC POLICY					
POLICY-1: The proposed NASA Ames Aerodynamics Testing Program would disproportionately affect low and very low income populations.	133	LTS	There is no feasible mitigation for this substantial, but less-than-significant, impact.	n/a	LTS
POLICY-2: The proposed NASA Ames Aerodynamics Testing Program would create noise levels that are inconsistent with local policies.	135	S	Please refer to Mitigation Measure NOISE-5.	n/a	SU
NOISE					
NOISE-1: NASA employees, on-site contractors, and visitors of NASA Ames Research Center could be exposed to noise levels above 90 dB for up to four hours per day, which would exceed the permissible exposure limit for noise levels established in the NASA Hearing Conservation Program. Additionally, the Noise Hazard Limit (85 dBA)[a] and the Action Level as defined by the Hearing Conservation Program would be exceeded in the NASA Ames Research Center during Level 2 and Level 3 testing.[b]	138	S	NOISE-1: The following mitigation measure would be implemented to decrease the potential for health risk and hearing damage of NASA Ames Research Center employees, on-site contractors, and visitors, as outlined in the NASA Health Standard on Hearing Conservation, NHS/IH-1845.4: (a) Prior to the implementation of individual testing projects, NASA would delineate the expected noise hazard area (above 85 dB) based on the best available data gathered to date. *continued*	$49,000 (total)	LTS

[a] All noise levels and noise exposure levels throughout this document are A-weighted in accordance with appropriate standards and criteria. All such values are in units of decibels, whose unit symbol is "dB" in conformance with American National Standard ANSI/ASME Y10.11-1984. The unit symbol "dBA" is not the standard symbol use d under ANSI Y10.11. All numerical noise values in this document symbolized "dB," are numerically identical to those using "dBA," often found in other references.

[b] Level 1, 2 and 3 testing are defined on page 27 of this document.

S = Significant SU = Significant and Unavoidable LTS = Substantial, but Less Than Significant

Table S-2

PROPOSED NASA AMES AERODYNAMICS TESTING PROGRAM SUMMARY TABLE *continued*

Impacts	FEIS Page Number Reference	Significance Without Mitigation	Mitigation Measures for Significant Impacts	Estimated Mitigation Cost	Significance With Mitigation
NOISE-1 continued	138	S	(b) Individuals exposed to 85 dB or higher would be required to wear hearing protection. Use of ear protectors would be enforced by NASA as specified in Section 7.1.4 of the Hearing Conservation Program. Additionally, disposable earplugs would be available for employee use where noise levels are less than 85 dB, if they so desire. Hearing protectors must attenuate employee noise exposure to a level of 85 dB or below. (c) Employee participation in the Medical Monitoring Program would be mandatory for all employees within the Action Level defined in the NASA Hearing Conservation Program. (d) Areas that have noise levels above 85 dB would be posted as noise hazard areas, during testing. (e) NASA would monitor testing at the Benchmark location (Monitor #1) and the Stevens Creek Trail (Monitor #2) to ensure aerodynamics testing is within the parameters set by the proposed NASA Ames Aerodynamics Testing Program. Direct feedback would be available between monitoring stations and the aerodynamics testing controller. If noise is recorded significantly above the testing parameters (3 dB), testing would cease immediately or power levels would be immediately reduced to conform to the program parameters. (f) A detailed mitigation plan, including the above measures, would be developed for specific projects implemented under the NASA Ames Aerodynamics Testing Program.	$49,000 (total)	LTS

S = Significant SU = Significant and Unavoidable LTS = Substantial, but Less Than Significant

Table S-2
PROPOSED NASA AMES AERODYNAMICS TESTING PROGRAM SUMMARY TABLE *continued*

Impacts	FEIS Page Number Reference	[illegible]	Mitigation Measures for Significant Impacts	Estimated Mitigation Cost	Significance With Mitigation
NOISE-2: Aerodynamics testing under the proposed NASA Ames Aerodynamics Testing Program would create noise hazard areas of 85 dB or more at the Onizuka Air Station Annex, within portions of Reach 1 of the Stevens Creek Trail, and at the Bicycle Commute Trail.	141	S	NOISE-2: Prior to implementing aerodynamics testing that would create noise levels in excess of 85 dB at the Onizuka Air Station Annex, at Reach 1 of the Stevens Creek Trail, or at the Bicycle Commute Trail, NASA would notify the Air Force, the City of Mountain View, and occupants in all affected locations. NASA would detail which areas would be exposed to noise levels above 85 dB, and would recommend that applicable residential units and facilities (including recreational) be vacated and closed during testing, and that all areas above 85 dB be posted as noise hazard areas to prevent prolonged exposure to these noise levels without hearing protection. Additionally, NASA will allow Onizuka Air Station Annex residents and contractors to participate in the NASA Hearing Conservation Program. These measures would be included in a detailed mitigation plan which would be developed for each project implemented under the NASA Ames Aerodynamics Testing Program.	Included in NOISE-1 estimate	LTS
NOISE-3: The proposed NASA Ames Aerodynamics Testing Program would result in incompatible exterior CNEL noise exposure at the Onizuka Child Development Center and the Youth and Teen Facility, according to the Air Force compatibility guidelines presented in Appendix C of the 1984 document entitled *Assessing Noise Impacts of Air Force Flying Operations*.	151	S	NOISE-3: The following mitigation measures are recommended to prevent impacts to the Onizuka Child Development Center and the Youth and Teen Facility: (a) Prior to the start of Level 2 or Level 3 testing, the Onizuka Child Development Center would be moved to a quieter location that meets classroom noise environment guidelines established by the Air Force or it will be vacated during Level 2 and Level 3 testing. (b) The Youth and Teen Center would be vacated during Level 2 and Level 3 testing. (c) Public access areas, including accessible Onizuka Air Station Annex property, that have noise levels above 85 dB would be posted as noise hazard areas during Level 2 and Level 3 testing. These measures would be included in each detailed mitigation plan developed for projects implemented under the NASA Ames Aerodynamics Testing Program. If these mitigation measures are not implemented, Level 2 or Level 3 testing would not occur.	(a) $2,100,000 (b) $15,000 (c) included in NOISE-1 estimate	LTS

S = Significant SU = Significant and Unavoidable LTS = Substantial, but Less Than Significant

Table S-2
PROPOSED NASA AMES AERODYNAMICS TESTING PROGRAM SUMMARY TABLE *continued*

Impacts	FEIS Page Number Reference	Significance Without Mitigation	Mitigation Measures for Significant Impacts	Estimated Mitigation Cost	Significance With Mitigation
NOISE-4: The proposed NASA Ames Aerodynamics Testing Program would create exterior CNEL noise exposure that would exceed 75 dB in Onizuka Air Station Annex housing areas. Appendix C of the Air Force noise impact assessment guidelines and the Air Force Family Housing Guide for Planning, Programming, Design and Construction prohibit residential land uses and related structures in areas exceeding an exterior CNEL of 75 dB. Where housing units are exposed to noise levels between CNEL of 65 and 75 dB, buildings are required to provided ample attenuation to create interior CNEL noise exposure of 45 dB.	156	S	NOISE-4: The following mitigation measures are recommended to mitigate this impact: (a) Onizuka Annex housing units exposed to average CNEL greater than 75 dB would be vacated during Level 2 and Level 3 testing. (b) Air Force housing units exposed to daily CNEL noise exposure of 65 to 75 dB would be required to provide average CNEL interior noise environments of 45 dB, or they would be vacated during Level 2 and Level 3 testing. These measures would be included in each detailed mitigation plan developed for projects implemented under the NASA Ames Aerodynamics Testing Program.	$1,000,000	LTS
NOISE-5: The proposed NASA Ames Aerodynamics Testing Program would create exterior CNEL noise exposure in the immediately adjacent residential and commercial areas that would be incompatible with surrounding civilian residential (>65 dB) and commercial (>70 dB) land uses, according the Mountain View General Plan.	157	S	NOISE-5: No mitigation is feasible to reduce this impact to less-than-significant levels. However, NASA would publish a testing schedule in local newspapers to notify the community of planned testing projects. Additionally, NASA would monitor Level 2 and Level 3 aerodynamics testing at the two established monitoring locations to ensure aerodynamics testing is within the parameters set by the proposed NASA Ames Aerodynamics Testing Program. Direct feedback would be available between the monitoring stations and the aerodynamics testing controller. If noise is recorded significantly above the testing parameters (3 dB), testing would cease immediately or power levels would be immediately reduced to conform to the program parameters.	$5,000	SU
NOISE-6: Aerodynamics testing implemented under the proposed NASA Ames Aerodynamics Testing Program may create annoyance and be considered a nuisance by the surrounding community.	159	LTS	There is no feasible mitigation for this substantial, but less-than-significant, impact.	n/a	LTS
NOISE-7: Aerodynamics testing implemented under the proposed program may create noise-induced vibration of objects in the surrounding community since low frequency noise is expected to dominate the aerodynamics testing.	160	LTS	There is no feasible mitigation for this substantial, but less-than-significant impact.	n/a	LTS

S = Significant SU = Significant and Unavoidable LTS = Substantial, but Less Than Significant

Table S-2
PROPOSED NASA AMES AERODYNAMICS TESTING PROGRAM SUMMARY TABLE *continued*

Impacts	[illegible] Reference	[illegible] Mitigation	Mitigation Measures for Significant Impacts	Estimated Mitigation Cost	Significance With Mitigation
FLORA AND FAUNA					
F&F-1: Burrowing owls currently use habitat within the area that would be exposed to noise levels greater than 90 dB. Hearing loss and an interruption in breeding could occur for birds due to operations under the proposed NASA Ames Aerodynamics Testing Program if they are exposed to these noise levels.	164	S	F&F-1: If Level 2 or Level 3 testing is conducted during the breeding season of the burrowing owl (March through August), a monitoring program would be implemented to determine whether there is interference with successful reproduction. Interference is defined as: • A significant drop in chick production rate as compared to owls; • A 50 percent burrow vacant rate within high noise areas; and/or • Unusual behavior. The monitoring program will be designed in consultation with the California Department of Fish and Game. If impacts are detected, appropriate mitigation would be implemented with input from this agency.	$25,000	SU
RECREATION					
REC-1: Recreation facilities at Onizuka Air Station Annex and NASA Ames Research Center would be exposed to CNEL noise levels greater than 75 dB with implementation of the proposed NASA Ames Aerodynamics Testing Program.	166	S	REC-1: NASA will close the Bicycle Commute Trail during Level 2 and Level 3 testing.	n/a	SU
REC-2: Public recreation facilities and land uses surrounding NASA Ames Research Center would be exposed to CNEL noise levels greater than 55 dB with implementation of the proposed NASA Ames Aerodynamics Testing Program.	167	S	REC-2: To prevent noise hazards, NASA would notify the City of Mountain View of Level 2 and Level 3 testing, and would recommend that Reach 1 of the Stevens Creek Regional Trail be posted and/or closed during Level 2 and Level 3 testing when the noise level is 85 dB or higher.	n/a	SU
REC-3: Private recreation facilities would be exposed to CNEL noise levels greater than 55 dB with implementation of the proposed NASA Ames Aerodynamics Testing Program.	168	S	REC-3: Mitigation measures outlined in the Noise section of this EIS would be implemented to appropriately notify the surrounding community of noise generating activities, and control the generation of noise.	n/a	SU

S = Significant SU = Significant and Unavoidable LTS = Substantial, but Less Than Significant

Table S-2
PROPOSED NASA AMES AERODYNAMICS TESTING PROGRAM SUMMARY TABLE *continued*

Impacts	FEIS Page Number Reference	Significance Without Mitigation	Mitigation Measures for Significant Impacts	Estimated Mitigation Cost	Significance With Mitigation
AIR QUALITY					
AIR-1: Annual emissions of ozone precursors, nitrogen oxides, and carbon monoxide would increase as a result of the proposed implementation of the NASA Ames Aerodynamics Testing Program.	171	S	AIR-1: NASA Ames will implement air quality mitigation prior to and during the implementation of the proposed NASA Ames Aerodynamics Testing Program, including: (a) Modifying the stationary source permit for the 40- by 80-Foot Wing Tunnel and the 80- by 120-Foot Wind Tunnel to include powered model testing of aircraft models included in the proposed NASA Ames Aerodynamics Testing Program prior to the inception of the program. (b) NASA will either obtain offsets, refrain from powered model testing on Spare the Air days, or implement other mitigation as identified by BAAQMD permit conditions.	n/a	LTS
SOCIOECONOMICS					
ECON-1: Noise levels associated with the NASA Ames Aerodynamics Testing Program may affect the value of the Santiago Villa Mobile Home Park as a property and a business.	173	S	There is no feasible mitigation for this potentially significant impact.	n/a	SU

S = Significant   SU = Significant and Unavoidable   LTS = Substantial, but Less Than Significant

E. Identification of the Preferred Alternative

Section 1502.14(e) of NEPA requires that an EIS identify the lead agency's preferred alternative in the Draft EIS if one exists, and identify such alternative in the Final EIS. At the Draft EIS stage, NASA did not identify a preferred alternative because environmental consequences and program options had not been fully evaluated.

When considering the environmental implications of the NASA Ames Aerodynamics Program options as analyzed in the Draft EIS, the concerns of community members that were voiced at the public meetings, and the feasibility of implementing various mitigation recommendations, NASA has determined that Alternative 2 is their preferred alternative, with a slight modification to further limit testing hours, and thereby reduce noise impacts to the community.

The proposed testing hours of the Preferred Alternative are shown in Table S-3. As can be seen by comparing this program description to Table 3: Testing Program Characteristics of Alternative 2 (Chapter 3, page 30), the Preferred Alternative has been further limited by removing evening Level 2 testing, and reducing the envelope for Level 3 testing by an hour in the morning, and by an hour in the early evening, thereby reducing noise impacts.

In order to illustrate the potential differences between the Preferred Alternative and the original Alternative 2, contours for this adjusted alternative were developed and are presented in Figure S-1. Additionally, the anticipated cumulative noise environment that would result with implementation of this alternative is shown in Figure S-2. This later figure considers both existing noise sources and the noise generated by the Preferred Alternative. No impacts other than those previously identified for Alternative 2 are anticipated with the implementation of the Preferred Alternative.

Table S-3
TESTING PROGRAM CHARACTERISTICS
PREFERRED ALTERNATIVE

Alternative 2: Program Parameters (all testing >58 dB at the Benchmark)	Maximum
Daily Hours (7AM-7AM)	8 hours
Annual Hours	600 hours
Annual Days (7AM-7AM)	150 days

Description	Testing Window	Maximum Noise at Benchmark (dB)	Max. Noise at Monitor #2	Max. Hours Per Window	Max. Hours Per Day	Max. Hours Per Year
Level 1 Testing						
40- by 80-Foot Wind Tunnel	Daytime (7AM-7PM)	65	70	6	8	600
	Nighttime (7PM-7AM)	65	70	6		
80- by 120-Foot Wind Tunnel	Daytime (7AM-7PM)	65	70	6		
	Nighttime (7PM-7AM)	65	70	6		
Level 2 Testing						
40- by 80-Foot Wind Tunnel	Daytime (7AM -7PM)	75	80	4	~~8~~ *6*	400
	~~Evening (7PM-10PM)~~	~~70~~	~~75~~	~~4~~		
80- by 120-Foot Wind Tunnel	Daytime (7AM -7PM)	80	85	4		
	~~Evening (7PM-10PM)~~	~~75~~	~~80~~	~~4~~		
Level 3 Testing						
80- by 120-Foot Wind Tunnel	Daytime (~~7~~ *8*AM - ~~7~~ *6*PM)	85	90	4	4	200

Notes: 1. ~~Strikeout~~ and *Italic* text indicate the changes that have been made to Alternative 2 to develop the Preferred Alternative.

2. All testing would be limited to the program parameters shown in the top portion of this table. Maximum testing hours at individual noise levels are not additive. For example, if eight hours of Level 1 testing occurred in one day, no testing could occur at either Level 2 or Level 3.

3. Maximum noise limits at the Benchmark and at Monitor #2 must be adhered to. Both are limits, not either/or.

Figure 1: Preferred Alternative
Maximum Daily CNEL Noise Exposure Contours (dB)

Figure 2: 2010 Cumulative CNEL Noise Environment

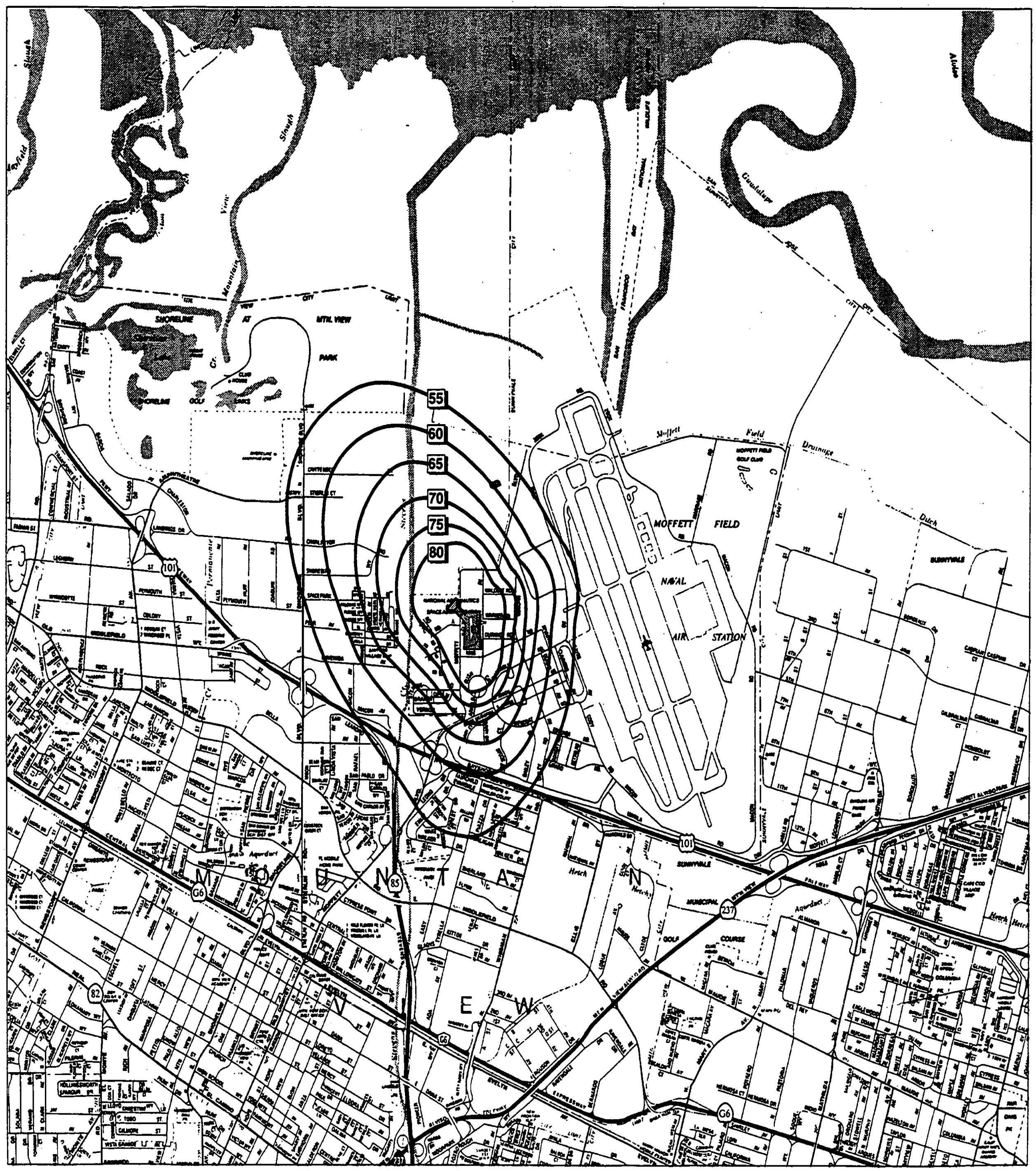

FIGURE S-1

Preferred Alternative
Maximum Daily
CNEL Noise Exposure Contours (dB)

Source: Charles Salter Associates. April 1996.

0 1/4 1/2
Scale in Miles

AMES AERODYNAMICS TESTING

469-038

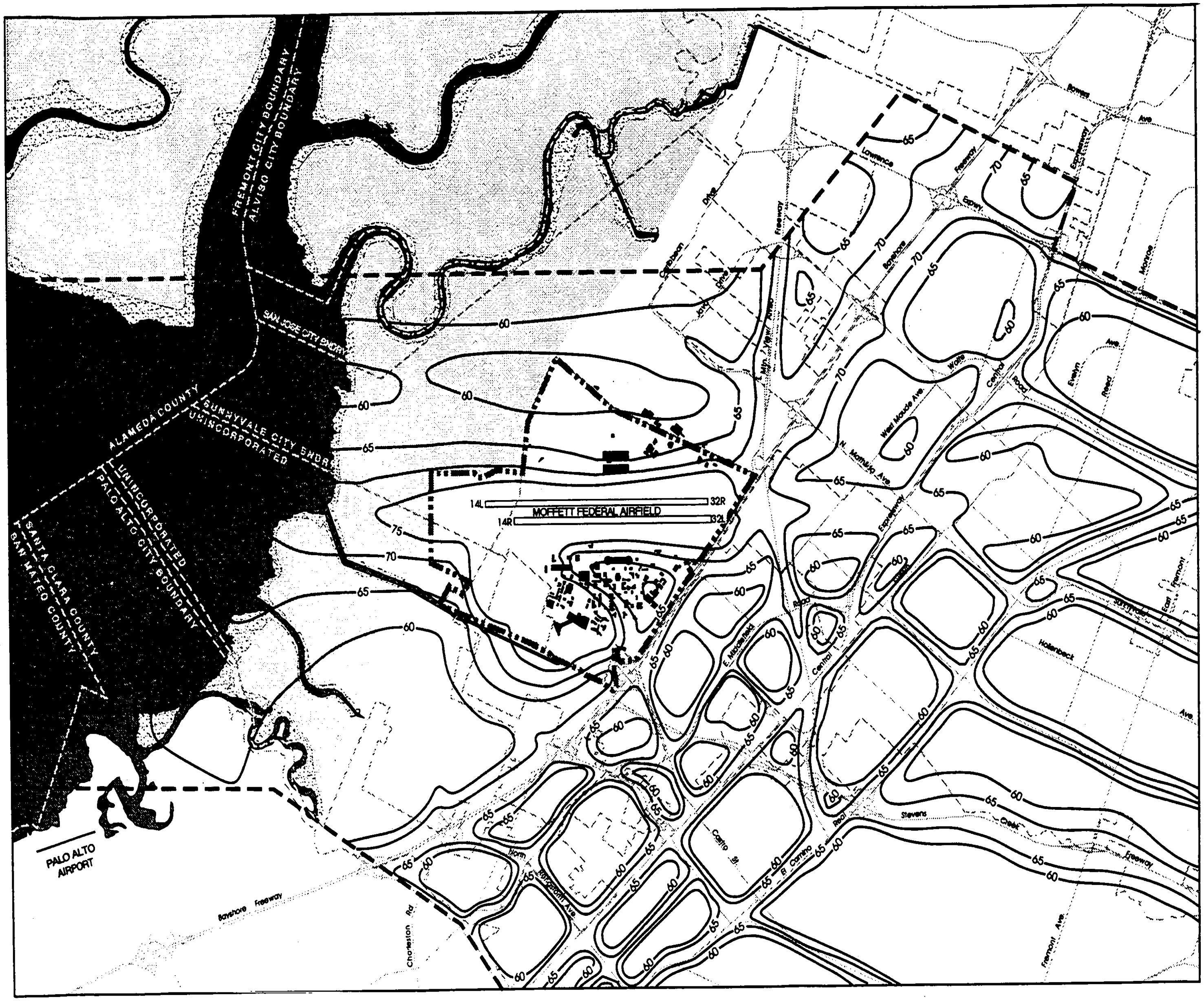

FIGURE S-2

2010 Cumulative CNEL Noise Environment

■ ■ ■

CNEL Noise Contour (dB)

Contour Information Boundary

Sources:
1. Moffett Field Comprehensive Use Plan Environmental Assessment, August 1994.
2. P & D Aviation, April 1996.
3. City of Mountain View 1992 General Plan.
4. City of Sunnyvale Noise Sub-Element of the General Plan, 1985.

scale in feet

0 2000 4000 6000 8000

AMES AERODYNAMICS TESTING

469-058

Chapter 1
INTRODUCTION

This Programmatic Environmental Impact Statement (EIS) has been prepared pursuant to the National Environmental Policy Act of 1969, as amended (NEPA) (42 U.S.C. 4321 *et seq.*), the Council on Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of NEPA (40 CFR parts 1500-1508), and NASA's policy and procedures (14 CFR Subpart 1216.3), to evaluate the environmental effects of the proposed NASA Ames Aerodynamics Testing Program. The proposed Aerodynamics Testing Program has been developed by the National Aeronautics and Space Administration (NASA) to address the unique needs of future aerodynamics testing of the next generation of aircraft. The proposed Aerodynamics Testing Program will define the noise envelope of future wind tunnel testing at the National Full-Scale Aerodynamics Complex (NFAC) at NASA Ames Research Center, Moffett Field, California. The program outlines parameters for testing at two facilities of the NFAC at NASA Ames Research Center: the 40- by 80-Foot Wind Tunnel and the 80- by 120-Foot Wind Tunnel.

The Draft EIS (DEIS), which was completed in June 1995, examines the potential environmental effects of implementation of the proposed Aerodynamics Testing Program, analyzes reasonable alternatives, and addresses measures to mitigate any associated environmental impacts.

This Final EIS (FEIS) responds to comments on the DEIS and makes necessary revisions to the DEIS in response to these comments. This document would be officially considered the FEIS on the NASA Ames Aerodynamics Testing Program if and when NASA certifies it as complete and adequate under the NEPA.

A. Report Organization

This EIS is organized as follows:

- *Summary* is a revised version of the Summary contained in the DEIS. This section briefly describes the proposed action and contains two summary tables. Tables S-1 compares the major characteristics of the three project alternatives and the No Action Alternative. Table S-2 lists the potential impacts of the proposed NASA Ames Aerodynamics Testing Program, recommends mitigation measures that would reduce or avoid such impacts, and the level of significance of each impact after mitigation measures are implemented.

- *Chapter 1: Introduction* describes the organization of the report, and gives a brief background on NEPA regulations, the public involvement for the project, and key terms used throughout the EIS.

- *Chapter 2: Purpose and Need* describes the purpose and need of the proposed action.

- *Chapter 3: Proposed Action and Alternatives Description* describes the proposed action and the alternatives to the proposed action.

- *Chapter 4: Affected Environment* describes the existing environmental conditions for the issue categories analyzed in this report.

- *Chapter 5: Environmental Impacts and Mitigation Measures* contains the environmental impact analysis. For each impact category, this report describes the potential impacts of the proposed action and alternatives, and measures which would mitigate or reduce identified impacts.

- *Chapter 6: Other NEPA Information* contains the required NEPA information regarding local short-term uses versus long term productivity, irreversible and irretrievable commitments of resources, growth-inducing effects, and cumulative effects.

- *Chapter 7: List of Commentors* includes the names of individuals and agencies who commented on the DEIS.

- *Chapter 8: Comments and Responses* contains reproductions of the letters received from the public on the DEIS and responses to these comments. The responses are keyed by a number which corresponds to the number of the letter (which precedes the responses), and the number of the comment within the letter.

- *Chapter 9: Report Preparation* provides a summary of report preparers, contacts, and references.

- *Chapter 10: Individuals and Agencies Receiving the Draft EIS* provides a summary of persons and groups receiving the June 1995 DEIS.

B. NEPA Regulations

Full-scale aerodynamics testing of powered high performance aircraft at the NFAC wind tunnel complex by NASA is considered a "major Federal action." A major Federal action includes actions that are potentially subject to Federal control and responsibility if those actions have effects that may be significant. The term "major" does not refer to the size of the action, but to the significance of its impact.

NASA, acting as lead agency, determined that an EIS is required to analyze potentially adverse environmental effects. NEPA requires that an EIS provide a full and fair discussion of significant environmental impacts, and that the EIS inform decision-makers and the public of reasonable alternatives, and mitigation measures that would avoid or mitigate adverse impacts.

This document is a program-level EIS and thus analyzes the environmental impacts of implementing a specified program of aerodynamics testing at NASA Ames Research Center in the NFAC wind tunnel complex. This program would be made up of smaller, specific, limited duration and scope projects, such as the X-32/X-35 JSF testing project, which is discussed further in Appendix C. If the program is adopted, any future testing project would be required to comply with the adopted Aerodynamics Testing Program, this Programmatic EIS, and associated Record of Decision prior to and during its implementation. NASA Ames would be required to find each proposed aerodynamics testing project consistent with the adopted program prior to its inception. If a newly proposed aerodynamics testing project does not comply with the NASA Ames Aerodynamics Testing Program, assuming the program's adoption, then new additional NEPA documentation would be prepared to analyze expected environmental impacts.

C. Public Involvement

NASA has undertaken a comprehensive public involvement process to inform the public about the proposed Aerodynamics Testing Program, and to determine the scope of the issues and concerns the public may have. Three public scoping meetings were held on the following dates, and at the following locations:

- February 2, 1995, Moffett Club, Moffett Field
- February 2, 1995, Slater Elementary School, Mountain View
- February 16, 1995, Sunnyvale City Hall Council Chambers, Sunnyvale

These meetings were held for the following purposes:

- To notify the surrounding communities that NASA is preparing an EIS on the proposed NASA Ames Aerodynamics Testing Program.
- To inform the public about the purpose and need for the proposed action.
- To invite interested and affected parties to participate in the EIS process.
- To determine the scope of environmental issues to be addressed in the EIS.
- To identify and de-emphasize issues determined to be less-than-significant.
- To identify community concerns that should be addressed in the EIS.
- To build an open relationship between NASA Ames Research Center and the surrounding communities of Mountain View and Sunnyvale.

Public notification of the scoping meetings took place through local newspapers, and a comprehensive mailing to agencies and residents who would be the most affected by the proposed testing. These meetings provided valuable insight into the issues to be addressed in this EIS, as well as provided a means for a dialogue between the affected parties and NASA Ames.

Among the suggestions made by meeting participants and agency contacts were:

- Study impacts to small children and infants, particularly at the Onizuka Air Station Annex Child Development Center.
- Compare current noise levels and proposed noise levels.
- Identify the frequency of the proposed noise, and noise-induced vibration resulting from the testing, such as the vibration of windows.
- Incorporate noise monitoring into the program to ensure that noise levels do not exceed those that have been approved.

- Evaluate potential impacts on recreation opportunities, such as Stevens Creek Regional Trail.
- Evaluate noise effects on wildlife, including the burrowing owls and California clapper rails.
- Study property values and their potential to decrease as a result of the proposed program.

These suggestions have been incorporated into the analyses in this EIS. Minutes from the scoping meetings, as well as a scoping report that summarizes oral and written comments received at the meetings, can be reviewed at the Sunnyvale Public Library, located at 655 West Olive Avenue in Sunnyvale.

D. EIS Scope

The following environmental issues, which have the potential for substantial impacts, are addressed in detail in this EIS:

1. Land Use
2. Public Policy
3. Noise
4. Flora and Fauna
5. Recreation
6. Air Quality
7. Socioeconomics

Focus on these issues was determined through the scoping process. The following issues are among the environmental impacts considered not to be substantial, and therefore not examined in detail in this EIS.

- *Water Supply*. No significant changes to water supply or quality would be expected from the program. The most significant amount of water used at NASA Ames Research Center is for cooling the wind tunnels. However, there would not be an increase in the amount of hours or frequency that the wind tunnels are used at NASA Ames Research Center if the NASA Ames Aerodynamics Testing Program is implemented. The change proposed by the NASA Ames Aerodynamics Testing Program is in the type of aircraft to be tested in the wind tunnels, which results in an increase in noise generation.

- *Utility Usage.* Again, since the frequency of wind tunnel operation is not expected to change, no significant changes in utility usage are expected.

- *Traffic and Transportation.* Transportation to and from the NASA Ames Research Center is predominantly by automobile. However, the project will not include any new employees or trip generation. Therefore, no impacts or changes to traffic and transportation are expected.

- *Waste Generation and Treatment.* Since no new construction or employees will occur as a result of the project, and wind tunnel operation frequency is not expected to change, no additional waste generation is expected.

- *Toxic Substances.* A considerable variety of hazardous and toxic substances are used at Moffett Field and NASA Ames Research Center. However, the use of these substances will not change as a result of the project. The engines of the aircraft tested within the wind tunnels use JP-8 fuel, which is a petroleum fuel similar to diesel. This is the main substance that will be used for the powered-model testing within the wind tunnels. No materials used at the NFAC facilities are stratospheric ozone depleting chemicals.

- *Radiation.* No radioactive materials will be used for the proposed NASA Ames Aerodynamics Testing Program, therefore no impacts are expected.

- *Cultural Resources.* The Shenandoah Plaza is listed as a designated historic district in the National Register, and the Unitary Plan Wind Tunnel is listed as an historic landmark. Additionally, the 40- by 80-Foot Wind Tunnel may be eligible for listing as an historic resource in the National Register. However, no effects to these resources are expected from the proposed NASA Ames Aerodynamics Testing Program. No physical changes are proposed to any facility. Impacts to areas with cultural resources would be limited to an increase in noise, which is analyzed further in this EIS.

- *Farmlands.* There are no farmland or agricultural uses in the vicinity of the NASA Ames Research Center, with the exception of the Shoreline Christmas Tree Farm. Noise from the project may be noticeable at the Christmas Tree Farm, and such impacts are analyzed further in the noise section of this document. No development will occur on existing agriculture or farmlands.

- *Coastal Zone Consistency.* In conformance with the Coastal Zone Management Act, the San Francisco Bay Conservation and Development Commission (BCDC) regulates filling and dredging in the San Francisco Bay and has jurisdiction over activities within a 30 meter (100-foot) shoreline band. NASA Ames has met with BCDC and has determined that the proposed program will not impact recreational uses along the San Francisco Bay. No development or activities are proposed by the NASA Ames Aerodynamics Testing Program that are not consistent with the San Francisco Bay Plan, therefore, no impacts are anticipated. A copy of the BCDC Consistency Determination is provided in Appendix L.

Generally, impacts and the environmental analyses included in this report are related to an increase in noise (and related vibration) that is expected from the proposed action, if it were to be implemented. The proposed action does not propose any new construction or any increase in the frequency of operation of the NFAC wind tunnel facilities. NASA proposes only a change in the type of wind tunnel testing that is to occur at the NFAC. The fact that the proposed action and reasonable alternatives do not include any new construction, employees, traffic generation, or utility usage is a primary reason that these additional environmental issue categories were not explored in detail in this EIS.

E. Key Terms

Several technical terms are used throughout this report, as summarized and defined below.

- *Noise:* Annoying, harmful, or unwanted sound.

- *Decibel (dB):* A unit for expressing the relative loudness or noise level of sounds. In this report, the accuracy of noise level estimates is ± 3 dB.

- *A-weighted Sound Level:* The sound level measured on an instrument containing an "A" Filter, which electronically simulates the frequency response of the human ear under an average level of sound. Decibels measured using the A-weighted sound level can be denoted as "dBA". All noise levels and noise exposure levels throughout this document are A-weighted in accordance with appropriate standards and criteria. All such values are in units of decibels, whose unit symbol is "dB" in conformance with American National Standard ANSI/ASME Y10.11-1984. The unit symbol "dBA" is not the standard symbol used under ANSI Y10.11. All numerical noise values in this document symbolized "dB," are numerically identical to those using "dBA," often found in other references.

- *Noise Level:* The instantaneous measure of the magnitude of a sound at any given time, measured in decibels (dB). Noise levels can be used to measure hazards to health and hearing that can result from exposures to even very brief but high noise levels.

- *Noise Dose:* A measure of average cumulative noise exposure over a stated time period which takes into account both the intensity of a sound and the duration of exposure.

- *Community Noise Equivalent Level (CNEL):* The CNEL represents the A-weighted average noise level in decibels, over a 24-hour period, with a 5 dB penalty for evening noise (7:00 p.m. to 10:00 p.m.) and a 10 dB penalty for nighttime noise (10:00 p.m. to 7:00 a.m.).

For a more detailed account of technical terms used in this EIS, please refer to Appendix A: Glossary.

Chapter 2
PURPOSE AND NEED FOR THE PROPOSED ACTION

■ ■ ■

The purpose of the proposed NASA Ames Aerodynamics Testing Program is to support the research and development of new aeronautical technologies for military and civilian use.

The proposed testing program has been developed in accordance with the NASA policies outlined below:

- *The National Aeronautic and Space Act of 1958.* The National Aeronautic and Space Act of 1958 established NASA and laid the foundation for its mission.

- *NASA Mission Statement.*[1] NASA's vision is to boldly expand the frontiers in air and space to inspire and serve America, and to benefit the quality of life on Earth. It is NASA's mission to explore, use, and enable the development of space for human enterprise; advance scientific knowledge and understanding of the Earth, the Solar System, and the universe and use the environment of space for research; and to research, develop, verify, and transfer advanced aeronautics, space, and related technologies.

- *NASA Strategic Plan.*[2] NASA's strategic enterprises include the advancement of the Aeronautics Enterprise, as outlined in the NASA Strategic Plan. For over 75 years, NASA and its predecessor, the National Advisory Committee for Aeronautics, have worked closely with U.S. industry, universities, and other Federal agencies to give the U.S. a preeminent position in aeronautics. Aeronautics plays a vital role in the economic health and national security of the nation, helping to generate almost one million high-quality jobs, over $40 billion in annual exports, and almost $30 billion in positive balance of trade. The U.S. leadership position,

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[1] *NASA Strategic Plan.* National Aeronautics and Space Administration (NASA). Washington, D.C. February 1996.

[2] Ibid.

> however, is being challenged by aggressive international competition. Future U.S. competitiveness in aeronautics, as well as the continued safety and productivity of the Nation's air transportation system, is dependent upon sustained NASA advances in aeronautics research and technology.

The proposed NASA Ames Aerodynamics Testing Program has been developed to allow NASA Ames Research Center to continue to contribute to NASA's Aeronautics Enterprise by expanding the capabilities of the wind tunnels at the National Full-Scale Aerodynamics Complex (NFAC). The proposed Aerodynamics Testing Program would allow NASA Ames Research Center to continue to lead the country in the testing and development of new technologies in air flight, which will support the United States' future economic and military posture.

Aircraft models are typically tested in controlled environments, such as wind tunnels, prior to the development of flying aircraft prototypes. Wind tunnels help to test an aircraft's performance prior to flight, thereby allowing for any necessary design changes or improvements before an investment in the aircraft prototype is made. Without wind tunnel testing, aircraft development would be primarily dependent on highly dangerous flight testing of prototype aircraft. Wind tunnels move air, or wind, over aircraft models to simulate the airspeeds experienced by an aircraft in flight. In the simulated flight environment of the wind tunnels, precise airflow measurements can be obtained for the detailed design of prototypes and production aircraft.

As aircraft change, so does the nature of wind tunnel testing. Future military and civilian aircraft will have more powerful engines than today's aircraft. Additionally, many of the new aircraft technologies use unconventional propulsion systems, where the dynamics of engine intake and exhaust is not fully understood. Since the engines themselves contribute to the airflow and aerodynamics of the aircraft, the models often need to be tested in the wind tunnels with their engines running. This is a relatively new need, since previously developed aircraft have used more conventional propulsion systems.
NASA is currently the lead government agency for two high priority civilian aircraft programs: the Advanced Subsonics Technology (AST) Program, and the High-Speed Research (HSR) Program, as described below.

- *AST Program.* The AST Program has two primary goals: the improvement of subsonic transport aircraft performance, and the advancement of high-speed, quiet and efficient, rotary-wing aircraft. The next generation of subsonic transport aircraft will be more fuel efficient and quieter than current aircraft. To achieve these goals will require an understanding of the interaction between new larger engines and aircraft wings during takeoffs, landings, and in-air maneuvering. The NFAC wind tunnel facilities are being used to evaluate the performance of these new aircraft, and to develop methods to improve helicopters and other rotorcraft. Rotorcraft testing requires large-scale models to fully understand the aerodynamics of these aircraft. However, as rotorcraft systems get larger, more noise is generated, and testing of these systems requires the community to be exposed to additional noise. Currently, the most advanced rotorcraft system is the tilt-rotor concept.

- *HSR Program.* The primary goal of the HSR Program is to determine the feasibility of producing an economical and environmentally friendly supersonic transport aircraft. Major hurdles to overcome in the development of this aircraft include reducing engine and airframe noise, reducing pollutants, and reducing sonic boom energy, while still making the aircraft economically competitive with current commercial subsonic transports. Specifically, the program must develop a propulsion system that can meet the new quieter Federal Aviation Administration's noise requirements in and around airports (FAR Part 36). The 40- by 80-Foot Wind Tunnel has been used since 1993 to study reduced-scale jet engine noise suppression systems that do not significantly degrade engine and aerodynamic performance. To validate noise suppression systems, testing must compare engine noise with and without suppression. NASA Ames is hoping to continue this work in 1999-2001, including the testing of large-scale engines to more accurately simulate and determine their performance and acoustic characteristics. The noise envelope defined in this EIS would allow this type of testing.

NASA Ames Research Center is actively participating in both of these programs, where the NFAC wind tunnel facilities are used to better understand various engine and airframe combinations and their in-flight performance before the aircraft are actually flown.

In addition to civil aircraft testing requirements, the military also needs to test and validate new technologies prior to flight. In particular, the military's testing needs are for fighter and attack aircraft, helicopters, and other rotorcraft, as described below.

- *Military Rotorcraft.* Modern rotorcraft are becoming larger and faster, with speeds approaching 300 miles per hour. Rotor blades and winged aircraft with tilt-rotors have complex airflows which are difficult to simulate at small or reduced scales. Air speeds must be accurately simulated to replicate what airflows will occur in flight, since the combination of increasingly high rotor blade speed and aircraft speed can create very complex airflows. The aerodynamic complexities are increased when an aircraft's propulsion is switched from a rotor to engines located on the wings, as is proposed for some new technologies in military aircraft. Large wind tunnels with airspeeds of 200 to 300 knots are essential to the successful evolution of these new military aircraft.

- *Military Fighter and Attack Aircraft.* New military technologies also include vertical and short takeoff and landing (VSTOL) fighter and attack aircraft, also known as powered-lift aircraft. VSTOL aircraft takeoff and land using an engine or nozzle pointed toward the earth's surface. For faster forward flight, thrust is transferred to a horizontal (or conventional) position for wing borne flight. To accurately test these aircraft before flight, they must be tested in controlled environments at large- or full-scale with their engines running, due to their complex aerodynamic qualities. If models are too small, airflow over critical areas will not be correctly represented, and collected data could be misleading. For the VSTOL aircraft, correct data is essential, since these type of aircraft are an emerging technology, and airflow assumptions and procedures used for conventional military aircraft are not applicable. Additionally, if wind tunnel walls are too close to an aircraft when it is being tested, airflow data can be significantly corrupted. For these reasons, the VSTOL aircraft concepts typically require wind tunnels that have a test section on the order of 100 feet in width. The current VSTOL design has the experimental aircraft designations of X-32 and X-35, and is part of the Department of Defenses' (DOD) Joint Strike Fighter (JSF) Development Program to field an affordable tri-service aircraft in the 2005 to 2010 time frame. More information on the JSF Program is provided in Appendix C.

NASA Ames' wind tunnel facilities at the NFAC are the only facilities in the world that can be used for the type of large- and full-scale testing needed for these new aircraft technologies. The 80- by 120-Foot Wind Tunnel is the largest wind tunnel in the world, and can test full-scale models of all fighter aircraft. The second NFAC wind tunnel facility, the 40- by 80-Foot Wind Tunnel, is generally considered the premier aeroacoustic facility in the world, and can generate wind speeds of up to 300 knots. This facility also features advanced technologies for acoustical data acquisition and analysis.

The next comparable facility to the 80- by 120-Foot Wind Tunnel is a smaller (14 meters by 24 meters or 45.9 feet by 78.7 feet) elliptical open test section wind tunnel in Russia. This tunnel is in a state of disrepair, and does not feature the technologies and utilities of the 80- by 120-Foot Wind Tunnel. The only acoustic facility in the world remotely comparable to the 40- by 80-Foot Wind Tunnel is the DNW in the Netherlands. The small test section size (4.5 meters by 6.1 meters or 15 feet by 20 feet) and the inability to test actual jet engines eliminates this facility as an alternate candidate for the X-32\X-35 JSF, AST, HSR, and other high performance large- and full-scale research testing.

The NASA Ames Aerodynamic Testing Program would allow NASA Ames to continue to support the development of future military and civilian aircraft that will require more powerful engines than today's aircraft. In order to safely and cost effectively transition from small-scale developmental testing to full-scale flight testing, large-scale controlled wind tunnel testing of these aircraft must be done. The NASA Ames NFAC provides that opportunity; there are no comparable facilities in the world. Without the NASA Ames Aerodynamic Testing Program, the risk of aircraft development, both in lives and dollars, would be significantly higher.

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Chapter 3
PROPOSED ACTION AND ALTERNATIVES DESCRIPTION

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NASA Ames Research Center at Moffett Field, California proposes to conduct full-scale aerodynamics testing of high performance aircraft powered by state-of-the-art engines, including vertical and short takeoff and landing (VSTOL) aircraft.

This chapter describes the proposed Aerodynamics Testing Program alternatives analyzed in this Environmental Impact Statement (EIS), along with the selection process used to develop the alternatives.

A. Regional Location

NASA Ames Research Center is located at Moffett Field on the southwest shoreline of the San Francisco Bay, about 40 kilometers (25 miles) east of the Pacific Coast in an unincorporated area of the County of Santa Clara, as shown in Figure 1. The City of Mountain View is adjacent to the western and southern boundaries of Moffett Field and the City of Sunnyvale is adjacent to the eastern and southern boundaries. Downtown San Jose is about 11 kilometers (7 miles) southeast, and the City of San Francisco is about 52 kilometers (32 miles) northwest. U.S. Highway 101 passes just south of the facility site. Moffett Field encompasses approximately 911 hectares (2,250 acres), including the NASA Ames Research Center.

B. Brief History of Moffett Field

In 1932, the Naval Air Station, Sunnyvale, was established to serve as the home port for the rigid airship Macon. A few days before the air station was dedicated, the Macon's East Coast sister ship, the Akron, was lost at sea, killing Rear Admiral William A. Moffett, who had established the Navy's rigid airship program. The landing field at NAS Sunnyvale was renamed NAS Moffett Field. After about 18

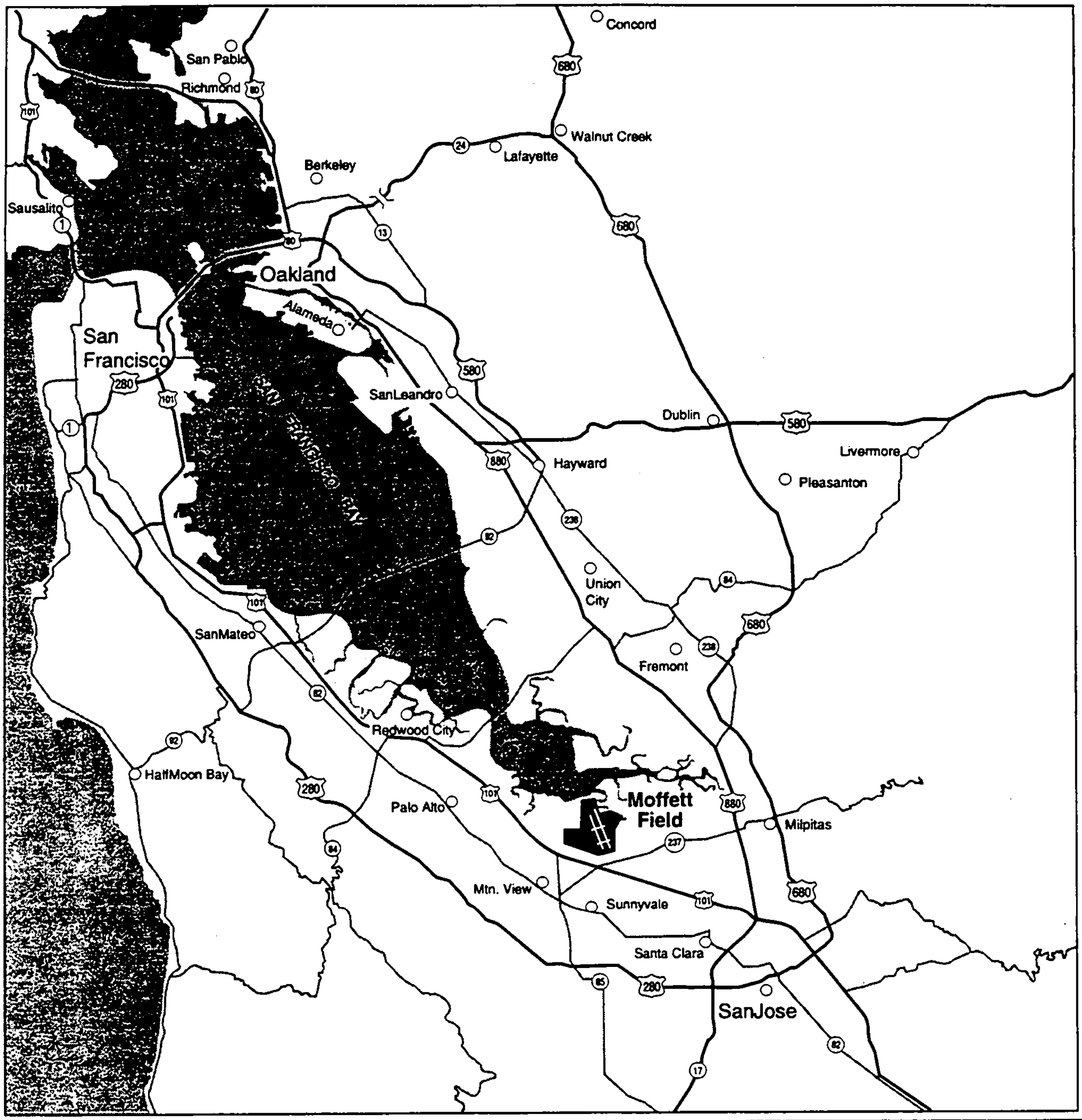

FIGURE 1

Regional Location

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NASA AMES RESEARCH CENTER, MOFFETT FIELD, CALIFORNIA

months of operation, the Macon was lost in a storm off Point Sur, and with the loss of its reason for being, the Navy transferred the property to the Army to serve as a training site. In April 1942, the Navy was reestablished as the host agency at the newly recommissioned Naval Air Station (NAS), Moffett Field.

The Ames Research Center was initially established adjacent to the Moffett Field location by Congress on August 9, 1939, as the Ames Aeronautical Laboratory (AAL), an element of the National Advisory Committee for Aeronautics (NACA). The AAL was the second of three NACA laboratories and was named after Dr. Joseph S. Ames, Chairman of the NACA from 1927 to 1939. The AAL was established because heightened concern about European politics at that time was leading the United States to address its aeronautical technologies in order to prepare for a potential armed conflict. A west coast aeronautical testing facility was deemed necessary to provide research and testing capabilities needed to serve the aeronautical industry there.

The criteria used to select the Ames site included the following:

- a desire to locate the facility on or adjacent to an Army or Navy base;
- proximity to a university of recognized standing;
- a reliable and readily available source of inexpensive electric power; and
- a climate where favorable flying conditions prevailed most of the year.

When Moffett Field and Ames were first developed, the surrounding lands were generally agricultural in nature, with a very low density population. The bulk of the growth of residential and commercial lands toward Moffett Field from the cities of Sunnyvale and Mountain View did not occur until the 1960s. A historic photo of Moffett Field in the early 1930s is presented in Figure 2.

The Ames Aeronautical Laboratory's initial charter was to conduct research and to develop technology for use by military aircraft manufacturers. The primary mission at that time was to examine aerodynamics problems of aircraft operating at high subsonic speeds. To establish the initial facility, NACA received a use permit for 25 hectares (62 acres) of land from the War Department on December 7, 1939. A few days later, it completed the purchase of an additional 16 hectares (39 acres) of land from private individuals and began the construction of Ames Aeronautical Laboratory. By 1950 NACA built 20 buildings or facilities, including six wind tunnels, two hangars, miscellaneous shops and technical facilities, and administrative space. Its major technical facility, the 40- by 80-Foot Wind Tunnel, began operational use the week of June 7, 1944.

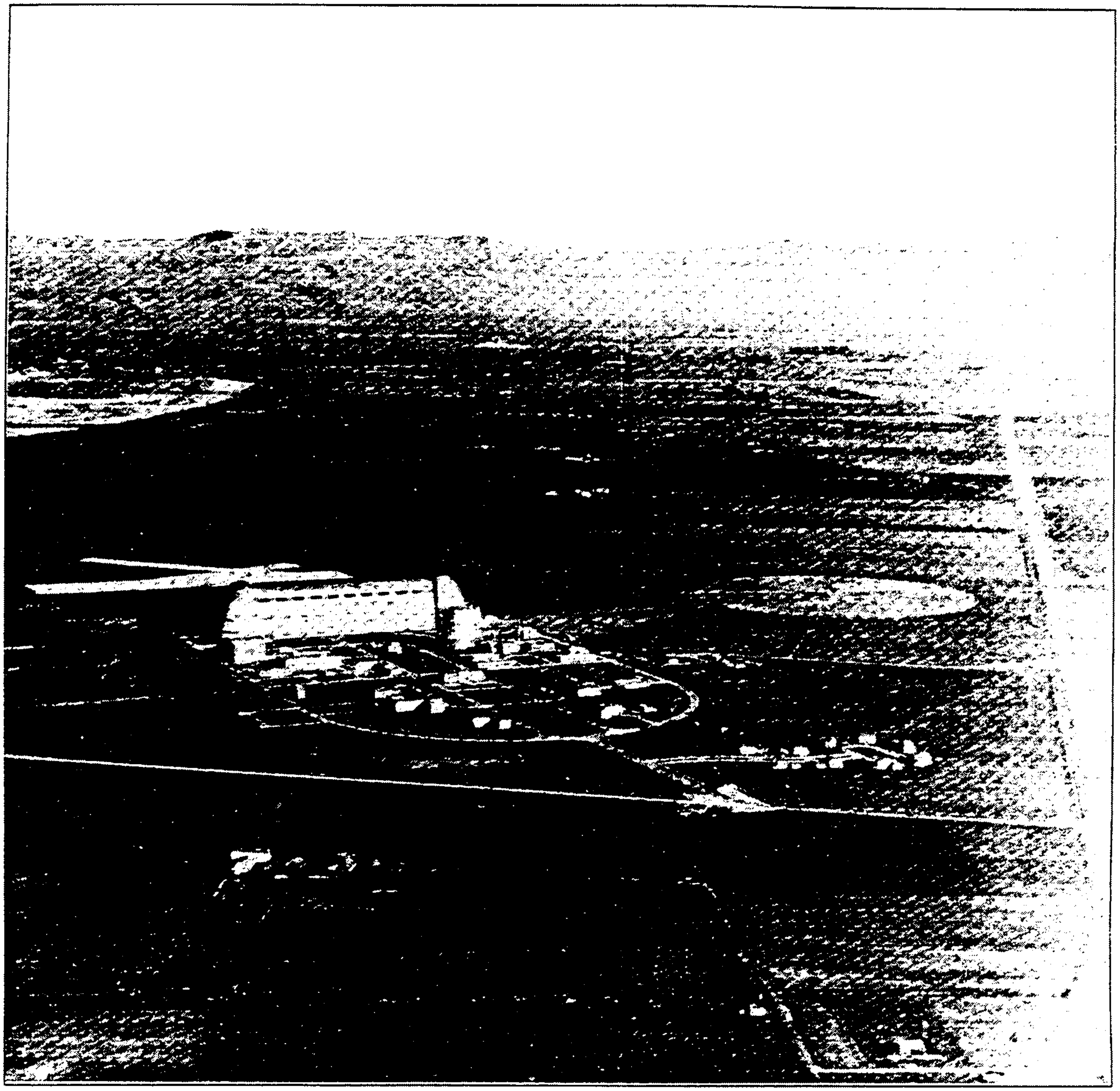

FIGURE 2

SOURCE: City of Mountain View General Plan. 1992.

Moffett Field in the 1930s

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NASA AMES RESEARCH CENTER, MOFFETT FIELD, CALIFORNIA

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During subsequent years the AAL continued to provide technological and testing support for military aircraft and assumed a new role in the support of non-military, civilian applications. As its role grew, an additional 3 hectares (8 acres) of land was acquired from the Navy, and eight more tunnels or support buildings were constructed, including a hypervelocity gun range, used to study reentry flight conditions, and the Unitary Plan Wind Tunnel Complex, a collection of three wind tunnel test sections with a common drive system that has since become one of the busiest transonic and supersonic testing facilities in the United States.

Upon the creation of the National Aeronautics and Space Administration (NASA) in 1958, the NACA and all of its laboratories were merged into this new agency. The Ames Aeronautical Laboratory was renamed the Ames Research Center and it now operated as a field center of NASA. NASA Ames' extensive experience in fluid mechanics and aerodynamics became an integral part in supporting the NASA mission, and this role continues to this day. Its responsibilities have also broadened, and it now has significant roles in aeronautics, reentry physics, space science, space research and technology development, life sciences, human factors (as applied both to aeronautical and space issues), and earth sciences.

After the creation of NASA, Ames continued to grow, adding 45 hectares (111 acres) of land in 1964, 57 hectares (140 acres) in 1967, and 22 hectares (55 acres) in 1973. This was the time of major growth at Ames. After that, there continued to be additional buildings constructed and small increments of land added by trade or purchase. In April 1978, the Navy provided an additional 3 hectares (7 acres) of land by use permit, resulting in a total facility size of 174 hectares (430 acres). This last acquisition was needed in order to build the 80- by 120-Foot Wind Tunnel, currently the largest in the world. It was in this period that NASA Ames constructed the rest of its current inventory of major technical facilities.

Recently, another acquisition of land and buildings occurred; but this is considered substantially different from the previous ones. In October, 1991, Congress and the President of the United States accepted the recommendations of the Base Closure and Realignment Commission (BRAC) to disestablish the Naval Air Station, Moffett Field. Because the availability of the airfield had become essential to Ames' mission, the BRAC recommended that NAS Moffett Field remain a Federal property and that the Department of Defense (DOD) negotiate a transfer of responsibility for Moffett Field to NASA. This suggestion was well received by the neighboring communities.

The property was transferred to NASA on July 1, 1994. It included 578 hectares (1,427 acres) of land and over 0.85 million square meters (2.8 million square feet) of buildings and other facilities. It did not include the family housing areas and several community-related facilities, which were retained by DOD for administration by Onizuka Air Station. NASA Ames now operates the remainder of the former NAS Moffett Field property -- now called Moffett Federal Airfield -- for the benefit of itself and several other government agencies, some of which were previously present at NAS Moffett Field, and others which relocated there subsequent to the transition.

C. Existing Testing Facilities

The National Full-Scale Aerodynamic Complex (NFAC) wind tunnel facilities is the site of the aerodynamics testing program being considered in this EIS. It includes two major wind tunnels; the 40- by 80-Foot Wind Tunnel and the 80- by 120-Foot Wind Tunnel. The location of these facilities is shown in Figure 3, and they are described below.

1. 40- by 80-Foot Wind Tunnel

The 40- by 80-Foot Wind Tunnel was built during World War II. Dr. Smith J. DeFrance, the first director of the Ames Aeronautical Laboratory, who supervised the design and construction of this facility, had previously overseen the design of the 30- by 60-Foot Wind Tunnel at Langley Memorial Aeronautical Laboratory.

The 40- by 80-Foot Wind Tunnel is a unique facility. The test section of the 40- by 80-Foot Wind Tunnel is large enough to test full-scale aircraft as well as aircraft models. Originally, this wind tunnel had a maximum speed of 200 knots. In the late 1970s, the maximum speed was increased to 300 knots and the acoustic test capability was dramatically improved with the addition of a quiet drive system and a test section acoustic liner. The tunnel can now test models at speed between 0 and 300 knots. The tunnel can be used to test models and any aircraft with operating engines. Because of acoustic treatment in the test section, the 40- by 80-Foot Wind Tunnel allows the collection of acoustic measurements in low-speed flight conditions with the microphones in the flow.

The 40- by 80-Foot Wind Tunnel, as a closed loop tunnel, has only minimal ventilation during testing operations. This ventilation is used to draw in fresh air and expel a small amount of the air heated by tunnel and engine operations in order to keep the tunnel air temperature reasonably constant and below maximum operational limits. The test section and drive motor portions of the tunnel are comprised of thick carbon steel plates, and each is enclosed in a superstructure that provides some noise containment. The rest of the tunnel walls and roof consists primarily of ⅜-inch asbestos/concrete panels suspended from an exostructure designed to provide a smooth inner wall. Turning vanes are present at the four corners of the 40- by 80-Foot Wind Tunnel to change the direction of the airflow with minimal impact on the quality of the flow.

Although a German-Dutch wind tunnel currently has a better environment for small-scale acoustic measurements, a Fiscal Year 1996 project will improve the 40- by 80-Foot Wind Tunnel's acoustic liner and make modifications to the tunnel drive system, establishing it as not only one of the largest subsonic wind tunnels, but also the premier tunnel in the world to use for free field acoustic measurements of model-, engine-, or aerodynamically-generated noise.

2. 80- by 120-Foot Wind Tunnel

The test section of the 80- by 120-Foot Wind Tunnel is the largest in the world. This test section is located on the western leg of the NFAC, as shown in Figure 3, and is part of the same building that forms the 40- by 80-Foot Wind Tunnel. The tunnel is a flow-through, non-circulating design that supports engine-on testing of models at speeds of 0 to 100 knots. It was built in 1980 to test evolving vertical takeoff and landing (VTOL) aircraft as well as helicopters and other rotorcraft. It is also used to test the low speed flight characteristics of large commercial and military aircraft, and can be used with actual aircraft as large as the Boeing 737. The 80- by 120-Foot Wind Tunnel uses the same motors that power the 40- by 80-Foot Wind Tunnel to provide air motion. It also uses a substantial portion of the 40- by 80-Foot Wind Tunnel wall to contain and direct the air.

The inlet of the 80- by 120-Foot Wind Tunnel is designed to draw air smoothly into the tunnel. The design also serves to reduce the level of sound that propagates back through the air inlet. The tunnel is designed to direct the 80- by 120-Foot Wind Tunnel exhaust air upwards at 45 degrees at the southern face of the NFAC, to minimize the effect of the fast-moving air or sound from the tunnel or model on the local area. Additionally, the inlets and exhaust are acoustically treated to reduce sound radiation.

D. Noise Reading Benchmark

For this EIS, NASA has proposed a "benchmark" location for the calculation of noise levels. The location of the benchmark is shown in Figure 3.

The benchmark is located on the top of the west levee of Stevens Creek, due west of the 80- by 120-Foot Wind Tunnel. This location was chosen for its proximity to the nearest civilian noise sensitive receptor (Santiago Villa Mobile Home Park), and for its relative seclusion from other noise sources, which could corrupt noise data from the proposed testing program.

NASA has developed the benchmark location as a tool to monitor and control noise levels generated by aerodynamics testing at NASA Ames Research Center. This location was selected by NASA to measure noise propagating from both of the testing facilities. In addition, NASA expects to secure access to this location to maintain a monitoring program in conjunction with aerodynamics testing. These practices will ensure that once a specific testing program is established, NASA will have the ability to measure and monitor noise associated with specific projects administered under the proposed Aerodynamics Testing Program.

In reaction to public comment on the Draft EIS, NASA determined that a second monitoring location should be established to further control testing proposed under the Aerodynamics Testing Program. This second monitoring station will be located along the Stevens Creek Trail on the axis with the inlet to the 80- by 120-Foot Wind Tunnel. Because of this monitoring station's relative location, noise levels are allowed to be 5 dB above the Benchmark location, as reflected in Tables 2 through 4 (and Table S-3: Testing Program Characteristics of the Preferred Alternative, page S-18).

E. Existing Facility Use

Existing use of the 40- by 80-Foot Wind Tunnel and the 80- by 120-Foot Wind Tunnel generates noise levels that have been part of Moffett Field and NASA Ames Research Center operations for many years. Current testing projects have been conducted for up to six hours per day and/or six hours per night at each facility. These existing conditions are described in Table 1, and brief descriptions follow.

FIGURE 3

Aerodynamics Testing Facilities

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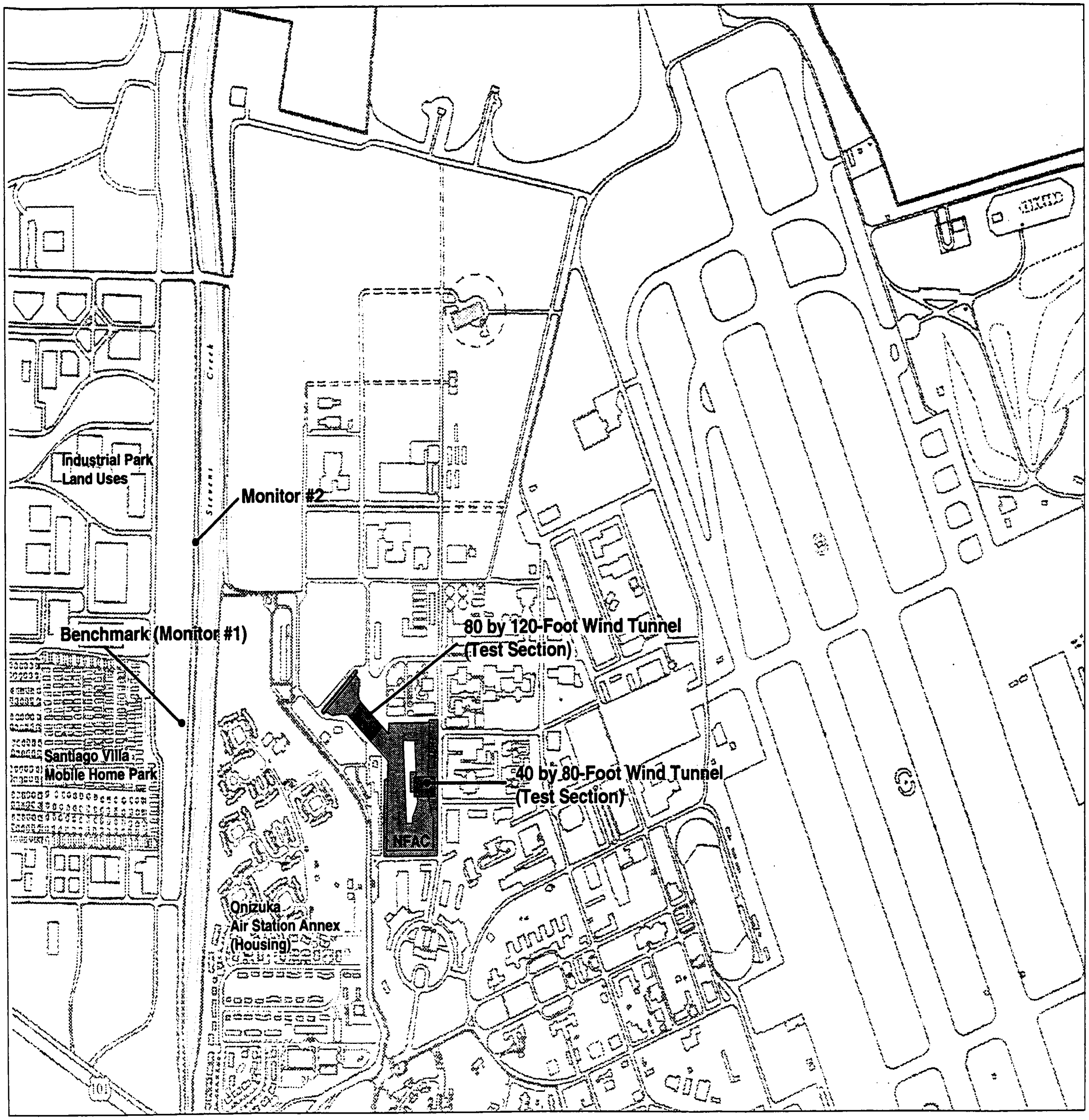

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Scale in Feet

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Table 1
EXISTING TESTING FACILITY USE

Description	Testing Window	Noise at Benchmark (dB)[a]	Typical Maximum Hours Per Window
40- by 80-Foot Wind Tunnel	Daytime (7AM-7PM)	<58	6
	Nighttime (7PM-7AM)	<58	6
80- by 120-Foot Wind Tunnel	Daytime (7AM-7PM)	<58	6
	Nighttime (7PM-7AM)	<58	6

[a] All noise levels and noise exposure levels throughout this document are A-weighted in accordance with appropriate standards and criteria. All such values are in units of decibels, whose unit symbol is "dB" in conformance with American National Standard ANSI/ASME Y10.11-1984. The unit symbol "dBA" is not the standard symbol used under ANSI Y10.11. All numerical noise values in this document symbolized "dB," are numerically identical to those using "dBA," often found in other references.

Source: NASA Ames Research Center.

- *40- by 80-Foot Wind Tunnel.* The 40- by 80-Foot Wind tunnel currently operates an average of 100 days a year. A typical test day can consist of one or two shifts, day or night. Each test shift averages approximately four hours, with the wind tunnel running.
- *80- by 120-Foot Wind Tunnel.* The 80- by 120-Foot Wind Tunnel is a non-return wind tunnel that shares the same drive system as the 40- by 80-Foot Wind Tunnel. Because both facilities use the same drive system, only one can be operated at a time. The current frequency and operation for this tunnel are similar to those of the 40- by 80-foot test section.

There have not been any annual or daily limitations on testing at these facilities. However, it is estimated that six hours is generally the maximum hours of daily or nightly operation for each of the wind tunnel facilities.

F. Program Goals

The purpose of this EIS is to analyze a proposed Aerodynamics Testing Program at NASA Ames Research Center that goes beyond the existing testing parameters described above.

The purpose of the proposed Aerodynamics Testing Program at NASA Ames Research Center, Moffett Field is to satisfy the following goals:

- *Support development of future generations of civil and military high performance aircraft.* The charter of NASA includes supporting the Department of Defense and United States industries in aeronautics advancement. NASA owns and operates the majority of the major aerodynamic and aeroacoustic testing facilities in the U.S. where large-scale aerodynamics testing can occur.
- *Advance supersonic jet and high thrust engine technology.* The advancement of supersonic jet and high thrust engine technology in certain applications requires full- or large-scale wind tunnel testing. Alternatives to large-scale wind tunnel testing are limited to prototype flight testing, which would be very expensive and would require unacceptable technical and personnel safety risks. Many of the high performance aircraft being developed for the future have complex air-flow configurations that are currently not possible to accurately simulate at a small-scale.
- *Maintain NASA Ames' position as a world leader in wind tunnel testing.* NASA Ames is currently home to the two largest wind tunnel facilities in the world. NASA's unique existing facilities enable their status as a world leader in wind tunnel testing. NASA will continue to support advancement in wind tunnel technology with the goal of supporting future wind tunnel testing needs of the United States.
- *Support the U.S. aerospace industry.* Commercial aircraft are a major U.S. export product. Foreign competition is primarily in the form of a consortium of foreign companies. To ensure competitiveness in the world market, it is essential that the U.S. government and NASA support a strong national program in aeronautics.
- *Encourage regional economic development.* In the present economic climate, U.S. manufacturers of commercial transport aircraft and related industries are sustaining severe degradation of available resources. Supporting the development of new aircraft technologies will aid in the economic recovery and development of the aerospace and related industries.

The NASA Ames Aerodynamic Testing Program would allow NASA Ames to continue to support the development of future military and civilian aircraft that will require more powerful engines than today's aircraft. In order to safely and cost effectively transition from small-scale developmental testing to full-scale flight testing, large-scale controlled wind tunnel testing of these aircraft must be done.

The NASA Ames NFAC provides that opportunity; there are no comparable facilities in the world. Without the NASA Ames Aerodynamic Testing Program, the risk of aircraft development, both in lives and dollars, would be significantly higher.

G. Description of Alternatives

This section describes the proposed Aerodynamics Testing Program alternatives analyzed in this EIS.

Under all program alternatives, excluding the No Action Alterative, aerodynamics testing that creates increased noise levels would occur in the 40- by 80-Foot Wind Tunnel and the 80- by 120-Foot Wind Tunnel of the NFAC. As previously noted, the proposed action does not propose any new construction or any increase in the frequency of operation of the NFAC wind tunnel facilities. NASA proposes only a change in the type of wind tunnel testing that is to occur at the NFAC. For this reason, the proposed NASA Ames Aerodynamics Testing Program alternatives do not include any new construction, employees, traffic generation, or utility usage.

Since impacts and the environmental analyses contained in this EIS are principally related to an increase in noise, testing operations beyond existing conditions have been separated into three distinct categories based on their noise generating qualities:

- *Level 1 Testing*. Level 1 testing would range from 58 to 65 dB,[1] when measured at the benchmark shown in Figure 3, and is expected to include the testing of low noise powered aircraft or models, electric motor powered rotorcraft models, and other low noise testing.
- *Level 2 Testing*. Level 2 testing would allow noise levels ranging from 65 to 80 dB when measured at the benchmark location. Level 2 testing is expected to include model testing with jet simulators and high performance jet engines, such as those for high performance vertical and short takeoff and landing (VSTOL) aircraft and models.

[1] All noise levels and noise exposure levels throughout this document are A-weighted in accordance with appropriate standards and criteria. All such values are in units of decibels, whose unit symbol is "dB" in conformance with American National Standard ANSI/ASME Y10.11-1984. The unit symbol "dBA" is not the standard symbol used under ANSI Y10.11. All numerical noise values in this document symbolized "dB," are numerically identical to those using "dBA," often found in other references.

- *Level 3 Testing*. Level 3 testing would range from 80 to 85 dB when measured at the benchmark and is expected to include the testing of high performance VSTOL aircraft and models.

Additionally, program limitations have been set that correspond with "testing windows". Testing windows have been defined so that testing during times of increased community sensitivity are clearly defined. For example, nighttime testing is typically penalized in estimating average noise exposure since is would generally not be as acceptable to the community. These testing windows have been defined to accurately describe, and limit, proposed testing. The testing windows used in the program descriptions are as follows:

- Daytime (7:00 a.m. to 7:00 p.m.)
- Evening (7:00 p.m. to 10:00 p.m.)
- Nighttime (7:00 p.m. to 7:00 a.m.)

NASA believes that noise levels up to 85 dB at the benchmark will be required for future wind tunnel tests in the NFAC; therefore all three alternatives allow for testing up to 85 dB. Additionally, all program alternatives would limit Level 2 and Level 3 testing to weekdays, and Level 3 testing would be further limited to daytime hours. The difference in the three alternatives is limited to the number of hours and the timing of testing, as described in the following sections and detailed in Tables 2, 3, and 4.

1. Alternative 1: 800 Annual Hours

Alternative 1 would allow the following overall program parameters, as described in Table 2, with noise levels measured at the benchmark.

- *Daily Hours*. All testing above 58 dB would be limited to 9 hours of testing per day.
- *Annual Hours*. All testing above 58 dB would be limited to 800 hours per year.
- *Annual Days*. The number of days per calendar year that high noise testing (above 58 dB for one hour or more) could occur would be limited to 180.

Table 2
TESTING PROGRAM CHARACTERISTICS
ALTERNATIVE 1: 800 ANNUAL HOURS

Alternative 1: Program Parameters (all testing >58 dB at the Benchmark)	**Maximum**
Daily Hours (7AM-7AM)	9 hours
Annual Hours	800 hours
Annual Days (7AM-7AM)	180 days

Description	**Testing Window**	**Maximum Noise at Benchmark (dB)**	**Max. Noise at Monitor #2**	**Max. Hours Per Window**	**Max. Hours Per Day**	**Max. Hours Per Year**
Level 1 Testing						
40- by 80-Foot Wind Tunnel	Daytime (7AM-7PM)	65	70	6	9	800
	Nighttime (7PM-7AM)	65	70	6		
80- by 120-Foot Wind Tunnel	Daytime (7AM-7PM)	65	70	6		
	Nighttime (7PM-7AM)	65	70	6		
Level 2 Testing						
40- by 80-Foot Wind Tunnel	Daytime (7AM-7PM)	75	80	4	9	400
	Nighttime (7PM-7AM)	75	80	4		
80- by 120-Foot Wind Tunnel	Daytime (7AM-7PM)	80	85	4		
	Nighttime (7PM-7AM)	80	85	4		
Level 3 Testing						
80- by 120-Foot Wind Tunnel	Daytime (7AM-7PM)	85	90	5	5	200

Notes:
1. All testing would be limited to the program parameters shown in the top portion of this table. Maximum testing hours at individual noise levels are not additive. For example, if nine hours of Level 2 testing occurred in one day, no testing could occur at either Level 1 or Level 3.
2. Maximum noise limits at the Benchmark and at Monitor #2 must both be adhered to. Both are limits, not either/or.

Table 3
TESTING PROGRAM CHARACTERISTICS
ALTERNATIVE 2: 600 ANNUAL HOURS

Alternative 2: Program Parameters (all testing >58 dB at the Benchmark)	Maximum
Daily Hours (7AM-7AM)	8 hours
Annual Hours	600 hours
Annual Days (7AM-7AM)	150 days

Description	Testing Window	Maximum Noise at Benchmark (dB)	Max. Noise at Monitor #2	Max. Hours Per Window	Max. Hours Per Day	Max. Hours Per Year
Level 1 Testing						
40- by 80-Foot Wind Tunnel	Daytime (7AM-7PM)	65	70	6	8	600
	Nighttime (7PM-7AM)	65	70	6		
80- by 120-Foot Wind Tunnel	Daytime (7AM-7PM)	65	70	6		
	Nighttime (7PM-7AM)	65	70	6		
Level 2 Testing						
40- by 80-Foot Wind Tunnel	Daytime (7AM -7PM)	75	80	4	8	400
	Evening (7PM-10PM)	70	75	4		
80- by 120-Foot Wind Tunnel	Daytime (7AM -7PM)	80	85	4		
	Evening (7PM-10PM)	75	80	4		
Level 3 Testing						
80- by 120-Foot Wind Tunnel	Daytime (7AM-7PM)	85	90	4	4	200

Notes:
1. All testing would be limited to the program parameters shown in the top portion of this table. Maximum testing hours at individual noise levels are not additive. For example, if eight hours of Level 2 testing occurred in one day, no testing could occur at either Level 1 or Level 3.
2. Maximum noise limits at the Benchmark and at Monitor #2 must both be adhered to. Both are limits, not either/or.

Table 4
TESTING PROGRAM CHARACTERISTICS
ALTERNATIVE 3: 400 ANNUAL HOURS

Alternative 3: Program Parameters (all testing >58 dB at the Benchmark)	Maximum
Daily Hours (7AM-7AM)	6 hours
Annual Hours	400 hours
Annual Days (7AM-7AM)	130 days

Description	Testing Window	Maximum Noise at Benchmark (dB)	Max. Noise at Monitor #2	Max. Hours Per Window	Max. Hours Per Day	Max. Hours Per Year
Level 1 Testing						
40- by 80-Foot Wind Tunnel	Daytime (7AM-7PM)	65	70	4	6	400
	Nighttime (7PM-7AM)	65	70	4		
80- by 120-Foot Wind Tunnel	Daytime (7AM-7PM)	65	70	4		
	Nighttime (7PM-7AM)	65	70	4		
Level 2 Testing						
40- by 80-Foot Wind Tunnel	Daytime (7AM-7PM)	75	80	4	6	400
80- by 120-Foot Wind Tunnel	Daytime (7AM-7PM)	80	85	4		
Level 3 Testing						
80- by 120-Foot Wind Tunnel	Daytime (7AM-7PM)	85	90	3	3	200

Notes:
1. All testing would be limited to the program parameters shown in the top portion of this table. Maximum testing hours at individual noise levels are not additive. For example, if six hours of Level 2 testing occurred in one day, no testing could occur at either Level 1 or Level 3.
2. Maximum noise limits at the Benchmark and at Monitor #2 must both be adhered to. Both are limits, not either/or.

Additionally, the following specific limits would be applied to the three testing levels.

- *Level 1 Testing.* In Alternative 1, Level 1 testing would be allowed anytime during a 24-hour period, but could not exceed nine hours of testing during the same 24-hour period.
- *Level 2 Testing.* Level 2 testing would also be allowed anytime during a 24-hour period, but could not exceed nine hours of testing during that same 24-hour period. Level 2 testing would also be limited to a maximum of 400 hours of testing per year.
- *Level 3 Testing.* Level 3 testing would be limited to daytime hours only (7:00 a.m. to 7:00 p.m.), with a maximum of five hours per day. Additionally, Level 3 testing would be limited to 200 hours of testing per year.A typical high noise testing project would require 200 hours of testing above 58 dB, when measured at the benchmark location. Alternative 1 would allow for approximately four of these testing projects per year. This alternative is expected to address all the aerodynamics testing demands in support of the goals of the NASA Ames Aerodynamics Testing Program. Alternative 1 would support the development of advanced military and civilian aircraft technologies in the United States, which is essential to a continued strong national posture, both economically and militarily.

2. Alternative 2: 600 Annual Hours

Alternative 2 would allow the following overall program parameters, as described in Table 3, with noise levels measured at the benchmark.

- *Daily Hours.* All testing above 58 dB would be limited to 8 hours of testing per day.
- *Annual Hours.* All testing above 58 dB would be limited to 600 hours per year.
- *Annual Days.* The number of days per calendar year that high noise testing (above 58 dB for one hour or more) could occur would be limited to 150.

Additionally, the following specific limits would be applied to the three testing levels.

- *Level 1 Testing.* Like Alternative 1, Alternative 2 would allow Level 1 testing anytime during a 24-hour period, but Level 1 testing could not exceed eight hours during the same 24-hour period.

- *Level 2 Testing.* Unlike Alternative 1, Level 2 testing would not be allowed between the hours of 10:00 p.m. and 7:00 am. Additionally, Level 2 testing could not exceed eight hours per 24-hour period. Level 2 testing would also be limited to a maximum of 400 hours of testing per year.
- *Level 3 Testing.* Level 3 testing would be limited to daytime hours (7:00 a.m. to 7:00 p.m.), with a maximum of four hours per day. Additionally, Level 3 testing would be limited to 200 hours of testing per year.

Alternative 2 would allow for approximately three high noise testing projects per year. Limiting the testing program to these parameters may minimally restrict the ability of NASA Ames to maintain their recognition as the premier aerodynamics research facility, however, the testing allocations of Alternative 2 would allow for the implementation of the most critical aerodynamics testing projects required to support the goals of the NASA Ames Aerodynamics Testing Program.

3. Alternative 3: 400 Annual Hours

Alternative 3 would allow the following overall program parameters, as described in Table 4, with noise levels measured at the benchmark.

- *Daily Hours.* All testing above 58 dB would be limited to 6 hours of testing per day.
- *Annual Hours.* All testing above 58 dB would be limited to 400 hours per year.
- *Annual Days.* The number of days per calendar year that high noise testing (above 58 dB for one hour or more) could occur would be limited to 130.

Additionally, the following specific limits would be applied to the three testing levels.

- *Level 1 Testing.* Like Alternatives 1 and 2, Alternative 3 would allow Level 1 testing anytime during a 24-hour period, but this testing could not exceed six hours during the same 24-hour period.
- *Level 2 Testing.* Unlike Alternatives 1 and 2, Alternative 3 would only allow Level 2 testing during the daytime (7:00 a.m. to 7:00 p.m.). Additionally, Level 2 testing could not exceed six hours per 24-hour period.
- *Level 3 Testing.* Level 3 testing would also be limited to daytime hours (7:00 a.m. to 7:00 p.m.), with a maximum of three hours per day. Additionally, Level 3 testing would be limited to 200 hours of testing per year.

Alternative 3 would allow for approximately two high noise testing projects per year. Limiting the testing program to these parameters may seriously restrict the ability of NASA Ames to maintain their recognition as the premier aerodynamics research facility, but the testing allocations of Alternative 3 would allow for the implementation of the minimum number of the most critical aerodynamics testing projects that would support the goals of the NASA Ames Aerodynamics Testing Program.

4. No Action Alternative

Under the No Action Alternative, none of the three aerodynamic testing programs would be administered. Aerodynamics testing beyond programs currently administered through existing policies at NASA Ames Research Center would not be implemented. Existing operations at the wind tunnel facilities would continue, as previously described in Table 1, but could not be expanded to test advanced technologies for supersonic jet airplanes and advanced technologies in vertical lift aircraft.

H. Unreasonable Options

The following on- and off-site alternatives were rejected during the scoping process because they are infeasible.

1. On-Site Alternatives

Unrestricted aerodynamic testing at the 40- by 80-Foot Wind Tunnel and the 80- by 120-Foot Wind Tunnel was considered in the scoping for this EIS. This alternative was rejected due to the unpredictable noise impacts to the community and to NASA Ames Research Center employees and contractors.

A variety of physical noise controls have also been evaluated for the 40- by 80-Foot Wind Tunnel and the 80- by 120-Foot Wind Tunnel. These alternatives have been found infeasible given economic and technical constraints, as described below.

a. <u>40- by 80-Foot Wind Tunnel</u>. The 40- by 80-Foot Wind Tunnel is a fully enclosed tunnel where ventilation to the exterior is minimized during testing operations. The small opening required for cooling is already acoustically treated to minimize noise radiation to the community. Thus, the only possible method for noise reduction at this test facility would be through changes to the tunnel structure itself. The tunnel structure's test section is comprised of carbon steel, and fairly lightweight transite or sheet metal on a steel framework comprises most of the rest of the tunnel itself. This tunnel structure provides only minimal noise attenuation from interior noise sources due to its lightweight construction. The acoustic liner to be installed in the test section in 1997 will provide a minor added noise attenuation. It would also be possible to attenuate noise by increasing the insulating qualities of the sheet metal panels. This would be most effectively accomplished by adding noise attenuating metal panelling on the existing external structural steel. This would require structural modifications for the hundreds of thousands of square feet of tunnel area. An initial estimate of improvements to the NFAC wind tunnel complex are given in Table 5. These estimates include improvements to the 80- by 120-Foot Wind Tunnel described below.

Another alternative that has been suggested is the construction of a barrier or wall around the tunnel facility. However, no barrier the height of the facility has been constructed anywhere in the world. This alternative may be technically feasible, but it is expected to be prohibitively expensive and visually unattractive, since the wall would be several hundred feet in height.

b. 80- by 120-Foot Wind Tunnel. Although they share a common fan drive, the flow-through operation of the 80- by 120-Foot Wind Tunnel is significantly different from the close circuit operation of the 40- by 80-Foot Wind Tunnel. The 80- by 120-Foot Wind Tunnel draws atmospheric air into a bell-shaped inlet and exhausts that air out the south wall of the facility. Flow into the inlet of the 80- by 120-Foot Wind Tunnel passes through an acoustically-treated vane set that is designed to calm turbulent atmospheric air as it flows into the test section and to keep noise from propagating back into the inlet and into the local community. Just prior to exhausting into the atmosphere at south end of the facility, the flow passes through another acoustically treated vane set. This vane set is also designed to keep noise from propagating out the exhaust and into the local community. In addition, the walls, floor, and ceiling of the test section and inlet are lined with six to ten inches of acoustic attenuation material. These liners are designed to attenuate noise going through the structure and to absorb noise before reaching the acoustically-treated vanes at the inlet and the exhaust. Additional noise attenuation of the 80- by 120-Foot Wind Tunnel would require the same tunnel enclosure described above, as well as extensive and expansive redesign of the tunnel inlet and discharge. Even then, complete closure of the wind tunnel inlets and outlets is not feasible since air must be drawn from and exhausted into the atmosphere through the wind tunnel fans to create airflow. The only possible way to attenuate the noise emanating from the inlet and outlet would be to add structures at the inlet and exhaust to further

Table 5
SUMMARY OF COSTS FOR NFAC ACOUSTIC MODIFICATIONS

Description	Estimated Cost
Inlet Structure	
Structural Steel	$17,985,000
Foundations	1,010,000
New Baffles	15,103,000
Subtotal	**$34,098,000**
Exhaust Structure	
Structural Steel	$13,464,000
Foundations	1,122,000
Turning Vanes	3,500,000
Subtotal	**$18,086,000**
Exterior Acoustic Treatment	**$23,106,000**
TOTAL	**$75,290,000**

attenuate noise with a likely performance degradation. The estimated cost for enclosure and inlet and discharge redesign and construction is shown in Table 5. In addition to the costs shown in the table, additional property would need to be acquired. The cost of property acquisition is estimated at $1,000,000 per acre.[2] Such mitigation is deemed not to be reasonable.

2. Off-Site Alternatives

In addition to the on-site alternatives, a number of off-site alternatives were evaluated. No other feasible testing locations or sites are available in the world, as described below.

The 80- by 120-Foot Wind Tunnel is the largest wind tunnel in the world. It can be used to test full-scale models and actual aircraft and propulsion systems up to 100 knots. Besides the 40- by 80-Foot Wind Tunnel, the only similarly sized facility is Russia's T-101 Subsonic Wind Tunnel (14 meters by 24 meters or 45.9 feet by 78.7 feet). The T-101 tunnel is an oval, open test section tunnel capable of 126 knots

[2] Mr. Dick Brown, NASA Ames Research Center. June 12, 1996.

(65 meters per second). This tunnel is in a state of disrepair, and does not provide required technologies or the utilities, and for many applications is too small for the proposed NASA Ames Aerodynamics Testing Program.

The 40- by 80-Foot Wind Tunnel is the second largest wind tunnel in the world and is a unique facility worldwide. Not only does it have the capability to test near or full-scale models, aircraft, and propulsion systems up to 300 knots, it also has good acoustical properties for noise measurements. The only serious contender is the DNW wind tunnel in the Netherlands, which has been considered the best wind tunnel for measurements of overall airframe noise, from relatively small models. However, the DNW wind tunnel only has a usable test section of 4.6 by 6.1 meters (15 by 20 feet) and it does not have the capability to test actual jet engines; which is essential for VSTOL and other future high performance aircraft testing.

Thus, any testing requiring large- or full-scale validation cannot be done elsewhere. The only alternative to full- or large-scale testing is the actual flight test of a prototype aircraft. Prototype flight tests, which are very expensive and are particularly dangerous when not supported by adequate research, do not provide the details needed for design and analysis. Helicopter rotor testing and VSTOL (powered-lift) testing are two areas where small-scale validation and computational methods have proven inadequate. It is usually impossible to accurately scale the dynamic characteristics and deflections of a full-scale rotor system. Likewise, VSTOL configurations have complex flows that interact between the airframe and propulsion system during hover and at low forward speed.

Other alternatives, such as suspending full-scale models from other aircraft or mounting the models onto high speed track devices or moving railroad cars, would not provide usable data. In addition, many of these alternatives have serious operational constraints and are logistically infeasible.

Finally, it is currently considered financially infeasible to construct new wind tunnels at another location for the proposed NASA Ames Aerodynamics Testing Program. NASA Ames estimates the replacement cost of the 40- by 80-Foot and the 80- by 120-Foot tunnels would be over $350 million; without considering possible land and utility acquisition costs.

I. Planned Public Notification Process

NASA will notify the surrounding community of proposed testing projects through a public notification process. NASA Ames will provide extensive notification of impending wind tunnel tests in conjunction with the Aerodynamics Testing Program, beginning at least six months in advance of a test. NASA is working closely with the Air Force to implement the mitigation measures required to protect the family housing residents and other Onizuka Air Station Annex occupants.

Additionally, in July 1997, NASA Ames developed a proposal for NASA to take over ownership of all family housing units at Moffett Federal Airfield following the realignment of Onizuka Air Station. The proposal has since been approved by NASA Headquarters, and is currently pending final approval from the Air Force and the Local Reuse Authority (final approval is expected in September 1997). If this change in ownership is approved, NASA will take ownership of the Moffett family housing in September of 2000. This change in ownership could result in a revision in the implementation approach for the mitigation measures outlined in this EIS, which could result in a change in the Mitigation Plan. However, the mitigation measures outlined in this EIS would continue to be required prior to the implementation of testing under the Aerodynamics Testing Program.

Central elements of the public outreach and notification plan include: establishing and staffing a phone number dedicated to current status of tests with message capability to register comments,concerns or complaints; test status on a NASA Ames World Wide Web dedicated "home page" with return comment/question availability and links to/from the Mountain View and Sunnyvale web sites; notifications, e.g. flyers, letters, etc., of imminent tests and schedules mailed to all Moffett Federal Airfield Resident Agencies, the residents of the Moffett military housing, the Santiago Villa Mobile Home Park, and neighboring businesses in the North Bayshore area; special announcements in the Mountain View Voice newspaper; news releases announcing upcoming tests with referral information included; and notification to city management offices of Mountain View, Sunnyvale, Los Altos and Palo Alto.

Additionally, NASA Ames staff will be available to brief interested groups prior to the tests. It is anticipated that NASA will notify the surrounding community of more specific test windows, rather than the blanket testing window of 7:00 am to 7:00 pm, using the example of Alternative 3.

Chapter 4
AFFECTED ENVIRONMENT

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The following chapter contains a description of the affected environment of identified environmental issues related to the proposed NASA Ames Aerodynamics Testing Program. Specific environmental consequences and impacts for these environmental issue areas are described in Chapter 5.

The following subjects are addressed:

A. Land Use
B. Public Policy
C. Noise
D. Flora and Fauna
E. Recreation
F. Air Quality
G. Socioeconomics

The decision to focus on these subjects was made as a result of the scoping process, which involved NASA representatives, regulatory agency representatives, local governments, and interested members of the public.

A. LAND USE

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1. Moffett Field Land Use

NASA Ames Research Center at Moffett Field is primarily part of the unincorporated land of the County of Santa Clara. Moffett Field encompasses approximately 911 hectares (2,250 acres), of which approximately 174 hectares (430.5 acres) is known as the NASA Ames Research Center.

Land uses and facilities at the NASA Ames Research Center include many specialized and unique facilities for aerospace research in the categories of physical science, space science, earth-system science, information systems, and life science, all of which are included in the mission of the Center. NASA Ames Research Center facilities include several wind tunnels and outdoor test facilities (covering the speed range from hover to subsonic to hypersonic), motion-based flight simulators, atmosphere-entry heat simulators, advanced digital-computation systems, free-flight ballistic test facilities, and experimental aircraft for flight research. Also a wide range of well-equipped ground based and airborne laboratories for the study of solar and geophysical phenomena, life synthesis, life detection, and life environmental factors exist at the Research Center. In addition, normal support services, such as warehouses, shops, cafeterias, and office buildings, are present at the Center.

The NASA Ames Research Center can be generally divided into three distinct land use areas as follows:

- The southern area of the site, comprising approximately one-third of the total site, is the oldest and most densely built-up area. This is the area principally obtained from the United States War Department by the National Advisory Committee for Aeronautics (NACA) in 1939.
- The central area of the site contains the newest facilities at the Research Center.

- The northernmost portion of the site is open space, with a few exceptions including the Outdoor Aerodynamic Research Facility (OARF). This area also includes wetlands which adjoin the Cargill Salt Company's salt ponds.[1]

Existing facilities at the NASA Ames Research Center are detailed in Table 6 and Figure 4.

Several Federal agencies, known as Resident Agencies, reside and use Moffett Field through agreement with NASA. At this time, these include the following:

- Navy Reserve
- California Air National Guard (CANG)
- Army
- Air Force

Under NASA's stewardship, Moffett Field is currently used for flight operations, research and development, administrative support, and operational and personnel support. In addition, much of the northern property is open space and wetlands.

2. Surrounding Land Uses

Properties adjacent to Moffett Field are generally within the city limits of the City of Sunnyvale and the City of Mountain View, as described below. Additional information on surrounding planned land uses can be found in Chapter 4B: Public Policy.

a. Mountain View and Sunnyvale. Land uses surrounding NASA Ames Research Center include commercial and industrial, residential, open space and recreational lands, and agriculture, as described below and shown in Figure 5.

(1) Industrial/Commercial. Commercial and industrial business parks are the predominant uses immediately surrounding the NASA Ames Research Center and Moffett Field. As shown in Figure 6, the surrounding industrial business parks include several computer and aircraft technology businesses located predominantly to the west in the City of Mountain View. These include the following:

- Silicon Graphics (Shoreline Technology Park)
- Acuson (Shoreline Business Park)

[1] *Environmental Resources Document*. National Aeronautics and Space Administration (NASA). NASA Ames Research Center, Moffett Field, California. June 1992.

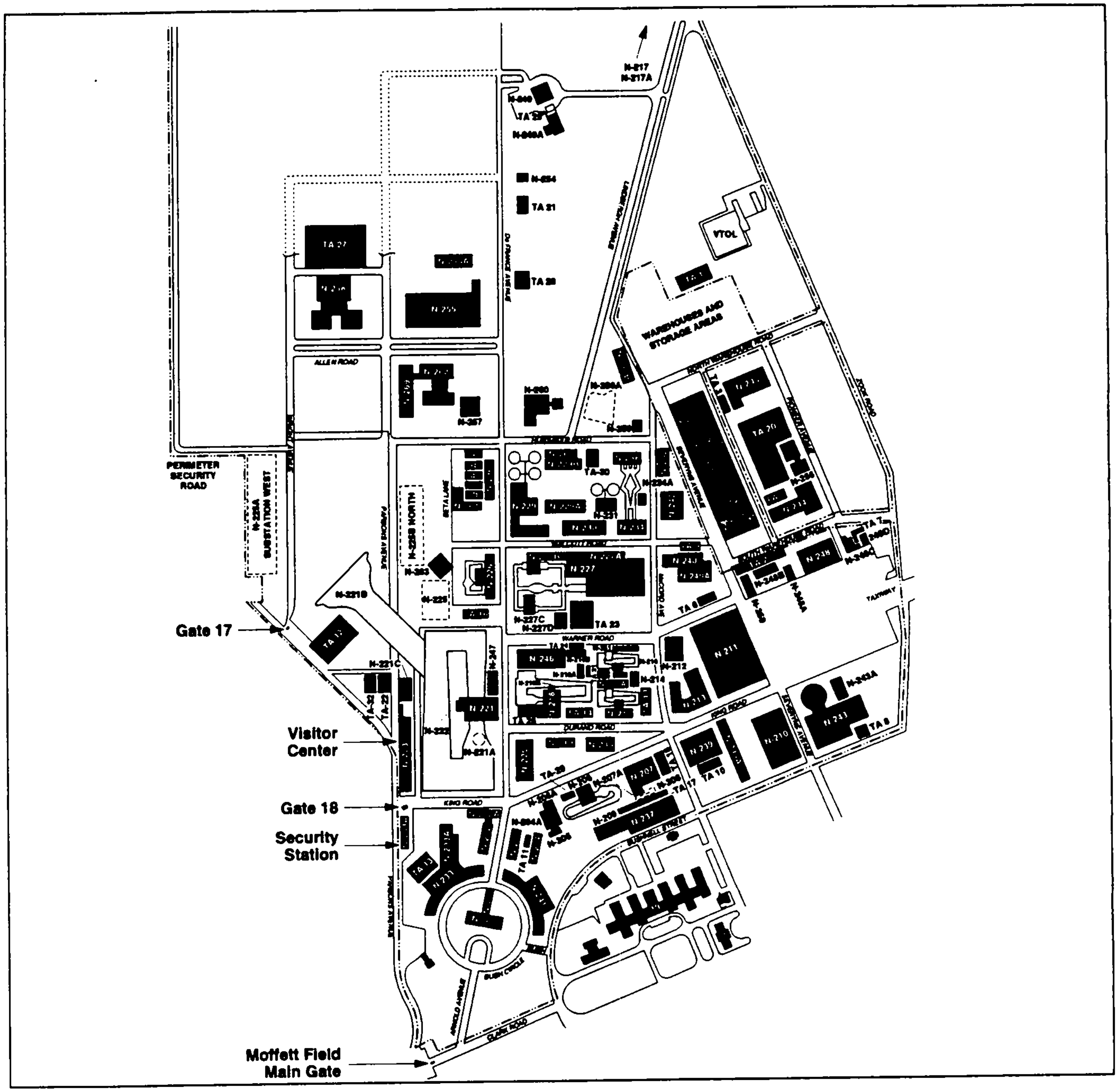


FIGURE 4

Not to Scale

NASA Ames Research Center Facilities

SOURCE: NASA Ames Research Center.

AMES AERODYNAMICS TESTING

NASA AMES RESEARCH CENTER, MOFFETT FIELD, CALIFORNIA

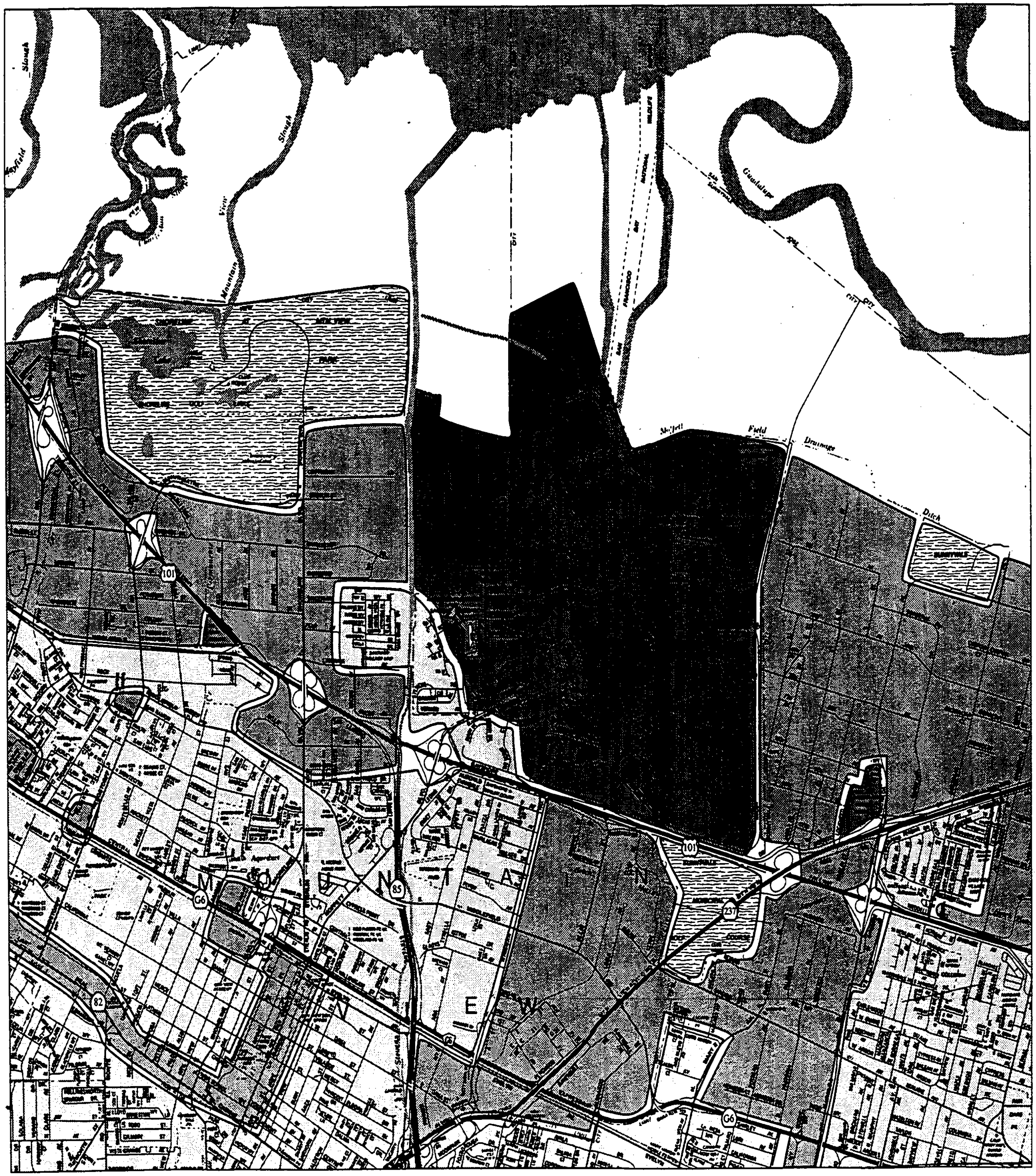
Table 6
NASA AMES RESEARCH CENTER FACILITIES

Facility Number	Facility Name	Use	Features
N-206	12-Foot Pressure Wind Tunnel	Low-turbulence testing (variable density); under renovation until mid-1994	Power supplied by a single-stage axial-flow fan driven by a 15,000-hp electrical motor
N-218	14-Foot Transonic Wind Tunnel	Aerodynamics research	Closed-circuit tunnel with an adjustable, flexible wall nozzle and a test section with four slotted walls
N-221	40- by 80-Foot Wind Tunnel	Low-speed testing and configuration validation	Closed-throat, closed-circuit tunnel with variable speed and pitch
N-221B	80- by 120-Foot Wind Tunnel	Low-speed testing and configuration validation	Closed-throat, nonreturn tunnel that shares six drive motors and fans with the 40- by 80-Foot Wind Tunnel
N-226	6- by 6-Foot Supersonic Wind Tunnel	Educational use	Asymmetric sliding block nozzle and perforated floor and ceiling for testing
N-227	Unitary Plan Wind Tunnel	Aerodynamics testing	Contains 11-Foot Transonic and 9- by 7-Foot and 8- by 7-Foot Supersonic Wind tunnels
N-229 & N-229A	3.5-Foot Hypersonic Wind Tunnel	Hypervelocity fluid dynamics	Four contoured, axisymmetric nozzles using air-film cooling to control nozzle wall temperature
N-233 & N-233A	Computation Facilities	NASA and Advanced Research Projects Agency (ARPA) programs requiring advanced computer technology and systems	Houses a CRAY Y-MP8/832 supercomputer, an IBM 4381 computer, numerous VAX systems, and a variety of workstations
N-234 & N-238	Thermal Protection Laboratory Arc-Jets	High-enthalpy materials research	Contains large supersonic and hypersonic arc-jet facilities
N-239A	Research Laboratory	Human-machine biomedical, and extraterrestrial research, ecosystem science, closed ecological life-support systems (CELSS).	Contains human environmental test facility and environmental chamber
N-240 & N-240A	Airborne Missions Life Science Flight Lab	Support for Airborne Science and Applications Program. Research in life-sciences payloads	Offices, laboratories, a high-bay test room, machine shop, computer facilities, and telecommunications equipment

Facility Number	Facility Name	Use	Features
N-243	Flight and Guidance Simulation Laboratory	Flight safety, aeronautical handling qualities, and flight dynamics	Contains moving-base flight-simulation devices
N-244	Space Projects Facility	Space projects, mission operations	Office, laboratories, a clean-room facility and an environmental test facility
N-245	Space Science Laboratory	Research in planetary atmospheres, planetary evolution, astrophysics, infrared astronomy, earth science, and planetary geology	Offices, an auditorium, two conference rooms, a high bay, a computer center, and 40 laboratory rooms; also contains laser equipment, spectrometers, and an electron microscope
N-211 & N-248	Aircraft Support Facilities	Proof of concept and flight systems studies; medium- and high-altitude airborne science programs	Contains a hangar, offices and shops
N-258	Numerical Aerodynamic Simulation Facility	Timesharing computations	Houses the CRAY Y-MP and CRAY-2 supercomputers, two Amdahl 5880 mainframe computers and five VAX 11-780 minicomputers
N-260	Fluid Mechanics Laboratory	Fluid-mechanics research	Houses offices, a computer room, a conference room, laboratories, a test bay, an Allis-Chalmers compressor unit, and a darkroom
N-261	Biomedical Research Facility	Neurosciences research	Contains a darkroom, electron microscopy facilities, computer areas, testing booths, and surgery facilities
N-262	Human Performance Research Laboratory	Research on advanced aeronautical and space systems	Contains offices, work areas and state-of-the-art laboratories

FIGURE 5

General Surrounding Land Uses



- Open Space (including salt ponds)
- Regional Recreation Areas
- Residential
- Commercial/Office/Industrial
- Institutional (Federal facilities including Moffett Field, NASA Ames Research Center, and Air Force Facilities)

SOURCE: Brady and Associates. February 1995.

NOTE: This map is intended to give general locations of surrounding land uses. It does not attempt to map exact land uses within the Cities of Sunnyvale and Mountain View. Please refer to the applicable General Plan for these designations.

0 1/4 1/2
Scale in Miles

AMES AERODYNAMICS TESTING

469:015

Adjacent Land Use

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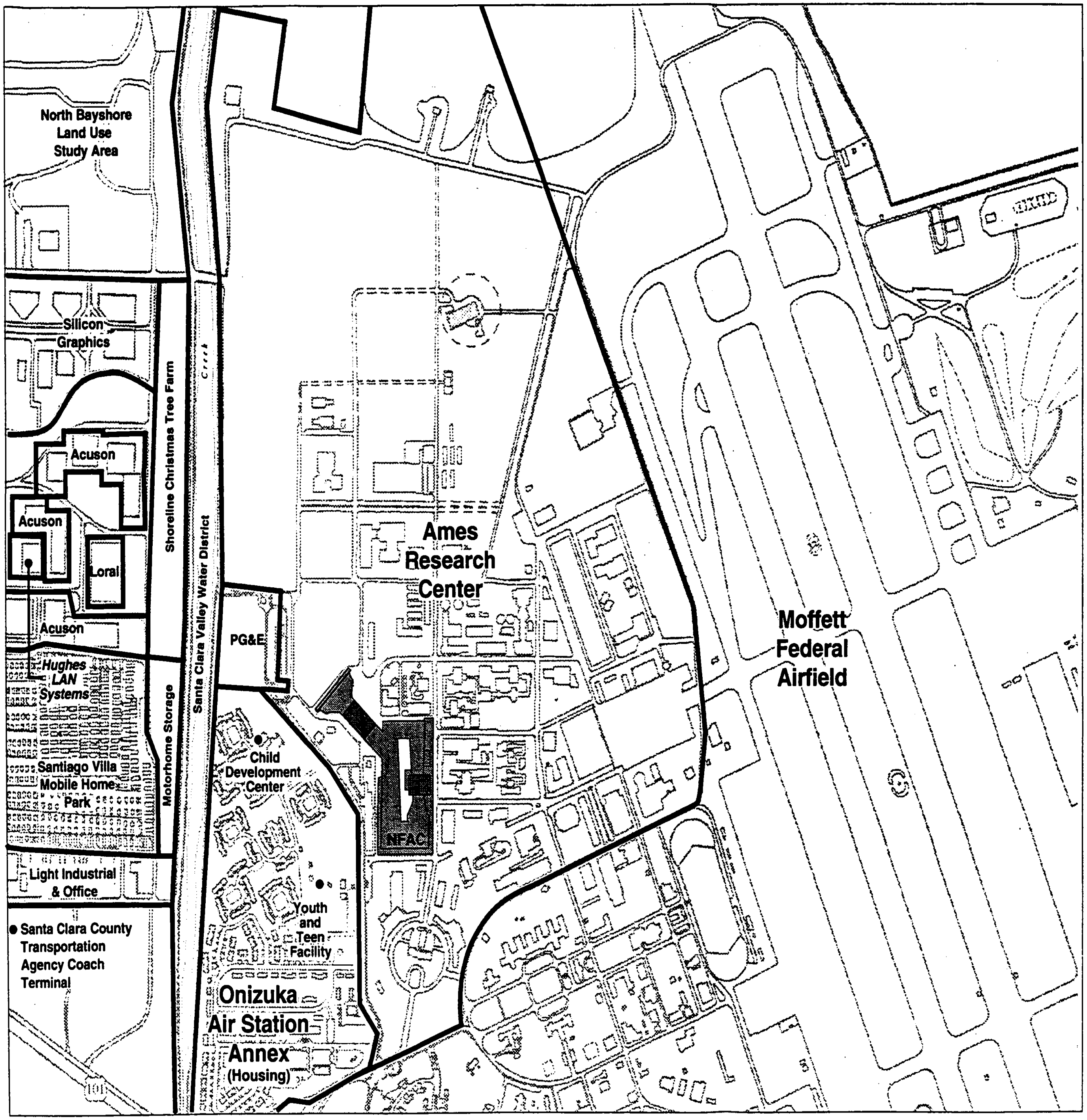

SOURCE: Brady and Associates. February 1995.

0 350 700
Scale in Feet

AMES AERODYNAMICS
TESTING

- Hughes LAN Systems (Shoreline Business Park)
- Loral (Shoreline Business Park)
- Shoreline Christmas Tree Farm

Additionally, there are miscellaneous light industrial and office uses immediately south of the Santiago Villa Mobile Home Park, along L'Avenida Avenue.

Other industrial areas of Mountain View in the vicinity of Moffett Field include general industrial uses immediately south of Highway 101, west of State Route 85. Additionally, many industrial uses are located to the south of Highway 101, east of Whisman Road.

The majority of lands in Sunnyvale that surround the NASA Ames Research Center and Moffett Field are industrial in nature. These include all the land to the north of State Route 237, and a significant portion of the lands to the south of Highway 101 west of Mathilda Avenue.

In the City of Sunnyvale, commercial uses are scattered east of Mathilda Avenue and south of Evelyn Avenue. Generally, no commercial lands exist in close proximity of NASA Ames Research Center in the City of Sunnyvale.

(2) Residential. In the City of Mountain View, residential uses in the immediate vicinity of Moffett Field and NASA Ames Research Center are limited to the Santiago Villa Mobile Home Park located to the west of Stevens Creek. The Mobile Home Park encompasses 15 hectares (37 acres) and has approximately 358 mobile homes. There is additional motorhome and trailer storage between the Mobile Home Park and Stevens Creek, however, this area is not used for residential purposes.

The Mobile Home Park is relatively self contained, providing its own recreational facilities and drainage system. Santiago Villa was originally approved as an interim land use in 1967.[2] However, the land use has become more permanent through the

[2] Jim Holley. City of Mountain View Community Development Department. Personal communication. February 7 and 9, 1995.

years. The North Bayshore Area Plan that was adopted for the area in 1977 designated the area as Mobile Home Park.[3] Additionally, the 1992 Mountain View General Plan designates the area as Mobile Home Park Residential.[4]

There are additional residential uses ranging from low to high density south of Highway 101. The closest of these are approximately 762 meters (2,500 feet) from the NFAC wind tunnel complex.

In the City of Sunnyvale, residential lands are generally not in the vicinity of NASA Ames Research Center. The closest residential lands are east of Mathilda Avenue, south of State Route 237. These residential land uses include mobile homes, low density housing, and some medium and high density housing. Historically, these land uses have been affected by Moffett Field flight operations since they are directly below the flight paths for arrivals and departures. However, operations at NASA Ames Research Center have not significantly affected these land uses since the aerodynamics test facilities are located further west.

(3) Open Space and Recreation. Open space and recreation land uses surrounding the NASA Ames Research Center include the wetlands and tidal marshes of the San Francisco Bay, the San Francisco Bay Trail, the Stevens Creek Regional Trail, Shoreline at Mountain View, various neighborhood parks, and several private recreation areas including facilities provided at the Shoreline Technology Park.

Open space and recreation land uses surrounding the NASA Ames Research Center in the City of Sunnyvale include the wetlands and tidal marshes of the San Francisco Bay, the San Francisco Bay Trail, various neighborhood parks, and the Sunnyvale Municipal Golf Course. These opportunities and resources are described in more detail in Chapter 4D: Flora and Fauna and Chapter 4E: Recreation.

(4) Agricultural Uses. The only land surrounding NASA Ames Research Center that is currently in agricultural use is the Shoreline Christmas Tree Farm located between Stevens Creek and the Shoreline Business Park. The use of this land for agriculture purposes is planned for under the Mountain View General Plan, and its commercial use is seasonal.

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[3] *North Bayshore Area Plan*. Mountain View, California. March 26, 1979.

[4] *City of Mountain View 1992 General Plan. A Comprehensive Revision of the 1982 Mountain View General Plan*. City of Mountain View, California. October 29, 1992.

(5) Existing Land Use Compatibility. In general, the land uses of Mountain View surrounding Moffett Field are compatible with the existing operations at NASA Ames Research Center and Moffett Field. The majority of properties are industrial in nature. The exceptions include the Santiago Villa Mobile Home Park located to the west of the site, and adjacent residential areas to the south.

The land uses of Sunnyvale surrounding Moffett Field are compatible with the existing operations at NASA Ames Research Center and Moffett Field. The majority of properties are industrial in nature. The exceptions in the City of Sunnyvale include the residential properties to the southeast of Moffett Field.

b. Onizuka Air Station Annex (Air Force Housing). Facilities at the Onizuka Air Station Annex include Air Force housing facilities, the Onizuka Child Development Center, the Youth and Teen Facility, and support services such as a medical and dental clinic.

(1) Air Force Housing. There are approximately 800 housing units located in the Onizuka Air Station Annex. These units are divided among Officer's housing, located along Highway 101 to the south of NASA Ames Research Center, and multifamily housing units located along Stevens Creek to the west of NASA Ames Research Center.

(2) Onizuka Child Development Center. The Onizuka Child Development Center is located approximately 183 meters (600 feet) southwest of the 80- by 120-Foot Wind Tunnel inlet. The Onizuka Child Development Center was established in this location by the Navy after the 1989 earthquake, which damaged previous childcare facilities located at Moffett Field south of the Shenandoah Plaza Historical District. Onizuka Air Force took the childcare facilities over when the area was transferred to their stewardship in April 1993.

The Onizuka Child Development Center serves approximately 120 to 130 children under the age of five. The center primarily serves active duty military personnel, but also serves the children of military retirees and a few children of NASA employees. Most of the NASA children are overflow from NASA's existing childcare center at NASA Ames.

Children arrive at the Onizuka Child Development Center beginning at 6:15 a.m., and have generally left the facility by 5:45 p.m. The children are generally indoors between 11:00 a.m. and 2:00 p.m.[5]

(3) Youth and Teen Facility. The Onizuka Youth and Teen Facility serves children and youths ranging in age from five to 18. Additionally, the center serves adults and families through Karate and Taekwon-Do classes, and outdoor recreation and picnic facilities.

When school is in session, the facility is occupied from 6:15 a.m. until approximately 9:00 a.m., when children leave for school. Children start returning to the facility around 12:30 p.m., and may remain there until as late as 10:00 p.m. During the summertime (mid-June through mid-September) hours of operation of the facility are generally between 6:15 a.m. until as late as 10:00 p.m. Several different programs are offered for different age groups and interests. The Youth and Teen Facility organizes activities such as dodgeball, football, basketball, roller hockey, arts and crafts, dance, movie excursions, and various fieldtrips.

Construction is currently taking place outside the Youth and Teen Facility to improve the available facilities. It is expected that this construction will be completed by June 1995.[6]

(4) Existing Land Use Compatibility. The Onizuka Air Station Annex is generally not compatible with existing operations at NASA Ames Research Center and Moffett Field. These conditions are not unusual for military housing. Aircraft operations, the testing of new aircraft, and the use of wind tunnels have historically created noise levels that are less than desirable for residential uses and incompatible with childcare uses.

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[5] Sheila Ward. Onizuka Air Station Annex Child Development Center Director. Personal communication. February 8, 1995.

[6] Val Liberty. Onizuka Youth and Teen Center. Personal communication, February 10, 1995.

B. PUBLIC POLICY

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Policy issues directly related to specific issue areas are also described in other sections of this chapter, including noise and recreation.

1. Environmental Justice

Environmental justice is the principle that low income populations and minority populations should not disproportionately bear the burden of environmental hazards. On February 11, 1994, the President of the United States issued an Executive Order on Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations.[7] The order is designed to focus Federal attention on the environmental and human health conditions in minority communities and low income communities with the goal of achieving environmental justice.

NASA has developed an Environmental Justice Strategy[8] which implements the Executive Order. NASA intends to integrate environmental justice into all of its programs and activities. In doing so, NASA plans to implement the environmental justice mandate promptly and effectively, while keeping the administrative burden at the minimum level necessary.

NASA's Environmental Justice Strategy is to provide a broad framework of the items that need to be accomplished to achieve environmental justice. Each NASA Center (including NASA Ames Research Center) is developing its own Environmental Justice Implementation Plan. NASA Ames is currently developing their Environmental Justice Implementation Plan.

Each NASA center is to adapt its NEPA process to ensure that environmental justice concerns are addressed in each Environmental Assessment and EIS, as appropriate. The applicability of the Executive Order should be based on

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[7] Executive Order #12898. *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*. February 11, 1994. (59FR 7629 of February 16, 1994.)

[8] National Aeronautics and Space Administration. *Environmental Justice Strategy*, March 14, 1995.

socioeconomic information to the extent possible, by identifying minority populations and/or low income populations that may be adversely affected by the Center's activities.

a. Minority Populations. Persons living in the City of Mountain View who identified themselves as white in the 1990 Census constituted the largest group (73 percent), followed in order by Asian (15 percent), other (7 percent), and black (5 percent). In general, the minority composition of Mountain View is less diverse than Santa Clara County as a whole, where whites constituted the majority (69 percent), followed by Asian (17 percent), other (9 percent), and black (4 percent).[9]

More specifically, there are four distinct residential populations that surround the NASA Ames Research Center, which are within two Census tracts that are primarily within the city limits of the City of Mountain View, and two Census tracts which are primarily Federal property within Santa Clara County:

- *Housing South of 101 (Census Tracts 5092.01 and 5091.04).* Civilian housing south of Highway 101 includes both single family and multifamily housing in the City of Mountain View. Though there are many housing areas south of the highway, Census Tracts 5092.01 and 5091.04 are the two tracts that are the closest to the NASA Ames Research Center and the NFAC wind tunnel complex. Census Tract 5092.01 is between Stevens Creek and Shoreline Boulevard and contains industrial uses directly adjacent to Highway 101, predominately residential uses south of the industry and north of the Central Expressway, and a mix of residential and commercial uses, including the downtown, south of Central Expressway. Census Tract 5091.04 is located to the east of Stevens Creek and State Route 85. The western half of the Census tract between Stevens Creek and Whisman Road includes predominately residential land uses. To the east of Whisman Road, the Census tract is almost entirely industrial.
- *Santiago Villa Mobile Home Park (Census Tract 5046.01).* Santiago Villa Mobile Home Park is located to the east of Shoreline Boulevard, off of Spacepark Way in the City of Mountain View. The mobile home park and the Onizuka Air Station Annex Housing comprise all of the housing in Census Tract 5046.01.

[9] *Statistical Profiles of Santa Clara County: Based on the 1990 Census.* Santa Clara County Advance Planning Office. October 1992.

- *Onizuka Air Station Annex Housing (Census Tract 5046.01).* Onizuka Air Station Annex Housing is multifamily military housing located between Stevens Creek and the NASA Ames Research Center on Federal property in Santa Clara County.
- *Senior Officers and Resident Agency Housing (Census Tract 5047).* The Senior Officers and Resident Agency (RA) Housing is located to the south of NASA Ames Research Center on Federal property in Santa Clara County. Though entry to the RA's Housing is through the Moffett Field Gate, the property is owned and operated by Onizuka Air Station. This housing is a mix of single family and multi-family housing and is the only housing in Census Tract 5047.

Collectively, persons living in these tracts who identified themselves as white and not hispanic in the 1990 Census constituted 63 percent of the population in these areas and hispanic persons constituted 7 percent of the population.[10] Additionally, 8 percent identified themselves as black; 1 percent identified themselves as American Indian, Eskimo, or Aleut; 16 percent identified themselves as Asian or Pacific Islander; and 6 percent identified themselves as "other". Specific detail for each Census tract is provided below. Based on these figures, the combined minority population for the four Census tracts is 37 percent.[11]

- *Census Tract 5046.01.* 68 percent of persons living in Census Tract 5046.01 identified themselves as white and not hispanic; 5 percent identified themselves as hispanic; 13 percent identified themselves as black; 1 percent identified themselves as American Indian, Eskimo, or Aleut; 10 percent identified themselves as Asian or Pacific Islander; and 3 percent identified themselves as "other". The combined minority population for Census Tract 5046.01 is approximately 33 percent.
- *Census Tract 5047.* 80 percent of persons living in Census Tract 5047 identified themselves as white and not hispanic; 3 percent identified

[10] The U.S. Census records hispanic status of the population and race separately. Persons of hispanic origin can classify themselves in any of the racial categories. For the purpose of this report, only the hispanic status of white persons is identified. However, persons of hispanic origin are within the percentages shown for other racial categories.

[11] As defined by the department of Housing and Urban Development (HUD), a minority community is one which has minority households, including hispanic white households, of 40 percent or more. However, the U.S. Census does not specifically define the number of minority households within each individual Census tract. For this reason, data for individual persons is presented for this analysis. It can be assumed that the percentages cited for individuals in this section are generally consistent with percentages of minority households.

themselves as hispanic; 9 percent identified themselves as black; 5 percent identified themselves as Asian or Pacific Islander; and 3 percent identified themselves as "other". The combined minority population for Census Tract 5047 is approximately 20 percent.

- *Census Tract 5091.04.* 57 percent of persons living in Census Tract 5091.04 identified themselves as white and not hispanic; 8 percent identified themselves as hispanic; 9 percent identified themselves as black; 1 percent identified themselves as Indian, Eskimo, or Aleut; 17 percent identified themselves as Asian or Pacific Islander; and 8 percent identified themselves as "other". The combined minority population for Census Tract 5091.04 is approximately 43 percent.
- *Census Tract 5092.01.* 66 percent of persons living in Census Tract 5092.01 identified themselves as white and not hispanic; 5 percent identified themselves as hispanic; 4 percent identified themselves as black; 20 percent identified themselves as Asian or Pacific Islander; and 5 percent identified themselves as "other". The combined minority population for Census Tract 5092.01 is approximately 37 percent.

As defined by the Department of Housing and Urban Development (HUD), a minority community is one which is more than 40 percent minority populations. Corresponding to this definition, Census Tract 5091.04 would be considered a minority community. Generally, the remaining figures for the Census tracts surrounding NASA Ames Research Center correspond with those for Mountain View and Santa Clara County, and indicate that minority populations are not concentrated around NASA Ames Research Center in the other three Census tracts. More detailed data is presented in Appendix D.[12]

b. Low Income Populations. Santa Clara County has attracted fast-growing high-technology industries since the 1950s, and it continues to do so. In 1990, Santa Clara County ranked fourth in the State in terms of population and jobs.[13]

The 1990 Census confirms the image of Santa Clara County as a relatively affluent county, with 11 percent of households having annual incomes over $100,000. The Census also shows, however, that 21 percent of households had an annual income

[12] 1990 Census Data. Association of Bay Area Governments (ABAG) Regional Data Center. Santa Clara County, California. August 1992.

[13] *Projections 1994: Forecasts for the San Francisco Bay Area to the Year 2010.* Association of Bay Area Governments. 1993.

under $25,000. Additionally, 5 percent of Santa Clara County families and 7.5 percent of the individuals were below the poverty level in 1989.

In Mountain View, incomes are not quite as high as the County, but are generally consistent with countywide incomes. In the City, 8 percent of households had annual incomes over $100,000, and 23 percent of households had an annual income under $25,000, which is considered very low income.[14] Additionally, 3.8 percent of the families and 6.2 percent of the individuals in the City of Mountain View were below the poverty level in 1989.

Collectively, incomes of households living in the four Census tracts nearest NASA Ames are consistent with those in Mountain View and Santa Clara County. In these four Census tracts, 6 percent of households had annual incomes over $100,000 and 49 percent have incomes between $40,000 and $99,999. Additionally, approximately 24 percent of the households in the four Census tracts are considered low income ($25,000 to $39,999) and approximately 21 percent are considered very low income households (less than $25,000). More specific detail for each Census tract is provided below:

- *Census Tract 5046.01.* Approximately 27 percent of the households in Census Tract 5046.01 are considered low income and 38 percent are considered very low income. Therefore, 65 percent of the households in Census Tract 5046.01 are low income or below, when compared to the City of Mountain View.
- *Census Tract 5047.* Approximately 24 percent of the households in Census Tract 5047 are considered low income and 11 percent are considered very low income. Therefore, 34 percent of the households in Census Tract 5047 are low income or below, when compared to the City of Mountain View.
- *Census Tract 5091.04.* Approximately 25 percent of the households in Census Tract 5091.04 are considered low income and 19 percent are considered very low income. Therefore, 43 percent of the households in Census Tract 5091.04 are low income or below, when compared to the City of Mountain View.

[14] As defined by the Department of Housing and Urban Development (HUD), low income households are those households with incomes that are 51 to 80 percent of the mean household income, and very low income households are those households with incomes under 50 percent of the mean household income. The overall mean household income for the City of Mountain View is $49,904. Based on this mean income, it is assumed that the incomes for low income households are between $25,000 to $39,999, and that the incomes for very low income households are below $25,000.

- *Census Tract 5092.01*. Approximately 21 percent of the households in Census Tract 5092.01 are considered low income and 20 percent are considered very low income. Therefore, 41 percent of the households in Census Tract 5092.01 are low income or below, when compared to the City of Mountain View.

The Santiago Villa Mobile Home Park and Onizuka Air Station Annex housing, which are the housing areas that will be most affected by the proposed action, comprise almost all of the housing in Census Tract 5046.01. Though both the area as a whole (as represented by the four Census tracts) and the Santiago Villa/Onizuka area do not have significant concentrations of persons below the poverty level when compared to Mountain View and Santa Clara County, there is an indication that a larger percentage of low and very low income populations live in the Santiago Villa and Onizuka areas. More detailed data are presented in Appendix D.[15]

2. Local Governmental Policy

NASA Ames Research Center and Moffett Field lie primarily within the unincorporated lands of the County of Santa Clara. Adjacent properties are within the city limits of the City of Sunnyvale and the City of Mountain View, which control zoning and land use of those properties.

Although Moffett Field is constitutionally exempt from the application of local land use plans and policies, NASA intends to cooperate with the cities of Sunnyvale and Mountain View on matters of mutual concern. In addition, NASA will attempt, whenever possible, to meet local planning guidelines and standards. Consistency with the cities' plans and policies to the extent practical, even if not required by law, will facilitate cooperation with the municipalities. NASA considers these local planning policies and guidelines as advisory resources.

This section examines general local policies related to NASA Ames and surrounding land uses. More detailed policies regarding noise also exist in local government policies, and they are outlined in Chapter 4C: Noise.

a. City of Mountain View. The primary policy document in the City of Mountain View is the City of Mountain View 1992 General Plan. The General Plan is the City's framework for future decisions, especially for community

[15] 1990 Census Data. Association of Bay Area Governments (ABAG) Regional Data Center. Santa Clara County, California. August 1992.

development and environmental protection. The Mountain View General Plan includes Goals, Policies, and Actions, which provide a set of statements to guide future policies of the community.

Of primary importance is the Land Use Map, which is part of the General Plan. The Land Use Map designates the general distribution, location, and intensity of land use in Mountain View.

Mountain View is almost fully developed, so the Land Use Map reflects the City's existing zoning and land uses. Generally, there have been no major shifts in Mountain View's land use pattern in the recent past.

Particular policies on noise and noise impacts are also discussed in the Mountain View General Plan, as follows:

Environmental Management Goal O.
Reduce noise levels at the source.

Policy 41. Restrict noise levels coming from stationary sources.

Action 41.a. Maintain noise thresholds for each land use category.

Action 41.b. Use CEQA and the development review processes to restrict new development from exceeding its noise threshold.

Action 41.c. Enforce the City's Stationary Equipment Noise Ordinance.

Action 41.d. Encourage NASA/Ames Research Center to reduce and control noise produced by its wind tunnels.

Additionally, issues of land use compatibility have been an issue with the Santiago Villa Mobile Home Park, which is located to the west of NASA Ames Research Center, directly across from Stevens Creek. Mobile home parks provide affordable housing in a safe and secure environment with low yard and house maintenance. As a result, mobile home parks attract many retired residents. Mountain View has demonstrated through General Plan policies and land use decisions that it supports the existing land use of Santiago Villa Mobile Home Park, despite land use compatibility issues.

Although the General Plan addresses the compatibility of residential land uses with General Industrial districts within the City of Mountain View (Community Development Goal L, Policy 34), the General Plan does not address residential compatibility issues with land uses outside the City of Mountain View. No development policies specifically address compatibility concerns for Santiago Villa Mobile Home Park and NASA Ames Research Center. For further discussion of this issue, please refer to Chapter 4A: Land Use.

b. City of Sunnyvale. Development within the City of Sunnyvale is also guided by a General Plan. Sunnyvale's General Plan is composed of separate and independent documents called elements and sub-elements. Included in the General Plan is a Land Use Map which designates land uses throughout the City, similar to Mountain View.

Sunnyvale is almost fully developed, so the Land Use Map reflects the City's existing zoning and land uses. Generally, there have been no major shifts in Sunnyvale's land use pattern in the recent past.

General Plan Goals, Policies, and Action Statements that are specifically relevant to NASA Ames Research Center and the NASA Ames Aerodynamics Testing Program include the following:

Goal 2.1A. Maintain a pattern of land use which provides for a variety and balance of land uses and which respects the capabilities and limitations of natural and man-made features.

Policy 2.1A.7. Acknowledge the presence of Moffett NAS[16] as a land use within the urban service area of the City.

Action 2.1A.7a. The City should consider annexing Moffett NAS into the City. In doing so, a separate zoning district may be considered for the area. This may provide greater control over the site if civilian use is pursued.

Goal 3.6A. Strive to maintain or achieve a compatible noise environment for all land uses in the community.

Policy 3.6A.1. Consider noise standards in the evaluation of land use issues and proposals.

[16] The Naval Air Station (NAS) at Moffett Field no longer exists. The Moffett Field property was transferred to NASA on July 1, 1994, and is now known as Moffett Federal Airfield. However, several of the government agencies that used NAS Moffett Field are still operating under NASA's stewardship.

Action 3.6A.1c. Comply with Federal guidelines for the compatibility of land uses in the NAS Moffett Field AICUZ[17] study area, except where the City determines that there are prevailing circumstances of a unique or special nature.

At this time, Action Statement 2.1A.7a is not actively being pursued. Additionally, existing land uses in Sunnyvale generally comply with Goal 3.6A and the corresponding policy and action statements, with the exception of approximately 15 percent of land uses under the Moffett Field approach and departure paths. The Sunnyvale General Plan states that aircraft on approach to Moffett Field are the second largest source of noise in Sunnyvale.[18]

c. Santa Clara County. NASA Ames Research Center and Moffett Field are primarily part of the unincorporated land of the County of Santa Clara. As Federal property, NASA Ames and Moffett are constitutionally exempt from the application of local land use plans and policies. However, NASA attempts, whenever possible, to meet local planning guidelines and standards. The primary policy document in the County of Santa Clara is the General Plan. However, since Moffett Field is a Federal property surrounded by incorporated lands, known as an "unincorporated pocket", specific guidance is not clearly provided in the Santa Clara County General Plan. In the past, NASA has used the Santa Clara County General Plan as guidance for issues related to noise and biological resources.

d. San Francisco Bay. See page 7 of this document for a discussion of the NASA Ames Aerodynamics Testing Program and its conformance with coastal and Bay related policies.

[17] AICUZ is the acronym for Air Installation Compatible Use Zones. These zones are safety zones that have been established by the Department of Defense for Federal airfields. Because Moffett Field is no longer under DOD control, these safety zones do not apply and are not further discussed in this document.

[18] *Sunnyvale General Plan Executive Summary*. Community Development Department. Sunnyvale, California. May 1994.

C. NOISE

■ ■ ■

There are a variety of approaches that can be implemented to assess the noise impacts of a proposed action, depending on the expected type, duration, and level of the noise. Due to high noise levels that would be generated by the proposed NASA Ames Aerodynamics Testing Program for limited amounts of time it was deemed most appropriate to assess two distinct types of noise impacts in this EIS, as follows:

- *Noise Level (Noise Hazards)*. The proposed NASA Ames Aerodynamics Testing Program would generate noise at high levels. This type of noise can be compared to existing wind tunnel operations, or aircraft operations that include hovering or engine run-ups while the aircraft is relatively stationary. Noise levels are used in this EIS to measure hazards to health and hearing that can result from exposure to high noise levels near the source. Noise standards for the workplace, including the Department of Labor Occupational Safety and Health Administration (OSHA) Noise Exposure Standards and the NASA Hearing Conservation Program, typically outline maximum noise levels for specific durations. Exceeding these levels or durations could cause temporary or permanent hearing damage. Typical noise levels of common events and activities are presented in Figure 7. Noise level impacts are addressed in the first part of this chapter.
- *Noise Exposure*. Noise exposure is also considered in this EIS. Noise exposure is a way of averaging the dose of noise over a period of time. Noise exposure measurements correlate more closely with human response to noise annoyance than do noise level measurements because they consider both the noise level and the duration of noise events. For this reason, nearly all noise criteria used for land use compatibility are based on noise exposure rather than noise level. Noise exposure contours show lines of equal noise exposure. Contour values become smaller with distance from the noise source to reflect the reduction of the noise as it travels across the earth's surface. Noise exposure contours will typically be numerically smaller than noise level contours for an individual noise event, since measurements of noise exposure take account of both periods of relative quiet and noise events. Examples of noise exposure descriptors are CNEL and DNL

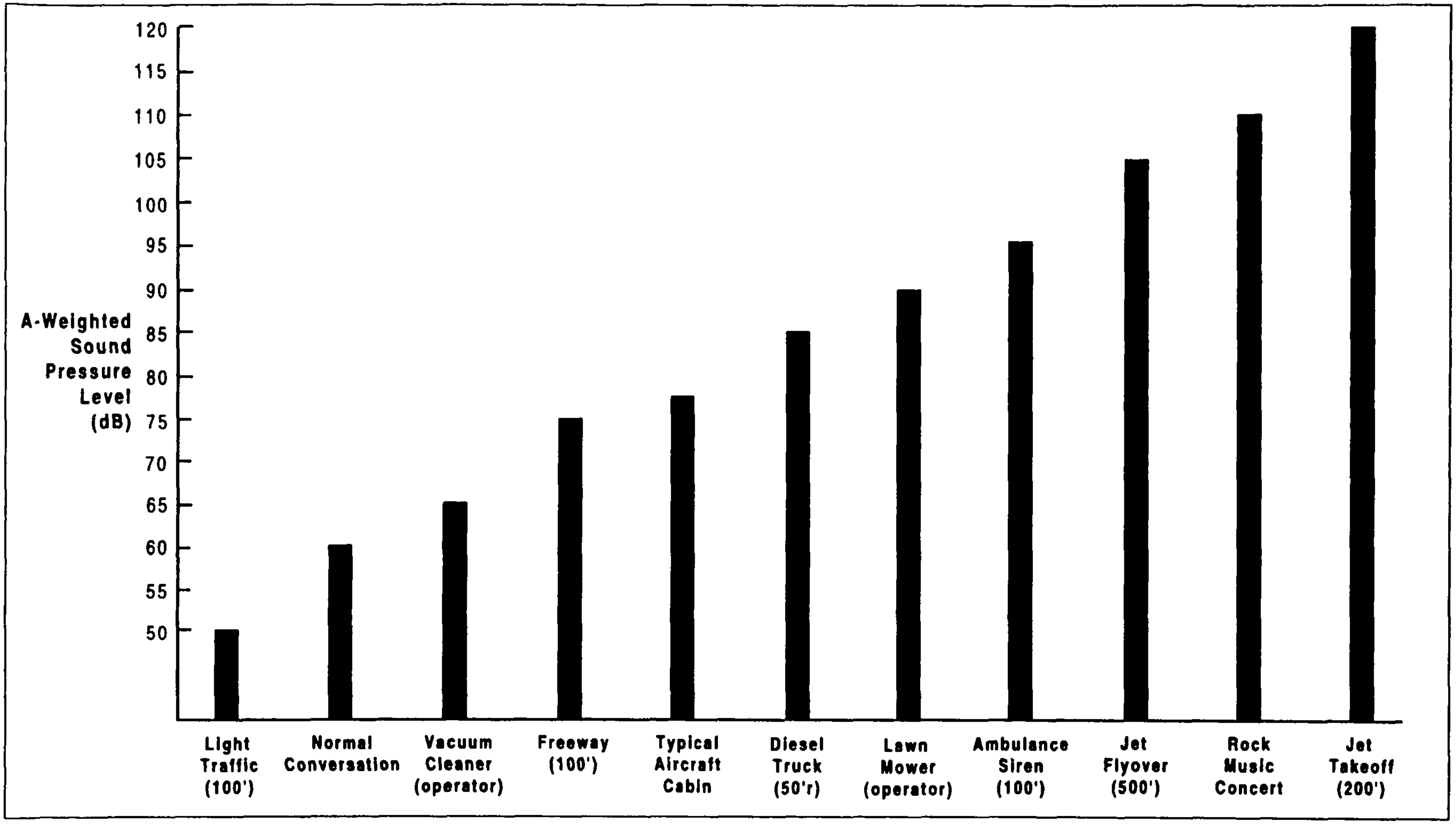

FIGURE 7

Typical Noise Levels (dB)

SOURCE: Charles Salter Associates.
February 1995.

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69-024

(quantity symbol L_{dn}).[19] Noise exposure impacts are addressed in the second part of this chapter.

All noise levels and noise exposure levels throughout this document are A-weighted in accordance with appropriate standards and criteria. All such values are in units of decibels, whose unit symbol is "dB" in conformance with American National Standard ANSI/ASME Y10.11-1984. The unit symbol "dBA" is not the standard symbol used under ANSI Y10.11. All numerical noise values in this document symbolized "dB," are numerically identical to those using "dBA," often found in other references.

The key technical terms that will be used in the following chapter are defined in Table 7. For a more complete listing of definitions, please refer to Appendix A: Glossary.

1. Background Information

This section gives background information on the key topics related to noise and the proposed NASA Ames Aerodynamics Testing Program, including a discussion of the basic properties of sound, the health effects of noise, a general overview of noise and human response, specific considerations for children, noise and weather effects, and the effects of airborne noise-induced vibration.

a. Sound Propagation and Attenuation. Several factors account for sound attenuation, or sound reduction, as is travels from a source, as described below.

- *Hemispherical Spreading*. Sound is always attenuated by hemispherical spreading, which generally is the reduction of the sound pressure level, or noise level, as the sound travels over a surface, usually the earth. This is the same phenomenon as the intensity of light diminishing with distance from the light source. Hemispherical spreading over a terrain is a lessening of the sound by 6 dB per doubling of the distance from the source. All frequencies of a sound attenuate uniformly over a surface by hemispherical spreading. The results of hemispherical spreading are affected by the directivity characteristics of the sound source. Complex sound sources emit more sound energy in one direction than another. These effects are much more pronounced close to the source than they are further away. As the distance from any noise source becomes larger, sound energy emanating from the

[19] Refer to Table 7, page 65, for definitions of these terms.

Table 7
DEFINITIONS OF ACOUSTICAL TERMS

Term	Definitions
Noise	Annoying, harmful, or unwanted sound.
decibel (dB)	A unit for expressing the sound pressure level (loudness), or amplitude, of sound. Sound levels are usually measured and expressed in decibels (dB) with 0 dB corresponding roughly to the threshold of hearing. A decibel is equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure, which is 20 micropascals (20 micronewtons per square meter).
A-weighted sound level	The sound level measured on an instrument containing an "A" Filter, which electronically simulates the frequency response of the human ear under an average level of sound. Decibels measured using the A-weighted sound level can be denoted as "dBA". All noise levels and noise exposure levels throughout this document are A-weighted in accordance with appropriate standards and criteria. All such values are in units of decibels, whose unit symbol is "dB" in conformance with American National Standard ANSI/ASME Y10.11-1984. The unit symbol "dBA" is not the standard used under ANSI Y10.11. All numerical noise values in this document symbolized "dB," are numerically identical to those using "dBA," often found in other references.
noise level	The instantaneous measure of the magnitude of a sound at any given time, measured in decibels (dB). Noise levels can be used to measure hazards to health and hearing that can result from exposures to even very brief but high noise levels.
noise dose	A measure of average noise exposure over a stated time period which takes into account both the level of a sound and the duration of exposure.
Community Noise Equivalent Level (CNEL)	The CNEL represents the A-weighted average noise level, or noise dose, over a 24-hour period, with penalties applied to noise events during the nighttime and evening. This noise dose descriptor is obtained after addition of 5 decibels in the evening from 7:00 p.m. to 10:00 p.m. and after addition of 10 decibels to sound levels in the night between 10:00 p.m. and 7:00 a.m.
Day-Night Average Sound Level (DNL or L_{dn})	The A-weighted average noise level, or noise dose, during a 24-hour day, obtained after addition of 10 decibels to levels measured in the night between 10:00 p.m. and 7:00 a.m. In most cases, the Day/Night Noise Level is comparable to CNEL, and the descriptors can generally be used interchangeably.
ambient noise level	The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.
intrusive noise	That noise which intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, and time of occurrence and tonal or informational content as well as the prevailing ambient noise level.

source becomes more equal in any given direction. Therefore, noise contours drawn to illustrate the sound energy become more circular as they get further away from the sound source.

- *Air Absorption.* Air absorption, unlike hemispherical spreading, attenuates sound at a particular frequency uniformly with distance. Air absorption dramatically affects high frequency sound while providing little or no attenuation of low frequencies. An example of this phenomena is when aircraft jet engines appear to shrill when up close, but produce only a low roar at distant locations. Though sound is attenuated through air absorption at all times, the degree of attenuation varies with the weather. Attenuation from air absorption can range from around 13 to 17 dB per kilometer.

b. Weather, Climate, and Sound Propagation. People often believe that sound attenuation can change depending on the weather. Though weather changes can affect the degree of sound propagation and attenuation, these effects are typically minimal and average weather conditions are used to compute noise contours. Hemispherical spreading is not affected by weather. However, several other types of sound attenuation can be affected by differing weather conditions, as described below.

(1) Air Absorption. Variations in temperature and humidity can cause minor changes in air absorption. Table 8 shows the effect of sound attenuation for the typical conditions for each of the four seasons of the year in Mountain View for the frequency spectrum anticipated for projects that would be administered under the proposed NASA Ames Aerodynamics Testing Program, which are generally low. As shown in the table, attenuation from air absorption would generally range from 13 to 17 dB per kilometer. Sound attenuation values for air absorption shown in Table 8 are independent of values predicted for hemispherical spreading, but are strongly dependent on frequency. The contours presented in this document use an air absorption value of approximately 14.6 dB per kilometer, corresponding to a standard fall day.

(2) Sound Refraction. The second type of sound phenomena which weather can affect is sound refraction. Sound refraction is a bending of sound which can either increase or decrease the sound attenuation at a given location. Typically, sound refraction is the bending of sound around some type of barrier. A common example of a barrier which causes sound refraction is a freeway sound wall. Sound walls have the effect of substantially reducing noise to areas immediately protected by the noise barrier, while possibly reflecting the noise to new locations in the immediate vicinity of the barrier. In general, sound walls or

gradients are unpredictable and they do not lend themselves to evaluating predictable long-term effects. [20 21]

- *Sound Refraction by Wind.* Steady, low velocity wind has a negligible effect on sound propagation. However, high velocity wind or changes in wind conditions with altitude (wind speed gradients) can produce refractive effects similar to those for temperature gradients. Sound propagation in the direction an item would be carried by the wind (downwind) results in sound waves refracting toward the earth. Like a temperature inversion, this has little or no effect at short distances. It does, however, reduce the refractive effects of surface barriers over long distances. Sound propagation upwind refracts the sound up and away from the earth. As with a negative temperature gradient, this may result in additional attenuation of up to 25 dB at distances less than three kilometers.

Both upwind and downwind effects are only measurable for steady long-term average wind velocities in excess of 10 knots. [22 23] Climatic data indicates that average wind velocity typically exceeds 10 knots for a few hours in the afternoon of the summer months in the project area. These north-by-northeast winds may result in some upwind or downwind refraction during these times.[24 25]

[20] L.N. Miller. *Noise Control for Buildings and Manufacturing Plants.* Bolt, Beranek, and Newman. Cambridge, MA. 1981.

[21] R.T. Harrison, R.N. Clark, and G.H. Stankey. *Predicting Impacts of Noise on Recreationists.* Project Report, Forest Service. U.S. Department of Agriculture. April 1980.

[22] D.N. Keast. *Procedure for Predicting Noise Environments Around Industrial Sites.* Bolt, Beranek, and Newman Report No. 2897. Prepared for the Long Island Lighting Company. September 1974.

[23] L.L. Beranek. *Noise and Vibration Control.* McGraw-Hill. New York, New York. 1971.

[24] NASA Ames Research Center. *Naval Air Station Moffett Field Existing Conditions Report, Phase 2.* NASA Ames Research Center Facilities Planning Office. May 22, 1992.

[25] Western Regional Climate Center. *Hourly Wind Data.* Reno, Nevada. Information extracted from copies of the historical National Climate Data Center (NCDC) Surface Airways Hourly Tapes. March 3, 1995.

Additionally, gusty winds can scatter sound over large distances; however, this effect is only transitory and cannot be reliably predicted.[26] Wind can also generates its own noise, such as the rustling of trees, which raises the background noise and may diminish the intrusive effects of a distant noise source.

c. Airborne Noise-Induced Vibration. One aspect of community response to noise involves high levels of low-frequency airborne sound that can induce building vibration. This phenomenon sometimes occurs in conjunction with ground vibration, as in the case of nearby train passbys, or can occur without perceptible ground vibration, as is typical with wind tunnel or aircraft noise. In this report, only airborne noise-induced vibration will be discussed since ground vibration is not expected to occur.[27]

House structures have many components that can readily be excited by noise and respond as complex vibrating systems.[28] Airborne vibration, or "rattling", is usually heard when noise emanates from the following items, which are listed, in decreasing likelihood of vibration:

- Windows
- Lightweight, lay-in ceiling tiles
- Walls
- Floors
- Dishes, ornaments and lamps due to the vibration of either the walls or the floors

Additionally, noise-induced vibration can sometimes be felt through windows, walls or floors by the touch of finger tips, and in extreme cases, damage to the item, such as plaster and tile, could occur from vibration. These phenomena are generally observable with very high sound pressure levels at frequencies below 300 Hz.

d. Health Effects of Noise.

(1) Hearing Loss. Hearing loss is the primary health risk associated with high noise levels. People who are exposed to an excessive amount of noise develop

[26] L.N. Miller. *Noise Control for Buildings and Manufacturing Plants.* Bolt, Beranek, and Newman. Cambridge, MA. 1981.

[27] Nelson, P.N. *Transportation Noise Reference Book.* Butterworths. London 1987.

[28] Hubbard, H.H. *Noise-Induced House Vibrations and Human Perception, Noise Control Engineering Journal*, 19, 49-55. 1982.

permanent hearing loss. In most persons, the beginning of noise-induced hearing loss is hard to define, but it follows repeated exposure to industrial or recreational noise, such as loud music. Damage to the inner ear generally does not create pain or any other obvious sensory response or alarm. Loss of hearing can result from exposure to impulse or impact noise as well as from exposure to steady-state (continuous) noise. The hearing loss caused by excessive exposure to noise is a permanent impairment, and no surgical procedure or medical device can restore the hearing to normal. Thus, prevention is the only way to avoid noise-induced hearing loss.[29]

The ear is injured by noise in two very different ways, depending upon the level of exposure. First, instantaneous peak sound pressure levels in excess of 140 dB can stretch the delicate inner ear tissues beyond their elastic limits, and rip or tear them apart. This type of damage is called acoustic trauma. Second, exposures to noise between 85 and 140 dB damage the ear metabolically, rather than mechanically. In this case, the potential for damage and hearing loss depends on the levels and the duration of exposure. This type of injury is called noise-induced hearing loss (NIHL) and, in contrast to acoustic trauma, is cumulative and grows over years of exposure.

Hearing damage has been studied extensively in the United States, resulting in the noise exposure standards of the Department of Labor's Occupational Safety and Health Administration (OSHA). Additionally, the NASA Health Standard on Hearing Conservation (NHS/IH-1845.4) establishes minimum requirements for hearing protection. Both of these regulatory mechanisms are discussed in more detail in Section B.1 of this chapter.

(2) Non-Auditory Health Effects. Short-term exposure studies have demonstrated that noise is capable of eliciting a variety of acute physiological and biochemical responses in humans. These responses appear to represent a generalized biologic stress reaction involving sympathetic activation of the autonomic nervous system. These include symptoms such as an increase in blood pressure, other forms of physical stress, and an overall increase in psychological stress.

Physical stress reactions can be observed when people are exposed to noise levels of 85 dB or more. Dilated pupils, elevated blood pressure, and an increase of stomach acid leading to a nauseous feeling are typical reactions when the noise environment

[29] American Family Physician. *Adverse Effects of Noise on Hearing*. Volume 47. Pages 1219-1226. Robert S. Bahadori and Barbara A. Bohne. 1992.

is increased above those levels normally found in a community noise environment. There is disagreement among experts as to whether these reactions pose a threat to health, with long-term exposure.

Psychological stress varies from individual to individual. This type of stress can be caused by sleep disturbance, inability to carry on a conversation, or other annoying factors of noise. The community standards described in Section B.2 of this chapter have been designed for sleep protection. When a noise environment exceeds these standards sleep disturbance, and thus psychological stress, may occur. Noise above 65 dB makes it difficult to have a normal conversation without raising one's voice, and could cause psychological stress in certain individuals.

e. Noise and Human Response. It is widely recognized that human response to noise is subjective and varies considerably among individuals. Unfortunately, there is no completely satisfactory way to measure the subjective effects of noise, or of the corresponding reactions of annoyance and dissatisfaction. This is primarily because of the wide variation in individuals' thresholds of annoyance, habituation to noise, and differing individual past experiences with noise. An important factor in assessing a person's subjective reaction to noise is comparing existing noise to proposed noise. Generally, the more a new noise exceeds existing noise, the less acceptable it is to the community. Therefore, a new noise source would be judged more annoying in a quiet area than it would in be in a noisier location. Knowledge of the following relationships is helpful in understanding how changes in noise and noise exposure are perceived:

- Except under special conditions, a change in sound level of 1 dB cannot be perceived.
- Outside of the laboratory, a 3 dB change is considered a just-noticeable difference.
- A change in level of at least 5 dB is required before any noticeable change in community response would be expected.
- A 10 dB change is subjectively heard as an approximate doubling in loudness and often causes an adverse community response.

Noise and land use compatibility guidelines generally correlate with widely accepted annoyance levels of a community. These regulations are discussed in more detail in Section B.2 of this chapter.

f. Noise and Children. Existing land uses in the vicinity of the 40- by 80-Foot Wind Tunnel and the 80- by 120-Foot Wind Tunnel include the Onizuka Air Force Child Development Center and the Air Force Youth and Teen Center, both of which are owned and operated by the Onizuka Air Station. Since these facilities serve children, a data and literature search was completed on the effects of noise on children for this EIS, which resulted in the following findings. Studies regarding this issue are not nearly as numerous as those for adults. It is standard practice to apply the same noise criteria to both children and adults, but the following information is provided to give an additional understanding of potential effects on children.

(1) Hearing Loss. Controversy remains concerning whether children are more or less susceptible than adults to permanent noise-induced hearing loss. Significant relationships between typical environmental exposures and hearing levels have not been demonstrated in children. There is no substantial difference in the anatomy of a child's and adult's hearing mechanisms, except for a statistical loss of hair cells within the cochlea, accounting for decreased hearing acuity in adults. It is standard practice to apply the same criteria for acceptable noise limits and durations to children as to adults. Given the dearth of research concerning noise-induced hearing loss in children, no conclusions can be reached as to whether children are subject to special noise concerns.

(2) Non-Auditory Health Effects. As discussed above, short-term exposure studies have demonstrated that noise is capable of eliciting a variety of acute physiological and biochemical responses in humans. Studies have shown that children exposed to high noise have had significantly higher blood pressure than the children exposed to low noise. Specifically, in a 1980 study conducted by Cohen the systolic pressure in children was 7 mm Hg higher during the first two years of school exposure to aircraft noise, decreasing to 2 mm Hg after four or more years of exposure. Additionally, Cohen reported that the diastolic pressure was 4 mm Hg higher in the first two years of exposure to aircraft noise, decreasing to 2 mm Hg after four or more years of exposure.[30] The blood pressure of the noise exposed children as a group, however, did not exceed normal blood pressure values for children of similar ages. A major area of disagreement continues to be whether these reactions pose a threat to health with long-term exposure.

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[30] Cohen, Sheldon; Evans Gary W.; Krantz, David S.; Stokols, Daniel. *Physiological, Motivational, and Cognitive Effects of Aircraft Noise on Children: Moving from the Laboratory to the Field*. *American Psychologist*, 35(3), 231-243. 1980.

(3) Speech Interference. It is well understood that children, by virtue of their less precise speech, limited vocabulary and less developed familiarity with language rules, are particularly susceptible to the speech interference effects of noise.[31] One study compared the ability to discriminate speech amid background noise of five and six year-old children with young adults. In the quiet background noise, the discrimination of the children was only two percent lower than for the adults. In high background noise, the discrimination of children was 17 to 20 percent lower than that for the adults.[32]

(4) Teacher and Caregiver Behavior. High noise levels adversely affect teachers and caregivers by creating high levels of annoyance and by interfering with speech communication. At moderately high noise levels teachers typically try to raise their voices to be heard. At high noise levels, teachers are most likely to stop teaching during noise intervals. Hence, speech interference and teaching disruption may adversely affect their interactions with children.

(5) Impaired Cognitive Development. Chronic exposure to high levels of noise during the periods in which children are acquiring speech, language, and listening skills may be detrimental to reading development and other areas of academic performance. Existing interior noise level standards for classrooms recommend that the equivalent 24-hour exposure (Leq {24} value) should not exceed 45 dB.[33] Continued exposure to higher levels of noise may render a child less rather than more able to withstand auditory distraction. Several studies have shown that as noise levels in schools and homes increased, reading scores of children decreased and the percentage of children reading below grade level increased. Students in noisy schools were also more likely to fail on a cognitive task and more likely to give up before the time to complete the task elapsed. One study showed that the cognitive development of infants was impaired by noisy environments, perhaps because the development of their selective attention skills was inhibited.

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[31] Dejoy, David M. *Environmental Noise and Children: Review of Recent Findings. The Journal of Auditory Research*, 23, 181-194. 1983.

[32] Larson, George; Petersen, Brenda. *Does Noise Limit the Learning of Young Listeners? Elementary School Journal*, 78(4), 264-165. 1978.

[33] *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety.* EPA 550/9-74-004. March 1974.

(6) General Conclusions. No specific conclusion regarding the issue of noise and children can accurately be drawn. Studies regarding noise and children are not as numerous as those for adults. Noise criteria that have been developed to analyze land use compatibility have been used to evaluate the impacts of noise on facilities with children, such as schools and day care centers. Application of these criteria should prevent any noise impacts to children.

2. Regulatory Environment

a. Hearing Conservation Standards.[34] Given the concerns outlined in Section A, the Department of Labor's Occupational Safety and Health Administration (OSHA) has developed noise exposure standards for U.S. workers. These noise exposure standards allow for noise levels of 90 dB for 8 hours per day and decreasing exposure duration for higher noise levels up to a maximum of 115 dB for 15 minutes or less without hearing protection. These standards apply to virtually all industries within the United States.

The NASA Health Standard on Hearing Conservation (NHS/IH-1845.4) establishes minimum requirements for the NASA Agency-wide Hearing Conservation Program. This standard is applicable to all NASA employees and NASA-controlled, government-owned facilities. Permissible exposure limits outlined by the NASA Hearing Conservation Program vary with the sound pressure level of the noise, as detailed in Table 9. It is NASA policy to control noise generated by NASA operations and to prevent occupational noise-related hearing loss. In accordance with this policy, maximum permissible exposure limits have been established to provide an environment free from hazardous noise.

The Hearing Conservation Program establishes a noise hazard area as any work area with a noise level of 85 dBA or greater. Thus, NASA's program is 5 dB more stringent than that of OSHA. Earmuffs or earplugs are to be provided to attenuate employee noise exposure to a level below 85 dBA. A combination of both ear muffs and plugs are to be required where noise levels equal or exceed 110 dBA.

b. Land Use Compatibility Noise Exposure Criteria. The nuisance effects of noise have traditionally been addressed in terms of noise annoyance. This annoyance is known to be associated with the level of noise, the duration of the noise, and increased sensitivity to evening and nighttime noise. Since 1972, when

[34] *Department of Labor Occupational Noise Exposure Standard.* 29 C.F.R. Part 1910, subpart G.

Table 9
PERMISSIBLE EXPOSURE LIMITS FOR NOISE
(NASA Hearing Conservation Program)

Duration (Hours)	dBA[a]
16	80
8	85
4	90
2	95
1	100
0.5	105
0.25	110
0.125 or less	115

[a] dBA is the abbreviation for the A-weighted sound level. The A-weighting filter deemphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear. All noise levels and noise exposure levels throughout this document are A-weighted in accordance with appropriate standards and criteria. All such values are in units of decibels, whose unit symbol is "dB" in conformance with American National Standard ANSI/ASME Y10.11-1984. The unit symbol "dBA" is not the standard symbol used under ANSI Y10.11. All numerical noise values in this document symbolized "dB," are numerically identical to those using "dBA," often found in other references.

Congress enacted the Noise Control Act (NCA),[35] several documents have been published that provide guidance on assessing the nuisance and annoyance effects of noise, and related land use compatibility issues. The following is a summary of the documents most applicable to assessing the noise created under the proposed NASA Ames Aerodynamics Testing Program.

- *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety (1974).* The NCA of 1972 required the Environmental Protection Agency (EPA) to publish information on acceptable community noise levels. The result was EPA-550/9-47-004, which is commonly referred to as the "Levels Document". This document establishes the DNL as the preferred community noise descriptor, with DNL values being directly related to the percentages of the community that would be annoyed by particular noise exposures.
- *Guidelines for Considering Noise in Land Use Planning and Control (1980).* In late 1979, the Federal Interagency Committee on Urban Noise (FICUN) was formed to unify noise policy among various Federal agencies. In 1980

[35] Noise Control Act (NCA), Public Law 92-574 (42 U.S.C. 4901 et seq).

it published Guidelines for Considering Noise in Land Use Planning and Control, which confirms DNL as the descriptor to be used for all noise sources. In 1992, a second interagency committee, the Federal Interagency Committee on Noise (FICON), published its *Federal Agency Review of Selected Airport Noise Analysis Issues*, which again confirms DNL as the best cumulative noise exposure measurement.

- *Sound Level Descriptors for Determination of Compatible Land Use (1990).* In 1990, the American National Standard Institute (ANSI) revised its 1980 standards for sound level descriptors for land use compatibility assessment to confirm DNL as the acoustical measure for assessing compatibility between various land uses and the outdoor noise environment.
- *General Plan Guidelines (1990).* Also in 1990, the California Governor's Office of Planning and Research (OPR) published guidelines to aid California municipalities in preparing their General Plans. This document uses the CNEL and DNL noise descriptors interchangeably to relate land use compatibility for community noise environments.

As described above, the most commonly used noise exposure measure for environmental noise is DNL or L_{dn}. This is a night penalized average used for most noise and land use compatibility criteria. The day-night average sound level is obtained after the addition of ten decibels (10 dB) to noise levels measured in the night between 10:00 p.m. and 7:00 a.m. In California, an alternative measure is the CNEL, which is similar to DNL except a 5 dB penalty is added during the evening hours of 7:00 to 10:00 p.m. CNEL values are typically between 0.5 dB and 1 dB above comparable DNL values. CNEL is generally used as the land use compatibility descriptor in this EIS to ensure that impacts during the evening hours are appropriately considered, except where previous analyses were prepared in DNL. However, since DNL and CNEL nearly always render results within 1 dB, they can generally be compared in land use compatibility analyses.

In general, noise criteria apply to land use compatibility for new development. These criteria are specified in terms of exterior noise levels, although the noise sensitive area may be indoors. Various methods exist for the accurate prediction of sound transmission loss and sound level reduction to the indoor environment. For the purposes of this EIS, noise criteria are presented in exterior noise levels.

No State or local noise criteria are binding on the type of noise to be created by the NASA Ames Aerodynamics Testing Program, since NASA Ames is a Federal agency and the engines and aircraft tested under the NASA Ames Aerodynamics Program would be considered exempt under the Noise Control Act of 1972. NASA attempts, whenever possible, to meet local guidelines and standards and considers them as advisory in nature. Additionally, NASA has no specific noise criteria of its own, beyond those guidelines presented in the NASA Health Standard on Hearing Conservation.[36] Despite the lack of binding regulation, NASA uses the following noise guidelines and regulations in this EIS to provide guidance for determining the relative impact of the proposed Aerodynamics Testing Program:

- *Federal Criteria*. Three Federal criteria provide guidance in determining noise impacts. These are the noise criteria from the Department of Housing and Urban Development (HUD), those from the Federal Aviation Administration (FAA), and guidelines created by the Air Force.
- *State Criteria*. The State of California Guidelines for preparation of Noise Elements of General Plans and the Caltrans Division of Aeronautics noise exposure criteria provide guidance in determining noise effects.
- *Local Criteria*. Local criteria that provide guidance near NASA Ames include noise criteria from the City of Mountain View, the City of Sunnyvale, and Santa Clara County.

Specific Federal, State, and local land use comparability noise criteria are described below and are summarized in Table 10. These noise criteria are written for various purposes. The levels provided by Federal agencies, such as HUD and the FAA, are to be used as general planning guidelines, considering cost and feasibility, along with health and welfare. HUD levels also determine if proposed sites are eligible for HUD insurance or financial assistance. The State of California Planning Guidelines were prepared as an information document to provide communities with a means of quantifying noise environments. The California Division of Aeronautics' regulation deals specifically with land use compatibility around airports. The Santa Clara County, Sunnyvale, and Mountain View criteria apply to proposed new construction. The overlap in noise exposure values over several degrees of acceptability show the variation in community acceptability to noise exposure.

(1) Federal Noise Criteria. For residential land use, outdoor DNL or CNEL below 65 dB is considered acceptable according to the Department of Housing and Urban Development (HUD) and the Federal Aviation Administration (FAA). According to the FAA, CNEL values below 70 dB are normally acceptable

[36] *National Aeronautics and Space Administration Health Standard on Hearing Conservation.* NHS/IH-1845.4. NASA Ames Research Center. 1991. This document is reviewed later in this section.

for commercial land use. Commercial land use is conditionally acceptable between 70 dB and 80 dB, while industrial land use in areas below CNEL values of 85 dB is normally acceptable. Open space use is to occur in areas below 75 dB. HUD does not detail noise criteria for land uses other than residential.

Additionally, the Air Force provides guidance on noise and compatible land uses. In 1981, the Air Force validated a Statement of Operational Need for Noise and Sonic Boom Description and Analysis. A set of guidelines were developed based on recommendations of the Committee on Hearing, Bioacoustics and Biomechanics (CHABA) of the National Academy of Sciences. This document is intended to provide detailed information for the preparation of noise related analysis of aircraft operations; however, it is also useful for analysis of wind tunnel operations and land use compatibility issues. The Air Force is also in the process of developing the Air Force Family Housing Guide, which provides specific guidance regarding noise exposure zones and appropriate mitigation for development in noise zones above DNL 65 dB. The guidelines presented by the Air Force are almost identical to those presented by the FAA, as shown in Table 10.

(2) State Noise Criteria. The California State Planning Guidelines for noise are presented in Figure 8. The State shows DNL or CNEL values below 60 dB to be acceptable for residential land use, and values below 70 dB as acceptable for commercial land use. Industrial land use in areas below CNEL values of 75 dB is also acceptable. Open space use is acceptable in areas below 70-75 dB, depending upon the specific nature of the space; for example, playgrounds are acceptable up to 70 dB and golf courses are acceptable up to 75 dB. The California Division of Aeronautics considers residential CNEL values below 65 dB to be acceptable.

(3) Local Noise Criteria. The City of Mountain View has one of the strictest residential noise standards of any municipality in California for residential land use. A DNL below 55 dB is specified for new construction, although many residences throughout the city are already exposed to more severe noise environments. The commercial and industrial land use criteria are 60 dB.

In addition to the noise exposure criteria in the Mountain View Noise Element, a noise ordinance is also referenced in the Noise Element and applied by the City. This specifies a 55 dB maximum noise level from stationary emitters in the City of Mountain View when measured at residential property lines during the daytime, and 50 dB during the nighttime (10:00 p.m. to 7:00 a.m).

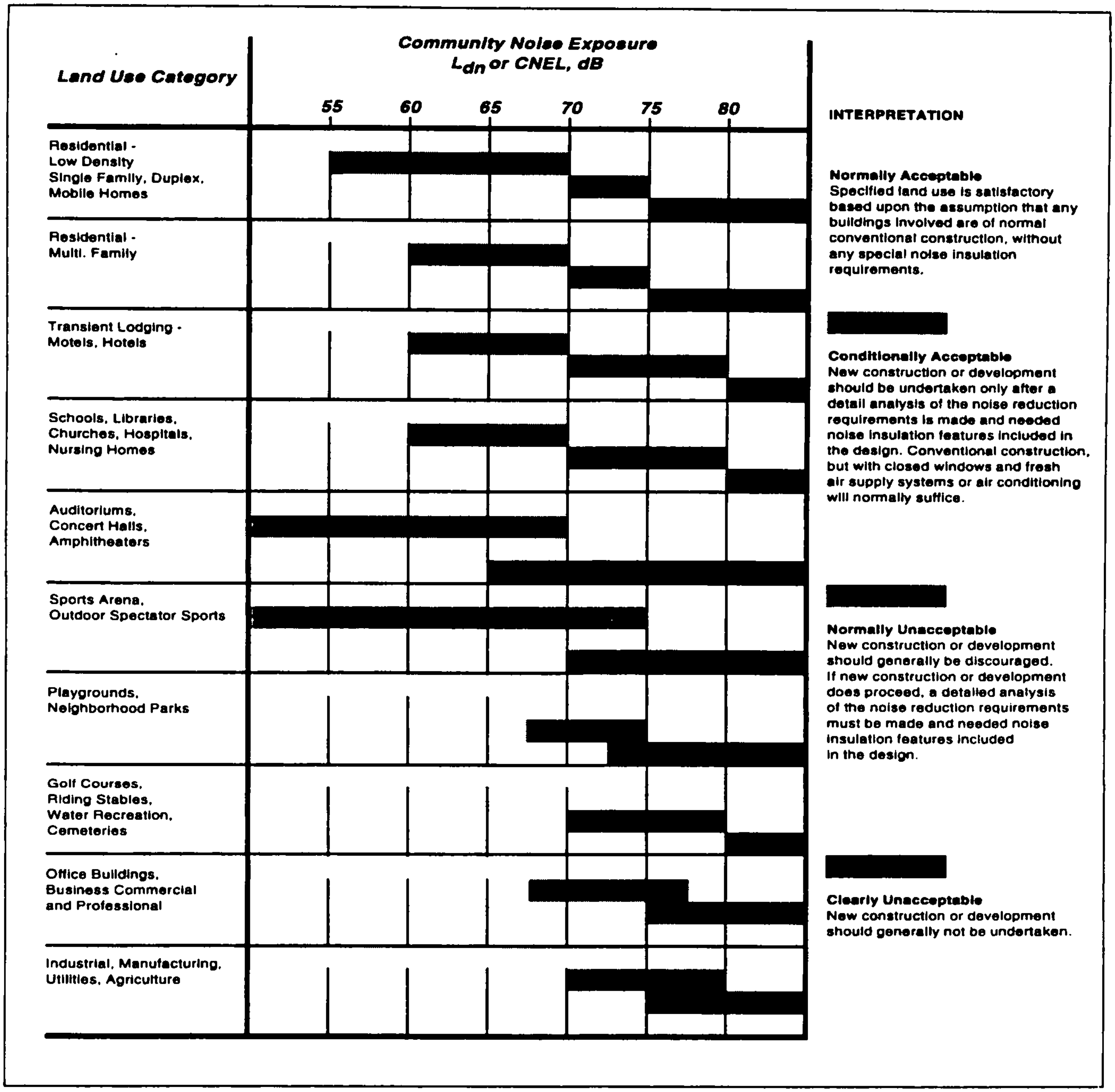

FIGURE 8

SOURCE: Guidelines for the preparation and content of the Noise Element of the General Plan. State of California Office of Planning and Research.

Land Use Compatibility for Community Noise Environments

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69-023

Table 10
LAND USE COMPATIBILITY NOISE EXPOSURE CRITERIA

Source	Measure	Residential		Commercial		Industrial		Open Space	
		Normally Acceptable	Conditionally Acceptable	Normally Acceptable	Conditionally Acceptable	Normally Acceptable	Conditionally Acceptable	Normally Acceptable	Conditionally Acceptable
Department of Housing and Urban Development (HUD)	DNL	<65	65 - 75	--	--	--	--	--	--
Federal Aviation Administration (FAA)	DNL/CNEL	<65	--	<70	70 - 80	<85	--	<75	--
Air Force	DNL/CNEL	<65	65 - 75	<70	70 - 80	<85	--	<75	--
California Planning Guidelines[a]	DNL/CNEL[b]	<60	55 - 70	<70	67.5 - 77.5	<75	70 - 80	<70 - 75	67.5 - 80
California Division of Aeronautics	CNEL[c]	<65	65 - 70	--	--	--	--	--	--
City of Mountain View	DNL/CNEL	<55	55 - 65	<60	60 - 70	<65	65 - 75	<55	55 - 65
City of Sunnyvale	DNL/CNEL	<60	60 - 70	<65	65 - 77.5	<70	70 - 80	<70	--
Santa Clara County	DNL	<55	55 - 65	<65	65 - 75	<70	70 - 75	<55	55 - 80

[a] Please refer to Figure 8.
[b] Uncorrected CNEL.
[c] Annual Average.
-- = No criteria for this land use

The Sunnyvale criteria follow the State Guidelines rather closely, the only exception being open space use, which is to occur in areas below a DNL of 70 dB. The authors of the Sunnyvale Noise Supplement indicated that CNEL and DNL should be interpreted as yearly averages throughout their document.

Like Mountain View, Santa Clara County follows the lowest noise acceptability limits found in California for residential land use, at a DNL of 55 dB.

c. Childcare and Classroom Environments. Existing land uses in the vicinity of the 40- by 80-Foot Wind Tunnel and the 80- by 120-Foot Wind Tunnel include the Air Force Onizuka Child Development Center and the Air Force Youth and Teen Center, both of which are owned and operated by the Onizuka Air Station.

Though no land use compatibility criteria applied to these facilities when they were constructed under the Navy's auspices, several criteria can provide guidance in analyzing their existing compatibility. These include the Air Force guidelines, which apply to Air Force flying operations, and regulations in California Law on freeway noise affecting classrooms.[37]

Air Force criteria[38] do not allow educational services within noise zones above a DNL of 75 dB. Additionally, if classrooms are to be allowed in outdoor noise zones with DNL values of 65 to 75 dB, specified noise reduction levels of 20 to 30 dB are to be incorporated into building construction. Normal construction can be expected to provide a noise reduction level up to 20 dB, thus these Air Force reduction requirements are more significant than that provided by typical construction. Additional consideration is to also be given to modifying noise reduction levels based on peak noise levels.

As an additional source for criteria guidelines, the California regulation on freeway noise affecting classrooms maintains a level of significance of 55 dB for interior classroom environments.

[37] California Law on Freeway Noise Affecting Classrooms. California Streets and Highways Code, Division 1, State Highways, Chapter 1 - Administration, Article 6; Section 216; Amended by Laws of 1973, Chapter 541; Laws of 1974, Chapter 645; Laws of 1975, Chapter 969; Laws of 1983, Chapter 707. Article 6: Freeway Locations.

[38] Assessing Noise Impact of Air Force Flying Operations. HQ USAF/LEEVX. March 1984.

As previously noted, there are no separate age categories for conventional community noise criteria. Noise compatibility land use criteria for schools and playgrounds are generally similar to those for other similar use spaces, such as offices and other outdoor recreation areas. There has been some evidence that children generally show fewer of the stress symptoms associated with noise annoyance than does the general population. However, the hearing mechanism of young persons is known to be somewhat more acute than in adults, as hearing has been shown to degrade with age, particularly at the higher frequencies.

3. Existing Noise Environment

The existing noise environment of NASA Ames Research Center and the surrounding community was evaluated for all areas potentially affected by the proposed NASA Ames Aerodynamics Testing Program.

Noise exposure contours and levels presented in this section were determined from NASA measurement surveys taken over the past 15 years and a noise monitoring program conducted for this EIS, which is described in Appendix E.

a. Existing Noise Sources. Noises generated by NASA Ames and Moffett Field have historically been a source of complaints from surrounding areas. Noise produced by many of the wind tunnels and aircraft operations generate complaints from residents off-site.

The following is a summary of the facilities involved in the proposed NASA Ames Aerodynamics Testing Program, and the existing noise generated at these facilities. These existing conditions are also described in Table 1 on page 25 of this EIS.

- *40- by 80-Foot Wind Tunnel.* The 40- by 80-Foot Wind Tunnel is a closed-circuit wind tunnel that currently operates an average of 100 days a year. A typical test day can consist of one or two shifts, day or night. Each test shift averages approximately four hours, with the wind tunnel running. Current maximum noise levels from this facility are presented in Figure 9.
- *80- by 120-Foot Wind Tunnel.* The 80- by 120-Foot Wind Tunnel is a non-return wind tunnel that shares the same drive system as the 40- by 80-Foot Wind Tunnel. Because both facilities use the same drive system, only one can be operated at a time. The current frequency and operation for this tunnel are similar to those of the 40- by 80-Foot test section. The 80- by 120-Foot Wind Tunnel currently operates an average of 100 days per year. Figure 10 shows the current maximum noise levels for the 80- by 120-Foot Wind Tunnel.

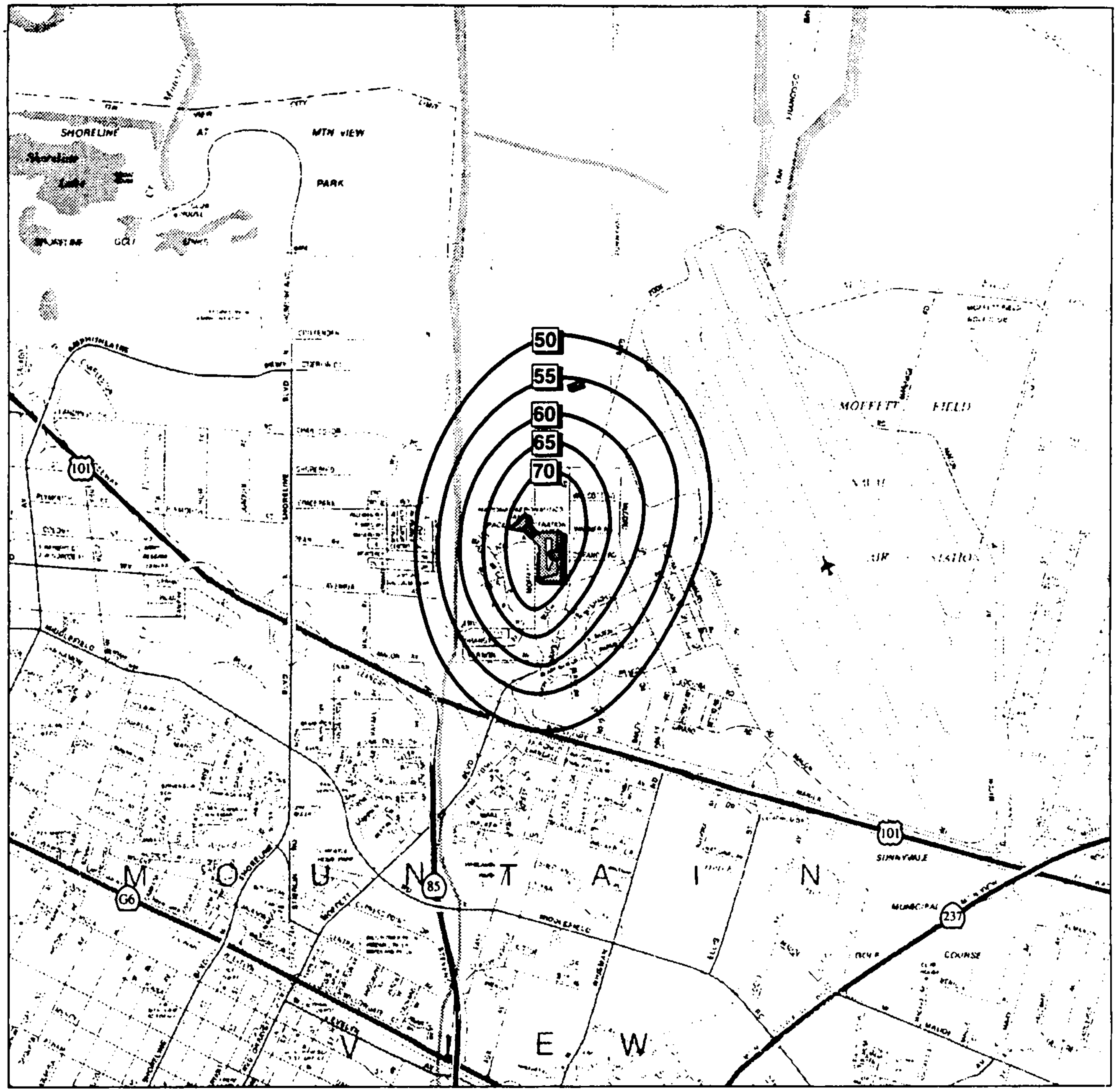

FIGURE 9

N

0 1/4 1/2
Scale in Miles

Existing 40- by 80-Foot Wind Tunnel Operations

Maximum Noise Level Contours (dB)

SOURCE: NASA Ames Research Center.

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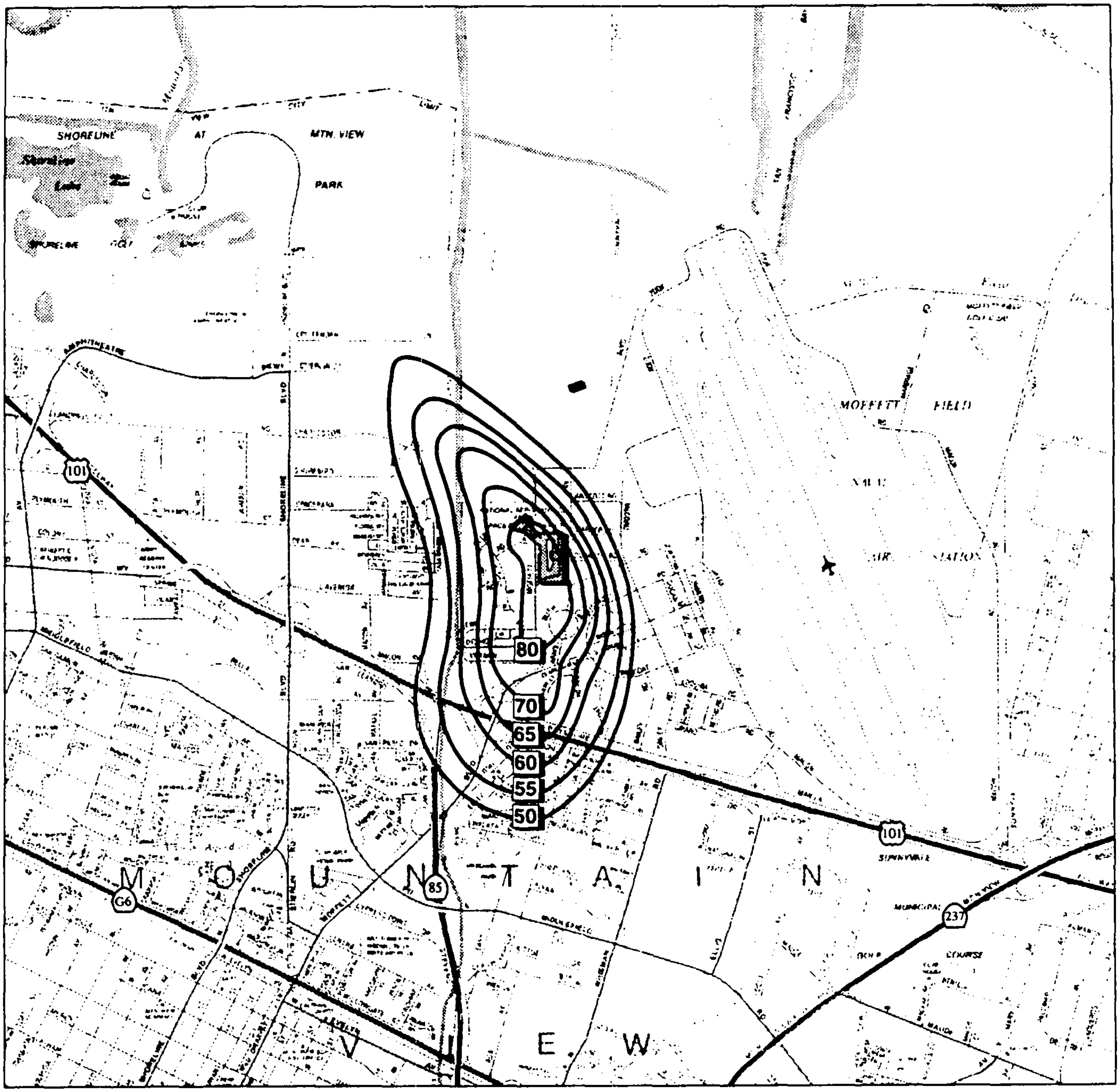

FIGURE 10

0 1/4 1/2
Scale in Miles

Existing 80- by 120-Foot Wind Tunnel Operations

Maximum Noise Level Contours (dB)

SOURCE: NASA Ames Research Center.

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469:030

NASA Ames has received noise complaints during operation of both the 40- by 80-Foot Wind Tunnel and the 80- by 120-Foot Wind Tunnel.

Additionally, the Unitary Plan Wind Tunnel Complex is the greatest source of the noise complaints received by the NASA Ames Research Center. The Unitary Plan Wind Tunnel Complex is comprised of the 11-Foot Transonic Wind Tunnel, the 9- by 7-Foot Supersonic Wind Tunnel, and the 8- by 7-Foot Supersonic Wind Tunnel. These facilities share a common drive system and operate in any combination up to three shifts per day. Noise contours for the Unitary Plan Wind Tunnel Complex do not currently exist and have not been presented in this document since operations of the complex would not change as a result of the proposed program.

The Outdoor Aerodynamic Research Facility (OARF) also produces significant noise at NASA Ames Research Center. The OARF is located in the northern portion of NASA Ames Research Center in an open area between the airfield runways and the western boundary of the property. The OARF is used to obtain a wide range of hover and acoustic data on full-scale or small-scale aircraft. The OARF is an open-air facility with a model mounting area capable of handling models and aircraft sized for installation in both of the above described wind tunnels. High noise generating projects, such as powered model tests, have run an average of two hours per day. Other tests have been administered at the facility for up to seven hours per day. Again, noise contours for the OARF have not been documented in this report since they vary considerably, and operations at the facility would not change as a result of the proposed program.

Other lower power wind tunnels and facilities at NASA Ames, such as the 12-Foot Pressure Wind Tunnel and 3.5-Foot Hypersonic Wind Tunnel, also generate noise, but their noise levels are lower than those of the facilities described above, and they have been responsible for infrequent complaints. All NASA Ames wind tunnels and facilities combined have been responsible for ten percent or less of the noise complaints at Moffett Field with the remaining complaints resulting primarily from airfield operations.

Moffett Field is home to a variety of government aircraft. Existing noise contours in CNEL for the airfield are presented in Figure 11.[39] Unlike wind tunnel operations, aircraft and airfield operations cannot be accurately portrayed in one maximum noise level contour, since several different aircraft operations and noise characteristics are considered in developing average noise exposure contours. For a

[39] *Moffett Field Comprehensive Use Plan, Final Environmental Assessment*. Moffett Field, California. NASA Ames Research Center. Brady and Associates. August 1994.

more detailed account of the types of aircraft considered in the development of these contours, refer to the Moffett Field Comprehensive Use Plan Final Environmental Assessment, which was prepared in August 1994.

Additionally, several significant noise sources beyond Moffett Field affect the surrounding community. They include heavy automobile and truck traffic along the Bayshore Freeway (U.S. 101), and noise from other thoroughfares such as the Central Express Way, Stevens Creek Freeway (Highway 85), and the South Bay Freeway (Highway 237). Traffic noise from these sources diminish greatly in the late nighttime and early morning. Additionally, the Shoreline Amphitheater can be a significant source of noise and noise complaints when concerts or similar activities are conducted. These noise sources currently create an environment perceived by some to be unacceptable.

b. Existing Ambient Noise Conditions. Composite noise exposure contours of existing noise conditions in the community are presented in Figure 12. These contours were developed using the following information:

- Noise exposure contours published in the Noise Elements of the General Plans for the City of Mountain View, City of Sunnyvale, and Santa Clara County, with extrapolations down to a DNL/CNEL of 55 dB.
- Noise exposure contours for the Moffett Field airstrip published in the 1994 Comprehensive Use Plan.
- NASA noise measurements and monitoring records for wind tunnel facilities.

To develop these contours, it was necessary to superimpose the contours from these independent sources. Where contours merged, noise exposure contributions were added.

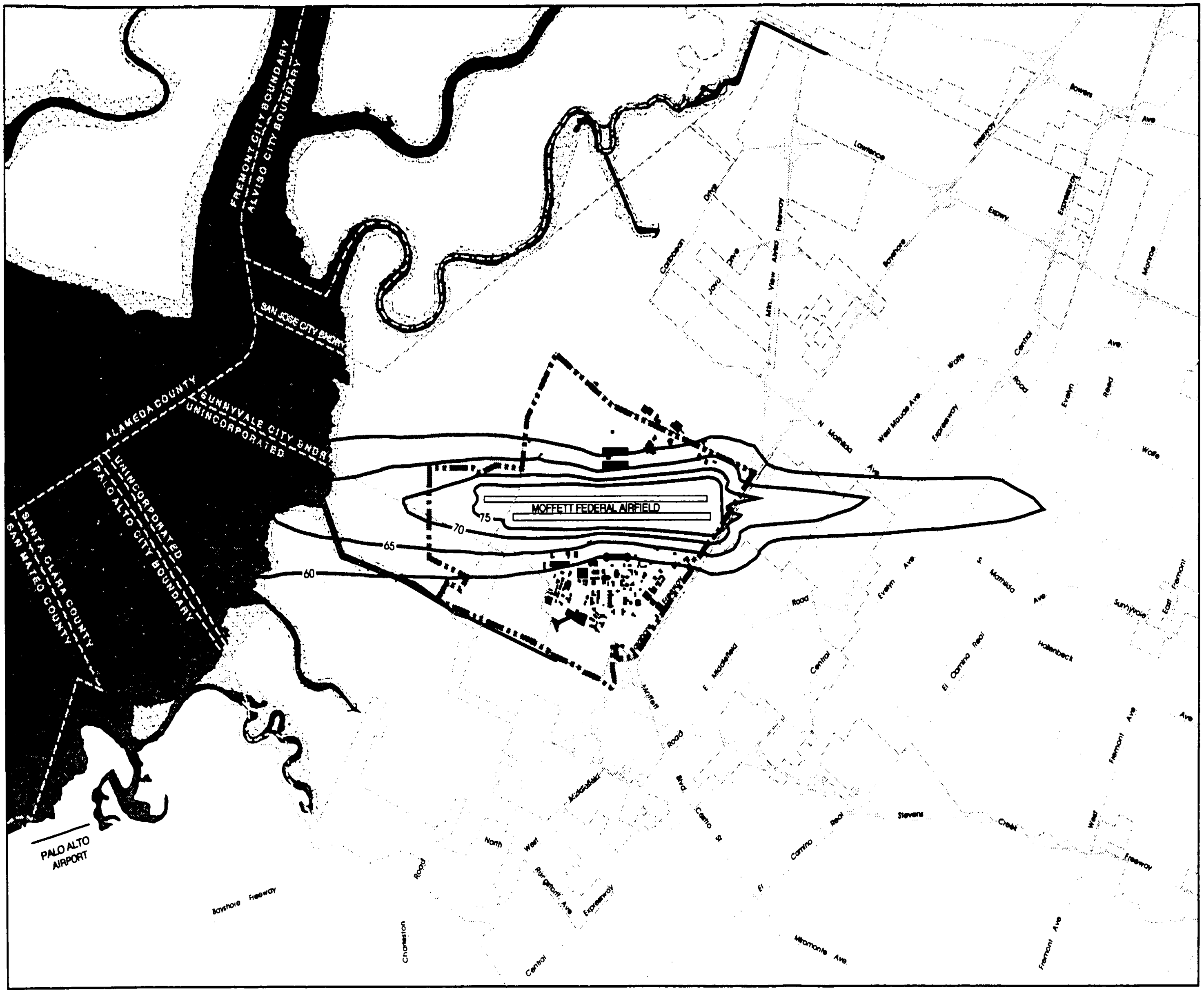
c. Existing Incompatible Land Uses. Several noise sensitive land uses already exist within incompatible noise zones near the wind tunnel complex. These include the Onizuka Child Development Center, which is currently in a daily CNEL noise zone of 80 dB. While this CNEL value includes a 10 dB penalty for nighttime testing when children are not at the facility, current daytime operation of the 80- by 120-Foot Wind Tunnel generates maximum noise levels from 75 to 80 dB at the Child Development Center, and these noise levels are currently generated up to six hours per day, as previously described. It is conceivable that these noise levels

FIGURE 11

Existing Airfield Operations Noise Exposure Contours (1995 Annual Average Noise Exposure Contours)

■ ■ ■

CNEL Noise Contour (dB)



Sources: P & D Aviation, May 1996.

scale in feet

0 2000 4000 6000 8000

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469.059

FIGURE 12

Existing Maximum Daily CNEL Noise Environment

■ ■ ■

CNEL Noise Contour (dB)

Contour Information Boundary

Sources:
1. P & D Aviation, May 1996.
2. City of Mountain View 1992 General Plan.
3. City of Sunnyvale Noise Sub-Element of the General Plan, 1985.
4. NASA Ames Research Center.

scale in feet

0 2000 4000 6000 8000

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could be reached for the entire time that many of the children are at the Center. Though these noise levels are not an averaged exposure, they provide an indication of the noise dose currently experienced at the Child Development Center. The Child Development Center is typically occupied for half of the work-day.

As previously described, Air Force criteria[40] do not allow educational services within noise zones above 75 DNL. Additionally, if classrooms are to be allowed in outdoor noise zones with DNL values of 65 to 75 dB, specified noise reduction levels of 20 to 30 dB are suggested to be incorporated into building construction, depending upon the relative noise level. Normal construction can be expected to provide a noise reduction level of approximately 20 dB; thus these reduction requirements are significantly over standard construction and normally assume mechanical ventilation and closed windows year round.

Since the Onizuka Child Development Center is a modular building (leased from a private firm), no additional sound attenuation can feasibly be implemented. Noise is typically transferred through the walls in such construction and it is infeasible to improve upon these structures.

The Youth and Teen Center is also in an existing daily CNEL noise zone of 80 dB. This would also be considered incompatible with existing operations at NASA Ames and Moffett Field using Air Force criteria. Most of the Onizuka Air Station Annex Housing and several of the closer residential land uses, such as Santiago Villa Mobile Home Park, are also considered incompatible uses with existing noise levels, under the City of Mountain View General Plan Noise Element.

[40] Assessing Noise Impact of Air Force Flying Operation. HQ USAF/LEEVX. March 1984.

D. FLORA AND FAUNA

■ ■ ■

1. Wildlife Habitat

The following upland habitats are in the vicinity of the proposed NASA Ames Aerodynamics Testing Program sites:

- Landscaped areas around buildings.
- Annual grassland/ruderal areas adjacent to developed sites between Lindbergh Avenue and Stevens Creek.
- Levee banks along Stevens Creek.

Additionally, wetlands north and west of the project site provide important habitat for many wildlife species, and including the following:

- Tidal brackish and salt marsh along Stevens Creek.
- Isolated seasonal marshes.
- Diked brackish marshes.
- Diked salt marshes.
- Storm water retention ponds.
- Salt evaporation ponds.

The locations of these habitat types are shown in Figure 13.

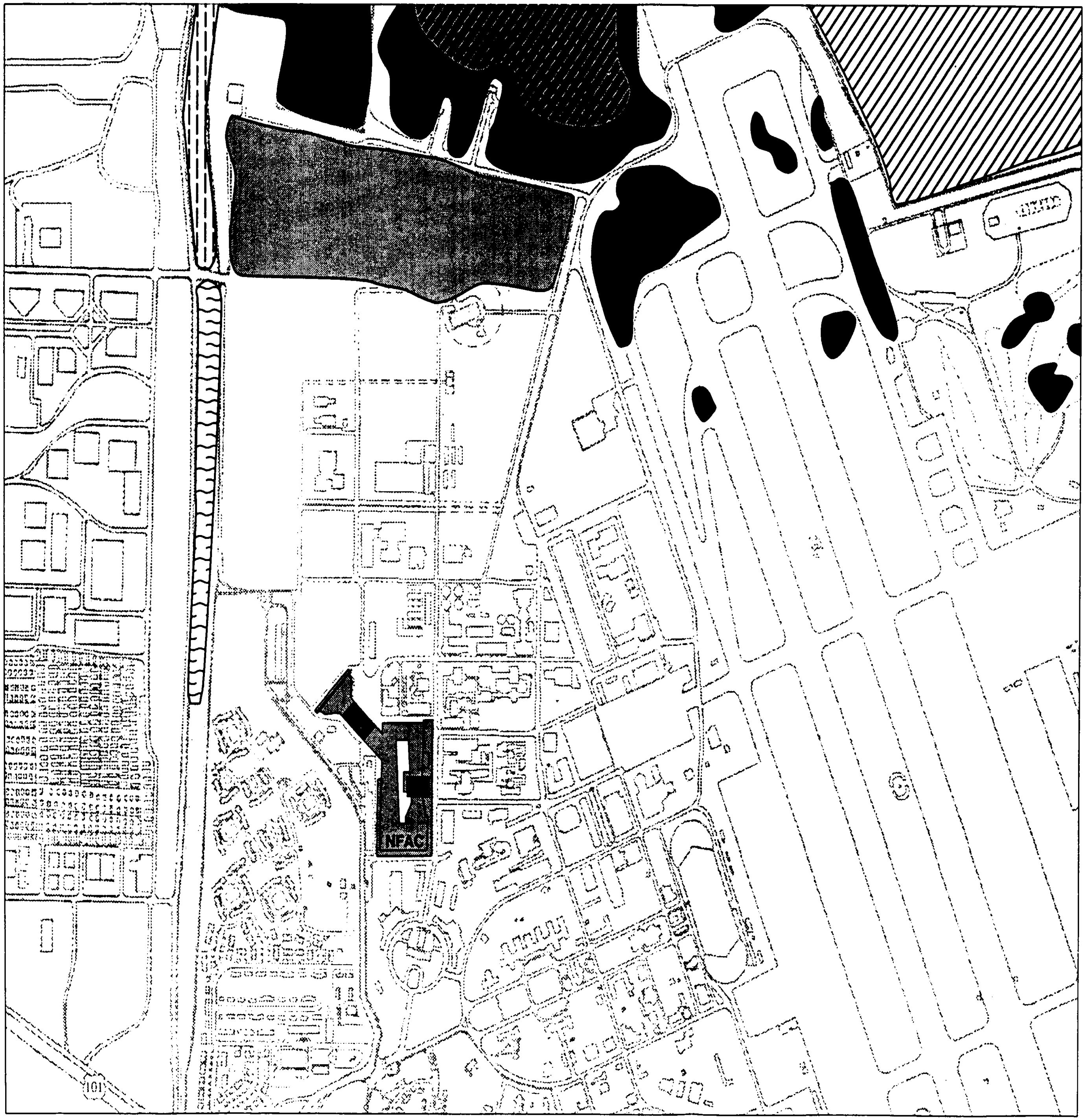
2. Wildlife Resources

All wildlife habitats within the area that may be exposed to increased noise levels have been extensively altered and disturbed by human activity over the past 150 years. There are no designated critical habitat areas within, or in the vicinity of, NASA Ames Research Center or Moffett Field. Nevertheless, the area continues to support valuable wildlife resources, including many species that are year-long residents, as well as large numbers of migratory waterfowl and shorebirds.

FIGURE 13

Wildlife Habitat

■ ■ ■



- Diked Brackish Marsh
- Diked Salt Marsh
- Isolated Seasonal Marsh
- Tidal Salt Marsh
- Tidal Brackish Marsh
- Storm water Retention Ponds
- Salt Evaporation Ponds
- Uplands Habitat/Developed Areas

SOURCE: WESCO Phase Site-wide Qualitative Habitat and Receptor Characterization Study. NAS Moffett Field, October 1993. Philip Leitner, February 1995.

N

0 350 700
Scale in Feet

AMES AERODYNAMICS TESTING

NASA AMES RESEARCH CENTER, MOFFETT FIELD, CALIFORNIA

469.043

Special-status species that are known to exist in, or are potentially present in the area include the following:

- Those currently listed as threatened or endangered under Federal or state law;
- Candidates for possible future Federal listing;
- Those with State designation as "Species of Special Concern"; and
- Those fully protected in California.

Special-status bird and mammal species are of particular interest in the context of the proposed project because any harm caused to them as a result of exposure would constitute an impact under State and Federal regulations.

A total of 14 special-status bird and mammal species have been reported to occur within 1.6 to 2.4 kilometers (1 to 1½ miles) of the facilities that would be used in the proposed project, as detailed in Table 11 and Table 12.

Half of these species are not known to breed in the area, but may exhibit transient or seasonal use. The California brown pelican, American white pelican, and California least tern are visitors to the salt evaporation ponds and may occasionally use the stormwater retention pond, as well. The western snowy plover has been reported on the salt pond levees. The American peregrine falcon and golden eagle may occasionally hunt over the area, especially in fall and winter. These wide-ranging raptors may utilize any portion of the area during hunting activity.

The other special-status species are resident throughout the year and may breed in or near the project area. Suitable habitat for the endangered California clapper rail and salt marsh harvest mouse is restricted to the tidal salt marsh along Stevens Creek and the adjoining diked salt marsh. The salt marsh common yellowthroat and possibly the black-shouldered kite nest in the diked brackish marshes just north of the Outdoor Aerodynamics Research Facility (OARF). Loggerhead shrikes nest in shrub thickets north of the OARF and hunt over a variety of adjacent habitats, including diked salt marsh, diked brackish marsh, isolated seasonal marshes, annual grassland/ ruderal areas, and levee banks along Stevens Creek. Northern harriers hunt over diked brackish marsh and annual grassland/ruderal habitat. Finally, burrowing owls utilize disturbed ruderal and landscaped areas between the wind tunnels and OARF as nesting and foraging habitat. More detail on burrowing owls is provided in Appendix H.

Table 11
SPECIAL STATUS BIRD AND MAMMAL SPECIES OCCURRING IN THE VICINITY OF NASA AMES

Common Name	Scientific Name	Sensitivity Status
Salt marsh harvest mouse	*Reithrodontomys raviventris raviventris*	FE/SE
California least tern	*Sterna antillarum browni*	FE/SE
California clapper rail	*Rallus longirostris obsoletus*	FE/SE
California brown pelican	*Pelecanus occidentalis californicus*	FE/SE
American peregrine falcon	*Falco peregrinus anatum*	FE/SE
Western snowy plover	*Charadrius alexandrinus nivosus*	FT/CSC
Black-shouldered kite	*Elanus caeruleus*	CFP
Loggerhead shrike	*Lanius ludovicianus*	C2/CSC
Western burrowing owl	*Athene cunicularia hypugea*	C2/CSC
Salt marsh common yellowthroat	*Geothlypsis trichas sinuosa*	C2/CSC
Northern harrier	*Circus cyaneus*	CSC
Golden eagle	*Aquila chrysaetos*	CSC
American white pelican	*Pelecanus erythrorhynchos*	CSC
Horned lark	*Eremophila alpestris aetia*	C2/CSC

Status Definitions
FE: Federally Endangered
FT: Federally Threatened
C2: Federal Listing May Be Warranted
SE: California (State) Endangered
CFP: California Protected
CSC: California Species of Special Concern

Source: Adapted from Table 1. WESCO. Phase I Site-wide Qualitative Habitat and Receptor Characterization Study. NAS Moffett Field. October 1993.

Table 12
WILDLIFE HABITAT AND POTENTIAL SPECIAL STATUS SPECIES

Habitat	Potential Special Status Species
Diked Brackish Marsh	Possible Salt Marsh Harvest Mouse Habitat
	Salt Marsh Yellowthroat Habitat
	Loggerhead Shrike Habitat
Diked Salt marsh	Salt Marsh Harvest Mouse Habitat
	Salt Marsh Yellowthroat Habitat
Isolated Seasonal Marsh	Loggerhead Shrike Habitat
Tidal Salt Marsh	Possible Salt Marsh Harvest Mouse Habitat
	Salt Marsh Yellowthroat Habitat
	Clapper Rail Habitat
Tidal Brackish Marsh	Possible Salt Marsh Harvest Mouse Habitat
	Salt Marsh Yellowthroat Habitat
	Clapper Rail Habitat
Upland Habitats	Loggerhead Shrike Habitat
	Burrowing Owl Habitat

3. Plant Resources

There are also a number of plant resources in the habitat areas considered in this chapter, including several rare or sensitive plant species. These resources are described in detail in the Site-Wide Ecological Assessment.[41] However, they are not considered further in this chapter because there is no evidence that they would be affected by noise or any other aspect of the project, primarily because no land clearing or development will occur if the proposed NASA Ames Aerodynamics Testing Program is implemented. It should also be noted that the City of Mountain View has asked the Army Corps of engineers to restore the Stevens Creek Marsh.

[41] WESCO. *Phase I Site-wide Qualitative Habitat and Receptor Characterization Study*. NAS Moffett Field. October 1993.

E. RECREATION

■ ■ ■

It is expected that the sole environmental change that could affect recreation would be an increase in noise. For this reason, the following sections detail the regulatory framework for noise control and recreation, and the existing recreation facilities that surround NASA Ames Research Center. Recreation facilities are also shown in Figures 14 and 15.

1. Regulatory Framework

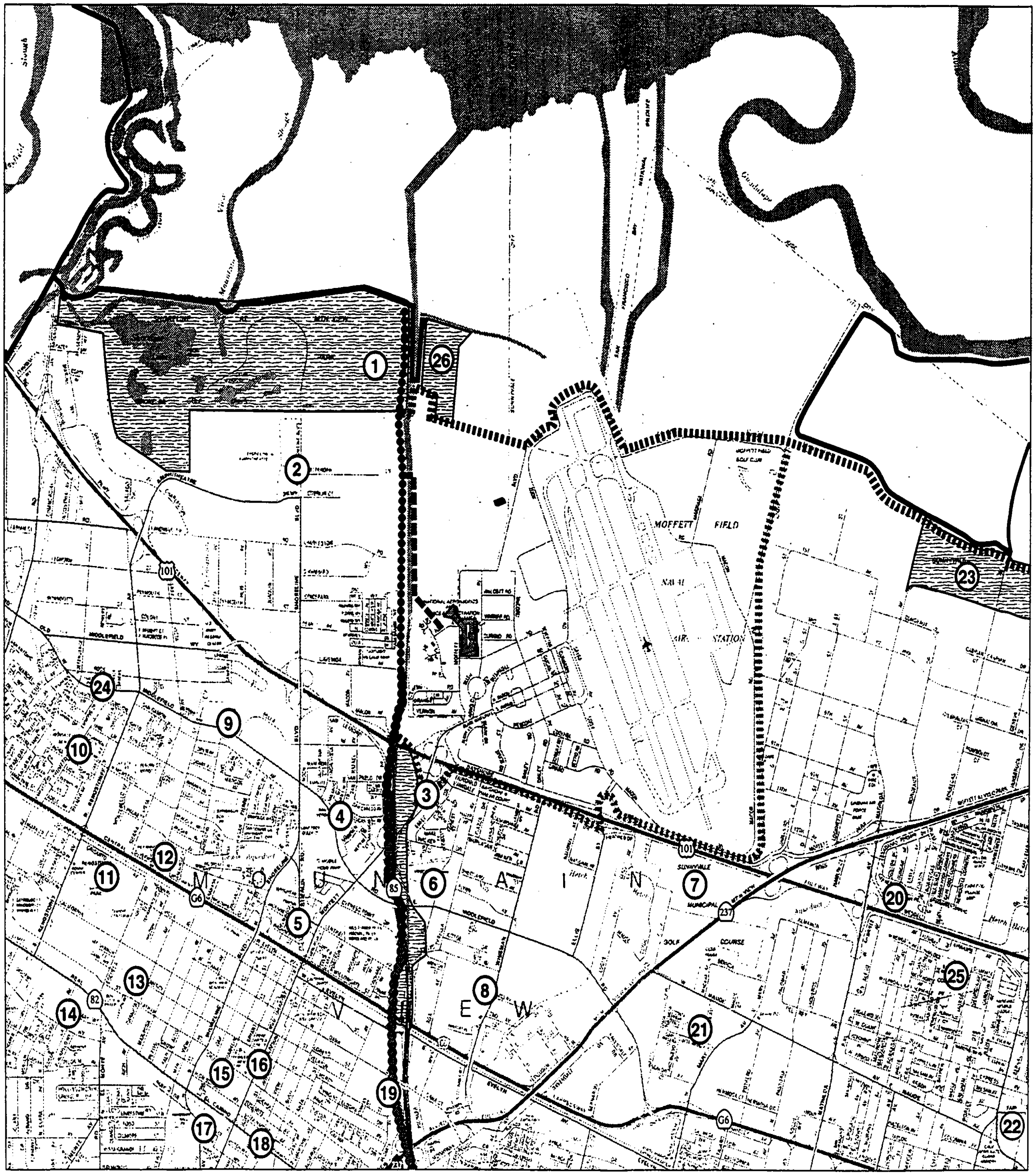
No State or local noise criteria are binding on the type of noise to be created by the NASA Ames Aerodynamics Testing Program, since NASA Ames is a Federal agency and the engines and aircraft tested under the NASA Ames Aerodynamics Program would be considered exempt under the Noise Control Act of 1972. However, NASA considers local guidelines and standards to be advisory and will work with the adjacent communities to reduce noise impacts. Several noise guidelines and regulations provide guidance for determining the relative impact of the proposed Aerodynamics Testing Program on recreation, including Federal, State, and local criteria. These criteria are presented in Table 13 for recreation and open space uses.

According to the Federal Aviation Administration, open space uses should be in areas with CNEL values below 75 dB. The California State Planning Guidelines show DNL or CNEL values below 70 to 75 dB as acceptable for open space use, depending upon the specific nature of the space; for example, playgrounds are acceptable in areas up to 70 dB, while golf courses are acceptable in areas up to 75 dB.

The City of Mountain View specifies a DNL value of less than 55 dB as acceptable for open space uses, with noise levels ranging from 55 to 65 dB listed as conditionally acceptable. Santa Clara County also specifies a DNL value of less than 55 dB as acceptable for open space, and DNL noise levels from 55 to 80 dB as conditionally acceptable for open space uses.

FIGURE 14

Surrounding Recreational Facilities



Public Parks

1. Shoreline at Mountain View
2. Shoreline Amphitheatre
3. Stevens Creek Regional Park (Proposed)
4. San Vernon Park
5. Jackson Park
6. Whisman School and Park
7. Sunnyvale Muncipal Golf Course
8. Slater School
9. Crittenden Junior High School
10. Monta Loma School
11. Rengstorff Park
12. Rex Manor Park
13. Castro School
14. Blackfield Park
15. Eagle Park
16. Pioneer Park
17. McKelvey Park
18. Fairmont Park
19. Landels School and Park
20. Orchard Gardens Park
21. Encinal Park
22. Fair Oaks Park
23. Sunnyvale Baylands
24. Thaddeus Park
25. Columbia Park
26. Stevens Creek Shoreline Nature Study Area

- Regional Park
- Stevens Creek Regional Trail (Existing)
- Stevens Creek Regional Trail (Proposed)
- San Francisco Bay Trail (Existing)
- San Francisco Bay Trail (Proposed)
- San Francisco Trail (Alternative Alignment)
- NASA Alternative Bicycle Commute Trail

N

0 1/4 1/2
Scale in Miles

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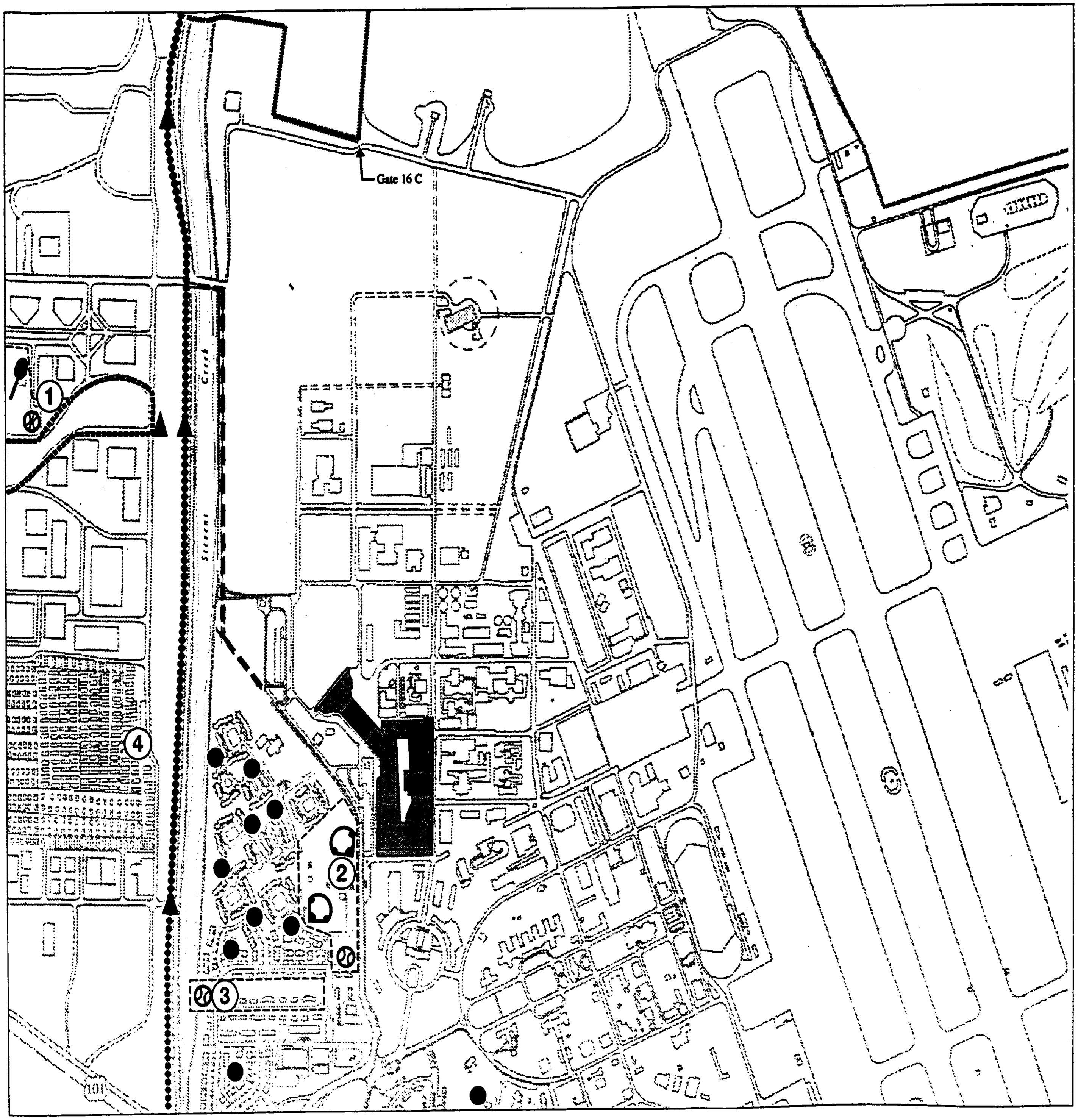
469:013

FIGURE 15

Adjacent Recreational Facilities



(1) Shoreline Technology Park
(2) Youth and Teen Center
(3) Onizuka Housing
(4) Santiago Mobilehome Park

- Baseball Diamonds
- Basketball Courts
- Tennis Courts
- Playground Facilities
- Par Course
- Stevens Creek Trail
- Stevens Creek Regional Trail (proposed)
- Trail Access
- San Francisco Bay Trail (proposed)
- NASA Alternative Bicycle Commute Trail

0 350 700
Scale in Feet

AMES AERODYNAMIC TESTING

NASA AMES RESEARCH CENTER, MOFFETT FIELD, CALIFORNIA

Table 13
OPEN SPACE AND RECREATION NOISE EXPOSURE CRITERIA

Source	Metric	Normally Acceptable	Conditionally Acceptable
Federal Aviation Administration	CNEL	<75	--
California Planning Guidelines	DNL/CNEL	<70 - 75	67.5 - 80
City of Mountain View	DNL	<55	55 - 65
Santa Clara County	DNL	<55	55 - 80

2. Recreation Facilities

a. Stevens Creek Regional Trail. Stevens Creek is a perennial stream that flows northeast from the Santa Cruz Mountains to San Francisco Bay through the cities of Cupertino, Sunnyvale, Los Altos and Mountain View. The Stevens Creek Regional Trail is a proposed 16 kilometers (10-mile) trail system beginning in Shoreline at Mountain View and crossing through several cities to the Stevens Creek Reservoir. Mountain View has completed the northernmost section of the trail (Reach 1) from Shoreline to L'Avenida.[42]

The creek corridor was first identified as a regional recreational asset more than 20 years ago.[43] Conceptual plans for the Stevens Creek Trail were defined in a 1980 report commissioned by the City of Mountain View, the Santa Clara Valley Water District, and the Midpeninsula Regional Open Space District.

The 1980 report, *Stevens Creek: A Plan of Opportunities*[44], highlights the corridor as a regional open space and recreation area and proposes that a bicycle and pedestrian trail be developed adjacent to the creek. Additionally, the importance of preserving the natural creek corridor while allowing recreational access to the open space land along the creek is stressed in the report. Environmental restoration of the creek corridor, including the reintroduction of a steelhead fishery, are proposed and only those recreational uses which would integrate with the natural environmental of Stevens Creek are recommended, such as walking, jogging, bicycling, fishing and nature exploration.

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[42] *City of Mountain View 1992 General Plan. A Comprehensive Revision of the 1982 Mountain View General Plan*. City of Mountain View. October 29, 1992.

[43] *Regional Parks, Trails and Scenic Highways Element*. Santa Clara County General Plan.

[44] *Stevens Creek: A Plan of Opportunities*. The Planning Collaborative Inc. 1980.

The 1991 *Stevens Creek Trail and Wildlife Corridor Feasibility Report*[45] analyzes the benefits of the Stevens Creek Trail, identifies a trail alignment through City-owned land along the creek, provides preliminary environmental assessment of the creek corridor, and identifies guidelines of agencies with jurisdiction along the creek and develops conceptual engineering solutions based on the agencies' criteria.

Plans for the Stevens Creek Regional Trail are divided into five "reaches" or sections. Reach 1 and Reach 2 are in the vicinity of Moffett Field, as illustrated in Figure 16. Reaches 3, 4, and 5 connect the first two reaches to the City of Los Altos.

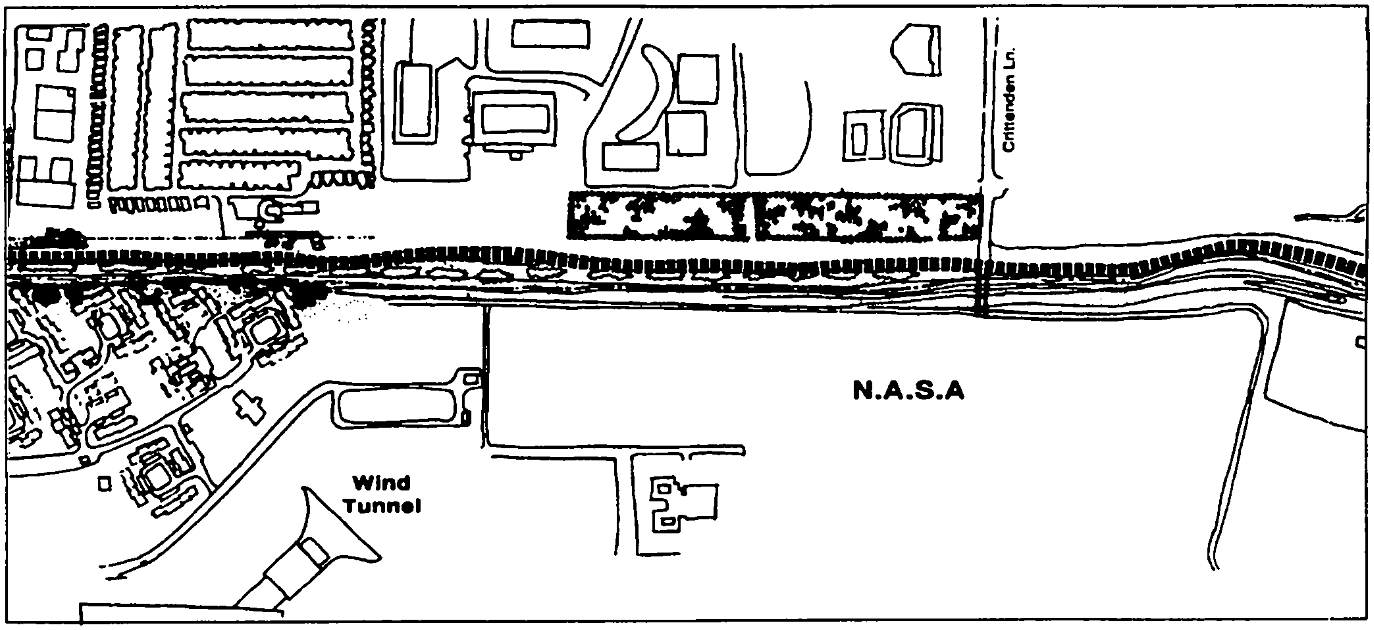
Reach 1 (Shoreline at Mountain View to L'Avenida) of the Stevens Creek Trail and Wildlife Corridor was studied, designed, funded and constructed prior to the completion of the 1991 feasibility report. It begins on the west bank of the creek within Shoreline at Mountain View and extends to L'Avenida. This 2 kilometers (1¼ mile) section of trail travels along the top of a Santa Clara Valley Water District levee. The northern end of the trail intersects both the Bay Trail and more than 11.2 kilometers (7 miles) of trails within Shoreline at Mountain View.

Reach 2 (L'Avenida to Whisman School) of the trail system will begin on the west bank of Stevens Creek at L'Avenida and will extend to Whisman School on the east bank of the creek. This 1.2 kilometer (¾-mile) section of the trail will pass beneath Highway 101, cross Moffett Boulevard and bridge over the creek to Whisman School. Construction on this Reach of the Stevens Creek Trail Corridor has recently begun.

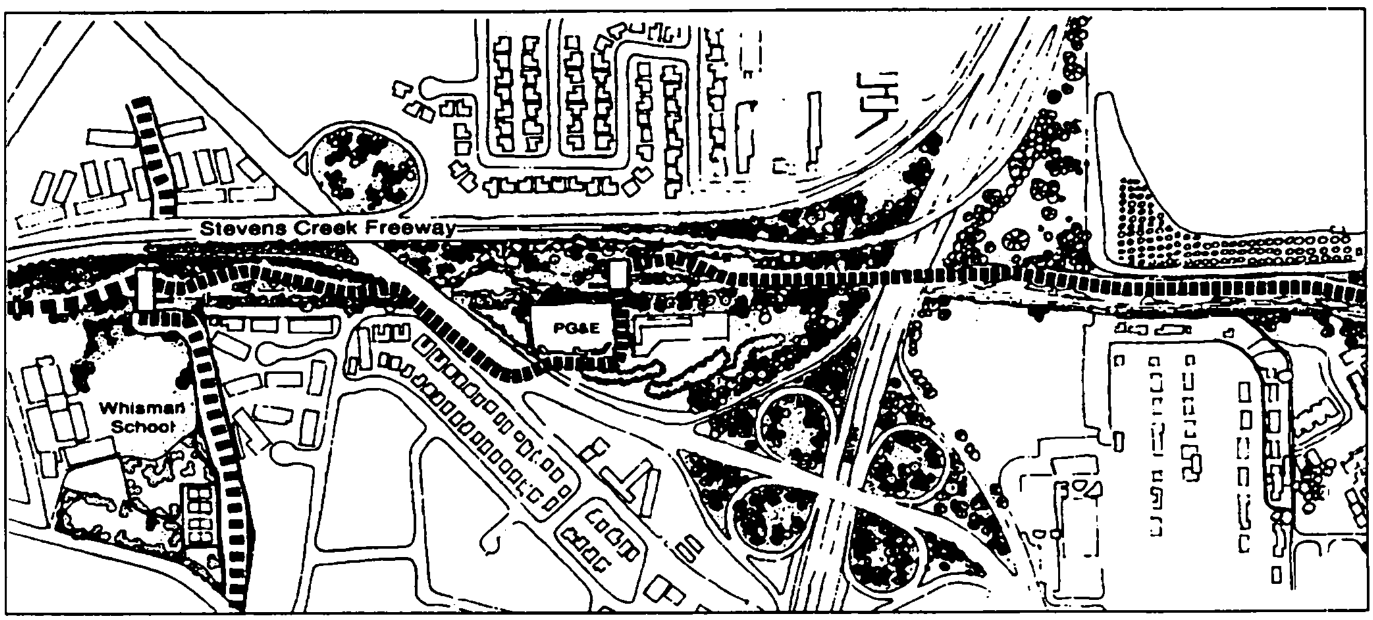
b. Shoreline at Mountain View. Shoreline at Mountain View is a 268 hectare (662 acre) regional recreation and wildlife preserve which forms the northern boundary of the City of Mountain View. This regional park has a 81 hectare (200 acre) golf course, and valuable wetland and upland habitat. Jogging, bicycling, wind surfing, small boat sailing, golf, and environmental education are among the activities available at Shoreline.

Shoreline at Mountain View has approximately 11.2 kilometers (7 miles) of paved pedestrian and bicycling trails. To the west, trails link up with the Palo Alto Baylands. Additionally, the trails at Shoreline link with the Stevens Creek

[45] *Stevens Creek Trail and Wildlife Corridor, Feasibility Report.* City of Mountain View. Jana Sokale, Environmental and Development Consultant. 1991.



A. Reach 1: Shoreline at Mountain View to L'Avenida



A. Reach 2: L'Avenida to Whisman School

FIGURE 16

N
Not to Scale

Stevens Creek Regional Trail

SOURCE: Stevens Creek Trail and
Wildlife Corridor; Feasibility Report.
City of Mountain View.
Jana Sokale. 1991.

Regional Trail
System

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Shoreline Nature Study Area (formerly known as the Crittenden Marsh) on the east of Stevens Creek, which is owned by the Midpeninsula Regional Open Space District.

The Shoreline Golf Links is a championship, par-72 course. Additionally, next to the Golf Links, there are restaurant and banquet facilities at *Michael's at Shoreline* and the newly restored, historic *Rengstorff House*.

The 20 hectare (50 acre) salt water *Shoreline Lake* provides sailing and wind surfing opportunities. The lake is human-made and is filled by a pumping system that brings salt water in from the San Francisco Bay via the Charleston Slough. The outflow empties into Permanente Creek which, in turn, flows back into the Bay. Steady wind conditions on the lake make it an ideal spot for sailing or wind surfing. Additionally, small craft, such as paddleboats, sail-boards and canoes, are available at the *Boathouse*, which operates year-round at Shoreline Lake.[46]

The City of Mountain View proposes to continue its support of Shoreline at Mountain View by improving and expanding wildlife habitats and recreational uses within the area. Future efforts of the City include ensuring unobstructed views of the Bay, supporting U.S. Fish and Wildlife Service San Francisco Bay Wildlife Refuge plans for expansion, continued restoration of open spaces for wildlife use, and development of a circulation plan to improve pedestrian and bicycle access to Shoreline.[47]

c. San Francisco Bay Trail. The San Francisco Bay Trail is a planned 400-mile (644 kilometers) bicycle and pedestrian trail system around the shoreline of San Francisco and San Pablo Bays. The trail was established by the California State Legislature in 1987. The Association of Bay Area Governments (ABAG) conducted a two-year planning process and approved the Bay Trail Plan in 1989, and is responsible for implementing the plan in cooperation with local governments, agencies and property owners around the Bay. Bay Trail policies and design guidelines are intended to complement the adopted regulations of local management agencies. When completed, the Trail will link shoreline trail systems through nine counties, 42 cities, and over 130 parks and public open space preserves.

[46] *Shoreline at Mountain View*. Informational Brochure. Reprint, February 1994.

[47] *City of Mountain View 1992 General Plan. A Comprehensive Revision of the 1982 Mountain View General Plan*. City of Mountain View. October 29, 1992.

ABAG, in cooperation with the South Bay Ad Hoc Committee of the San Francisco Bay Trail coalition, is studying the feasibility of extending the Bay Trail to connect existing Bay Trail segments in the cities of Sunnyvale and Mountain View.

The alignment preferred by the Ad Hoc Committee is along the northern side of Moffett Field, near the waters of the San Francisco Bay. NASA has concerns over the development of the northern route of the Bay Trail because it would bring public users of the trail within the vicinity of active ordnance magazines, ordnance handling pads, a firing range, the Outdoor Aeronautics Research Facility (OARF), and the end of the runway at Moffett Field. Laser research is also periodically conducted in close proximity to the proposed northern alignment.

On December 15, 1994, the San Francisco Bay Conservation and Development Commission (BCDC) approved a Consistency Determination for the Moffett Field Comprehensive Use Plan, which allows for the development of the Bay Trail to the maximum extent feasible consistent with safety and security needs at Moffett Field. To date, safety and security needs have precluded the development of the Bay Trail to the north of Moffett Field and Ames Research Center. However, NASA has begun discussions with the Ad Hoc Committee regarding the development of a trail segment from the footbridge crossing Stevens Creek at Shoreline to the peninsula at the stormwater retention pond at NASA Gate 16c.

d. Other Recreation Facilities. In addition to the recreation opportunities described above, the cities of Mountain View and Sunnyvale maintain a variety of parks and open space opportunities. These facilities are shown in Figure 14.

e. Private Recreation Facilities. In the vicinity of Moffett Field, several recreation facilities are maintained by private and Federal organizations. These include private recreation facilities in business parks, Federal recreation facilities in the Onizuka Air Station Annex, and those facilities within the Moffett Federal Airfield. These facilities are shown on Figure 15.

(1) Shoreline Technology Park Recreation Area. Just west of Moffett Field, the Shoreline Technology Park, whose primary tenant is Silicon Graphics, maintains a recreation area that provides a variety of open space and recreation opportunities. These include tennis courts, basketball courts, a baseball diamond, volleyball courts, picnic facilities, and a par course that surrounds an open wetland area. These facilities are maintained for the private use of employees and tenants at the Shoreline Technology Park. Access to the Stevens Creek Regional Trail is also available from the par course trail system.

(2) Onizuka Housing Recreation Facilities. Within the Federally owned Onizuka Air Station Annex there are several recreational facilities provided for the use of the residents of the housing area. These include several baseball diamonds and basketball courts, the Youth and Teen Center, and many playground facilities scattered throughout the housing areas. Additionally, there is a par course facility to the south of the Senior Officer's Quarters, located in the eastern annex. This trail system also provides access to the Moffett Field recreation facilities described below.

(3) Moffett Field Recreation Facilities. Adjacent to the southern portion of the runways of Moffett Field are some military and civilian recreation facilities. This area serves as the central core of Moffett Field and includes a park, playing fields and picnic grounds.

NASA has also developed the Bicycle Commute Trail, which is shown in Figures 14 and 15. This bicycle and pedestrian path is located from the Stevens Creek Regional Trail to the Wright Avenue gate (gate 17) of NASA Ames Research Center. The trail is open during daylight hours on days when Ames Research Center is open. It is used for Ames civil service and contractor personnel, and the general public, when going to or from Ames Research Center.

Additionally, the Onizuka Air Station Service Flight and the Navy Air Reserves provide leisure time entertainment for active duty and retired military personnel. Recreational facilities include a gymnasium, swimming pool, golf course and club house, racquetball courts, recreational parks and tennis courts.[48]

[48] *Naval Air Station Moffett Field, Existing Conditions Report, Phase 2.* NASA Ames Research Center Facilities Planning Office. May 22, 1992.

F. AIR QUALITY

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1. Regulatory Environment

Both the U.S. Environmental Protection Agency and the California Air Resources Board have established ambient air quality standards for common pollutants. These ambient air quality standards set levels of contaminants which represent safe levels that avoid specific adverse health effects associated with each pollutant. The ambient air quality standards cover what are called "criteria" pollutants because the health and other effects of each pollutant are described in criteria documents. Table 14 identifies the major criteria pollutants, characteristics, health effects and typical sources.

The Federal and California State ambient air quality standards are summarized in Table 15 for important pollutants. The Federal and State ambient standards were developed independently with differing purposes and methods, although both processes attempted to avoid health-related effects. As a result, the Federal and State standards differ in some cases. In general, the California State standards are more stringent. This is particularly true for ozone and particulate matter (PM-10).

The Federal Clean Air Act and the California Clean Air Act of 1988 require that the State Air Resources Board, based on air quality monitoring data, designate portions of the State where the Federal or State ambient air quality standards are not met as "nonattainment areas". Because of the differences between the national and State standards, the designation of nonattainment areas is different under the Federal and State legislation.

a. Federal Air Quality Regulations. For the purposes of the Federal Clean Air Act all of the urban areas of the San Francisco Bay Area Air Basin, including those in Santa Clara County, have been designated as a moderate "nonattainment area" for carbon monoxide and a "maintenance area" for ozone. The County is an attainment area or is unclassified for all other national ambient air quality standards.[49] Measured levels of ozone and

[49] Bay Area Attainment Status Summary. Bay Area Air Quality Management District (BAAQMD). September 1993. Updated and confirmed via personal communication with Jane McCrea. Public Information Office. BAAQMD. May 11, 1995.

Table 14
MAJOR CRITERIA AIR POLLUTANTS

Pollutant	Characteristics	Health Effects	Major Sources
Ozone (O_3)	A highly reactive photochemical pollutant created by the action of sunshine on ozone precursors (primarily reactive hydrocarbons and oxides of nitrogen), often called photochemical smog. Common nomenclature for ozone precursors include ROG (Reactive Organic Gases), TOG (Total Organic Gases), and VOC (Volatile Organic Compounds). VOC, TOG and ROG are all measures of hydrocarbon emissions. VOC includes only hydrocarbons that evaporate into the atmosphere. VOC and TOG are functionally very similar. ROG, however, only includes specific volatile compounds known to take part in the photochemical reaction in the atmosphere that produces ozone. ROG is therefore a fraction of VOC and TOG. All three measures of hydrocarbons are used by different air quality agencies.	• Eye Irritation • Respiratory function impairment.	The major sources ozone precursors are combustion sources such as factories and automobiles, and evaporation of solvents and fuels.
Carbon Monoxide (CO)	Carbon monoxide is an odorless, colorless gas that is highly toxic. It is formed by the incomplete combustion of fuels.	• Impairment of oxygen transport in the bloodstream. • Aggravation of cardiovascular disease. • Fatigue, headache, confusion, dizziness. • Can be fatal in the case of very high concentrations.	Automobile exhaust, combustion of fuels, combustion of wood in woodstoves and fireplaces.
Nitrogen Dioxide (NOx)	Reddish-brown gas that discolors the air, formed during combustion.	• Increased risk of acute and chronic respiratory disease.	Automobile and diesel truck exhaust, industrial processes, fossil-fueled power plants.
Sulfur Dioxide (SO_2)	Sulfur dioxide is a colorless gas with a pungent, irritating odor.	• Aggravation of chronic obstructive lung disease. • Increased risk of acute and chronic respiratory disease.	Diesel vehicle exhaust, oil-powered power plants, industrial processes.
Particulate Matter (PM-10)	Solid and liquid particles of dust, soot, aerosols and other matter which are small enough (<10 microns [μ] in diameter) to remain suspended in the air for a long period of time.	• Aggravation of chronic disease and heart/lung disease symptoms.	Combustion, automobiles, field burning, factories and unpaved roads. Also a result of photochemical processes.

Source: Donald Ballanti, Certified Consulting Meteorologist.

Table 15
FEDERAL AND STATE AMBIENT AIR QUALITY STANDARDS

Pollutant	Averaging Time	Federal Primary Standard	State Standard
Ozone (O_3)	1-Hour	0.12 PPM	0.09 PPM
Carbon Monoxide (CO)	8-Hour	9.0 PPM	9.0 PPM
	1-Hour	35.0 PPM	20.0 PPM
Nitrogen Dioxide (NO_x)	Annual	0.05 PPM	--
	1-Hour	--	0.25 PPM
Sulfur Dioxide (SO_2)	Annual	0.03 PPM	--
	24-Hour	0.14 PPM	0.05 PPM
	1-Hour	--	0.5 PPM
PM-10	Annual	50 $\mu g/m^3$	30 $\mu g/m^3$
	24-Hour	150 $\mu g/m^3$	50 $\mu g/m^3$
Lead	30-Day Avg.	--	1.5 $\mu g/m^3$
	Month Avg.	1.5 $\mu g/m^3$	--

PPM = Parts per Million
$\mu g/m^3$ = Micrograms per Cubic Meter

carbon monoxide in the San Francisco Bay Air Basin have improved to the point that the Bay Area Air Quality Management District (BAAQMD) requested redesignation of the area as a maintenance area for ozone and carbon monoxide.[50]

The states were required to prepare a State Implementation Plan (SIP) to show how the Federal standards were to be attained by 1987. The Bay Area portion of the SIP was the *1982 Bay Area Air Quality Plan*.[51] Despite considerable improvement in air quality, the Bay Area did not meet the 1987 deadline for attainment of the Federal air quality standards.

The Federal Clean Air Act Amendments of 1990 mandate a new attempt at attaining the national standards, requiring that nonattainment areas develop plans and strategies to meet the Federal standards. Failure to meet the requirements of the Federal Clean Air Act could result in the imposition of sanctions (e.g., withholding

[50] Bay Area Air Quality Management District (BAAQMD) et. al., *San Francisco Bay Area Redesignation Request and Maintenance Plan for the National Ozone and Carbon Monoxide Standard*, August 1993.

[51] ABAG, BAAQMD and MTC; *1982 Bay Area Air Quality Plan*, December 1982.

of highway project funding). The Federal Clean Air Act, as amended, requires that Federal actions be found in conformity with the State Implementation Plan (SIP) for non-attainment and maintenance areas. Conformity to a SIP is defined as being consistent with a SIP's purpose of eliminating or reducing the severity and number of violations of the national ambient air quality standards (NAAQS) and achieving expeditious attainment of such standards.[52] The Federal agency responsible for the action is required to determine if its actions conform to the applicable SIP.

b. State Air Quality Regulations. Under the California Clean Air Act Santa Clara County is a moderate nonattainment area for carbon monoxide, a serious nonattainment for ozone, and a nonattainment area for PM-10. The county is either in attainment or unclassified for other pollutants.[53]

The California Clean Air Act requires local air pollution control districts to prepare air quality attainment plans. These plans must provide for district-wide emission reductions of five percent per year averaged over consecutive three-year periods or if not, provide for adoption of "all feasible measures on an expeditious schedule". The Act also grants air districts explicit statutory authority to adopt indirect source regulations and transportation control measures, including measures to encourage or require the use of ridesharing, flexible work hours or other measures which reduce the number or length of vehicle trips.

The area-wide plan required by the California Clean Air Act was adopted in October 1991.[54] The Plan proposes the imposition of controls on stationary sources (factories, power plants, industrial sources, etc.) and Transportation Control Measures designed to reduce emissions from automobiles. Since the Plan does not provide for a 5 percent annual reduction in emissions, it proposes the adoption of "all feasible measures on an expeditious schedule".

2. Current Air Quality

NASA Ames Research Center is within the nine-county Bay Area Air Basin. The BAAQMD operates air quality monitoring sites throughout the Bay Area, including one in neighboring Mountain View. The Mountain View monitoring site measures

[52] 42 U.S.C. 7401 et seq.

[53] Bay Area Attainment Status Summary. Bay Area Air Quality Management District (BAAQMD). September 1993. Updated and confirmed via personal communication with Jane McCrea. Public Information Office. BAAQMD. May 11, 1995.

[54] Bay Area Air Quality Management District, *Bay Area '91 Clean Air Plan (CAP)*, 1991.

a single pollutant, ozone. The nearest multi-pollutant monitoring sites are in Redwood City, several miles to the north, and in downtown San Jose, several miles to the south. A summary of air quality data from these monitoring sites are shown in Table 16.

Table 16 shows that the Federal ambient air quality standards for most criteria pollutants are met in the South Bay. Concentrations of ozone and PM-10 do, however, exceed the State standards. A general north-to-south deterioration in air quality is evident in the data shown in Table 16.

The operation of Moffett Field and the NASA Ames Research Center currently generates air pollutant emissions from aircraft operations and stationary sources. Recent estimates of current levels of annual emissions are summarized in Table 17 for the three most important pollutants. These pollutants are considered important because they are a nonattainment pollutant (CO) or they are precursors to a maintenance pollutant (ROG and NOx). The stationary source emissions shown in Table 17 are permitted by the BAAQMD, and NASA is currently pursuing a permit to add propulsion testing in the NFAC wind tunnel facilities as a stationary source. Additionally, aircraft operations are exempt from the BAAQMD permit process.

Table 16
SUMMARY OF AIR QUALITY DATA FOR MOUNTAIN VIEW, SAN JOSE AND REDWOOD CITY[a]

Pollutant	Standard	Station	Days Exceeding Standard in: 1991	1992	1993	1994
Ozone (O_3)	Federal 1-Hour	Mountain View	0	0	0	0
		San Jose	0	0	0	0
		Redwood City	0	0	0	0
Ozone (O_3)	State 1-Hour	Mountain View	3	1	2	0
		San Jose	6	3	3	3
		Redwood City	0	0	1	0
Carbon Monoxide (CO)	State/Federal 8-Hour	San Jose	4	0	0	0
		Redwood City	0	0	0	0
PM-10	Federal 24-Hour	San Jose	1	0	0	0
		Redwood City	0	0	0	0
PM-10	State 24-Hour	San Jose	10	13	10	7
		Redwood City	12	7	5	6

[a] California Air Resources Board, *California Air Quality Data*, Annual Summaries, 1992-1994.

Table 17
CURRENT AIRCRAFT AND STATIONARY SOURCE EMISSIONS FOR MOFFETT FIELD
(Tons Per Year)

	CO	ROG	NOx
Aircraft Operations[a]	207	117	62
Stationary Sources[b]	3	3	13
NFAC Propulsion Testing[c]	3	1	27
Total	213	121	102

ROG = Reactive Organic Gases
NOx = Nitrogen Oxides
CO = Carbon Monoxide

[a] NASA Ames Research Center, *Moffett Field Comprehensive Use Plan Final Environmental Assessment*, 1994.

[b] Bay Area Air Quality Management District (BAAQMD), *Source Emissions for Plant No. 550, 1995*.

[c] NASA Ames Research Center, April 1995.

G. SOCIOECONOMICS

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This chapter examines background information on the potential socioeconomic effects of the proposed NASA Ames Aerodynamics Testing Program by analyzing the existing effects of noise on the property values surrounding the site. Further baseline information on population and income can be found in Section B of this chapter under the discussion on environmental justice.

1. NASA Ames Research Center and the Local Economy

The mission of the NASA Ames Research Center is to conduct research and to develop new aerospace technology that improves the safety and performance of aircraft and supports space-exploration efforts. The Center also performs a supporting role to other NASA centers in research and development of technology for crew-tended spacecraft such as the space shuttle. In addition, NASA Ames directs the operation and management of flight research, flight tests, and supporting activities. Specifically, the NASA Ames mission specifies the following objectives that are applicable to the proposed NASA Ames Aerodynamics Testing Program:

<u>Aeronautics and Flight Systems</u>.

- *Fundamental Aerodynamics*. Advancing the general state-of-the-art, both theoretical and experimental.
- *Short-Haul Aircraft Technology*. Developing a technology base for facilitating incorporation of short-haul aircraft into overall air transportation systems.
- *Helicopter Technology*. Acting as lead center for helicopter technology for NASA and developing a technology base for improving efficiency and flexibility for both civil and military applications.
- *Computational Fluid Dynamics*. Furthering the state-of-the-art through the definition of new systems, both hardware and software, and the application to aeronautical and other related areas.
- *Flight Simulation*. Improving the state-of-the-art to permit more effective use of simulators in aircraft design and validation-of-flight simulation.

- *Military Support.* Providing technical support to military aviation in areas consistent with other NASA Ames aeronautics roles and unique NASA Ames capabilities.

NASA Ames Research Center has approximately 3,400 civil servants and support service contractors as well as approximately 575 full- and part-time academic researchers. The strong research and development capabilities of NASA Ames Research Center, the secure Federal airfield of Moffett Field, and the diverse operational capabilities of the Resident Agencies at Moffett Field benefit the local community, industries, and educational institutions.

NASA Ames Research Center's support for the development of new products and activities includes the research and testing of newly emerging technologies. Many of the facilities and capabilities of NASA Ames are in great demand by private industries, due to their relative uniqueness.

2. Noise and Property Values: Background Information

No studies of the effects of an aerodynamics testing program, or a similar project, on property values are available. However, research is available related to airport noise and its effect on property values. A summary of the most relevant studies associated with the proposed project is provided in Appendix J and summarized below.

The two most relevant studies on the impact of airport noise on property values identified were prepared in 1990 and 1994 regarding the Manchester International Airport in Stockport, England. Though these reports are the best available data for assessing property value impacts related to the noise generated from the proposed program, there are some very important differences between these types of noise generated under different conditions. Jet noise associated with planes landing at airports does not emanate from a stationary location as it would with the proposed testing program. Activity of an airport is also more constant and occurs over a longer period of time during the day and week than noise generating activities of the proposed testing program.

The first study at Manchester International Airport, conducted in 1990, modeled the effects of noise on 3,472 property sales over an eleven-year period. The analysis included such variables as type of residential unit, number of bedrooms, and other property characteristics such as presence of a garage, garden or home central heating. The properties sales were assigned a neighborhood classification system, which distinguished each property by residential neighborhood characteristics.

Each property was also assigned a common noise index, which is know as the Noise and Number Index (NNI).[55] This noise descriptor is the measurement commonly used in England.

The 1990 analysis concluded that properties located in areas affected by the noise of aircraft using Manchester International Airport appeared to have lower market values than those in other parts of Stockport. However, these differences could be attributed to neighborhood quality, locational attributes and other characteristics of the properties, not necessarily related to airport noise.[56] In addition, there are several shortcomings of this study that include the lack of certain data, including detailed information on the size and condition of each dwelling and property and the proximity of each property to amenities such as parks or schools. For this reason, the 1990 analysis was challenged and the issues reconsidered in 1994.

The second analysis of the Manchester International Airport used the same data set as the 1990 analysis. However, the 1994 analysis used an artificial neuron network (ANN) model. This model attempts to replicate the inner workings of the human brain in a mathematical computer model.[57] The ANN model starts with an input of the variables without the effect of the variable being tested (in this instance a property value that varies by noise level). The model then "learns" through thousands of iterations to predict the noise levels at each property. The model results found that after controlling for housing and neighborhood characteristics, noise levels of NNI of 40 dB decreased property values from four to ten percent,

[55] The Noise and Number Index (NNI) is used in the United Kingdom to assess aircraft noise impacts. The NNI considers the average level of noisiness in units of perceived noise level (PNL in dB) during the daytime period, and then considers the number of audible events exceeding 80 dB PNL during the daytime period. There is no *direct* correlation between CNEL and NNI since NNI considers both a noise exposure and the number of audible events exceeding a prescribed level. However, if specific operations parameters are known for aircraft operations, as is with Manchester Airport, an approximate conversion can be made. Assuming that Manchester Airport has between 400 and 860 operations per day, a measurement period resulting in an NNI of 40 dB is approximately equal to a CNEL value between 65 and 70 dB.

[56] Pennington, G., N. Topham, and R. Ward. *Aircraft Noise and Residential Property Values Adjacent to Manchester International Airport*. Journal of Transport Economics and Policy. Volume 24, Number 1. Pages 45-59. 1990.

[57] According to Collins and Evans the basic element of an ANN is a simple processing devise called a neuron, which may be likened to the neurons in the brain. It can track direct inputs in the forms of numerical values, which it adds together with a bias level, and effects a simple mathematical transformation to give an output value.

depending on the type of unit.[58] A NNI of 40 dB is approximately equal to a CNEL value between 65 and 70 dB.[59]

3. Current Property Values

The following section summarizes recent sales data of local adjacent properties for the period from January 1993 to March 1995. This baseline information is provided to evaluate whether the noise levels currently associated with Moffett Field and Highway 101 have had any effects on the sales prices of residential and commercial land. Table 18 presents a summary of the average sales prices and other information for each land use category in the vicinity of Moffett Field. Additionally, Figures 17, 18, and 19 summarize the information found in this data search.[60]

a. Single Family Residential. The South Bay housing real estate market can be characterized as very high or strong demand with limited new development potential, serving an area with large employment concentrations and job opportunities. These conditions have driven up the demand for housing and housing prices in what is commonly referred to as the Silicon Valley. The cities of Mountain View and Sunnyvale are at the center of this regional employment area related to "high tech" electronics and computer-related firms.

Housing prices in this region are some of the highest in the State and nation. This condition is expected to continue in the near future, given that significant amounts of new housing development in the immediate area are unlikely and that employment opportunities are expected to continue to expand in the area.[61]

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[58] Collins, Alan and Alec Evans. *Aircraft Noise and Residential Property Values, An Artificial Neural Network Approach*. Journal of Transport Economics and Policy. Volume 28, Number 2. Pages 175-197. 1994.

[59] Assuming the Manchester Airport has between 400 and 860 operations per day. Charles Salter Associates. March 1995. There are several technical differences in the methodologies used to generate the Noise and Numerical Index and the CNEL measure used in this EIS that make a definitive equivalency impossible to calculate. This equivalency should be considered a rough approximation.

[60] DataQuick. January 1993 to March 1995.

[61] Projections 1994. Association of Bay Area Governments (ABAG): Forecasts of Employment and Household Growth for Santa Clara County.

FIGURE 17

Recent Single Family Residential Sales Transactions

(January 1993 to March 1995)

■ ■ ■

Price Range:

- ● $0 to $150,000
- ▼ $150,000 to $200,000
- ■ $200,000 to $250,000
- ★ $250,000 to $425,000

Sample=88

SOURCE: Data Quick; Economic and Planning Systems.

Not to Scale

AMES AERODYNAMICS TESTING

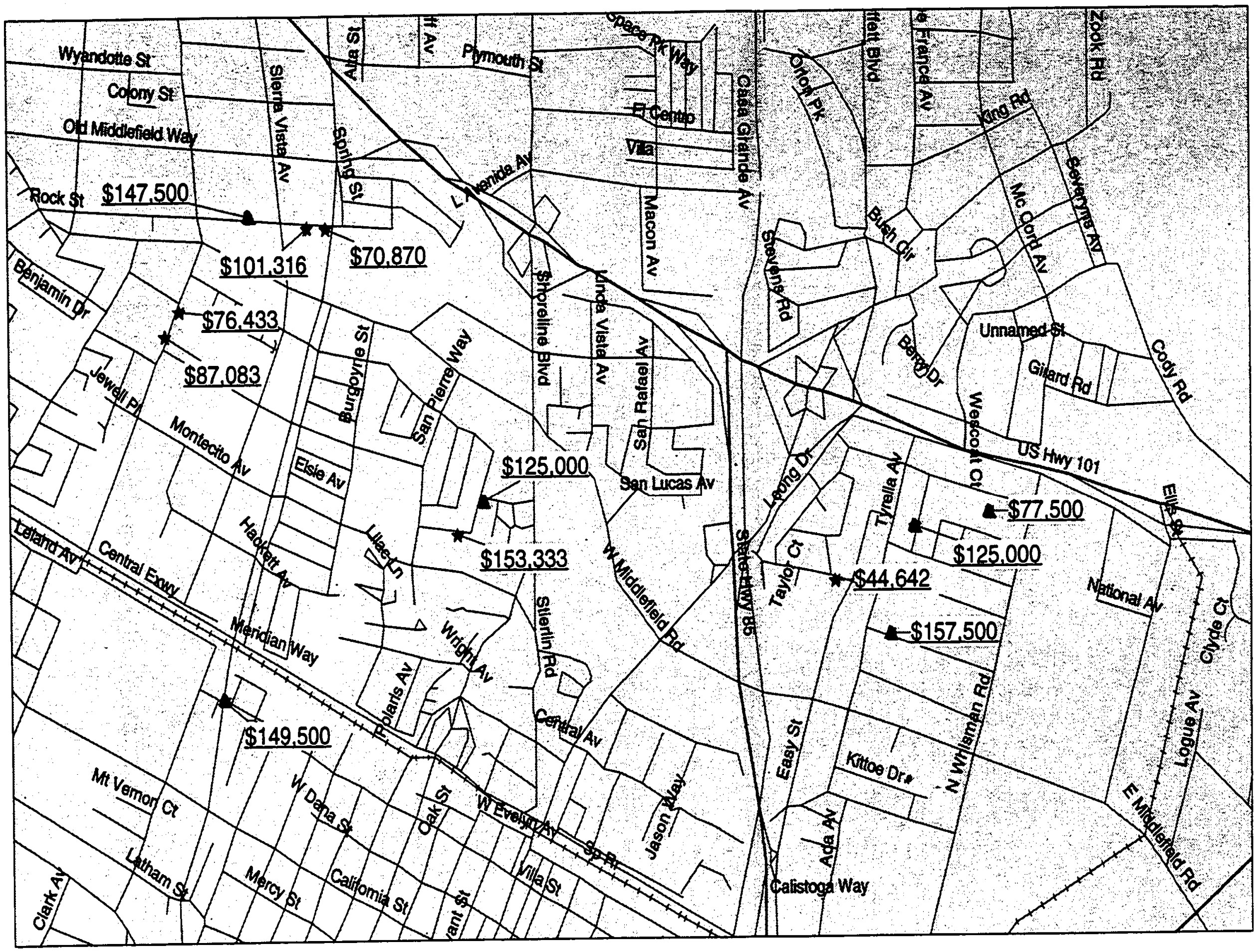
NASA AMES RESEARCH CENTER, MOFFETT FIELD, CALIFORNIA

469:052

FIGURE 18

Recent Apartment and Duplex Sales Transactions

(January 1993 to March 1995; Average per unit sales price)



▲ Duplexes
★ Apartments

Sample=12 (6 duplexes; 6 apartment complexes)

SOURCE: Data Quick; Economic and Planning Systems.

N
Not to Scale

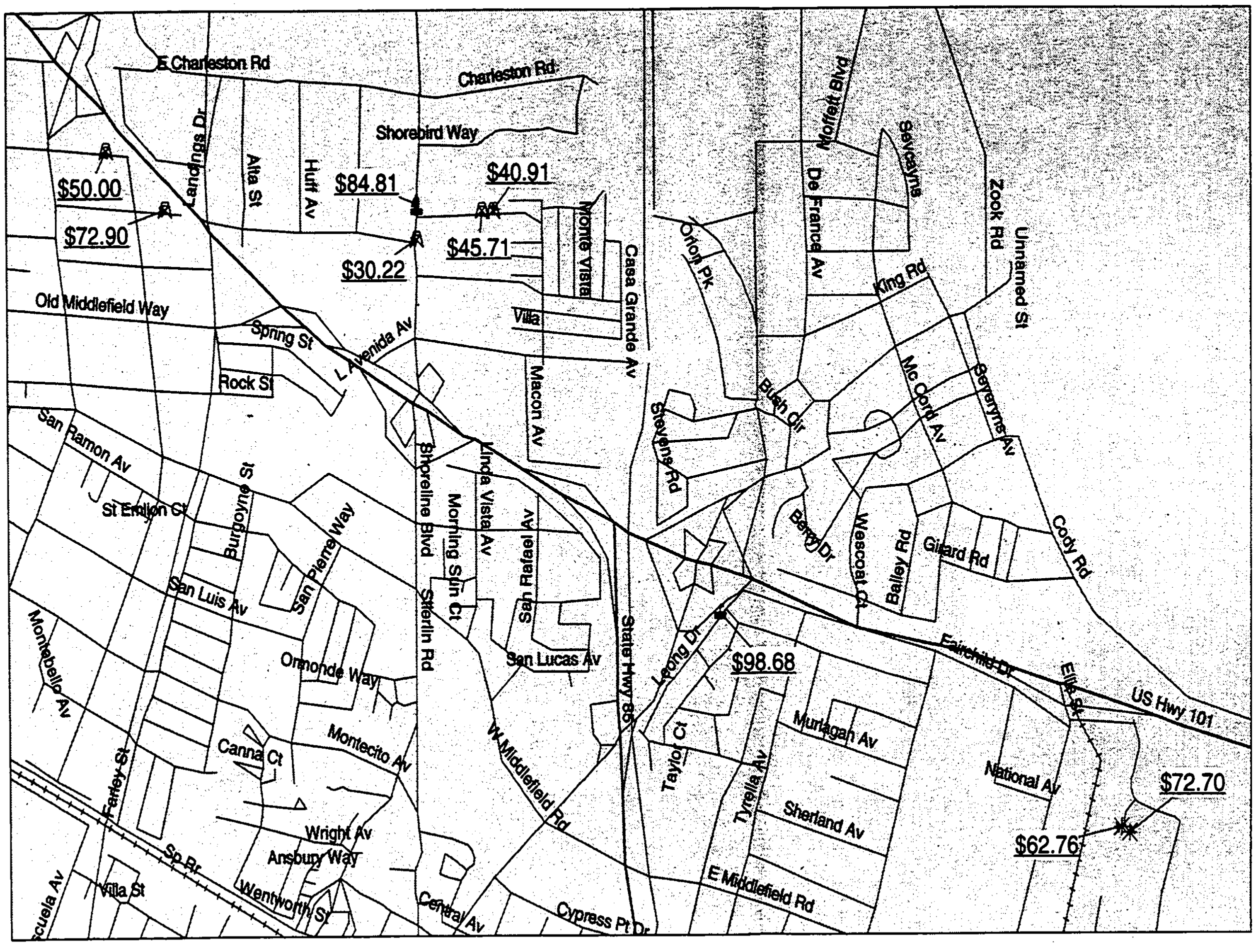
AMES AERODYNAMICS TESTING

469:053

FIGURE 19

Recent Industrial and Commercial Sales Transactions

(January 1993 to March 1995; Prices shown per square foot)



Restaurant
Office
Industrial
R&D Building

Sample=9 (7 industrial; 2 commercial)

SOURCE: Data Quick; Economic and Planning Systems.

Not to Scale

AMES AERODYNAMIC TESTING

469:054

Table 18
SUMMARY OF AVERAGE SALES PRICES AND OTHER INFORMATION BY LAND USE TYPE
(In the vicinity of NASA Ames Research Center, as shown on Figures 17, 18, and 19)

	Recent Sales Transactions by Land Use Category (1993-1995)				
	Single Family[a]	Duplexes[b]	Multi-Family[c]	Industrial/ R&D Flex[d]	Retail/ Commercial[e]
Average Sales Price	$232,000	$234,000	$1,410,000	$1,107,000	$763,000
Average Sales Price per Unit	na	$117,000	$89,000	na	na
Average Lot Size (sq.ft.)	6,227	14,802	44,439	55,632	44,824
Average Unit or Building Size (sq.ft.)	1,252	2,184	NA	19,580	8,680
Average Price per Square Feet of Space	$195	$107	NA	$54	$92
Average Number of Units per Building	na	2	18	na	na
Average Age of Unit or Building	37	52	30	25	18

Note: na means Not Applicable and NA means Not Available. Sales price figures have been rounded to the nearest hundred.

[a] Based on 88 sales transactions from January 1993 to 1995.
[b] Based on 6 sales transactions from January 1993 to 1995; only three sale transactions reported square footage data.
[c] Based on 6 sales transactions from January 1993 to 1995.
[d] Based on 7 sales transactions from January 1993 to 1995.
[e] Based on 2 sales transactions from January 1993 to 1995.

Sources: Dataquick; Economic & Planning Systems, Inc.

As summarized in Table 18, the average sales price for a single family home in the area is $232,000, the average unit size is 1,252 square feet, and the average lot size is 6,227 square feet. The average price per square foot was approximately $195 for the homes analyzed in this data search. Additionally, there is a cluster of newer, higher priced homes in the area, west of Shoreline Boulevard and south of Middlefield Road, in the vicinity of San Pierre Way. These homes are shown on Figure 17 as homes in the $250,000 to $425,000 price range. The highest sales price reported during this two-year period was $425,000.

Correlation coefficients were calculated on the single family sales transactions to determine if correlation between sales price, price per square foot and distance to Moffett Field and State Highway 101 exists, as summarized in Appendix K.[62] This data indicates that there is no apparent relationship between proximity to Moffett Field and the value of single family residential units. Additionally, no significant negative correlations between proximity to the testing facility and average price or price per square foot for single family homes were found based on available sales data.[63] Conversely, there is a slight correlation between sales price and distance from State Highway 101, meaning that in general homes are less expensive the closer they are to the freeway.

b. Duplexes and Apartments. For duplexes, the price per square foot is generally lower than single family residential, at $107 per square foot. The total average price for the 2-unit complexes is generally comparable to the single family average price, at $234,000 per duplex.

For multi-family or apartment complexes, the average size complex is 18 units, with an average price of about $89,000 per unit. Several of these properties had been bought and sold during the two-year period (January 1993 to March 1995), at a significantly higher price with the second sale, which suggests the properties were purchased, renovated and then resold.[64]

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[62] The address of each sales transaction was first geo-coded with its latitude and longitude and then the distance from the testing facilities and State Highway 101 was estimated. This measure is used as a proxy for the noise level at each parcel; it is assumed that the closer one is to the testing facility and/or State Highway 101, that the noise level will be higher. For this analysis it is not possible to survey the noise level at the location of each sales transaction.

[63] For this statistical analysis 88 single family transactions were analyzed using the Statistical Package for the Social Sciences (SPSS) software. It should be noted that most of these residential units are outside an area that is currently considered above the acceptable noise level.

[64] Unlike the comparatively large sample size for single family homes, the small sample size for apartment and duplex sales transactions prohibit any type of meaningful statistical analysis.

c. Santiago Villa Mobile Home Park. The Santiago Villa Mobile Home Park is the closest civilian residential development to the NASA Ames testing facilities. The mobile home park has 358 units, which tend to turn over at a rate of about 14 per year.

Table 19 summarizes the characteristics and current property values for Santiago Villa. About 60 percent of the mobile homes in the park were constructed before 1975 and have an average value of about $40,000 per unit.

The remaining 40 percent of the units were constructed after 1975, and have an average value of about $80,000 per unit.[65] Mobile home units are considered personal property and are not tracked by real estate data services.

The current value of the mobile home park as a business, and as a piece of property, can be estimated based on some general assumptions regarding net operating income, current lease rates, and a capitalization rate, as shown in Table 19. The average monthly lease per space is $470 per month, which generates approximately $4,230 per year after operating expenses.[66] The total net operating income is estimated at about $1.5 million. Assuming a capitalization rate of nine percent, the current value of the mobile home park is about $16.8 million. Using these estimations, the average value per space would be about $47,500 and the total estimated value of the mobile home units at Santiago Villa is approximated at $20 million. Additionally, the property owners recently had an appraisal prepared for the property which set the value at about $17 million or $425,000 per acre, which is generally consistent with the figures shown in Table 19.[67]

[65] Don Ronsten. Property Manager of Santiago Villa Mobile Home Park, Mountain View. Personal communication. March 20, 1995.

[66] Based on information provided by Don Ronsten, Property Manager at Santiago Villa Mobile Home Park, Mountain View, telephone conversation, March 20, 1995.

[67] Based on information provided by Bud Flocchini, Co-Owner of Santiago Villa Mobile Home Park, Mountain View, telephone conversation, March 20, 1995.

Table 19
SUMMARY OF SANTIAGO VILLA MOBILE HOME PARK CHARACTERISTICS AND VALUE

CHARACTERISTICS		
Units constructed before 1975[a]	215	
Units constructed after 1975[a]	143	
Total units		358
Average turnover rate per year[a]		14 units
MOBILE HOME UNIT VALUE		
Average pre-1975 unit value[a]	$40,000	
Average post-1975 unit value[a]	$80,000	
Total estimated mobile home unit value[b]		$20,048,000
LAND AND BUSINESS VALUE		
Average monthly rent per space	$470	
Average annual rent per space	$5,640	
Annual operating expense per space (25 percent of rent)	$1,410	
Estimated total net income		$1,514,340
Estimated capitalized value[c]		$16,826,000
Estimated market value of land + improvements (40-acre site)[d]		$17,000,000

[a] Based on information from the Manager of Santiago Villa Mobile Home Park, Don Ronsten, telephone conversation, March 20, 1995.

[b] Represents rough estimate of total value of units within the mobile home park.

[c] EPS' estimate of market value, using general industry assumptions about operating expenses and a capitalization rate of 10 percent.

[d] Based on owner's recent appraisal and opinion of the park's market value. Per telephone conversation with Bud Flocchini, Co-owner of Santiago Villa Mobile Home Park, March 20, 1995. Owners feel market value is more like $18 to $18.5 million.

Sources: Santiago Villa Mobile Home Park; Economic & Planning Systems, Inc.

While real estate data services do not track the sales of mobile homes, these units can be considered generally stationary. According to the property manager of Santiago Villa, rarely are the mobile home units moved. The units are sold and the buyer takes over the current lease on the space. Thus, while in concept these homes are not permanent, in practice, they function as single family homes with long-term land leases. Santiago Villa reports very low vacancy rates, although they experience an annual turnover rate of about four percent. Given the relatively small number of mobile home parks in the area, it is unlikely that replacement spaces exist in Mountain View for these mobile home units.[68]

Other recent sales of mobile home parks in Santa Clara County over the last five years show a low land value and per space value, as detailed in Appendix K. There have been three sales of mobile home parks in the last five years for which complete sales transaction data is available. The parks that recently sold were about half the size of Santiago Villa and all three are located in San Jose. The average selling price was $4.96 million for a 160-space, 16.5 acre mobile home park. The average value per acre of these three recent sales is about $300,000 per acre, or about 31 percent less than the estimated market value of Santiago Villa. Sales data does not indicate the relative condition of the property, which is an important factor in determining property value.

d. Commercial and Industrial Properties. As shown in Table 18, the average price per square foot for industrial research and development space in the area is about $54 per square foot. For commercial uses the average sales price is about $92. Both of these figures are comparable to industrial and commercial projects throughout the South Bay, and do not appear unusually low.[69]

[68] Based on information provided by Don Ronsten, Property Manager at Santiago Villa Mobile Home Park, Mountain View. Personal communication, March 20, 1995.

[69] Due to the relatively small sample size for adjacent commercial and industrial space, no statistical analysis could be conducted.

Chapter 5
ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

■ ■ ■

The following chapter contains an analysis of identified environmental issues related to the proposed NASA Ames Aerodynamics Testing Program. For each project alternative, impacts and mitigation measures are numbered consecutively. Impact numbers begin with a reference to the impact section, such as "LU" for Land Use or "NOISE" for Noise. Thus, the first noise impact would be numbered NOISE-1, the second NOISE-2, and so forth.

Impacts are also categorized by type of impact as follows:

- S = Significant
- SU = Significant and Unavoidable
- LTS = Substantial, but Less Than Significant

These notations are found following each impact and each mitigation measure to identify their significance before and after mitigation.

A. LAND USE

■ ■ ■

The proposed NASA Ames Aerodynamics Testing Program would have a significant impact with regard to land use if it would:

- Introduce new land uses that would conflict with established uses within or adjacent to the NASA Ames Research Center.
- Create uses that would be incompatible with planned land uses under the General Plans of the surrounding cities.

1. Alternatives 1, 2 and 3

Land use impacts of the three alternatives for the proposed NASA Ames Aerodynamics Testing Program would be limited to those created by noise. For this reason, all land use impacts are discussed in Section C: Noise, of this chapter. Please refer to the this section for an analysis of land use compatibility issues related to noise.

2. No Action Alternative

Under the No Action Alternative, none of the three proposed aerodynamics testing programs would be administered. Aerodynamics testing projects beyond those currently administered through existing policies at NASA Ames Research Center would not be implemented. Existing operations at the wind tunnels would continue, but could not be expanded to test advanced technologies such as supersonic jet airplanes and vertical lift aircraft.

Since no increase in noise is expected through the No Action Alternative, there would be no expected impacts with regard to land use.

B. PUBLIC POLICY

■ ■ ■

The proposed NASA Ames Aerodynamics Testing Program and program alternatives would have a significant impact with regard to policy consistency if it would:

- Conflict with existing NASA policies or long-range strategic goals.
- Conflict with existing Federal laws and policies, including Air Force and NASA requirements and policies.

Additionally, an EIS must include a list of all Federal permits, licenses, and other approvals that need to be obtained to implement the proposed program or project [40 CFR 1502.25(b)]. This requirement ensures that other planning is integrated into the process at the earliest possible time to ensure that program or project decisions reflect environmental values, and to avoid delays later in the process. The proposed NASA Ames Aerodynamics Testing Program may require an amendment to the Bay Area Air Quality Management District's (BAAQMD) stationary air emission source permit for the NFAC wind tunnel facilities to allow additional powered (engines on) aircraft testing inside the wind tunnels. This is discussed further in Chapter 5F, Air Quality. Since the proposed aerodynamics testing program does not include any new construction or alterations, no other new permits are required.

1. Alternatives 1, 2 and 3

a. Environmental Justice.

Impact POLICY-1: The proposed NASA Ames Aerodynamics Testing Program would disproportionately affect low and very low income populations. (LTS)

As previously discussed in Section 4B of this document, Census Tract 5046.01, which includes Santiago Villa Mobile Home Park and Onizuka Air Station Annex housing, is considered to have a larger percentage of low and very low income households when compared to the City of Mountain View as a whole. It is anticipated that the NASA Ames Aerodynamics Testing Program would affect this community the most. There is no feasible mitigation for this substantial, but less than significant, impact beyond the public notification process that NASA Ames has undertaken and the mitigation measures outlined in the Noise section of this chapter.

The other three surrounding and most affected civilian Census tracts would not be significantly affected by the proposed action since CNEL noise exposure resulting from the project would be less than 65 dB. These Census tracts also have roughly the proportion of low and very low income households when compared to the City of Mountain View, therefore no impact with regard to environmental justice is expected to these three Census tracts.

The proposed action is not believed to have a highly disproportionate and adverse effect on minority populations. Census Tract 5091.04, which is located just south of Moffett Field, is considered a minority community according to the Department of Housing and Urban Development (HUD) definition. However, noise exposure in this area would not be above a CNEL of 65 dB. The other surrounding and most affected Census tracts are not considered minority communities according to the HUD definition.

In compliance with the Executive Order on Environmental Justice and NEPA regulations, NASA has undertaken a comprehensive public involvement process to notify the public of the proposed NASA Ames Aerodynamics Testing Program, and to identify issues and concerns the public may have. Three public scoping meetings were held to notify the surrounding communities about the proposed NASA Ames Aerodynamics Testing Program and the EIS and NEPA process, to determine the scope of significant issues to be addressed in the EIS, and to provide an impetus for an open relationship between NASA Ames Research Center and the surrounding communities of Mountain View and Sunnyvale. In addition, a separate meeting was held with the residents of Santiago Villa.

Public notification of the scoping meetings took place through local newspapers, and through a mailing that focused on the most affected members of the community and interested agencies. This mailing included property owners and businesses most likely to be affected within the initial projected 55 dB and higher noise contours of the project. Public meetings were also held during the Draft EIS comment period as an integral part of the EIS process.

b. Local Governmental Policy.

Impact POLICY-2: The proposed NASA Ames Aerodynamics Testing Program would create noise levels that are inconsistent with local policies. (S)

In general, Mountain View and Sunnyvale policies support the development and operation of NASA Ames Research Center. However, policies also are directed to reduce noise and land use conflicts. The proposed NASA Ames Aerodynamics Testing Program is expected to create noise levels that will not be consistent with local policies. This impact is considered significant and unavoidable, since there is no feasible mitigation to lower noise levels below Mountain View's noise guidelines. This impact is detailed further in Section C of this chapter, along with proposed mitigation measures to control and monitor these impacts.

2. No Action Alternative

Under the No Action Alternative, none of the three proposed NASA Ames Aerodynamics Testing Programs would be administered. Aerodynamics testing beyond projects currently administered through existing policies at NASA Ames Research Center would not be implemented. Existing operations at the wind tunnels would continue, but could not be expanded to noisier testing. This alternative would be the most consistent with local noise policies.

C. NOISE

■ ■ ■

Criteria of significance for noise impacts have been developed for this EIS using previously described criteria as guidelines. Specific guidance is provided by the NASA Hearing Conservation Program, and community land use compatibility criteria. The specific source for each criteria of significance is referenced below.

Using these criteria for guidance, it has been determined that the proposed NASA Ames Aerodynamics Testing Program would create a potential health hazard, and thereby have a significant impact with regard to noise level, if it would:

- Expose people to hazardous noise levels (NASA Health Standard on Hearing Conservation, NHS/IH-1845.4).

The proposed testing program would have a significant impact with regard to noise exposure, community response, and land use compatibility if it would:

- Expose the Onizuka Air Station Annex Child Development Center and Youth and Teen Facility to exterior CNEL noise exposure greater than 75 dB[1] and/or interior CNEL exposure greater than 45 dB (United States Air Force. *Assessing Noise Impacts of Air Force Flying Operations.* Appendix C. 1984 and United States Air Force. *Draft Air Force Family Housing Guide for Planning, Programming, Design and Construction.* October 1994).
- Expose the Onizuka Air Station Annex housing to exterior CNEL noise exposure greater than 75 dB and/or interior CNEL exposure greater than 45 dB (United States Air Force. *Assessing Noise Impacts of Air Force Flying Operations.* Appendix C. 1984 and United States Air Force. *Draft Air Force Family Housing Guide for Planning, Programming, Design and Construction.* October 1994).

---

[1] All noise levels and noise exposure levels throughout this document are A-weighted in accordance with appropriate standards and criteria. All such values are in units of decibels, whose unit symbol is "dB" in conformance with American National Standard ANSI/ASME Y10.11-1984. The unit symbol "dBA" is not the standard symbol used under ANSI Y10.11. All numerical noise values in this document symbolized "dB," are numerically identical to those using "dBA," often found in other references.

- Expose civilian residential land uses to exterior CNEL noise exposure greater than 65 dB (City of Mountain View General Plan. 1992).
- Expose commercial and light industrial land uses to exterior CNEL noise exposure greater than 70 dB (City of Mountain View General Plan. 1992).

This section is divided into two impact assessments: noise levels (noise hazards) and noise exposure. For a more complete discussion about the difference between noise levels and noise exposure, please refer to Chapter 4C: Noise.

The analysis in this section includes noise hazard and noise exposure contours. These contours should be considered best estimates, since varying environmental conditions can affect noise levels at any given location. In general, noise contours can vary up to 3 dB without the average individual noticing a change. For this reason, a variation of the expected noise levels up to 3 dB is not considered significant, and should be considered inherent in these analyses.

1. Noise Hazards (Alternatives 1, 2 and 3)

Noise hazards that could occur from implementation of the proposed NASA Ames Aerodynamics Testing Program are directly related to high noise levels that would be generated by the proposed action.

Alternatives 1, 2 and 3 would each allow the same noise levels, with a maximum level of 85 dB when measured at the benchmark. Thus noise hazard impacts would be the same for each of the three alternatives. Figure 20 presents maximum outdoor 85 dB noise level contours for the proposed NASA Ames Aerodynamics Testing Program. A noise level of 85 dBA[2] is the noise hazard level identified in the NASA Hearing Conservation Program. Figure 20 distinguishes between 85 dB maximum noise levels generated from each of the two wind tunnel facilities.

[2] All noise levels and noise exposure levels throughout this document are A-weighted in accordance with appropriate standards and criteria. All such values are in units of decibels, whose unit symbol is "dB" in conformance with American National Standard ANSI/ASME Y10.11-1984. The unit symbol "dBA" is not the standard symbol used under ANSI Y10.11. All numerical noise values in this document symbolized "dB," are numerically identical to those using "dBA," often found in other references.

Impact NOISE-1: NASA employees, on-site contractors, and visitors of NASA Ames Research Center could be exposed to noise levels above 90 dB for up to four hours per day, which would exceed the permissible exposure limit for noise levels established in the NASA Hearing Conservation Program. Additionally, the Noise Hazard Limit (85 dBA) and the Action Level as defined by the Hearing Conservation Program would be exceeded in the NASA Ames Research Center during Level 2 and Level 3 testing. (S)

It is likely that many of the exposure limits detailed previously in Table 9, page 75, would be exceeded with implementation of the testing program. Noise levels at or above 85 dBA are considered a potential health hazard, as defined by the NASA Hearing Conservation Program, since prolonged exposure is known to potentially cause hearing damage. However, as outlined in Table 9, the limit for exposure to noise of 85 dBA is eight hours. Though eight hours of continuous testing is not expected to occur under the program at maximum levels, the permissible exposure limits for noise would be exceeded for 90 dBA, 95 dBA, and greater, closer to the facilities. Since it is infeasible to predict the noise levels and expected duration of noise generated from projects implemented under the proposed NASA Ames Aerodynamics Testing Program for all locations within NASA Ames Research Center, the noise hazard area of 85 dB is used as a general envelope where impacts to health, and potential hearing loss could occur if the appropriate precautionary measures are not taken.

Mitigation Measure NOISE-1: The following mitigation measure would be implemented to decrease the potential for health risk and hearing damage of NASA Ames Research Center employees, on-site contractors, and visitors, as outlined in the NASA Health Standard on Hearing Conservation, NHS/IH-1845.4:

(a) Prior to the implementation of individual testing projects, NASA would delineate the expected noise hazard area (above 85 dB) based on the best available data gathered to date.

(b) Individuals exposed to 85 dB or higher would be required to wear hearing protection. Use of ear protectors would be enforced by NASA as specified in Section 7.1.4 of the Hearing Conservation Program. Additionally, disposable earplugs would be available for employee use where noise levels are less than 85 dB, if they so desire. Hearing protectors must attenuate employee noise exposure to a level of 85 dB or below.

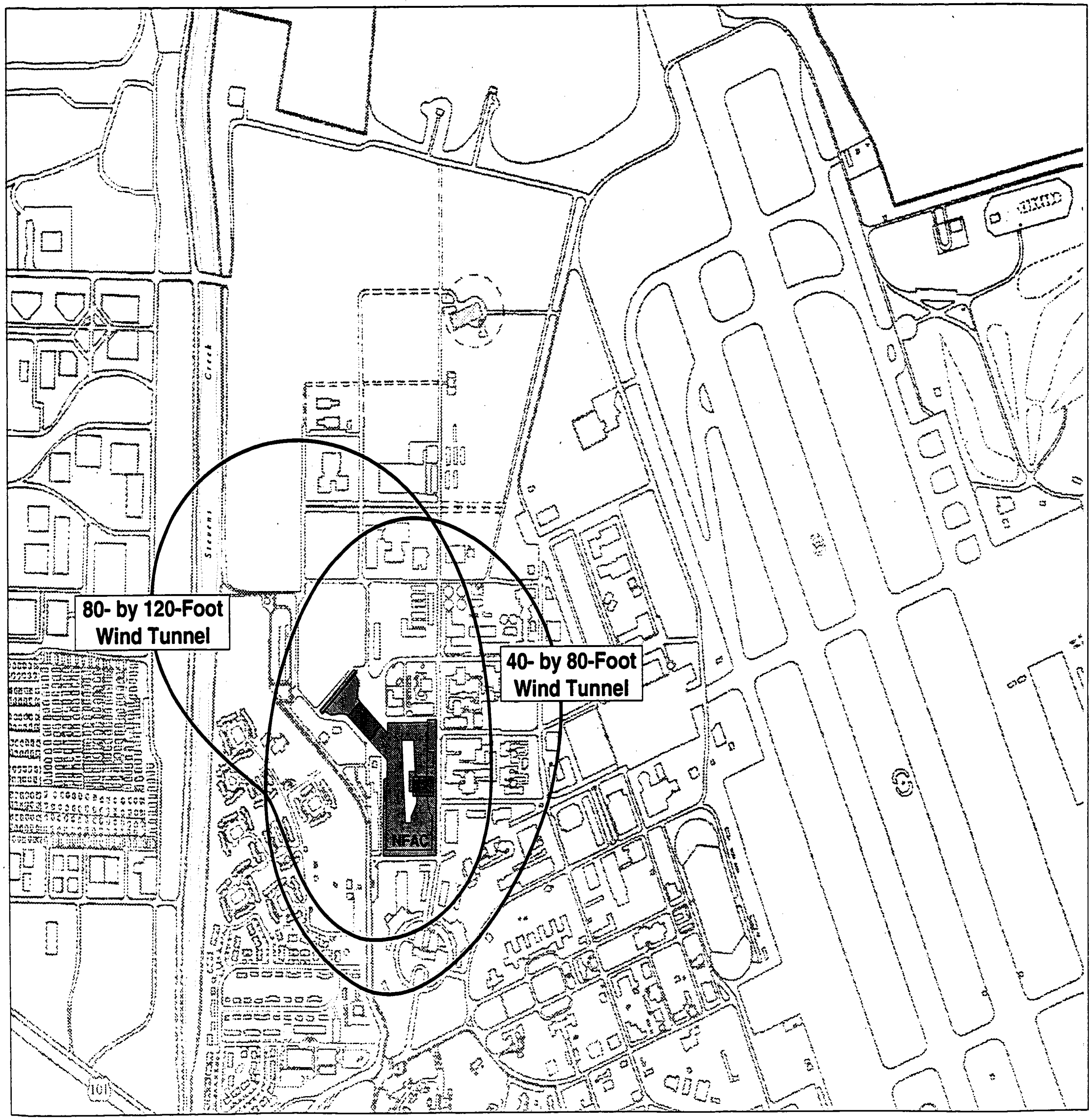

FIGURE 20

NASA Ames Aerodynamics Testing Program: 85 dB Maximum Noise Level Contours

■ ■ ■

SOURCE: Charles Salter Associates. April 1995.

N

0 350 700
Scale in Feet

AMES AERODYNAMICS TESTING

(c) Employee participation in the Medical Monitoring Program would be mandatory for all employees within the Action Level defined in the NASA Hearing Conservation Program.

(d) Areas that have noise levels above 85 dB would be posted as noise hazard areas during testing.

(e) NASA would monitor testing at the Benchmark location (Monitor #1) and the Stevens Creek Trail (Monitor #2) to ensure aerodynamics testing is within the parameters set by the proposed NASA Ames Aerodynamics Testing Program. Direct feedback would be available between monitoring stations and the aerodynamics testing controller. If noise is recorded significantly above the testing parameters (3 dB), testing would cease immediately or power levels would be immediately reduced to conform to the program parameters.

The locations of the above monitors are shown on Figure 3 on page 23 of this EIS.

(f) A detailed mitigation plan, including the above measures, would be developed for specific projects implemented under the NASA Ames Aerodynamics Testing Program. (LTS)

To mitigate noise impacts to a less-than-significant level, it would be necessary to implement all the above mitigation measures prior to testing program implementation. Operation of all outdoor facilities and employee protection and medical monitoring would have to conform to the NASA Hearing Conservation Program.

Impact NOISE-2: Aerodynamics testing under the proposed NASA Ames Aerodynamics Testing Program would create noise hazard areas of 85 dB or more at the Onizuka Air Station Annex, within portions of Reach 1 of the Stevens Creek Trail, and at the Bicycle Commute Trail. (S)

Noise levels at or above 85 dB are considered a potential health hazard, as prolonged exposure is known to potentially cause hearing damage. For this reason, prolonged exposure to exterior noise environments at or above 85 dB is to be generally avoided.

Several land uses at the Onizuka Air Station Annex would be exposed to excessive noise levels resulting from the Aerodynamics Testing Program, including Air Force housing, the Onizuka Child Development Center, and the Youth and Teen Facility. There are no adopted criteria that outline permissible noise levels on Air Force property (though criteria do exist for average noise exposure, or noise dose), most likely because noise levels as high as those that would be generated by the proposed NASA Ames Aerodynamics Testing Program are generally not anticipated for Air Force housing and ancillary uses. An 85 dB noise level has been used as the criteria of significance for this impact since no standard exists, and since this is the criteria used by NASA for assessing impacts on their own property. As discussed later in this section, the Air Force has established criteria for noise exposure (this impact discussion begins on page 151). Based upon this noise exposure criteria, several impacts have been identified (NOISE-3 and NOISE-4).

As shown in Figure 20, noise generated during both Level 2 and Level 3 testing could create noise levels greater than 85 dB at the Onizuka Air Station Annex, including approximately 132 Air Force housing units.

Additionally, noise generated could exceed 85 dB at Reach 1 of the Stevens Creek Trail and at the Bicycle Commute Trail (which are shown on Figure 15 on page 101).

> Mitigation Measure NOISE-2: Prior to implementing aerodynamics testing that would create noise levels in excess of 85 dB at the Onizuka Air Station Annex, at Reach 1 of the Stevens Creek Trail, or at the Bicycle Commute Trail, NASA would notify the Air Force, the City of Mountain View, and occupants in all affected locations. NASA would detail which areas would be exposed to noise levels above 85 dB, and would recommend that applicable residential units and facilities (including recreational) be vacated and closed during testing, and that all areas above 85 dB be posted as noise hazard areas to prevent prolonged exposure to these noise levels without hearing protection. Additionally, NASA will allow Onizuka Air Station Annex residents and contractors to participate in the NASA Hearing Conservation Program. These measures would be included in a detailed mitigation plan which would be developed for each project implemented under the NASA Ames Aerodynamics Testing Program. (LTS)

Though 132 Air Force housing units fall within the 85 dB noise level contour, it is anticipated that 182 housing units would be vacated during testing to ensure that individuals are not exposed to hazardous noise levels, and to simplify evacuation by vacating entire housing complexes.

With implementation of the above mitigation measures, this impact would be considered less-than-significant since individuals would be protected from prolonged exposure to noise levels of 85 dB or more.

In July 1997, NASA Ames developed a proposal for NASA to take over ownership of all family housing units at Moffett Federal Airfield following the realignment of Onizuka Air Station. If this change in ownership is approved, NASA will take ownership of the Moffett family housing in September of 2000.

2. Noise Exposure (Alternatives 1, 2 and 3)

Figures 21, 22 and 23 present the daily average noise exposure contours for the three alternatives of the proposed NASA Ames Aerodynamics Testing Program. These contours depict the maximum noise exposure which would be allowed during any 24-hour period under absolute worst case conditions. These noise exposure contours were compiled by taking the maximum noise level emission from the noise source, and calculating the CNEL noise exposure contribution for the maximum allowed duration, for the daytime and nighttime periods, according to the CNEL noise definition.

To create these figures, the noise contributions were first computed independently for the 40- by 80-Foot Wind Tunnel and the 80- by 120-Foot Wind Tunnel. The independent maximum noise exposure contours for each wind tunnel were used to create a single composite worst-case noise contour map for each of the alternatives by overlaying the independent noise exposure contours for the 40- by 80-Foot Wind Tunnel and the 80- by 120-Foot Wind Tunnel.

Figures 21, 22 and 23 were prepared in this manner to present a large amount of information as clearly and concisely as possible. However, concurrent use of the two wind tunnels is not possible, so the contours do not realistically represent an expected noise contour for any given time. The actual noise exposure area would generally be smaller than that shown in the figures.

The noise exposure modeling and impact analyses in this EIS are presented for maximum daily conditions since the proposed Aerodynamic Testing Program would produce noise levels that would vary considerably from day-to-day. For example, it is expected that there would be no testing on some days and loud testing on others.

Table 20
EXPECTED INCREASE IN NOISE EXPOSURE
(Maximum Daily CNEL; dB)

Fig. 24 Ref.	Location	Existing	Alternative 1			Alternative 2			Alternative 3		
			Program	Cumulative	Increase	Program	Cumulative	Increase	Program	Cumulative	Increase
A	Benchmark	75	84	85	10	80	81	6	77	79	4
B	Santiago Villa Mobile Home Park	70	77	78	8	75	76	6	72	74	4
C	Child Development Center[a]	83	92	93	10	85	87	4	85	87	4
D	Youth Center[a]	80	90	90	10	82	84	4	82	84	4
E	Air Force Housing	68	75	76	8	73	74	6	69	72	4
F	Industrial Park	70	78	79	9	74	76	6	72	74	4
G	Montecito (residential)	55	<50	55	0	<50	55	0	<50	55	0
H	Golf Course	74	<50	74	0	<50	74	0	<50	74	0
I	San Pablo (residential)	65	58	66	1	53	65	0	<50	65	0
J	Middlefield (commercial)	70	54	70	0	<50	70	0	<50	70	0
K	Forest Road (residential)	55	62	63	8	59	61	6	52	57	2
L	Stevens Creek Regional Trail (recreational)	75	86	86	11	82	83	8	79	81	6

[a] The CNEL values for the Onizuka Child Development Center and the Youth and Teen Facility have been compiled by incorporating a penalty for nighttime testing, as required by the CNEL noise descriptor. However, these facilities are typically not in use during these times, so actual noise exposure would be less.

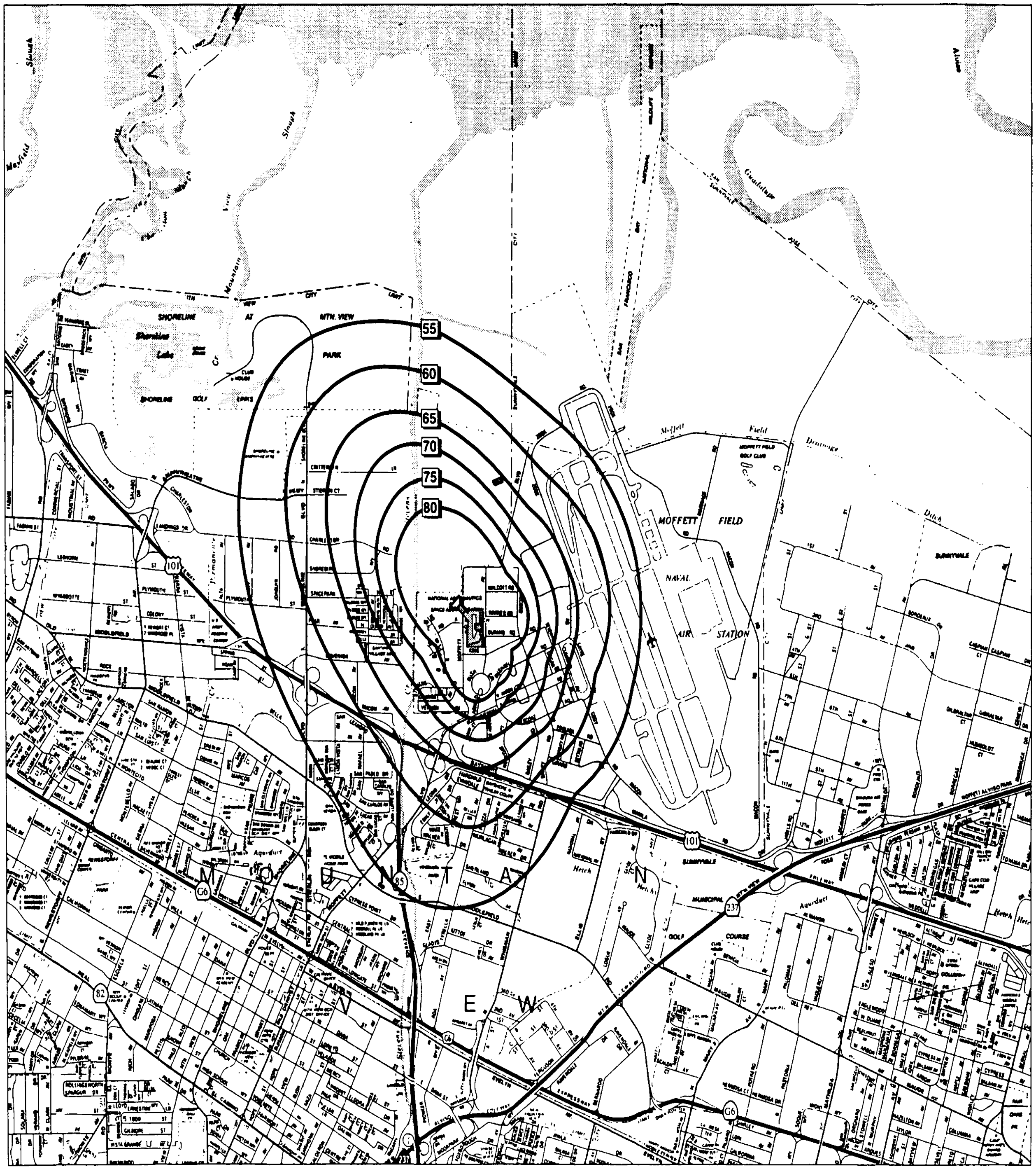

FIGURE 21

Alternative 1: Maximum Daily CNEL Noise Exposure Contours (dB)

■ ■ ■

Source: Charles Salter Associates, April 1995.

0 1/4 1/2
Scale in Miles

AMES AERODYNAMICS TESTING

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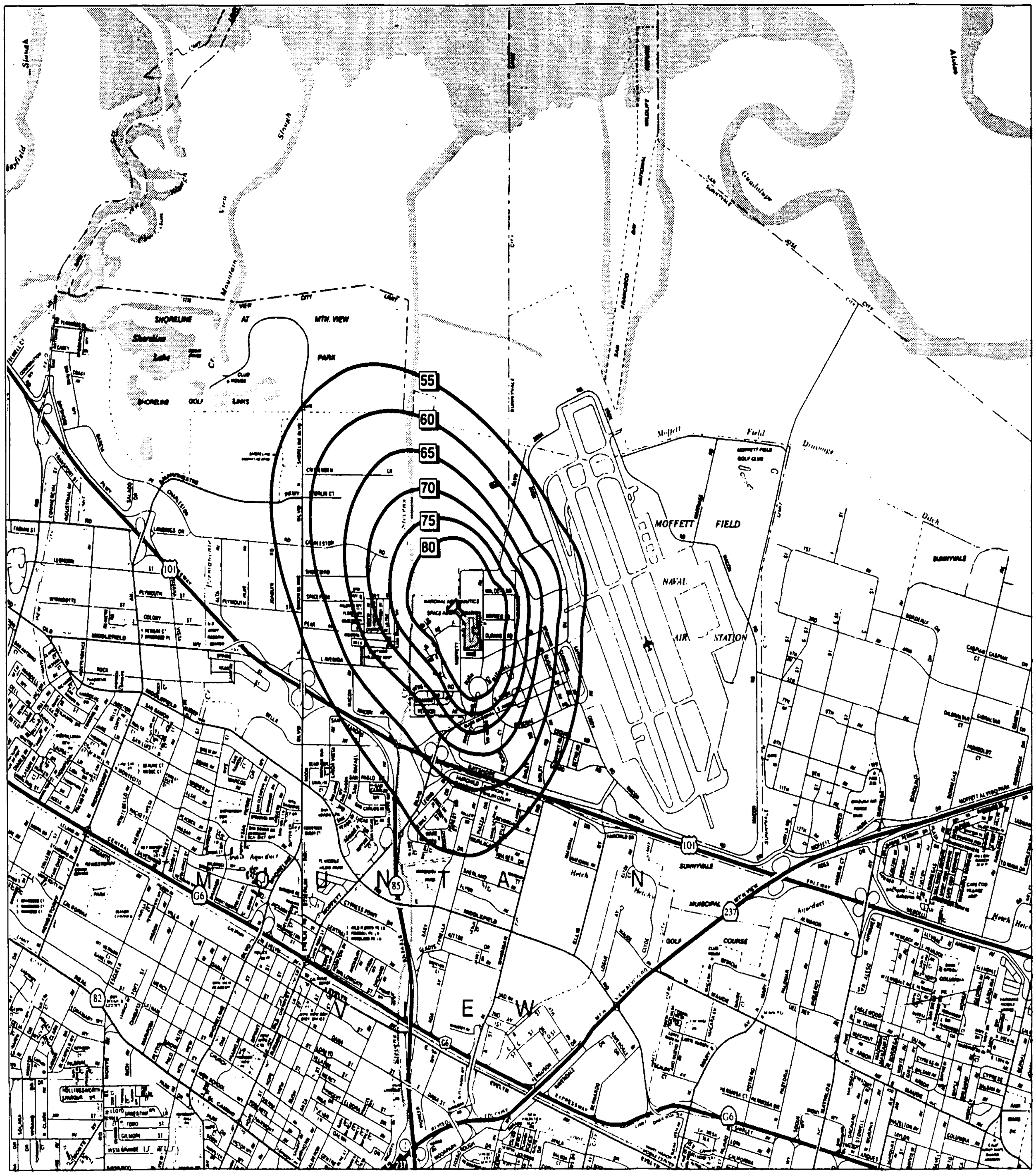

FIGURE 22

Alternative 2: Maximum Daily CNEL Noise Exposure Contours (dB)

■ ■ ■

Source: Charles Salter Associates, April 1995.

N

0 1/4 1/2
Scale in Miles

AMES AERODYNAMICS TESTING

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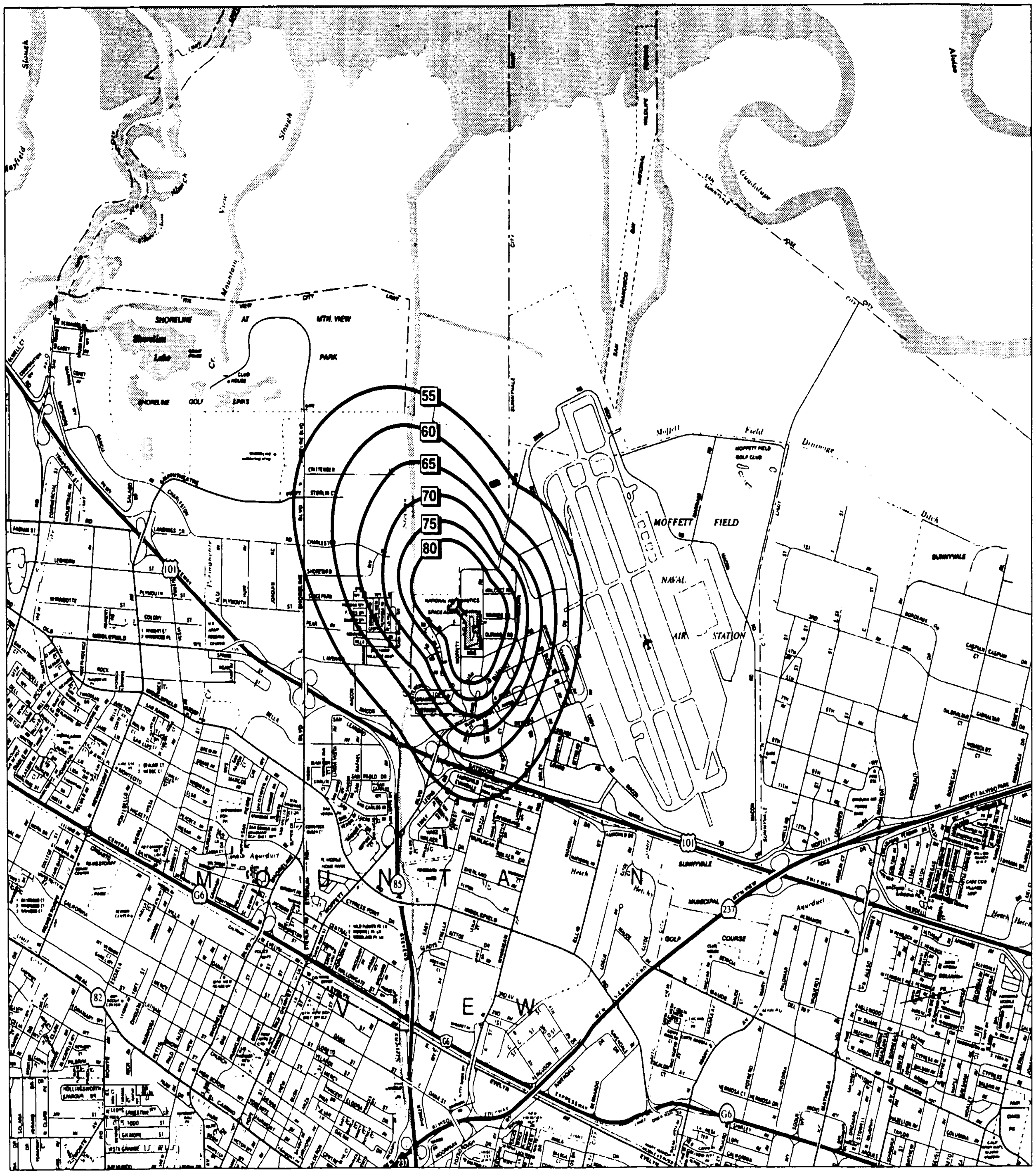
469 038

FIGURE 23

Alternative 3: Maximum Daily CNEL Noise Exposure Contours (dB)

■ ■ ■



Source: Charles Salter Associates, April 1995.

0 1/4 1/2
Scale in Miles

AMES AERODYNAMICS TESTING

NASA AMES RESEARCH CENTER, MOFFETT FIELD, CALIFORNIA

469 039

Annual average noise contour maps were not prepared since annual mapping would average these two conditions and noise exposure would appear to be much less than what could be anticipated under the proposed program on a particular day. The maximum daily noise exposure contours presented in this report can generally be compared to noise exposure criteria, even though these criteria are generally established for average annual conditions. This methodology is used in this EIS to prevent any possible understatement of the maximum possible noise exposure. Therefore, noise impact conclusions from such criteria apply to maximum daily periods; average annual noise impact would always be substantially less.

In general, the noise exposure from the 40- by 80-Foot Wind Tunnel is expected to produce the largest noise exposure in its vicinity on the east side of the tunnel complex, while the 80- by 120-Foot Wind Tunnel creates the largest noise exposure on the west side of the complex.

Expected changes in outdoor noise exposure resulting from each of the program alternatives are detailed in Table 20 for several key points in the surrounding community, which are identified in Figure 24. This table was created by comparing the noise exposure contours of Figure 12 with Figures 21, 22 and 23. As can be seen in the table, several areas will be exposed to increased noise exposure if any of the proposed NASA Ames Aerodynamics Testing Program alternatives are implemented. The following section details these impacts.

Impact NOISE-3: The proposed NASA Ames Aerodynamics Testing Program would result in incompatible average exterior CNEL noise exposure at the Onizuka Child Development Center and the Youth and Teen Facility, according to the Air Force compatibility guidelines presented in Appendix C of the 1984 document entitled *Assessing Noise Impacts of Air Force Flying Operations*. (S)

Aerodynamics testing under the proposed NASA Ames Aerodynamics Testing Program would exceed the generally accepted interior noise standard of 24-hour equivalent noise exposure of 45 dB for classroom environments. As previously described in Chapter 4C, exposure to this type of noise environment could result in the following:

- Non-auditory health effects.
- Speech interference.
- Undesirable teacher and caregiver behavior.
- Impaired cognitive development.

Additionally, Air Force criteria[3] do not allow educational services within DNL noise zones above 75 dB. If classrooms are to be allowed in exterior DNL noise zones of 65 to 75 dB, specified noise reduction up to 30 dB are suggested to be incorporated into building construction, thus resulting in an interior DNL noise environment of at least 45 dB.

The relatively thin and lightweight prefabricated construction of the Onizuka Child Development Center results in acoustical attenuation properties which cannot be significantly improved. Noise is typically transferred through the walls in such construction, and it is infeasible to improve upon these structures since they lack the structural integrity to carry the additional weight of noise attenuation materials necessary to reduce noise to acceptable noise exposure conditions.

It should be noted that these facilities currently exist in incompatible noise zones. The Onizuka Child Development Center is currently in a daily CNEL noise zone of 80 dB, as is the Youth and Teen Facility. However, as required by the CNEL noise descriptor, these noise zones have been compiled by incorporating a penalty for nighttime testing, when these facilities are not in use.

While CNEL remains the standard descriptor for most land use planning throughout California, it has become standard practice to use $L_{eq(24)}$ in lieu of CNEL for daytime-only land uses, such as schools, when the nighttime noise contribution is significant. The $L_{eq(24)}$ metric was developed specifically for daytime-only uses by the Environmental Protection Agency and is defined in their original "Levels Document."[4] $L_{eq(24)}$ is simply the same 24-hour energy average as CNEL, but without the 5 dB penalty for evening noise and the 10 dB penalty for nighttime noise. The worst case $L_{eq(24)}$ noise exposure has been computed for the 40- by 80-Foot Wind Tunnel and 80- by 120-Foot Wind Tunnel for each of the alternatives at the Youth and Teen Facility to develop a better measure of the noise impact upon this daytime-only land use. Results are given in the following bullets. The decrease in $L_{eq(24)}$ values from CNEL values depends on the utilization under the worst case scenario.

- *Alternative 1:* A CNEL of 90 dB, compared to an $L_{eq(24)}$ of 86 dB;
- *Alternative 2:* A CNEL of 82 dB, compared to an $L_{eq(24)}$ of 80 dB; and
- *Alternative 3:* A CNEL and $L_{eq(24)}$ of 82 dB.

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[3] Assessing Noise Impact of Air Force Flying Operation. HQ USAF/LEEVX. March 1984.

[4] *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety*, EPA/ONAC 550/9-74-004, March 1974.

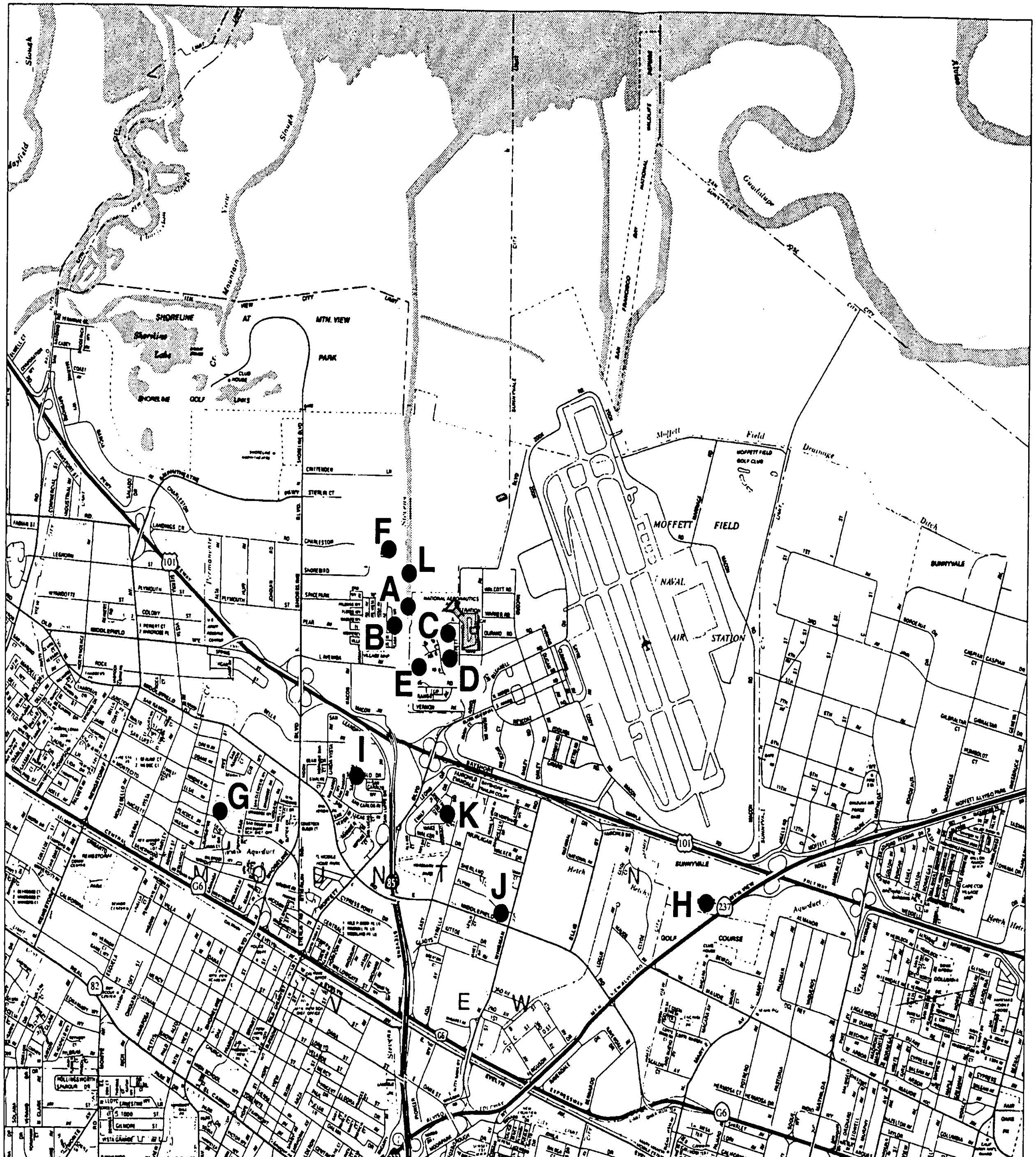

FIGURE 24

Daily Noise Exposure Comparison Locations

■ ■ ■

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Mitigation Measure NOISE-3: The following mitigation measures are recommended to prevent impacts to the Onizuka Child Development Center and the Youth and Teen Facility:

(a) Prior to the start of Level 2 or Level 3 testing, the Onizuka Child Development Center would be moved to a quieter location that meets classroom noise environment guidelines established by the Air Force, or it will be vacated during Level 2 and Level 3 testing.

(b) The Youth and Teen Center would be vacated during Level 2 and Level 3 testing.

(c) Public access areas, including accessible Onizuka Air Station Annex property, that have noise levels above 85 dB would be posted as noise hazard areas during Level 2 and Level 3 testing.

These measures would be included in each detailed mitigation plan developed for projects implemented under the NASA Ames Aerodynamics Testing Program. If these mitigation measures are not implemented, Level 2 and Level 3 testing would not occur. (LTS)

Three alternative mitigation measures were also considered, but rejected, as a part of the EIS process. One rejected measure was to have daytime testing only occur while the children at the Onizuka Child Development Center and Youth and Teen Facility are indoors. This would prevent exposure of the children to potentially harmful noise levels outdoors, which could occur during playground time and arrival and departure to the Onizuka Child Development Center and Youth and Teen Facility. However, noise exposure would still be incompatible with a classroom environment, and could interfere with speech, classroom activities, and children's concentration.

The second rejected measure was to limit all testing to nighttime hours to fully mitigate impacts to the Onizuka Child Development Center. However, it is anticipated that this alternative would create greater impacts to the surrounding residential community due to sleep disturbance. Therefore, this alternative was not pursued in this EIS.

The final rejected measure would have been to halt testing when children are being picked up or dropped off by school buses. Generally, school buses pick children up in the vicinity of Moffett Field between 7:00 a.m. and 10:00 a.m., and school bus drop-off is between 12:00 p.m. and 4:00 p.m. These buses serve the Whisman School District, which includes the Monta Loma Elementary School, the Whisman Elementary School, the Theuerkauf Elementary School, and the Crittenden Junior

High School. No public school buses serve the Mountain View School District. This measure was deemed infeasible since school bus drop-off and pick-up occurs relatively often, and it would be difficult to schedule testing not to conflict with the bus schedules.

NASA will become the new owners of the Onizuka military housing in the year 2000. NASA's ownership of the housing areas will facilitate the implementation of the above mitigation measures. Prior to 2000, NASA will continue to work with the Air Force to ensure necessary measures are implemented before testing under the Aerodynamics Testing Program occurs.

Impact NOISE-4: **The proposed NASA Ames Aerodynamics Testing Program would create exterior CNEL noise exposure that would exceed 75 dB in Onizuka Air Station Annex housing areas.[5] Appendix C of the Air Force noise impact assessment guidelines and the Air Force Family Housing Guide for Planning, Programming, Design and Construction prohibit residential land uses and related structures in areas exceeding exterior CNEL of 75 dB. Where housing units are exposed to noise levels between CNEL of 65 and 75 dB, buildings are required to provided ample attenuation to create interior CNEL noise exposure of 45 dB. (S)**

Air Force criteria[6] do not allow residential uses within DNL noise zones above 75 dB. Additionally, if housing is to be allowed in outdoor DNL noise zones of 65 to 75 dB, specified noise reduction levels up to 30 dB are suggested to be incorporated into building construction.

It should be noted that several of the Onizuka Air Force housing units currently exist in incompatible noise zones. However, implementation of the proposed NASA Ames Aerodynamics Testing Program would increase this noise exposure by more than 5 dB, which is considered a significant impact.

Mitigation Measure NOISE-4: The following mitigation measures are recommended to mitigate this impact:

[5] Two of the apartment complexes within the Onizuka housing area are currently exposed to outdoor CNEL noise exposure of 75 dB or more, as shown on Figure 12. This is an existing incompatible use. However, implementation of the NASA Ames Aerodynamics Program would increase this noise exposure by more than 5 dB, which is considered a significant impact and would be mitigated by the measures outlined in NOISE-4.

[6] *Assessing Noise Impact of Air Force Flying Operation.* HQ USAF/LEEVX. March 1984 and *Draft Air Force Family Housing Guide for Planning, Programming, Design and Construction.* October 1994.

(a) Onizuka Annex housing units exposed to average CNEL greater than 75 dB would be vacated during Level 2 and Level 3 testing.

(b) Air Force housing units exposed to daily CNEL noise exposure of 65 to 75 dB would be required to provide average CNEL interior noise environments of 45 dB, or they would be vacated during Level 2 and Level 3 testing.

These measures would be included in each detailed mitigation plan developed for projects implemented under the NASA Ames Aerodynamics Testing Program. (LTS)

If these mitigation measures are not implemented, this impact would continue to be significant.

Onizuka Air Station Annex housing units should be improved to provide attenuation to ensure acceptable noise exposure in the interior areas. The interior noise environment should have a maximum CNEL noise exposure of 45 dB, in accordance with the State Building Code noise standard and the Air Force guidelines. This can be achieved through a detailed design program, which will likely entail replacement of existing windows with acoustical windows, sound insulation of the roof structure, and acoustical baffling of the attic and subfloor ventilators. However, these improvements may not be possible due to construction constraints of the existing housing facilities. Where retrofit is not possible, the housing units should be vacated during testing.

NASA will become the new owners of the Onizuka military housing in the year 2000. NASA's ownership of the housing areas will facilitate the implementation of the above mitigation measures. Prior to 2000, NASA will continue to work with the Air Force to ensure necessary measures are implemented before testing under the Aerodynamics Testing Program occurs.

<u>Impact NOISE-5</u>: **The proposed NASA Ames Aerodynamics Testing Program would create exterior CNEL noise exposure in the immediately adjacent residential and commercial areas that would be incompatible with surrounding civilian residential (>65 dB) and commercial (>70 dB) land uses, according the Mountain View General Plan. (S)**

This noise exposure would not cause any hearing damage risk to surrounding land uses. Nonetheless, they would result in a degree of annoyance, which would produce a significant unavoidable noise impact.

These impacts are in the form of increased noise exposure over both the existing ambient conditions and in excess of those specified in the various community noise criteria. Impacts would manifest themselves in the form of annoyance, and would include interference with speech communication at large distances, requirements for higher volume settings for normal listening to television and radio, and possibly psychological effects such as stress. These effects are known to vary considerably among individuals.

This is considered a significant unavoidable impact. The following measure would, however, ensure that residents are notified of expected testing, and that impacts would be maintained within the envelope foreseen in this EIS.

> Mitigation Measure NOISE-5: NASA would publish a testing schedule in local newspapers to notify the community of planned testing projects. Additionally, NASA would monitor Level 2 and Level 3 aerodynamics testing at the two established monitoring locations to ensure aerodynamics testing is within the parameters set by the proposed NASA Ames Aerodynamics Testing Program. Direct feedback would be available between the monitoring stations and the aerodynamics testing controller. If noise is recorded significantly above the testing parameters (3 dB), testing would cease immediately or power levels would be immediately reduced to conform to the program parameters. (SU)

The monitoring locations are further detailed on page 22 and Figure 3 (page 23) of this FEIS. With implementation of the above mitigation measure this impact would still be considered significant, since community disturbance and annoyance could still occur. The following sections detail and compare the different impacted areas of the three program alternatives. Expected impacts of each alternative are within the applicable contour boundary of the program alternative.

a. Alternative 1. The only civilian residential property that would be exposed to CNEL greater than 65 dB as a result of Alternative 1 would be the Santiago Villa Mobile Home Park, which includes 358 units, and encompasses 15 hectares (37 acres).

Additionally, noise exposure greater than 70 dB CNEL are expected at approximately 25 hectares (61 acres) of commercial and industrial park land uses to the west of NASA Ames Research Center. Current tenants of these commercial lands include the following:

- Silicon Graphics (Shoreline Technology Park)
- Acuson (Shoreline Business Park)

- Hughes LAN Systems (Shoreline Business Park)
- Loral (Shoreline Business Park)
- Shoreline Christmas Tree Farm

However, impacts to commercial and industrial park areas are generally expected to be less since the CNEL values of Alternative 1 occur by considering nighttime testing, when commercial facilities would not generally be in use. The daytime-only impact, described by the $L_{eq(24)}$ metric, would be 7 dB below the CNEL levels around the 40- by 80-Foot Wind Tunnel, and 4 dB below the CNEL levels around the 80- by 120-Foot Wind Tunnel.

b. Alternative 2. Alternative 2 would impact approximately 250 units of the Santiago Villa Mobile Home Park. The impacted area for residential uses would be less when compared to Alternative 1. This reduction is primarily because testing would only be allowed during the daytime and evening hours, and nighttime testing (10:00 p.m. to 7:00 a.m.) would be prohibited.

Additionally, noise exposure greater than 70 dB CNEL are expected to affect 11 hectares (28 acres) of commercial and industrial park land uses. These impacts are less than those of Alternative 1 when analyzed using CNEL guidelines. However, in practical terms, impacts in commercial areas would be expected to be the same as for Alternative 1, since the higher CNEL values of Alternative 1 would result from testing at night, when commercial facilities would typically not be in use. The daytime-only impact, described by the $L_{eq(24)}$ metric, would be 2 dB below the CNEL levels around the 40- by 80-Foot Wind Tunnel, and also 2 dB below the CNEL levels around the 80- by 120-Foot Wind Tunnel.

Since the publication of the Draft EIS, NASA has identified a slight modification to Alternative 2 as their preferred alternative. For environmental review purposes, the preferred alternative can be considered approximately equal to Alternative 2; however the area exposed to incompatible noise would decrease slightly.[7]

c. Alternative 3. Alternative 3 would create incompatible noise exposure at 150 units of the Santiago Villa Mobile Home Park. Additionally, community response to the testing might be less since Level 2 and Level 3 testing would only occur before 7:00 p.m., while many residents are away from home and/or at work, and when very few residents would be sleeping.

[7] For a more detailed discussion of the preferred alternative, and the process NASA followed to select the program parameters, please refer to Section E of the Summary of this report, which begins on page S-17.

Additionally, noise exposure greater than a CNEL value of 70 dB are expected at approximately 7 hectares (16 acres) of commercial and industrial park land uses to the west of NASA Ames Research Center. This area would be similar to, but smaller than, that for Alternative 2. The daytime-only impact, described by the $L_{eq(24)}$ metric, would be the same as the CNEL value since Alternative 3 is a daytime-only operation and no evening or nighttime penalties are incorporated into the CNEL.

Impact NOISE-6: Aerodynamics testing implemented under the proposed NASA Ames Aerodynamics Testing Program may create annoyance and be considered a nuisance by the surrounding community. (LTS)

Though the areas specifically delineated as impact areas under NOISE-5 represent areas which would have a "significant" impact, as defined by the CNEL noise descriptor, and applicable regulations and guidelines, the community at-large may experience annoyance from the proposed NASA Ames Aerodynamics Testing Program. There is no feasible mitigation for this substantial, but less-than-significant, impact.

3. Airborne Noise-Induced Vibration (Alternatives 1, 2 and 3)

Impact NOISE-7: Aerodynamics testing implemented under the proposed program may create noise-induced vibration of objects in the surrounding community since low frequency noise is expected to dominate the aerodynamics testing. (LTS)

Airborne noise-induced vibration could include vibration of objects such as windows, pictures or suspended objects. The cause of this type of vibration is low frequency noise, which is attributable to the wind tunnel itself as well as many of the aircraft that could be tested under the proposed NASA Ames Aerodynamics Testing Program.

Frequency spectra would differ for each of the testing projects implemented under the Aerodynamics Testing Programs, since each would use a different engine with different sound qualities. An example frequency spectrum for the X-32/X-35 JSF testing project is presented in Appendix G.

The frequency spectrum for the X-32/X-35 JSF testing project contains a high percentage of low frequency sound. Therefore, vibration would be expected as a result of the testing. The model used to predict airborne noise-induced vibrations was developed for standard wood-frame construction. It is predicted that vibrations and rattling of the windows and lightweight ceilings would occur within the mobile homes, the Air Force housing units, the Onizuka Child Development Center and the Youth Center. Additionally, given that mobile homes may be of more lightweight construction than typical wood-frame housing, the walls may also vibrate despite the prediction of the model used for this study. Similar results would be expected for other future testing projects.

Vibrations of objects may cause annoyance for surrounding community members, but no hazards are anticipated to result from such occurrences, and the affected area would be generally the same or less than the area described for Impact NOISE-5. There is no feasible mitigation for this impact.

4. No Action Alternative

Under the No Action Alternative, none of the three proposed aerodynamics testing programs would be administered. Aerodynamics testing beyond projects currently administered through existing policies at NASA Ames Research Center would not be implemented. Existing operations at the wind tunnels would continue, but could not be expanded to include noisier testing.

Since no increase in powered model testing would occur under the No Action Alternative, there would be no noise impacts beyond those currently experienced.

However, it is important to note that noises generated by NASA Ames and Moffett Field have historically been a source of complaints from the surrounding community, and existing operations at Moffett Field contribute significantly to noise impacts to the existing Air Force Onizuka Child Development Center. This facility should be relocated regardless of implementation of the proposed NASA Ames Aerodynamics Testing Program. Additionally, surrounding residential uses, including the Air Force housing, would also continue to have noise impacts. Though the Santiago Villa Mobile Home Park would not experience noise above 58 dB from the NFAC wind tunnel facilities, this noise could still occur during the nighttime. Additionally, noise from other wind tunnel facilities at NASA Ames Research Center and flight operations at MFA would result in a continuing incompatible land use condition.

D. FLORA AND FAUNA

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The proposed NASA Ames Aerodynamics Testing Program would have a significant impact with regard to biology if it would:

- Cause a substantial reduction in plant, fish, or wildlife habitat.
- Result in a loss of sensitive vegetation.
- Create a substantial interference with movement of resident or migratory wildlife, or interfere with the use of the adjacent bay and tidal wetlands.
- Cause a jeopardy to threatened or endangered plant, fish, or wildlife species.

It is expected that the sole environmental change experienced by wildlife in the vicinity of the aerodynamic test facilities would be an increase in noise. Though no specific criteria regarding exposure of biological resources to noise have been documented, the Air Force has categorized noise-sensitive land uses to include habitats of rare, threatened or endangered species.[1]

There are no rigorous scientific studies detailing the physiological or behavioral responses of free-living wildlife to the noise levels and exposure durations proposed in this project. In the face of this uncertainty, it is reasonable to assume that hearing loss, whether permanent or temporary, could occur. This could increase risk of predation and would interfere with detection of acoustic signals critical for breeding. Physiological stress could increase the likelihood of reproductive failure and reduced breeding success.

Sound pressure level criteria for protection of wildlife have been developed from studies on laboratory species. Based upon the best available data concerning effects of noise on animals, two criteria have been developed for the protection of wildlife within the area that may be exposed to higher ambient noise levels, as follows.

1 Assessing Noise Impact of Air Force Flying Operations. HQ USAF/LEEVX. March, 1984.

- Wildlife would be protected from hearing loss if the sound pressure levels to which they are exposed do not exceed 90 dB.[2]
- Wildlife would be protected from physiological stress, including interference with reproduction, if the sound pressure levels to which they are exposed do not exceed 70 dB.

More detail on available studies and data regarding noise and wildlife is presented in Appendix I.

The alternatives for the proposed NASA Ames Aerodynamics Testing Program would not involve any loss of wildlife habitat due to construction of facilities or filling of wetlands. All project activities would be conducted at existing test facilities.

It is expected that there would be no change in the level of human activity at the test locations. That is, there would be no significant increase in number of personnel present or in the number of vehicular trips generated as compared to current levels of aerodynamic testing. Therefore, no additional disturbance to wildlife in adjacent habitats would come about as a result of human activities associated with the project.

The sole environmental change experienced by wildlife in the vicinity of the aerodynamic test facilities would be an increase in ambient sound pressure levels. The nature and significance of any adverse impacts to wildlife would depend upon the intensity of project-related noise and its duration at any particular location.

. **Alternatives 1, 2, and 3**

Seven of the special-status bird and mammal species should not be adversely affected by the proposed program, since they do not breed here, are only occasional visitors, and there is alternative habitat available in the region. These species are the California brown pelican, the American white pelican, the California least tern, the western snowy plover, the American peregrine falcon, the northern harrier, and the golden eagle.

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[2] All noise levels and noise exposure levels throughout this document are A-weighted in accordance with appropriate standards and criteria. All such values are in units of decibels, whose unit symbol is "dB" in conformance with American National Standard ANSI/ASME Y10.11-1984. The unit symbol "dBA" is not the standard symbol used under ANSI Y10.11. All numerical noise values in this document symbolized "dB," are numerically identical to those using "dBA," often found in other references.

Suitable tidal and diked salt marsh habitat for the remaining species exists to the north and west of the Outdoor Aerodynamic Research Facility (OARF). This habitat is suitable for the California clapper rail and salt marsh harvest mouse, and is used by the salt marsh common yellowthroat, loggerhead shrike, black shouldered kite, and the burrowing owl. However, this area is outside the area for potential impacts to biological species, since the wind tunnel facility is located about 3,000 feet (914 meters) from these habitats. NASA Ames has been involved in informal consultation with the United States Fish and Wildlife Service (USFWS) and has preliminarily determined that the projected maximum noise levels at this distance would not exceed 75 dB and no significant impacts to special-status species utilizing these habitats are expected.

However, burrowing owls have used habitat within 1,500 feet (457 meters) of the wind tunnel facility that would be exposed to maximum sound pressure levels of 90 dB or higher during proposed aerodynamic testing. This exposure compares to current maximum noise levels in this area that do not exceed 80 dB (Figures 9 and 10). Additionally, burrowing owl nesting has been recorded within 100 feet (30.5 meters) of the wind tunnel facility.

Impact F&F-1: **Burrowing owls currently use habitat within the area that would be exposed to noise levels greater than 90 dB. Hearing loss and an interruption in breeding could occur for birds due to operations under the proposed NASA Ames Aerodynamics Testing Program if they are exposed to these noise levels. (S)**

Only the area immediately surrounding the 40- by 80-Foot Wind Tunnel and the 80- by 120-Foot Wind Tunnel would be exposed to 90 dB or higher. If burrowing owls continue to use this location, as they have in the past, a monitoring program should be implemented to determine if these birds are being adversely impacted by the higher noise levels, as described below.

Mitigation Measure F&F-1: If Level 2 or Level 3 testing is conducted during the breeding season of the burrowing owl (March through August), a monitoring program would be implemented to determine whether there is interference with successful reproduction. Interference is defined as:

- A significant drop in chick production rate as compared to owls;
- A 50 percent burrow vacant rate within high noise areas; and/or
- Unusual behavior.

The monitoring program will be designed in consultation with the California Department of Fish and Game. If impacts are detected, appropriate mitigation would be implemented with input from this agency. (SU)

Since this mitigation measure does not prevent impacts to the burrowing owl, the possible impact is still considered significant, even with implementation of the above measure. It could be expected that the owls may either move away from the wind tunnel on their own, or stay underground in their burrows during high noise testing. Additionally, it is the opinion of the California Department of Fish and Game that, though the owls may respond to the noise when operations start, they would probably acclimate to the situation and return to their normal behavior patterns (refer to Appendix M).

2. No Action Alternative

Under the No Action Alternative, none of the three proposed aerodynamics testing programs would be administered. Aerodynamics testing beyond that currently administered through existing policies at NASA Ames Research Center would not be implemented. Existing operations at the wind tunnels would continue, but could not be expanded to include noisier testing.

Since no increase in powered model testing is expected through the No Action Alternative, there would be no expected impacts to biology.

E. RECREATION

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The proposed NASA Ames Aerodynamics Testing Program would have a significant impact with regard to recreation if it would:

- Conflict with an established recreational land use in the area.
- Inhibit the future development of recreational opportunities in the area.

It is expected that the sole environmental change affecting recreation will be an increase in noise. As previously described, no State or local noise criteria are binding on the type of noise to be created by the NASA Ames Aerodynamics Testing Program, since NASA Ames is a Federal facility and the engines and aircraft tested under the NASA Ames Aerodynamics Program would be considered exempt under the Noise Control Act of 1972.

Specific criteria of significance for recreational land uses have been developed for this EIS using previously described criteria as guidelines. The specific source for each criteria of significance is referenced below:

- Expose recreational uses at the Onizuka Air Station Annex or other Federal uses to daily CNEL levels greater than 75 dB (United States Air Force. *Assessing Noise Impacts of Air Force Flying Operations.* Appendix C. 1984 and United States Air Force. *Draft Air Force Family Housing Guide for Planning, Programming, Design and Construction.* October 1994).
- Expose civilian recreational land uses to CNEL noise exposure greater than 55 dB (City of Mountain View General Plan, 1992).

A. Environmental Impacts and Mitigation Measures

1. Alternatives 1, 2 and 3

Impact REC-1: **Recreation facilities at Onizuka Air Station Annex and NASA Ames Research Center would be exposed to CNEL noise levels greater than 75 dB with implementation of the proposed NASA Ames Aerodynamics Testing Program. (S)**

The Federal recreational facilities that would experience CNEL noise exposure of 75 dB and greater from the proposed NASA Ames Aerodynamics Testing Program include the Bicycle Commute Trail and recreational facilities throughout the housing areas of the Onizuka Air Station Annex.

Mitigation Measure REC-1: NASA will close the Bicycle Commute Trail during Level 2 and Level 3 testing. (SU)

Since this measure would not mitigate impacts to the Onizuka Air Station Annex, the above impact would remain significant.

Impact REC-2: **Public recreation facilities and land uses surrounding NASA Ames Research Center would be exposed to CNEL noise levels greater than 55 dB with implementation of the proposed NASA Ames Aerodynamics Testing Program. (S)**

Within the City of Mountain View, the public recreational facilities that would experience CNEL noise exposure of 55 dB and greater from the proposed NASA Ames Aerodynamics Testing Program are the Stevens Creek Regional Trail, Shoreline at Mountain View, Shoreline Amphitheatre, Stevens Creek Shoreline Nature Study Area, San Vernon Park, Whisman School and Park, existing and proposed alignments of the Bay Trail, and the proposed Stevens Creek Regional Park. However, it is important to note that the Mountain View CNEL guideline of 55 dB is comparatively stringent when considering other noise exposure criteria for recreational uses, as summarized in Table 10 on page 80 of this EIS.

Since the primary difference among the proposed NASA Ames Aerodynamics Testing Program alternatives is the nighttime testing schedule, implicit assumptions in the CNEL noise metric that nighttime testing would create more acoustic disturbances are generally not applicable when considering impacts to recreational facilities since they are typically closed from sunset to sunrise.

The noise impacts to the above referenced recreational facilities are generally not considered noise hazards; rather they are impacts related to annoyance or land use compatibility issues. The one exception is potential impacts to Stevens Creek Regional Trail (also referenced in Impact and Mitigation Measure NOISE-2).

<u>Mitigation Measure REC-2</u>: To prevent noise hazards, NASA would notify the City of Mountain View of Level 2 and Level 3 testing, and would recommend that Reach 1 of the Stevens Creek Regional Trail be posted and/or closed during Level 2 and Level 3 testing when the noise level is 85 dB or higher. (SU)

Since there is no substantial way to mitigate the noise from the NASA Ames Aerodynamics Testing Program, no mitigation is possible beyond the posting and/or closure of Reach 1 of the Stevens Creek Regional Trail.

Impacts to other recreational facilities would continue to be significant since CNEL noise exposure to these facilities would continue to be greater than 55 dB, which is the guideline provided in the City of Mountain View General Plan. However, this noise exposure would not cause any hearing damage risk.

Noise exposure to recreational facilities from existing sources will continue to have significant impacts on the existing and proposed Bay Trail. However, the proposed ATP will not add to existing noise levels. It should be noted that on December 15, 1994, the San Francisco Bay Conservation and Development Commission (BCDC) approved a Consistency Determination for the Moffett Field Comprehensive Use Plan, which allows for the development of the Bay Trail to the maximum extent feasible consistent with safety and security needs at Moffett Field. To date, safety and security needs have precluded the development of the Bay Trail to the north of Moffett Field and Ames Research Center. However, NASA is currently negotiating with the South Bay Ad-Hoc Trail Committee to develop a section of the trail from the shoreline bridge across Stevens Creek to the peninsula north of NASA Gate 16C.

<u>Impact REC-3</u>: Private recreation facilities would be exposed to CNEL noise levels greater than 55 dB with implementation of the proposed NASA Ames Aerodynamics Testing Program. (S)

Private recreation facilities that would be exposed to CNEL noise levels greater than 55 dB include the Shoreline Technology Park recreation area. This impact is in the form of increased noise exposure over the existing ambient conditions.

This impact is considered a significant unavoidable impact. Because it is directly related to noise impacts described in Section 5C, the mitigation measures outlined in that section should be implemented, as follows.

Mitigation Measure REC-3: Mitigation measures outlined in the Noise section of this EIS would be implemented to appropriately notify the surrounding community of noise generating activities, and control the generation of noise. (SU)

With the implementation of these measures, this impact would still be considered significant, since disturbance and annoyance could still occur. However, this noise exposure would not cause any hearing damage risk to surrounding land uses.

2. No Action Alternative

Under the No Action Alternative, none of the three proposed aerodynamics testing programs would be administered. Aerodynamics testing beyond that currently administered through existing policies at NASA Ames Research Center would not be implemented. Existing operations at the wind tunnels would continue, but could not be expanded to test supersonic jet airplanes and advanced technologies in vertical lift aircraft.

Since no increase in powered model testing is expected through the No Action Alternative, there would be no expected impacts to recreational facilities resulting from this alternative.

F. AIR QUALITY

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The proposed NASA Ames Aerodynamics Testing Program and program alternatives would have a significant impact with regard to air quality if it would:

- Conflict with adopted environmental plans, policies, or regulations for air pollutants, including Federal general conformity requirements.
- Cause a violation of an ambient air quality standard.
- Contribute substantially to an existing or projected air quality violation.
- Expose sensitive receptors to substantial pollutant emission sources and concentrations.

1. Alternatives 1, 2 and 3

The proposed NASA Ames Aerodynamics Testing Program would not require construction of new facilities, and thus would not have any construction-period air quality impacts. The air quality impacts of the three alternatives would be related to powered testing of aircraft in the 40- by 80-Foot Wind Tunnel and the 80- by 120-Foot Wind Tunnel. The engines of the aircraft are expected to use JP-8 fuel, which is a petroleum fuel similar to diesel. Jet engine exhausts during these powered tests would represent the only new emissions to the regional air basin.

The annual emission increase attributable to testing of aircraft has been estimated using engine fuel flow rates and emission rates provided by independent aircraft contractors of the X-32/X-35 JSF testing project. The fuel flow rates and emission factors utilized were for an engine size and type that represent a worst-case emission assumption for engine types that would be tested in anticipated projects administered under the proposed NASA Aerodynamics Testing Program. Estimated annual emissions attributable to the program are shown in Table 21.

Table 21

ESTIMATED WORST-CASE AIR EMISSIONS INCREASE (Tons/Year)

	CO	ROG	NOx
Alternative 1: 800 Annual Hours	70.2	5.1	122.4
Alternative 2: 600 Annual Hours	51.9	3.6	85.1
Alternative 3: 400 Annual Hours	33.6	2.1	47.7

As previously discussed, NASA Ames is in a Federal nonattainment area for carbon monoxide, and a maintenance area for ozone. The General Conformity Final Rule that amends the Code of Federal Regulations, Title 40, Parts 6, 51 and 93 regarding determining conformity of Federal actions to State or Federal Implementation Plans requires conformity determinations when the net total of direct and indirect emissions that would be caused by the Federal action would exceed certain "de minimus" levels for nonattainment or maintenance areas. For the Bay Area Air Basin, these "de minimus" thresholds are 100 tons per year for ozone precursors (Reactive Organic Gases), nitrogen oxides, or carbon monoxide.

The significance of project-related emissions of ozone precursors and carbon monoxide can be evaluated by comparing project impacts to the "de minimus" thresholds. These emissions estimates shown in Table 21 are "worst case" estimates because they assume that testing will occur for 100 percent of the test window hours and engine types will have the highest possible emissions.

The incremental emissions for CO and ROG would be below the "de minimus" thresholds for all alternatives. Emissions of NO_X would only exceed the "de minimus" threshold for Alternative 1. Because the proposed Aerodynamics Testing Program would result in an increase in air emissions, the following impact and mitigation measure are identified.

Impact AIR-1: Annual emissions of ozone precursors, nitrogen oxides, and carbon monoxide would increase as a result of the proposed implementation of the NASA Ames Aerodynamics Testing Program. (S)

Mitigation Measure AIR-1: NASA Ames will implement air quality mitigation prior to and during the implementation of the proposed NASA Ames Aerodynamics Testing Program, including:

(a) Modifying the stationary source permit for the 40- by 80-Foot Wind Tunnel and the 80- by 120-Foot Wind Tunnel to include powered testing of aircraft models included in the proposed NASA Ames Aerodynamics Testing Program prior to the inception of the program.

(b) NASA will either obtain offsets, refrain from powered model testing on Spare the Air days, or implement other mitigation as identified by BAAQMD permit conditions. (LTS)

Though the NASA Ames Aerodynamics Testing Program would be consistent with the State Implementation Plan, NASA Ames would be required to pursue a modification to the stationary source permit for the 40- by 80-Foot Wind Tunnel and the 80- by 120-Foot Wind Tunnel to include powered testing of aircraft models included in the proposed NASA Ames Aerodynamics Testing Program prior to the inception of the program. With this permit modification, a conformity determination would not be required for the implementation of the Aerodynamics Testing Program.[3]

2. No Action Alternative

Under the No Action Alternative, none of the three proposed aerodynamics testing programs would be administered. Aerodynamics testing beyond those currently administered through existing policies at NASA Ames Research Center would not be implemented. Existing operations at the wind tunnels would continue, but could not be expanded to test supersonic jet airplanes and advanced technologies in vertical lift aircraft.

Since no increase in powered model testing is expected through the No Action Alternative, there would be no expected increase in air emissions due to aerodynamics testing.

3 Erwin Mussen, Bay Area Air Quality Management District (BAAQMD). Personal communication. June 21, 1996.

G. SOCIOECONOMICS

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The NASA Ames Aerodynamics Testing Program would have a significant impact if it would negatively affect existing property values of residential or non-residential properties surrounding the testing facilities. Since the only environmental change that could negatively affect socioeconomics would be an increase in noise levels, the following criteria of significance has been established to evaluate these impacts:

- Expose residential property to exterior daily CNEL exposure of greater than 65 dB.

The following analysis assumes the findings from the 1994 study conducted for Manchester International Airport, as previously summarized in Chapter 4G, are applicable to the proposed NASA Ames Aerodynamics Testing Program. In reality, the proposed testing program would not involve the types of continuous noise levels that occur at an international airport. In fact, there may be many periods of time when no testing occurs.

1. Residential Property Values (Alternatives 1, 2, and 3)

Real estate markets vary greatly from one location to another and they are affected by factors such as quality and availability of schools and public amenities, infrastructure and public services, crime levels, proximity to employment centers, transportation access, neighborhood character and history, and supply and demand conditions. For these reasons, it is difficult to predict the potential effects related to property values is uncertain.

Impact ECON-1: **Noise levels associated with the proposed NASA Ames Aerodynamics Testing Program may affect the value of the Santiago Villa Mobile Home Park as a property and a business. (S)**

As shown in Figures 21, 22, and 23, portions of the Santiago Villa Mobile Home Park would be exposed to CNEL noise exposure greater than 65 dB for all three program alternatives.

As previously discussed, Santiago Villa includes 358 mobile home units and a club house. The current appraised market value of the park is approximately

$17 million. The value of the mobile home units, collectively, is estimated at about $20 million, or from $40,000 to $80,000 per unit, depending on the age of the unit. It is predicted that a reduction in property values of zero to five percent may occur for leasehold properties similar to the Santiago Villa Mobile Home Park.[4] Available literature does not specifically analyze the potential impacts on property values for mobile home units or parks. However, it can be assumed that the actual mobile home units may experience a similar reduction in property value.

For the mobile home units, it is estimated that a reduction in property value could range from zero to $1,800 for the $40,000 units and zero to $3,600 for the $80,000 units. Thus, a worst case impact would range from a $1,800 to $3,600 reduction in the value of mobile home units within the Santiago Mobile Home Park. However, due to the high demand for housing of this type in the south Bay Area, some individuals may be willing to pay current prices, regardless of proposed noise, given that there are limited replacement opportunities for mobile home spaces.

While it is not possible to predict with certainty that a loss of property value will occur, this analysis uses the findings of current literature to define a potential impact. Since, there are no feasible measures which could reduce noise levels at the mobile home park, no feasible mitigation exists for this potentially significant impact.

2. Commercial and Industrial Property Values

Over time commercial and industrial uses have encroached on Moffett Field, given the high value of real estate in the South Bay, and the need or desire of many businesses to be close to Highway 101. In the research conducted for this EIS, no studies were found that predicst the impact of noise levels on non-residential property values. The majority of studies focus on residential uses and when commercial activity is discussed, the positive benefits of being close to an airport, including the ease of personal transportation and goods transport, are identified.

Given the high demand for non-residential real estate and industrial and research and development buildings in the South Bay, it is unlikely that any reduction in property value would occur. As previously described, the average price per square foot for industrial research and development space in the area is comparable to industrial and commercial projects throughout the South Bay, and do not appear

4 This value corresponds to neighborhoods characterized as "unimproved terraces with older people". See Pennington (1990), which summarizes the ACORN neighborhood classifications used in both this and the Collins and Evans (1994) study. This classification, ACORN #12, is the closest equivalent to a mobile home park serving an older clientele.

unusually low. Additionally, commercial and industrial land uses are frequent in noisy areas, such as around airports.

3. No Action Alternative

Under the No Action Alternative, none of the three proposed aerodynamics testing programs would be administered. Aerodynamics testing beyond projects currently administered through existing policies at NASA Ames Research Center would not be implemented. Existing operations at the wind tunnels would continue, but could not be expanded to include noisier testing.

Since no increase in powered model testing would occur under the No Action Alternative, there would be no noise impacts beyond those currently experienced, and property values would not be increased or reduced.

However, if the proposed NASA Ames Aerodynamics Testing Program is not implemented, NASA Ames could not further its support of the national and local aeronautics and flight systems industries. Without the implementation of the proposed NASA Ames Aerodynamics Testing Program, the ability of NASA Ames to meet the following specific objectives of its mission would be severely constrained:

- *Fundamental Aerodynamics.* Advancing the general state-of-the-art, both theoretical and experimental.

- *Military Support.* Providing technical support to military aviation in areas consistent with other NASA Ames aeronautics roles and unique NASA Ames capabilities.

NASA Ames Research Center's support for local and national products and activities includes the research and testing of newly emerging technologies. Many of the facilities and capabilities of NASA Ames are in great demand for private industries and national contractors, due to their relative uniqueness. If these facilities are severely constrained, the amount of research work available to NASA Ames Research Center could be affected.

H. SUMMARY OF MITIGATION MEASURES

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The following is a summary of the mitigation measures outlined in this chapter. With implementation of these measures, impacts of the proposed action would be significantly reduced. However, significant and unavoidable impacts would still occur if the proposed NASA Ames Aerodynamics Testing Program were to be implemented, as detailed in the Summary section in the front of this EIS, and the previous textual discussion in this chapter.

1. Noise

Mitigation Measure NOISE-1: The following mitigation measure would be implemented to decrease the potential for health risk and hearing damage of NASA Ames Research Center employees, on-site contractors, and visitors, as outlined in the NASA Health Standard on Hearing Conservation, NHS/IH-1845.4:

(a) Prior to the implementation of individual testing projects, NASA would delineate the expected noise hazard area (above 85 dB) based on the best available data gathered to date.

(b) Individuals exposed to 85 dB or higher would be required to wear hearing protection. Use of ear protectors would be enforced by NASA as specified in Section 7.1.4 of the Hearing Conservation Program. Additionally, disposable earplugs would be available for employee use where noise levels are less than 85 dB, if they so desire. Hearing protectors must attenuate employee noise exposure to a level of 85 dB or below.

(c) Employee participation in the Medical Monitoring Program would be mandatory for all employees within the Action Level defined in the NASA Hearing Conservation Program.

(d) Areas that have noise levels above 85 dB would be posted as noise hazard areas during testing.

(e) NASA would monitor testing at the Benchmark location (Monitor #1) and the Stevens Creek Trail (Monitor #2) to ensure aerodynamics testing is within the parameters set by the proposed NASA Ames Aerodynamics Testing Program. Direct feedback would be available between monitoring stations and the aerodynamics testing controller. If noise is recorded significantly above the testing parameters (3 dB), testing would cease immediately or power levels would be immediately reduced to conform to the program parameters.

(f) A detailed mitigation plan, including the above measures, would be developed for specific projects implemented under the NASA Ames Aerodynamics Testing Program. (LTS)

<u>Mitigation Measure NOISE-2</u>: Prior to implementing aerodynamics testing that would create noise levels in excess of 85 dB at the Onizuka Air Station Annex, at Reach 1 of the Stevens Creek Trail, or at the Bicycle Commute Trail, NASA would notify the Air Force, the City of Mountain View, and occupants in all affected locations. NASA would detail which areas would be exposed to noise levels above 85 dB, and would recommend that applicable residential units and facilities (including recreational) be vacated and closed during testing, and that all areas above 85 dB be posted as noise hazard areas to prevent prolonged exposure to these noise levels without hearing protection. Additionally, NASA will allow Onizuka Air Station Annex residents and contractors to participate in the NASA Hearing Conservation Program. These measures would be included in a detailed mitigation plan which would be developed for each project implemented under the NASA Ames Aerodynamics Testing Program.

<u>Mitigation Measure NOISE-3</u>: The following mitigation measures are recommended to prevent impacts to the Onizuka Child Development Center and the Youth and Teen Facility:

(a) Prior to the start of Level 2 or Level 3 testing, the Onizuka Child Development Center would be moved to a quieter location that meets classroom noise environment guidelines established by the Air Force, or it will be vacated during Level 2 and Level 3 testing.

(b) The Youth and Teen Center would be vacated during Level 2 and Level 3 testing.

(c) Public access areas, including accessible Onizuka Air Station Annex property, that have noise levels above 85 dB would be posted as noise hazard areas during Level 2 and Level 3 testing.

These measures would be included in each detailed mitigation plan developed for projects implemented under the NASA Ames Aerodynamics Testing Program. If these mitigation measures are not implemented, Level 2 or Level 3 testing would not occur.

Mitigation Measure NOISE-4: The following mitigation measures are recommended to mitigate this impact:

(a) Onizuka Annex housing units exposed to average CNEL greater than 75 dB would be vacated during Level 2 and Level 3 testing.

(b) Air Force housing units exposed to daily CNEL noise exposure of 65 to 75 dB would be required to provide average CNEL interior noise environments of 45 dB, or they would be vacated during Level 2 and Level 3 testing.

Mitigation Measure NOISE-5: No mitigation is feasible to reduce this impact to less-than-significant levels. However, NASA would publish a testing schedule in local newspapers to notify the community of planned testing projects. Additionally, NASA would monitor Level 2 and Level 3 aerodynamics testing at the benchmark location through a permanent noise monitor to ensure aerodynamics testing is within the parameters set by the proposed NASA Ames Aerodynamics Testing Program. Direct feedback would be available between the monitoring station and the aerodynamics testing controller. If noise is recorded significantly above the testing parameters (3 dB), testing would cease immediately or power levels would be immediately reduced to conform to the program parameters.

2. Flora and Fauna

Mitigation Measure F&F-1: If Level 2 or Level 3 testing is conducted during the breeding season of the burrowing owl (March through August), a monitoring program would be implemented to determine whether there is interference with successful reproduction. Interference is defined as:

- A significant drop in chick production rate as compared to owls;
- A 50 percent burrow vacant rate within high noise areas; and/or
- Unusual behavior.

The monitoring program will be designed in consultation with the California Department of Fish and Game. If impacts are detected, appropriate mitigation would be implemented with input from this agency.

3. Recreation

Mitigation Measure REC-1: NASA will close the Bicycle Commute Trail during Level 2 and Level 3 testing.

Mitigation Measure REC-2: To prevent noise hazards, NASA would notify the City of Mountain View of Level 2 and Level 3 testing, and would recommend that Reach 1 of the Stevens Creek Regional Trail be posted and/or closed during Level 2 and Level 3 testing when the noise level is 85 dB or higher.

Mitigation Measure REC-3: Mitigation measures outlined in the Noise section of this EIS would be implemented to appropriately notify the surrounding community of noise generating activities, and control the generation of noise.

4. Air Quality

Mitigation Measure AIR-1: NASA Ames will implement air quality mitigation prior to and during the implementation of the proposed NASA Ames Aerodynamics Testing Program, including:

(a) Modifying the stationary source permit for the 40- by 80-Foot Wing Tunnel and the 80- by 120-Foot Wind Tunnel to include powered model testing of aircraft models included in the proposed NASA Ames Aerodynamics Testing Program prior to the inception of the program.

(b) NASA will either obtain offsets, refrain from powered model testing on Spare the Air days, or implement other mitigation as identified by BAAQMD permit conditions.

Chapter 6
OTHER NEPA INFORMATION

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The following chapter contains other NEPA information for the proposed NASA Ames Aerodynamics Testing Program Alternatives regarding local short-term uses versus long-term productivity, irreversible and irretrievable commitments of resources, growth-inducing effects, and cumulative effects.

A. Local Short-Term Use versus Long-Term Productivity

It is expected that the long-term effects of the proposed NASA Ames Aerodynamics Testing Program would be positive in that NASA could continue to support the United States commercial and military aerospace industry. However, these long-term benefits would occur after significant short-term impacts to the surrounding community have occurred.

The three proposed NASA Ames Aerodynamics Testing Program alternatives would provide for the continued advancement of the commercial and military aerospace industry. An example of this is in providing much needed support for the development of the X-32/X-35 JSF aircraft, which is currently intended to replace the Air Force F-16, the Navy F-18, the Marine Corp AV-8B, and the United Kingdom (UK) Harrier (AV-8B). The projected replacement date, somewhere between 2005 and 2010, is of great importance; otherwise the U.S. will have to use current aging aircraft.

There is also a longer term concern that, should the U.S. allow the aeronautics research and technology developments stagnate, competition from other nations, with inexpensive labor markets and manufacturing expertise could overtake U.S. technology.

Additionally, long-term advancement of the commercial aerospace industry is an important goal of the proposed NASA Ames Aerodynamics Testing Program. Foreign competition is primarily in the form of a consortium of foreign companies that are subsidized by respective national governments. Foreign companies have become formidable competitors. Further advancement of projects such as the High Speed Civil Transport (HSCT) will ensure that the United States commercial aerospace industry also remains highly competitive in the long-term.

The attainment of these long term benefits would require wind tunnel testing somewhere and somehow before these future aircraft are flight tested or put into production. The wind tunnel tests provide a controlled environment which allow for the precise airflow measurements that must be obtained for the detailed design of the aforementioned prototypes and production aircraft. Additionally, powered-lift configurations, like the X-32/X-35 JSF, have complex flowfields due to interactions between the airframe and the propulsion system that cannot be accurately simulated at small-scale. Therefore, designs must be validated in wind tunnels at large to full-scale prior to building and flying a demonstrator or prototype aircraft. The 80- by 120-Foot Wind Tunnel at NASA Ames is the only facility in the world that can accommodate these large models.

Unfortunately, significant population and industrial growth have occurred in close proximity to the 80- by 120-Foot Wind Tunnel and other aerodynamics testing facilities at NASA Ames. Though this attribute has been a positive force in supporting educational and research projects in Santa Clara County, it generates concerns about noise levels emanating from the wind tunnel facilities, and the effects of this noise on the surrounding communities. As noise levels increase due to advances in aerodynamics propulsion capabilities, these concerns increase.

NASA Ames Research Center has historically been at the forefront of wind tunnel testing, and proposes to continue with the proposed NASA Ames Aerodynamics Testing Program. However, increases in testing at NASA Ames will include short-term noise impacts to the surrounding community. Though these impacts are not expected to be at harmful levels, they are expected to reach annoying levels from time to time.

B. Irreversible and Irretrievable Commitments of Resources

The proposed program and the program alternatives would not cause any irreversible and irretrievable commitments of nonrenewable resources to uses that future generation may be unable to reverse. The fact that the program and its alternatives do not include any new construction, employees, traffic generation, or utility usage is a primary reason that commitment of nonrenewable resources is not expected. It is anticipated that the construction of the aircraft models to be tested within the wind tunnels will commit limited amounts of metals and other materials.

C. Growth-Inducing Effects

The proposed program and the program alternatives would not induce local growth. The fact that the program and its alternatives do not include any new construction, employees, traffic generation, or utility usage is a primary reason that growth is not expected.

D. Cumulative Effects

Cumulative impacts occur when two or more individual effects together create a considerable environmental impact, or if they compound or increase other environmental impacts. Cumulative impacts are those that result from the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions regardless of which agency (federal or nonfederal) or person undertakes such actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time.

Almost all of the environmental impacts discussed in this report are all directly attributable to an increase in noise. The fact that the program and its alternatives do not include any new construction, employees, traffic generation, or utility usage is a primary reason impacts are not expected in many of these issue categories.

Because of the non-linear way in which noise and noise exposure combines, the cumulative impacts of noise are generally negligible. The rules for decibel addition used in community noise prediction are:

- If two sound levels are within 1 dB of each other, their sum is the highest value plus 3 dB.
- If two sound levels are within 2 to 4 dB of each other, their sum is the highest value plus 2 dB.
- If two sound levels are within 5 to 9 dB of each other, their sum is the highest value plus 1 dB.
- If two sound levels are greater than 9 dB apart, the contribution of the lower value is negligible and the sum is simply the higher value.

Generally, when two or more noise sources combine, the majority of the impact results solely from the greater noise, which generally masks, or drowns out, the lower noise levels. The maximum cumulative noise impact exists when two sounds of equal value combine, which is highly unlikely in this situation. For these reasons, no additional cumulative impacts are expected to occur. Noise impacts are expected to be limited to those previously outlined in this report. Specific projections of cumulative noise impacts are detailed in Table 20, on page 144 of Chapter 5C.

With regards to air quality, the South Bay and greater Bay Area are experiencing continued growth in population and vehicle use that will affect the emission of regional pollutants such as hydrocarbons and oxides of nitrogen. Current projections are that regional emissions of these pollutants will decrease in the future, despite cumulative growth in population and vehicle use, due to regional programs for reducing emissions that are in place or currently being considered. Continued improvement in regional air quality is projected through the year 2000 with attainment of all Federal ambient air quality standards forecast during this period. Attainment of the California ambient air quality standards for ozone and PM_{10} throughout the entire Bay Area Air Basin is not projected by the year 2000.

Chapter 7
LIST OF COMMENTORS

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A. Written Comments

Federal and State Agencies

1. Joel A Medlin, Field Supervisor. U.S. Fish and Wildlife Service. U.S. Department of the Interior. June 7, 1995.

2. Lynne Trulio, Ph.D., Ecologist. San Jose State University. August 8, 1995.

3. David Farrel, Chief. Office of Federal Activities. United States Environmental Protection Agency. August 30, 1995

4. Timothy A. Roberts, Colonel. 50th Space Wing, 750 SG/CC. Onizuka Air Station. Department of the Air Force. November 20, 1995.

Regional and Local Agencies

5. Brian Wiese, Trail Development Coordinator. San Francisco Bay Trail Project. Association of Bay Area Governments. August 8, 1995.

6. Julie Bondurant, Park Planner. Planning and Development Department. County of Santa Clara. August 14, 1995.

7. Nadine P. Levin, Assistant City Manager. City of Mountain View. August 14, 1995.

8. Del Woods, Senior Planner. Midpeninsula Regional Open Space District. August 14, 1995.

9. Barbara Waldman, Mayor. City of Sunnyvale. August 16, 1995.

Private Individuals and Organizations

10. Robert Peyre, President. Diversified Property Management Associates. August 8, 1995.

11. The Millar Family. August 11, 1995.

12. Gerald G. Vurek, President. Windsor Lochs Homeowners Association. August 11, 1995.

13. Tom Rivell. August 14, 1995.

B. Oral Comments

Three public meetings were held on the Draft EIS. A summary of these comments is included in Chapter 8. The minutes for these meetings provide a more comprehensive documentation of the oral comments and NASA's presentation of the Draft EIS. Copies of the minutes are available for review at the Sunnyvale Public Library, located at 655 West Olive Avenue in Sunnyvale. The following meetings were held.

1. Moffett Club, Building 943, Moffett Field, California. July 31, 1995, 2:00 p.m.

2. Graham Elementary School, Mountain View, California. July 31, 1995, 7:00 p.m.

3. Sunnyvale City Council Chambers, Sunnyvale, California. August 3, 1995, 7:00 p.m.

Chapter 8
COMMENTS AND RESPONSES

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This chapter includes a reproduction of each letter received during the public review and comment period. Comments were received from Federal, State, regional, and local agencies, and private individuals and organizations. Each comment and response is labeled with a reference number in the margin.

Where the same comment has been made more than once, a response may direct the reader to another numbered response. Where a response requires revisions to the Draft Environmental Impact Statement (DEIS), these revisions have been made to the text of this Final EIS (FEIS).

The following letters were received directly by NASA (the lead agency) in response to the DEIS. Each letter is reproduced in its entirety, and is immediately followed by responses to the comments in it. Letters are categorized by commentator, with Federal and State agencies first, regional and local agencies second, and private individuals and organizations last. Within each category, letters are arranged in chronological order.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
Sacramento Field Office
2800 Cottage Way, Room E-1803
Sacramento, California 95825

IN REPLY REFER TO:

1-1-95-I-732

June 7, 1995

Ms. Sandy Olliges
Assistant Chief
Safety, Health and Environmental Services
National Aeronautics and Space Administration
Ames Research Center
Moffett Field, California 94035-1000

Subject: Informal Endangered Species Consultation on Proposed Aerodynamics Testing at the Ames Research Center, Moffett Field, California

Dear Ms. Olliges:

This responds to your letter dated April 24, 1995, requesting concurrence with the determination that the proposed action, aerodynamics testing within the 40-by-80-by-120-foot wind tunnel at the Ames Research Center, is not likely to adversely affect the federally endangered California clapper rail (*Rallus longirostris obsoletus*). We have reviewed the material transmitted with your correspondence, along with other material earlier transmitted by your office, and concur with this determination. However, our determination is based upon our understanding that aerodynamics testing at the Outdoor Aerodynamics Research Facility is not being proposed. Therefore, unless new information reveals effects of the proposed action that may affect listed species in a manner or to an extent not considered, or a new species or critical habitat is designated that may be affected by the proposed action, no further action pursuant to the Endangered Species Act of 1973, as amended, is necessary. 1-1

Please contact Jim Browning of my staff at (916) 979-2752, if you have questions regarding this response.

Sincerely,

Cay C. Goude
for Joel A. Medlin
Field Supervisor

cc: ARD-ES, Portland, OR
SFBNWR, Project Leader

LETTER 1:
Joel A Medlin, Field Supervisor. U.S. Fish and Wildlife Service. U.S. Department of the Interior. June 7, 1995.

1-1: Comment noted. This comment concurs with the findings of the EIS that the aerodynamics testing within the 40- by 80-Foot Wind Tunnel and the 80- by 120-Foot Wind Tunnel, as proposed by the NASA Ames Aerodynamics Testing Program alternatives, is not anticipated to have an adverse impact on the federally listed endangered California clapper rail (*Rallus longirostris obsoletus*).

SJSU SAN JOSE STATE UNIVERSITY

A campus of The California State University

College of Social Sciences • Department of Geography and Environmental Studies
One Washington Square • San José, California 95192-0116 • 408/924-5475 • 408/924-5450

August 8, 1995

Sandra Olliges
Mail Stop 218-1
NASA Ames Research Center
Moffett Field, CA 94035-1000

Dear Sandra,

I have recently received the Draft Environmental Impact report for the NASA Ames Aerodynamics Testing Program and I have reviewed the biotics section, particularly with reference to the burrowing owl.

The sections on impacts and mitigations accurately reflect the discussions I have had with you and Kathleen Kovar concerning the possible impacts of the project on burrowing owls. Monitoring the effects of the noise on the birds and, if necessary, implementing appropriate measures is the best course of action given our uncertainty concerning how owls may react to the anticipated noise levels. 2-1

Thank you very much for including this information in the environmental review process.

Sincerely,

Lynne Trulio

Lynne Trulio, Ph.D.
Ecologist

LETTER 2:
Lynne Trulio, Ph.D., Ecologist. San Jose State University. August 8, 1995.

2-1: Comment noted. This comment acknowledges that the findings of the NASA Ames Aerodynamics Testing Program EIS with reference to the burrowing owl have been made in concurrence with the on-site biologist at Moffett Field. Mitigation measures for potential impacts on burrowing owls will be developed and implemented if impacts are detected. This mitigation measure has been developed due to the uncertainty concerning how the burrowing owls may react to the anticipated noise levels. This measure has also been further detailed in this FEIS to incorporate criteria for determining potential impacts through the monitoring program (see pages S-15 and 164).

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105-3901

AUG 30 1995

Sandy Olliges (mailstop 218-1)
Safety, Health & Environmental Services Office
NASA Ames Research Center
Moffett Field CA 94035

Dear Ms. Olliges:

The US Environmental Protection has reviewed the Draft Environmental Impact Statement (DEIS) for the **NASA AMES RESEARCH CENTER AERODYNAMIC TESTING PROGRAM, Moffett Field, California.** Our comments on the DEIS are provided pursuant to the National Environmental Policy Act (NEPA), Section 309 of the Clean Air Act, and the Council on Environmental Quality's Regulations for Implementing NEPA (40 CFR 1500-1508).

The purpose of the proposed program is to support the research and development of new aeronautical technologies for military and civilian use. The DEIS outlines parameters for testing at two NASA Ames facilities: the 40-by-80 foot wind tunnel and the 80-by-120 foot wind tunnel. The DEIS addresses three action alternatives and No Action. The three action alternatives address the amount of testing that would be conducted each year: 800, 600 and 400 hours. No new construction is proposed since the two existing wind tunnels would be used in the testing program. On August, 16 EPA met with NASA and the Air Force to discuss the proposed program. EPA appreciates that NASA granted EPA an individual extension until August 31 to provide this comment letter.

Based upon our review of the DEIS, we have rated the document as Category EC-2 (Environmental Concerns - Insufficient Information). Please refer to the enclosed rating sheet for further explanation of EPA's rating system for DEIS's. Our environmental concerns relate to impacts and mitigation associated with air quality and noise. We are concerned that no air quality mitigation is proposed in the DEIS even though the program would result in increased emissions of air pollutants such as oxides of nitrogen and reactive organic gases. We suggest that NASA identify air mitigation and include commitments in the Final Environmental Impact Statement (FEIS) and Record of Decision (ROD).

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In terms of noise, we are concerned with projected noise impacts that would adversely affect residents of Air Force housing and children at the Air Force Child Development Center (CDC) and Youth & Teen Facility (YTF) as well as the lack of detail of measures proposed to mitigate adverse noise impacts to Air Force housing and the CDC and YTF. We are also concerned with projected noise impacts to residents at the Santiago Villa Mobile Home Park. No mitigation measures for noise impacts to Santiago Villa are proposed except for notification of testing times. As a policy matter, we are seriously concerned that the DEIS states that NASA Ames, as a Federal facility, has a blanket exemption from compliance with State and local noise control requirements for <u>all</u> projects and activities.

We have also provided information on pollution prevention features that NASA should consider as it moves toward project implementation. The DEIS did not reflect any consideration of CEQ's guidance memorandum on pollution prevention. Our detailed comments on noise, air quality and pollution prevention are enclosed. We appreciate the opportunity to comment on the DEIS. Please send one copy of the FEIS to my attention (code: E-3) when it is filed with EPA's Washington, D.C. office. If you have any questions, please call David Tomsovic of my staff at 415-744-1569 (fax 415-744-1598).

Sincerely,

Edward E Yates
for

David Farrel, Chief
Office of Federal Activities

Enclosures: 3
EPA rating sheet on DEIS's
Detailed EPA comments on DEIS
Pollution Prevention Checklists, Defense & Missiles

cc: Laura Doty, NASA Ames
Michael Tye, USAF, San Francisco
Lt. Christopher Brousseau, Onizuka Air Station, Sunnyvale
Bill de Boisblanc, BAAQMD, San Francisco

M.I. #2384

SUMMARY OF RATING DEFINITIONS AND FOLLOW-UP ACTION

Environmental Impact of the Action

LO-Lack of Objections

The EPA review has not identified any potential environmental impacts requiring substantive changes to the proposal. The review may have disclosed opportunities for application of mitigation measures that could be accomplished with no more than minor changes to the proposal.

EC-Environmental Concerns

The EPA review has identified environmental impacts that should be avoided in order to fully protect the environment. Corrective measures may require changes to the preferred alternative or application of mitigation measures that can reduce the environmental impact. EPA would like to work with the lead agency to reduce these impacts.

EO-Environmental Objections

The EPA review has identified significant environmental impacts that must be avoided in order to provide adequate protection for the environment. Corrective measures may require substantial changes to the preferred alternative or consideration of some other project alternative (including the no action alternative or a new alternative). EPA intends to work with the lead agency to reduce these impacts.

EU-Environmentally Unsatisfactory

The EPA review has identified adverse environmental impacts that are of sufficient magnitude that they are unsatisfactory from the standpoint of environmental quality, public health or welfare. EPA intends to work with the lead agency to reduce these impacts. If the potential unsatisfactory impacts are not corrected at the final EIS stage, this proposal will be recommend for referral to the Council on Environmental Quality (CEQ).

Adequacy of the Impact Statement

Category 1-Adequate

EPA believes the draft EIS adequately sets forth the environmental impact(s) of the preferred alternative and those of the alternatives reasonably available to the project or action. No further analysis or data collection is necessary, but the reviewer may suggest the addition of clarifying language or information.

Category 2-Insufficient Information

The draft EIS does not contain sufficient information for EPA to fully assess environmental impacts that should be avoided in order to fully protect the environment, or the EPA reviewer has identified new reasonably available alternatives that are within the spectrum of alternatives analyzed in the draft EIS, which could reduce the environmental impacts of the action. The identified additional information, data, analyses, or discussion should be included in the final EIS.

Category 3-Inadequate

EPA does not believe that the draft EIS adequately assesses potentially significant environmental impacts of the action, or the EPA reviewer has identified new, reasonably available alternatives that are outside of the spectrum of alternatives analyzed in the draft EIS, which should be analyzed in order to reduce the potentially significant environmental impacts. EPA believes that the identified additional information, data, analyses, or discussions are of such a magnitude that they should have full public review at a draft stage. EPA does not believe that the draft EIS is adequate for the purposes of the NEPA and/or Section 309 review, and thus should be formally revised and made available for public comment in a supplemental or revised draft EIS. On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the CEQ.

*From: EPA Manual 1640, "Policy and Procedures for the Review of Federal Actions Impacting the Environment."

US EPA COMMENTS ON NASA DEIS, NASA AMES AERODYNAMIC TESTING PROGRAM

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AIR QUALITY

Issue: The Draft Environmental Impact Statement (DEIS) does not identify air quality mitigation for the proposed program even though increased emissions are projected. The DEIS also states that a general conformity determination under Clean Air Act Section 176 is not required for the project (p. 163, footnote 8).

Discussion: The DEIS presents the expected air emissions of carbon monoxide, reactive organic gases and oxides of nitrogen for Alternatives 1, 2 and 3 (Table 20, p. 163). The most emissions for all three pollutants would come with Alternative 1. Despite these increased emissions, no air quality mitigation is discussed or proposed in the DEIS, even though Alternatives 1 and 2 "may have a significant impact on ozone air quality, since NOx emissions would exceed the Federal 'de minimus' thresholds." (DEIS, pp. S-5 and S-6). NOx emissions would increase by 122.4 and 85.1 tons per year under Alternatives 1 and 2, respectively, over No Action.

Based upon EPA's discussion with NASA on August 16, one or more air permits would be required for the proposed program (Authority to Construct and/or Authority to Operate permits). The agency issuing the permit(s) would be the Bay Area Air Quality Management District (BAAQMD). Because the San Francisco Bay Area is a carbon monoxide nonattainment area and an ozone maintenance area, EPA is concerned that emissions associated with the program may have adverse consequences on the Bay Area's air quality. We are even more concerned that no air quality mitigation was identified or proposed in the DEIS despite the program having a "significant impact" on ozone levels. (p. S-5). 3-1

Recommendation: We encourage NASA to identify appropriate air quality mitigation for the program, in consultation with the permit-issuing agency (BAAQMD). There are several air quality mitigation measures that NASA may want to explore as it moves forward with the program. For example, NASA could avoid testing during peak ozone periods such as "Spare the Air" days. Another would be to explore the cost and technical feasibility of capturing project-related emissions; the feasibility of reducing emissions using a blend of lower-emission fuels should be discussed. The FEIS should also discuss whether other feasible air quality mitigation measures may exist or could be implemented. Appropriate commitments regarding air quality mitigation should be included in the Final Environmental Impact Statement (FEIS) and Record of Decision.

NOISE COMPLIANCE, IMPACTS & MITIGATION AUG 30 1995

Issue: Page 74 states that "No State or local noise criteria regulate noise at NASA Ames...since NASA Ames is a Federal facility and is not subject to State or local noise control regulations." A similar statement is made on p. 160 and possibly elsewhere in the document.

Discussion: The Noise Control Act of 1972 contains language regarding both "products" regulated under the law as well as a section regarding Federal programs and Federal facilities. Under the definition of "products" to be regulated by EPA under the law, certain exceptions are provided including "(ii)...rockets or equipment which are designed for research, experimental, or developmental work to be performed by...[NASA]. (Section 3(2)(B) of the Noise Control Act). Also excluded from EPA regulatory control as "products" are military weapons or equipment designed for combat use, and machinery or equipment designed for use in experimental work done by or for the Federal Government.

Section 4(b) of the Noise Control Act regards Federal programs and Federal facilities. Section 4(b) states that:

> "Each department, agency, or instrumentality of the executive, legislative, and judicial branches of the Federal Government- (1) having jurisdiction over any property or facility, or (2) engaged in any activity resulting, or which may result, in the emission of noise, shall comply with Federal, State, interstate, and local requirements respecting control and abatement of environmental noise to the same extent that any person is subject to such requirements."

3-2

The DEIS contains no reference to the language in Section 4(b) noted above. Neither does the DEIS contain any reference to Executive Order 12088 (**Federal Compliance with Pollution Control Standards**, October 13, 1978) which provides that Executive agencies are "responsible for compliance with applicable pollution control standards" (Section 1-102 of Executive Order 12088). Additionally, Section 1-202 of the Executive Order provides that Federal agencies shall consult with "State...and local agencies [on] the best techniques and methods available for the prevention, control, and abatement of environmental pollution," including noise pollution. We could find no reference that NASA consulted with State and local agencies regarding the best techniques and methods to prevent, control and abate noise projected to occur with implementation of the program.

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Recommendation: We recommend that the FEIS revisit the statements on pp. 74 and 160 that the facility is "not subject to State or local noise control regulations," referencing the language in Section 4(b) of the Noise Control Act. We suggest that this discussion focus not only on noise associated with the testing program but also with other noise associated with NASA Ames' programs and activities such as construction-related noise. 3-2

The FEIS should also discuss the applicability of Executive Order 12088 and NASA's consultation efforts with State and local agencies to prevent, control and abate noise associated with the testing program.

Issue: The DEIS identifies adverse noise impacts associated with the program and puts forth noise mitigation for various affected parties (generally NASA vs. non-NASA). EPA believes that further clarification is needed in the FEIS on the mitigation of noise impacts to Air Force housing units and the Child Development Center (CDC) and Youth & Teen Facility (YTF), and what agency (NASA or Air Force) will fund and implement such mitigation.

Discussion: The DEIS clearly depicts projected adverse noise impacts to NASA employees, on-site contractors and visitors; children at the CDC and the YTF; employees at Onizuka Air Station Annex; residents of Air Force housing units; and private parties such as residents of the Santiago Villa Mobile Home Park. Different mitigation measures are proposed for various affected parties. For example, mitigation for NASA Ames' employees, on-site contractors and visitors exposed to 85 dB or greater would include a requirement that such individuals wear hearing protection as well as mandatory employee participation in a medical monitoring program. We support the mitigation measures proposed for NASA Ames' employees, on-site contractors and visitors. 3-3

However, impacts <u>and</u> mitigation for Air Force-related parties is in need of further clarification in the FEIS. For example, the DEIS (p. 138) is not clear when it states, "it is anticipated that 182 [Air Force] housing units would be <u>vacated during testing</u> to ensure that individuals are not exposed to hazardous noise levels, and to simplify evacuation by vacating entire housing complexes." (underline added). We are uncertain what is meant by the phrase "vacated during testing." Does it mean that the Air Force housing would be vacated during the testing windows shown on pp. 29-31? Or does it mean that the Air Force housing would be vacated for the entire duration of a particular test, i.e., possibly lasting two or more weeks?

The reader gets the impression that the occupants of Air Force housing would be removed from their dwellings during certain hours of the day, but could return when that day's testing is

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completed. However, NASA informed EPA that occupants of Air
Force housing would be vacated from their dwellings during the
entire time when a test program is being conducted, which could
be two weeks or more (8/7/95 telecon between Sandy Olliges, NASA
and David Tomsovic, EPA).

<u>Recommendation</u>: We recommend that the FEIS clarify what is meant 3-3
that Air Force housing would be "vacated during testing." The
FEIS should also clarify the statement on p. 149 that, prior to
Level 2 or 3 testing, the CDC "would be moved to a quieter
location" and that the YTF "would be vacated" during Level 2 or 3
testing. The FEIS should clarify whether it would be NASA or the
Air Force that would implement and fund the noise mitigation
described for Air Force personnel and dependents.

<u>General Noise Comments</u>

1. The DEIS (pp. 34-35) states that noise attenuation for the
larger wind tunnel would exceed $75 million, but no cost estimate
is given for noise attenuation of the smaller wind tunnel. 3-4
Rather, p. 34 quotes an estimated figure of $20/square foot for
"hundreds of thousands of square feet of tunnel area." We
suggest that the FEIS provide a cost estimate for noise
attenuation of the smaller tunnel if it is available.

2. We suggest that the FEIS provide a table depicting the costs
of the various mitigation scenarios including
* noise attenuation of the wind tunnels,
* construction of a new CDC,
* construction of a new YTF, 3-5
* noise-proofing the military housing, and
* other mitigation that may be feasible to reduce adverse
noise impacts to both NASA and non-NASA personnel and
dependents.

3. We suggest that the FEIS provide more detail on what
arrangements would be made between NASA and the Air Force to fund
mitigation for adverse noise impacts. Additionally, the FEIS
should discuss whether NASA intends to pass on the cost of 3-6
project-related noise mitigation to private aerospace entities
that may use the wind tunnels, or whether the full cost of
mitigation would be borne solely by NASA and/or the Air Force.

POLLUTION PREVENTION

<u>Issue</u>: The DEIS did not appear to reflect pollution prevention
measures for the project.

<u>Discussion</u>: The Council on Environmental Quality (CEQ) issued a 3-7
memorandum to all Federal agencies concerning the integration of
pollution prevention principles, techniques and mechanisms in

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Federal agency NEPA documents (refer to the January 29, 1993 Federal Register at pp. 6478-6481). The CEQ adopted a very broad definition of pollution prevention including reducing/eliminating hazardous pollutants; modifying industrial processes; recycling; and energy/water efficiency and conservation. For your reference I've enclosed two pollution prevention checklists found in EPA's **POLLUTION PREVENTION/ENVIRONMENTAL IMPACT REDUCTION CHECKLISTS** (January 1995). 3-7

Recommendation: Although a number of the pollution prevention areas in the two checklists are not applicable to your project (e.g., electromagnetic radiation concerns), the checklists contain a variety of measures that NASA should consider as it proceeds with project implementation. Appropriate commitments regarding pollution prevention should be included in the FEIS and Record of Decision.

POLLUTION PREVENTION/ENVIRONMENTAL IMPACT REDUCTION CHECKLIST FOR DEFENSE TESTING AND RELATED ACTIVITIES

How Can Defense Testing and Related Activities Affect the Environment?

Testing and evaluation projects for Department of Defense programs can have a variety of effects on the environment. These effects include air quality impacts from launch vehicle exhaust, potential depletion of stratospheric ozone levels, electromagnetic radiation hazards, generation of hazardous materials and wastes, noise impacts, pollution of surface water and groundwater sources, impacts to biological resources, and soil erosion and contamination.

Also see checklists on Rocketry/Missile Projects, Ecosystem Preservation and Protection, and Siting.

What Questions Should Be Asked To Ensure That These Effects Are Minimized or Eliminated?

Air Quality Concerns. Routine releases of rocket testing propellant combustion products (including carbon dioxide, carbon monoxide, hydrogen gas, hydrogen chloride, nitrogen gas, chlorine, and aluminum oxide) can cause adverse human health effects and contribute to acid rain. Also of concern is the volatilization of hazardous chemicals from accidental spills and leaks.

- Are there opportunities to reduce the adverse effects of air emissions by the relocation of test facilities to areas where air quality impacts would be less serious?
- Will the project use enclosed test facilities equipped with vapor recovery systems and oxidizer vapor scrubber systems? *
- Will the number of test launches be minimized? Will the timing of test launches be restricted to avoid occasions of damp weather and low-level inversions?
- Are there provisions for reducing potential spills and uncontrolled releases of hazardous materials? Has a spill prevention and control plan been written?

Upper Atmosphere Concerns. Test rocket exhaust compounds (including hydrogen chloride, metallic oxide particulates, ice, soot, nitrogen compounds, and hydrogen compounds) can lead to stratospheric ozone destruction. Combustion gases (including carbon dioxide, nitrous oxide, and water vapor) from missile launches absorb infrared radiation and can contribute to global warming.

- Will the number of rocket/missile launches be minimized to the greatest extent feasible? One technique is to rely on test simulations whenever possible.
- Does the project suggest any alternatives to the use of hydrogen chloride (a major ozone-depleting chemical)?

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* Indicates an environmental impact reduction opportunity.

Electromagnetic Radiation Concerns. Communication systems, transmitters, and ground-based radar systems used to guide missiles produce electromagnetic radiation (EMR) that could result in adverse impacts on humans and the environment.

- Does the project consider coordinating with the U.S. Fish and Wildlife Service to site radar systems away from established migratory bird flyways to avoid exposure to EMR from the trajectory beams?

- Will power densities of EMR be controlled to acceptable safety levels? Have standoff distances from EMR power sources been specified?

Hazardous Material/Waste Management Concerns. Testing and evaluation projects involve the use of hazardous materials, including reactive solid rocket propellants, toxic solvents, oxidizers, and toxic liquid rocket fuel. The use of these materials can affect the environment through improper storage, air emissions of volatile chemicals, routine releases (i.e., evaporation, transportation, combustion, test launch debris), and accidental spills and other uncontrolled releases.

- Are there opportunities to reduce the amount of hazardous and toxic materials used as part of the project? For example, will the use of such compounds as beryllium and mercury be minimized?

- Are there provisions for reducing potential spills and uncontrolled releases of hazardous materials? Has a spill prevention and control plan been developed?

- Is there a plan for expeditious recovery of flight test vehicles and debris containing hazardous materials? *

Noise Concerns. Noise associated with military testing activities (such as testing launches and detonation of explosives) can affect both humans and wildlife. Sonic booms generated from the flight of test missiles can interrupt the breeding habits of some wildlife species.

- Does the project specify adequate buffer zones around explosion sites or rocket/missile test sights?

- Are a wide range of sound attenuation measures, such as noise barriers, concrete bunkers, and water damping, included as part of the project?

Surface Water Concerns. Surface water quality near launching and test-firing facilities and below rocket/missile trajectories could be affected by the deposition of contaminants from exhaust clouds, contamination from fallen rocket/missile debris, spills or leaks of propellant, and contaminated stormwater runoff.

- Does the project require the preparation of Spill Prevention Control and Countermeasures Plans, Stormwater Pollution Prevention Plans, and Soil Erosion and Sediment Control Plans?

- Are proposed testing facilities located away from surface waterbodies?

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* Indicates an environmental impact reduction opportunity.

Groundwater Concerns. Military testing and evaluation projects involve the use of hazardous materials, including reactive solid rocket propellants, toxic solvents, oxidizers, and toxic liquid rocket fuel. Groundwater aquifers could be contaminated by spilled or leaked hazardous materials.

- Will closed-looped fueling systems be used to minimize the potential for spills and leaks of propellants or other hazardous liquids?

- If wells are required for groundwater withdrawal, will they be constructed to prevent the intermixing of high-quality groundwater with lower quality groundwater in the aquifer?

Biological Resources Concerns. The construction of new or expanded facilities for military testing and evaluation activities could require the filling of wetlands and could result in habitat loss from the siting of structures and utility lines. Potential impacts to terrestrial and aquatic biota could result from noise and exhaust emissions during rocket testing and from electromagnetic radiation.

- Does siting of the project take into consideration avoiding proximity to wetlands, surface waterbodies, and migratory bird flyways?

- Are mitigation measures included to avoid water pH reduction from settled rocket/missile exhaust clouds that could result in fish kills?

- Are adequate sound attenuation measures, such as noise barriers, concrete bunkers, and water damping, proposed to avoid or reduce impacts to wildlife in the vicinity of the test area?

Geology/Soils Concerns. Defense testing activities that involve blasting, detonation, or intensive earthmoving activities in areas of weakly consolidated soils or highly fissured rock could cause landslides and other geologic hazards. In addition, soil erosion and contamination could result from test firing, debris craters, and off-road travel associated with testing.

- Can existing facilities and roads be used to minimize the energy used in construction and soil disturbance caused by new construction?

- Does the project call for the preparation of soil erosion and sediment control plans? Are specific control measures suggested (e.g., seeding exposed soil, watering to prevent fugitive dust)?

Other References

Army Regulation 200-1, Environmental Protection and Enhancement.

Army Regulation 220-2, Environmental Effects of Army Actions.

U.S. Department of the Interior, Denver Service Center. September 1993. *Guiding Principles of Sustainable Design*. National Park Service (NPS) publication number NPS D-902; GPO publication number GPO 777443.

POLLUTION PREVENTION/ENVIRONMENTAL IMPACT REDUCTION CHECKLIST FOR ROCKETRY/MISSILE PROJECTS

How Can Rocketry/Missile Projects Affect the Environment?

The testing, production, maintenance, and decommissioning of rockets/missiles for Department of Defense programs can have a variety of impacts on the environment. These impacts include air quality effects from launch vehicle exhaust, potential depletion of stratospheric ozone levels, electromagnetic radiation hazards, generation of hazardous materials and wastes, noise impacts, pollution of surface water and groundwater sources, effects on biological resources, and soil erosion and contamination.

Also see checklists on Defense Testing and Related Activities, Ecosystem Preservation and Protection, and Siting.

What Questions Should Be Asked To Ensure That These Effects Are Minimized or Eliminated?

Air Quality Concerns. Routine releases of rocket propellant combustion products (including carbon dioxide, carbon monoxide, hydrogen gas, hydrogen chloride, nitrogen gas, chlorine, and aluminum oxide) during testing can cause adverse human health effects and contribute to acid rain. In addition, the production, maintenance, and decommissioning of rockets/missiles can cause harmful routine air emissions and the risk of chemical volatilization from accidental spills and releases.

- Are there opportunities to reduce the adverse effects of air emissions by relocation of rocket/missile test facilities to areas where air quality impacts would be less serious? *
- Will the project use enclosed test facilities equipped with vapor recovery systems and oxidizer vapor scrubber systems? *
- Will solvents (such as butyl alcohol and Freon-113) used in electronic parts production be routinely recovered? *
- Are there provisions for minimizing the removal of vegetation and the generation of dust during construction activities for rocket ground entry points?
- Does the project include provisions for reducing air emissions from rocket/missile decommissioning activities (e.g., the emissions caused by the open detonation of rocket motors and incineration of rocket fuel)?

Upper Atmosphere Concerns. Rocket exhaust compounds (including hydrogen chloride, metallic oxide particulates, ice, soot, nitrogen compounds, and hydrogen compounds) can lead to stratospheric ozone destruction. Combustion gases (including carbon dioxide, nitrous oxide, and water vapor) from missile launches absorb infrared radiation and can contribute to global warming.

- Will the number of rocket/missile launches be minimized to the greatest extent feasible? One technique is to rely on test simulations whenever possible.

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* Indicates an environmental impact reduction opportunity.

- Does the project suggest any alternatives to the use of hydrogen chloride, which is a major ozone-depleting chemical?

- Will ozone-depleting solvents, such as chloroform, be used in electronics production? Are there provisions for phasing-out the use of these solvents?

Electromagnetic Radiation Concerns. Communication systems, transmitters, and ground-based radar systems used to guide missiles produce electromagnetic radiation (EMR) that could result in adverse impacts to humans and the environment.

- Does the project consider coordinating with the U.S. Fish and Wildlife Service to site radar systems away from established migratory bird flyways to avoid exposure to EMR from the trajectory beams? *

- Will the power densities of EMR be controlled to acceptable safety levels? Have standoff distances from EMR power sources been specified? *

Hazardous Material/Waste Management Concerns. The testing, production, maintenance, and decommissioning of rockets/missiles involves the use of hazardous materials (including reactive solid rocket propellants, toxic solvents, oxidizers, and toxic liquid rocket fuel) and generates hazardous wastes. The use of hazardous materials can affect the environment through air emissions of volatile chemicals, accidental spills, and other uncontrolled releases. In addition, the disassembly and destruction of rockets/missiles may generate large quantities of hazardous wastes.

- Are there opportunities to reduce the amount of hazardous and toxic materials used in the fabrication and operation of the rockets/missiles? For example, will the use of such compounds as beryllium and mercury be minimized?

- Are there provisions for reducing potential spills and uncontrolled releases of hazardous materials? Is there a spill prevention and control plan?

- Is there a plan for the expeditious recovery of flight test vehicles and debris containing hazardous materials?

Noise Concerns. Noise associated with rocket engine testing and rocket launches is a potential concern for humans and wildlife. Sonic booms generated from rocket launches and the flight of test missiles can interrupt the breeding habits of some wildlife species.

- Does the project specify adequate buffer zones around rocket/missile test sights? *

- Are a wide range of sound attenuation measures (such as noise barriers, concrete bunkers, and water damping) included as part of the project?

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* Indicates an environmental impact reduction opportunity.

Surface Water Concerns. Surface water quality near launching and test-firing facilities and below rocket/missile trajectories could be affected by the deposition of contaminants from exhaust clouds, contamination from fallen rocket/missile debris, spills or leaks of propellant, and contaminated storm-water runoff. In addition, the production, maintenance, and decommissioning of rockets/missiles could use large amounts of water and adversely affect surface water quality.

- Does the project require the preparation of Spill Prevention Control and Countermeasures Plans, Storm-water Pollution Prevention, and Soil Erosion and Sediment Control Plans?

- Are proposed testing facilities located away from surface waterbodies?

- Will the amount of water required for production and decommissioning activities be minimized?

Groundwater Concerns. The testing, production, maintenance, and decommissioning of rockets/missiles all have the potential to adversely affect groundwater quality. Rocket/missile testing and production would involve the use of hazardous materials, including reactive solid rocket propellants, toxic solvents, oxidizers, and toxic liquid rocket fuel. Such hazardous materials could contaminate groundwater aquifers through leakage or accidental spills.

- Will closed-looped fueling systems be used to minimize the potential for spills and leaks of propellants or other hazardous liquids?

- Are Spill Prevention Control and Countermeasures Plans required to reduce the likelihood of contaminants escaping from confined areas and to specify procedures for cleaning up contaminated soil?

Biological Resources Concerns. The construction of new or expanded facilities for rocket/missile testing and launches could require the filling of wetlands and could result in habitat loss from the siting of structures and utility lines. Potential impacts to terrestrial and aquatic biota could result from noise and exhaust emissions during rocket/missile launches and from electromagnetic radiation emitted from radars and transmission devices.

- Does siting of the project take into consideration avoiding proximity to wetlands, surface waterbodies, and migratory bird flyways?

- Are mitigation measures included to avoid water pH reduction from settled rocket/missile exhaust clouds that could result in fish kills?

- Are adequate sound attenuation measures, such as noise barriers, concrete bunkers, and water damping, proposed to avoid or reduce impacts to surrounding wildlife?

- Will sensitive habitats be avoided if trenching to install utilities and/or fiber-optic communication lines is necessary?

Geology/Soils Concerns. Rocket/missile launches or intensive earthmoving activities in areas of weakly consolidated soils or highly fissured rock could cause landslides and other geologic hazards. In addition, soil erosion and contamination could result from rocket/missile launches, debris craters, and off-road travel associated with testing. Decommissioning activities, such as open detonation, could introduce contaminants to adjacent soils.

- Can existing facilities and roads be used to minimize soil disturbance caused by new construction?
- Does the project call for preparation of soil erosion and sediment control plans? Are specific control measures suggested (e.g., seeding of exposed soil, watering to prevent fugitive dust)?
- Have alternatives to the open detonation of rocket motors and incineration of rocket fuel been considered to minimize potential soil contamination?

Other References

Army Regulation 200-1, Environmental Protection and Enhancement.

Army Regulation 220-2, Environmental Effects of Army Actions.

U.S. Department of the Interior, Denver Service Center. September 1993. *Guiding Principles of Sustainable Design*. National Park Service (NPS) publication number NPS D-902; GPO publication number GPO 77443.

LETTER 3:
David Farrel, Chief. Office of Federal Activities. United State Environmenta Protection Agency. August 30, 1995.

3-1: Impact and Mitigation Measure AIR-1 have been added to the EIS in this FEIS, as summarized in Chapter 2 and as revised in Chapter 5 (pages 170 to 172). The DEIS was in error to state that NO_X emissions of Alternative 1 and Alternative 2 would exceed the Federal "de minimus" threshold. The "de minimus" threshold would only be exceeded for Alternative 1.

3-2: Pages 74, 96, and 160 of the DEIS have been revised in this FEIS (revised pages 76, 98 and 166).

The Noise Control Act of 1972 (42 USC 4901 through 4918) contains language regarding both "products" regulated under the law as well as a section regarding Federal programs and Federal facilities. Under the definition of "products" to be regulated by EPA under the law, certain exceptions are provided:

> "(A) any aircraft, aircraft engine, propeller, or appliance, as such terms are defined in section 1301 of Title 49 [the Federal Aviation Act of 1958]; or
>
> (B)(i) any military weapons or equipment which are designed for combat use; (ii) any rockets or equipment which are designed for research, experimental, or developmental work to be performed by the National Aeronautics and Space Administration; or (iii) to the extent provided by regulations of the Administrator, and other machinery or equipment designed for use in experimental work done by or for the Federal Government." [Noise Control Act, Section 3(3); 49 USC 4902(3)]

Of these four types of exceptions, the types of devices which would be tested in the NASA Ames Research Center's Aerodynamics Testing Program would easily fit into one or more of the first three exceptions. For example, the X-32/X-35 JSF test device is at the same time an "aircraft engine," a "military weapon," and NASA "equipment ... designed for research, experimental, or developmental work...." It is clear that Congress did not intend these types of devices to be regulated as "products" under the Noise Control Act.

At the same time, there is Section 4(b) of the Noise Control Act, which states in relevant part that:

> "Each department, agency, or instrumentality of the executive, legislative, and judicial branches of the Federal Government - (1) having jurisdiction over any property or facility, or (2) engaged in any activity resulting, or which may result, in the emission of noise, shall comply with Federal, State, interstate, and local requirements respecting control and abatement of environmental noise to the same extent that any person is subject to such requirements."

The questions presented by Section 4(b) are whether, and if so to what extent, Section 4(b) constitutes a waiver of the Federal Government's (and hence NASA's) sovereign immunity by Congress, thereby subjecting Federal facilities to State and local noise control laws. A corollary question, which is prompted by the above-quoted exceptions in Section 3(3) to the "product" regulation established in other sections of the Noise Control Act, is whether the Act, rather than waiving sovereign immunity, in fact preempts State and local regulation, and, if so, to what extent? For purposes of this Environmental Impact Statement, these questions must be directed only at the proposed Aerodynamics Testing Program.

A study of Federal statutory and case law, including the Noise Control Act of 1972, as amended, its legislative history, and relevant cases, in particular *Romero-Barcelo v. Brown*, 643 F.2d 835 (1981); *rev'd on other grounds*, 102 S. Ct. 1798 (1982), supports the conclusion that while Congress has not preempted the entire area of noise control regulation, it has also not waived the sovereign immunity of the Federal Government to State and local regulation, at least in regard to the types of devices listed in Section 3 of the Noise Control Act as exceptions to the Act's "product" regulation provisions (see e.g., Section 6 of the Act; 42 USC 4905). Consequently, state and local noise control laws and ordinances do not apply to the NASA Ames Aerodynamics Testing Program. States and their political subdivisions may regulate "products" as set forth in the Noise Control Act, but the devices listed as exceptions in Section 3 are excluded from such regulation. Other types of noises at Federal facilities, such as from construction, railroad, or manufacturing activities, may also be subject to State and local regulation, but such activities are outside of scope of this Environmental Impact Statement.

Regarding Executive Order 12088 (Federal Compliance with Pollution Control Standards, October 13, 1978), it provides in Section 1-102 that the head of each Federal agency "is responsible for compliance with applicable pollution control standards..."
The key word is "applicable," which in regard to State and local standards simply raises the subsequent questions of sovereign immunity waiver and preemption discussed above. Even though the Noise Control Act is mentioned in E.O. 12088 (along with other major Federal environmental legislation), Federal agencies are only required to comply with those standards which are otherwise made applicable.

3-3: This EIS is a program level document. Mitigation measures are not defined to a project level detail. The measures contained in the EIS outline feasible mitigation for the NASA Ames Aerodynamics Testing Program, for which a detailed mitigation plan will be developed for individual projects, if the NASA Ames Aerodynamics Testing Program is adopted. The mitigation plan would be implemented pursuant to a Memorandum of Understanding (MOU) between NASA and the testing party. The MOU would further specify who would pay for the mitigation measures. Mitigation Measures NOISE-1, NOISE-2, NOISE-3 and NOISE-4 have been revised in this FEIS to include this requirement (pages 141, 142, 155, and 156).

The mitigation measures in this EIS were designed to allow flexibility in their implementation, while still preventing significant health impacts to the surrounding community. The mitigation measures outline what must occur to prevent unacceptable impacts. However, the specifics of their implementation (vacated only during testing windows, or long-term closure or evacuation of the housing) should be decided by the involved Federal agencies on the basis of the situation existing at the time of testing and would be described in the MOU.

All mitigation measures in this EIS would be implemented prior to program initiation. Additionally, as noted in Mitigation Measure NOISE-3, Level 2 and Level 3 testing would not occur until a reasonable solution is implemented to meet the requirements of this mitigation measure.

NASA has provided estimated mitigation costs beginning on page S-11 of this FEIS. The measures contained in the EIS outline mitigation for the NASA Ames Aerodynamics Testing Program, for which a detailed mitigation plan can be subsequently developed and funding responsibilities identified, if the NASA Ames Aerodynamics Testing Program is adopted.

3-4: Pages 34 to 36 of the DEIS have been revised in this FEIS. The original DEIS statement was in error. The cost estimate of $75 Million is for the modification of both the 80- by 120-Foot and 40- by 80-Foot Wind Tunnels.

3-5: Page 36 of the DEIS has been amended in this FEIS to detail the costs for NFAC acoustic modifications. Additionally, NASA has provided estimated mitigation costs beginning on page S-11 of this FEIS.

Please refer to Response 3-3. The measures contained in the EIS outline mitigation for the NASA Ames Aerodynamics Testing Program, for which a detailed mitigation plan can be subsequently developed, if the NASA Ames Aerodynamics Program is adopted.

Additionally, it should be noted that noise proofing the military housing that would be exposed to average CNEL greater than 75 dB would not result in a less than significant impact, since it is highly unlikely that interior noise levels would be decreased to an average CNEL of 45 dB (the interior level of significance). Additionally, outdoor noise levels would also still be unacceptable (average CNEL greater than 75 dB).

3-6: Please refer to Response 3-3.

3-7: Comment noted. NASA specific pollution prevention checklists (as presented on the following pages), shall be used prior to any test proposed under the NASA Ames Aerodynamics Testing Program. Any appropriate measures shall be contained in the specific mitigation plans, which are to be developed for each project proposed under the NASA Ames Aerodynamics Testing Program.

POLLUTION PREVENTION/ENVIRONMENTAL IMPACT REDUCTION FOR NASA WIND TUNNEL TESTING AND RELATED ACTIVITIES

How can NASA Wind Tunnel Testing and Related Support Activities Affect the Environment?

Tests conducted in Wind Tunnels for aerodynamic testing and simulation programs and related support activities can have a variety of effects on the environment. These effects include air quality impacts from hazardous materials usage and aircraft exhaust emissions, generation of hazardous wastes from operation and maintenance activities, noise impacts, surface and groundwater impacts, soil contamination, and impacts to biological resources.

What Questions Should Be Asked to Ensure that these Effects are Minimized or Eliminated?

Air Quality Concerns. Routine releases of aircraft exhaust during testing (including carbon dioxide, carbon monoxide, oxides of sulfur and nitrogen, and particulates) may cause adverse human health effects and contribute to local smog formation. Volatilization of hazardous chemicals from O&M functions supporting wind tunnel tests and releases from accidental spills and leaks are also of concern to human health and the environment.

- Are there opportunities to reduce the adverse effects of air emissions and releases by using less toxic materials or chemical alternatives (e.g. acceptable alternatives to ozone depleting cleaners and refrigerants)?
- Will the project use enclosed test facilities equipped with vapor recovery systems and vapor scrubber systems?
- Will ozone-depleting substances such as chloroform and CFC-113, be used in electronics production? Are there provisions for phasing out the use of these solvents?
- If ozone depleting substances must be used (e.g. CFC-113 in rotorcraft testing slipring applications), will these substances be used in enclosed systems or otherwise recovered to avoid waste and emissions?
- Will the number of tests be minimized?
- Are there provisions for reducing potential spills and uncontrolled releases of hazardous materials? Has a spill prevention and control plan been written?

Hazardous Material/Waste Management Concerns. Wind tunnel support functions require the use of hazardous materials, including oxygenated solvents, halogenated solvents, mineral spirits, cleaners, paints, aerosols, hydraulic fluids, and lubricating oils. The use of these materials can affect the environment through improper storage, routine releases, and accidental spills and other releases.

- Are there opportunities to reduce the amount of hazardous materials used as part of the project?
- Are there provisions for reducing potential spills and uncontrolled releases of hazardous materials? Has a spill prevention and control plan been developed?
- Are employees trained in the proper handling and use of hazardous materials with regard to worker protection, hazard communication, spill prevention and control, waste management, and techniques to minimize chemical use and waste.

Noise Concerns. High noise levels generated during tunnel testing activities can affect both humans and wildlife.

- Does the project specify adequate buffer zones around tunnel facilities?
- Are the employees and the public adequately warned in advance of the tests?
- Are sound attenuation measures such as noise barriers or enclosures considered when designing new facilities or upgrades to existing facilities?

Surface Water Concerns. Surface waters near testing facilities could be affected by spills or releases of fuels or other hazardous materials into storm or sanitary sewer collection systems.

- Is the project covered by the provisions of an existing Spill Prevention Control and Countermeasures Plan and Storm Water Pollution Prevention Plan or does the project need to be included in these plans.
- Are proposed testing facilities located away from surface water bodies?
- Are measures in place to minimize water consumption in wind tunnel cooling systems (e.g. reuse wastewaters in cooling towers from other sources such as dewatering projects and groundwater remediation activities).

Groundwater and Soils Concerns. Wind tunnel testing projects require the storage and use of relatively large volumes of jet fuel. Fuel is supplied to tunnel operations from underground and aboveground storage tanks and piping systems which have a potential for leaking, causing contaminated soils and shallow subsurface aquifers.

- Will closed-looped fueling systems be used to minimize the potential for spills and leaks of fuels?

- Are measures in place to prevent tank overfilling (e.g. automatic shut-off valves)?

- Are procedures in place to systematically check all seals, joints, fittings, etc. prior to pumping fuel from the tank into test vehicles to prevent releases during each fueling operation.

- Are tank inventory losses tracked, tank systems inspected, and tank integrity tests performed to monitor for leaks?

Biological Resources Concerns. The construction of new or expanded wind tunnel facilities involving the siting of structures and the installation of underground utilities could result in habitat loss.

- Are mitigation measures considered during the siting of facilities to avoid proximity to wetlands, surface water bodies, and protected species habitats.

- Are noise attenuation measures proposed to reduce impacts to wildlife in the vicinity of the test area.

- Are protected species habitats relocated to mitigate habitat loss from facilities construction projects.

DEPARTMENT OF THE AIR FORCE
50TH SPACE WING (AFSPC)

4

MEMORANDUM FOR NASA AMES RESEARCH CENTER DIRECTOR
ATTENTION: DR. KEN MUNECHIKA

FROM: 750 SG/CC
Onizuka Air Station
1080 Lockheed Way Box 041
Sunnyvale CA 94089-1235

SUBJECT: Comments on Draft Environmental Impact Statement (EIS)

1. On 14 August 1995, Lt Col Jim Porter forwarded 750th Space Group comments on the June 1995 Draft EIS for the NASA Ames Aerodynamics Testing Program. You have asked that I review those comments, given that I did not take command of the group until 25 August 1995. Attached is my revision. Please include with the official EIS record.

2. The overall concerns expressed in our 14 August submission remain valid. The proposed testing will affect personnel residing in Military Family Housing (MFH), patrons of the Child Development and Youth/Teen Centers, and any contract employees working in the vicinity of the wind tunnel. Consequently, the timing of the testing during the day and during any particular time of year will be critical as discussed in Table S-1, paragraphs 1-2 of the attachment. Furthermore, an Air Force noise expert from the Air Force Center for Environmental Excellence voiced concern that the calculated noise contours may not accurately reflect the expected real-world result (attachment at Table S-1, paragraph 3 and at "Additional General Comments"). Given the anticipated effect of the proposed testing on Onizuka properties on Moffett Federal Airfield, Table S-2 of the attachment details concerns about accomplishing adequate mitigation measures. In addition, the funding for mitigation measures is not identified. 4-1

3. I realize it is to Onizuka Air Station's benefit, as well as NASA Ames', to keep the EIS as simple as possible. However, the EIS is our opportunity to address concerns and ensures adequate protection of the welfare of the Onizuka community. My consultations with my environmental and bioenvironmental staff, Air Force environmental experts, the medical community, and my staff judge advocate convince me we need to address the concerns detailed in the attachment to this letter.

TIMOTHY A. ROBERTS
Colonel, USAF
Commander

Attachment:
Comments on EIS

cc:
750 SG/CD
750 MSS/CE

Table S-1: Comparison of Alternative Characteristics

1. **Alternative 3 - Testing envelope times.** The testing window of 7:00 a.m. to 7:00 p.m. will make mitigation's for Military Family Housing (MFH) and the Youth/Teen center very difficult to implement. **4-2**

2. **Testing at different times of the year.** Many more children will be present in the affected area during the summer months. The cost and complexity of mitigation measures will be greater if the number of children (which must be included in all mitigation measures) increases. Conversely, if level 2 or level 3 testing is conducted while the children are outside of the affected area (i.e., at school), the number of the affected population decreases, and the cost of mitigation measures drops. **4-3**

3. **Benchmark Location.** Given the following conditions, additional precautions should be taken as stated in paragraphs 3.1 and 3.2 below: a) the single proposed benchmark is at the boundary of federal property and the closest civilian residential area; b) a large military residential population lives within the boundaries of federal property (182 families); c) the noise contours described in the EIS are only predictions of the actual noise propagation patterns; d) the noise contours have not been empirically validated; e) the Air Force noise expert from the Air Force Center for Environmental Excellence questioned the methods used to develop the noise contours; and f)validation of the noise contour in one direction does not necessarily prove that the noise propagation pattern in other directions matches the predicted pattern. **4-4**

   3.1. An additional permanent benchmark location be established in the immediate vicinity of Bldg 852. **4-5**

   3.2. Since all planning guidelines for noise levels in residential areas are given in terms of 24-hour average noise levels, and not peak noise levels, the 24-hour average noise measurement of 75 dB CNEL should be included as a testing characteristic included in Table S-1 for all benchmarks. **4-6**

4. **REC-1: Recreational facilities subject to incompatible exterior noise exposure (70 dB).** Additional Air Force facilities such as the softball fields near the Youth/Teen center and a number of children's playgrounds in the Orion Park & Macon Terrace MFH areas would also be affected, and must be included here. **4-7**

5. **Delete sentence.** Paragraph 4.b, page S-7 "However, this alternative would not meet the purpose and need of the proposed action." **4-8**

Table S-2: Proposed Testing Program Summary Table

1. **General Comments:** Mitigation measures are not defined in sufficient detail for implementation. Lack of detail requires NASA to develop case-by-case action plans for each project requiring level 2 or 3 testing. NASA has estimated that affected parties would have one-year lead times to plan for implementation; thus this case-by-case approach is questionable for the following reasons: **4-9**

1.1. **Military Family Housing is not slated for closure.** Most mitigation measures were designed under the assumption that military family housing would be closing in the near future, making the requirement to "vacate housing" and "vacate the CDC & Youth/Teen Center" less important than they are. The Air Force has committed to operating MFH until the year 2000, at which time a separate decision will be made within DoD to continue or discontinue MFH operations. **4-10**

1.2. **Implementation details are not defined.** Where will vacated residents of MFH go during level 2 and level 3 testing? What will be done with the CDC? **4-11**

1.3. **Funding sources for mitigation actions are not defined.** According to 40 CFR 1505.3, **the lead agency** is required to "condition funding of actions on mitigation." No method of funding for relocation of child care services or housing residents, or sound insulation of housing units is offered in the discussions of Mitigation Measures Noise Levels-2, 3, and 4. ***Impacted parties are not required to bear the costs of mitigation.*** **4-12**

1.3.1. The cost to implement mitigation measures must be considered during the evaluation of the feasibility of the project alternatives.

1.3.2. Alternatives which are too costly for NASA to implement should be identified, and then eliminated for economic reasons

1.3.3. Who will fund the mitigation measures?

1.4. **Federal planning & programming requirements are not considered in the feasibility of implementing mitigation measures.** Given the following conditions, it is unlikely that the normal government mechanisms could adequately support short-notice mitigation measures:

1.4.1. Air Force planning and programming cycles for construction-type projects are well over 18 months long. Will NASA rely on Air Force engineering or contracting vehicles to implement mitigation measures?

1.4.2. X-32 testing is expected to start no earlier than February 1997. This barely provides enough time to develop and implement workarounds for MFH, the CDC, and the Youth/Teen center--all of which will be in operation during February 1997. Specific mitigation proposals or case-by-case action plans are needed. **4-13**

1.4.3. The expected one-year notification does not provide enough time for government agencies to respond to actions on a case-by-case basis if contracted construction/renovation or support services must be provided to impacted parties by the government.

2. Noise-1. What is the "Action Level" as defined by the NASA Hearing Conservation Program? Is it different than 85 dB? What standard was used to develop the "Action Level"? **4-14**

3. **Implementation of Mitigation Measures.** The EIS is structured such that NASA notifies other agencies of testing programs, leaving the implementation of the mitigation measures (i.e., evacuation of buildings) to the affected agencies. **4-15**

   3.1. Who will fund the operations associated with implementing the mitigation measures?

4. **Noise-2, Mitigation Measures.**

   4.1. This mitigation states "NASA would identify which areas would be exposed to noise levels above 85 dB, and would recommend applicable residential units and facilities be vacated."

      4.1.1. The only requirement is that NASA notify the Air Force and MFH occupants when noise will exceed 85 dB in the housing areas. It does not require NASA to implement, or fund any required actions. **4-16**

      4.1.2. **This implies planning, funding and implementation of mitigation measures affecting MFH, the CDC, etc. would be the responsibility of the Air Force.**

         4.1.2.1. NASA representatives previously indicated NASA intends to resolve the funding mitigation measures with "the Air Force", clarify whether NASA means Onizuka Air Station, or the Air Force program office for the X-32 CALF program. Who will fund the mitigation measures?

   4.2. Many Air Force contractors will need access to the areas within the 85 dB peak noise contour regardless of when the testing is performed. Examples include: MFH Maintenance, Grounds Maintenance, Refuse Collection, and Custodial and Street Sweeping contractors. **4-17**

      4.2.1. This section should include mitigation measures identical to those listed in Noise-1.

      4.2.2. There may be additional contract costs associated with these contracts due to participation in another government-mandated program. These costs should be included in the Socioeconomic Impacts, and should be paid for by the program generating the requirement for local Air Force contractors to participate in the Hearing Conservation Program. **4-18**

      4.2.3. This mitigation measure should include participation of Air Force contractors in the NASA Hearing Conservation Program, and the Medical Monitoring program outlined in Noise-1. **4-19**

   4.3. **Noise Levels in Air Force Housing** The *Air Force Family Housing Guide for Planning, Programming, Design and Construction*, January 1995, provides noise levels compatible with military family housing. The statement on Page 137 that "there are no adopted criteria...for noise levels on the Air Force property" is **4-20** incorrect. The value of 75 dB, above which the Housing Guide prohibits housing construction, should be used as the criteria for Impact Noise-2.

5. **Noise-3, Mitigation Measure.**

5.1. The sentence which reads "The following mitigation measures are recommended..." should be changed to "The following mitigation measures will be implemented by NASA" 4-21

6. **Noise-4, Mitigation Measure.**

6.1. Paragraph (b) under mitigation measures should be modified to read "Air Force housing units exposed to daily CNEL noise exposure levels equal to, or greater than 65 dB would be modified such that the unit provided a maximum interior CNEL level of 45 dB. 4-22

7. **Noise-5, Noise-6 and Noise-7, Mitigation Measures.**

7.1. These sections state "no mitigation is feasible" which is not correct. Given that the EIS has been revised to reflect a programmatic change for NASA Ames, it is appropriate that long-term solutions be identified, programmed, and implemented. 4-23

8. **Recreation, Mitigation Measure.** Recreational facilities on the Onizuka Annexes should be included in this discussion. (See comments on paragraph 4 under Table S-1) 4-24

9. **Socioeconomic**

9.1. The following should be addressed: (a) construction of the new CDC, (b) demolition of the existing CDC, (c) relocation costs of MFH residents during level 2 and 3 testing, implementation costs of the NASA Hearing Conservation Program, (d) program costs of providing sound insulation to MFH units in a 65 dB - 75 dB CNEL zone, (e) additional costs to Air Force service contracts (as noted in paragraph 4.2 of this section), (f) economic impact on home daycare providers who live in the affected area (would no longer be able to provide service, and would lose income), etc. 4-25

9.2. According to 40 CFR 1502.14, **the lead agency** is required to evaluate impacts (to include economic, 40 CFR 1508.8) of the alternatives in comparative form. The Air Force requests the costs to vacate residences and the Youth/Teen Center, relocate Child Development Center, and to insulate houses to interior noise levels of 45 dB (Mitigation Measure Noise-2, 3, and 4) be included in the section of the EIS on Socioeconomic impacts.

10. **Operational Date for the 80'x120' Wind Tunnel** According to NASA's Public Affairs Office, the 80'x120' Wind Tunnel became operational in 1987. This date is significant because it means that the 80' X 120' wind tunnel was built after the military family homes in Orion Park, constructed in 1968, and Macon Terrace, constructed in 1982. 4-26

11. **Ownership of the Senior Officers' Quarters** The statement, on page 53, that ownership of the Senior Officers' Quarters and Resident Agency Housing is shared by the Air Force and the Naval Air Reserve is incorrect. All housing at Moffett Federal Airfield, including the Senior Officers' Quarters on Berry Drive, and adjacent housing on Berry Court and Wescoat Court, is solely operated and maintained by the Air Force. **4-27**

Additional General Comments:

1. The NASA letter (13 Feb 95, Potential Blast Effects from X-32 CALF) noted localized blast effects were incorporated into the noise prediction codes. The Air Force representative from the Air Force Center for Environmental Excellence met with representatives from NASA (6 April 95) and concluded "The contours for both the CNELs and the maximum noise levels are based on sketchy information and invalidated models." It is unclear exactly how the noise contours for each alternative were generated. A consensus from the experts would be most helpful. **4-28**

2. **CNEL Noise Contours**

2.1. Contours previously provided mentioned the X-32 project, and when coupled with the engine test profile showing the noise produced at each level of testing, it was determined the previous contours represented the X-32 test run in accordance with the profile provided. The 75 dB CNEL contours in the draft EIS appear to be very similar to contours previously provided by NASA, which we understood to be the CNEL contours produced by the X-32 project. **4-29**

2.1.1. Are the contours presented in the EIS descriptive of the noise environment created by the X-32 project, or of the program (which allows up to 6 hours of level 2 & level 3 testing each day)?

2.1.2. NASA has limited the amount of level 2 and level 3 testing which can occur each day since the 75 dB 24-hour average noise level contours fall within the 85 dB peak noise contours. The EIS should clearly show this decision. **4-30**

2.1.2.1. NASA defined the 85 dB peak noise contour as the boundary of the "danger zone" (it encompasses the 75 dB CNEL noise contours); significant variance from the duration of level 2 and level 3 testing (from the proposed testing schedule for the X-32) will push the 75 dB CNEL contours OUTSIDE of the 85 dB peak noise contour. **This would increase the number of MFH units which would then have to be evacuated or sound-insulated.** **4-31**

2.1.2.2. Produce noise contours for both the X-32 project, and the program described in the EIS. **4-32**

2.2. Figure 12 shows the existing CNEL noise environment, which includes the current operations of the 80' X 120' and 40' X 80' windtunnels. Figures 21, 22 and 23 show the estimated CNEL noise contours for each of the proposed alternatives. However, the combination of the existing noise environment with each of the proposed alternatives is not shown. The combination of multiple noise sources **4-33** could increase the CNEL noise environment in military family housing to an unacceptable level, for more housing units than are currently enclosed in the noise contours described in the EIS. There is a need to produce figures which show the expected CNEL noise environment, including existing sources, for each alternative. **4-33**

LETTER 4:
Timothy A. Roberts, Colonel. 50th Space Wing, 750 SG/CC. Onizuka Air Station. Department of the Air Force. November 20, 1995.

Most of the comments included in this letter are related to potential impacts to the Onizuka Air Station Annex housing and related facilities, which are currently owned and operated by the Air Force. The following responses are made with this consideration in mind. However, in July 1997, NASA Ames developed a proposal for NASA to take over ownership of all family housing units at Moffett Federal Airfield following the realignment of Onizuka Air Station in the year 2000. NASA Headquarters has authorized Ames to pursue plans to change ownership of the housing, to be effective September 2000. The Air Force and the local (Mountain View and Sunnyvale) reuse authority have approved the concept of this plan.
The implementation of all mitigation measures outlined in this EIS and the corresponding National Full-Scale Aerodynamics Complex Mitigation Implementation Plan (MIP) will still be required, but the implementation authority would shift from the Air Force to NASA. Prior to September 2000, NASA will work with the Air Force to encourage them to adopt as many of the features of the MIP that are practicable while the housing remains under its control. For example, one of the mitigation measures for impact NOISE-2 on the Air Force family housing is for NASA to recommend that the Air Force vacate all residential and recreational facilities and areas exposed to noise levels of 85 dB or more during testing. If NASA does take ownership of this housing area, NASA would then be fully responsible for ensuring that the identified high noise areas were vacated during testing.

4-1: This introduction states that this letter is to be considered a revision to the letter from James E. Porter III of the 750th Space Group. Additionally, it summarizes the contents of the enclosures to the letter; such contents are addressed in more detail in the following responses.

4-2: Though it is not a required mitigation measure of the EIS, NASA will notify the surrounding community of proposed testing projects through a public notification process. NASA Ames will provide extensive notification of impending wind tunnel tests in conjunction with the ATP, beginning at least six months in advance of a test. NASA is also working closely with the Air Force to implement the mitigation measures required to protect the family housing residents and other Onizuka Air Station Annex occupants.

Central elements of the public outreach and notification plan include: establishing and staffing a phone number dedicated to current status of tests with message capability to register comments, concerns or complaints; test status on a NASA Ames World Wide Web dedicated "home page" with return comment/question availability and links to/from the Mountain View and Sunnyvale web sites; notifications, e.g. flyers, letters, etc., of imminent tests and schedules mailed to all Moffett Federal Airfield Resident Agencies, the residents of the Moffett military housing, the Santiago Villa Mobile Home Park, and neighboring businesses in the North Bayshore area; special announcements in the Mountain View Voice newspaper; news releases announcing upcoming tests with referral information included; and notification to city management offices of Mountain View, Sunnyvale, Los Altos and Palo Alto. Details of the public outreach and notification plan are contained in the Mitigation Implementation Plan (MIP), and will be enclosed with each copy of this FEIS. The FEIS and MIP will be distributed to interested government entities, organizations, and members of the general public.

Additionally, NASA Ames staff will be available to brief interested groups prior to the tests. It is anticipated that NASA will notify the surrounding community of more specific test windows, rather than the blanket testing window of 7:00 am to 7:00 pm, using the example of Alternative 3.

It should be noted that only six maximum daily hours of testing could occur under Alternative 3, should it be adopted. This would be the maximum amount of time that mitigation would be required in any given day.

4-3: Comment noted. NASA will take these issues into consideration when implementing specific testing projects, should the NASA Ames Aerodynamics Testing Program be adopted. NASA is continuing to work closely with the Air Force and surrounding communities to ensure mitigation measures are implemented to protect surrounding land uses. However, NASA in advance cannot determine whether it will be practicable to avoid testing during the summer.

4-4: Comments noted. In addressing these comments it is important to review the methods used to develop the noise contours. Additionally, it should be noted that average daily contours cannot be truly empirically validated unless the testing program actually occurred for a day at the maximum time allotments described in Tables 2 through 4. However, these noise contours have been developed using a maximum noise level at a benchmark location, and the associated noise level contours that were measured empirically from a single source jet engine, as described in Appendix C. The following paragraphs further describe the methods used for developing the average daily CNEL contours.

In general, Figures 21, 22, and 23 were developed by first constructing noise level contours for the individual operational scenarios. Specifically, a noise level contour set was developed for independent operation of the 40- by 80-Foot Wind Tunnel and the 80- by 120-Foot Wind Tunnel. The noise level contour set depends upon the sound power spectrum of the noise source and the sound attenuation and directivity characteristics of the wind tunnel structure.

An initial contour set was developed for the 80- by 120-Foot wind tunnel by NASA technical staff. This set was developed by measuring A-weighted noise levels around the wind tunnel facility from a J97 engine noise source, and subsequently adjusting the contour levels by computation for the MD CALF VTOL configuration (see DEIS, Appendix C, NASA Memorandum for Record, Figure 12, September 13, 1994). The 1/3 octave band spectrum reference, used as the basis for subsequent calculations, was that given by NASA (see DEIS, Appendix G, Table G-1). These 1/3 octave values were summed to octave band levels forming the basis for subsequent far-field sound level computations. This was repeated similarly for the 40- by 80-Foot Wind Tunnel.

Noise propagation to the far field was computed in octave bands for selected radial directions from the 80- by 120-Foot Wind Tunnel noise source. Noise from certain sources, such as from the tunnel inlet, has higher near-field sound levels and subsequently propagates greater distance to the far field. However, directivity effects diminish with distance producing more circular contours in the far field. Parameters used to compute noise propagation to the far field are:

- Inverse square law for hemispherical radiation (producing an ideal 6 dB attenuation per distance doubling for all frequencies).

- Atmospheric air absorption for average annual conditions, using the *Standard Values of Atmospheric Absorption as a Function of Temperature and Humidity*, SAE ARP 866A. Atmospheric absorption is effective in attenuating high-frequency noise over distance, with decreasing effectiveness to negligible attenuation at the lowest frequencies predicted (i.e., 25 Hz).

- Application of low-frequency phase cancellation at large distances from the noise source. This phenomena agrees well with empirical measurement results from propagation of low-frequency noise large distances from major industrial facilities, and is sometimes referred to as "Lloyd's Mirror".

No attenuation was computed for the absorption and diffraction effects of natural or man-made barriers in the far field. These are difficult to compute effectively, and they change with time and meteorological conditions. Generally, these diffraction effects are substantial for the higher frequencies and less significant for lower frequencies, particularly at large distances. Likewise, no additional attenuation or gain was given for anomalous meteorological conditions such as wind, atmospheric turbulence, or inversion layers. These phenomena are transitory and difficult to reliably predict, particularly without detailed meteorological information such as lapse rate. Thus, sound propagation predictions are generally conservative; actual far-field sound levels will typically be below those predicted.

No single computer program is available to reliably predict the combination of the above attenuation effects. However, a variety of computation techniques were applied, including Matlab and various proprietary programs of Charles M. Salter and Associates.

These computations resulted in static noise level contours, which form the basis for all noise exposure contours for each of the two wind tunnel facilities. Noise propagation patterns (shapes of noise contours) do no change with duration of operation or changes in noise levels, only the numerical values of the contours change. The CNEL noise exposure was computed for each of the scenarios by computing an offset from the sound level values. Offset computation considered the duration of daytime, evening, and nighttime operations and their respective bias in the CNEL computation procedure.

4-5: The area in the immediate vicinity of Building 852 will be included in the hand held monitoring program that NASA has included in their detailed mitigation and monitoring plan. Monitoring will be conducted during the first week of each test to establish a noise footprint of the specific engine tested, and to ensure that noise levels remain below those established by the Aerodynamics Testing Program.

4-6: This recommended mitigation measure and project description method would be very difficult to monitor, since each testing project could not be monitored for CNEL in real time. CNEL represents an average noise level computed over a 24-hour period. In order to control noise levels in "real time," instantaneous noise levels will be monitored and compared to acceptable limits as defined by this FEIS. As needed, engine power will be adjusted to lower noise levels to stay in compliance with the Aerodynamics Testing Program.

4-7: Page 161 of the DEIS has been amended in this FEIS to respond to this comment (revised pages 166 and 167).

4-8: This sentence has not been deleted from the EIS as the commentator has suggested, since it is a correct assessment as written. NEPA requires an analysis of purpose and need of each alternative (1502.13CEQ). The No Action Alternative would not meet the purpose and need which are the basis for the implementation of the proposed action as it is described in Chapter 2 of the EIS.

4-9: This comment is partially correct. Since this is a program level EIS, mitigation measures are not defined to a project level detail. However, the measures contained in the EIS provide feasible and implementable mitigation for the NASA Ames Aerodynamics Testing Program, after which a detailed mitigation plan will be subsequently developed for individual projects, if the NASA Ames Aerodynamics Program is adopted. Mitigation Measures NOISE-1, NOISE-2, NOISE-3 and NOISE-4 have been revised in this FEIS to include this requirement.

4-10: It is not correct that the mitigation measures were designed under the assumption that military family housing would be closing in the near future, though it was understood that this was a possibility. Though the Air Force has committed to operating multi-family housing until the year 2000, the mitigation measures in the EIS are still valid. All mitigation measures in this EIS would be implemented prior to project initiation. Additionally, as noted in Mitigation Measure NOISE-3, Level 2 and Level 3 testing would not occur until a reasonable solution, agreed upon by NASA Ames and the DOD, is implemented to meet the requirements of this mitigation measure.

4-11: The details for implementation of the mitigation measures outlined in this EIS are included in the Mitigation Plan (MIP). If NASA's takeover of the family housing at Moffett Field occurs as planned, implementation of all mitigation measures outlined in this EIS and the corresponding MIP will still be required prior to the start of testing under the Aerodynamics Testing Program, but implementation authority would shift from the Air Force to NASA.

4-12: Please refer to Responses 3-3, 4-9 and 4-10. The following is the section of the federal regulations referenced by the commentator:

40 CFR 1505.3 Implementing the decision.
Agencies may provide for monitoring to assure that their decisions are carried out and should do so in important cases. Mitigation and other conditions established in the environmental impact statement or during its review and committed as part of the decision shall be implemented by the lead agency or other appropriate consenting agency. The lead agency shall:

(a) Include appropriate conditions in grants, permits or other approvals.
(b) Condition funding or actions on mitigation.
(c) Upon request, inform cooperating or commenting agencies on progress in carrying out mitigation measures which they have proposed and which were adopted by the agency making the decision.
(d) Upon request, make available to the public the results of relevant monitoring.

These actions are to take place after the EIS is completed, and will be clarified in the Record of Decision. No action will be undertaken until agreed upon mitigation is in place.

4-13: Please refer to Responses 3-3, 4-9 and 4-10. (NOTE: The planned February 1997 testing did not occur as stated on comments 4-13.)

4-14: As defined by the NASA Health Standard on Hearing Conservation (NHS/IS-1845.4, page 2), the Action Level is an exposure to an 8-hour time-weighted average of 80 decibels measured with a dosimeter or sound level meter on the A-scale, slow response, or equivalent, a dose of fifty percent. The action level is the criterion for instituting noise surveys and for employee participation in the Medical Monitoring Program. It should be noted that exposure to an 8-hour time-weighted average of 80 decibels, is considered equivalent to a 4-hour time-weighted average of 85 decibels, etcetera.

4-15: Please refer to Responses 3-3, 4-9, 4-10, and 4-12. The details for implementation of the mitigation measures outlined in this EIS will be included in the final Mitigation Plan. If NASA's take over of the family housing at Moffett Field occurs as proposed, implementation of the mitigation measures outlined in this EIS would be further facilitated. This change in ownership could result in a revision in the implementation approach for the mitigation measures outlined in this EIS, which could result in a change in the Mitigation Plan. However, the mitigation measures outlined in this EIS would continue to be required prior to the implementation of testing under the Aerodynamics Testing Program. As to funding and carrying out mitigation measures, these issues will be resolved prior to the subject testing as mutually agreed upon by NASA and affected agencies.

4-16: NASA has provided estimated mitigation costs beginning on page S-11 of this FEIS. The measures contained in the EIS outline mitigation for the NASA Ames Aerodynamics Testing Program, for which a detailed mitigation plan can be subsequently developed and funding responsibilities identified, if the NASA Ames Aerodynamics Testing Program is adopted.

As noted in Mitigation Measure NOISE-3, Level 2 and Level 3 testing will not occur until a reasonable solution is implemented to meet the requirements of this mitigation measure, including vacating the Child Development Center and the Youth and Teen Center during testing. Who bears the cost of mitigation would be determined prior to requiring the residents to vacate the housing.

If NASA's take over of the family housing at Moffett Field occurs as proposed, implementation of the mitigation measures outlined in this EIS would be further facilitated. This change in ownership could result in a revision in the implementation approach for the mitigation measures outlined in this EIS, which could result in a change in the Mitigation Plan. However, the mitigation measures outlined in this EIS would continue to be required prior to the implementation of testing under the Aerodynamics Testing Program.

4-17: Impact and Mitigation Measure NOISE-1 apply not only to NASA employees, but also to on-site contractors (including Air Force contractors) and visitors of NASA Ames Research Center. Additionally, residents and contractors to Onizuka Air Station Annex may voluntarily take part in NASA's Hearing Conservation Program. This possibility has been factored into Mitigation Measure NOISE-2. However, NASA cannot require Onizuka Air Station Annex participation in a NASA program.

4-18: Please refer to Response 4-16.

4-19: Please refer to Response 4-17.

4-20: As described on page 136, NASA used the Air Force Family Housing Design Guide in its determination of significant environmental effects that could result from the Aerodynamics Testing Program.

As detailed on page 137, the impact assessment in this EIS is divided into two sections: noise levels (noise hazard) and noise exposure. The statement on page 141 of the FEIS that "there are no adopted criteria... for noise <u>levels</u> on the Air Force property" is correct. The values described in the Air Force Family Housing Design Guide are for noise exposure (Ldn), not noise levels. Page 62 of this FEIS specifically describes the differences between noise levels and noise exposure. Impact NOISE-2 addresses or relates to noise levels, therefore a noise exposure criteria cannot be used as a criteria of significance. Additional language has been added to this section of the FEIS to clarify this distinction.

When the DEIS was prepared, the Air Force Family Housing Design Guide was not available. Information and guidelines included in this document have since been incorporated into this FEIS. Please refer to pages 78 and 136, and Impact NOISE-4 on page 156.

4-21: As noted in Mitigation Measure NOISE-3, Level 2 and Level 3 testing will not occur until a reasonable solution is implemented to meet the requirements of this mitigation measure, including vacating the Child Development Center and the Youth and Teen Center during testing. At this time, detailed mitigation plans have not been developed. Such plans would outline the specific funding and implementation responsibilities for each measure.

4-22: Normal construction can be expected to provide a noise reduction level of approximately 20 dB. Additional noise attenuation can be realized by making structural improvement, but it is conventionally accepted that the maximum attenuation that can be expected is 30 dB. Therefore, it would not be feasible to require attenuation for structures exposed to a CNEL above 75 dB, since an interior CNEL noise exposure of 45 dB would not be possible. Thus, it is recommended that housing units exposed to average CNEL greater than 75 dB be vacated during Level 2 and Level 3 testing.

4-23: Please refer to pages 34 through 37 of this FEIS. No known mitigation measures would reduce the effects of Impacts NOISE-5, NOISE-6 and NOISE-7, and none were offered by the commentator.

4-24: Please refer to Response 4-7.

4-25: Please refer to Response 4-16.

4-26: Construction of the 80- by 120-Foot Wind Tunnel began in the late 1970s, and construction plans began much earlier. The original plan was to have the tunnel operational in 1983, but completion was delayed until 1987. The military housing was constructed in the years provided by the commentator.

4-27: Comment noted. Page 53 of the DEIS has been revised in this FEIS (revised page 55).

4-28: Please refer to Response 4-4.

4-29: All of the noise contours presented within the body of the DEIS are descriptive of the NASA Ames Aerodynamics Testing Program, as described in Tables 2, 3, and 4 of the document. The noise levels anticipated for the X-32/X-35 JSF testing project, as presented in the Memorandum of Record dated September 13, 1994 (included in Appendix C of the DEIS), have been used to predict the highest expected noise levels required to test aircraft of the next generation within the two wind tunnels. These noise levels and contours were then used to develop the maximum noise level of the NASA Ames Aerodynamics Testing Program alternatives.

The only X-32/X-35 JSF project noise contours presented in the DEIS are those within Appendix C. Testing of the X-32/X-35 JSF would be a project that is expected to fall within the testing envelope of the NASA Ames Aerodynamics Testing Program.

4-30: The comment that "NASA has limited the amount of Level 2 and Level 3 testing which can occur each day since the 75 dB 24-hour average noise level contours fall within the 85 dB peak noise contours" is incorrect. The program alternatives as described in Tables 2, 3, and 4 were developed to accurately describe a range of viable testing scenarios for NASA Ames Research Center. It is a coincidence that the 85 dB peak noise level contour encompasses the maximum daily CNEL noise exposure contour of 75 dB for Alternative 3 (Figure 23) and for the estimated X-32/X-35 JSF project contours (Figures C-3 and C-5). The maximum daily CNEL noise exposure contour of 75 dB for Alternative 1 (Figure 21) and Alternative 2 (Figure 22) do not fall within the 85 dB peak noise level contour. The Onizuka Annex should be vacated within both the maximum daily CNEL noise exposure contour of 75 dB and the 85 dB peak noise level contour (when considering differing criteria). Whether housing would be vacated for a number of hours per day or for the entire day during testing periods, has yet to be resolved. Before housing is vacated, NASA and the DOD will agree upon the specific mitigation. Ames suggested that the 85 dB peak noise level contours (as shown in Figure 20) be used as the primary guide when vacating residential units, if testing were not to exceed that described in Alternative 3 of the NASA Ames Aerodynamics Testing Program. This measure would simplify compliance with the mitigation measures outlined in the DEIS. However, if either Alternative 1 or Alternative 2 were to be adopted by NASA, the CNEL noise exposure contour should be used to vacate residential units.

4-31: Please refer to Response 4-30. It is incorrect that NASA defined the 85 dB peak noise contour as the boundary of the "danger zone" because it encompasses the 75 dB CNEL noise contour. NASA based this identification on the NASA Health Standard on Hearing Conservation (NHS/IS-1845.4), which defines the following:

> *Noise Hazard Area - any work area with a noise level of 85 dBA, or greater.*

It is correct that increases in Level 2 and Level 3 testing will increase CNEL noise exposure contours. This increase in testing time and duration is indicated by the corresponding increase in the areas encompassed by noise exposure contours of the three program alternatives.

4-32: Noise contours for the X-32/X-35 JSF Project are contained in Appendix C.

Noise contours for the NASA Ames Aerodynamics Testing Program are presented in Figures 20, 21, 22, and 23.

It is important to note this DEIS has not presented an analysis of the impacts associated with the X-32/X-35 JSF project, but a testing program that could encompass a testing project such as the X-32/X-35 JSF. Appendix C is presented to provide the reader with an indication of what an individual testing project would entail. Also see the response to comment 4-29.

4-33: Because of the non-linear way in which noise and noise exposure combine, the cumulative impacts of noise are generally negligible. The rules for decibel addition used in community noise prediction are:

- If two sound levels are within 1 dB of each other, their sum is the highest value plus 3 dB.
- If two sound levels are within 2 to 4 dB of each other, their sum is the highest value plus 2 dB.
- If two sound levels are within 5 to 9 dB of each other, their sum is the highest value plus 1 dB.
- If two sound levels are greater than 9 dB apart, the contribution of the lower value is negligible and the sum is simply the higher value.

Generally, when two or more noise sources combine, the majority of the impact results solely from the greater noise, which generally masks, or drowns out, the lower noise levels. The maximum cumulative noise impact exists when two sounds of equal value combine, which is highly unlikely in this situation. For this reason, no additional cumulative impacts are expected to occur, as described on pages 183 to 184 of this FEIS.

A figure showing the expected CNEL noise environment for the preferred alternative, including existing sources, has been created and included in the summary of this FEIS for information purposes.

SAN FRANCISCO
BAY TRAIL

August 8, 1995

Ms. Sandra Olliges
Mail Stop 318-1
NASA Ames Research Center
Moffett Field, kCA 94035-1000

RE: DEIR: Aerodynamics Testing Program

Dear Ms. Olliges:

The Bay Trail Project has received and reviewed a copy of the subject document and has the following comments:

While the Bay Trail is briefly mentioned as a surrounding recreational use in Sec 4.A(3) (p. 48), it is not specifically detailed in the following sections. The proposed Bay Trail alignment along the north side of Moffett Field should be shown along with the Stevens Creek Trail on the maps showing Surrounding Recreational Facilities (p. 97) and Adjacent Recreational Facilities (p. 99). Attached is a map showing this alignment.

In addition, we request that the following paragraphs be inserted under Section 4E, Affected Environment: Recreation:

> San Francisco Bay Trail.
> The San Francisco Bay Trail is a planned 400-mile bicycle and pedestrian trail system around the shoreline of San Francisco and San Pablo Bays. The trail was established by the California State Legislature in 1987. The Association of Bay Area Governments (ABAG) conducted a two-year planning process and approved the Bay Trail Plan in 1989, and is responsible for implementing the plan in cooperation with local governments, agencies and property owners around the Bay. Bay Trail policies and design guidelines are intended to complement the adopted regulations of local management agencies. When completed, the Trail will link shoreline trail systems through nine counties, 42 cities, and over 130 parks and public open space preserves. 5-1

Administered by the Association of Bay Area Governments
P.O. Box 2050 • Oakland California 94604-2050
Joseph P. Bort MetroCenter • 101 Eighth Street • Oakland California 94607-4756
Phone: 510-464-7935
Fax: 510-464-7970

Under the sponsorship of the Bay Trail Project, the South Bay ad hoc Committee, has been making efforts since 1989 to implement a trail connection across northern Santa Clara County. A critical segment, both for recreational trail users and commuting cyclists, would connect the Shoreline at Mountain View with Sunnyvale Baylands Park, crossing Moffett Field and the adjacent Lockheed property. This segment is shown in NASA's Moffett Field Comprehensive Use Plan Final Environmental Assessment (1994).

The EIR for the Aerodynamic Testing Program should be consistent with the Comprehensive Use Plan by citing this alignment. The NASA Ames administration recently agreed to work with local and regional interests to open the western portion of this trail segment. This effort should be recognized in the subject document and any impacts which may "inhibit the future development of the recreational opportunities" (p. 160) should be addressed and mitigated. (We believe that the Aerodynamics Testing Program should not impact development and use of the Moffet Field Bay Trail segment because the noise levels will be lower than at the Stevens Creek Trail). **5-1**

We appreciate the opportunity to comment on the DEIR for the Aerodynamics Testing Program. Kindly keep us on your list for future revisions.

Sincerely,

Brian Wiese

Brian Wiese
Trail Development Coordinator

LETTER 5:
Brian Wiese, Trail Development Coordinator. San Francisco Bay Trail Project. Association of Bay Area Governments. August 8, 1995.

5-1: Figures 14 and 15 and page 104 of the DEIS have been revised in this FEIS to respond to the Association of Bay Area Governments' comments (revised pages 98 to 108).

County of Santa Clara

Environmental Resources Agency
Parks and Recreation Department

298 Garden Hill Drive
Los Gatos, California 95030
(408) 358-3741 FAX 358-3245
Reservations (408) 358-3751 TDD (408) 356-7146

August 14, 1995

Ms. Sandy Olliges
Mail Stop 218-1
NASA Ames Research Center
Moffett Field, CA 94035-1000

Subject: **Draft Enironmental Imapct Statement for the NASA Ames Aerodynamics Testing Program**

Dear Ms. Olliges:

The Santa Clara County Parks and Recreation Department appreciates the opportunity to comment on the Draft Environmental Impact Statement (DEIS) for the NASA Ames Aerodynamics Testing Program. Our comments focus on potential impacts to existing and proposed recreational facilities in the project vicinity.

Existing Conditions. The description of regional park and trail facilities portrayed in the Land Use Section of the DEIS on page 48 is consistent with the Parks and Recreation Element of the 1995 Santa Clara County General Plan and with the Draft Countywide Trails Master Plan Update which is now in circulation. To provide consistency with the Land Use Section of the DEIS, as well as the Moffett Field Comprehensive Use Plan Final Environmental Assessment, Figures 14 and 15 (pages 97 & 99) should be modified to include the proposed San Francisco Bay Trail. We also would like to recommend that the proposed Alternative Bicycle Commute Trail, which is planned to connect the PG & E site to the Stevens Creek trail, be identified on Figures 14 and 15. **6-1**

Impacts and Mitigations. The Impacts discussion on page 160 states that the only recreation facility that would experience CNEL noise exposure of 70 dB and greater would be the Stevens Creek Regional Trail. However, the proposed Alternative Bicycle Commute Trail also would be subject to extremely high noise levels during Level 2 and 3 testing. Mitigations Measures should be identified for this trail route that are consistent with those proposed for the Stevens Creek Trail. The DEIS also may want to note that the proposed project would not create a significant adverse impact on the proposed Bay Trail route since the Bay Trail is specifically addressed in the Moffett Field Comprehensive Use Plan Final Environmental Impact Assessment.

Mitigation Measure REC- 1 is consistent with the following Santa Clara County Draft Countywide Trails Master Plan Policies which state: **6-2**

> *PR-TS (i) 2.B. Prior to developing any new trail route for public use, prepare design and management plans that ensure provision of services necessary to provide for the safety and support of trail users and affected landowners, and respond to the unique safety and use concerns associated with highway safety, traffic operations, public transit, and businesses such as quality water source development, intensive agriculture, grazing, mining, railroads, and defense research and testing industries.*

> *PR-TS 4.1. Trails shall be temporality closed when conditions become unsafe or environmental resources are severely impacted....*

Thank you for the opportunity to respond to the DEIS on the NASA Ames Aerodynamics Testing Program. If you have any questions on this response, please call me at (408) 358-3741 ext 152.

Sincerely,

Julie Bondurant
Park Planner

cc: Jill Keimach, Bay Trail Project Manager

LETTER 6:
Julie Bondurant, Park Planner. Planning and Development Department. County of Santa Clara. August 14, 1995.

6-1: Figures 14 and 15 and page 104 of the DEIS have been revised in this FEIS to respond to Ms. Bondurant's comments (revised pages 98 to 108).

6-2: Mitigation Measure REC-1 has been amended in this FEIS to address the potential for impact to the Bicycle Commute Trail.

Page 161 of the DEIS has been revised in this FEIS to add a sentence describing that no impact is anticipated to the San Francisco Bay Trail (revised FEIS page 168) due to the proposed Aerodynamics Testing Program.

CITY OF MOUNTAIN VIEW

Office of the City Manager • 500 Castro Street • Post Office Box 7540 • Mountain View, California 94039-7540
415-903-6301 • FAX 415-962-0384

August 14, 1995

Ms. Sandra Olliges
NASA Ames Research Center
Mail Stop 218-1
Moffett Field, CA 94035-1000

Dear Ms. Olliges:

Thank you for the opportunity to review and comment on the NASA Ames Aerodynamics Testing Program Draft Environmental Impact Statement (EIS).

City of Mountain View staff have reviewed the draft document and offer the enclosed comments for your consideration. For ease of review, the City's comments are noted by the page number of the document.

If, after reviewing the comments, there is need for clarification, please contact me at (415) 903-6301.

Sincerely,

Nadine Levin

Nadine P. Levin Oz
Assistant City Manager

NPL/AT/SLD
603-8-14-95L/E†

Enclosure

cc: CM, CDD, CSD

CITY OF MOUNTAIN VIEW COMMENTS REGARDING
DRAFT ENVIRONMENTAL IMPACT STATEMENT
NASA AMES AERODYNAMICS TESTING PROGRAM

SUMMARY CHAPTER

Table S-1—The Clapper Rail and Salt Marsh Harvest Mouse should be added to the identified biological species which might be subject to noise impacts since they reside in Stevens Creek north of Crittenden Bridge. 7-1

Pages S-5 and S-7—Additional explanation/clarification is needed regarding why 250 mobile home units will be affected under the Alternative 2 scenario compared to the 150 homes impacted under Alternative 3. Also, additional explanation regarding the differing number of acres impacted under Alternatives 1 and 3 (28 and 16 acres, respectively) is needed. 7-2

Table S-2—In addition to publishing the test schedule in local newspapers, a telephone "hot line" should be established for residents to secure information regarding the tests or to register complaints. 7-3

CHAPTER 1—INTRODUCTION

Page 3—The public meetings which were conducted discussed/described a single test project only, not an aerodynamics testing program. This section should indicate that the public meetings covered only a single test project. 7-4

Page 22—Two additional "benchmarks" are needed—one near the Crittenden Bridge and a second adjacent to Stevens Creek Tidal Marsh. 7-5

Page 32—Instead of using "approximately" four tests per year, a range that includes a "not to exceed" should be used. 7-6

Pages 47 and 49—In addition to the number of mobile homes, the number of residents should be stated. Additionally, an estimate of the total number of people affected should be stated. 7-7

SECTION B—PUBLIC POLICY

Page 55—A census track map is needed with the noise model diagram. 7-8

CITY OF MOUNTAIN VIEW COMMENTS REGARDING DRAFT ENVIRONMENTAL IMPACT STATEMENT NASA AMES AERODYNAMICS TESTING PROGRAM

SECTION D—FLORA AND FAUNA

Page 90—The City's requirement that the Army Corps of Engineers restore the Stevens Creek Marsh should be addressed and identified in this section. **7-9**

CHAPTER 5—ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Public Policy, Page 129—The City of Mountain View is concerned that Impact Policy-1 identifies that the testing program will have a disproportionate affect on low- and very low-income populations. Specifically, the City's concerns include the following: **7-10**

- This section concludes that the impact will be less than significant. On what basis is this impact considered less than significant?

- This section also concludes that no mitigation measures are possible. What kind of mitigation measures are suggested or mandated by Executive Order No. 12898? The report needs to explain why monetary compensation for lost property values would not be an appropriate mitigation for the impacts on very low-income residents. **7-11**

- Santiago Villa Mobile Home Park (Tract 5046.01), which is the area most affected by the proposed project, has almost twice the number of very low-income households than the County average. Residents of the mobile home park are primarily senior citizens. Impacts of the project will be more severe for senior citizens because of their generally limited ability to change addresses or incomes. The cumulative impacts of the decreased property values and reduced quality of life for these residents should be addressed. **7-12**

- The impact on minority populations should be addressed in this section as identified in other sections of the Draft Environmental Impact Statement (EIS). In the Whisman residential neighborhood (Tract 5091.04), more than 40 percent of the population are minorities. This neighborhood also could be significantly affected by some of the project alternatives and should be included as an impacted group. **7-13**

CITY OF MOUNTAIN VIEW COMMENTS REGARDING DRAFT ENVIRONMENTAL IMPACT STATEMENT NASA AMES AERODYNAMICS TESTING PROGRAM

Noise, Page 132

- The EIS should address whether senior citizens will be more affected by noise impacts and experience more adverse health impacts than the general population. 7-14

- The EIS should address how the testing program will affect the outdoor concerts at Shoreline Amphitheatre, particularly the nighttime testing. Is there a difference in the impact of the alternatives? 7-15

- Impact Noise-5 identifies adverse noise impacts to residents and businesses in Mountain View. This impact is identified as a significant, unavoidable impact. The EIS needs to provide more specific information regarding the potential impacts and possible mitigation measures. 7-16

  — Psychological stress caused by increased noise levels can cause physiological health problems. Identify and discuss possible stress-related health effects due to increased noise levels and possible mitigation.

  — There is little discussion about the difference in the impact on residents between daytime and nighttime noise. This should be addressed in greater detail. Is nighttime testing likely to disturb people's sleep, particularly the low-level noise vibrations in mobile homes? How would this affect people's health. 7-17

  — What would be the interior noise levels caused by the project in the mobile homes? 7-18

  — It is assumed that affected industries do not have evening and swing shifts. Please verify this assumption with those industries. 7-19

  — The EIS should acknowledge that the project may have an impact on the quality of the North Bayshore industrial park. This is the premiere industrial park in Mountain View where City regulations require generous landscaping, art and outstanding architecture. The EIS should address the economic impacts on these businesses given the increased noise levels resulting from the project. 7-20

CITY OF MOUNTAIN VIEW COMMENTS REGARDING DRAFT ENVIRONMENTAL IMPACT STATEMENT NASA AMES AERODYNAMICS TESTING PROGRAM

— The Draft EIS identifies only one very limited mitigation measure. It does not address whether the test facilities could be reconstructed or reconfigured to result in less noise impacts on the west and south sides of the facility where there is the greatest impact to people and businesses. This possible mitigation should be discussed. **7-21**

- Impact Noise-7 identifies impacts caused by noise-induced vibrations, particularly for the mobile home park residents due to the type of mobile home construction. However, it concludes that this impact is less than significant. On what basis is this impact considered less than significant?

  It would seem that vibrations would often have a more significant impact than noise, particularly in this area where earthquakes are inevitable and every vibration could be considered a possible earthquake. What will be the impact on stress levels and sleep from these vibrations? What are the related health impacts? **7-22**

Recreation, Page 160—The City's General Plan (Community Development Chapter, Policy 9) requires that the City: "Ensure compatible land uses next to the City's natural resources." Impact Rec-1 in the Draft EIS identifies a significant impact to the Stevens Creek Trail. It also identifies closure of the trail as the only possible mitigation measure. Mitigation measures should be related to the project not surrounding land uses, and this reference should be deleted. This section also does not address the difference in impact the different project alternatives would have on the trail. The final EIS should address this issue. **7-23**

AT/MGR
603-8-14-95R/E†

LETTER 7:
Nadine P. Levin, Assistant City Manager. City of Mountain View. August 14, 1995.

7-1: NASA conducted informal consultation with the U.S. Fish and Wildlife Service and the California Department of Fish and Game. Both concurred with the identification of impacts in the DEIS. Both species are located near the outfall of Stevens Creek which is located in the stretch of Stevens Creek farthest from the 80- by 120-Foot Wind Tunnel. Based on the noise contours, no substantial impact will occur to the clapper rail or to the salt marsh harvest mouse. Noise generated by the program will be monitored to ensure that impacts to sensitive species do not occur. In addition, please refer to Letters 1 and 2 included in this FEIS.

7-2: Additional explanation is provided on pages 158 to 159 of this FEIS. The differing areas of impact for the three alternatives were developed by comparing the location of the respective CNEL noise contours, as shown on Figures 21, 22, and 23 (pages 145 to 150).

As described on page 143, noise contours were prepared for the NASA Ames Aerodynamics Testing Program alternatives to depict the maximum noise exposure which would be allowed during any 24-hour period under absolute worst case conditions. Noise exposure is a way of averaging the dose of noise over a period of time. Noise exposure measurements correlate more closely with human response to noise annoyance than do noise level measurements because they consider both the noise level and the duration of noise events, as well as the time of day of exposure. For this reason, nearly all noise criteria used for land use compatibility are based on noise exposure rather than noise level.

The noise exposure contours presented in Figures 21, 22, and 23 (pages 145 to 150) were compiled by taking the maximum noise level emissions from the noise source, and calculating the CNEL noise exposure contribution for the maximum allowed duration, for the daytime and nighttime periods, according to the CNEL noise definition.

7-3: NASA Ames will provide extensive notification of impending wind tunnel tests in conjunction with the ATP, beginning at least six months in advance of a test. Central elements of the public outreach and notification plan include: establishing and staffing a phone number dedicated to current status of tests with message capability to register comments, concerns or complaints; test status on a NASA Ames World Wide Web dedicated "home page" with return comment/question availability and links to/from the Mountain View and Sunnyvale web sites; notifications, e.g. flyers, letters, etc., of imminent tests and schedules mailed to all Moffett Federal Airfield Resident Agencies, the residents of the Moffett military housing, the Santiago Villa Mobile Home Park, and neighboring businesses in the North Bayshore area; special announcements in the Mountain View Voice newspaper; news releases announcing upcoming tests with referral information included; and notification to city management offices of Mountain View, Sunnyvale, Los Altos and Palo Alto. Additionally, NASA Ames staff will be available to brief interested groups prior to the tests.

7-4: It is not correct that a single test project was discussed in the scoping meeting. The proposed action of this EIS has always been proposed as "program level". Information was provided in the scoping meeting on the proposed X-32/X-35 JSF project to describe a typical project that might fall within the scope of the proposed Aerodynamics Testing Program. Copies of the transcripts from the scoping meetings are available in the Sunnyvale public library.

7-5: Comment noted. In an effort to keep the EIS as simple and understandable as possible, NASA initially elected to establish one primary benchmark. In response to public comment, NASA has established a second monitoring location at the Stevens Creek Trail, as discussed in more detail on page 22 of this FEIS. Though additional monitoring stations are not committed to in the EIS, NASA may elect to establish such stations.

7-6: Maximum test durations, frequencies, and time periods are outlined for each alternative in Tables 2 through 4 (pages 29 to 31). Testing would be required to conform to the maximum hours of testing per day.

7-7: The number of residents affected by the proposed testing can be estimated by multiplying the average number of residents per household unit by the number of units affected. No exact number of residents is available from Santiago Villa Mobile Home Park. In Mountain View, the average persons per household is 2.3. Therefore, it is estimated that 823 persons live within the park. Similarly, Alternative 1 would significantly impact all the residents of the park (approximately 823 persons). Alternative 2 would significantly impact approximately 575 persons, and Alternative 3 would significantly impact approximately 345 residents. It is important to note that these are approximations. For this reason, exact population counts were not included in the DEIS.

7-8: Appendix D provides more detailed information on the Census tracts surrounding Moffett Field, including a Census tract map.

7-9: The DEIS has been revised in this FEIS to state that the City has asked the Army Corps of Engineers to restore the Stevens Creek Marsh.

7-10: As described on page 133 of this FEIS, the proposed NASA Ames Aerodynamics Testing Program would have a significant impact with regard to policy consistency if it would:

- Conflict with existing NASA policies or long-range strategic goals; or
- Conflict with existing Federal laws and policies, including Air Force and NASA requirements and policies.

Specific directives of the Executive Order on Environmental Justice include the analysis of environmental effects, including human health and economic and social effects of Federal actions, including effects on minority communities and low-income communities. NEPA documents are to address significant and disproportionate adverse environmental effects of proposed Federal actions on minority communities and low-income communities. Additionally, each Federal agency is directed to provide opportunities for community input in the NEPA process, including identifying potential effects and mitigation measures in consultation with affected communities and improving the accessibility of meetings, crucial documents, and notices.

Pursuant to the Executive Order on Environmental Justice and CEQ and NASA NEPA regulations, NASA has undertaken a comprehensive public involvement process to notify the public of the proposed Aerodynamics Testing Program, and to scope out the issues and concerns the public may have. Three public scoping meetings were held to notify the surrounding communities about the proposed Aerodynamics Testing Program and the EIS and NEPA process, to determine the scope of significant issues to be addressed in the EIS, and to initiate an open relationship between NASA Ames Research Center and the surrounding communities. Three public meetings were also held during the DEIS public review period. Public notification of all the public meetings took place through local papers, through a mass mailing that focused on the most affected members of the community and interested agencies, and through a series of briefings, one of which was made to the residents of Santiago Villa Mobile Home Park.

NASA Ames Research Center has followed the NASA Environmental Justice Strategy by notifying the public and paying particular attention to those communities which are low income and/or minority and has proceeded consistent with NASA's Environmental Justice Strategy. This notification is a mitigation measure that the low income population shares with the rest of the community. Additionally, the mitigation measure and mitigation plan applies to the low income population as it does the rest of the community. This is not to say that noise impacts are less than significant. As indicated by Impact NOISE-5, even with mitigation, noise impacts of the NASA Ames Aerodynamics Testing Program are considered significant and unavoidable.

7-11: Executive Order 12898 does not mandate compensation. The Executive Order's premise is for Federal agencies to ensure that environmental impacts on minority populations and low-income populations are taken into consideration in the decision-making process. To ensure that the community is allowed input into the process, Federal facilities are required to identify potential off-site environmental effects and develop a proactive notification process to ensure that the community is notified of potential hazards. NASA has taken a proactive approach in compliance with the provisions of this mandate

7-12: Pages 133 through 134 of this FEIS address the fact that Santiago Villa has a larger percentage of low and very low income households when compared to the City of Mountain View as a whole. Additionally, Impact POLICY-1 has been identified regarding this issue.

Pages 173 through 175 of this FEIS address the fact that property values may decrease at Santiago Villa. Additionally, Impact ECON-1 has been identified regarding this issue. However, as stated on page 174 of this FEIS, it is not possible to predict with any confidence that a loss of property value will occur. It is possible that the high demand for housing in the South Bay Area will result in no reduction in property values, even with increased noise at infrequent intervals.

7-13: Appendix D, page D-2 of the DEIS provides statistics on the racial composition of Census Tract 5091.4. Although it is true that the combined minority population is relatively high in this census tract, none of the proposed alternatives will significantly impact this area (see pages 145 to 150). All three alternatives will generate noise levels under 65 CNEL, therefore, there is no significant, disproportionate impact.

7-14: We have no information that would suggest senior citizens are more affected by noise than other individuals, or that specific individual will show greater-than-average hearing loss following noise exposure.[1]

7-15: Wind tunnel noise levels in the vicinity of Shoreline Amphitheater would not be loud enough to create an effect.

7-16: Page 68 of the DEIS has been amended in this FEIS to expand the discussion regarding psychological stress created by increased noise (revised FEIS pages 70 to 71). Noise and land use compatibility guidelines generally correlate with widely accepted annoyance levels of a community. As indicated in the DEIS, unavoidable significant noise impacts to the community are anticipated if the NASA Ames Aerodynamics Testing Program is implemented. These impacts may be in the form of increased psychological stress in the affected areas of the community.

1 *Noise and Hearing Loss - Consensus Conference.* JAMA, June 20, 1990 - Vol 263, No. 23. Page 3188.

The only feasible mitigation to potential noise impacts, including specific impacts of psychological stress created by noise, would be to decrease the noise levels and noise exposure created by the NASA Ames Aerodynamics Testing Program. NASA believes that noise levels up to 85 dB at the benchmark will be required for future wind tunnel tests in the NFAC. As discussed on pages 34 through 36, there are no feasible alternatives that would substantially reduce the noise emanating from the wind tunnels. If NASA reduced the noise levels allowed in the NASA Ames Aerodynamics Testing Program, the program would not fulfill the identified purpose of supporting the research and development of new aeronautical technologies for military and civilian use.

7-17: Page 68 of the DEIS has been amended in this FEIS to expand the discussion regarding sleep disturbance (revised FEIS page 71). As discussed on page 76 of this FEIS, the community noise exposure measure of CNEL, which is used for analysis in the EIS, includes a penalty of 5 dB for noise emitted during the evening hours of 7:00 to 10:00 pm, and a 10 dB penalty for noise between 10:00 pm and 7:00 am. These penalties are added to nighttime noise to estimate the increased sensitivity of the community at these times.

Additionally, it should be noted that the program alternatives allow for a range of nighttime testing, as described in Tables 2 through 4. Alternative 1 allows for nighttime testing up to 80 dB at the benchmark. Alternative 2 allows for nighttime testing up to 65 dB at the benchmark, and limited evening (7:00 pm to 10:00 pm) testing up to 75 dB at the benchmark. Alternative 3, the program alternative with the least impact, would only allow nighttime testing up to 65 dB at the benchmark. These differences in the alternatives are described in Table S-1, and on pages S-6 through S-8 of this FEIS.

7-18: As described in Table E-1 of Appendix E, the outdoor to indoor reduction in noise for the mobile home units tested on December 5, 1994 range from 19 to 25 dB. Assuming the worst-case scenario (noise reduction of 19 dB), the following are the highest noise levels and highest maximum noise exposure anticipated through the NASA Ames Aerodynamics Testing Program Alternatives:

	Alt. 1	Alt. 2	Alt. 3
Maximum Noise Level (dB)	64	64	64
Maximum Daily Noise Exposure (dB CNEL)	59	57	55

7-19: It is assumed that "commercial facilities would not generally be in use" during nighttime testing. This is not to say that evening and swing shifts do not exist within these facilities. Even if evening or swing shifts occur, the impacts to these personnel are expected to be less than impacts experienced during the day, since, comparatively, noise levels will not be as high and these individuals are not anticipated to be sleeping. The penalties applied by the CNEL descriptor (5 dB for noise between 7:00 p.m. and 10:00 p.m. and 10 dB for noise between 10:00 p.m. and 10:00 a.m.) incorporate the assumption that the majority of individuals are sleeping at this time. For this reason, as described on page 153 of the DEIS, impacts to commercial and industrial park areas are generally expected to be less than the CNEL noise descriptor may indicate when encompassing nighttime testing. Additionally, the majority of testing outlined by the NASA Ames Aerodynamics Testing Program alternatives would occur during the day, especially that testing which generates the highest noise levels.

7-20: Please refer to page 173 of this FEIS. In the research conducted for the EIS, no studies were found that predict the impact of noise levels on non-residential property values. Given the high demand for non-residential real estate and industrial and research and development buildings in the South Bay, it is unlikely that any reduction in property values would occur.

7-21: Please refer to pages 34 to 36 as revised in this FEIS.

7-22: There has been no historical evidence of ground-borne vibrations around NASA Ames, indicating that the soil conditions do not effectively transmit ground vibrations. The principal source of potential far-field vibrations from the NASA Ames Aerodynamics Testing Program would be from airborne vibrations, meaning that the vibrations would arise from sound propagated through the atmosphere to a far-field structure.

The criteria of significance used for analysis in the EIS are outlined on pages 136 and 137. Impacts related to airborne noise-induced vibration may cause annoyance for surrounding community members, but no hazards are anticipated. Since no hazards are anticipated related to vibration, this impact is considered less than significant.

It is anticipated that some psychological and stress-related effects could occur since the airborne vibrations (that could cause window rattling) could be considered annoying by many individuals. However, as with noise impacts, human response to these vibrations is subjective and would vary considerably among individuals. There is no reliable way to estimate these effects.

7-23: It is noted that the City is required to ensure compatible land uses next to the City's natural resources. However, facilities in question are not within the City limits. NASA is not aware of any other feasible, practicable mitigation measures other than closing Stevens Creek Trail. Closure of the trail remains the best method to mitigate potential impacts to potential public users during periods of high-level noise testing. As discussed on pages 141-142, all three alternatives produce the same peak noise level on the trail. NASA will notify the City of Mountain View prior to testing so that the trail can be posted and/or closed.

MIDPENINSULA REGIONAL OPEN SPACE DISTRICT

August 14, 1995

Ms. Sandy Olliges
Mail Stop 218-1
NASA Ames Research Center
Moffett Field, CA 94035-1000

Dear Ms. Olliges,

Midpeninsula Regional Open Space District staff members have reviewed the Draft Environmental Impact Statement (DEIS) for the NASA Ames Aerodynamics Testing Program. The District owns and manages the adjacent Stevens Creek Nature Shoreline Study Area and we are interested in potential impacts the testing program may have on the preserve and nearby recreational facilities.

Our comments focus on potential impacts to recreation and wildlife resources and are noted by page number.

Pages 97, 99	Figures 14 and 15, titled Surrounding Recreational Facilities, and Adjacent Recreational Facilities, do not show the District's 55 acre Stevens Creek Shoreline Nature Study Area. In addition, the two figures do not include the proposed San Francisco Bay Trail and NASA's Alternative Bicycle Commute Trail. The San Francisco Bay Trail alignment should be shown as it is in NASA's 1994 Moffett Field Comprehensive Use Plan Final Environmental Assessment. The Alternative Bicycle Commute Trail is planned to connect from the PGE site to Stevens Creek Trail.	**8-1**
Page 104	In the first paragraph Crittenden Marsh has been misspelled. It should be noted that Crittenden Marsh was officially renamed Stevens Creek Shoreline Nature Study Area when it was acquired by the District in 1980.	**8-2**
Page 160	The statement is made that the proposed testing program would have a significant impact with regard to recreation if it would "inhibit the future development of recreational opportunities in the area".	**8-3**
	The San Francisco Bay Trail should be addressed in a consistent manner with the 1994 Moffett Field Comprehensive Use Plan Final Environmental Assessment. It should be pointed out that the testing program will not pose an obstacle to future Bay Trail planning efforts because projected noise levels will not exceed 70 dB in the vicinity of the proposed Bay Trail alignment.	**8-4**
	The Alternative Bicycle Commute Trail is proposed to parallel Stevens Creek adjacent to the wind tunnel where noise levels are extremely high during high level testing. The bicycle trail is expected to be open to employees and the general public during daylight hours on weekdays, thereby, exposing trail users to the same level of noise as trail users are exposed to along the Stevens Creek Trail. Mitigation measures may need to be consistent with those proposed for the Stevens Creek Trail, including intermittent trail closures.	**8-5**

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Page 158 The first paragraph states there is suitable habitat for a number of special-status bird and mammal species to the north and west of the project area. According to the 1994 Comprehensive Use Plan Final Environmental Assessment, there is also suitable habitat for the Clapper Rail, Salt Marsh Yellowthroat and Pt. Reyes Bird's Beak within the tidal brackish marsh adjacent to the wind tunnels where noise levels are anticipated to reach 80 dB (see figure 5, page 43). If this is the case, it is unclear why potential impacts on these three species are not addressed in addition to the impacts on the burrowing owl. **8-6**

The mitigation measure for Impact F & F-1 lacks specificity in regards to defining a threshold for significant impact on the burrowing owl, timelines for studies and implementation of potential mitigation measures. Mitigation measure F & F-1 should include a determination of the level at which point the impacts on the burrowing owl need to be mitigated, followed by measurable performance standards by which the success of the mitigation can be determined, and contingent mitigation if monitoring reveals that the success standards are not met. **8-7**

Mitigation measures for impacts on special-status bird and mammal species could include the protection and enhancement of habitats to the north of the project area. **8-8**

Your consideration of our comments is appreciated. If you have any questions regarding our review of this program, please contact me at (415) 691-1200.

Sincerely,

Del Woods

Del Woods,
Senior Planner

LETTER 8:
Del Woods, Senior Planner. Midpeninsula Regional Open Space District. August 14, 1995.

8-1: Figures 14 and 15 have been revised in this FEIS to respond to this comment.

8-2: Page 104 of the DEIS has been amended in this FEIS to respond to this comment (revised FEIS page 106).

8-3: Comment noted.

8-4: Pages 104 and 160 of the DEIS have been amended in this FEIS to respond to this comment (revised FEIS pages 106 and 166).

8-5: Please refer to Responses 6-1 and 6-2 in this FEIS.

8-6: Since preparation of the Comprehensive Use Plan Environmental Assessment in 1994, the U.S. Fish and Wildlife Service on behalf of NASA Ames Research Center, recently completed a year-long sensitive species survey. The survey verified existing habitat and species on-site. No evidence of the clapper rail or Pt. Reyes bird's beak was found within the tidal brackish marsh adjacent to the OARF. The Pt. Reyes bird's beak is a plant species that would not be affected by noise levels.

NASA conducted informal consultation with the U.S. Fish and Wildlife Service to determine whether proposed testing was likely to detrimentally impact existing species on site such as the salt marsh yellowthroat. It was the determination of the Fish and Wildlife Service that the project would not cause a significant impact, as indicated in the letter following these responses.

8-7: Mitigation Measure F&F-1 has been revised in this FEIS to respond to this comment. A local burrowing owl expert, Dr. Lynne Trulio, has reviewed the mitigation measures outlined in the EIS and concurs that the measures are adequate. (Please refer to Letter 2 of this FEIS) further, Dr. Trulio will monitor the owls on an ongoing basis to ensure they are not being impacted. Specific measures for monitoring would be included in a detailed mitigation plan which would be developed for specific projects implemented under the NASA Ames Aerodynamics Testing Program.

8-8: Please refer to pages 162 through 165 of this FEIS. No impacts are anticipated other than those described for the burrowing owl, for which mitigation has been identified. Please refer to Response 8-7. Additionally, it is NASA's policy to conserve and protect the wetland habitat area north of the project area.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
Sacramento Field Office
2800 Cottage Way, Room E-1803
Sacramento, California 95825

IN REPLY REFER TO:

1-1-95-I-732

June 7, 1995

Ms. Sandy Olliges
Assistant Chief
Safety, Health and Environmental Services
National Aeronautics and Space Administration
Ames Res arch Center
Moffett ield, California 94035-1000

Subject: Informal Endangered Species Consultation on Proposed Aerodynamics Testing at the Ames Research Center, Moffett Field, California

Dear Ms. Olliges:

This responds to your letter dated April 24, 1995, requesting concurrence with the determination that the proposed action, aerodynamics testing within the 40-by-80-by-120-foot wind tunnel at the Ames Research Center, is not likely to adversely affect the federally endangered California clapper rail (*Rallus longirostris obsoletus*). We have reviewed the material transmitted with your correspondence, along with other material earlier transmitted by your office, and concur with this determination. However, our determination is based upon our understanding that aerodynamics testing at the Outdoor Aerodynamics Research Facility is not being proposed. Therefore, unless new information reveals effects of the proposed action that may affect listed species in a manner or to an extent not considered, or a new species or critical habitat is designated that may be affected by the proposed action, no further action pursuant to the Endangered Species Act of 1973, as amended, is necessary.

Please contact Jim Browning of my staff at (916) 979-2752, if you have questions regarding this response.

Sincerely,

Cary C. Goude

for Joel A. Medlin
Field Supervisor

cc: ARD-ES, Portland, OR
SFBNWR, Project Leader

CITY OF SUNNYVALE

The Heart of Silicon Valley

456 WEST OLIVE AVENUE SUNNYVALE, CALIFORNIA 94086 (408) 730-7470

August 16, 1995

Ms. Sandra Olliges
Mail Stop 218-1
NASA Ames Research Center
Moffett Field, CA 94035-1000

Subject: Draft Environmental Impact Statement for wind tunnel testing

Dear Ms. Olliges:

Thank you for providing the City of Sunnyvale with an opportunity to review the Draft Environmental Impact Statement (DEIS) on NASA's proposed wind tunnel testing program. We have reviewed the DEIS and would like to make the following comments:

1. Although the benchmark and its immediate surrounding area are not within the borders of the City of Sunnyvale, the City has, nevertheless, received complaints in the past of distressing noise levels from residents of the Lakewood Village neighborhood when wind tunnel testing has taken place. These complaints have been sporadic rather than occurring on every occasion of testing. This pattern of complaints makes us wonder if weather patterns are affecting the range and/or intensity of noise from the wind tunnel testing. The DEIS does not provide information on the effects of weather conditions on the distance that the sound created by wind tunnel testing might travel, although there have been studies showing a correlation between weather patterns and sound travel. We would request that a study be done to determine if, under certain weather conditions, the distance that sound travels from the testing site is increased. If a correlation exists, the impacts of noise generated from wind tunnel testing could be mitigated by refraining from testing during these weather conditions. 9-1

2. To help us mitigate the impact of unexpected high levels of noise on Sunnyvale residents, we request that the City be informed of specific times when testing will take place so that we, in turn, can notify our citizens. 9-2

3. Of the Alternatives proposed, the City would prefer Alternative # 3, which involves 400 annual hours of testing between 7:00 a.m. and 7:00 p.m. 9-3

We request that you include the following mitigations in the Final Environmental Impact Statement:

1. Prepare a weather/sound study to determine under what conditions, if any, sound from wind tunnel testing may travel further and/or be more intense. Based on study results, refrain from testing during times when weather conditions may exacerbate the noise impact of testing. 9-4

2. Provide the City with information on the dates and times that testing will occur, so that we can inform our citizens. 9-5

Thank you for your attention to this request.

Sincerely,

Barbara Waldman

Barbara Waldman
Mayor

BW:TR:jr

LETTER 9:
Barbara Waldman, Mayor. City of Sunnyvale. August 16, 1995.

9-1: As discussed on page 67 of this FEIS, if an inversion layer (thermal inversion) exists, sound can carry further than under typical conditions. Thermal inversion is known to occur fairly often in the Mountain View and Sunnyvale area. However, temperature gradients are unpredictable, and they do not lend themselves to estimating specific noise levels or to evaluating predictable long-term effects.

9-2: Comment noted. NASA will notify the City of Sunnyvale of proposed testing projects.

9-3: Comment noted. Of the Alternatives proposed, the City of Sunnyvale prefers Alternative 3.

9-4: Please refer to Response 9-1.

9-5: Please refer to Response 9-2.

DPMA

DIVERSIFIED PROPERTY MANAGEMENT ASSOCIATES

Aug 8, 1995

Sandy Olliges
NASA Ames Research Center
Safety, Health and Environmental Services Office
Mail Stop 218-1
Moffett Field, CA 94035-1000

Dear Sandy:

The following letter is intended to serve as documented public feedback regarding the proposal for increased advanced aircraft testing as part of the existing NASA AMES Aerodynamic Testing Program.

We have reviewed the Draft Impact Environmental Statement and have attended one of the Public Review Meetings so we feel that we are well informed about the current proposal and the options which are outlined within.

As condominium owners in the current affected area, we summarize our feedback as the following:

- Current evening noise levels from Highway 101, Shoreline Ampitheatre, and the NASA AMES Aerodynamic Testing Facility are already at levels which are considered to be unacceptable, especially during the spring, summer, and fall months where windows are kept open for ventilation. **10-1**

- We do not support the occurrence of <u>ANY</u> wind tunnel testing during the hours of 7:00 p.m. to 7:00 a.m. This represents a significant difference from NASA's current program which allows for the current level of testing to potentially occur 24 hours per day. **10-2**

- In the interest of technology and helping the U.S. maintain its competitive advantage in the aircraft industry, we do support <u>Alternative 3</u> which only allows for increased levels of testing to occur between the 7:00 a.m. to 7:00 p.m. timeframe. **10-3**

- We request that if NASA moves forward with the Advanced Aircraft Testing Program, at any level, that the Residents of Mountain View are given the opportunity to provide feedback at a desginated milestone 6 months after the first actual advanced aircraft test occurs to determine the real impact and to assess if any additional mitigation measures are required. **10-4**
- We also request that NASA consider financial reimbursement for affected residents **10-5**

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who do experience devaluations in property value that can be attributed to the Aerodynamics Testing Program. 10-5

- We do not believe that NASA's current outreach efforts to the community regarding this issue have been an effective means of evaluating the public's support/lack of support for this program. Recommendations for additional input could include a Public Town Hall meeting at City Hall which is broadcast on Channel 3, a local community channel. We also recommend active attempts to hold public sessions with groups of effected Home Owner's Associations where the Home Owner's Association coordinates the meeting agenda/logistics. 10-6

As Mountain View residents, taxpayers, and employees of high-technology companies that are located in Mountain View, we hope that NASA will take into serious consideration the feedback that has been documented here.

Best Regards,
FOR THE BOARD OF DIRECTORS, MOUTAIN VIEW PARK HOA

ROBERT PEYRE
PRESIDENT
DPMA

cc: A copy of this letter will be provided to the Mayor of Mountain View and City Hall

LETTER 10:
Robert Peyre, President. Diversified Property Management Associates. August 8, 1995.

10-1: Comment noted. As noted on page 85 of this FEIS, NASA Ames currently receives noise complaints during operation of both the 40- by 80-Foot Wind Tunnel and the 80- by 120-Foot Wind Tunnel. Additionally, page 83 has been amended in this FEIS to note that current noise levels from Highway 101 and the Shoreline Amphitheater are considered unacceptable by some individuals. Page 86 of this FEIS also details existing incompatible lands uses within vicinity of the wind tunnel facilities.

10-2: Comment noted.

10-3: Comment noted.

10-4: Comment noted. NASA will notify the City of Mountain View of proposed testing projects. NASA Ames will provide extensive notification of impending wind tunnel tests in conjunction with the ATP, beginning at least six months in advance of a test. Central elements of the public outreach and notification plan include: establishing and staffing a phone number dedicated to current status of tests with message capability to register comments, concerns or complaints; test status on a NASA Ames World Wide Web dedicated "home page" with return comment/question availability and links to/from the Mountain View and Sunnyvale web sites; notifications, e.g. flyers, letters, etc., of imminent tests and schedules mailed to all Moffett Federal Airfield Resident Agencies, the residents of the Moffett military housing, the Santiago Villa Mobile Home Park, and neighboring businesses in the North Bayshore area; special announcements in the Mountain View Voice newspaper; news releases announcing upcoming tests with referral information included; and notification to city management offices of Mountain View, Sunnyvale, Los Altos and Palo Alto. Additionally, NASA Ames staff will be available to brief interested groups prior to the tests.

Additionally, following the first set of tests, the public will be given an opportunity to provide input to possible alternatives or additional mitigation measures, should test impacts significantly differ from those predicted through the ATP.

10-5: As discussed on pages 173 to 175 of this FEIS, it is difficult to determine the potential effects of the NASA Ames Aerodynamics Testing Program on property values. The economic analysis contained in the DEIS assumes the findings from the 1994 study conducted for the Manchester International Airport are applicable to the proposed NASA Ames Aerodynamics Testing Program. The conclusions of this study are that residential properties exposed to exterior daily CNEL exposure of greater than 65 dB surrounding an international airport could experience property depreciation. Using the 65 dB CNEL threshold, only the Santiago Villa Mobile Home Park could be affected. The worst case impact would range from a $1,800 to $3,600 reduction in the value of individual mobile home units. However, due to the high demand for housing of this type in the south Bay Area, some individuals may be willing to pay current prices, regardless of proposed noise. NASA does not plan to offer financial reimbursement.

10-6: Comment noted. NASA has advertised and held public meetings concerning the proposed program. Public forums were held in Mountain View both during the scoping process and during the comment period for the Draft EIS. Comments provided at the public meetings during the Draft EIS comment period are summarized and answered later in this chapter. NASA has no plans for further public meetings prior to completion of the National Environmental Policy Act process.

The Millar Family
1140 Polk Ave.
Sunnyvale, CA 94086
408-738-2068
E-mail: bigwave@ix.netcom.com

August 11, 1995

Aeronautical Tests and Simulation Division
Mail Stop 218-1
NASA Ames Research Center
Moffet Field, CA 94035-1000

Attention: Sandra Olliges

Dear Sandra Olliges:

We are writing you today to state our objections to the draft EIS and to point out its shortcomings.

- Comprehensive noise management program: NASA Ames has to put in place a program that addresses all noise that emanates from their facility, not just restricted to selected pieces equipment on your installation. We for one do not care whether the noise is coming from the 80x120 ft wind tunnel, the Unitary Plan Wind Tunnel Complex, the Outdoor Aerodynamic Research Facility, or any other part of the installation. This plan also must include a ban on all testing from 10:00 p.m. to 7:00 a.m. seven days a week. These are the hours that the majority of the people, who live adjacent to NASA Ames, will be at home and most likely be sleeping. These are also the hours in which a weather phenomena known as a "temperature inversion" is most likely to occur, which greatly aids in noise transmission. **11-1**
They explained to us at one of the NASA Ames public scoping meetings that the main reason for running these wind-tunnel tests at night had to due with the cost of electrical power. That is not sufficient reason for NASA Ames to run these tests at night. The noise that currently comes from NASA Ames at night is intolerable and should not be permitted. If NASA Ames were a business, instead of a facility of the federal government, they would not be allowed to produce noise, in either the amount or for the duration that it currently does. We think that it is hypocritical that the federal government does not even abide by it own laws.

- Non auditory health effects of noise: The draft EIS minimizes, if not outright ignores, the non auditory health effects of noise. It is a proven medical fact that noise has a detrimental effect on the health of people who are subjected to it, whether they are aware of the noise or not. **11-2**

- Insufficient number of permanent sound monitoring sites: One permanent sound monitoring station is **insufficient** for measuring the noise coming from the NASA-Ames facility. The noise from NASA Ames propagates in 360 degrees from the facility and one monitoring station cannot properly measure this. **11-3**

(over)

- Lack of baseline data: This report lacks baseline data for noise emanations from the wind tunnels when they are run without test articles. The wind tunnels themselves generate noise independent of the test article placed in them. This information is necessary to determine whether the wind tunnel, the test article or a combination of the two are responsible for the majority of the noise.
  Also data must be gathered to determine the conditions in which sound is most likely to travel the farthest, so that they can suspended testing during these times. **11-4**

- Independent data needs to be collected: NASA Ames, or companies in their employ, have gathered all of the data for the draft EIS. Some data contained in the draft EIS seems to have been gathered when the conditions were the most favorable to NASA Ames and is very suspect. According to your data, the testing done at NASA Ames should be barely audible where we live (more than 2.5 miles away). Not only is the noise from NASA Ames audible, it is excessive especially at night. **11-5**

- More public information: NASA Ames needs to provide the public with the actual data gathered at the "benchmark," and all of the other noise data collected, to allow the public to oversee their operations. **11-6**

- Make more information available via web site: NASA Ames' current Internet web site needs to be more dynamic and to provide the community with testing schedules, current weather and noise data. In addition your web site should contain information on whom to contact concerning noise complaints and should include their phone numbers and E-mail addresses. **11-7**

- Proper staffing and procedures to handle noise complaints: We found no mention in the draft EIS on how NASA Ames plans to handle complaints from the public about noise. Your current noise complaint system of "log and ignore" is a complete failure and needs to be scrapped. You need to have a mechanism for acting upon noise complaints promptly and properly. A single phone number for noise complaints must be installed. We should not be forced to play phone tag between various officials. NASA Ames must staff these phones at all times whenever testing is being done. If operations are going to continue 24 hours a day, seven days a week, then personnel must be present to respond to noise complaints and violations. **11-8**

NASA Ames has shown in the past a callous disregard for the health and well being of the people who live in the neighborhoods surrounding their facility. We see no reason that they should be rewarded with increased business in the future. The only acceptable plan of action that we can support at this time is the "no action alternative." NASA Ames must clean up their act and deal properly with their current problems before they look to future. **11-9**

Sincerely,

David Millar Bruce Millar Patricia Millar Ralph Millar

David Millar Bruce Millar Patricia Millar Ralph Millar

LETTER 11:
The Millar Family. August 11, 1995.

11-1: Comment noted. Please refer to Responses 9-1 and 10-1. NASA Ames plans to prepare a comprehensive noise management program in the near future.

11-2: Please refer to page 68 of the DEIS, as amended in this FEIS (revised FEIS pages 70 to 72).

11-3: Please refer to Response 7-5.

11-4: Please refer to Appendix C.

11-5: Comment noted. NASA Ames welcomes independent assessment of the data contained in the EIS. NASA also welcomes any additional information which would suggest that the presented data are inaccurate.

11-6: Please refer to Appendix C. Additional information can be obtained by contacting NASA Ames directly. Noise data will be made available on request.

11-7: Comment noted. See response to comment 10-4.

11-8: Comment noted. Please refer to Response 4-2.

11-9: Comment noted that commentators prefer the "no action" alternative.

August 11, 1995

Sandy Olliges
NASA Ames Research Center
Safety, Health and Environmental Services Office
Mail Stop 218-1
Moffett Field, CA 94035-1000

Re: Draft EIS NASA Ames
Aerodynamics Testing Program

Dear Sandy Olliges:

I note the following deficiencies in the Draft EIS:

Chapter 3, Part G: Descriptions of Alternatives

There does not seem to be an option to restrict operation to the 7 AM to 11 PM period. As described, "alternatives" 1-3 show operations could take place within that period for Level 1 testing in both wind tunnels. My personal experience has been the most annoying activities do occur in the 11 PM to 7AM period. 12-1

Although a barrier or wall was considered unfeasible, I suggest that there is a concept for a barrier that would offer a low cost attenuation of at least 9 dB in the direction of the residential locales. This concept is for a helium filled fabric structure. It could be "L" shaped about 1000 feet long by 200 feet high and about a foot thick with a longitudinal cylindrical top structure to provide additional lift.. It would be self erecting and self supporting, guyed by cables. The helium would be contained in formed vertical tube structures like a huge quilt. The helium could be recovered during deflation. The fabric and helium filling would provide a reflective surface that would redirect the sound out toward the bay and uninhabited areas. At a fabrication cost of $10/sqft, the cost would be under $5 million, part of which could be recovered by putting advertising (tasteful, of course) on this, the world's largest billboard. This latter suggestion is a bit tongue-in-cheek, but the concept is serious. 12-2

Chapter 4, Part C: Noise

Section b. (2) Sound Refraction by Temperature Gradients

This section fails to note that thermal inversions can cause substantial <u>increases</u> in noise transmission. This effect has been blamed for the ongoing dispute between Palo Alto and the City of Mountain View over Shoreline Amphitheater concert noise. These inversions often occur at night and we ought to expect distant complaints during noisy late night operations. 12-3

Although the report notes that complaints have been received at times during current operations, no effort has been included in the report to use the complaint locations to give a reality check for Figure 10 which illustrates the alleged maximum noise level contours. I know from personal experience that current operations are excessively noisy at my location (the western end of the Whisman-Walker cul-de-sac), which is well beyond Figure 10's 50 dB contour. 12-4

Traffic noise from US 101 and Hwy. 85 diminishes greatly between 11 PM and 5 AM at our location. It is improper to say, as is stated in the last paragraph of page 83, that the traffic is "nearly continuous" and leave the impression that night time wind tunnel noise would be merged with the highest daytime traffic noise. 12-5

Chapter 4, Part G: Socioeconomics

There is no information on the number of condominium or other common interest properties in the noise impact area. This leaves out as much as 1/3 of the residential property in the area. These properties have significant numbers of two story structures and the noise level from current NASA operations tends to be higher in the upper story than at 6 feet where measurements reported in the document were made. 12-6

The report is deficient in finding the number of people and in the number of non-apartment dwelling units likely to be in the high noise zone. Figure C-1 suggests that, if one uses the 55 dB contour line, the most likely affected region is bounded by Hwy. 101, Shoreline, Middlefield, and Whisman. In the absence of more specific data, approximately 1/4 of the residents of Census tract 5092.01 and 2/3 of 5091.04 fall within that region. Assuming that households in the >$40,000 likely live in single family or common interest development homes, there would be about 1,300 homes that would suffer decreased property values. If the mean assessed value is $200,000, and if the mean decrement is 5% (suggested by reading the abstract of Collins and Evans, page J-1 Draft EIS), then the local residents suffer a burden of $13 million, and Santa Clara County suffers an approximate annual tax loss of $130,000. This burden affects services like schools, fire and police. The majority of apartments are in the part of the affected region closest to the noise source. Thus, although the report suggests that the impact would not affect very low and low income households disproportionately, that economic group will indeed be more affected: affected by being in the highest noise contour of the region and by having the most children in the local schools. Noisy nighttime operations that disturb the sleep increase stress levels beyond the stresses associated with low income. We can expect more domestic disturbances and higher need for police, and yet the tax base loss reduces the availability of community support services. 12-6

NASA should consider establishing a "Noise Impact Fund" that would reimburse property sellers 5% of the sales price. It would be available for one sale after the testing program starts - the buyer will have benefitted from the reduced price and will need no further compensation for lost value. The Impact Fund would also provide Mountain View City with the $130,000 annually lost in property taxes. The five year cost for single family dwellings would be likely be less than $7 million because about half the affected properties would change hands in that time. The cost for apartment owners could be establsihed if they could show that rental income was additionally depressed relative to comparable properties outside the impact area. The Fund would be fair because we, as taxpayers, pay our share of NASA's cost and receive a proportionate portion of the national benefit. However, we bear a higher burden of the program cost, environmentally, than taxpayers in general.

In general, I found the report to be well written and useful. As I have pointed out, I believe there are deficiencies that, if addressed, would lead to a more balanced presentation. **I do believe that an additional option should be considered: no operations between 11 P. M. and 7 A. M.** 12-7

Sincerely yours,

Gerald G. Vurek
248 Walker Dr., No. 25
Mountain View, CA 94043

President, Windsor Lochs Homeowners Association

LETTER 12:
Gerald G. Vurek, President. Windsor Lochs Homeowners Association. August 11, 1995.

12-1: Comment noted. There is no alternative in the EIS that restricts all testing operations to the hours between 7:00 am to 11:00 pm because this constraint on testing would be even more restrictive than existing facility operations. However, NASA's preferred alternative (description beginning on page S-17) also limits testing above 65 dB at the benchmark to daytime hours only.

12-2: From the standpoint of acoustics, the structure described in this comment would provide less than 2 dB of sound attenuation, rather than the 9 dB stated. Sound attenuation through various materials depends upon the mass and elastic properties of the structure. Fabric structures, such as tents of any sort, are extremely lightweight and provide negligible sound attenuation.

12-3: Page 65 of the DEIS has been amended in this FEIS to respond to this comment (revised FEIS page 67).

12-4: Figure 10, on page 84 of this FEIS does not illustrate the maximum noise level contours of all sources at NASA Ames Research Center. This figure only illustrates the maximum noise levels currently attributable to the 80- by 120-Foot Wind Tunnel. Other sources at NASA Ames may be the cause of the noise referred to by the commentator. As described on page 85 of this FEIS, the Unitary Plan Wind Tunnel Complex is the greatest source of noise complaints received by the NASA Ames Research Center, and it is likely that noise emanating from this source is greater than 50 dB at the end of the Whisman-Walker cul-de-sac when this facility is in operation. Additionally, aircraft at Moffett Field often take part in engine run-ups and testing that create noise levels greater than those shown in Figure 10. Figure 12 on page 89 of this FEIS is an illustration of composite noise contours in the community.

12-5: Page 83 of the DEIS has been revised in this FEIS to respond to this comment (revised FEIS page 86).

12-6: The commentator is in error in applying the findings of the Collins and Evans study (page J-1 of the DEIS) and the Manchester International Airport Study to properties within the 55 dB contour. As found at Manchester International Airport, impacts to property values only occurred to those properties exposed to noise greater than Noise and Number Index (NNI) of 40 dB. As described in footnote 55 on page 117 of this FEIS, a NNI of 40 dB is approximately equal to a CNEL value between 65 and 70 dB. Therefore, for the purposes of this EIS, a CNEL level of significance of 65 dB has been used to estimate economic impacts. This is also consistent with community noise exposure criteria. As described on page 173 of this FEIS, the only residences exposed to a CNEL of greater than 65 dB are those within the Santiago Villa Mobile Home Park. Also, NASA has not authority to establish a noise impact fund. This would require an act of Congress.

12-7: Please refer to Response 12-1.

Tom Rivell
1598 Blaney Ave.
San Jose, CA 95129

Aug. 14, 1995

Ms. Sandra Olliges
NASA Ames
MS 218-1
Moffett Field, CA 94035-1000

Dear Ms. Olliges:

My comments on NASA's Draft Environmental Impact Statement on Ames' Aerodynamics Testing Program, dated June 1995 are enclosed.

Sincerely,

T Rivell

Tom Rivell

Enclosure: Comments on NASA's DEIS on Ames' Aerodynamics Testing Program, dated 6/95

Comments on NASA's Draft Environmental Impact Statement on Ames' Aerodynamics Testing Program, dated June 1995, Tom Rivell

Alternatives

NASA considers only two alternatives. No Action is not an option; it must be considered. NASA fails to consider a Relocate Test alternative. The EIS will not be acceptable if a Relocate Test alternative is not considered. This alternative would be to test the model in another wind tunnel or to test a smaller model. An alternative to wind tunnel testing is also possible; e.g., flight test or computation. Since this is a programmatic EIS the Relocate Test alternatives will have to be considered for every proposed test. 13-1

Please add this alternative and explain how it would be accomplished and how decisions would be reviewed impartially outside of NASA and independent of the organization proposing the test.

Impacts

Burrowing Owls - NASA says if they find that testing is doing harm to burrowing owls they will think about making modifications to the test plan. Isn't that too late? If you cannot demonstrate that the noise will not harm the owls, then relocate them before testing (see Mitigation below). The owls that were living near the 80 x 120 inlet moved to another location farther away several months ago. 13-2

Air Quality - Ames claims: "No significant impacts are expected to air quality." However, some of the aircraft to be tested will have fuel-burning engines running during the test. In most cases the engine exhaust will enter the atmosphere. If engines are required to run for several hours each day, then there probably will be an adverse impact on air quality. Please describe the impact on air quality (see Mitigation below). 13-3

Energy Consumption - The DEIS does not address the impact of energy consumption. Obviously the requirement to generate large quantities of electrical power has an adverse effect on the environment. Ames Research Center consumes large quantities of electrical energy (well over 260 billion kilowatt-hours annually). Much of it is consumed unnecessarily due to antiquated lighting often left burning 24 hours a day, 365 days a year. Many computers, printers and copy machines don't have energy saving features and are left on unnecessarily 24 hours a day, 365 days a year. People in the San Francisco Bay Area occasionally go without power during a heat wave, while Ames Research Center is continuing to waste energy. The President and the Congress have required federal facilities to reduce their energy consumption and increase their energy efficiency (Energy Policy Act of 1992 and Executive Order 12902). Some facilities are exempt from the reduction in consumption requirement; however, none are exempt from the increased energy efficiency requirement. 13-4

NASA proposes tests that will consume large quantities of electrical energy, but fails to access the impact on the environment and on possible power failures in the Bay Area. Most of the power that Ames Research Center consumes is provided by the federal government, but a significant quantity comes from PG&E when the federal limit is exceeded.

Please provide statistics on Ames Research Center's reduction in energy consumption since 1985 and it's increase in energy efficiency since 1990. Federal goals are a 30 percent reduction in consumption by 2005 and a 20 percent increase in efficiency by 2005. Please explain how Ames plans to reach these goals.

Please describe Ames Research Center's plans to use solar and other energy sources as required by Presidential Executive Order.

Please describe Ames Research Center's plans to conduct comprehensive energy and water consumption audits as required by the Energy Policy Act of 1992 and Executive Order 12902. Note that the Executive Order states that no-cost audits are available to many federal facilities.

Please describe Ames Research Center's plans to use Energy Savings Performance contracts and Shared Energy Savings contracts as mandated by federal law and by Presidential Executive Order. Note that these contracts do not require the use of appropriated funds. 13-4

Please note that the above items should be included in the EIS because of the impact of energy and water consumption.

Mitigation

Relocation of Residents and Children - Ames claims the impact of noise will be mitigated by relocation of children in the child care facility and Onizuka housing residents. However, there is no explanation of how this can or will be accomplished. Will the wind tunnel customer be required to provide housing and child care for those required to be relocated? What if the tenants and parents refuse the relocation options offered? 13-5

Trail Closure - Ames states that portions of the Stevens Creek Trail will be closed. The people of Santa Clara County may not agree that wind tunnel tests are more important than recreation and refuse to allow trail closure during daylight hours. Will tests be conducted during daylight hours if the trail remains open? An alternative would be to permit the proposed Bay Trail around the north end of the Ames-Moffett property. 13-6

Energy and Water Consumption - Please describe how Ames' will mitigate the impact of energy and water consumption. 13-7

Effect of Noise on Employees, etc. - Areas with noise levels greater than 85 dB should be closed to everyone but essential personnel. 13-8

Effect of Noise on Onizuka Residents - Ames says that residents will be notified and that it will be recommended that units be vacated. Residents may be unwilling or unable to vacate. Air Force may be unwilling or unable to provide adequate interior noise protection. Areas with noise levels greater than 85 dB should be closed to everyone but essential personnel. Tests should not occur if mitigation measures acceptable to residents are not implemented. 13-9

Effect of Noise on Burrowing Owls - The DEIS says "mitigation would be implemented" only "if impacts are detected." Appendix I says: "Sound pressure levels shall not exceed 70 dB in habitat." Please incorporate the sound-pressure-level mitigation measure in the final EIS, not in an Appendix. 13-10

Impact on Air Quality - Ames has not acknowledged the impact on air quality. However, I will suggest some mitigation measures. Shut down lawn mowers and leaf blowers. Eliminate use of unleaded automotive fuels. Use alternative automotive fuels. Convert Cushman/Diahatsu-type utility vehicles to low- or no-emission fuels. Promote bicycle commuting by providing access to the Center's Gate 17 from the Steven's Creek Trail. 13-11

LETTER 13:
Tom Rivell. August 14, 1995.

13-1: The statement by the commentator that NASA only considered two alternatives is incorrect. NASA considered many alternatives. Per the National Environmental Policy Act (40 CFR 1302.13) NASA is required to examine a range of reasonable alternatives that meet the proposed purpose and need for the project. Four reasonable alternatives were chosen and are described in detail starting on page 27 of this FEIS. Three alternative levels of testing are proposed. In addition, the no action alternative is described on page 34. Further, additional on-site and off-site alternatives were examined and determined to be infeasible as outlined on pages 34 through 37 of this FEIS.

13-2: A local burrowing owl expert, Dr. Lynne Trulio, has reviewed NASA's mitigation plan for the NASA Ames Aerodynamics Testing Program and concurred with NASA's findings, as summarized in Letter 2 in this FEIS.

13-3: Comment noted. NASA has revised the EIS to indicate that there will be a significant air quality impact.

13-4: As indicated on pages 5 and 6 of this FEIS, the proposed action involves utilization of an existing facility. No new construction is proposed, nor will energy consumption be increased as a result of the project. Additionally, no increase in water consumption is proposed by this action. There will be no new energy impacts. According to the Regulations for Implementing NEPA (40 CFR 1302.2 (b)) "impacts shall be discussed in proportion to their significance. There shall be only brief discussion of other than significant issues." Therefore, an expanded discussion on energy is not provided. A full discussion of baseline energy information can be found in NASA's Environmental Resources Document (ERD) on file in the NASA Ames library.

13-5: The measures contained in the EIS outline feasible mitigation for the NASA Ames Aerodynamics Testing Program, for which a detailed mitigation plan will be subsequently developed, if the NASA Ames Aerodynamics Program is adopted. This subsequent mitigation plan would detail how the relocation of residents and children would be accomplished. If no mutually agreeable solution can be agreed upon by NASA and the Onizuka tenants, the NASA Ames Aerodynamics Testing Program will not be implemented.

13-6: Comment noted. NASA would notify the City of Mountain View of Level 2 and Level 3 testing and recommend that Reach 1 of the Stevens Creek Regional Trail be closed during this testing. However, NASA cannot control land uses beyond Moffett Field. If the City of Mountain View chooses to keep the trail open during high-noise testing, Impact REC-1 would continue to be significant. However, noise levels are not anticipated to meet "hazard" levels and durations as defined by the NASA Hearing Conservation Program in the vicinity of the Stevens Creek Regional Trail.

NASA does not support the full development of the northern route of the Bay Trail at this time because it would bring public users of the trail within the vicinity of active ordnance magazines, ordnance handling pads, a firing range, the OARF and the end of the runway at Moffett Federal Airfield. Laser research is also periodically conducted in close proximity to the commentator's proposed northern alignment. Additionally, please refer to Comment 7-2 which is a comment made by the Parks and Recreation Department of the County of Santa Clara specifically related to the Bay Trail issue.

13-7: Please refer to Response 13-4. There would be no new energy or water consumption impacts resulting from the NASA Ames Aerodynamics Testing Program.

13-8: Comment noted. Please refer to Mitigation Measure NOISE-1 on page 138 of this FEIS.

13-9: Comment noted. Page 155 of this FEIS states that if the mitigation measures are not implemented, Level 2 and Level 3 testing would not occur.

13-10: Please refer to Response 13-2.

13-11: Comment noted. Please refer to Response 13-3.

PUBLIC MEETING 1
Moffett Club; July 31, 1995, 2:00 p.m.

- - -

My name is Chris Brousseau. And although I am an officer in the Air Force, I'm just here to speak as a private citizen. I do have some technical concerns about the EIS that have not been addressed in previous discussions with your staff.

My first question centers around Figures 21, 22 and 23, which talk about the CNEL noise levels as a result of each alternative. It's my understanding that the agreement of the -- that the 85 db peak noise contour would encompass the 75 db CNEL contour which is -- is that the case for the alternatives that are mentioned?

Given the mitigation measure mentioned in Table S-2, talks about the number of military family housing units which would have to be vacated as a result of the alternatives are driven by this 75 db CNEL contours. So I want to make sure we are talking about the correct standards.

Given that, in the past, there has been discussion about reducing the size of the window during which testing during Level 2 and Level 3 could happen. Currently, in Alternative 3, that window is listed as 7:00 a.m. to 7:00 p.m. I have proposed previously that this window be reduced to something like 9:00 a.m. to 4:00 p.m. in order to eliminate the need for mitigation actions for places like the teen youth center, to reduce the number of people who would be affected by this testing, and military housing, etcetera. And this has been pushed aside because NASA's interest is to optimize the flexibility of the program.

I have talked about kind of a bi-modal mitigation option, whereas if the military family housing is occupied by members in the armed forces, the window be restricted to 9:00 a.m. to 4:00 p.m. because that would, again, reduce the amount of mitigation required. However, given that it is perceived that a number of military people may be leaving due to base closure options, a second option as part of that same mitigation measure would be that if the people do, in fact, leave and houses are permanently vacated, then the testing window could be expanded to 7:00 a.m. to 7:00 p.m., giving NASA its flexibility to run the program.

Talking about economic impacts, it's clear to me you've done extensive research on what will happen in the local area as far as Sunnyvale and Mountain View, and impacts and importance of the program on, I guess, the national economy. But it's not clear to me in the EIS what impacts this program would have upon the people in housing and the programs that manage those people. For instance, since the mitigation is not clear, yet the EIS clearly says the houses will be vacated, who pays for that? And has it been included -- have those costs been included in the economic analysis?

Further, I know that there are a number of home day-care providers that live in the affected area. Have those people been factored into the economic analysis? And if not, should they be?

When you say at the time of mitigation that people will be notified, how much time frame are you talking about? A day? A week? A month? And are you going to have accesses, like you say, for the home day-care providers? Are you going to offer them a place to go and a way to get there? Or are they just going to be told: We're going to test from this time to that time; you have to leave?

As a following question to that, that I think gets to the point of what I'm struggling with: Since it is a programmatic EIS, typically when these are written, you write mitigation measures that account for all the foreseeable problems as a result of things which are implemented under that program. Therefore, it sounds to me that what should be done is either an EIS on a case-by-case basis or this EIS structured so that those mitigations are accounted for. In other words, if the housing is occupied, you can pretty much agree that the people there must be moved out. Yet no specific measures are put in place in this EIS to make sure that happens. Basically what the EIS says is: When it comes about that we need to do something under this EIS, then we'll figure out how we're going to do it.

The EIS says that NASA will notify people about the program, etcetera, etcetera. But it does not say if NASA will implement the mitigation measures.

You have to consider the alternative of testing somewhere else. The test that you proposed several months ago, you could probably make a very, very strong case that this is the only place in the world that can be tested. Now if you're going to open this up and make it programmatic, then you have to consider that alternative of testing somewhere else.

PUBLIC MEETING 1:
Moffett Club; July 31, 1995, 2:00 p.m.

PM1-1: Please refer to Response 4-30. In a meeting between the Air Force and NASA Ames it was noted that the 85 dB peak noise contour encompasses the maximum daily CNEL noise exposure contour of 75 dB for Alternative 3 (Figure 23) and for the estimated X-32/X-35 JSF project contours (Figures C-3 and C-5). The maximum daily CNEL noise exposure contour of 75 dB for Alternative 1 (Figure 21) and Alternative 2 (Figure 22) do not fall within the 85 dB peak noise level contour.

PM1-2: NASA's identified preferred alternative, as described on pages S-17 and S- 18, further restricts Level 3 testing to the hours between 8:00 am and 6:00 pm. Hours of operation have not been further reduced because this action would severely limit NASA's ability to implement the program.

PM1-3: The EIS does not analyze the economic impacts of vacating the Air Force housing and the associated Air Force housing programs. This is due largely to the fact that the exact future of this housing area was unknown when the Draft EIS was prepared.

However, in July 1997, NASA Ames developed a proposal for NASA to take over ownership of all family housing units at Moffett Federal Airfield following the realignment of Onizuka Air Station in the year 2000. NASA Headquarters has authorized Ames to pursue plans to change ownership of the housing, to be effective September 2000. The Air Force and the local (Mountain View and Sunnyvale) reuse authority have approved the concept of this plan. The implementation of all mitigation measures outlined in this EIS and the corresponding National Full-Scale Aerodynamics Complex Mitigation Implementation Plan (MIP) will still be required, but implementation authority would shift from the Air Force to NASA. Prior to September 2000, NASA will work with the Air Force to encourage them to adopt as many of the features of the MIP that are practicable while the housing remains under its control.

NASA has provided estimated mitigation costs beginning on page S-11 of this FEIS.

PM1-4: The measures that the commentator is describing are measures that NASA Ames will consider in developing a detailed mitigation plan, which is beyond the scope of this EIS. All affected people would be given adequate advance notice as determined by consultations between NASA and affected agencies and the specific circumstances associated with a given test project.

PM1-5: The EIS outlines what measures would be required prior to and concurrent with implementation of the NASA Ames Aerodynamics Testing Program. As defined under the National Environmental Policy Act (NEPA), a programmatic EIS is one prepared on a "broad federal action" such as the adoption of a regulation, policy, plan, or program (40 CFR 1502.4b). Preparation of a programmatic EIS presents the opportunity for the federal agency to evaluate the potential cumulative impacts of the reasonably foreseeable actions under a proposed program. The preparation of a programmatic EIS facilitates and expedites the preparation of subsequent project-specific NEPA documents through the use of tiering.

The mitigation measures contained in the EIS are based on this programmatic approach. Simply stated, a mitigation measure is a solution to an environmental problem. The measures contained in the EIS outline feasible mitigation for the NASA Ames Aerodynamics Testing Program, for which a detailed mitigation plan can be subsequently developed, if the NASA Ames Aerodynamics Program is adopted. Testing will not be initiated until a means of implementing the mitigation measures in this EIS is determined. Additionally, implementation of the mitigation measures included in this EIS may be further facilitated if NASA acquired the Moffett family housing as currently proposed.

PM1-6 Please refer to Response PM1-5.

PM1-7 Please refer to pages 35 to 36 of the DEIS, as amended in this FEIS (revised FEIS pages 36 to 37).

PUBLIC MEETING 2
Graham Elementary School; July 31, 1995, 7:00 p.m.

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So what's the decision criteria by which you're going to choose one of the alternatives?

Do you have any idea how long this testing actually would go on? Is this an indefinite request?

And the 58 dB maximum, is that comparable to your current maximum? Because that has some occasional impact on the neighborhood.

Is there a possibility that since there is a potential financial impact on the community, when you weigh the cost benefits of this activity, that -- in the same way that federal installations provide what is called impact money, is there a way to satisfy the impacted local residents' concerns about the loss of value of their property?

I guess my concern is that the draft report doesn't really address a significant fraction that -- I'm speaking as the president of a homeowners association -- a significant fraction of the residents in the neighborhood that are going to be affected by the sound level; that is common-interest development, condominiums. It only addresses apartment house owners, owners of the trailer park and single-family residents. And I think that doesn't really cover a very substantial fraction of the property involved.

So what I'm suggesting is that a reasonable estimate of the impact could be made based on the literature study which suggests perhaps a 5 percent decrease in value directly attributable, that the owners of the impacted area would be granted that kind of relief. They will certainly be impacted by the very loud noise levels, but the people who live in the area bounded by Middlefield, Shoreline, and Whisman and 101, which is a substantial fraction of the population, has a substantial number of common-interest development as well as single-family homes. And since I live in that area, I know that the present testing level is occasionally annoying.

Just to echo his comments, we live in a condominium complex and live around the same area he does, and we have also experienced your current noise testing that has infringed on us by keeping us awake all night and waking us up at night. To say your current level of testing is acceptable is something at least you should know maybe it's not.

Also, we, as residents in this area, have to deal with freeway noise and also Shoreline noise in addition to your noise. So that's something that needs to be taken into consideration when planning, is that we have to deal with all of this noise.

And also, the home values over the units in this area have decreased significantly over the past few years. We are not going to be tolerant of anything that will continue that situation.

I think that the fact the distribution of low-income persons within the district, although they have been broken out only by the Census Bureau -- what's the tract number. I think the actual distribution is such that the lowest income people live closest to 101 in the noisiest area. And so, clearly, they would be more affected than people farther away, such as the people here. So it's perhaps difficult to do a finer cut in this census information, but I just point that out.

Alternative 3 or maybe an Alternative 4 -- yes -- currently we can hear the testing that's in the evening. An Alternative 4 that says we'll limit the testing in the evening and reduce the noise there and increase what's going on in the day when most people are not around.

PUBLIC MEETING 2:
Graham Elementary School; July 31, 1995, 7:00 p.m.

PM2-1: NASA will evaluate the costs and benefits (including considerations of national defense, economy, and environment) in making its final decision. The Record of Decision will explain this final decision, and will further discuss the detailed factors considered by NASA in making its decision.

PM2-2: If the NASA Ames Aerodynamics Testing Program is approved, aerodynamics testing would be allowed pursuant to the adopted program and EIS for an indefinite period. However, the actual future testing scenario may vary widely. For instance, in some years testing may be much lower than others.

PM2-3: Yes, the 58 dB maximum is reflective of current noise conditions at NASA Ames attributable to the 40- by 80-Foot Wind Tunnel and the 80- by 120- Foot Wind Tunnel. Noise from other sources at NASA Ames can be higher.

PM2-4: NASA knows of no Federal "impact money" program which would be applicable in this situation.

PM2-5: Please refer to Response 10-5. None of the three NASA Ames Aerodynamics Testing Program alternatives would result in residential areas being exposed to exterior daily CNEL exposure of greater than 65 dB, with the exception of the Santiago Villa Mobile Home Park. A CNEL of 65 dB is the threshold identified by the Manchester International Airport study. There is no literature to support the 5 percent decrease in value, as suggested by the commentator. NASA is not aware of any study that correlates condominium values with noise.

PM2-6: Please refer to Responses 10-5 and PM2-5.

PM2-7: Comment noted. The EIS uses the best information currently available. As indicated by the commentator, it would be difficult to get more detailed information without doing a cost- and time-intensive survey.

PM2-8: Alternative 3 allows no nighttime testing above 65 dB when measured at the benchmark. This is generally consistent with current noise levels from a variety of sources at NASA Ames and Moffett Field.

PUBLIC MEETING 3

Sunnyvale City Council Chambers; August 3, 1995, 7:00 p.m.

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My name is Jerry Reed (phonetic). I'm here as a private citizen, and my views don't necessarily reflect that of the Air Force, so I'll state that up front. I had questions on how the noise contours were determined in the Draft EIS, specifically in figures 20, 21, 22, 23, which are your proposed alternative measures or actions.

Was a software model package used to crunch data, or was it more based upon --

If one of the tests in one of the proposed alternatives does occur, will the noise contour model for this alternative be validated during the test? How would that be done? Would additional benchmarks be used? I know you've got the one Benchmark.

I guess the concern could be is -- would be is I know you're looking at trying to limit anyone entering the 85 dB area, and it seems like it would make sense, especially in populated areas, to have a Benchmark established in one of those locations so that if it does exceed, you can move your line of demarcation in or out based upon --

I should say what action will NASA take if the noise contour model or noise levels measured at the Benchmark are exceeded during the testing? I know you mentioned you'd go back, shut the test down, and look at if there is a change that needs to be made in the actual program or something. What happens if that doesn't work?

What's the definition of "significant"?

On Page 137, you state that there is no adopted criteria that outlines permissible exposure limit for noise level on Air Force property. When, in fact, the Air Force has -- Air Force family-housing guide has a program design of construction which established noise criteria for Air Force properties. Why is this criteria not being used in the Draft EIS?

My understanding of the NEPA process requires the lead agency, which is NASA in this case, to, one, identify impacts from each proposed alternative, which you've done, determine mitigation measures for these impacts and evaluate the impacts, including economic impacts, of the mitigation measures and to fund mitigation measures. I don't see where mitigation costs were really evaluated. I also don't -- as part of the economic discussion. And I also don't really see how -- anyplace where it talks about funding the mitigation measures that would be required.

Has NASA looked at trying to develop any kind of program to take people to a movie or anything like that as part of the mitigation program?

I guess -- you know, the hours are pretty wide. You're looking at a 12-hour day and to tell people that -- you know, you're talking a lot of units to say all of a sudden they need to vacate, go somewhere.

My name is Bruce Millar. I'm an engineer. I work at...(inaudible). As a bit of background, I worked on the spacecraft; prior to that, I worked in the aircraft industry. So I understand and see a need for this, and it's very important, so on and so forth. That's wonderful. Why am I here? I can't sleep at night. My family cannot sleep at night. We're kept awake by the low-level vibration.

So I have a couple of comments. What I really believe that NASA Ames needs is a very comprehensive noise management program. Because, quite frankly, whether it's the large wind tunnel or small wind tunnel or whatever, you know, I think we need to control the noise. It doesn't make any difference to me whether it's a big wind tunnel or a small wind tunnel keeping us awake at night. I think -- so it has to be comprehensive. I really believe we should ban all noise after 10:00 at night to at least 7:00 in the morning.

The EIS draft doesn't talk about non-auditory health effects. There is obviously impacts on people's health due to noise, and that is just ignored.

Now, so as far we -- as far as I can read here, there was insufficient sites for the noise monitoring... For how you determined it. But that is all affected by weather -- temperature eversion, so on and so forth. Did you take those measurements every day and night or just at certain specific times?

It's not just the 55 decibel; it's the constantness of it, the length of time that it goes on, the droning, and the vibration that's disturbing.

You should be able to put stuff in there like that -- like weather and testing schedules and so on, and contact numbers. But quite frankly -- Whenever this has occurred, we wanted -- we started calling, and we got, you know, passed from one person to another to another until we really found someone to talk to, someone who could give us an answer. And it was quite a search. It wasn't even then before it was finally admitted: Yeah, you have a wind tunnel -- it is a wind tunnel problem. They tried to blame it on aircraft engines or Highway 85. That wasn't it at all. We have lived here 35 years. We have P-3s fly over us all the time. No big deal. Makes a little bit of noise; you go back to sleep. They run a test of engines at Moffett; no big deal. You hear it go for 15 minutes or so; that's okay; go back to sleep. But this here, just constant, starts -- we can hear the big engines start to chug up 12:00, 1:00 in the morning. We knew we'd had it. We knew we were in for it. And as soon as I got up at 6:00, I could hear it start up. I'm not a particularly sensitive individual. I sleep through -- I sleep like a rock. But when it wakens me, I mean, that's pretty bad.

So you know, my bottom line is that as much as I want to see you do good and expand your work and all that sort of thing, I don't see why you can -- how you can reward yourself, you know, with more work until you get your present house in order.

I have a question about high-level testing, and the possible duration of that. So that would only occur, at the most, one time during the day?

So the proposed trail closure, then, on Stevens Creek trail will occur for an hour or two?

One other thing that I didn't see addressed, and maybe it's because it surfaced after the study was underway, was this proposal for the alternative trail on the east side of Stevens Creek, which I'm to understand would be open through the PG&E facility during the daytime hours only. And it would be open to the public. So I would imagine a similar type of closure would have to occur on that.

Is the major factor for running at night the cost of power?

There isn't anything else you can do to minimize the noise? Because the noise levels have definitely increased over the past 18 months.

My son got up one night -- he was so mad -- and he called; couldn't get an answer; again jumped in his car and drove down 85 right to Moffett. Sure enough, there it was. No one would call back.

The reason we're here is because he has bad health. And part of his complaint is sleeping, sleep deprivation. So, of course, if he doesn't get sleep -- he is essentially housebound. So he is very, very sensitive to that type of disruption at night.

PUBLIC MEETING 3:
Sunnyvale City Council Chambers; August 3, 1995, 7:00 p.m.

PM3-1: Please refer to Response 4-4.

PM3-2: NASA Ames will periodically take measurements in the field to verify that noise levels do not exceed those predicted in the EIS. Please refer to Response 4-4 and Response 7-5.

PM3-3: Please refer to Response PM3-2.

PM3-4: No testing would be allowed beyond that analyzed in the EIS. If NASA Ames could not viably test within the program parameters, they would be required to reanalyze the project under the National Environmental Policy Act (NEPA). No testing beyond the program described in this EIS could be legally allowed without prior environmental analysis.

As described in Mitigation Measure NOISE-5 and on page 7 of this FEIS, the accuracy of noise level estimates is within 3 dB. If noise is recorded significantly above the testing parameters (3 dB), testing would cease immediately or power levels would be immediately reduced to conform to the program parameters.

PM3-5: As defined by NEPA, whether a proposed action "significantly" affects the quality of the human environment is determined by considering the context in which it will occur and the intensity of the action (40 CFR 1508.27). Further, a significant effect is a substantial or potentially substantial change, usually adverse, in the physical conditions within the area of the project.

PM3-6: Please refer to Response 4-20.

PM3-7: Please refer to Response 3-3 and Response PM1-5.

PM3-8: NASA Ames has developed a detailed mitigation plan, taking the commentators' suggestions into account, which does not include such measures. Further refinement of specific additional measures will be made, and then will be communicated by the NASA Ames Public Affairs Office.

PM3-9: Comment noted. This suggestion will be considered.

PM3-10: Comment noted.

PM3-11: Please refer to pages 70 to 71 of this FEIS. Additionally, please refer to Responses 7-16 and 7-17.

PM3-12: Please refer to Appendix C and Appendix E. Additionally, please refer to Response 4-4 for a further description of how the noise contours were developed. As described on pages 67 to 68 of this FEIS, temperature gradients are unpredictable and they do not lend themselves to evaluating predictable long-term effects.

PM3-13: Comment noted.

PM3-14: Please refer to Response 4-2.

PM3-15: Please refer to Tables 2, 3, and 4 in this FEIS (pages 29-31). The highest level testing (Level 3) could occur for 5 maximum daily hours in Alternative 1, 4 maximum daily hours in Alternative 2, and 3 maximum daily hours in Alternative 3. It is conceivable that testing would occur more than one time per day at these noise levels, as long as the maximum daily hours are not exceeded.

PM3-16: The trail closure on Stevens Creek trail would be recommended when Level 2 and Level 3 testing occurs. This means that the trail could be closed more than an hour or two. Depending on the timing of proposed testing, the trail could be closed as much as 8 hours (to accommodate maximum Level 2 testing under Alternative 3).

PM3-17: Figures 14 and 15 and pages 104, 160 and 161 of the DEIS have been revised in this FEIS to respond to this comment (revised FEIS pages 98 to 108 and 166 to 169).

PM3-18: Yes, a major factor for running at night is the cost of power and power availability.

PM3-19: Please refer to Response 4-2. NASA will have a published telephone number in-place to receive comments and complaints.

Chapter 9
REPORT PREPARATION

■ ■ ■

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Chapter 10
INDIVIDUALS AND AGENCIES THAT RECEIVED THE DRAFT EIS

■ ■ ■

A. Federal Agencies and Officials

California Air National Guard
Council on Environmental Quality
Department of the Navy, Engineering Field Activity - San Bruno
Department of the Navy Moffett Field
Federal Emergency Management Agency
National Science Foundation
Office of Congresswoman Anna Eshoo
Santa Clara Naval Air Reserve
U.S. Air Force, Onizuka Air Station
U.S. Army Corps of Engineers - San Francisco
U.S. Army Corps of Engineers - Sunnyvale
U.S. Department of Commerce
U.S. Department of Defense
U.S. Department of Health and Human Services/Public Health Service - Centers for Disease Control
U.S. Department of Interior
U.S. Department of Labor
U.S. Department of the Air Force
U.S. Department of Transportation
U.S. Environmental Protection Agency - Region IX
U.S. Fish and Wildlife Service, Western Region

B. State Agencies and Officials

California Department of Fish and Game
Office of Planning and Research - State Clearinghouse
State Office of Historic Preservation

C. Local Agencies and Officials

Association of Bay Area Governments. Bay Trails Project
Bay Area Air Quality Management District
City and County of San Francisco
City Clerk of Mountain View
City of Mountain View
City of Mountain View - Shoreline Park
City of San Jose Planning Department
City of Sunnyvale Community Development Department
City of Sunnyvale Parks and Recreation Department
City of Sunnyvale, Asst. City Manager
Metropolitan Transportation Commission
Mid-Peninsula Open Space District
Regional Water Quality Control Board, San Francisco Bay Region
San Francisco Bay Conservation Development Commission
San Francisco Water Department
Santa Clara County Assessor's Office
Santa Clara Valley Water District
Santa Clara County Planning Office
Sunnyvale City Council

D. Organizations

Alamo Park Association
Amah Tribe of Ohlone Costanoan Indians
California League of Conservation Voters
Citizens for a Better Environment
Committee for Green Foothills
League of Women Voters/Palo Alto
Middlefield/Whisman Neighborhood Association
Moffett Field Historical Society
Oceanic Society, San Francisco Bay Chapter
Peninsula Conservation Center Foundation
Peninsula Open Space Trust
Pacific Studies Center
San Jose State University, Environmental Resource Center
Santa Clara County Manufacturing Association, Environmental Programs

Santa Clara County Greenbelt Coalition
Santa Clara Valley Audubon Society
Sierra Club
Silicon Valley Toxics Coalition

E. Businesses

Antypas & Associates
Associates Leasing
Barclay Mapworks Inc.
Baumbach Engineering
Canonie Environmental
Cargill Salt Company
Ceramic Bonding Inc.
Contour Inc.
Fiesta Del Mar
Hing Yue Tung Enterprises Limited
Lockheed Missiles and Space Company
Midway Automotive
Nishimoto Enterprises
Norcal Waste Systems
Norton Consulting
Penn Electrical Corporation
PSC Associates
RD Chemical Company
Schlumberger Technology Corporation

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Abel, Frances
Allen, Sharon L.
Aragon, Richard P.
Baez. Jacoba
Baldwin, Dean W. & Sharon L.
Bailou, E.V. & Barbara J.
Barnett, Ross
Baumgartner, Vicki & William D.
Bautista. Efren & Eleanor
Beck, Carole A.

Belli, Mr. & Mrs. Alfred
Benevento, Ben H. & Adriana
Benevento, Claudia
Bernal, Martin
Bishop, Galen L. & Sandra
Boarman, Richard R.
Bolton, Clyde M.
Boyajian, Eric G.
Brousseau, Christopher
Brown, David B.
Brown, Richard
Brown, Timothy A.
Browne, Peter a Judy T.
Brunner, Herb
Bryant, Ronit
Bucchieri, Adeline D.
Buffalow, Henry
Butler, Anne A. & Walter S.
Cardoza, Humberto & Patricia
Carmichael, Ralph L.
Case, Arthur H. & Ruth M.
Cassidy, Michael R. & Alice A.
Castelli, Alphonse & HIlda R.
Cataldo, Ronald V.
Chacon, Philip E.
Chaney, Galen & Christine
Chao, Thomas
Chapman, Margaret E.
Chessin Stephen A.
Chuck, Millie
Coleman, Ronald B.
Coppedge, Stuart
Corey, Gloria L. & Jack E.
Cormode, John
Costa Teresa L.
Coullaud, Stephane
Cox, Thomas M.
Crosby, Christine
Crow, William D. & Phyllis J.
Danley, David
Davies, Gareth A. & Maureen

De Vera, A.
Demele, Curt R. & Joan M.
Deurioste, George A.
Dewitt, Steve H. & Millie L.
Ditlevson, Richard P. & Dolores
Dittmar, Edna
Dodge, C.
Drakos, Dolores
Drew, Alma B.
Duncan, Judith L.
Edwards, Gwyn P.
Eltreim, Robert W.
Elek, Joe & Patricia
Evans, Rosemary B.
Fernandes, Antonio L. & Inez V.
Ferrin, Karen C. & Lorris K.
Fisher, Michael
Flisram, Norman O. & Frances
Flynn, Margaret
Fonseca, Lorrie D.
Fontes, Manuel A. & Carnation
Forrest, Norma L.
Fretz, G.R.
Freund, Louise H.
Fromm, Rolf-Dietric & Beate
Garbett, Bill
Gash, John T. & Patricia S.
Gerst, A. Ott
Gilbert Sam & Lore
Gongora, Guadalupe
Goodwin, Robert Pollak & Barbara
Gorgen, David
Green, John Patrick
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Huberty, Teresa E.
Hunter, Loren E.
Hutchins, Ray S. & Susan H.
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Jacobson, Margaret
Jenab, Khalil
Jocius, Alexander C.
Jones, Margaret
Jones, Orval & Helen M.
Jones, Pauline G. & Keith
Jones, Tom
Jordan, Joe
Judkins, James G.
Kaczor, Robb
Kassner, Don
Kawakami, George T. & Edythe U.
Kaylor, Antoinette
Keith, R.G.
Klein, Robert J.
Kioss, James J. & Mary C.
Koehler, Dorothy E.
Krupocki, Irene & Peter S.
Kumlega, Jackie
Lacey, Ernest
Lachetti, Paul S.
Lake, Jon C.& Yukari S.
Lawrence, Anthony L. & Carol L.
Lawrence, D.C.
Lawrence, Terry
Lee, Franklin J. & Lily S.

Lee, Jason
Lesti, Paul
Love, William W.
Macks, Howard K. & Theresa R.
Magnussen, Dan D.
Marchese, Salvatore & Adeline M.
Martin, Kevin T. & Petricia A.
Martinez, Gregory R.
Mathas, Gail B.
Matua, Doran
McCullough, Ester
McDonald, Sylvia
McEvoy, John B.
McPeak, Sunne
Millar, Dave
Moore, Usa L. M.
Nishiura, Takao & Takako
Noah, Craig M. & Lynn D.
Noel, Roger C. & Susan L.
Norga, Jean-Louis R. Sr.
O'Connell, Michael E. & Heather
O'Connor, E. L.
Orans, Robin
Patterson, Robert E.
Penafiel, Hugo R.
Perry, Stanley G. & Rose L.
Pinto, Marie C. & John Melvin
Poso, Anthony J.
Prucha, Sandra K.
Quan, Wasson
Razban, Bruce B.
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Schauer, David B. & Carol D.
Schmid, Karen J.
Schulte, Mark
Schurz, Dan
Serdahl, Eric
Shewalter, Pat
Sias, Paula & Arturo L.
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Silver, Michael E. & Claire M.
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Spohr, Valerie A.
Starner, Suanne P.
Stimson, Ethel T.
Stout, Gerald C.
Strassman, Edward D. & Christina
Sweeney, Paul
Takayama, Georgene
Tamaru, James Y. & Yoko
Tamases, Rachel
Tatman, Raymond L.S.L.
Thibeault, Aldege
Tli-Sikkila, Mry E. Malo
Tonner, Amanda L.
Truilo, Lynne
Turner, Dewey E. & Grecia C.
Vega, Henry M. & Sharon L.
Velasquez, Edward & Nora
Viola, Sal & Sharon
Vlach, William F.
Vurek, Gerald G. & Ruth K.
Walker, Michael S.
Wallace, Richard H.
Walsh, Louise
Wang, Yi

Weintraub, Nina
Weisiger, Karen
Welker, Irwin E.
Williams, James E. & Mary J.
Wilson, Ben
Wolfish, Estelle M.
Wu, Ida P.
Zagorites, Harry A.

Appendix A
GLOSSARY

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A-weighted sound level: The sound level measured on an instrument containing an "A" Filter, which electronically simulates the frequency response of the human ear under an average level of sound. Decibels measured using the A-weighted sound level can be denoted as "dBA". All noise levels and noise exposure levels throughout this document are A-weighted in accordance with appropriate standards and criteria. All such values are in units of decibels, whose unit symbol is "dB" in conformance with American National Standard ANSI/ASME Y10.11-1984. The unit symbol "dBA" is not the standard symbol used under ANSI Y10.11. All numerical noise values in this document symbolized "dB," are numerically identical to those using "dBA," often found in other references.

acoustic trauma: When the inner ear is injured from exposure to sound levels in excess of 140 decibels (dB). When this type of injury occurs, the delicate inner ear tissues are stretched beyond their elastic limits, and they are ripped, or torn apart.

action level: As defined by the NASA Hearing Conservation Program, an exposure to an 8-hour time-weighted average of 80 decibels measured with a dosimeter or sound level meter on the A-scale, slow response; or equivalently, a dose of fifty percent. The action level is the criterion for instituting noise surveys and for NASA employee participation in the Medical Monitoring Program.

adverse: A term used to describe unfavorable, harmful, or detrimental environmental condition changes.

ambient noise: The background noise associated with a given environment, being usually a composite of sounds from many sources near and far.

assessment: Determination of the nature, amount, importance, or value of an environmental condition change.

attenuation: To lessen in severity; to decrease or reduce.

audiogram: A chart, graph, or table resulting from an audiometric test. An audiogram shows an individual's hearing threshold level as a function of frequency.

audiologist: A professional specializing in the study and rehabilitation of hearing who is certified by the American Speech, Hearing and Language Association, or licensed by a State Board of Examiners.

audiometer: An electronic instrument which measures hearing threshold levels and conforms to the requirements and specification of the current ANSI Standard S3.6.

background noise: Same as ambient noise. The noise associated with a given environment, being usually a composite of sounds from many sources near and far.

buffer: A strip of land intended to protect one type of land use from another with which it is incompatible.

carbon monoxide: Carbon monoxide is an odorless, invisible gas usually formed as the result of incomplete combustion of organic substances. About 78 percent of the carbon monoxide emitted in the San Francisco Bay area comes from motor vehicles. High levels of carbon monoxide can impair the transport of oxygen in the bloodstream, thereby aggravating cardiovascular disease and causing fatigue, headaches, and dizziness.

census tract: Small portions of populated areas in which data is collected for statistical analysis.

community noise equivalent level (CNEL): The CNEL represents the A-weighted average continuous noise level in decibels over a 24-hour period, with special weighting factors applied to noise events during the nighttime (10 p.m. to 7 a.m.), the evening (7 p.m. to 10 p.m.), and the daytime (7 a.m. to 7 p.m.).

day-night average sound level (DNL or L_{dn}): The A-weighted average sound level in decibels during a 24-hour period with a 10 dB weighting applied to nighttime sound levels (10 p.m. to 7 a.m.). This exposure method is similar to the CNEL, but deletes the evening time period (7 p.m. to 10 p.m.) as a separate factor.

decibel (dB): A unit for expressing the relative intensity (loudness) of sounds. The decibel is the logarithm of the ratio of the intensity of a given sound to the faintest sound discernible by the human ear. This is equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure, which is 20 micropascals (20 micronewtons per square meter).

degradation: The reduction of environmental quality in an area through a lessening of diversity, the creation of growth anomalies, or the supplanting of native species by non-native plant and animal species.

ecology: The interrelationship of living things to one another and to their environment or the study of such relationships.

ecosystem: The continuing interaction of a biological community with its environment.

emission standard: The maximum amount of a pollutant legally permitted to be discharged from a source, either mobile or stationary.

endangered: A species or subspecies of plant or animal whose prospects of survival and reproduction are in immediate jeopardy.

Environmental Impact Statement (EIS): An environmental impact document prepared in accordance with the National Environmental Policy Act.

estimate: A statement regarding future conditions based on non-mathematical analysis.

estuary: The part of the mouth or lower course of a river in which the river's current meets the sea's tide. An arm or inlet of the sea at the lower end of a river.

forecast: A statement regarding future conditions based on non-linear numerical assumptions.

frequency: The number of complete pressure fluctuations per second above and below atmospheric pressure. Usually measured in hertz.

general plan: A legal document, in the form of a map and accompanying text adopted by the local legislative body, which is a compendium of its policies regarding the long-term development of its jurisdiction. It is sometimes called a city plan, comprehensive plan, or master plan.

habitat: The environment with which an organism interacts and from which it gains its resources; habitat is often variable in size, content, and location, changing with the phases in an organism's life cycle.

hazardous noise: A noise hazard exists wherever an operation, process or procedure generates noise of sufficient duration and intensity to be capable of producing a permanent loss of hearing in an unprotected person.

hemispherical spreading: The reduction of a sound pressure level as a sound travels over a surface.

hertz (Hz): A unit of measurement of frequency numerically equal to cycles per second.

impulsive or impact noise: Variations in noise levels that involve peaks of intensity that occur at intervals of greater than one second. If the noise peaks occur at intervals of one second or less, the noise is considered continuous.

inversion layer: An atmospheric condition in which a layer of warm air traps cooler air near the surface of the earth, preventing the normal rising of surface air.

isothermal conditions: Conditions of constant temperatures with altitude.

issue: A point or item of discussion focusing on environmental questions germane to a proposed action, used as the structuring unit in this environmental impact assessment.

labor force: Residents of working age who are employed or seeking employment.

lead agency: The public agency which has principal responsibility for carrying out or approving a project. The lead agency is also responsible for preparing and certifying an adequate EIR/EIS.

loudness: Loudness is a subjective perception of the magnitude of sound.

National Environmental Policy Act (NEPA): Enacted in 1969, NEPA contains a declaration of policy expressing a commitment to environmental values and a requirement that federal agencies prepare Environmental Impact Statements (EISs) for major federal actions which may have a significant adverse impact on the environment.

nitrogen dioxide: Nitrogen dioxide is the "whiskey brown" colored gas readily visible during periods of heavy air pollution. The major sources of nitrogen dioxide are vehicular, residential, and industrial combustion.

noise: Annoying, harmful, or unwanted sound.

noise dose: A measure of cumulative noise exposure over a stated time period which takes into account both the level of a sound and the duration of exposure.

noise hazard area: As defined by the NASA Hearing Conservation Program, any work area with a noise level of 85 dB, or greater.

noise induced hearing loss (NIHL): Loss of hearing that occurs over a long period of time. Results from exposure to noises between 85 and 140 decibels (dB).

noise level: The instantaneous measure of the magnitude of a sound at any given time. Noise levels can be used to measure hazards to health and hearing that can result from exposures to even very brief but high noise levels.

ordinance: A law adopted by a city, county or local agency governing body.

ozone: Ozone is the most prevalent class of photochemical oxidants formed in the urban atmosphere. Ozone is not usually emitted directly into the atmosphere, but is a secondary air pollutant produced in a stable atmosphere with strong sunlight, through a complex series of photochemical reactions involving hydrocarbons and nitrogen oxides. Motor vehicles are the major source of ozone precursors in the San Francisco Bay Area. Ozone causes eye and respiratory irritation, reduces resistance to lung infection, and may aggravate pulmonary conditions in persons with lung disease. Ozone also damages some materials such as rubber, and may damage plants and crops.

projection: A statement regarding future conditions based on linear extrapolations of past and present conditions.

propagation: The transmission of sound waves through the air.

rare: A condition in which a species or subspecies, although not currently threatened with extinction, exists in such small numbers throughout its range that it may be endangered if the quality of its environment worsens.

reactive organic gases: Classes of hydrocarbons (olefins, substituted aromatics, and aldehydes) that are likely to react with ozone and nitrogen dioxide in the atmosphere to form photochemical smog.

refraction: The bending of a ray or wave of light, heat, or sound, as it passes obliquely from one medium to another with different physical properties.

regional employment: The number of jobs provided in a region.

retrofit: Replacement of existing fixtures with new or modified fixtures to improve efficiency.

secondary employment: Combined indirect and induced employment.

significant: As defined by NEPA, whether a proposed action "significantly" affects the quality of the human environment is determined by considering the context in which is will occur and the intensity of the action. Further, a significant effect is a substantial of potentially substantial change, usually adverse, in the physical conditions within the area of the project.

sound refraction: The bending of sound waves as they travel through different mediums.

sound pressure level: The term used to identify a sound measurement expressed in decibels. It is mathematically equivalent to 20 times the common logarithm of the ratio of a measured sound pressure to the standard reference pressure of 20 micropascals (measured in decibels).

stationary source: An immobile source of air pollution, such as a heating plant or an exhaust stack from a laboratory.

temporary use: A use established for a fixed period of time with the intent to discontinue such use upon the expiration of the time period.

thermal inversion: An atmospheric condition in which a layer of warm air traps cooler air near the surface of the earth, preventing the normal rising of surface air.

time weighted average: The sound level which, if constant over an 8-hour workday exposure, would result in the same noise dose as measured.

unemployment rate: The number of persons of working age who are actually seeking employment, divided by the number of persons in the labor force.

unincorporated area: Areas that are not within the bounds of an incorporated city.

vacancy rate: The number of habitable housing units that are vacant for rent or sale divided by the total number of habitable housing units.

wetland: A term generally applied to an area where the ground is permanently wet or wet most of the year.

wildlife corridors: A natural corridor, such as an undeveloped ravine, that is frequently used by wildlife to travel from one area to another.

zoning ordinance: A local law that contains detailed standards and procedures to implement the general plan. The ordinance divides the city into various zoning districts with different land uses permitted in the districts.

Appendix B
INDEX

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Appendix C
X-32/X-35 JSF TESTING PROJECT BACKGROUND INFORMATION

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The X-32/X-35 Joint Strike Fighter (JSF) testing project could be one of the first projects implemented under the NASA Ames Aerodynamics Testing Program. Additionally, the X-32/X-35 test aircraft and associated proposed testing project established the operational boundaries of high noise testing in the National Full-Scale Aerodynamics Complex (NFAC) wind tunnel facilities. Testing at Ames for the High Speed Civil Transport (HSCT) program, which is developing new technology for supersonic civilian airliners that are economically viable and environmentally friendly, is another program that could fall under envelope of the Aerodynamics Testing Program. The following section provides background information specifically for the X-32/X-35 JSF Program.

A Department of Defense (DOD) program called Joint Strike Fighter (JSF), with participation between the Defense Advanced Research Projects Agency (DARPA), the National Aeronautics and Space Administration (NASA), U.S. Industry, and the United Kingdom's Ministry of Defense has been established. This was formerly known as the DOD JAST (Joint Advanced Strike Technology) program or the DARPA CALF (Common Affordable Lightweight Fighter) program. The DARPA CALF program was absorbed into the DOD JAST program in 1994 and then the JAST program was renamed the JSF program in early 1996.

The JSF program is investigating the technical feasibility of fielding an affordable, military viable, multi-service aircraft in the 2010 timeframe. This program currently has a dual experimental aircraft designation of X-32 and X-35. It is intended that the next phase of the JSF program have two contractors, each with their own experimental aircraft designation. This next phase is planned to start in late 1996 with first flight of each contractor's demontrator aircraft (X-32 and X -35) in the 1999 to 2000 time frame.

The JSF concept currently has three variations; a Short Takeoff Vertical Landing (STOVL) attack aircraft for the U.S. Marine Corp. and the U.K. Royal Navy; an Air Force Conventional Takeoff and Landing (CTOL) multi-role fighter aircraft; and an aircraft carrier capable fighter/attack aircraft for the Navy. The X-32/X-35 JSF program provides an unique opportunity to develop a truly common and affordable aircraft for expeditionary naval forces and fixed-base land use.

The main requirement for this program is that the resulting aircraft or aircraft derivatives must be affordable. Currently the only performance requirements are that the aircraft empty weight must be less than 24,000 pounds and that the aircraft occupy no more room than an F-18C; all other performance parameters are program goals and are tradable for cost and weight benefits. In order to keep costs down, it is envisioned that all versions have as much commonality as possible in terms of airframe, engine, and other aircraft systems.

Three contractors, Boeing, Lockheed Martin, and McDonnell Douglas/Northrop Grumman/BAe have developed large-scale powered models for test. Testing of all three models has been proposed for NASA Ames' 80- By 120-Foot Wind Tunnel. Two of the configurations were predicted to exceed current allowed maximum noise levels and was the impetus for the NASA Ames Aerodynamics Testing Program. The JSF Program is currently the only aircraft programs that will bring increased fighter capability to the U.S. at an affordable cost. This program is one of DOD's "highest priorities."

No tests of the X-32/X-35 models are currently planned or proposed for the 40- by 80-Foot Wind Tunnel. However, testing of similar models at this facility was included in the Aerodynamics Testing Program to allow NASA to meet future needs of the JSF Program and other DOD and civilian aerospace projects as they arise.

Because the X-32/X-35 JSF design is capable of powered-lift flight operations, there are complex flowfield interactions between the airframe and propulsion system. Currently powered-lift configurations cannot be accurately simulated at small-scale or by computation methods for the purpose of detailed design and analysis. Therefore, the designs must be validated in wind tunnels at large- to full-scale during the aircraft development phase and prior to building and flying a demonstrator or prototype aircraft.

Figures C-1 through C-5 describe the testing project that has been proposed for the X-32/X-35 JSF Testing Project. Figure C-1 shows the maximum noise levels proposed for testing the noisiest X-32/X-35 large-scale powered model in the 80- by 120-Foot Wind Tunnel. Figure C-2 describes a typical test scenario for the proposed test window. This would include daily testing in two phases, as shown by the figure. It is expected that this testing scenario would last approximately eight weeks. Figure C-3 shows the average daily CNEL noise exposure contours generated by this scenario. Figure C-4 describes a second proposed alternative for testing the X-32/X-35 models, which would only include a single test window. This alternative would last approximately 16 weeks, which represents a doubling of the duration of the first scenario. Figure C-5 shows the average daily CNEL noise exposure contours generated by this second scenario.

Lastly, this appendix presents a report that was developed by NASA concerning noise on the proposed X-32/X-35 JSF testing project. This section provides the baseline data used to develop the parameters for the NASA Ames Aerodynamics Testing Program.

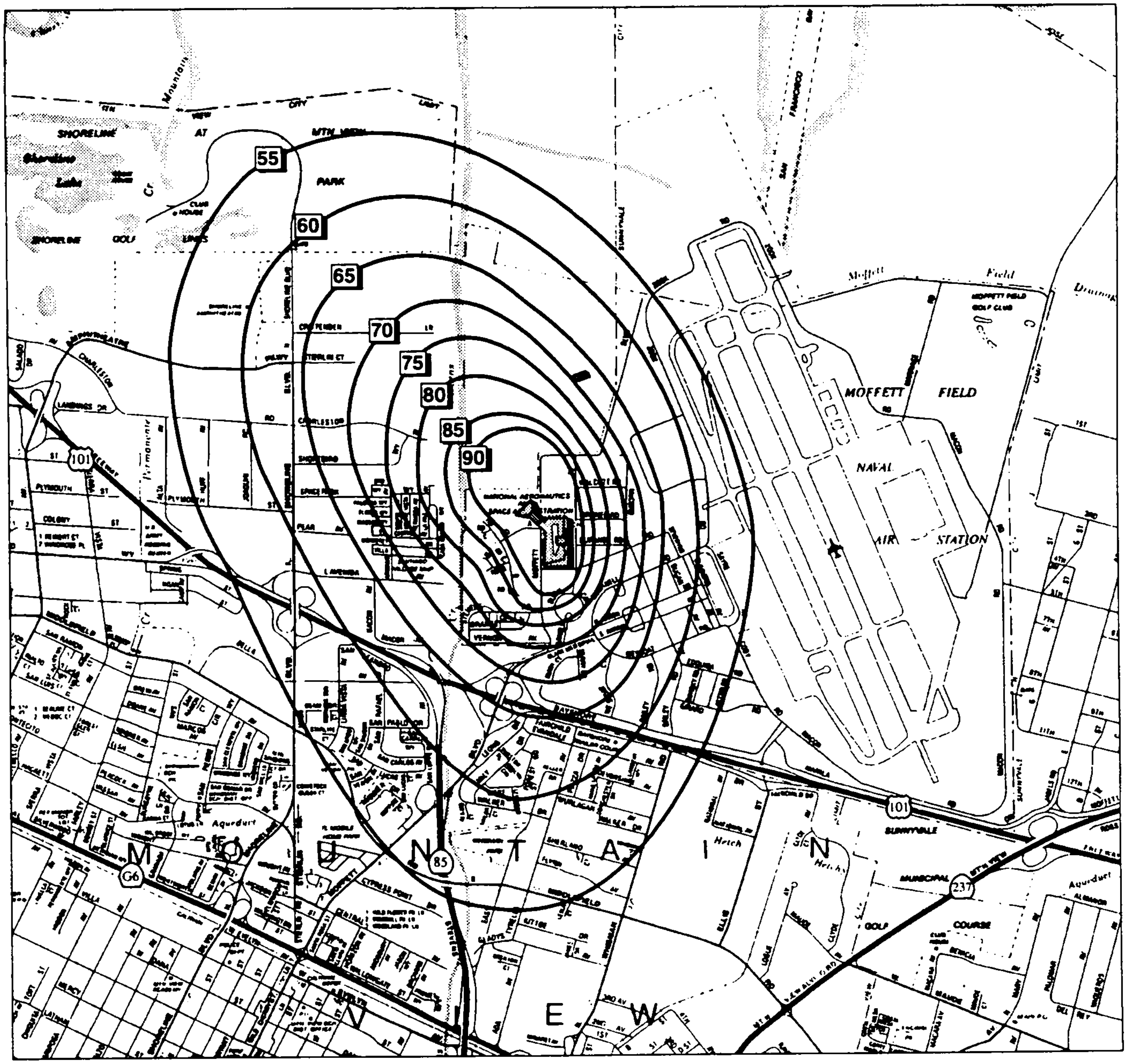


FIGURE C-1

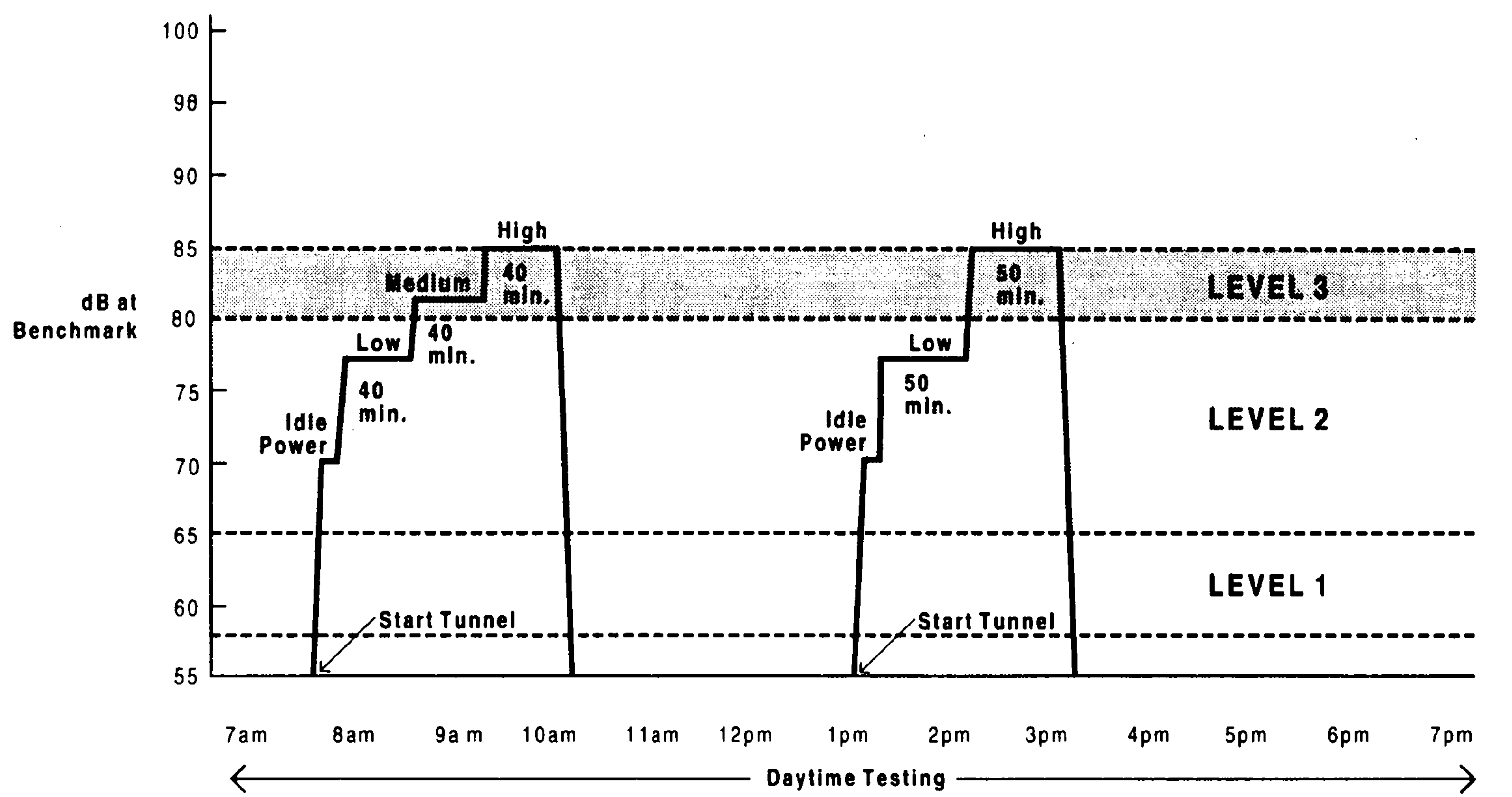
0 1/4 1/2
Scale in Miles

The X-32/X-35 JSF Testing Project

Maximum Noise Level Contours (dB)

AMES AERODYNAMICS
TESTING

NASA AMES RESEARCH CENTER, MOFFETT FIELD, CALIFORNIA



SOURCE: NASA Ames Research Center.

NOTE : This figure applies only to the proposed X-32/X-35 JSF Testing Project. Existing ambient conditions are not considered. This testing scenario uses two shifts: One occuring in the morning for 2 hours and 45 minutes and the second occuring in the afternoon for 2 hours and 15 minutes.

FIGURE C-2

X-32/X-35 JSF Alternative 1: Two Daily Shifts

AMES AERODYNAMICS TESTING

NASA AMES RESEARCH CENTER, MOFFETT FIELD, CALIFORNIA

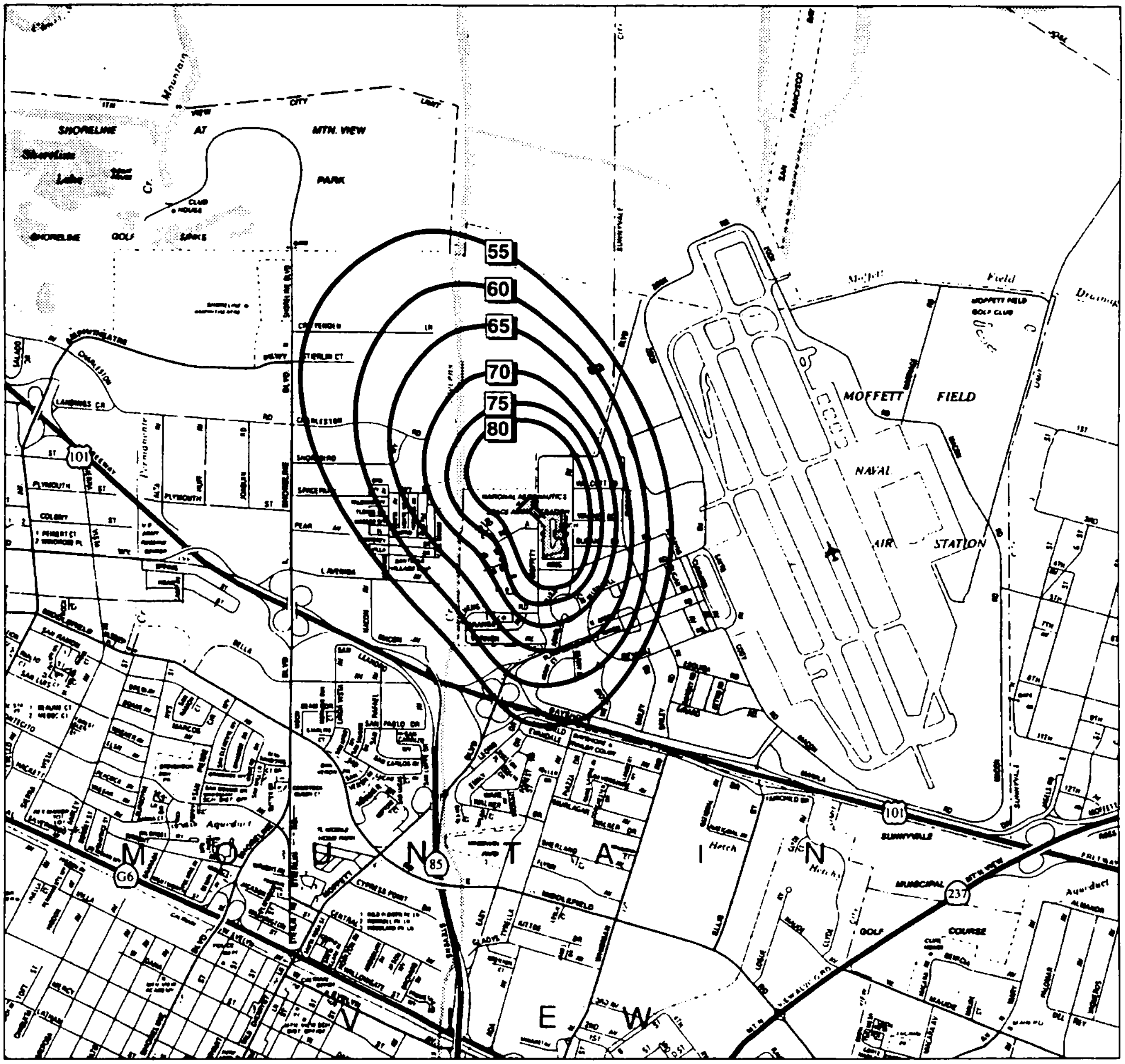


FIGURE C-3

0 1/4 1/2
Scale in Miles

SOURCE: Charles Salter Associates, March 1995.

NOTE: These contours represent two shifts of the X-32/X-35 JSF testing occuring during the day: One occuring in the morning for 2 hours and 45 minutes and the second occuring in the afternoon for 2 hours and 15 minutes.

X-32/X-35 JSF Testing Project
Alternative 1: Two Daily Shifts
Daily CNEL Contours (dB)

AMES AERODYNAMICS TESTING

NASA AMES RESEARCH CENTER, MOFFETT FIELD, CALIFORNIA

69-050

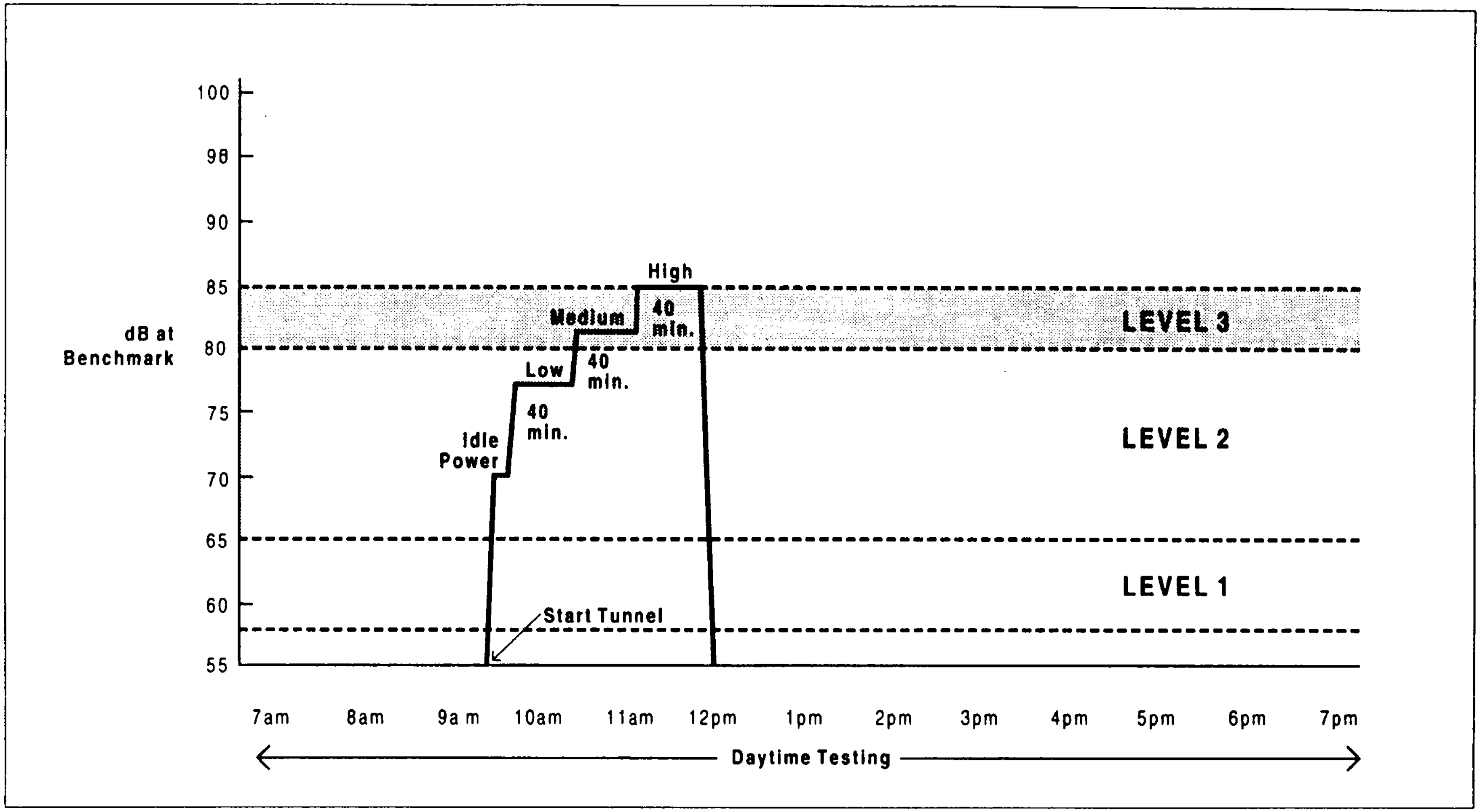


FIGURE C-4

SOURCE: NASA Ames Research Center.

NOTE : This figure applies only to the proposed X-32/X-35 JSF Testing Project. Existing ambient conditions are not considered. This testing scenario uses one shift occuring in the daytime for 2 hours and 45 minutes.

X-32/X-35 JSF Alternative 2: One Daily Shift

AMES AERODYNAMICS TESTING

NASA AMES RESEARCH CENTER, MOFFETT FIELD, CALIFORNIA

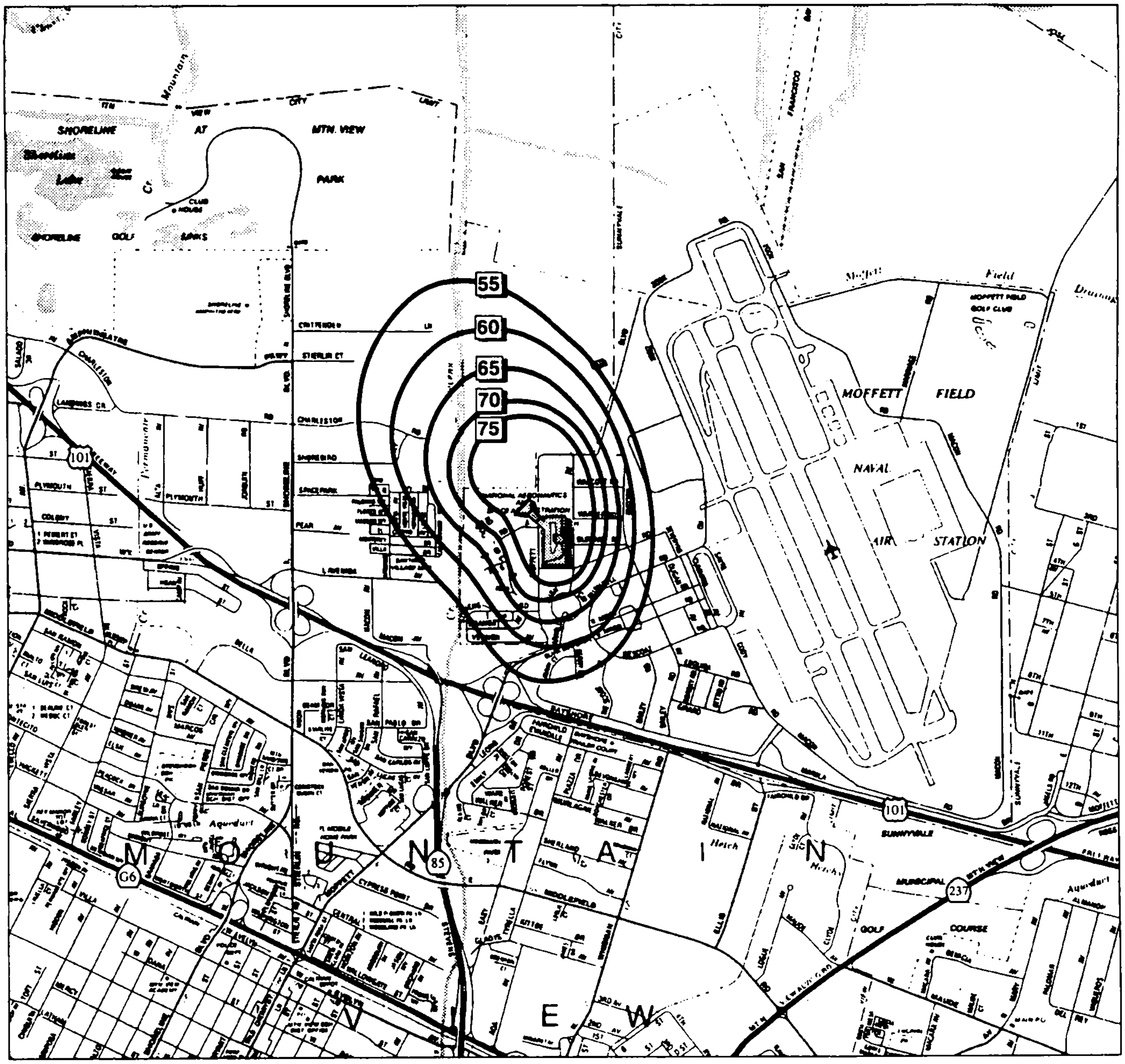


FIGURE C-5

0 1/4 1/2
Scale in Miles

SOURCE: Charles Salter Associates, March 1995.

NOTE: These contours represent one shift of X-32/X-35 JSF testing occuring during the daytime for approximately 2 hours and 15 minutes.

X-32/X-35 JSF Testing Project
Alternative 2: One Daily Shift
Daily CNEL Contours (dB)

AMES AERODYNAMICS
TESTING

National Aeronautics and
Space Administration

Ames Research Center
Moffett Field, California 94035-1000

Reply to Attn of: FFF:247-2

Sept 13,1994

Memorandum for Record

FROM: Julie Hayes, FFF and Paul Soderman, FFF

SUBJECT: J97 noise in community and in NFAC - implications for the CALF program - REVISED 9/13/94

Ames Research Center plans to conduct tests of large-scale, powered CALF models next year. Three different CALF models might be tested at the OARF and in the 80- x 120-foot wind tunnel. Before these tests begin, several issues must be addressed concerning the noise generated by this type of testing.

- **community noise**
  Estimated noise levels are needed for the adjacent community so as to minimize annoyance.
- **noise for workers in 40- x 80- foot tunnel**
  Construction in the 40- x 80- foot wind tunnel is scheduled at the time of CALF testing.
- **verify far field acoustic prediction codes**
  Current prediction codes lack 80- x120-foot wind tunnel wall attenuation.
- **measure efficacy of acoustic lining**
  Determine sound attenuation provided by the 80- x120- acoustic modifications.

A repeat of the 1983 test[1] of a J97 engine was conducted in order to provide information toward resolution of the above issues. Measurements of the J97 engine noise in the area surrounding the wind tunnel indicated the direction of the noise propagation toward adjacent residential areas. Noise data inside and outside the test section at specified engine settings were used to verify acoustic prediction codes. And because an acoustic lining had been added to the test section since the 1983 J97 test, the efficacy of the lining was measured. Finally the data from the J97 were scaled to predict the sound pressure levels of the engines to be used for the CALF powered models.

test description

The J97 engine is a small turbojet rated at 4500 lb. max. thrust and 70 lb./sec. max. mass flow. It was tested in October 1983 in order to gather representative data of noise propagation outside the facility. Since that time an acoustic lining and improved inlet vanes have been added to the wind tunnel. On August 8 and 10, 1994, the J97 was retested with Pete Zell as test director in the 80- x 120-foot wind tunnel test section. This time it was operated in two different configurations: cruise, the conventional configuration with the engine exhaust pointed downstream; and VTOL, with the engine exhaust deflected vertically with a 90° elbow duct to simulate the vertical lift mode of the CALF models. A photograph of the VTOL configuration is shown in figure 1.

On both days of testing, the acoustic test team was deployed to stations outside the facility (including nearby residential areas) and inside the facility (80- x120- control room, 40- x 80- test section, circuit, and high bay). Acoustic spectra were obtained in the test section by a microphone located 26 ft. from the exhaust nozzle. And overall A-weighted sound pressure measurements were taken at more than 70 different locations. These locations are described as stations on the maps in figures 2 and 3.

On Monday, August 8, the engine was run in the cruise configuration. Measurements were taken with the engine operated at 94.5% max. RPM and held for 30 minutes. Vibration of the engine on its mount prevented loading the engine to the target setting of 98% max. RPM.

The engine nozzle was fit with the 90° elbow and on Wednesday, August 10, the engine was run in the VTOL configuration. Again, vibrations prevented the engine from being fully loaded, and measurements were taken for 20 minutes at 90% max. RPM.

On both days total temperature and total pressure measurements were taken with thermocouples and a rake at the engine exhaust plane. In the cruise configuration, temperature and pressure measurements were taken as the engine setting varied as follows: idle, 80% max. RPM, 88% max. RPM, and 94.5% max. RPM. In the VTOL configuration, the temperature and pressure were measured only at 90% max. RPM. These nozzle measurements were used to adjust the noise data to the 88% and 98% max. RPM for comparison with 1983 data. For example, the cruise noise data at 94.5% max. RPM was corrected to 88% by subtracting 7 dBA and to 98% by adding 3 dBA. The 98% max. RPM condition is used for comparison with CALF model projected sound levels and will be discussed in the conclusion section of this memo.

measured noise data

Tables 1 and 2 list the measurements recorded at the various community stations for the cruise configuration and the VTOL configuration respectively. Sound levels measured in and around the 40- x 80-foot wind tunnel, including the microphone located in the test section, are listed in table 3. The noise contours were drawn to help visualize the sound propagation from the wind tunnel. The shape of the contours is determined by the interpolation of measured data.

J97 noise predictions

Because the J97 could not be operated at the reference power setting 98% max. rpm, it was necessary to extrapolate the acoustic data from lower power settings as discussed above. To aid that extrapolation, jet noise predictions were made using an empirical method described in ref. 2. This prediction method incorporates noise from the engine core, flow mixing, and shocks. As an input to that code, the nozzle diameters of 12.4 inch (cruise) and 15.9 inch (VTOL) were used along with exhaust temperatures and nozzle pressure ratios shown on figures 4 and 5. The VTOL exhaust diameter is the effective diameter based on the duct area less the turning vane cross-sectional area.

Figures 6 and 7 show the predicted A-wt noise levels at the test section microphone compared with the limited measured data from that station. The predicted and measured cruise noise levels are reasonably close. At 98% rpm the data were extrapolated from lower power settings to give 136 dBA at the test section microphone for cruise operation and 141 dBA for VTOL operation. This is within 2 dBA of the prediction.

results of acoustic modification

The cruise configuration data was compared with measured data from the 1983 J97 test to determine the noise attenuation achieved by the wind tunnel acoustic modifications[3], which include the wall, floor, and ceiling linings and new acoustic inlet vanes. The contour lines from the 1983 test and the 1994 test are shown in figure 8. Noise levels recorded on August 8, 1994, are 10 to 12 dBA lower than those recorded before the acoustic modifications. At the trailer park levels are 12 dB lower; and at the wind tunnel inlet, levels are 10 dB lower.

community noise: cruise vs. VTOL

For the second day of testing, the elbow duct was attached to the J97 exhaust nozzle. While the elbow is not representative of CALF vertical thrust engines, it does simulate the exhaust direction. To compare the sound level of the engine plus elbow to the engine alone, the VTOL data and the cruise data were scaled to the same power setting of 98% max. RPM. Figure 9 compares the sound propagation around the wind tunnel. Near the wind tunnel inlet, the noise levels recorded in the VTOL configuration are approximately 10 dBA higher. Conversely, near the wind tunnel exit the VTOL noise levels are approximately the same. As expected, the VTOL configuration radiates more noise upstream than does the cruise configuration. As the sound propagates further from the wind tunnel, interference from buildings and trees makes the data more difficult to interpret. The VTOL noise levels at the trailer park are about 5 dBA louder than the cruise configuration noise levels.

facility noise: cruise vs. VTOL

Noise data measured in and around the 40-x 80-foot wind tunnel at zero airspeed are shown figures 10 and 11, cruise configuration and VTOL configuration , respectively. For comparison, the data are scaled to 98% max. RPM. In figure 11, the VTOL noise levels are significantly lower in the 40- x 80-foot wind tunnel test section, while levels surrounding the wind tunnel are slightly louder. The noise level in the test section with the overhead doors closed was 102 dBA in the VTOL configuration and 110 dBA in the cruise configuration. This discrepancy is due to improper closure of vane set 3. During the cruise configuration testing, vane set 3 had two vanes open 25%. As a result a loss of only 10 dBA was measured across the vane set. During the VTOL configuration test, the vane set was completely closed and a 20 dBA loss was measured across the vane set. In the 40- x 80- high bay area the noise levels were 85 dBA for the cruise configuration and 83 dBA in the VTOL configuration. During the VTOL configuration testing, the doors were closed and then opened for comparison. With the test section overhead doors open, the noise in the high bay area increased by 4 dBA.

CALF model conclusions

Now that we have noise contours and wind tunnel wall/inlet/exhaust attenuation, we can predict the noise from CALF models operating in the 80- x 120-foot wind tunnel. Consistant with the J97 data, the jet prediction code indicates that the MD CALF model is loudest in VTOL operation, with cruise operation noise levels 8 dBA lower. In VTOL operation the code predicts levels will be approximately 6 dBA louder than the J97 VTOL jet at 98 % power. (This is 4 dBA less than predicted in reference 4.) Thus, we only have to increase by 6 dBA the contour levels of figure 9 to get the CALF contours plotted in figure 12. From this analysis, the predicted trailer park noise will be 71-81 dBA during operation of the MD CALF model at top power condition (3.5 NPR). This analysis is based on the model located 12 m above the test section floor with no blast deck, thus full absorption is attained from the treated floor. Should the model location require a blast deck, the hard floor will reduce some of the overall sound absorption causing an increase of 2 dBA (± 2 dBA) or 73-83 dBA in the trailer park. (The estimate from ref. 4 for this case was 83 dBA.)

The predicted MD CALF model VTOL operation noise levels for the 40- x 80-foot wind tunnel and high bay are described in Appendix A. Construction configurations discussed in the appendix include a pressure barrier (Barrier 1) upstream of the 40- x 80- test section, a sound barrier (Barrier 2) downstream of the test section, and high bay conditions with the test section disassembled.

Lockheed CALF model noise level predictions are 22 dBA lower than MD CALF noise levels. The Lockheed prediction assumes jet noise is the dominant source and does not include noise from the lifting fans. The predicted noise levels are described in Appendix B.

1 Memo from P. Soderman to V. Corsiglia, "Noise from a J97 Engine in the 80-x12-Foot Wind Tunnel Test Section," Nov. 10, 1983.

2 Soderman, P.T.: The Prediction of STOVL Noise - Current Semi-Empirical Methods and Comparisons with Jet Noise Data. SAE Tech Paper 901058, SAE Aerospace Atlantic, Dayton, OH, April 1990.

3 Memo from P. Soderman to B. Smith, "80 x 120 IST Acoustic Measurements and Results," Dec. 22, 1987.

4 Memo from P. Soderman to F. Schmitz, "CALF model community noise update", June 29, 1994

Station	*Cruise 98%	Cruise 94.5%	*Cruise 88%	Cruise 80%	Station	*Cruise 98%	Cruise 94.5%	*Cruise 88%	Cruise 80%
1	(90)	87	80	66.5	39	(74)	71	69	
2	(92)	88.5	81	63	40	(69)	65.5	58	49
3	(78)	74.5	(68)		40.1	(74)	71	(64)	
4	(78)	74.5	(68)		41	(63)	60	(53)	
4	(80)	76.5	(70)		42	(65)	62	(55)	
5	(81)	77.5	(71)		44	(60)	57	(50)	
6	(78)	74.5	(68)		45	(88)	84.5	(78)	
8	(64)	60.5	(54)		45.05	(85)	82	(75)	
9	(96)	93	86.5	68	45.1	(85)	81.5	75.5	64.5
10	(72)	69	(62)		46	(91)	88	(81)	
11	(68)	65	(58)		46	(89)	85.5	(79)	
12	(76)	73	(66)		47	(97)	94	(87)	
17	(67)	64	(57)		48	(101)	98	92	80
18	(70)	67	(60)		48	(102)	99	(92)	
19	(64)	61	(54)		48	(104)	101	(94)	
20	(80)	76.5	(70)		49	(94)	91	(84)	
21	(69)	65.5	(59)		50	(89)	86	(79)	
22	(97)	93.5	87		51	(81)	78	(71)	
23	(87)	84	76.5		52	(66)	62.5	(56)	
24	(82)	78.5	71.5	58.5	53	(76)	73	(66)	
25	(77)	74	(67)		53			61.5	57.5
25	(78)	75	(68)		54	(89)	86	(79)	
26	(87)	84	(77)		54	(93)	90	82	80
27	(83)	80	(73)		55	(90)	87	(80)	
28	(77)	74	(67)		56	(83)	80	(73)	
28	(78)	75	(68)		57	(82)	79	(72)	
29	(79)	76	69	56	58	(83)	80	(73)	
30	(77)	74	(67)		59	(81)	78	(71)	
31	(80)	76.5	(70)		61	(86)	83	(76)	
31	(78)	75	(68)		61	(85)	81.5	(75)	
32	(76)	73	(66)		36/31	(77)	74	(67)	
33	(68)	65	(58)		36/37	(76)	73	(66)	
34	(61)	58	(51)		42A	(66)	62.5	(56)	
35	(61)	58	(51)		44A	(63)	60	(53)	
36	(74)	70.5	(64)		45.15A	(81)	78	(71)	
36	(74)	70.5	(64)		45.15B	(84)	81	(74)	
37	(70)	66.5	(60)		46A	(75)	72	(65)	
37	(71)	68	(61)		A1	(72)	69	(62)	
38	(74)	71	(64)		Lt.S.vane	(106)	103	(96)	
38	(70)	67	(60)		Rt.S.vane	(106)	103	(96)	

*(scaled data)

Data A-weighted overall

TABLE 1: CRUISE CONFIGURATION FIELD DATA

Station	*VTOL 98%	VTOL 90%	VTOL 88%	VTOL 80%	Station	*VTOL 98%	VTOL 90%	VTOL 88%	VTOL 80%
1	(95)	81.5	80	72	38	(77)	64		
2	(92)	78.5			38	(78)	65		
3	(84)	71			39	(84)	71		
4	(83)	70			40	(80)	67	65	60
5	(85)	72			40	(81)	68		
6	(83)	70			40.1	(83)	70		
6	(82)	69			40.1	(78)	65		
7	(72)	59			40.2	(72)	59		
8	(70)	57			40.2	(65)	52		
9	(100)	87	86	76	41	(67)	54		
10	(80)	67			43	(72)	59		
12	(83)	70			45	(91)	78		
13	(77)	64			45.05	(88)	75		
15	(77)	64			45.1	(88)	75	73	67
18	(81)	68			46	(101)	88		
20	(85)	71.5			46	(100)	87		
21	(76)	63			47	(104)	91		
22	(98)	85			48	(112)	99	98	89
23	(92)	79			48	(111)	98		
24	(86)	73	72	63.5	48	(113)	100		
25	(86)	73			49	(107)	94		
26	(89)	76			50	(100)	87		
27	(87)	74			51	(90)	77		
28	(83)	70			53	(85)	72		
28	(83)	70			53			56	55
28	(83)	70			54	(97)	84		
29	(82)	69			54	(102)	89	88	82
29	(84)	71	62	59	55	(101)	88		
30	(78)	65			56	(96)	83		
30	(81)	68			57	(86)	73		
31	(84)	71			58	(94)	81		
31	(84)	71			59	(92)	79		
32	(81)	68			61	(95)	82		
33	(75)	62			61	(96)	83		
34	(67)	54			44A	(67)	53.5		
35	(65)	52			45.15A	(84)	71		
36	(78)	64.5			45.15B	(87)	74		
36	(77)	64			46A	(83)	70		
36	(80)	67			A1	(81)	68		
37	(74)	61			Lt.S.vane	(121)	108		
37	(76)	62.5			Rt.S.vane	(121)	108		101

*(scaled data)

Data A-weighted overall

TABLE 2: VTOL CONFIGURATION FIELD DATA

Station	*Cruise 98%	Cruise 94.5%	Cruise 88%	Cruise 80%
40-x 80- overhead doors closed				
TCR	(129)	125.5	118	107
T1	(119)	115		
T2	(109)	105.5		
T3	(084)	80.5		
T4	(079)	75.5		
T5	(096)	92		
T6	(108)	104		
T7	(117)	113.5		
T8	(124)	120		
T9	(129)	125		
TS	(136)	132.5	132	122
(scaled data) Data A-weighted overall				

Station	*VTOL 98%	VTOL 90%	VTOL 88%
40-x 80- overhead doors closed			
T1	(115)	102	100
T2	(102)	89	
T3	(083)	70	
40-x 80- overhead doors open			
T3	(087)	74	
T4	(082)	69	
T5	(097)	84	
T6	(112)	98.5	
T7	(119)	106	
T8	(123)	110	
T9	(135)	122	
T10	(096)	82.5	
T11	(093)	80	
T12	(104)	90.5	
TS	(141)	128.4	
(scaled data) Data A-weighted overall			

TABLE 3: J97 DATA MEASURED IN AND AROUND TEST SECTION

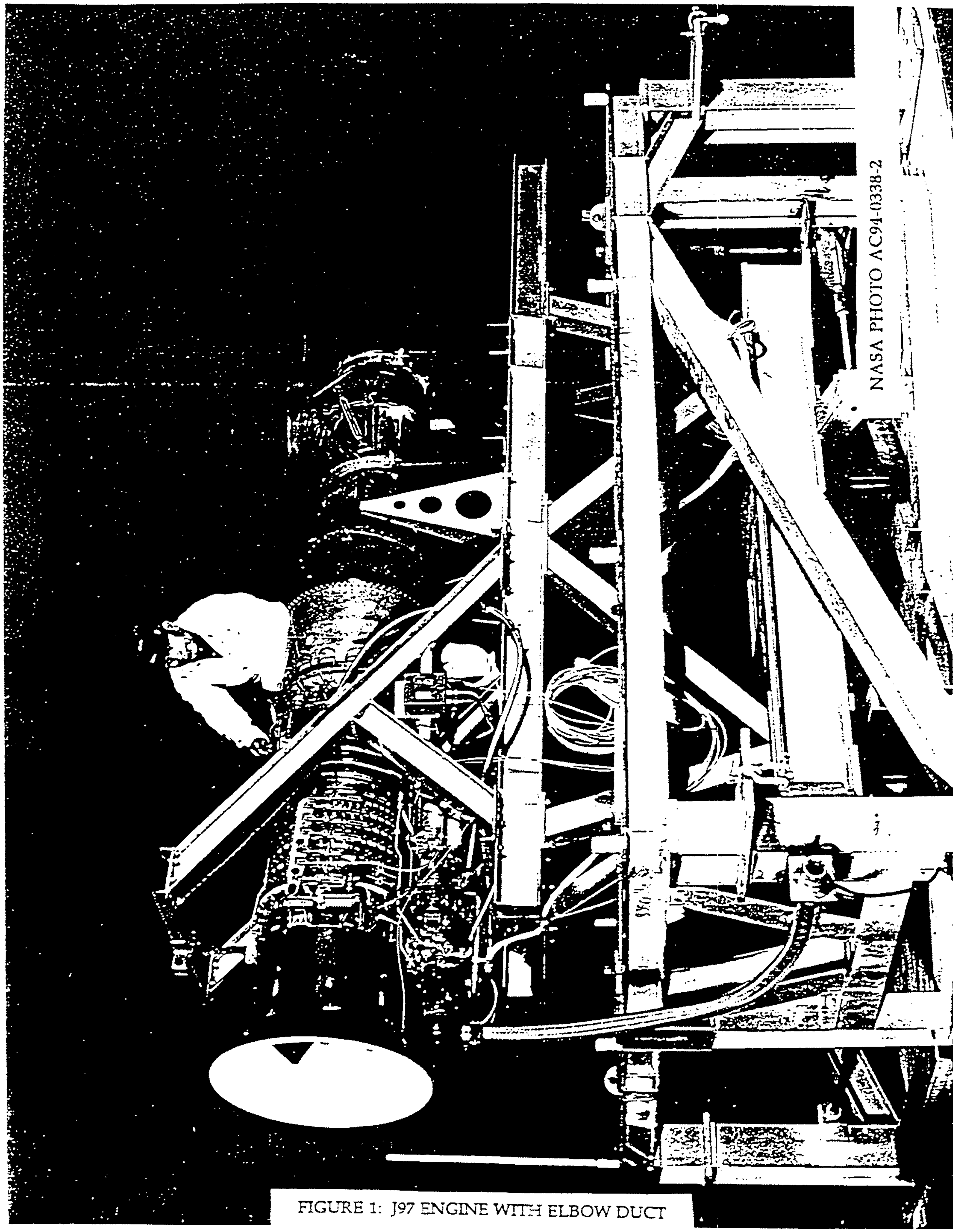


FIGURE 1: J97 ENGINE WITH ELBOW DUCT

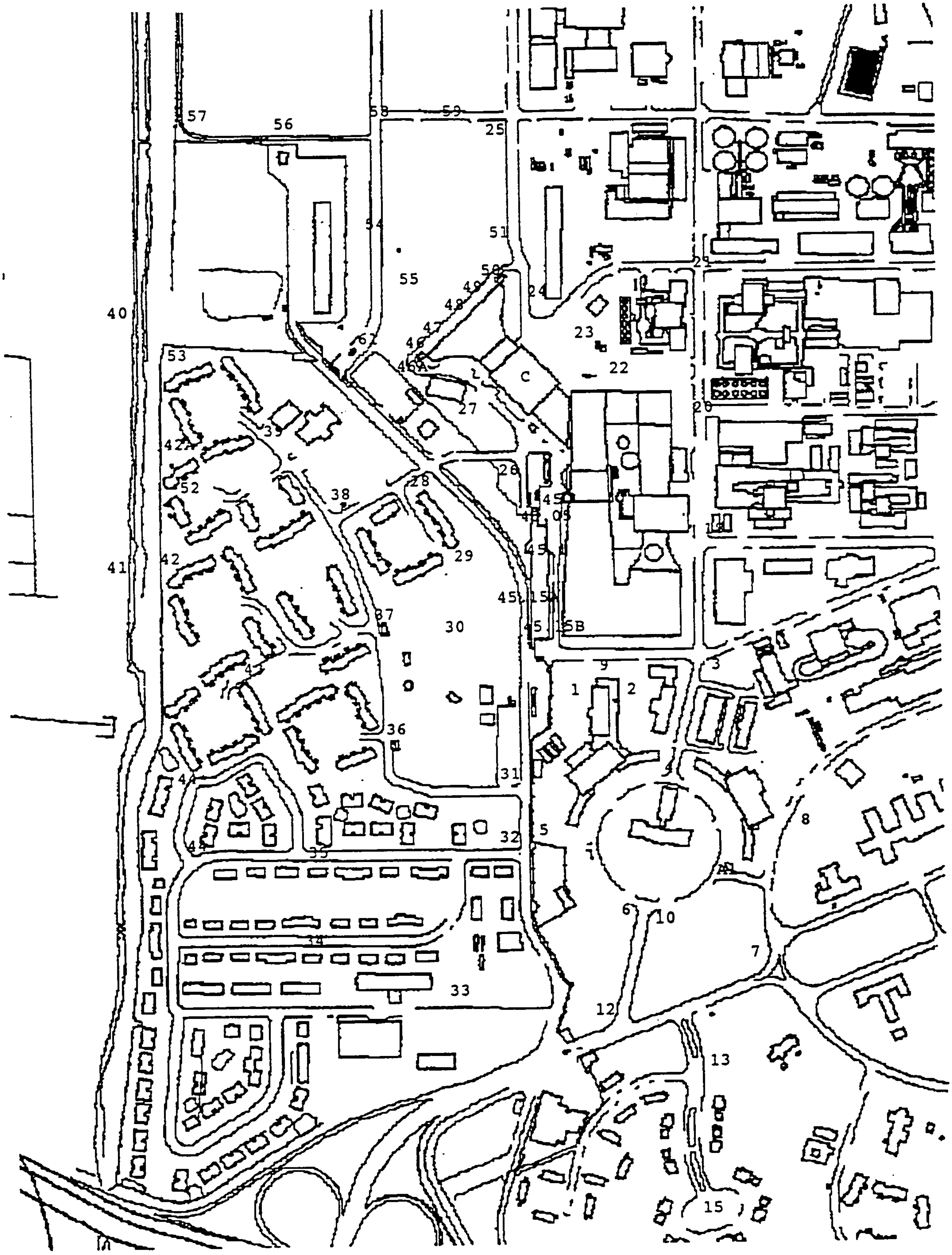
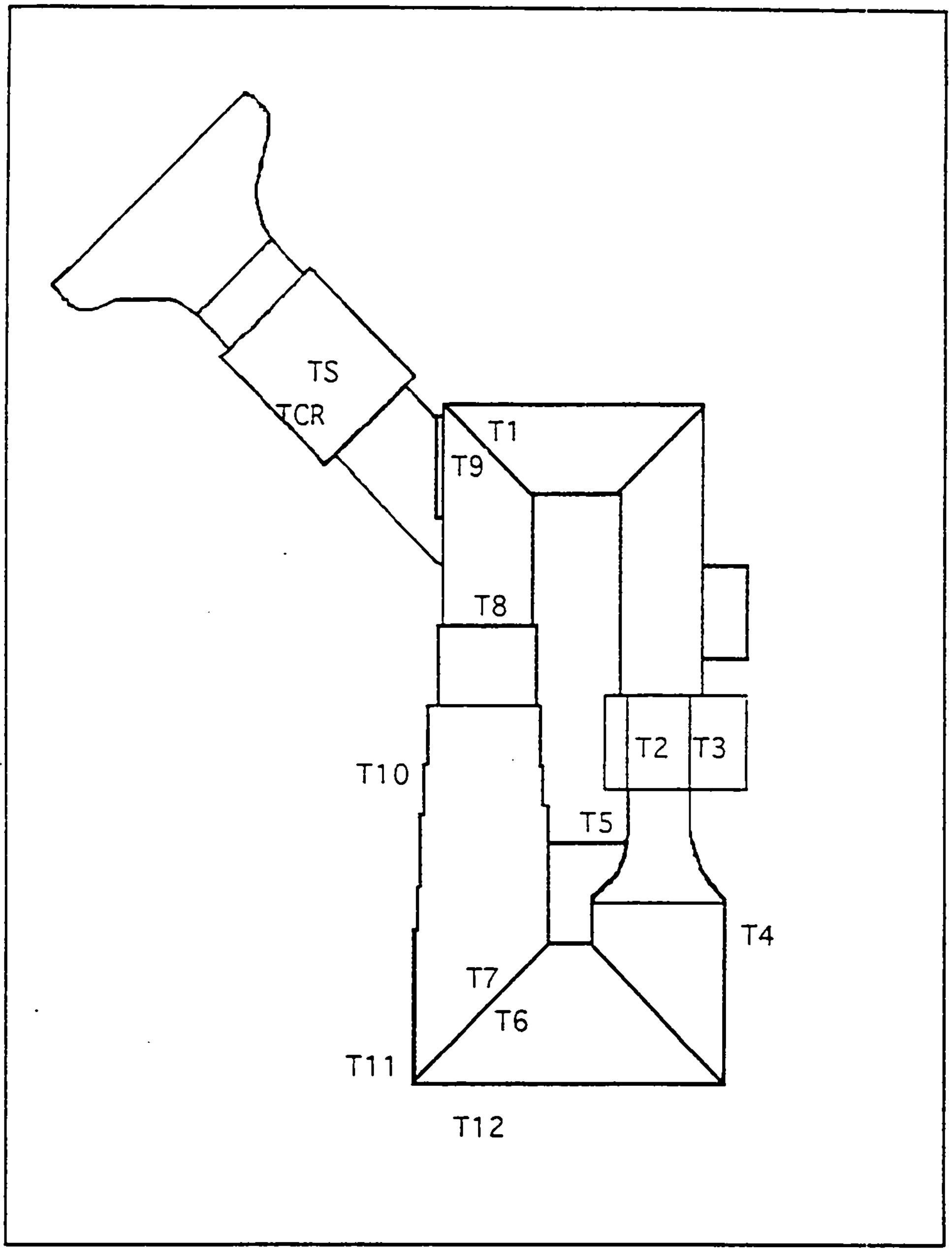


FIGURE 2: COMMUNITY NOISE STATIONS



STATIONS	LOCATION
TS	80- x 120- test section
TCR	80- x 120- control room
T1	between vane sets 2 &3
T2	40- x 80- test section
T3	40- x 80- high bay
T4	outside near DeFrance road
T5	inner courtyard of the circuit
T6	vane set 6 (downstream side)
T7	vane set 6 (upstream side)
T8	fan drive
T9	vane set 3 (downstream side)
T10	outside along Bldg. 223
T11	outside along Bldg. 223
T12	outside at 40- x 80- air exchange

FIGURE 3: FACILITY NOISE STATIONS

P. Soderman
9/7/94

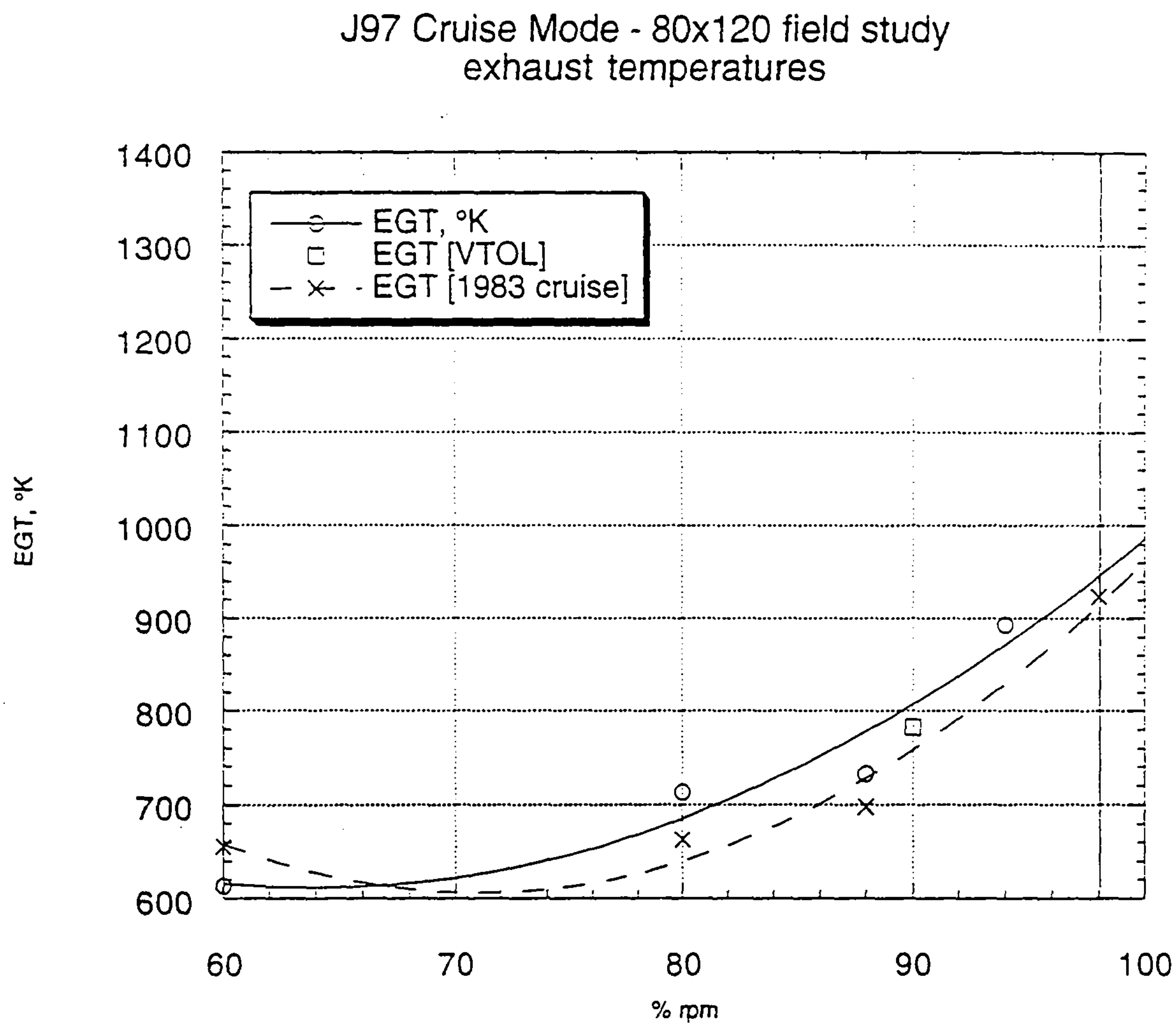


Figure 4

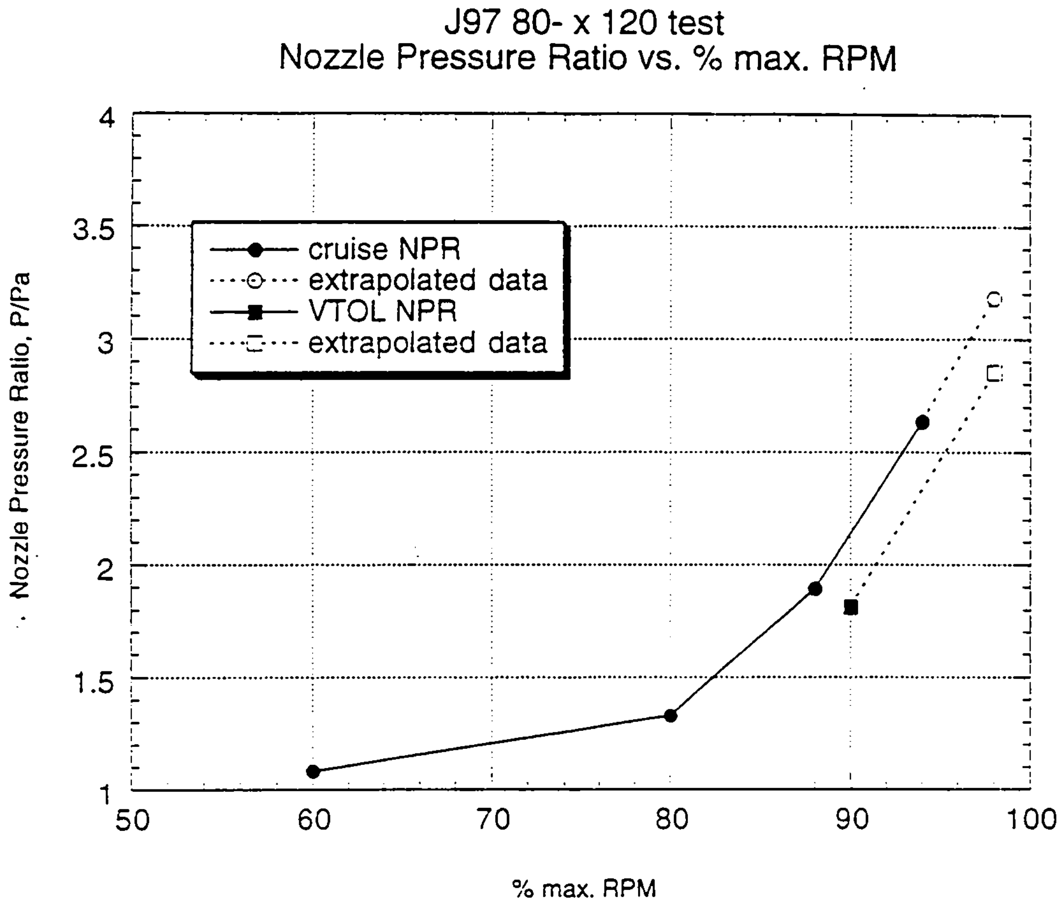
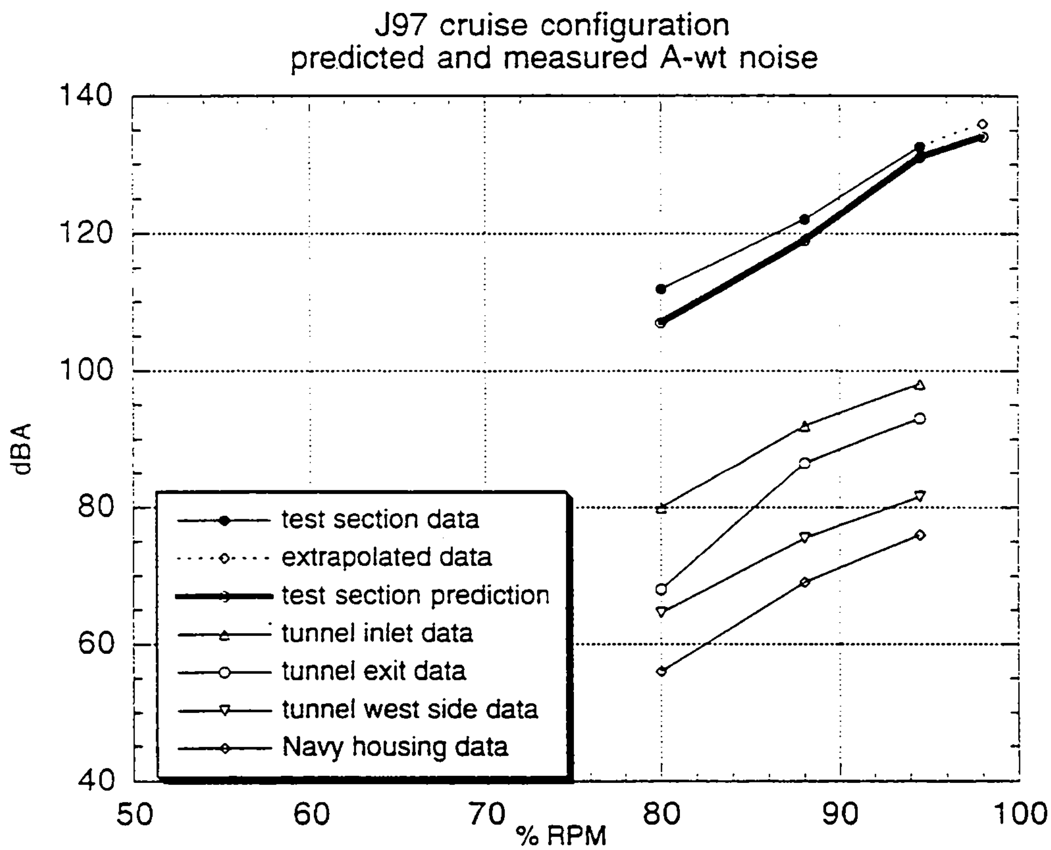
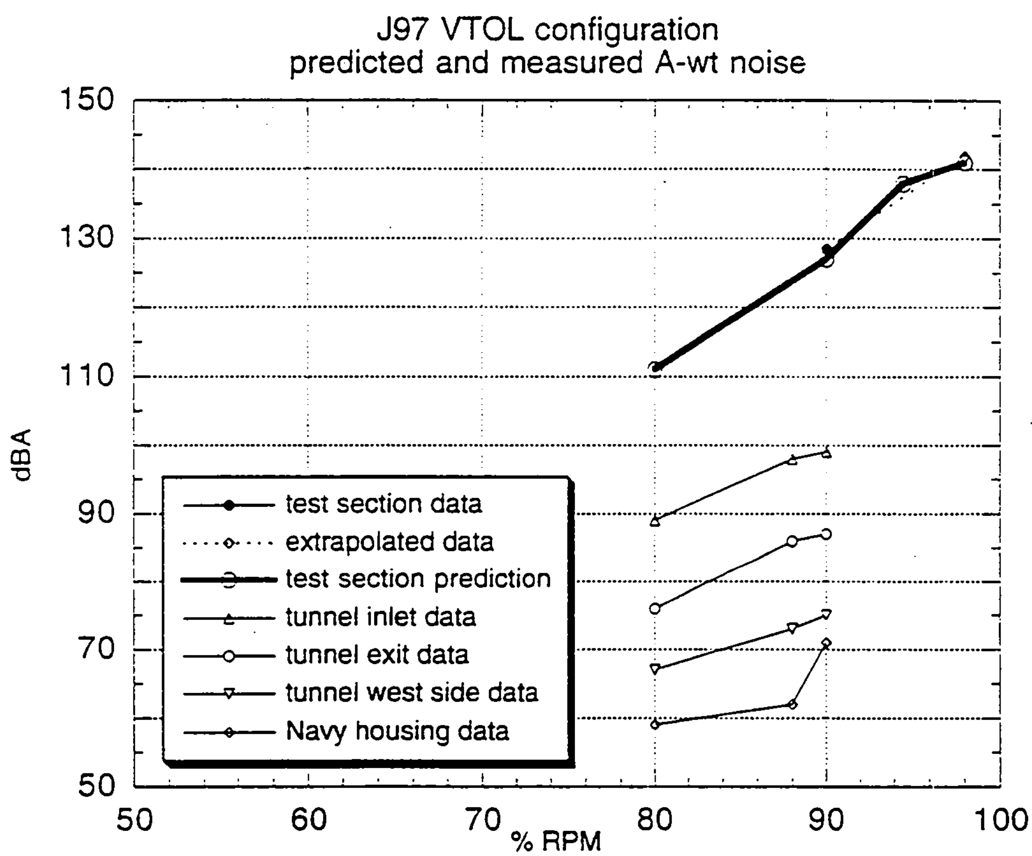

J97 80- x 120 test
Nozzle Pressure Ratio vs. % max. RPM
cruise NPR
extrapolated data
VTOL NPR
extrapolated data
Nozzle Pressure Ratio, P/Pa
% max. RPM
4
3.5
3
2.5
2
1.5
1
50
60
70
80
90
100

Figure 5



J97 cruise configuration
predicted and measured A-wt noise
140
120
100
80
60
40
dBA
50
60
70
80
90
100
% RPM
test section data
extrapolated data
test section prediction
tunnel inlet data
tunnel exit data
tunnel west side data
Navy housing data

Figure 6



J97 VTOL configuration
predicted and measured A-wt noise
150
130
110
90
70
50
dBA
50
60
70
80
90
100
% RPM
test section data
extrapolated data
test section prediction
tunnel inlet data
tunnel exit data
tunnel west side data
Navy housing data

Figure 7

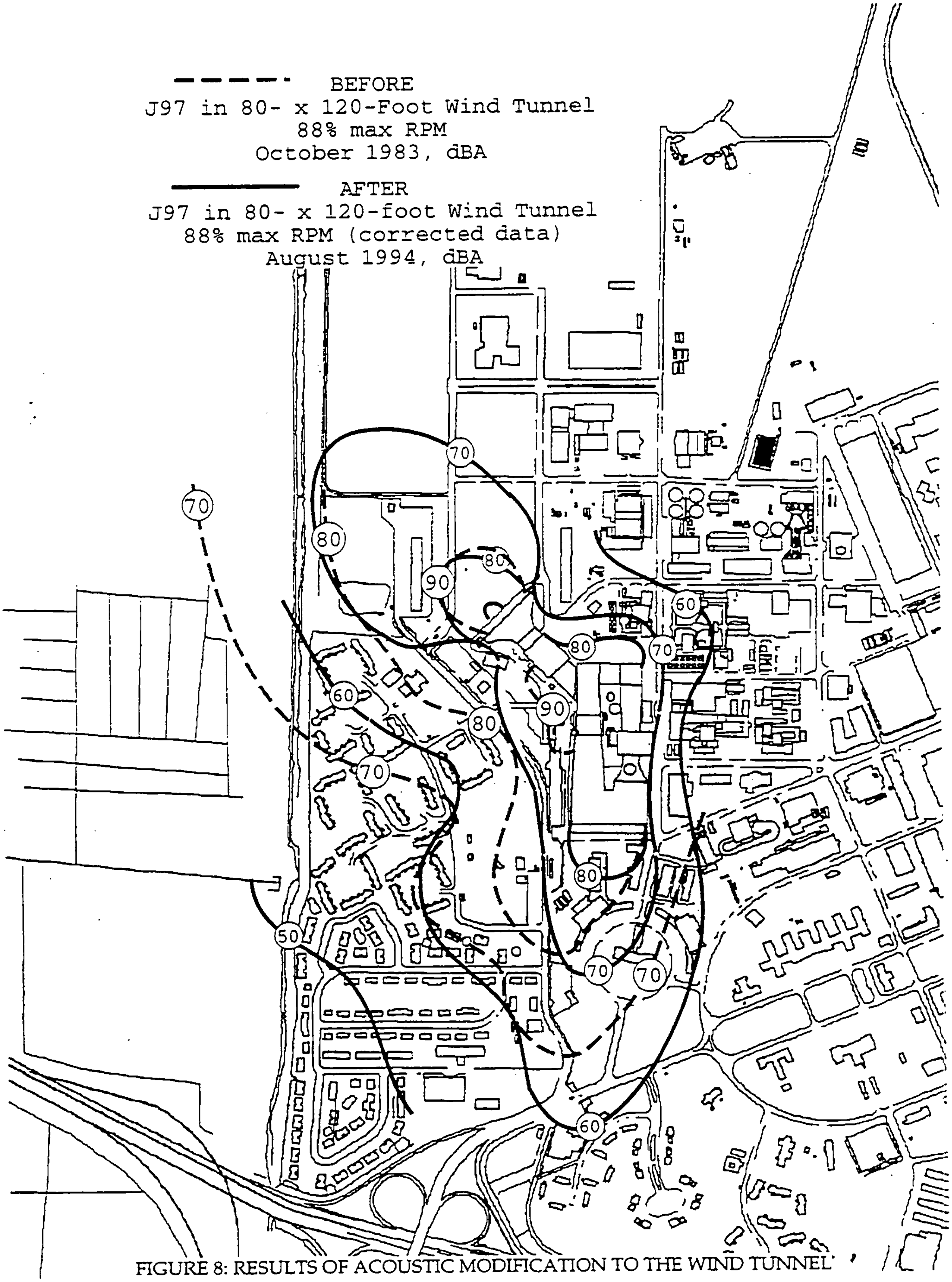


FIGURE 8: RESULTS OF ACOUSTIC MODIFICATION TO THE WIND TUNNEL

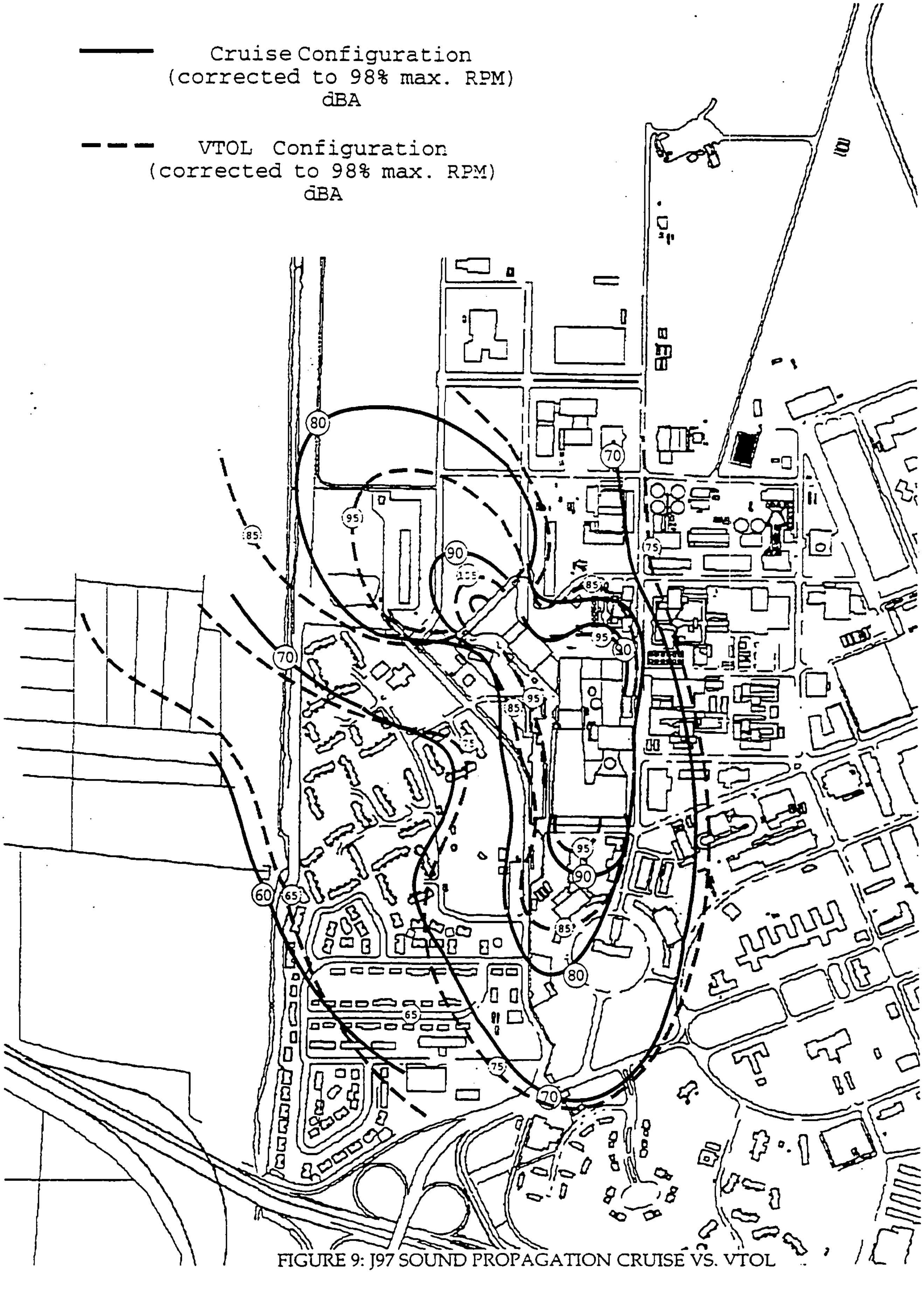


FIGURE 9: J97 SOUND PROPAGATION CRUISE VS. VTOL

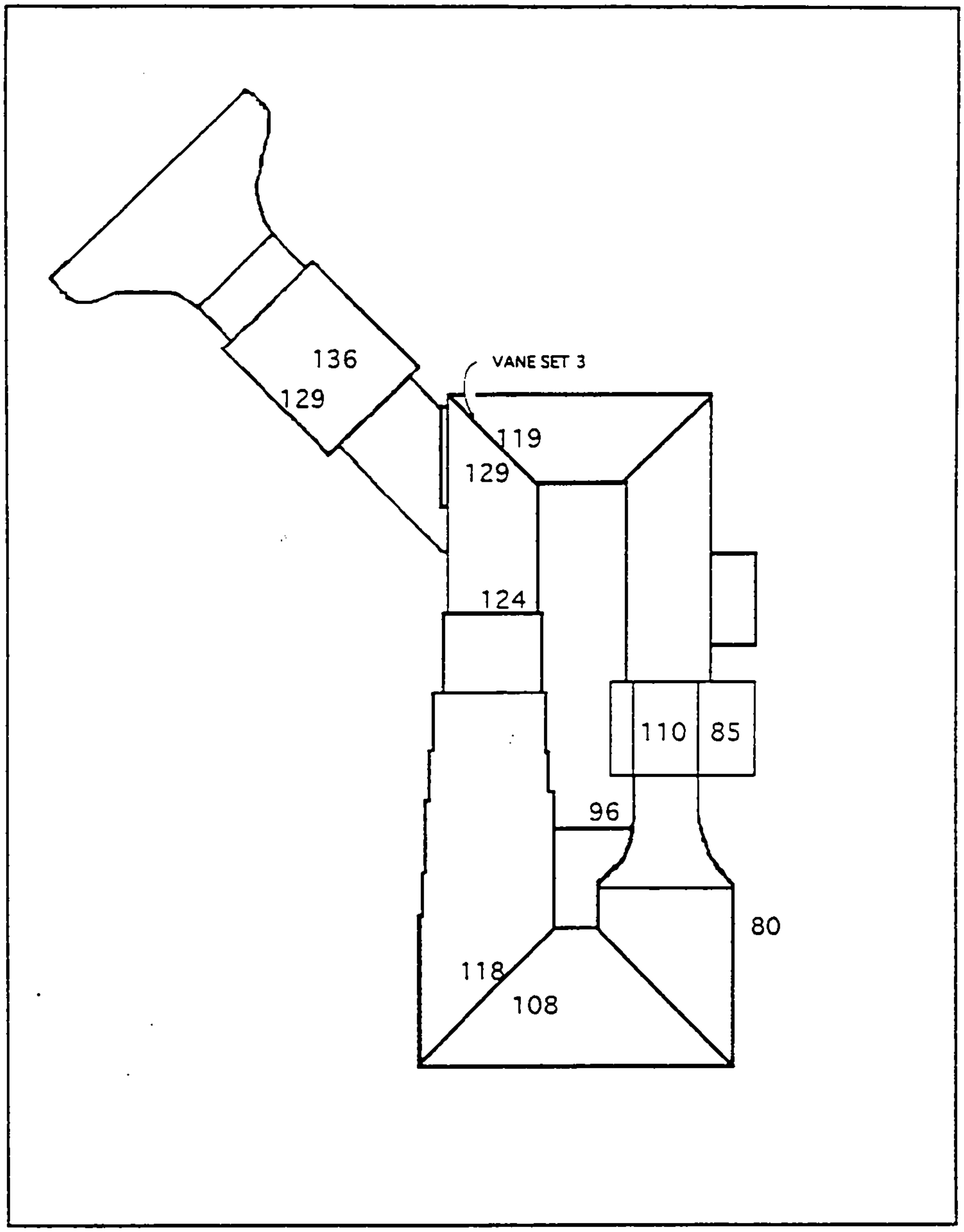


FIGURE 10: J97 NOISE IN CRUISE CONFIGURATION (extrapolated to 98% max. RPM), dBA

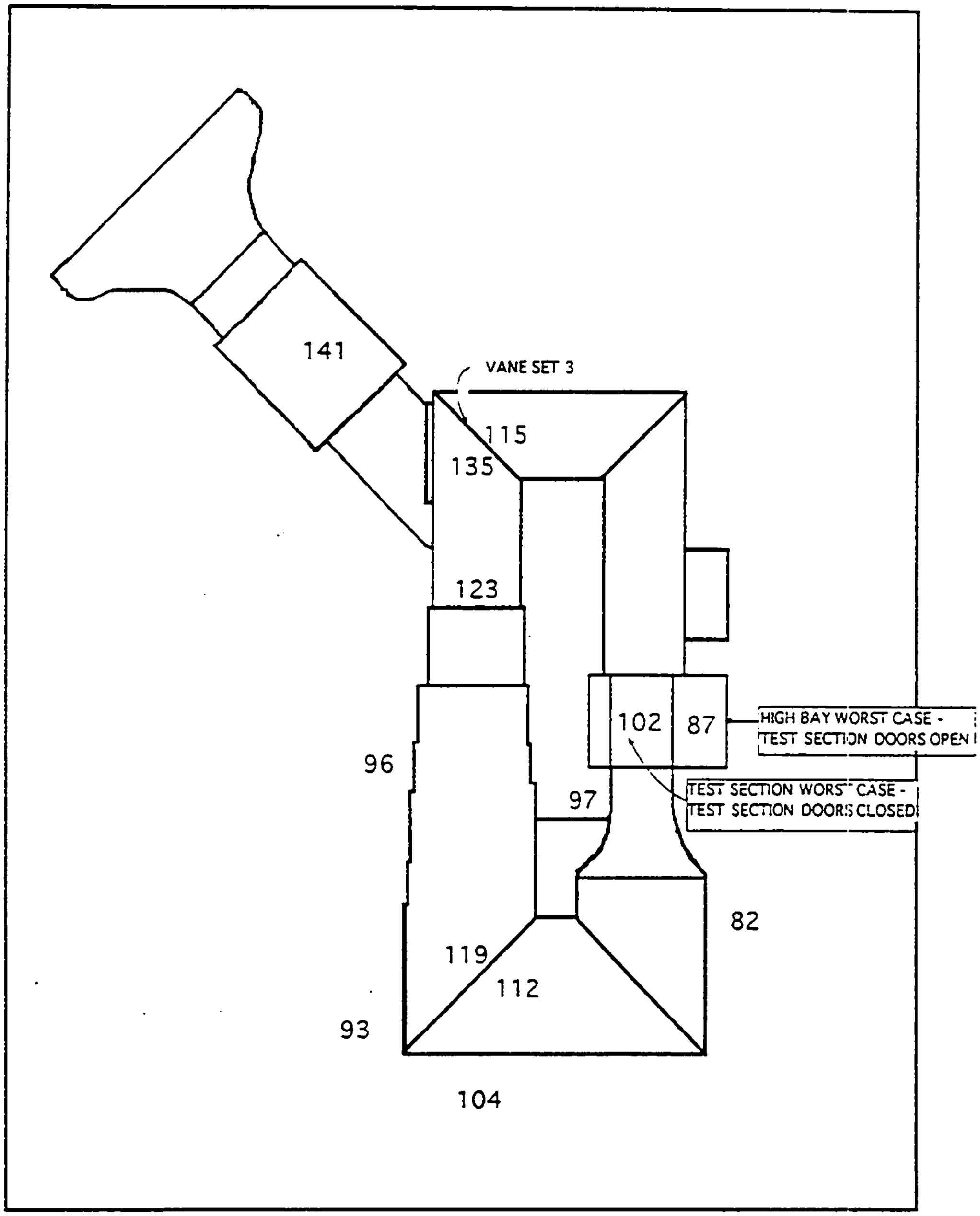


FIGURE 11: J97 NOISE IN VTOL CONFIGURATION (prediction at 98% max. RPM), dBA

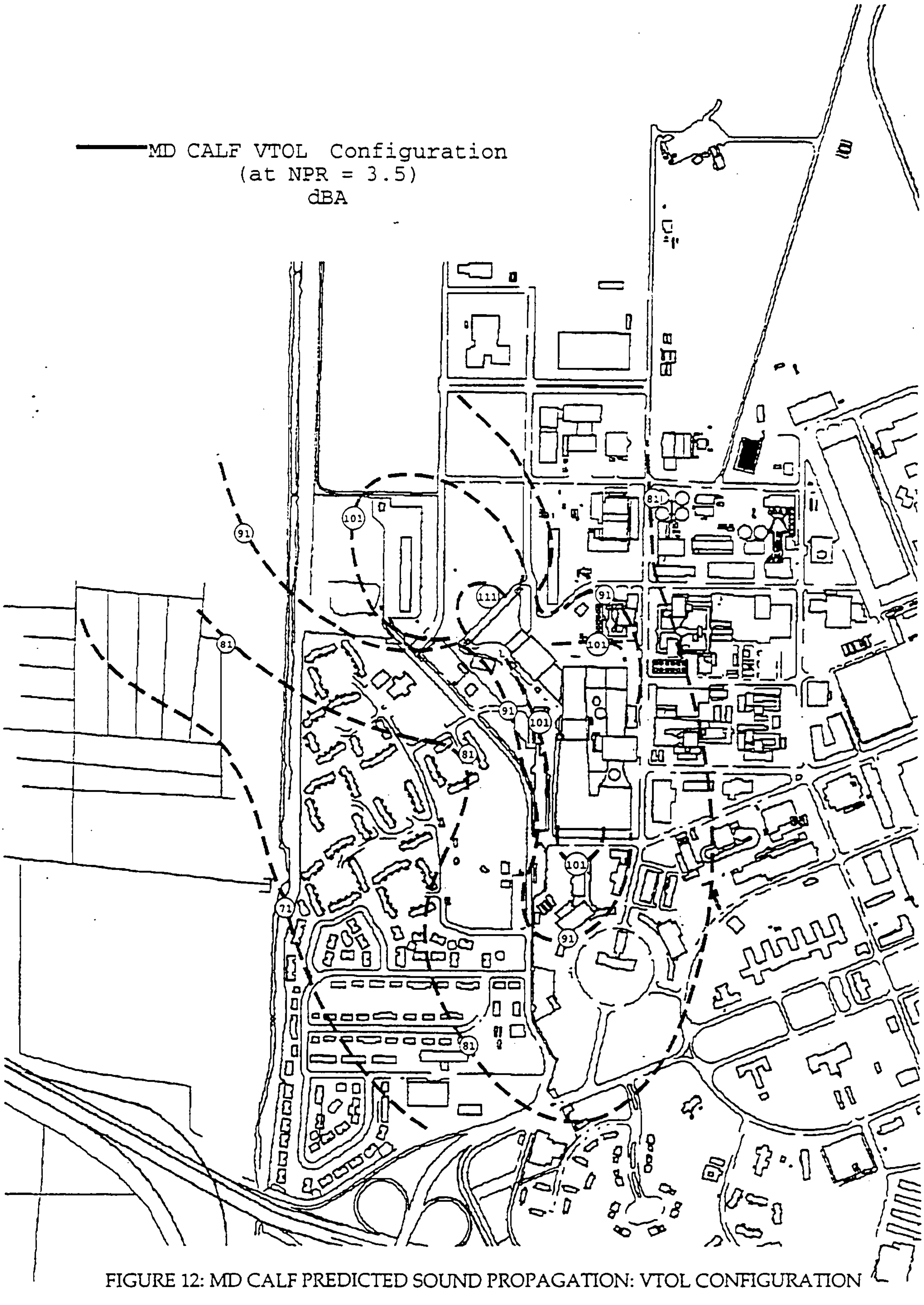


FIGURE 12: MD CALF PREDICTED SOUND PROPAGATION: VTOL CONFIGURATION

APPENDIX A

Sept. 9, 1994

MD CALF Full Power (NPR 3.5) - VTOL configuration

Overhead test section doors closed

No isolation barriers

40- x 80-foot wind tunnel test section = 108 dBA
  Rationale: CALF prediction based on data scaled from J97 test
40- x 80-foot wind tunnel high bay = 89 dBA
  Rationale: CALF prediction based on data scaled from J97 test

- Test section disassembled: expected levels in the high bay: >100 dBA

Add Isolation Barrier #1 to upstream side of test section lining (assume sealed barrier)

40- x 80-foot wind tunnel test section = 105 dBA
  Rationale: two sources: one from upstream, one from downstream. transmission loss through 3/4" plywood is 35 dBA, but noise propagation now primarily from downstream side of test section
40- x 80-foot wind tunnel high bay = 89 dBA
  Rationale: no change to high bay levels because noise propagation comes from circuit

- Test section disassembled: expected levels in the high bay: >100 dBA

Add Isolation Barrier #2 to downstream side of test section lining

40- x 80-foot wind tunnel test section = 76 dBA
  Rationale: transmission loss through 3/4" plywood is 35 dBA, each source is treated
40- x 80-foot wind tunnel high bay = 89 dBA

- Test section disassembled: expected levels in the high bay: 89 dBA

Overhead test section doors open

No isolation barriers

40- x 80-foot wind tunnel test section = 106 dBA
  Rationale: approximately 2 dBA loss through open overhead doors
40- x 80-foot wind tunnel high bay = 93 dBA
  Rationale: 4 dBA increase measured when overhead doors are opened

- Test section disassembled: expected levels in the high bay: >100 dBA

Add Isolation Barrier #1 to upstream side of test section lining

40- x 80-foot wind tunnel test section = 103 dBA
  Rationale: three sources: one from upstream, one from downstream, one from high bay through open doors. transmission loss through 3/4" plywood is 35 dBA, but noise propagation now primarily from downstream side of test section
40- x 80-foot wind tunnel high bay = 93 dBA
  Rationale: no change to high bay levels

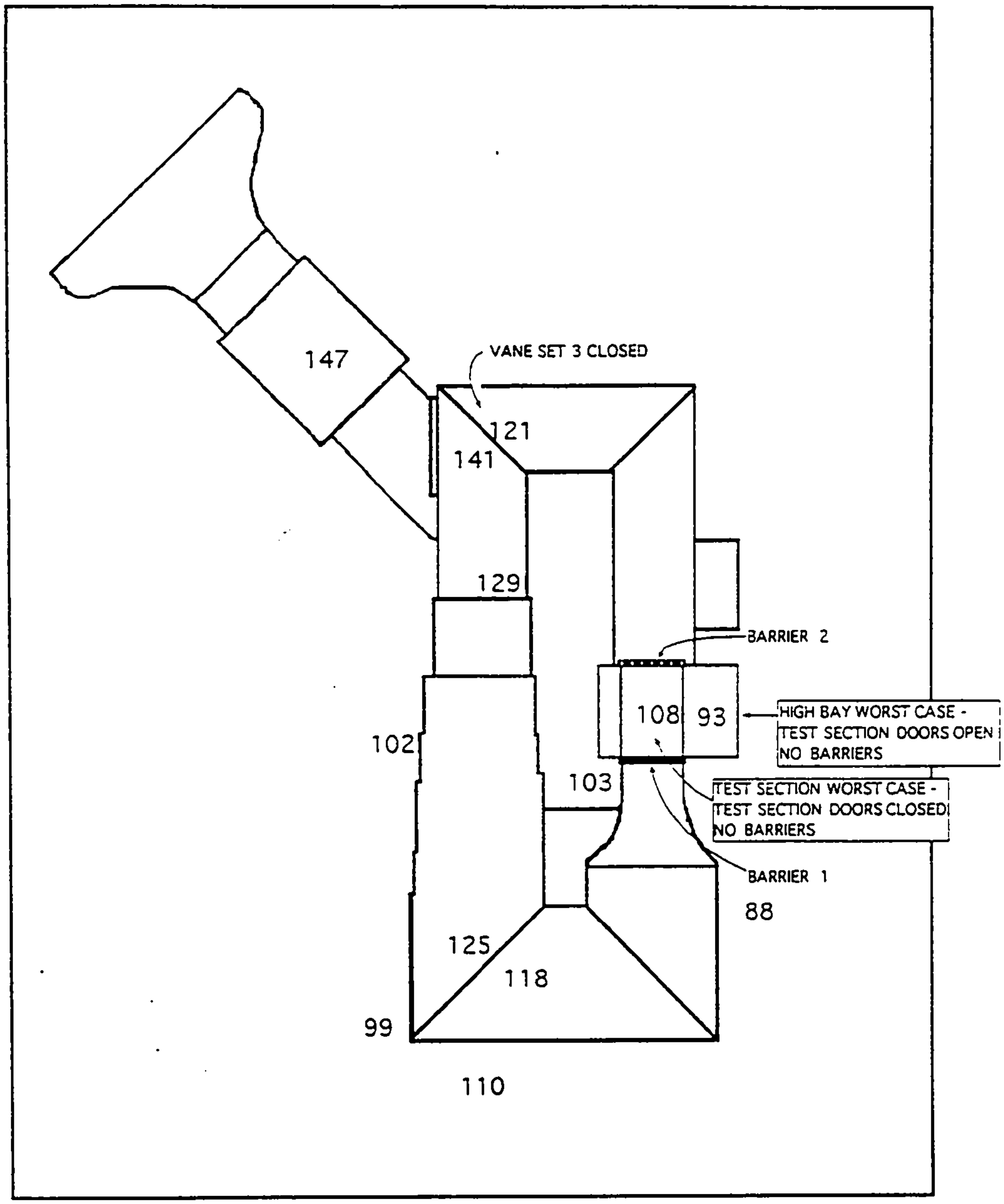
- Test section disassembled: expected levels in the high bay: >100 dBA

Add Isolation Barrier #2 to downstream side of test section lining

40- x 80-foot wind tunnel test section = 86 dBA
  Rationale: transmission loss through 3/4" plywood is 35 dBA, two sources are treated, but now the high bay noise propagates into the test section
40- x 80-foot wind tunnel high bay = 89 dBA
  Rationale: high bay levels return to original level, because noise propagation comes from circuit

- Test section disassembled: expected levels in the high bay: 89 dBA

All values have an error of ± 3 dBA.



MD CALF NOISE IN VTOL CONFIGURATION (Full Power NPR=3.5), dBA

Error +/- 3 dBA for all values.

APPENDIX B

Sept. 9, 1994

Lockheed CALF Full Power (NPR 2.0) - VTOL configuration, Jet Noise Only

Overhead test section doors closed

No isolation barriers

40- x 80-foot wind tunnel test section = 86 dBA
Rationale: CALF prediction based on data scaled from J97 test
40- x 80-foot wind tunnel high bay = 67 dBA
Rationale: CALF prediction based on data scaled from J97 test
- Test section disassembled: expected levels in the high bay: ≥80 dBA

Add Isolation Barrier #1 to upstream side of test section lining (assume sealed barrier)

40- x 80-foot wind tunnel test section = 83 dBA
Rationale: two sources: one from upstream, one from downstream. transmission loss through 3/4" plywood is 35 dBA, but noise propagation now primarily from downstream side of test section
40- x 80-foot wind tunnel high bay = 67 dBA
Rationale: no change to high bay levels because noise propagation comes from circuit
- Test section disassembled: expected levels in the high bay: ≥ 80 dBA

Add Isolation Barrier #2 to downstream side of test section lining

40- x 80-foot wind tunnel test section = 54 dBA
Rationale: transmission loss through 3/4" plywood is 35 dBA, each source is treated
40- x 80-foot wind tunnel high bay = 67 dBA
- Test section disassembled: expected levels in the high bay: 67 dBA

Overhead test section doors open

No isolation barriers

40- x 80-foot wind tunnel test section = 84 dBA
Rationale: approximately 2 dBA loss through open overhead doors
40- x 80-foot wind tunnel high bay = 71 dBA
Rationale: 4 dBA increase measured when overhead doors are opened
- Test section disassembled: expected levels in the high bay: ≥ 80 dBA

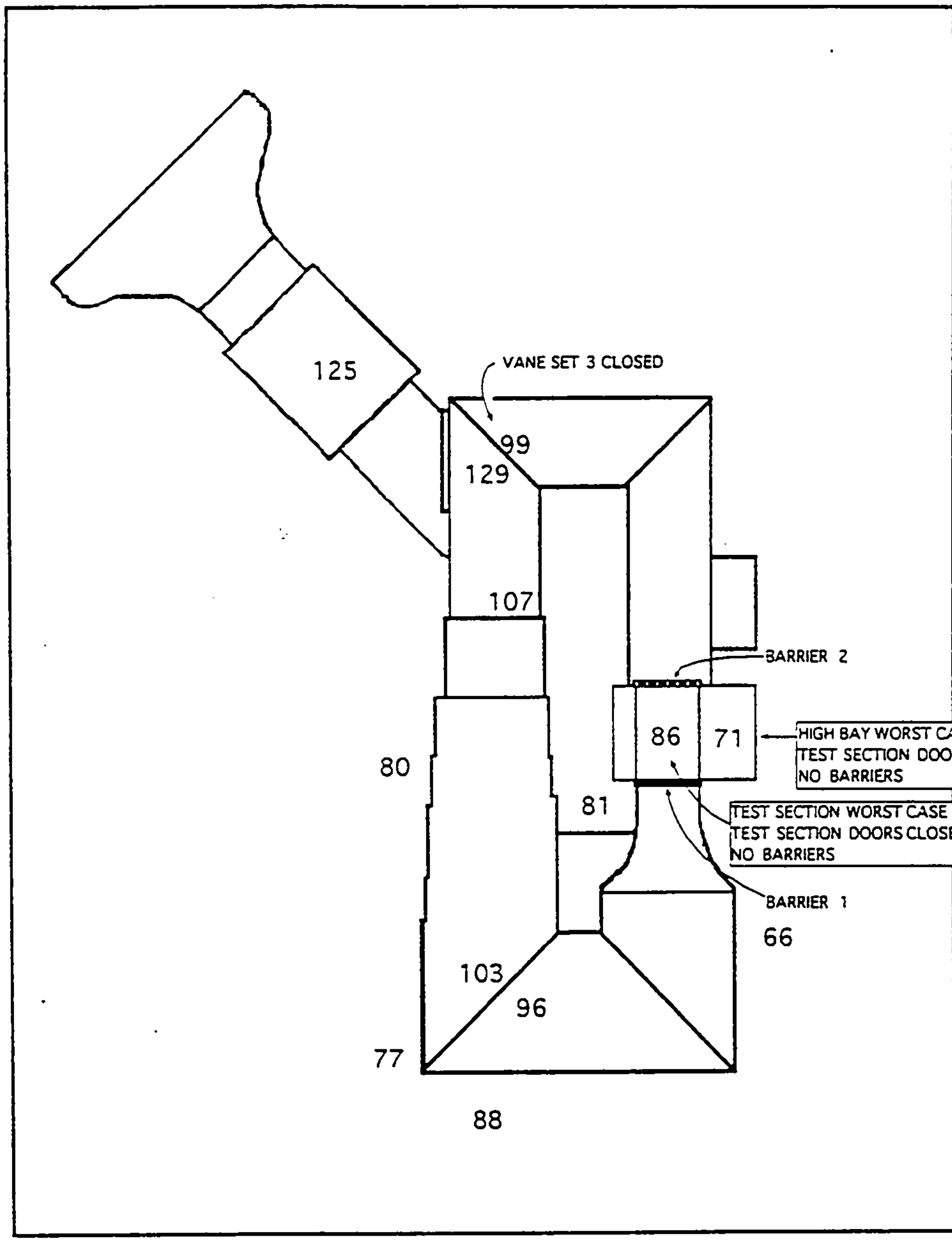
Add Isolation Barrier #1 to upstream side of test section lining

40- x 80-foot wind tunnel test section = 81 dBA
Rationale: three sources: one from upstream, one from downstream, one from high bay through open doors. transmission loss through 3/4" plywood is 35 dBA, but noise propagation now primarily from downstream side of test section
40- x 80-foot wind tunnel high bay = 71 dBA
Rationale: no change to high bay levels
- Test section disassembled: expected levels in the high bay: ≥ 80 dBA

Add Isolation Barrier #2 to downstream side of test section lining

40- x 80-foot wind tunnel test section = 64 dBA
Rationale: transmission loss through 3/4" plywood is 35 dBA, two sources are treated, but now the high bay noise propagates into the test section
40- x 80-foot wind tunnel high bay = 67 dBA
Rationale: high bay levels return to original level, because noise propagation comes from circuit
- Test section disassembled: expected levels in the high bay: 67 dBA

All values have an error of ± 3 dBA.



LOCKHEED CALF NOISE VTOL CONFIGURATION (Full Power NPR=2.0, Jet Noise Only)

Error +/- 3 dBA for all values.

Appendix D
NASA AMES SURROUNDING CENSUS TRACT INFORMATION, 1990

■ ■ ■

Table D-1
1990 SUMMARY OF RACE
CENSUS TRACTS SURROUNDING NASA AMES RESEARCH CENTER

Tract	5046.01	5047	5091.04	5092.01	Total
RACE					
All Persons (for which race was determined)	2,237	1,672	7,429	3,838	15,176
White (not hispanic)	1,509	1,330	4,249	2,528	9,616
	67.5%	79.5%	57.2%	65.9%	63.4%
White (hispanic)	116	56	605	202	979
	5.2%	3.3%	8.1%	5.3%	6.5%
Black	298	157	630	136	1,221
	13.3%	9.4%	8.5%	3.5%	8.0%
American Indian, Eskimo, or Aleut	26	--	75	11	112
	1.2%	--	1.0%	0.3%	0.7%
Asian or Pacific Islander	233	86	1,271	756	2,346
	10.4%	5.1%	17.1%	19.7%	15.5%
Other	55	43	599	205	902
	2.5%	2.6%	8.1%	5.3%	5.9%
Combined Minority Population	728	342	3,180	1,310	5,560
	32.5%	20.5%	42.8%	34.1%	36.6%

Note: As defined by the Department of Housing and Urban Development (HUD), a minority community is one which has minority households, including hispanic white households, of 40 percent or more. However, the U.S. Census does not specifically define the number of minority households within each individual Census tract. For this reason, data for individual persons is presented in this table. It can be assumed that the percentages shown in this table are generally consistent with the percentage of households for each applicable category.

Source: 1990 Census Data. Association of Bay Area Governments (ABAG) Regional Data Center. Santa Clara County, California. August 1992.

Table D-2
1990 SUMMARY OF INCOME AND POVERTY STATUS
CENSUS TRACTS SURROUNDING NASA AMES RESEARCH CENTER

Tract	5046.01	5047	5091.04	5092.01	Total
INCOME (1989)					
Households (for which 1989 income was defined)	807	169	3,140	2,012	6,128
< $25,000 (very low income)	308	18	587	399	1,312
	38.2%	10.7%	18.7%	19.8%	21.4%
$25,000 to $39,999 (low income)	219	40	770	420	1,449
	27.1%	23.7%	24.5%	20.9%	23.6%
$40,000 to $99,999	280	103	1,594	1,026	3,003
	34.7	60.9%	50.8%	51.0%	49.0%
> $100,000	--	8	189	167	364
	--	4.7%	6.0%	8.3%	5.9%
Low and Very Low Income Households	527	58	1,357	819	2,761
	65.3%	34.3%	43.2%	40.7%	45.1%
POVERTY (1989)					
Total Persons	2,771	635	7,397	4,206	15,009
Persons < Poverty	165	25	395	266	851
	6.0%	3.9%	5.3%	6.3%	5.7%
Total Families	705	162	1,668	940	3,475
Families < Poverty	39	6	52	22	119
	5.5%	3.7%	3.1%	2.3%	3.4%

Note: As defined by the Department of Housing and Urban Development (HUD), low income households are those households with incomes that are 51 to 80 percent of the mean household income, and very low income households are those households with incomes under 50 percent of the mean household income. The overall mean household income for the City of Mountain View is $49,904. Based on this mean income, the above table assumes that the incomes for low income households are between $25,000 to $39,999, and that the incomes for very low income households are below $25,000.

Source: 1990 Census Data. Association of Bay Area Governments (ABAG) Regional Data Center. Santa Clara County, California. August 1992.

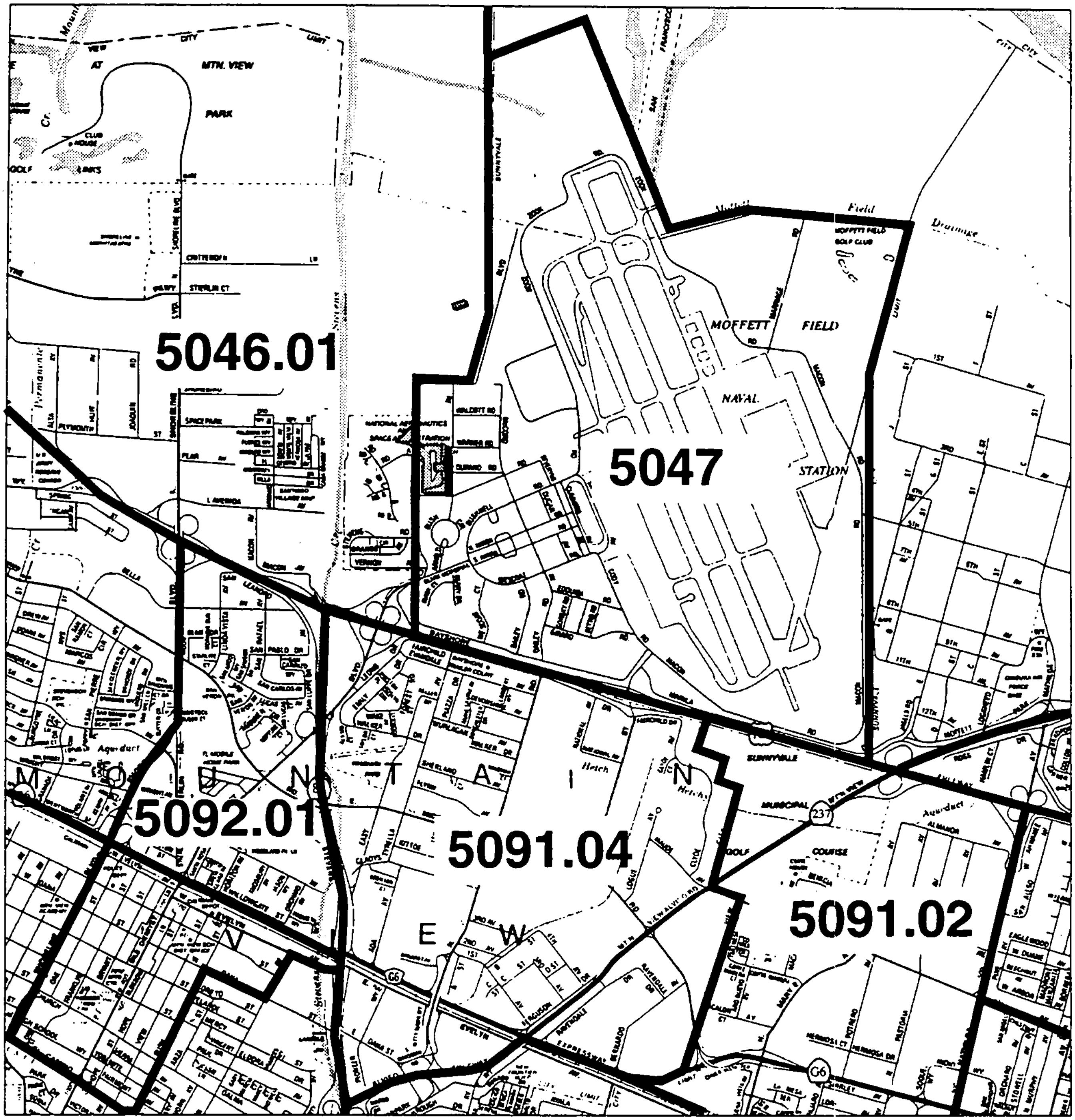


FIGURE D-1

N

0 1/4 1/2
Scale in Miles

SOURCE: United Staes Census. 1990

Census Tracts Surrounding NASA Ames Research Center

AMES AERODYNAMICS TESTING

Appendix E
NOISE MEASUREMENT PROGRAM

■ ■ ■

A. Short-Term Measurements

The purpose of the short-term measurements was to evaluate the outdoor-to-indoor sound isolation characteristics of a number of noise-sensitive buildings in the vicinity of the NFAC wind tunnel complex. The following buildings were included in this measurement program.

- Santiago Villa Mobile Home Park (2 units)
- Onizuka Air Station Annex Child Development Center
- Onizuka Air Station Housing (units 703F and 845E)
- NASA Ames' Teacher Resource Center
- NASA Ames' Visitor Resource Center
- NASA Ames Research Center Buildings 221 and 261
- Health Care Center

The table presented in this appendix shows the outdoor-to-indoor octave band noise reduction provided by these buildings. This data was obtained by conducting sound level measurements on December 5, 1994 with a jet engine mounted on a steel frame adjacent to the 80- by 120-foot test section of the NFAC. The engine was then operated at 90 percent throttle. Octave band sound levels were measured inside and outside each of the buildings. Ambient sound levels were also measured inside each of the buildings to confirm that the indoor sound levels with the engine running were, in fact, generated by the engine.

Table E-1
SUMMARY OF OCTAVE BAND NOISE REDUCTION MEASUREMENTS
(Jet engine running west of the 80- by 120-Foot Wind Tunnel; Dec. 5, 1994)

Location	Outdoor to Indoor Noise Reduction (Octave Band center Frequency in Hertz)								
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**dB**
Santiago Villa Mobile Home Park (unit 1)	11	4	17	23	29	29	17	21	**25**
Santiago Villa Mobile Home Park (unit 2)	17	13	18	22	19	18	20	27	**19**
Child Development Center	16	21	26	29	34	33	27	24	**32**
Teacher Resource Center	18	20	25	31	33	32	32	36	**32**
Onizuka Air Force Housing (unit 703F)	19	17	21	24	23	21	22	26	**22**
Onizuka Air Force Housing (unit 845E)	20	24	20	22	24	24	31	26	**23**
Health Care Center	10	26	28	37	30	31	14	n/a	**32**
Visitor Center	19	21	24	24	29	28	26	26	**27**
Ames Research Center Building 221	18	13	19	25	29	34	35	34	**26**
Ames Research Center Building 261	A-weighted level increased to only 3.5 dB above ambient with engine on. A-weighted indoor to outdoor noise reduction is probably about 30 dB.								

Most of the measurements were made by recording the noise on magnetic audio cassettes or digital audio tape, which was subsequently analyzed and measured. However, octave band sound levels at the Medical Center, the Visitor's Center, and Buildings 221 and 261 were measured on-site during the tests using the octave band filter accessories for the B&K 2230 sound level meters.

B. Long Term Measurements

The purpose of the long-term measurements was to help describe the existing outdoor noise environment in the vicinity of the aerodynamics testing facilities. Programmable digital sound level meters were used to collect statistical information on sound levels at three locations over a period of nearly six days, from November 30, 1994 to December 6, 1994. The location of the monitoring stations is shown in Figure E-1. The digital sound level meters recorded the A-weighted sound level each half second, then calculated and stored summary statistical information hourly. This information includes maximum level (L_{max}), minimum level (L_{min}), L_{10}, L_{33}, L_{50}, L_{90} (L_n is the level exceeded in n% of the data points), and equivalent level (L_{eq}).

Figures 1 through 15 show the hourly L_{eq}, hourly L_{90}, and L_{dn} at each location for each of the five complete days from 1 December through 5 December. The figures include L_{90} because this metric provides a good approximation of the background sound level in the absence of any discernable single events.

The unusually high noise levels at each of the three measurement sites between 2:00 and 3:00 are a result of the short-term noise measurements. For approximately 30 minutes of this hour, a jet engine was running outdoors adjacent to the 80- by 120-Foot Wind Tunnel. The L_{90}, indicated by a dotted line was not significantly affected by the high level, short duration noise of the engine.

Between 7 and 8 pm on 2 December there was another relatively high level, short duration noise. This may well have been noise from testing in one of the wind tunnels.

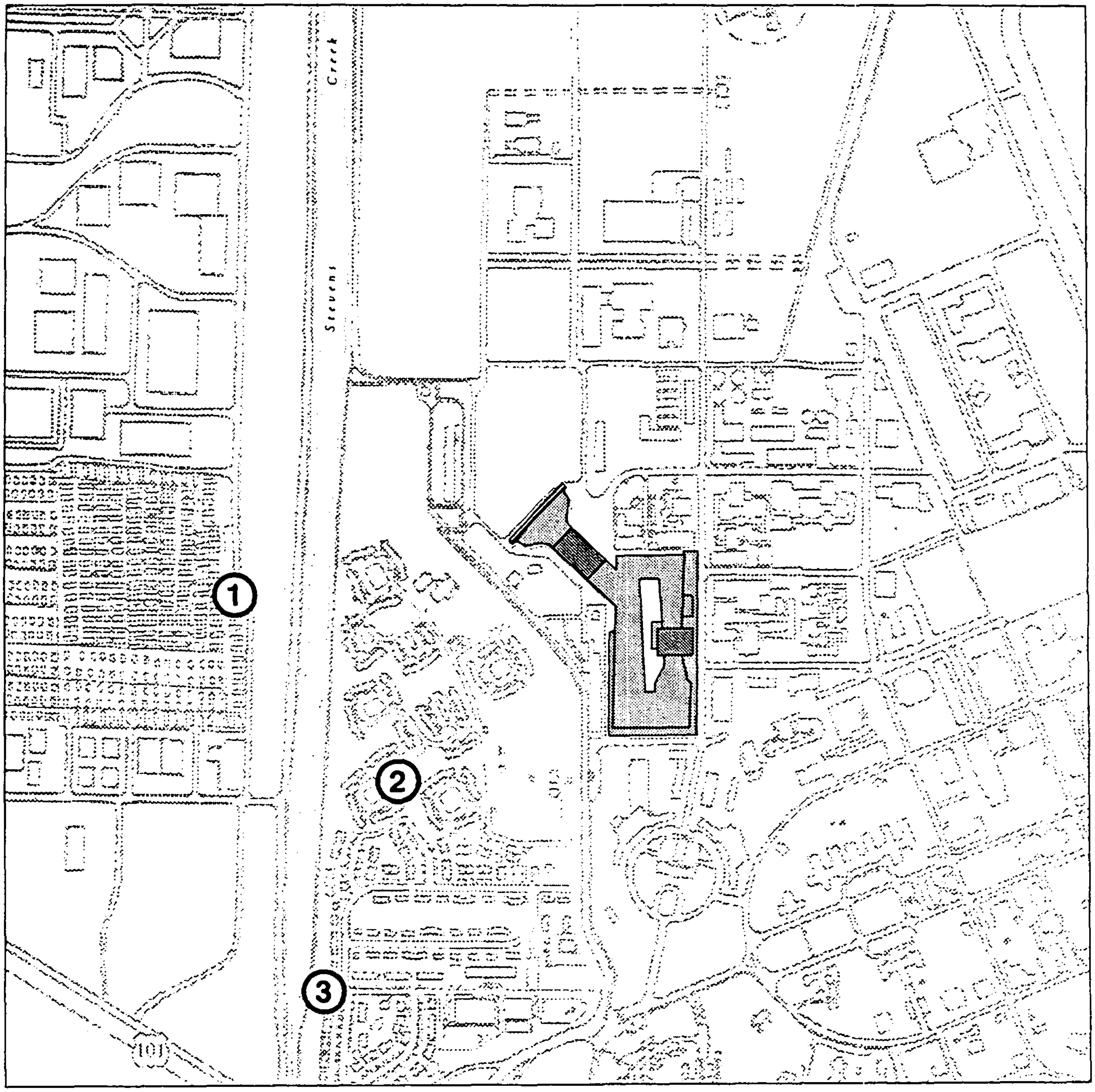


FIGURE E-1

0 350 700
Scale in Feet

SOURCE: Charles Salter Associates.
February 1995.

Noise Monitoring Locations

(1) Noise monitor
on power line tower

(2) Noise monitor
in tree near townhomes

(3) Noise monitor
on light pole in front of houses

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9.026

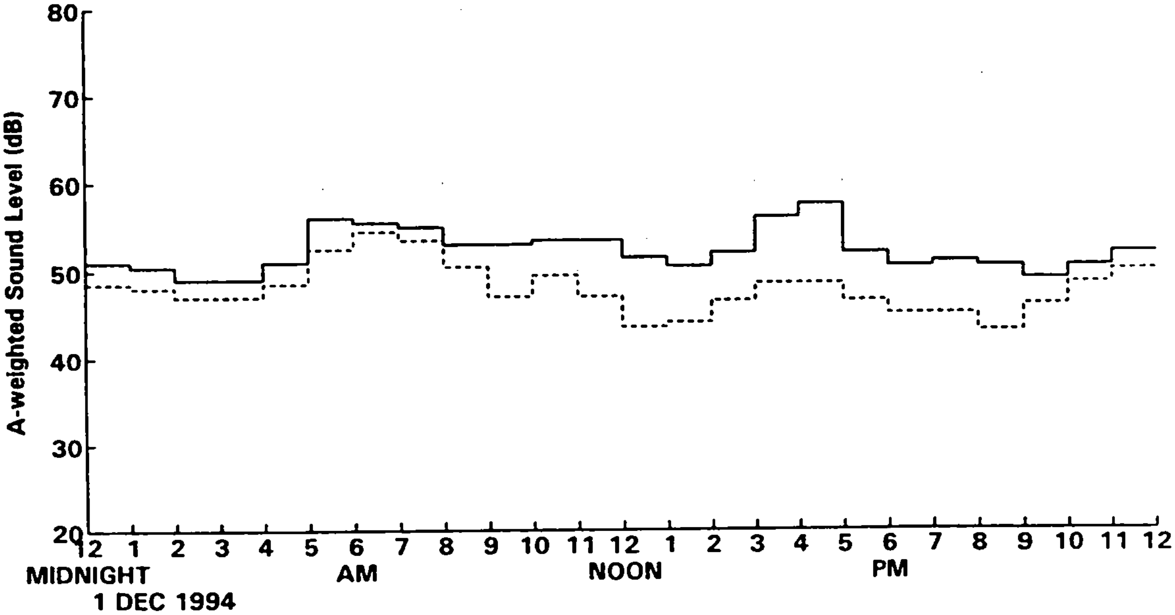


Figure 1: Moffett Field; 1 Dec. 1994
Across Creek on Power Line Tower
6 ft above ground
Ldn = 59 dB

Leq

L90

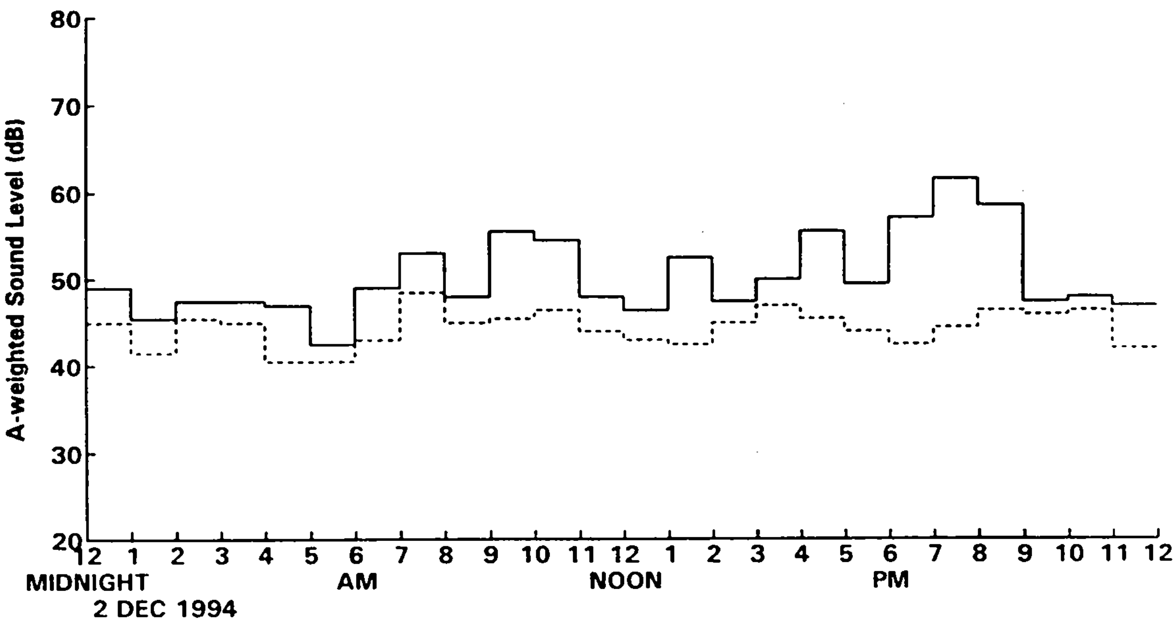


Figure 2: Moffett Field; 2 Dec. 1994
Across Creek on Power Line Tower
6 ft above ground
Ldn = 56 dB

Leq

L90

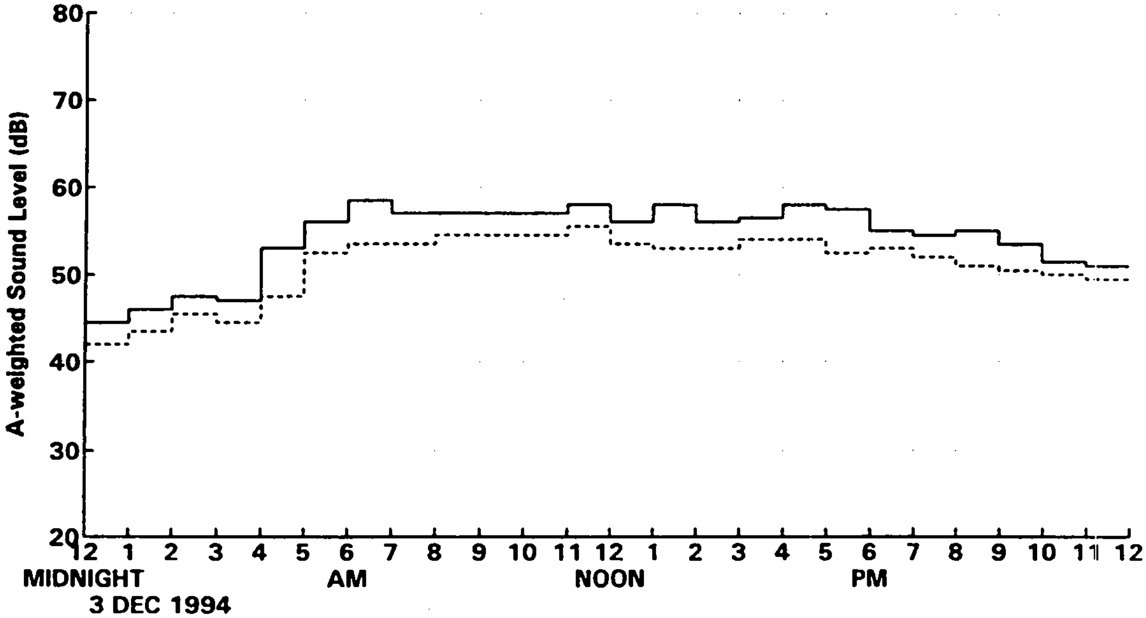


Figure 3: Moffett Field; 3 Dec. 1994
Across Creek on Power Line Tower
6 ft above ground
Ldn = 60 dB

Leq

L90

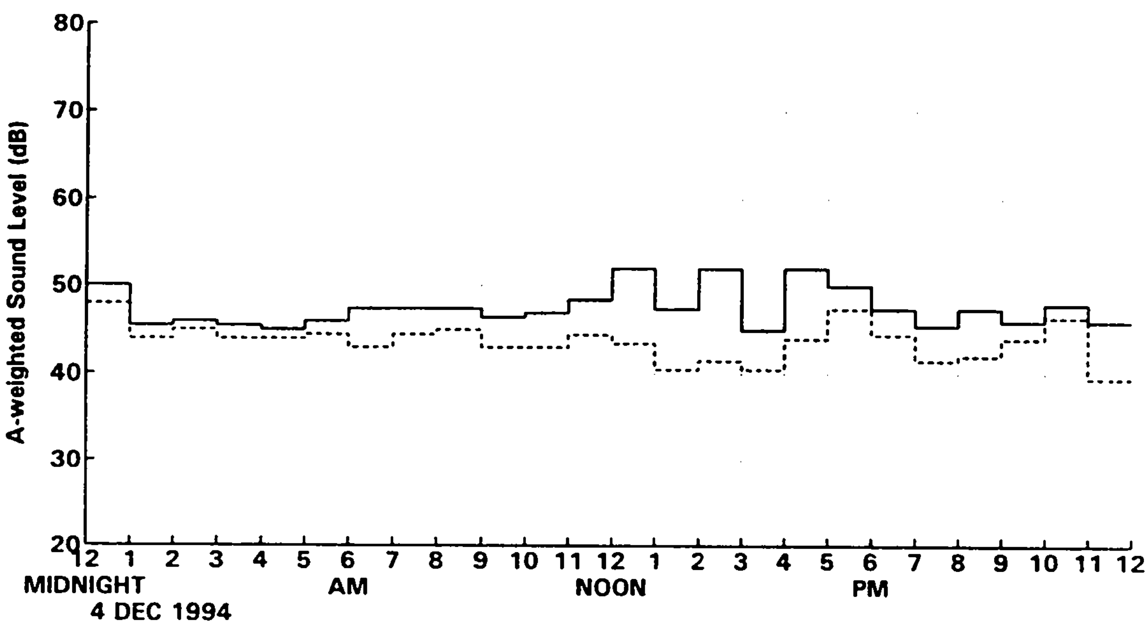


Figure 4: Moffett Field; 4 Dec. 1994
Across Creek on Power Line Tower
6 ft above ground
Ldn = 54 dB

Leq

L90

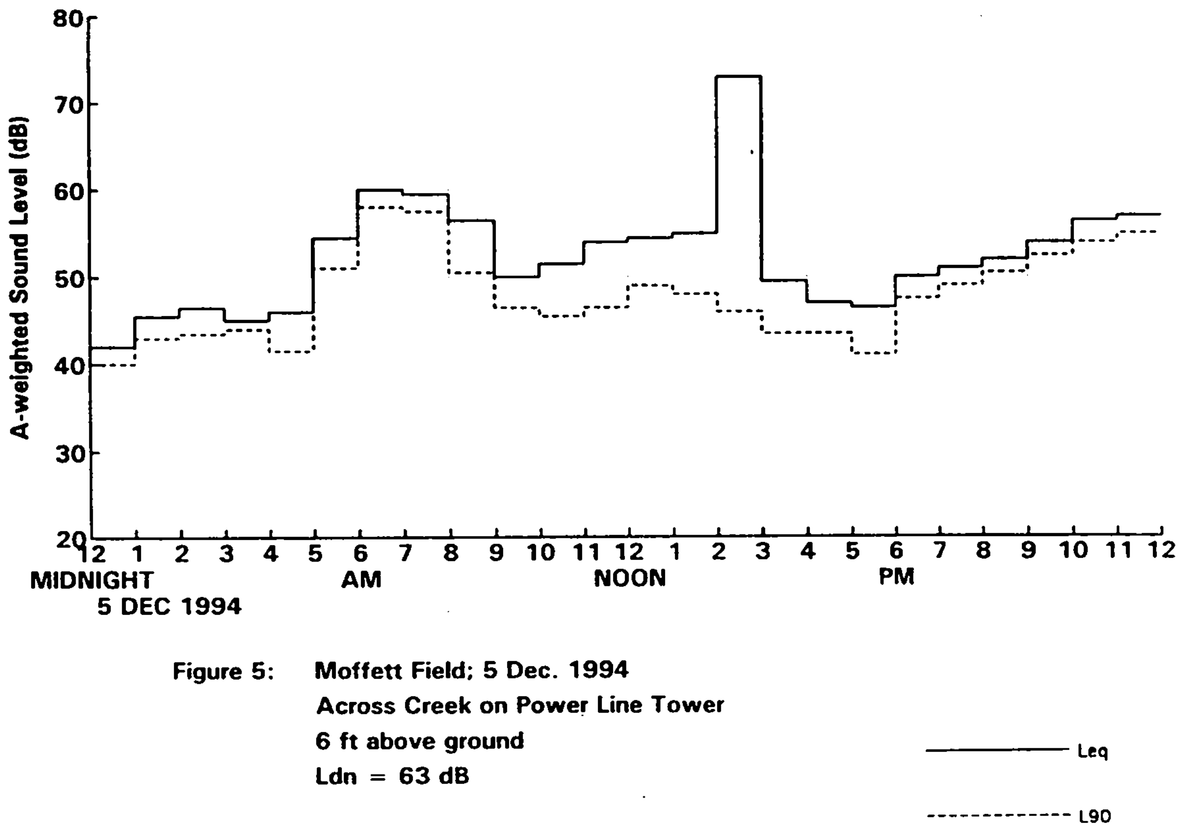


Figure 5: Moffett Field; 5 Dec. 1994
Across Creek on Power Line Tower
6 ft above ground
Ldn = 63 dB

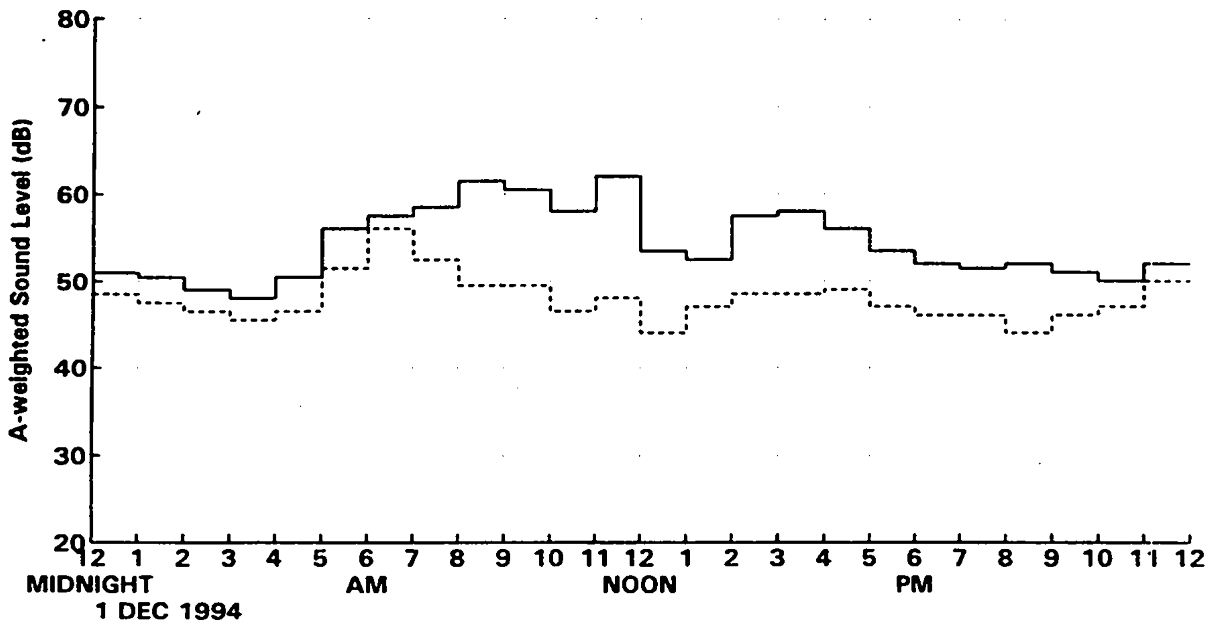
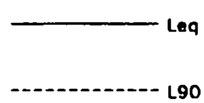


Figure 6: Moffett Field Housing; 1 Dec. 1994
Near newer townhouses off of Stevens Way
Suspended in tree 6 ft above ground
Ldn = 60 dB



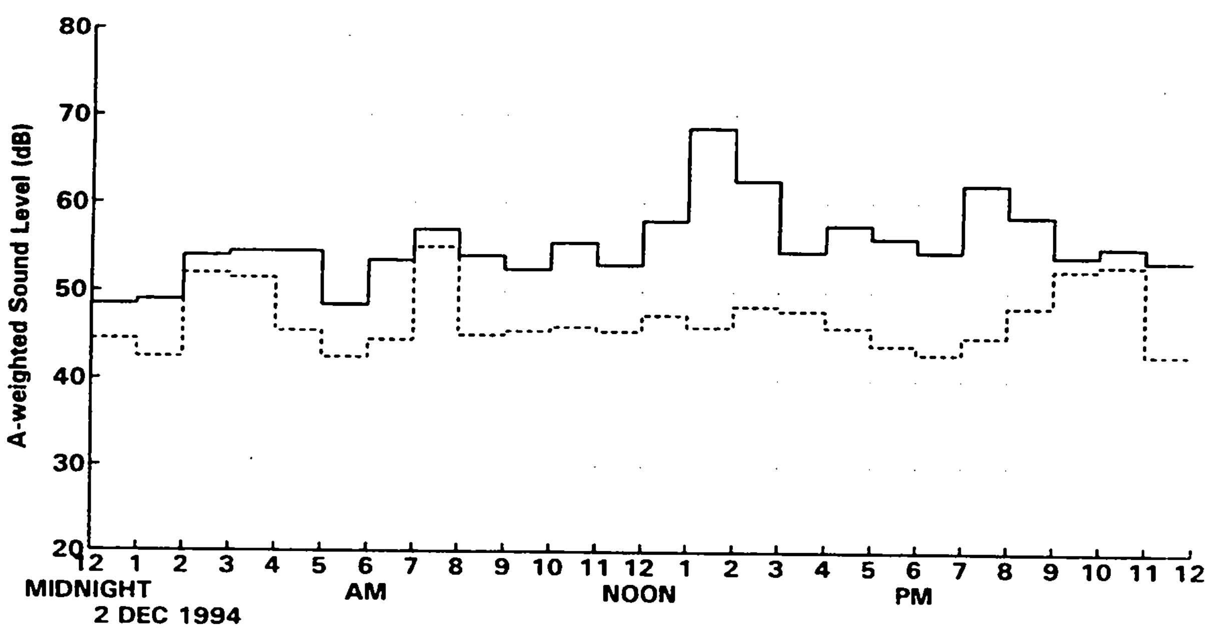
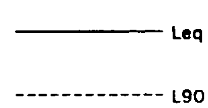


Figure 7: Moffett Field Housing; 2 Dec. 1994
Near newer townhouses off of Stevens Way
Suspended in tree 6 ft above ground
Ldn = 61 dB



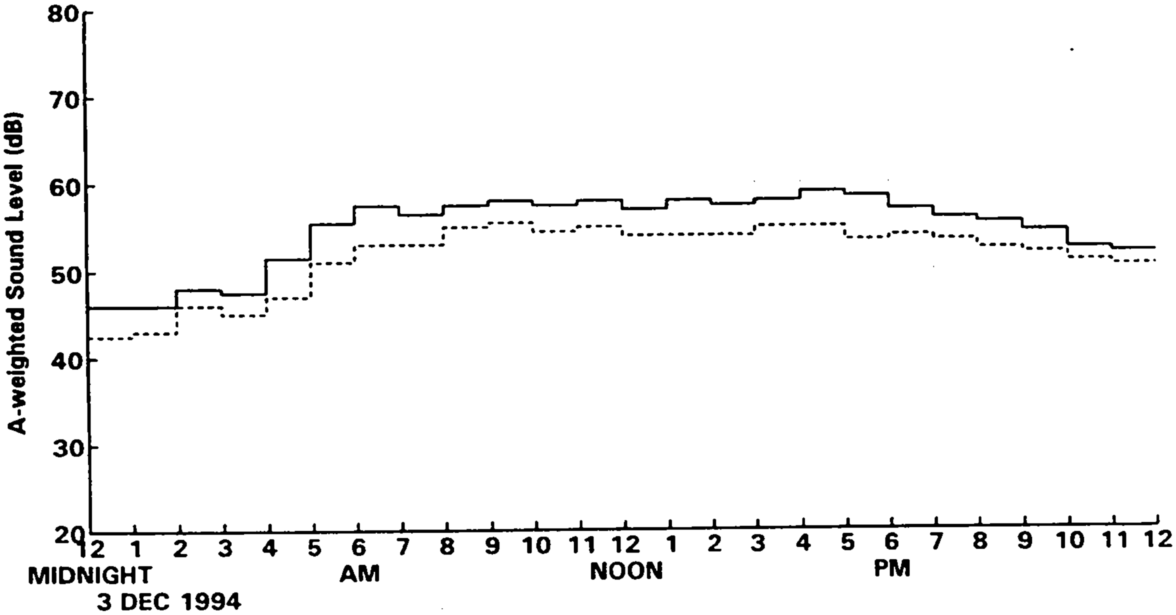


Figure 8: Moffett Field Housing; 3 Dec. 1994
Near newer townhouses off of Stevens Way
Suspended in tree 6 ft above ground
Ldn = 60 dB

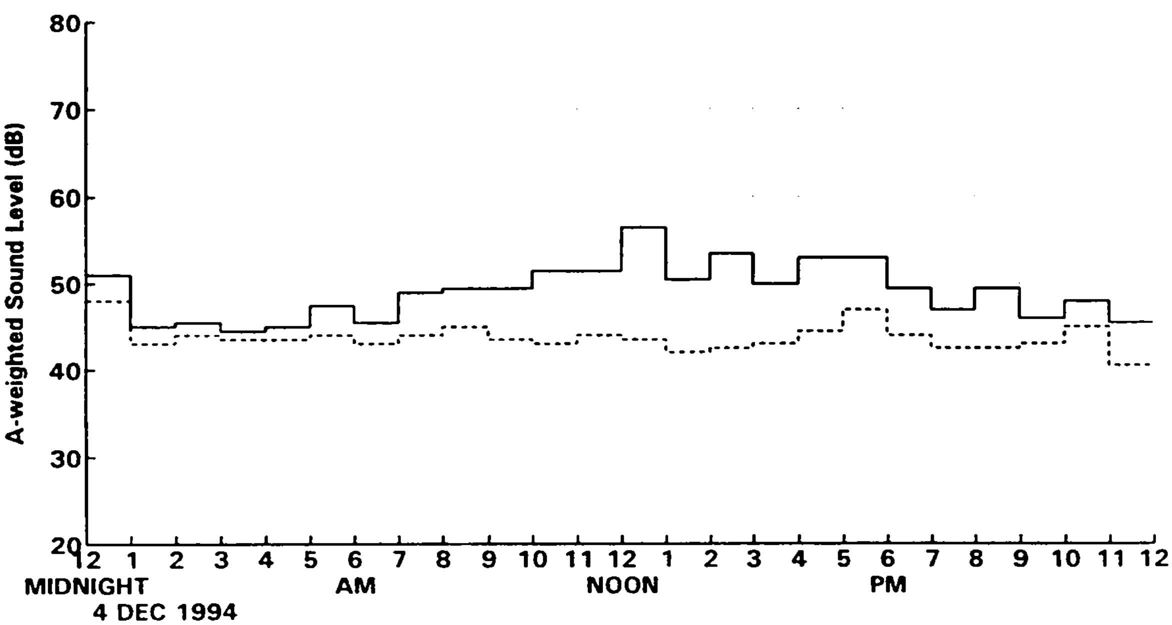


Figure 9: Moffett Field Housing; 4 Dec. 1994
Near newer townhouses off of Stevens Way
Suspended in tree 6 ft above ground
Ldn = 54 dB

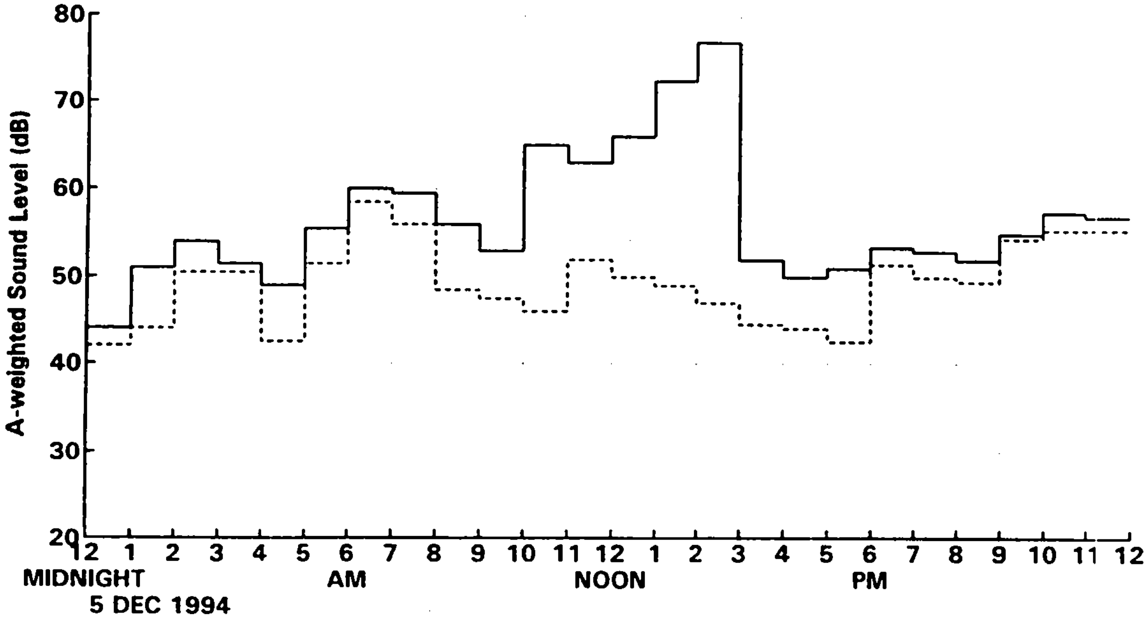


Figure 10: Moffett Field Housing; 5 Dec. 1994
Near newer townhouses off of Stevens Way
Suspended in tree 6 ft above ground
Ldn = 67 dB

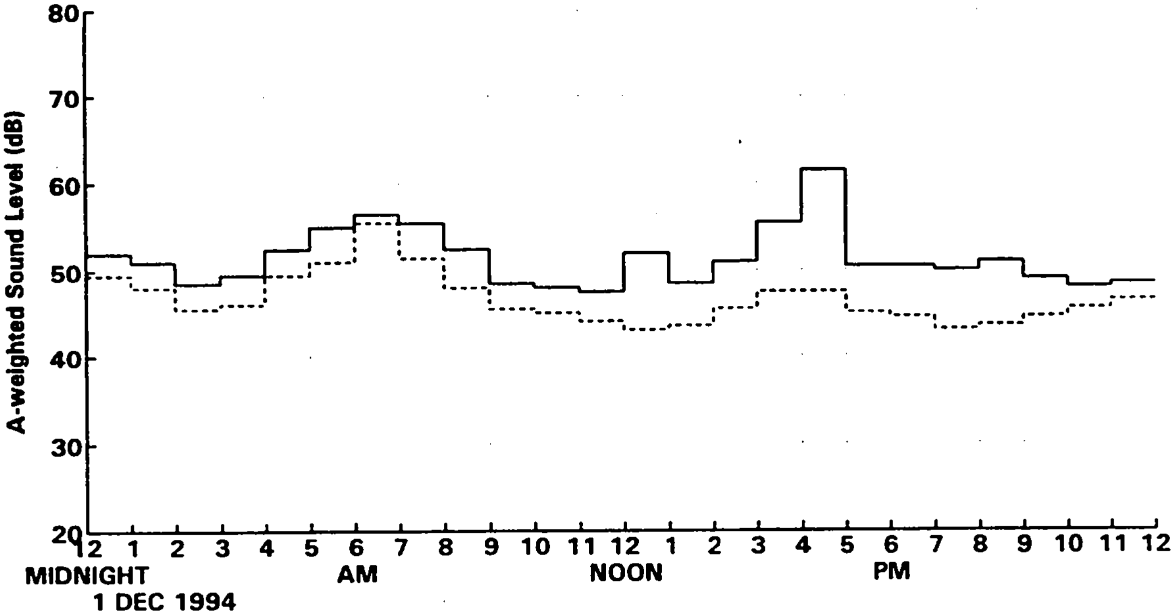
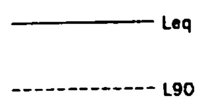


Figure 11: Moffett Field Housing; 1 Dec. 1994
In front of 347 Orange Ave near
Stevens Rd.; On pole 6 ft above ground
Ldn = 59 dB



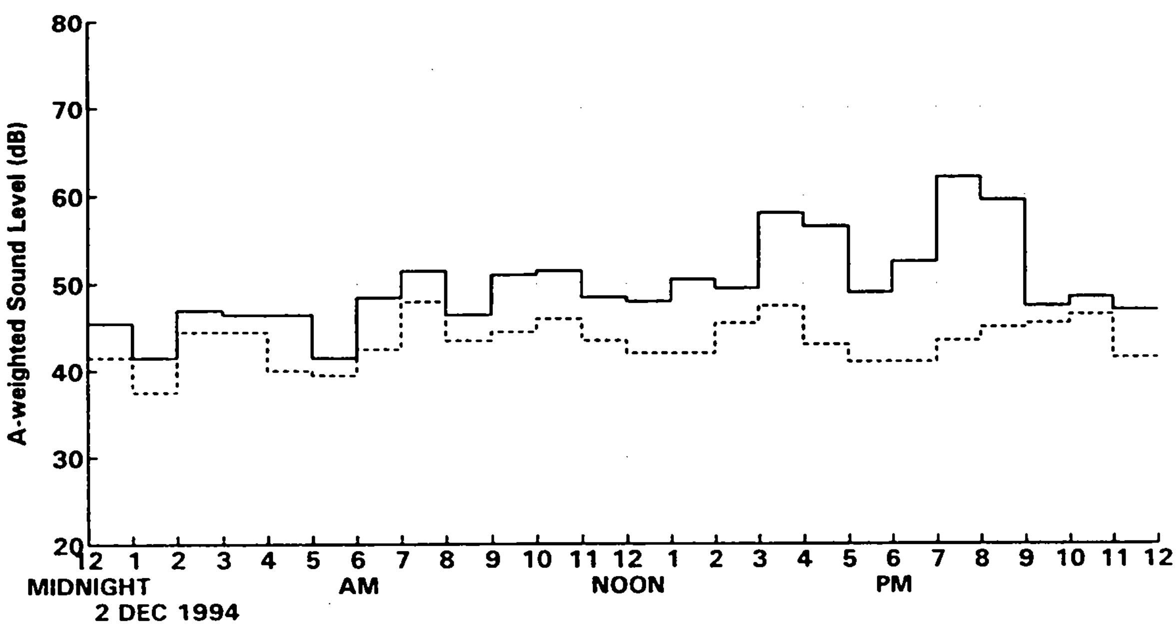
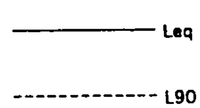


Figure 12: Moffett Field Housing; 2 Dec. 1994
In front of 347 Orange Ave near
Stevens Rd.; On pole 6 ft above ground
Ldn = 56 dB



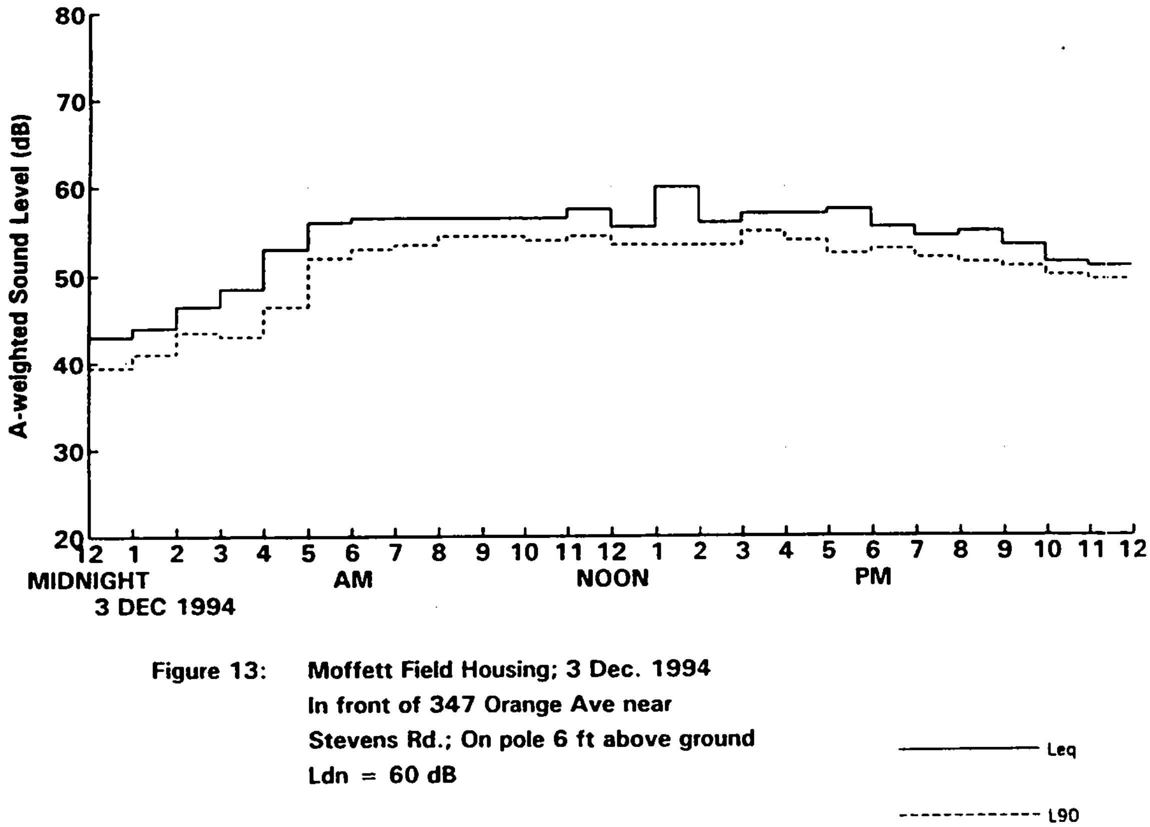


Figure 13: Moffett Field Housing; 3 Dec. 1994
In front of 347 Orange Ave near
Stevens Rd.; On pole 6 ft above ground
Ldn = 60 dB

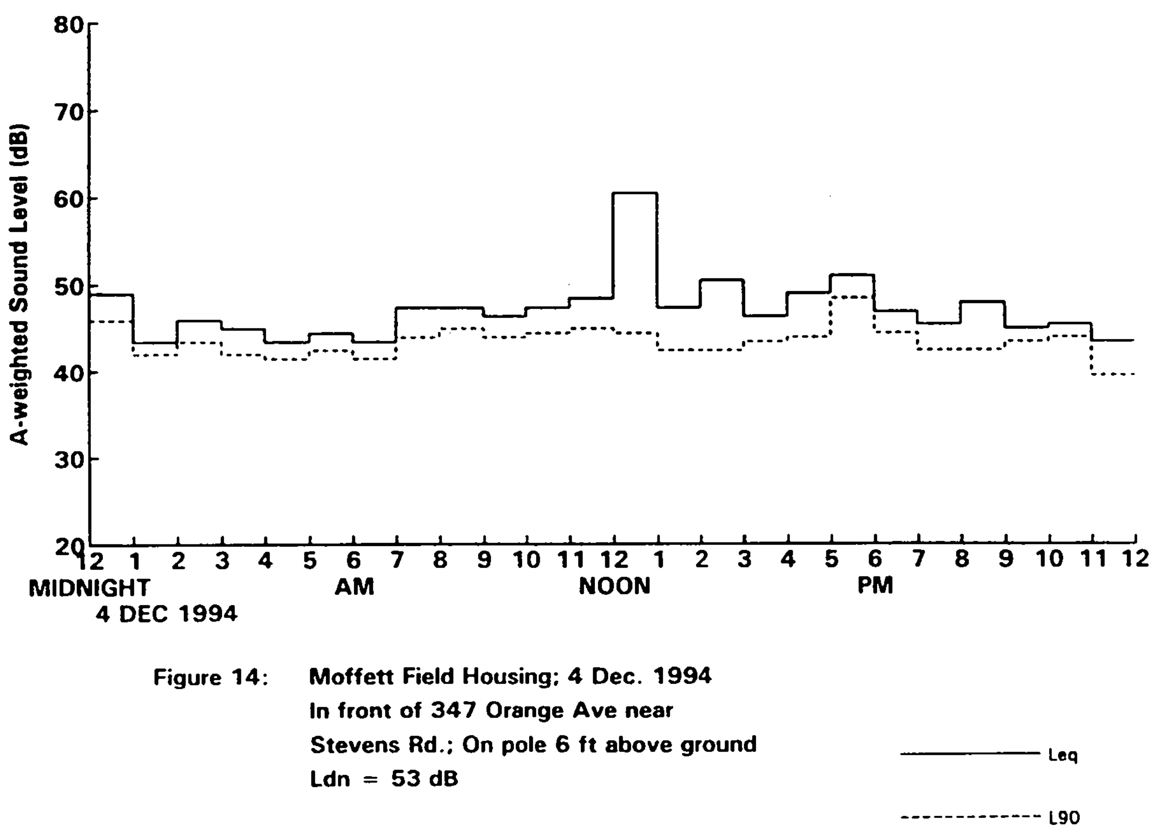


Figure 14: Moffett Field Housing; 4 Dec. 1994
In front of 347 Orange Ave near
Stevens Rd.; On pole 6 ft above ground
Ldn = 53 dB

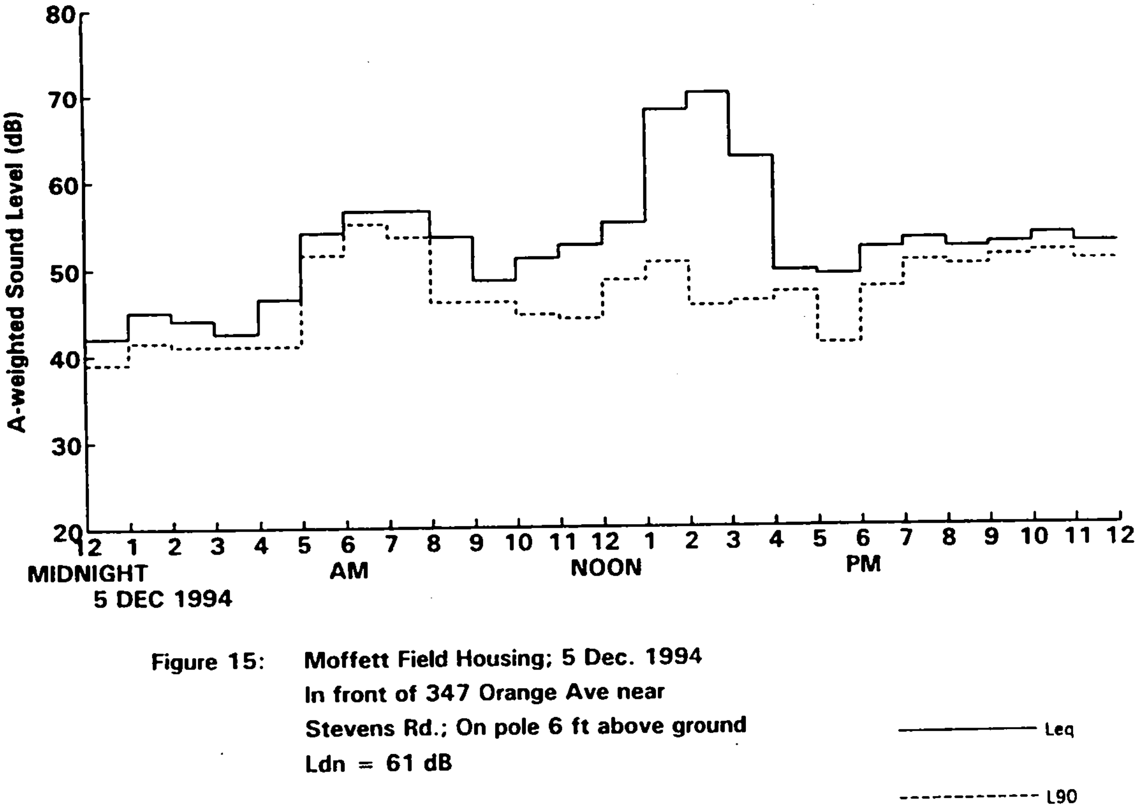


Figure 15: Moffett Field Housing; 5 Dec. 1994
In front of 347 Orange Ave near
Stevens Rd.; On pole 6 ft above ground
Ldn = 61 dB

Moffett Field
Across Creek on Power Line Tower
6 ft above ground

12-06-1994
10:36:13
MOFFETA

Date	Start Time	Leq		
1 DEC	0:00:01	51.0		
1 DEC	1:00:01	50.5		
1 DEC	2:00:01	49.0		
1 DEC	3:00:01	49.0		
1 DEC	4:00:01	51.0		
1 DEC	5:00:01	56.0		
1 DEC	6:00:01	55.5		
1 DEC	7:00:01	55.0		
1 DEC	8:00:01	53.0		
1 DEC	9:00:01	53.0		
1 DEC	10:00:01	53.5		
1 DEC	11:00:01	53.5		
1 DEC	12:00:02	51.5		
1 DEC	13:00:02	50.5		
1 DEC	14:00:02	52.0		
1 DEC	15:00:02	56.0		
1 DEC	16:00:02	57.5		
1 DEC	17:00:01	52.0		
1 DEC	18:00:00	50.5		
1 DEC	19:00:00	51.0		
1 DEC	20:00:00	50.5		
1 DEC	21:00:00	49.0		
1 DEC	22:00:00	50.5		
1 DEC	23:00:00	52.0	Ldn = 58.9	CNEL = 59.0

Moffett Field
Across Creek on Power Line Tower
6 ft above ground

12-06-1994
10:36:13
MOFFETA

Date	Start Time	Leq
2 DEC	0:00:00	49.0
2 DEC	1:00:00	45.5
2 DEC	2:00:00	47.5
2 DEC	3:00:00	47.5
2 DEC	4:00:00	47.0
2 DEC	5:00:00	42.5
2 DEC	6:00:00	49.0
2 DEC	7:00:00	53.0
2 DEC	8:00:00	48.0
2 DEC	9:00:00	55.5
2 DEC	10:00:00	54.5
2 DEC	11:00:00	48.0
2 DEC	12:00:00	46.5
2 DEC	13:00:00	52.5
2 DEC	14:00:00	47.5
2 DEC	15:00:00	50.0
2 DEC	16:00:00	55.5
2 DEC	17:00:01	49.5
2 DEC	18:00:01	57.0
2 DEC	19:00:01	61.5
2 DEC	20:00:01	58.5
2 DEC	21:00:01	47.5
2 DEC	22:00:01	48.0
2 DEC	23:00:01	47.0

Ldn = 55.9   CNEL = 57.6

Moffett Field
Across Creek on Power Line Tower
6 ft above ground

12-06-1994
10:36:13
MOFFETA

Date	Start Time	Leq
3 DEC	0:00:01	44.5
3 DEC	1:00:01	46.0
3 DEC	2:00:01	47.5
3 DEC	3:00:01	47.0
3 DEC	4:00:01	53.0
3 DEC	5:00:01	56.0
3 DEC	6:00:01	58.5
3 DEC	7:00:01	57.0
3 DEC	8:00:01	57.0
3 DEC	9:00:01	57.0
3 DEC	10:00:01	57.0
3 DEC	11:00:01	58.0
3 DEC	12:00:01	56.0
3 DEC	13:00:01	58.0
3 DEC	14:00:01	56.0
3 DEC	15:00:01	56.5
3 DEC	16:00:01	58.0
3 DEC	17:00:02	57.5
3 DEC	18:00:02	55.0
3 DEC	19:00:02	54.5
3 DEC	20:00:02	55.0
3 DEC	21:00:02	53.5
3 DEC	22:00:02	51.5
3 DEC	23:00:02	51.0

Ldn = 60.1 CNEL = 60.3

Moffett Field
Across Creek on Power Line Tower
6 ft above ground

12-06-1994
10:36:13
MOFFETA

Date	Start Time	Leq
4 DEC	0:00:02	50.0
4 DEC	1:00:02	45.5
4 DEC	2:00:02	46.0
4 DEC	3:00:02	45.5
4 DEC	4:00:02	45.0
4 DEC	5:00:02	46.0
4 DEC	6:00:02	47.5
4 DEC	7:00:02	47.5
4 DEC	8:00:02	47.5
4 DEC	9:00:02	46.5
4 DEC	10:00:02	47.0
4 DEC	11:00:02	48.5
4 DEC	12:00:02	52.0
4 DEC	13:00:01	47.5
4 DEC	14:00:00	52.0
4 DEC	15:00:00	45.0
4 DEC	16:00:00	52.0
4 DEC	17:00:00	50.0
4 DEC	18:00:00	47.5
4 DEC	19:00:00	45.5
4 DEC	20:00:00	47.5
4 DEC	21:00:00	46.0
4 DEC	22:00:00	48.0
4 DEC	23:00:00	46.0

Ldn = 53.6   CNEL = 53.8

Moffett Field
Across Creek on Power Line Tower
6 ft above ground

12-06-1994
10:36:13
MOFFETA

Date	Start Time	Leq		
5 DEC	0:00:00	42.0		
5 DEC	1:00:00	45.5		
5 DEC	2:00:00	46.5		
5 DEC	3:00:00	45.0		
5 DEC	4:00:00	46.0		
5 DEC	5:00:00	54.5		
5 DEC	6:00:00	60.0		
5 DEC	7:00:00	59.5		
5 DEC	8:00:00	56.5		
5 DEC	9:00:00	50.0		
5 DEC	10:00:00	51.5		
5 DEC	11:00:00	54.0		
5 DEC	12:00:00	54.5		
5 DEC	13:00:01	55.0		
5 DEC	14:00:01	73.0		
5 DEC	15:00:01	49.5		
5 DEC	16:00:01	47.0		
5 DEC	17:00:01	46.5		
5 DEC	18:00:01	50.0		
5 DEC	19:00:01	51.0		
5 DEC	20:00:01	52.0		
5 DEC	21:00:01	54.0		
5 DEC	22:00:01	56.5		
5 DEC	23:00:01	57.0	Ldn = 62.9	CNEL = 63.0

Moffett Field Housing 12-06-1994
Near newer townhouses off of Stevens Way 10:21:39
Suspended in tree 6 ft above ground MOFFETB

Date	Start Time	Leq
1 DEC	0:00:01	51.0
1 DEC	1:00:01	50.5
1 DEC	2:00:01	49.0
1 DEC	3:00:01	48.0
1 DEC	4:00:01	50.5
1 DEC	5:00:01	56.0
1 DEC	6:00:01	57.5
1 DEC	7:00:01	58.5
1 DEC	8:00:01	61.5
1 DEC	9:00:01	60.5
1 DEC	10:00:01	58.0
1 DEC	11:00:02	62.0
1 DEC	12:00:02	53.5
1 DEC	13:00:02	52.5
1 DEC	14:00:02	57.5
1 DEC	15:00:02	58.0
1 DEC	16:00:02	56.0
1 DEC	17:00:01	53.5
1 DEC	18:00:00	52.0
1 DEC	19:00:00	51.5
1 DEC	20:00:00	52.0
1 DEC	21:00:00	51.0
1 DEC	22:00:00	50.0
1 DEC	23:00:00	52.0

Ldn = 60.2 CNEL = 60.4

Moffett Field Housing 12-06-1994
Near newer townhouses off of Stevens Way 10:21:39
Suspended in tree 6 ft above ground MOFFETB

Date	Start Time	Leq
2 DEC	0:00:00	48.5
2 DEC	1:00:00	49.0
2 DEC	2:00:00	54.0
2 DEC	3:00:00	54.5
2 DEC	4:00:00	54.5
2 DEC	5:00:00	48.5
2 DEC	6:00:00	53.5
2 DEC	7:00:00	57.0
2 DEC	8:00:00	54.0
2 DEC	9:00:00	52.5
2 DEC	10:00:00	55.5
2 DEC	11:00:00	53.0
2 DEC	12:00:00	58.0
2 DEC	13:00:00	68.5
2 DEC	14:00:00	62.5
2 DEC	15:00:00	54.5
2 DEC	16:00:00	57.5
2 DEC	17:00:01	56.0
2 DEC	18:00:01	54.5
2 DEC	19:00:01	62.0
2 DEC	20:00:01	58.5
2 DEC	21:00:01	54.0
2 DEC	22:00:01	55.0
2 DEC	23:00:01	53.5

Ldn = 61.4 CNEL = 62.0

Moffett Field Housing 12-06-1994
Near newer townhouses off of Stevens Way 10:21:39
Suspended in tree 6 ft above ground MOFFETB

Date	Start Time	Leq
3 DEC	0:00:01	46.0
3 DEC	1:00:01	46.0
3 DEC	2:00:01	48.0
3 DEC	3:00:01	47.5
3 DEC	4:00:01	51.5
3 DEC	5:00:01	55.5
3 DEC	6:00:01	57.5
3 DEC	7:00:01	56.5
3 DEC	8:00:01	57.5
3 DEC	9:00:01	58.0
3 DEC	10:00:01	57.5
3 DEC	11:00:01	58.0
3 DEC	12:00:01	57.0
3 DEC	13:00:01	58.0
3 DEC	14:00:01	57.5
3 DEC	15:00:01	58.0
3 DEC	16:00:01	59.0
3 DEC	17:00:02	58.5
3 DEC	18:00:02	57.0
3 DEC	19:00:02	56.0
3 DEC	20:00:02	55.5
3 DEC	21:00:02	54.5
3 DEC	22:00:02	52.5
3 DEC	23:00:02	52.0

Ldn = 60.0 CNEL = 60.4

Moffett Field Housing 12-06-1994
Near newer townhouses off of Stevens Way 10:21:39
Suspended in tree 6 ft above ground MOFFETB

Date	Start Time	Leq
4 DEC	0:00:02	51.0
4 DEC	1:00:02	45.0
4 DEC	2:00:02	45.5
4 DEC	3:00:02	44.5
4 DEC	4:00:02	45.0
4 DEC	5:00:02	47.5
4 DEC	6:00:02	45.5
4 DEC	7:00:02	49.0
4 DEC	8:00:02	49.5
4 DEC	9:00:02	49.5
4 DEC	10:00:02	51.5
4 DEC	11:00:02	51.5
4 DEC	12:00:02	56.5
4 DEC	13:00:01	50.5
4 DEC	14:00:00	53.5
4 DEC	15:00:00	50.0
4 DEC	16:00:00	53.0
4 DEC	17:00:00	53.0
4 DEC	18:00:00	49.5
4 DEC	19:00:00	47.0
4 DEC	20:00:00	49.5
4 DEC	21:00:00	46.0
4 DEC	22:00:00	48.0
4 DEC	23:00:00	45.5

Ldn = 54.3 CNEL = 54.6

Moffett Field Housing 12-06-1994
Near newer townhouses off of Stevens Way 10:21:39
Suspended in tree 6 ft above ground MOFFETB

Date	Start Time	Leq		
5 DEC	0:00:00	44.0		
5 DEC	1:00:00	51.0		
5 DEC	2:00:00	54.0		
5 DEC	3:00:00	51.5		
5 DEC	4:00:00	49.0		
5 DEC	5:00:00	55.5		
5 DEC	6:00:00	60.0		
5 DEC	7:00:00	59.5		
5 DEC	8:00:00	56.0		
5 DEC	9:00:00	53.0		
5 DEC	10:00:00	65.0		
5 DEC	11:00:00	63.0		
5 DEC	12:00:00	66.0		
5 DEC	13:00:01	72.5		
5 DEC	14:00:01	77.0		
5 DEC	15:00:01	52.0		
5 DEC	16:00:01	50.0		
5 DEC	17:00:01	51.0		
5 DEC	18:00:01	53.5		
5 DEC	19:00:01	53.0		
5 DEC	20:00:01	52.0		
5 DEC	21:00:01	55.0		
5 DEC	22:00:01	57.5		
5 DEC	23:00:01	57.0	Ldn = 66.6	CNEL = 66.7

Moffett Field Housing
In front of 347 Orange Ave near
Stevens Rd.; On pole 6 ft above ground

12-06-1994
10:12:29
MOFFETC

Date	Start Time	Leq
1 DEC	0:00:01	52.0
1 DEC	1:00:01	51.0
1 DEC	2:00:01	48.5
1 DEC	3:00:01	49.5
1 DEC	4:00:01	52.5
1 DEC	5:00:01	55.0
1 DEC	6:00:01	56.5
1 DEC	7:00:01	55.5
1 DEC	8:00:01	52.5
1 DEC	9:00:01	48.5
1 DEC	10:00:01	48.0
1 DEC	11:00:02	47.5
1 DEC	12:00:02	52.0
1 DEC	13:00:02	48.5
1 DEC	14:00:02	51.0
1 DEC	15:00:02	55.5
1 DEC	16:00:02	61.5
1 DEC	17:00:01	50.5
1 DEC	18:00:01	50.5
1 DEC	19:00:01	50.0
1 DEC	20:00:01	51.0
1 DEC	21:00:01	49.0
1 DEC	22:00:01	48.0
1 DEC	23:00:01	48.5

Ldn = 58.9   CNEL = 59.0

Moffett Field Housing 12-06-1994
In front of 347 Orange Ave near 10:12:29
Stevens Rd.; On pole 6 ft above ground MOFFETC

Date	Start Time	Leq
2 DEC	0:00:01	45.5
2 DEC	1:00:01	41.5
2 DEC	2:00:01	47.0
2 DEC	3:00:01	46.5
2 DEC	4:00:01	46.5
2 DEC	5:00:01	41.5
2 DEC	6:00:01	48.5
2 DEC	7:00:01	51.5
2 DEC	8:00:01	46.5
2 DEC	9:00:01	51.0
2 DEC	10:00:01	51.5
2 DEC	11:00:01	48.5
2 DEC	12:00:01	48.0
2 DEC	13:00:01	50.5
2 DEC	14:00:01	49.5
2 DEC	15:00:01	58.0
2 DEC	16:00:01	56.5
2 DEC	17:00:02	49.0
2 DEC	18:00:02	52.5
2 DEC	19:00:02	62.0
2 DEC	20:00:02	59.5
2 DEC	21:00:02	47.5
2 DEC	22:00:02	48.5
2 DEC	23:00:02	47.0

Ldn = 55.5 CNEL = 57.6

Moffett Field Housing
In front of 347 Orange Ave near
Stevens Rd.; On pole 6 ft above ground

12-06-1994
10:12:29
MOFFETC

Date	Start Time	Leq		
3 DEC	0:00:02	43.0		
3 DEC	1:00:02	44.0		
3 DEC	2:00:02	46.5		
3 DEC	3:00:02	48.5		
3 DEC	4:00:02	53.0		
3 DEC	5:00:02	56.0		
3 DEC	6:00:02	56.5		
3 DEC	7:00:02	56.5		
3 DEC	8:00:02	56.5		
3 DEC	9:00:02	56.5		
3 DEC	10:00:02	56.5		
3 DEC	11:00:02	57.5		
3 DEC	12:00:02	55.5		
3 DEC	13:00:02	60.0		
3 DEC	14:00:02	56.0		
3 DEC	15:00:02	57.0		
3 DEC	16:00:02	57.0		
3 DEC	17:00:03	57.5		
3 DEC	18:00:03	55.5		
3 DEC	19:00:03	54.5		
3 DEC	20:00:03	55.0		
3 DEC	21:00:03	53.5		
3 DEC	22:00:03	51.5		
3 DEC	23:00:03	51.0	Ldn = 59.5	CNEL = 59.9

Moffett Field Housing
In front of 347 Orange Ave near
Stevens Rd.; On pole 6 ft above ground

12-06-1994
10:12:29
MOFFETC

Date	Start Time	Leq		
4 DEC	0:00:03	49.0		
4 DEC	1:00:03	43.5		
4 DEC	2:00:03	46.0		
4 DEC	3:00:03	45.0		
4 DEC	4:00:03	43.5		
4 DEC	5:00:03	44.5		
4 DEC	6:00:03	43.5		
4 DEC	7:00:03	47.5		
4 DEC	8:00:03	47.5		
4 DEC	9:00:03	46.5		
4 DEC	10:00:03	47.5		
4 DEC	11:00:03	48.5		
4 DEC	12:00:03	60.5		
4 DEC	13:00:01	47.5		
4 DEC	14:00:00	50.5		
4 DEC	15:00:00	46.5		
4 DEC	16:00:00	49.0		
4 DEC	17:00:00	51.0		
4 DEC	18:00:00	47.0		
4 DEC	19:00:00	45.5		
4 DEC	20:00:00	48.0		
4 DEC	21:00:00	45.0		
4 DEC	22:00:00	45.5		
4 DEC	23:00:00	43.5	Ldn = 53.2	CNEL = 53.4

Moffett Field Housing
In front of 347 Orange Ave near
Stevens Rd.; On pole 6 ft above ground

12-06-1994
10:12:29
MOFFETC

Date	Start Time	Leq
5 DEC	0:00:00	42.0
5 DEC	1:00:00	45.0
5 DEC	2:00:00	44.0
5 DEC	3:00:00	42.5
5 DEC	4:00:00	46.5
5 DEC	5:00:00	54.0
5 DEC	6:00:00	56.5
5 DEC	7:00:00	56.5
5 DEC	8:00:00	53.5
5 DEC	9:00:00	48.5
5 DEC	10:00:00	51.0
5 DEC	11:00:00	52.5
5 DEC	12:00:00	55.0
5 DEC	13:00:01	68.0
5 DEC	14:00:01	70.0
5 DEC	15:00:01	62.5
5 DEC	16:00:01	49.5
5 DEC	17:00:01	49.0
5 DEC	18:00:01	52.0
5 DEC	19:00:01	53.0
5 DEC	20:00:01	52.0
5 DEC	21:00:01	52.5
5 DEC	22:00:01	53.5
5 DEC	23:00:01	52.5

Ldn = 61.3   CNEL = 61.5

File Name: MOFFETA
Description: Moffett Field
Across Creek on Power Line Tower
6 ft above ground
Report Date: 12-06-1994 Time: 10:36:13 Engr:
Serial #: 700B0380

D A T A   R E P O R T

Run Date	12/04
Stop Date	12/30
Run Time 1	13:00
Stop Time1	99:00
Run Time 2	99:00
Stop Time 2	99:00
R/S	06
Memory	1950.0
LVL	56.4
Time	0139:22:43
SEL	113.4
Lmin	25.0
Lmax	95.0
Lpk	114.5
L10	56.5
L33	52.0
L50	49.5
L90	44.0
OVLD	00
RMS Exc	0069
Pk Exc	0000
Dose	0.7
Proj	0.0
Crit	90.0
Thld	32.0
Exch	3
RMS Thld	70.0
Pk Thld	140.0
Hyst	5
Excd	0
Intv	1
Dur	01:00
Auto-Stop	0
LDL	0
Ln	1
Hist	0
Save Pk	0
Per	60.0
Detc	SLOW
Wght	A
Pk Unwgt	0
Cal	17.0

File Name: MOFFETA

Description: Moffett Field
Across Creek on Power Line Tower
6 ft above ground

Report Date: 12-06-1994 Time: 10:36:13 Engr:

INTERVAL REPORT

Cnt	Date	Time	Dur	Leq	Lmax	L10	L33	L50	L90	Lmin	Ex	Ov
1	30 NOV	12:00	1:00	46.5	64.0	47.5	46.0	45.5	44.5	27.5	0	0
2	30 NOV	13:00	1:00	58.5	86.0	54.0	47.5	46.5	45.5	44.0	3	0
3	30 NOV	14:00	1:00	58.5	86.0	55.0	48.0	47.0	44.5	43.5	3	0
4	30 NOV	15:00	1:00	58.5	83.0	59.5	53.5	51.0	47.5	45.0	2	0
5	30 NOV	16:00	1:00	54.0	70.5	55.5	52.0	51.5	49.5	48.5	1	0
6	30 NOV	17:00	1:00	51.0	60.5	52.5	50.5	50.0	49.0	48.0	0	0
7	30 NOV	18:00	1:00	52.5	65.5	53.5	52.5	51.5	50.0	49.0	0	0
8	30 NOV	19:00	1:00	53.0	62.5	55.0	53.5	51.5	49.5	48.5	0	0
9	30 NOV	20:00	1:00	54.5	60.0	56.5	55.5	54.5	52.0	50.5	0	0
10	30 NOV	21:00	1:00	53.5	58.5	55.0	54.0	53.5	52.0	50.0	0	0
11	30 NOV	22:00	1:00	52.0	57.5	53.0	52.0	51.5	50.5	49.0	0	0
12	30 NOV	23:00	1:00	51.0	57.0	52.0	51.0	50.5	49.5	48.0	0	0
13	1 DEC	0:00	1:00	51.0	59.0	53.0	51.5	50.5	48.5	47.0		
14	1 DEC	1:00	1:00	50.5	59.5	52.5	50.5	49.5	48.0	47.0	0	
15	1 DEC	2:00	1:00	49.0	60.0	50.5	49.0	48.5	47.0	46.5		
16	1 DEC	3:00	1:00	49.0	57.5	50.0	49.0	48.5	47.0	45.5	0	
17	1 DEC	4:00	1:00	51.0	56.0	52.5	51.5	50.5	48.5	46.5		
18	1 DEC	5:00	1:00	56.0	62.5	58.0	57.0	56.0	52.5	51.0	0	
19	1 DEC	6:00	1:00	55.5	67.0	56.5	55.5	55.0	54.5	53.5		
20	1 DEC	7:00	1:00	55.0	66.5	55.5	54.5	54.5	53.5	52.0	0	
21	1 DEC	8:00	1:00	53.0	67.0	54.0	53.0	52.0	50.5	49.5		
22	1 DEC	9:00	1:00	53.0	67.0	54.0	51.5	50.5	47.0	45.0	0	
23	1 DEC	10:00	1:00	53.5	64.0	56.0	53.5	52.0	49.5	46.0	0	0
24	1 DEC	11:00	1:00	53.5	65.0	57.0	53.5	51.5	47.0	40.5	0	0

I N T E R V A L R E P O R T

Cnt	Date	Time	Dur	Leq	Lmax	L10	L33	L50	L90	Lmin	Ex	Ov
25	1 DEC	12:00	1:00	51.5	74.0	51.0	46.5	45.5	43.5	41.5	1	0
26	1 DEC	13:00	1:00	50.5	63.5	54.5	48.0	46.0	44.0	42.0	0	0
27	1 DEC	14:00	1:00	52.0	67.5	54.5	49.0	48.0	46.5	44.5	0	0
28	1 DEC	15:00	1:00	56.0	76.0	59.0	52.0	50.0	48.5	46.5	2	0
29	1 DEC	16:00	0:32	57.5	85.5	52.5	50.0	49.5	48.5	47.5	3	0
30	1 DEC	17:00	1:00	52.0	69.5	52.5	50.0	49.0	46.5	45.0	0	0
31	1 DEC	18:00	1:00	50.5	67.0	53.5	48.0	47.0	45.0	44.0	0	0
32	1 DEC	19:00	1:00	51.0	67.5	53.5	48.5	47.5	45.0	42.0	0	0
33	1 DEC	20:00	1:00	50.5	64.5	53.0	47.0	45.5	43.0	41.5	0	0
34	1 DEC	21:00	1:00	49.0	66.5	50.0	48.5	47.5	46.0	44.5	0	0
35	1 DEC	22:00	1:00	50.5	58.0	52.0	50.5	50.0	48.5	47.0	0	0
36	1 DEC	23:00	1:00	52.0	59.0	53.5	52.0	51.5	50.0	48.0	0	0
37	2 DEC	0:00	1:00	49.0	66.0	51.0	49.0	47.5	45.0	41.0	0	
38	2 DEC	1:00	1:00	45.5	52.5	48.0	45.5	43.0	41.5	40.0	0	
39	2 DEC	2:00	1:00	47.5	52.0	49.0	47.5	47.0	45.5	44.5	0	
40	2 DEC	3:00	1:00	47.5	50.5	49.0	48.0	47.5	45.0	44.0	0	
41	2 DEC	4:00	1:00	47.0	50.5	49.0	48.0	46.0	40.5	39.0	0	
42	2 DEC	5:00	1:00	42.5	49.0	43.5	42.5	42.0	40.5	39.0	0	
43	2 DEC	6:00	1:00	49.0	62.5	51.5	50.5	46.5	43.0	41.5	0	
44	2 DEC	7:00	1:00	53.0	68.5	52.5	50.5	50.0	48.5	45.0	0	
45	2 DEC	8:00	1:00	48.0	63.0	50.0	47.0	46.5	45.0	43.5	0	
46	2 DEC	9:00	1:00	55.5	73.0	56.5	51.0	49.0	45.5	44.0	2	
47	2 DEC	10:00	1:00	54.5	71.0	53.5	49.5	48.5	46.5	44.5	1	0
48	2 DEC	11:00	1:00	48.0	63.5	50.0	47.0	45.5	44.0	42.0	0	0

INTERVAL REPORT

Cnt	Date	Time	Dur	Leq	Lmax	L10	L33	L50	L90	Lmin	Ex	Ov
49	2 DEC	12:00	1:00	46.5	63.0	46.5	45.0	44.5	43.0	41.5	0	0
50	2 DEC	13:00	1:00	52.5	79.0	46.5	44.0	43.5	42.5	41.0	1	0
51	2 DEC	14:00	1:00	47.5	61.0	49.5	47.0	46.5	45.0	44.0	0	0
52	2 DEC	15:00	1:00	50.0	67.5	51.5	48.5	48.0	47.0	45.5	0	0
53	2 DEC	16:00	1:00	55.5	74.0	56.0	49.0	47.0	45.5	40.0	4	0
54	2 DEC	17:00	1:00	49.5	62.5	53.5	47.5	45.5	44.0	40.5	0	0
55	2 DEC	18:00	1:00	57.0	80.0	51.5	45.5	44.5	42.5	41.5	2	0
56	2 DEC	19:00	1:00	61.5	81.0	56.5	48.5	46.5	44.5	42.0	5	0
57	2 DEC	20:00	1:00	58.5	81.0	53.5	48.5	48.0	46.5	41.0	2	0
58	2 DEC	21:00	1:00	47.5	58.0	49.0	47.5	47.0	46.0	45.5	0	0
59	2 DEC	22:00	1:00	48.0	61.5	49.0	48.0	47.5	46.5	45.5	0	0
60	2 DEC	23:00	1:00	47.0	61.5	50.0	47.5	44.5	42.0	41.0	0	0
61	3 DEC		0:00	1:00	44.5	49.5	47.0	44.5	43.5	42.0		41.0
62	3 DEC		1:00	1:00	46.0	59.5	47.0	46.0	45.0	43.5		42.5
63	3 DEC		2:00	1:00	47.5	55.0	49.5	48.0	47.0	45.5		43.0
64	3 DEC		3:00	1:00	47.0	55.5	49.0	47.0	46.5	44.5		42.0
65	3 DEC		4:00	1:00	53.0	69.5	55.5	52.5	51.0	47.5		44.5
66	3 DEC		5:00	1:00	56.0	68.5	58.5	55.5	54.5	52.5		50.5
67	3 DEC		6:00	1:00	58.5	71.0	61.5	58.0	56.5	53.5		51.5
68	3 DEC		7:00	1:00	57.0	73.0	59.0	56.0	55.0	53.5		51.5
69	3 DEC		8:00	1:00	57.0	69.0	59.0	57.0	56.5	54.5		53.0
70	3 DEC		9:00	1:00	57.0	69.0	59.0	57.0	56.0	54.5		53.0
71	3 DEC	10:00	1:00	57.0	69.5	58.0	56.5	56.0	54.5	53.0	0	0
72	3 DEC	11:00	1:00	58.0	70.5	59.5	57.5	56.5	55.5	54.0	1	0

I N T E R V A L R E P O R T

Cnt	Date	Time	Dur	Leq	Lmax	L10	L33	L50	L90	Lmin	Ex	Ov
73	3 DEC	12:00	1:00	56.0	71.0	57.0	55.5	55.0	53.5	51.5	1	0
74	3 DEC	13:00	1:00	58.0	78.5	57.0	54.5	54.5	53.0	51.5	3	0
75	3 DEC	14:00	1:00	56.0	70.5	58.0	55.0	54.5	53.0	51.5	1	0
76	3 DEC	15:00	1:00	56.5	71.0	58.0	56.0	55.0	54.0	52.5	2	0
77	3 DEC	16:00	1:00	58.0	81.0	57.0	55.5	55.0	54.0	50.0	1	0
78	3 DEC	17:00	1:00	57.5	83.5	57.0	55.0	54.5	52.5	51.0	1	0
79	3 DEC	18:00	1:00	55.0	70.5	56.5	55.0	54.5	53.0	51.5	1	0
80	3 DEC	19:00	1:00	54.5	66.5	55.0	54.0	53.5	52.0	50.0	0	0
81	3 DEC	20:00	1:00	55.0	75.0	55.0	53.0	52.5	51.0	49.5	2	0
82	3 DEC	21:00	1:00	53.5	68.5	54.0	52.5	51.5	50.5	48.5	0	0
83	3 DEC	22:00	1:00	51.5	58.0	52.5	51.5	51.5	50.0	48.0	0	0
84	3 DEC	23:00	1:00	51.0	57.0	52.0	51.0	50.5	49.5	48.0	0	0
85	4 DEC	0:00	1:00	50.0	55.5	51.5	50.0	49.5	48.0	44.5	0	
86	4 DEC	1:00	1:00	45.5	51.0	46.5	45.5	45.0	44.0	43.0	0	
87	4 DEC	2:00	1:00	46.0	57.0	47.0	46.0	45.5	45.0	43.5	0	
88	4 DEC	3:00	1:00	45.5	51.5	46.5	45.5	45.5	44.0	43.0	0	
89	4 DEC	4:00	1:00	45.0	53.0	46.0	45.0	44.5	44.0	42.5	0	
90	4 DEC	5:00	1:00	46.0	65.0	46.5	45.5	45.5	44.5	43.0	0	
91	4 DEC	6:00	1:00	47.5	69.5	45.5	44.5	44.0	43.0	41.5	0	
92	4 DEC	7:00	1:00	47.5	66.5	48.5	46.5	46.0	44.5	42.5	0	
93	4 DEC	8:00	1:00	47.5	62.5	48.5	47.5	46.5	45.0	43.5	0	
94	4 DEC	9:00	1:00	46.5	61.0	48.0	46.0	45.5	43.0	41.5	0	
95	4 DEC	10:00	1:00	47.0	63.5	48.5	46.0	45.0	43.0	41.5	0	0
96	4 DEC	11:00	1:00	48.5	66.0	50.0	47.0	46.5	44.5	41.5	0	0

I N T E R V A L R E P O R T

Cnt	Date	Time	Dur	Leq	Lmax	L10	L33	L50	L90	Lmin	Ex	Ov
97	4 DEC	12:00	0:24	52.0	77.5	48.0	45.0	44.5	43.5	42.5	2	0
98	4 DEC	13:00	1:00	47.5	68.5	49.5	44.0	43.0	40.5	25.0	0	0
99	4 DEC	14:00	1:00	52.0	68.0	55.5	46.0	44.5	41.5	40.5	0	0
100	4 DEC	15:00	1:00	45.0	61.0	46.5	44.5	43.5	40.5	39.5	0	0
101	4 DEC	16:00	1:00	52.0	76.0	50.0	47.0	46.0	44.0	41.5	1	0
102	4 DEC	17:00	1:00	50.0	64.0	50.5	49.5	49.0	47.5	45.5	0	0
103	4 DEC	18:00	1:00	47.5	60.0	49.5	47.5	46.5	44.5	43.5	0	0
104	4 DEC	19:00	1:00	45.5	62.5	47.0	44.5	43.5	41.5	40.5	0	0
105	4 DEC	20:00	1:00	47.5	67.0	48.0	45.0	44.5	42.0	40.0	0	0
106	4 DEC	21:00	1:00	46.0	58.5	47.0	46.0	45.5	44.0	41.5	0	0
107	4 DEC	22:00	1:00	48.0	54.0	49.0	48.0	47.5	46.5	44.0	0	0
108	4 DEC	23:00	1:00	46.0	64.0	48.5	45.5	44.0	39.5	37.5	0	0
109	5 DEC		0:00	1:00	42.0	48.0	43.0	42.0	41.5	40.0		38.5
110	5 DEC		1:00	1:00	45.5	56.0	46.5	45.5	45.0	43.0		41.5
111	5 DEC		2:00	1:00	46.5	50.5	49.0	48.0	45.5	43.5		42.5
112	5 DEC		3:00	1:00	45.0	49.5	46.0	45.5	45.0	44.0		42.5
113	5 DEC		4:00	1:00	46.0	54.0	49.0	45.5	44.5	41.5		39.5
114	5 DEC		5:00	1:00	54.5	64.5	57.5	55.0	53.5	51.0		47.5
115	5 DEC		6:00	1:00	60.0	71.0	61.0	60.0	60.0	58.0		55.5
116	5 DEC		7:00	1:00	59.5	67.0	61.0	60.0	59.5	57.5		55.5
117	5 DEC		8:00	1:00	56.5	70.5	59.0	55.5	54.0	50.5		48.0
118	5 DEC		9:00	1:00	50.0	61.0	52.0	50.0	49.0	46.5		44.5
119	5 DEC	10:00	1:00	51.5	70.5	54.0	51.0	49.0	45.5	42.0	1	0
120	5 DEC	11:00	1:00	54.0	72.5	53.5	49.5	48.5	46.5	45.0	2	0

I N T E R V A L R E P O R T

Cnt	Date	Time	Dur	Leq	Lmax	L10	L33	L50	L90	Lmin	Ex	Ov
121	5 DEC	12:00	1:00	54.5	72.5	54.5	51.5	51.0	49.0	43.5	2	0
122	5 DEC	13:00	1:00	55.0	73.5	55.0	51.0	50.5	48.0	46.5	4	0
123	5 DEC	14:00	1:00	73.0	85.0	79.5	55.5	54.0	46.0	44.0	2	0
124	5 DEC	15:00	1:00	49.5	64.5	52.5	46.5	45.5	43.5	41.5	0	0
125	5 DEC	16:00	1:00	47.0	66.0	49.5	45.5	45.0	43.5	41.5	0	0
126	5 DEC	17:00	1:00	46.5	62.0	49.5	44.0	42.5	41.0	39.5	0	0
127	5 DEC	18:00	1:00	50.0	64.0	51.0	50.0	49.5	47.5	46.5	0	0
128	5 DEC	19:00	1:00	51.0	60.5	52.5	51.0	50.0	49.0	48.0	0	0
129	5 DEC	20:00	1:00	52.0	61.0	53.0	52.0	51.5	50.5	49.5	0	0
130	5 DEC	21:00	1:00	54.0	58.5	55.5	54.0	53.5	52.5	51.5	0	0
131	5 DEC	22:00	1:00	56.5	61.5	58.5	57.0	56.0	54.0	52.0	0	0
132	5 DEC	23:00	1:00	57.0	62.0	58.5	57.0	56.5	55.0	53.5	0	0
133	6 DEC	0:00	1:00	56.5	61.5	58.5	57.0	56.0	54.5	52.0	0	
134	6 DEC	1:00	1:00	55.5	62.5	57.5	55.5	55.0	52.5	47.0	0	
135	6 DEC	2:00	1:00	53.5	67.5	54.5	53.5	52.5	51.5	49.0	0	
136	6 DEC	3:00	1:00	51.5	59.5	53.5	52.0	51.0	47.5	43.0	0	
137	6 DEC	4:00	1:00	52.0	65.0	54.0	51.5	51.0	48.0	45.0	0	
138	6 DEC	5:00	1:00	55.0	60.5	57.0	55.5	54.5	51.5	48.0	0	
139	6 DEC	6:00	1:00	59.5	68.5	61.5	59.5	59.0	57.5	56.0	0	
140	6 DEC	7:00	1:00	58.0	71.5	59.5	58.5	57.5	54.5	53.5	1	
141	6 DEC	8:00	0:25	57.0	80.5	57.5	54.0	53.5	51.0	50.0	1	

File Name: MOFFETB
Description: Moffett Field Housing
Near newer townhouses off of Stevens Way
Suspended in tree 6 ft above ground
Report Date: 12-06-1994 Time: 10:21:39 Engr:
Serial #: 700B0370

DATA REPORT

Run Date	12/04
Stop Date	12/30
Run Time 1	13:00
Stop Time1	99:00
Run Time 2	99:00
Stop Time 2	99:00
R/S	05
Memory	1978.0
LVL	60.0
Time	0140:32:22
SEL	117.1
Lmin	33.0
Lmax	91.5
Lpk	112.5
L10	58.5
L33	54.5
L50	51.5
L90	44.5
OVLD	00
RMS Exc	0190
Pk Exc	0000
Dose	1.6
Proj	0.1
Crit	90.0
Thld	32.0
Exch	3
RMS Thld	70.0
Pk Thld	140.0
Hyst	5
Excd	0
Intv	1
Dur	01:00
Auto-Stop	0
LDL	0
Ln	1
Hist	0
Save Pk	0
Per	60.0
Detc	SLOW
Wght	A
Pk Unwgt	0
Cal	15.0

File Name: MOFFETB
Description: Moffett Field Housing
Near newer townhouses off of Stevens Way
Suspended in tree 6 ft above ground
Report Date: 12-06-1994 Time: 10:21:39 Engr:

I N T E R V A L R E P O R T

Cnt	Date	Time	Dur	Leq	Lmax	L10	L33	L50	L90	Lmin	Ex	Ov
1	30 NOV	11:00	1:00	57.0	70.0	58.0	56.0	55.5	53.0	48.0	0	0
2	30 NOV	12:00	1:00	53.5	73.0	55.0	50.0	48.0	45.5	44.0	4	0
3	30 NOV	13:00	1:00	57.5	77.0	58.0	55.0	53.5	47.0	44.5	3	0
4	30 NOV	14:00	1:00	57.0	77.0	58.0	54.0	52.0	45.0	43.0	3	0
5	30 NOV	15:00	1:00	58.0	80.0	60.0	55.5	53.0	48.0	45.0	5	0
6	30 NOV	16:00	1:00	55.0	70.5	58.0	53.5	52.0	49.5	47.5	1	0
7	30 NOV	17:00	1:00	53.0	72.5	55.5	51.5	50.5	48.5	47.0	1	0
8	30 NOV	18:00	1:00	55.0	74.5	57.5	52.5	51.0	49.0	48.0	1	0
9	30 NOV	19:00	1:00	52.5	65.5	55.0	52.0	51.0	50.0	48.0	0	0
10	30 NOV	20:00	1:00	56.0	67.0	57.5	56.5	55.5	53.0	50.5	0	0
11	30 NOV	21:00	1:00	57.0	66.5	58.5	57.5	56.5	52.5	50.5	0	0
12	30 NOV	22:00	1:00	52.0	72.0	53.5	52.0	51.5	50.0	49.0	1	0
13	30 NOV	23:00	1:00	50.5	64.5	52.0	51.0	50.0	49.0	47.0	0	0
14	1 DEC	0:00	1:00	51.0	60.0	52.5	51.0	50.0	48.5	46.5	0	
15	1 DEC	1:00	1:00	50.5	58.5	53.0	50.5	49.5	47.5	46.5	0	
16	1 DEC	2:00	1:00	49.0	59.0	50.5	48.5	48.0	46.5	45.0	0	
17	1 DEC	3:00	1:00	48.0	56.0	49.5	48.0	47.5	45.5	44.0	0	
18	1 DEC	4:00	1:00	50.5	55.5	52.5	51.5	50.5	46.5	45.5	0	
19	1 DEC	5:00	1:00	56.0	71.5	58.5	57.5	56.0	51.5	50.0	1	
20	1 DEC	6:00	1:00	57.5	69.0	58.0	57.5	57.0	56.0	55.0	0	
21	1 DEC	7:00	1:00	58.5	73.0	62.0	58.0	56.5	52.5	50.5	3	
22	1 DEC	8:00	1:00	61.5	73.0	66.5	61.5	54.0	49.5	48.0	6	
23	1 DEC	9:00	1:00	60.5	75.5	64.5	56.5	54.5	49.5	46.0	6	
24	1 DEC	10:00	1:00	58.0	78.0	60.5	53.0	49.5	46.5	44.0	7	0

File Name: MOFFETB

INTERVAL REPORT

Cnt	Date	Time	Dur	Leq	Lmax	L10	L33	L50	L90	Lmin	Ex	Ov
25	1 DEC	11:00	1:00	62.0	73.5	65.5	60.0	56.0	48.0	44.5	9	0
26	1 DEC	12:00	1:00	53.5	71.0	56.0	52.0	49.0	44.0	42.5	2	0
27	1 DEC	13:00	1:00	52.5	67.0	55.5	52.0	50.5	47.0	44.0	0	0
28	1 DEC	14:00	1:00	57.5	77.5	60.5	55.5	53.0	48.5	46.0	5	0
29	1 DEC	15:00	1:00	58.0	78.5	60.5	55.0	52.5	48.5	46.5	6	0
30	1 DEC	16:00	0:54	56.0	81.0	56.0	52.0	50.5	49.0	47.0	2	0
31	1 DEC	17:00	1:00	53.5	72.0	56.0	50.5	49.5	47.0	45.5	1	0
32	1 DEC	18:00	1:00	52.0	65.5	56.0	50.0	48.0	46.0	44.0	0	0
33	1 DEC	19:00	1:00	51.5	66.5	55.0	50.0	48.5	46.0	44.5	0	0
34	1 DEC	20:00	1:00	52.0	68.5	55.0	49.0	47.0	44.0	42.5	0	0
35	1 DEC	21:00	1:00	51.0	72.5	51.0	48.5	47.5	46.0	44.5	1	0
36	1 DEC	22:00	1:00	50.0	63.0	51.0	49.5	49.0	47.0	45.5	0	0
37	1 DEC	23:00	1:00	52.0	61.0	53.5	52.0	51.5	50.0	47.0	0	0
38	2 DEC	0:00	1:00	48.5	63.5	50.5	48.5	47.5	44.5	41.0	0	
39	2 DEC	1:00	1:00	49.0	59.5	52.0	47.0	45.5	42.5	41.5	0	
40	2 DEC	2:00	1:00	54.0	58.5	56.5	54.5	53.5	52.0	50.5	0	
41	2 DEC	3:00	1:00	54.5	57.5	56.5	55.5	55.0	51.5	50.0	0	
42	2 DEC	4:00	1:00	54.5	58.0	57.5	56.0	53.5	45.5	43.5	0	
43	2 DEC	5:00	1:00	48.5	75.5	46.0	44.5	44.0	42.5	41.5	1	
44	2 DEC	6:00	1:00	53.5	70.0	56.0	55.0	49.5	44.5	43.0	0	
45	2 DEC	7:00	1:00	57.0	69.0	59.0	56.5	56.0	55.0	50.5	0	
46	2 DEC	8:00	1:00	54.0	80.5	56.0	52.0	50.0	45.0	43.5	4	
47	2 DEC	9:00	1:00	52.5	67.5	56.0	51.0	48.0	45.5	43.5	0	
48	2 DEC	10:00	1:00	55.5	77.0	57.0	51.0	49.0	46.0	44.0	4	0

I N T E R V A L   R E P O R T

Cnt	Date	Time	Dur	Leq	Lmax	L10	L33	L50	L90	Lmin	Ex	Ov	
49	2 DEC	11:00	1:00	53.0	67.0	56.0	53.0	52.0	45.5	44.0	0	0	
50	2 DEC	12:00	1:00	58.0	81.5	57.0	53.5	52.5	47.5	44.0	3	0	
51	2 DEC	13:00	1:00	68.5	81.0	74.0	62.5	57.0	46.0	43.0	20	0	
52	2 DEC	14:00	1:00	62.5	81.0	64.5	53.5	52.0	48.5	46.0	2	0	
53	2 DEC	15:00	1:00	54.5	70.0	57.0	53.0	51.5	48.0	45.5	0	0	
54	2 DEC	16:00	1:00	57.5	76.5	58.5	52.0	49.5	46.0	37.0	4	0	
55	2 DEC	17:00	1:00	56.0	84.5	57.0	50.0	47.5	44.0	40.5	8	0	
56	2 DEC	18:00	1:00	54.5	75.5	56.5	49.0	46.0	43.0	42.0	2	0	
57	2 DEC	19:00	1:00	62.0	81.0	58.0	50.0	47.5	45.0	43.0	5	0	
58	2 DEC	20:00	1:00	58.5	77.0	56.0	53.0	52.5	48.5	43.5	2	0	
59	2 DEC	21:00	1:00	54.0	67.0	54.5	53.5	53.5	52.5	50.5	0	0	
60	2 DEC	22:00	1:00	55.0	62.5	56.5	56.0	54.5	53.0	51.5	0	0	
61	2 DEC	23:00	1:00	53.5	67.0	57.0	56.0	45.5	43.0	41.5	0	0	
62	3 DEC		0:00	1:00	46.0	57.5	48.0	45.5	45.0	42.5	41.0		0
63	3 DEC		1:00	1:00	46.0	57.5	47.5	46.0	44.5	43.0	42.0		0
64	3 DEC		2:00	1:00	48.0	56.0	49.5	48.5	47.5	46.0	44.0		0
65	3 DEC		3:00	1:00	47.5	61.5	49.0	47.5	46.5	45.0	42.5		0
66	3 DEC		4:00	1:00	51.5	66.5	54.5	51.0	50.0	47.0	44.0		0
67	3 DEC		5:00	1:00	55.5	77.0	57.5	54.5	53.5	51.0	48.0		1
68	3 DEC		6:00	1:00	57.5	77.0	60.0	57.0	55.5	53.0	51.0		2
69	3 DEC		7:00	1:00	56.5	72.0	58.5	56.0	55.0	53.0	51.0		1
70	3 DEC		8:00	1:00	57.5	70.5	59.0	57.0	56.5	55.0	52.5		1
71	3 DEC		9:00	1:00	58.0	71.5	59.5	58.0	57.0	55.5	53.0		2
72	3 DEC	10:00	1:00	57.5	75.5	59.0	56.5	56.0	54.5	53.0	1	0	

File Name: MOFFETB Page 5

I N T E R V A L R E P O R T

Cnt	Date	Time	Dur	Leq	Lmax	L10	L33	L50	L90	Lmin	Ex	Ov
73	3 DEC	11:00	1:00	58.0	71.5	60.0	57.5	56.5	55.0	53.0	1	0
74	3 DEC	12:00	1:00	57.0	68.5	58.5	56.0	55.5	54.0	52.5	0	0
75	3 DEC	13:00	1:00	58.0	75.5	59.5	56.5	55.5	54.0	52.5	4	0
76	3 DEC	14:00	1:00	57.5	75.5	59.0	56.5	55.5	54.0	52.5	3	0
77	3 DEC	15:00	1:00	58.0	76.0	59.5	57.0	56.5	55.0	54.0	1	0
78	3 DEC	16:00	1:00	59.0	80.5	59.0	57.0	56.5	55.0	50.5	3	0
79	3 DEC	17:00	1:00	58.5	80.5	59.0	56.0	55.5	53.5	51.5	1	0
80	3 DEC	18:00	1:00	57.0	78.0	58.5	56.0	55.5	54.0	52.5	2	0
81	3 DEC	19:00	1:00	56.0	66.5	58.0	55.5	55.0	53.5	51.5	0	0
82	3 DEC	20:00	1:00	55.5	72.0	57.0	54.5	54.0	52.5	50.5	1	0
83	3 DEC	21:00	1:00	54.5	67.0	55.5	53.5	53.0	52.0	50.0	0	0
84	3 DEC	22:00	1:00	52.5	63.0	53.5	52.5	52.0	51.0	49.0	0	0
85	3 DEC	23:00	1:00	52.0	64.0	53.0	52.0	51.5	50.5	49.0	0	0
86	4 DEC	0:00	1:00	51.0	65.5	52.0	51.0	50.0	48.0	45.0	0	
87	4 DEC	1:00	1:00	45.0	60.5	45.5	44.5	44.0	43.0	42.0	0	
88	4 DEC	2:00	1:00	45.5	65.5	46.0	45.0	45.0	44.0	43.0	0	
89	4 DEC	3:00	1:00	44.5	48.5	45.5	45.0	44.5	43.5	42.0	0	
90	4 DEC	4:00	1:00	45.0	61.0	45.0	44.5	44.0	43.5	42.0	0	
91	4 DEC	5:00	1:00	47.5	68.0	46.0	45.0	45.0	44.0	42.5	0	
92	4 DEC	6:00	1:00	45.5	62.0	45.5	44.0	44.0	43.0	41.5	0	
93	4 DEC	7:00	1:00	49.0	65.5	52.0	46.5	45.5	44.0	42.5	0	
94	4 DEC	8:00	1:00	49.5	65.5	51.0	48.0	47.0	45.0	43.0	0	
95	4 DEC	9:00	1:00	49.5	65.5	51.5	47.0	46.0	43.5	42.0	0	
96	4 DEC	10:00	1:00	51.5	79.0	54.0	46.5	44.5	43.0	41.0	1	0

I N T E R V A L   R E P O R T

Cnt	Date	Time	Dur	Leq	Lmax	L10	L33	L50	L90	Lmin	Ex	Ov
97	4 DEC	11:00	1:00	51.5	70.5	54.5	49.0	47.5	44.0	41.5	1	0
98	4 DEC	12:00	0:39	56.5	84.0	55.0	49.5	46.5	43.5	42.0	1	0
99	4 DEC	13:00	1:00	50.5	70.0	53.0	47.0	44.5	42.0	33.0	0	0
100	4 DEC	14:00	1:00	53.5	69.5	58.5	50.0	46.0	42.5	41.0	0	0
101	4 DEC	15:00	1:00	50.0	63.5	53.5	47.5	45.0	43.0	41.0	0	0
102	4 DEC	16:00	1:00	53.0	69.5	57.0	50.5	47.5	44.5	42.0	0	0
103	4 DEC	17:00	1:00	53.0	73.0	57.5	50.0	49.0	47.0	44.5	1	0
104	4 DEC	18:00	1:00	49.5	69.0	51.5	47.0	46.0	44.0	42.5	0	0
105	4 DEC	19:00	1:00	47.0	67.0	48.5	45.0	44.0	42.5	40.5	0	0
106	4 DEC	20:00	1:00	49.5	66.0	51.5	47.0	45.5	42.5	41.0	0	0
107	4 DEC	21:00	1:00	46.0	62.5	46.5	45.0	44.5	43.0	41.5	0	0
108	4 DEC	22:00	1:00	48.0	63.5	48.5	46.5	46.5	45.0	43.5	0	0
109	4 DEC	23:00	1:00	45.5	59.5	47.0	44.5	43.5	40.5	39.5	0	0
110	5 DEC	0:00	1:00	44.0	58.5	46.0	44.5	43.5	42.0	39.0	0	
111	5 DEC	1:00	1:00	51.0	57.0	52.5	52.0	51.5	44.0	40.5	0	
112	5 DEC	2:00	1:00	54.0	58.0	56.5	55.5	52.5	50.5	49.0	0	
113	5 DEC	3:00	1:00	51.5	53.5	52.5	51.5	51.5	50.5	49.5	0	
114	5 DEC	4:00	1:00	49.0	60.0	52.5	48.0	45.5	42.5	41.5	0	
115	5 DEC	5:00	1:00	55.5	65.0	58.5	55.0	54.0	51.5	49.5	0	
116	5 DEC	6:00	1:00	60.0	66.0	61.0	60.5	60.0	58.5	57.5	0	
117	5 DEC	7:00	1:00	59.5	70.0	61.0	59.5	59.0	56.0	54.5	0	
118	5 DEC	8:00	1:00	56.0	70.5	59.0	56.0	54.0	48.5	47.5	2	
119	5 DEC	9:00	1:00	53.0	68.5	54.5	52.5	51.5	47.5	45.0	0	
120	5 DEC	10:00	1:00	65.0	84.0	62.5	53.0	50.5	46.0	43.5	2	0

INTERVAL REPORT

Cnt	Date	Time	Dur	Leq	Lmax	L10	L33	L50	L90	Lmin	Ex	Ov
121	5 DEC	11:00	1:00	63.0	86.0	64.0	58.0	56.0	52.0	47.0	5	0
122	5 DEC	12:00	1:00	66.0	85.0	67.0	59.0	54.0	50.0	48.5	12	0
123	5 DEC	13:00	1:00	72.5	91.5	68.5	61.5	58.5	49.0	47.0	8	0
124	5 DEC	14:00	1:00	77.0	87.5	84.0	58.5	56.5	47.0	45.0	3	0
125	5 DEC	15:00	1:00	52.0	70.5	55.5	49.0	47.5	44.5	42.0	1	0
126	5 DEC	16:00	1:00	50.0	64.5	53.5	48.0	46.5	44.0	42.0	0	0
127	5 DEC	17:00	1:00	51.0	69.0	54.5	48.5	46.0	42.5	41.0	0	0
128	5 DEC	18:00	1:00	53.5	64.0	56.0	53.5	53.0	51.5	51.0	0	0
129	5 DEC	19:00	1:00	53.0	65.0	54.5	53.0	52.0	50.0	47.5	0	0
130	5 DEC	20:00	1:00	52.0	62.5	53.5	51.5	51.0	49.5	48.0	0	0
131	5 DEC	21:00	1:00	55.0	64.0	56.0	55.5	55.0	54.5	53.5	0	0
132	5 DEC	22:00	1:00	57.5	64.0	59.0	58.0	57.0	55.5	53.5	0	0
133	5 DEC	23:00	1:00	57.0	64.5	58.5	57.5	57.0	55.5	54.5	0	0
134	6 DEC	0:00	1:00	59.0	65.5	60.5	59.5	58.5	57.0	54.5	0	
135	6 DEC	1:00	1:00	58.0	62.0	59.0	58.5	58.0	56.5	51.5	0	
136	6 DEC	2:00	1:00	57.0	66.0	58.0	57.0	57.0	56.0	53.0	0	
137	6 DEC	3:00	1:00	54.0	61.0	57.0	56.5	51.5	47.5	45.0	0	
138	6 DEC	4:00	1:00	51.5	65.0	53.0	51.5	50.5	48.0	46.0	0	
139	6 DEC	5:00	1:00	55.5	63.5	58.0	55.5	54.5	51.5	48.5	0	
140	6 DEC	6:00	1:00	60.5	75.5	61.5	60.5	60.5	59.5	58.0	1	
141	6 DEC	7:00	0:59	60.5	83.5	61.5	60.0	59.0	57.0	56.0	4	

File Name: MOFFETC
Description: Moffett Field Housing
In front of 347 Orange Ave near
Stevens Rd.; On pole 6 ft above ground
Report Date: 12-06-1994 Time: 10:12:29 Engr:
Serial #: 700B0443

D A T A R E P O R T

Run Date	12/04
Stop Date	12/30
Run Time 1	13:00
Stop Time1	99:00
Run Time 2	99:00
Stop Time 2	99:00
R/S	04
Memory	1978.0
LVL	55.4
Time	0140:35:31
SEL	112.5
Lmin	31.0
Lmax	93.0
Lpk	122.0
L10	56.0
L33	51.5
L50	48.5
L90	43.0
OVLD	00
RMS Exc	0097
Pk Exc	0000
Dose	0.6
Proj	0.0
Crit	90.0
Thld	32.0
Exch	3
RMS Thld	70.0
Pk Thld	140.0
Hyst	5
Excd	0
Intv	1
Dur	01:00
Auto-Stop	0
LDL	0
Ln	1
Hist	0
Save Pk	0
Per	60.0
Detc	SLOW
Wght	A
Pk Unwgt	0
Cal	13.0

File Name: MOFFETC
Description: Moffett Field Housing
In front of 347 Orange Ave near
Stevens Rd.; On pole 6 ft above ground
Report Date: 12-06-1994 Time: 10:12:29 Engr:

INTERVAL REPORT

Cnt	Date	Time	Dur	Leq	Lmax	L10	L33	L50	L90	Lmin	Ex	Ov
1	30 NOV	11:00	1:00	52.5	71.5	51.0	48.5	47.5	46.5	40.0	3	0
2	30 NOV	12:00	1:00	49.0	73.0	48.0	45.5	45.0	43.5	42.5	2	0
3	30 NOV	13:00	1:00	56.0	77.5	53.5	47.0	46.5	44.0	42.5	3	0
4	30 NOV	14:00	1:00	58.5	82.0	54.0	47.0	46.0	44.5	43.0	3	0
5	30 NOV	15:00	1:00	55.5	76.0	57.0	51.5	49.0	45.0	42.5	3	0
6	30 NOV	16:00	1:00	54.0	75.5	55.0	52.5	52.0	48.5	47.0	1	0
7	30 NOV	17:00	1:00	52.0	65.5	53.5	52.0	51.5	50.5	49.0	0	0
8	30 NOV	18:00	1:00	54.0	64.0	55.0	54.0	53.5	51.0	49.5	0	0
9	30 NOV	19:00	1:00	52.5	62.0	53.5	52.5	52.0	50.5	49.5	0	0
10	30 NOV	20:00	1:00	55.5	61.5	56.5	55.5	55.5	53.5	51.0	0	0
11	30 NOV	21:00	1:00	54.5	59.0	56.0	55.0	54.5	52.5	50.5	0	0
12	30 NOV	22:00	1:00	52.0	55.5	53.5	52.5	52.0	50.0	48.5	0	0
13	30 NOV	23:00	1:00	52.0	62.0	54.0	52.5	52.0	50.5	48.5	0	0
14	1 DEC	0:00	1:00	52.0	57.5	54.0	52.5	51.5	49.5	46.5	0	
15	1 DEC	1:00	1:00	51.0	63.0	53.5	51.5	50.5	48.0	45.0	0	
16	1 DEC	2:00	1:00	48.5	57.5	51.0	48.5	47.5	45.5	42.5	0	
17	1 DEC	3:00	1:00	49.5	59.5	52.5	50.0	48.5	46.0	42.5	0	
18	1 DEC	4:00	1:00	52.5	59.0	54.5	53.0	52.0	49.5	45.5	0	
19	1 DEC	5:00	1:00	55.0	60.5	57.5	56.5	54.5	51.0	49.5	0	
20	1 DEC	6:00	1:00	56.5	62.5	57.5	56.5	56.5	55.5	54.5	0	
21	1 DEC	7:00	1:00	55.5	75.0	56.0	55.5	55.0	51.5	50.0	1	
22	1 DEC	8:00	1:00	52.5	74.5	51.5	50.0	49.5	48.0	47.5	1	
23	1 DEC	9:00	1:00	48.5	68.5	50.0	48.5	47.5	45.5	44.0	0	
24	1 DEC	10:00	1:00	48.0	66.5	49.0	47.0	46.5	45.0	41.5	0	0

INTERVAL REPORT

Cnt	Date	Time	Dur	Leq	Lmax	L10	L33	L50	L90	Lmin	Ex	Ov
25	1 DEC	11:00	1:00	47.5	67.5	48.0	46.0	45.5	44.0	43.0	0	0
26	1 DEC	12:00	1:00	52.0	74.5	48.5	45.0	44.0	43.0	41.5	3	0
27	1 DEC	13:00	1:00	48.5	67.5	50.5	46.5	45.5	43.5	42.0	0	0
28	1 DEC	14:00	1:00	51.0	66.5	53.0	48.5	47.5	45.5	43.5	0	0
29	1 DEC	15:00	1:00	55.5	75.0	57.5	50.5	49.5	47.5	45.5	3	0
30	1 DEC	16:00	0:49	61.5	93.0	53.0	49.5	49.0	47.5	46.0	3	0
31	1 DEC	17:00	1:00	50.5	71.5	51.0	48.0	47.0	45.0	44.5	1	0
32	1 DEC	18:00	1:00	50.5	66.0	53.5	48.0	46.5	44.5	43.0	0	0
33	1 DEC	19:00	1:00	50.0	67.0	52.0	47.0	46.0	43.0	41.0	0	0
34	1 DEC	20:00	1:00	51.0	65.0	54.0	47.0	45.5	43.5	41.5	0	0
35	1 DEC	21:00	1:00	49.0	70.5	48.5	46.5	46.0	44.5	43.5	1	0
36	1 DEC	22:00	1:00	48.0	60.5	49.0	47.5	47.0	45.5	44.0	0	0
37	1 DEC	23:00	1:00	48.5	64.0	50.0	48.5	48.0	46.5	44.0	0	0
38	2 DEC	0:00	1:00	45.5	60.0	47.0	45.5	44.5	41.5	38.5	0	
39	2 DEC	1:00	1:00	41.5	50.0	45.5	40.5	39.0	37.5	35.5	0	
40	2 DEC	2:00	1:00	47.0	53.0	48.5	47.5	46.5	44.5	43.5	0	
41	2 DEC	3:00	1:00	46.5	60.5	48.0	47.0	46.5	44.5	42.0	0	
42	2 DEC	4:00	1:00	46.5	50.5	49.5	47.5	45.0	40.0	38.0	0	
43	2 DEC	5:00	1:00	41.5	53.0	43.0	42.0	41.5	39.5	37.5	0	
44	2 DEC	6:00	1:00	48.5	64.5	51.5	50.0	46.5	42.5	41.0	0	
45	2 DEC	7:00	1:00	51.5	69.0	51.5	50.5	50.0	48.0	45.0	0	
46	2 DEC	8:00	1:00	46.5	56.0	48.0	46.5	46.0	43.5	41.5	0	
47	2 DEC	9:00	1:00	51.0	79.0	49.0	46.5	46.0	44.5	43.5	1	
48	2 DEC	10:00	1:00	51.5	68.5	53.0	49.5	48.5	46.0	44.5	0	0

INTERVAL REPORT

Cnt	Date	Time	Dur	Leq	Lmax	L10	L33	L50	L90	Lmin	Ex	Ov
49	2 DEC	11:00	1:00	48.5	72.0	48.0	46.0	45.5	43.5	42.0	1	0
50	2 DEC	12:00	1:00	48.0	71.5	46.5	44.0	43.5	42.0	41.0	1	0
51	2 DEC	13:00	1:00	50.5	75.0	49.5	44.5	43.5	42.0	41.0	2	0
52	2 DEC	14:00	1:00	49.5	68.5	51.5	48.5	47.5	45.5	43.5	0	0
53	2 DEC	15:00	1:00	58.0	87.5	54.0	50.5	49.5	47.5	46.0	3	0
54	2 DEC	16:00	1:00	56.5	77.0	54.0	47.5	46.0	43.0	37.5	4	0
55	2 DEC	17:00	1:00	49.0	70.5	50.5	44.0	43.0	41.0	39.5	1	0
56	2 DEC	18:00	1:00	52.5	76.5	51.0	44.5	43.5	41.0	40.0	1	0
57	2 DEC	19:00	1:00	62.0	82.5	54.0	48.0	45.5	43.5	41.5	5	0
58	2 DEC	20:00	1:00	59.5	81.0	51.0	47.5	47.0	45.0	42.0	2	0
59	2 DEC	21:00	1:00	47.5	60.5	48.0	47.5	47.0	45.5	44.5	0	0
60	2 DEC	22:00	1:00	48.5	63.5	49.5	48.5	48.0	46.5	45.0	0	0
61	2 DEC	23:00	1:00	47.0	60.5	49.5	48.5	44.0	41.5	39.5	0	0
62	3 DEC	0:00	1:00	43.0	54.0	46.0	43.0	42.0	39.5	38.5	0	[illegible]
63	3 DEC	1:00	1:00	44.0	61.0	44.0	42.5	42.5	41.0	39.5	[illegible]	[illegible]
64	3 DEC	2:00	1:00	46.5	60.0	48.0	46.5	45.5	43.5	41.5	0	[illegible]
65	3 DEC	3:00	1:00	48.5	66.5	50.0	47.0	46.0	43.0	40.0	[illegible]	[illegible]
66	3 DEC	4:00	1:00	53.0	70.0	56.5	53.0	51.0	46.5	42.0	0	[illegible]
67	3 DEC	5:00	1:00	56.0	65.0	58.5	56.0	55.0	52.0	48.5	[illegible]	[illegible]
68	3 DEC	6:00	1:00	56.5	68.0	59.0	56.5	55.5	53.0	50.0	0	[illegible]
69	3 DEC	7:00	1:00	56.5	73.5	58.0	56.0	55.5	53.5	51.0	[illegible]	[illegible]
70	3 DEC	8:00	1:00	56.5	67.5	58.0	56.5	55.5	54.5	52.5	0	[illegible]
71	3 DEC	9:00	1:00	56.5	69.5	58.0	56.5	56.0	54.5	51.5	0	[illegible]
72	3 DEC	10:00	1:00	56.5	72.0	57.5	56.0	55.5	54.0	52.0	1	0

I N T E R V A L R E P O R T

Cnt	Date	Time	Dur	Leq	Lmax	L10	L33	L50	L90	Lmin	Ex	Ov	
73	3 DEC	11:00	1:00	57.5	71.0	58.5	56.5	56.0	54.5	52.0	2	0	
74	3 DEC	12:00	1:00	55.5	69.5	57.0	55.5	55.0	53.5	51.5	0	0	
75	3 DEC	13:00	1:00	60.0	87.0	57.0	55.5	55.0	53.5	51.5	5	0	
76	3 DEC	14:00	1:00	56.0	69.5	57.5	55.5	55.0	53.5	51.5	0	0	
77	3 DEC	15:00	1:00	57.0	70.5	58.5	57.0	56.5	55.0	53.0	2	0	
78	3 DEC	16:00	1:00	57.0	78.5	57.0	55.5	55.5	54.0	48.0	1	0	
79	3 DEC	17:00	1:00	57.5	81.5	57.0	54.5	53.5	52.5	50.5	1	0	
80	3 DEC	18:00	1:00	55.5	74.0	56.5	55.0	54.5	53.0	51.5	1	0	
81	3 DEC	19:00	1:00	54.5	67.0	56.0	54.5	53.5	52.0	49.5	0	0	
82	3 DEC	20:00	1:00	55.0	77.0	55.5	53.5	53.0	51.5	50.0	1	0	
83	3 DEC	21:00	1:00	53.5	68.0	54.5	52.5	52.0	51.0	48.5	0	0	
84	3 DEC	22:00	1:00	51.5	57.0	53.0	52.0	51.5	50.0	48.0	0	0	
85	3 DEC	23:00	1:00	51.0	54.5	52.0	51.0	50.5	49.5	47.5	0	0	
86	4 DEC		0:00	1:00	49.0	65.0	51.0	49.5	48.5	46.0		43.5	0
87	4 DEC		1:00	1:00	43.5	57.5	44.5	43.5	43.5	42.0		40.5	0
88	4 DEC		2:00	1:00	46.0	60.5	47.5	45.5	45.0	43.5		41.5	0
89	4 DEC		3:00	1:00	45.0	61.0	46.0	44.5	44.0	42.0		40.0	0
90	4 DEC		4:00	1:00	43.5	56.5	44.5	43.0	42.5	41.5		40.0	0
91	4 DEC		5:00	1:00	44.5	59.5	46.0	44.5	44.0	42.5		40.5	0
92	4 DEC		6:00	1:00	43.5	63.5	44.0	43.0	42.5	41.5		39.0	0
93	4 DEC		7:00	1:00	47.5	64.0	49.5	47.0	46.0	44.0		42.0	0
94	4 DEC		8:00	1:00	47.5	60.5	49.5	47.5	46.5	45.0		43.0	0
95	4 DEC		9:00	1:00	46.5	58.5	48.5	46.5	46.0	44.0		42.0	0
96	4 DEC	10:00	1:00	47.5	66.5	48.5	46.0	45.5	44.5	43.0	0	0	

INTERVAL REPORT

Cnt	Date	Time	Dur	Leq	Lmax	L10	L33	L50	L90	Lmin	Ex	Ov
97	4 DEC	11:00	1:00	48.5	61.0	50.5	48.5	47.0	45.0	43.5	0	0
98	4 DEC	12:00	0:35	60.5	90.5	50.0	46.5	46.0	44.5	43.0	1	0
99	4 DEC	13:00	1:00	47.5	66.5	48.5	44.5	43.5	42.5	31.0	0	0
100	4 DEC	14:00	1:00	50.5	67.5	54.5	46.0	44.0	42.5	41.0	0	0
101	4 DEC	15:00	1:00	46.5	64.0	48.0	46.0	45.5	43.5	42.0	0	0
102	4 DEC	16:00	1:00	49.0	65.0	51.5	48.5	47.5	44.0	42.0	0	0
103	4 DEC	17:00	1:00	51.0	63.5	52.0	51.0	50.5	48.5	44.5	0	0
104	4 DEC	18:00	1:00	47.0	56.0	49.0	47.5	46.5	44.5	42.5	0	0
105	4 DEC	19:00	1:00	45.5	61.0	47.5	45.0	44.0	42.5	40.5	0	0
106	4 DEC	20:00	1:00	48.0	68.5	47.5	45.5	45.0	42.5	40.0	0	0
107	4 DEC	21:00	1:00	45.0	54.0	46.5	45.0	44.5	43.5	41.5	0	0
108	4 DEC	22:00	1:00	45.5	54.0	47.0	46.0	45.5	44.0	41.5	0	0
109	4 DEC	23:00	1:00	43.5	61.0	46.5	43.0	42.0	39.5	37.5	0	0
110	5 DEC	0:00	1:00	42.0	61.5	43.0	41.5	40.5	39.0	36.5	0	
111	5 DEC	1:00	1:00	45.0	67.5	45.5	44.5	44.0	41.5	39.0	0	
112	5 DEC	2:00	1:00	44.0	56.0	46.0	45.0	43.5	41.0	39.0	0	
113	5 DEC	3:00	1:00	42.5	48.5	44.0	43.0	42.5	41.0	39.5	0	
114	5 DEC	4:00	1:00	46.5	55.0	49.5	47.0	45.0	41.0	37.5	0	
115	5 DEC	5:00	1:00	54.0	58.0	55.5	54.5	53.5	51.5	48.0	0	
116	5 DEC	6:00	1:00	56.5	65.5	57.5	56.5	56.0	55.0	52.5	0	
117	5 DEC	7:00	1:00	56.5	67.5	58.0	57.5	56.5	53.5	52.0	0	
118	5 DEC	8:00	1:00	53.5	71.0	56.0	53.5	51.5	46.0	45.0	2	
119	5 DEC	9:00	1:00	48.5	67.0	49.5	47.5	47.0	46.0	44.5	0	
120	5 DEC	10:00	1:00	51.0	76.0	52.0	49.0	48.0	44.5	42.0	2	0

I N T E R V A L R E P O R T

Cnt	Date	Time	Dur	Leq	Lmax	L10	L33	L50	L90	Lmin	Ex	Ov
121	5 DEC	11:00	1:00	52.5	71.5	53.0	48.5	47.5	44.0	42.0	1	0
122	5 DEC	12:00	1:00	55.0	73.0	55.5	53.0	52.0	48.5	44.0	3	0
123	5 DEC	13:00	1:00	68.0	86.5	69.0	55.5	53.0	50.5	46.5	5	0
124	5 DEC	14:00	1:00	70.0	87.0	75.5	55.5	54.0	45.5	44.0	2	0
125	5 DEC	15:00	1:00	62.5	80.0	68.0	59.5	51.5	46.0	42.5	4	0
126	5 DEC	16:00	1:00	49.5	68.0	50.0	48.5	48.0	47.0	46.0	0	0
127	5 DEC	17:00	1:00	49.0	63.5	52.5	48.0	43.5	41.0	40.0	0	0
128	5 DEC	18:00	1:00	52.0	76.5	51.0	50.0	49.0	47.5	46.5	1	0
129	5 DEC	19:00	1:00	53.0	63.0	54.5	53.0	52.5	50.5	49.5	0	0
130	5 DEC	20:00	1:00	52.0	65.5	53.0	52.0	51.5	50.0	48.0	0	0
131	5 DEC	21:00	1:00	52.5	56.5	54.0	53.0	52.5	51.0	49.5	0	0
132	5 DEC	22:00	1:00	53.5	58.0	55.0	54.0	53.5	51.5	49.5	0	0
133	5 DEC	23:00	1:00	52.5	58.5	54.0	52.5	52.0	50.5	48.5	0	0
134	6 DEC	0:00	1:00	51.5	61.5	54.0	52.0	51.0	49.0	46.0	0	
135	6 DEC	1:00	1:00	50.5	59.0	52.5	51.0	50.5	48.0	44.0	0	
136	6 DEC	2:00	1:00	49.5	64.0	50.5	48.5	48.0	46.5	44.0	0	
137	6 DEC	3:00	1:00	48.5	59.5	50.5	48.5	47.5	45.5	40.5	0	
138	6 DEC	4:00	1:00	50.5	65.0	52.5	50.0	49.0	46.0	42.5	0	
139	6 DEC	5:00	1:00	54.0	63.0	56.5	55.0	54.0	50.0	46.0	0	
140	6 DEC	6:00	1:00	58.5	73.5	59.5	58.0	57.5	56.5	54.5	6	
141	6 DEC	7:00	1:00	56.5	71.0	58.0	57.0	55.0	51.5	50.5	2	
142	6 DEC	8:00	0:10	61.0	82.5	58.0	51.5	51.0	49.5	48.0	3	

Appendix F
WORST CASE DAILY SCENARIOS

■ ■ ■

Tables F-1 through F-3 show the worst case daily scenarios used to create the NASA Ames Aerodynamics Testing Program Alternative contours presented in this EIS (Figures 21, 22, and 23). The program contours in this EIS depict the maximum noise exposure which would be allowed during any 24-hour period under absolute worst case conditions. The noise exposure contours were computed by taking the maximum noise level emission from each noise source, and calculating the CNEL noise exposure contribution for the maximum allowed duration, for the daytime and nighttime periods, according the CNEL noise definition. CNEL noise exposure contribution values with penalties of 5 dB for evening testing and 10 dB for nighttime testing are shown in the table within parentheses.

Contours for each alternative combine the independent maximum noise exposure possible for operations at the 40- by 80-Foot Wind Tunnel and the 80- by 120-Foot Wind Tunnel. The contours for the program alternatives were prepared in this manner to present a large amount of information as clearly and concisely as possible. However, concurrent use of the two wind tunnels is not possible, so the contours do not realistically represent an expected noise contour for any given time.

Table F-1
ALTERNATIVE 1: WORST CASE DAILY SCENARIO

Testing Window	Noise at Benchmark (w/CNEL penalty)	Hours Per Window
80- by 120-Foot Wind Tunnel Testing Scenario		
Nighttime (10PM-7AM)	80 (90)	4
Daytime (7AM-7PM)	85	5
40- by 80-Foot Wind Tunnel Testing Scenario		
Nighttime (10PM-7AM)	75 (85)	4
Daytime (7AM-7PM)	75	4
Nighttime (10PM-7AM)	65 (75)	1

Table F-2
ALTERNATIVE 2: WORST CASE DAILY SCENARIO

Testing Window	Noise at Benchmark (w/CNEL penalty)	Hours Per Window
80- by 120-Foot Wind Tunnel Testing Scenario		
Daytime (7AM-7PM)	85	4
Evening (7PM-10PM)	80 (85)	4
40- by 80-Foot Wind Tunnel Testing Scenario		
Daytime (7AM-7PM)	75	4
Evening (7PM-10PM)	70 (75)	4

Table F-3
ALTERNATIVE 3: WORST CASE DAILY SCENARIO

Testing Window	Noise at Benchmark (w/CNEL penalty)	Hours Per Window
80- by 120-Foot Wind Tunnel Testing Scenario		
Daytime (7AM-7PM)	85	3
Daytime (7AM-7PM)	80	3
40- by 80-Foot Wind Tunnel Testing Scenario		
Daytime (7AM-7PM)	75	4
Nighttime (10PM-7AM)	65 (75)	2

Appendix G
X-32/X-35 JSF TESTING PROJECT FREQUENCY SPECTRUM

■ ■ ■

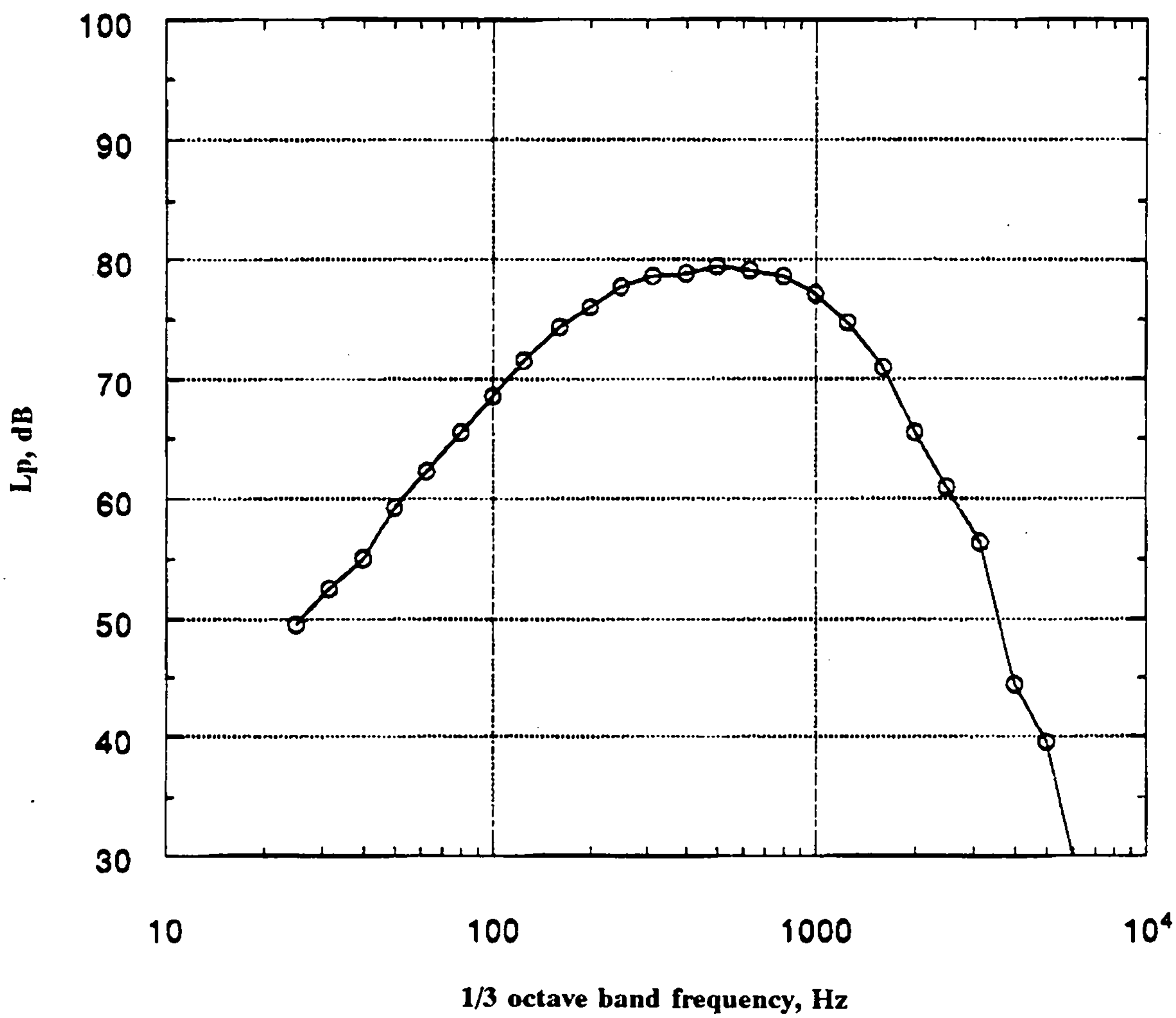
Table G-1 presents the noise spectrum of a typical jet powered X-32/X-35 JSF model in simulated vertical takeoff at high power. The noise is representative of what would be heard at the benchmark location during X-32/X-35 JSF operation. Even though the maximum noise in the third-octave spectrum is slightly less than 80 dB, the summation of the sound over all frequencies would result in an 85 dB overall sound level.

Table G-1
CALF VTOL NOISE SPECTRUM AT BENCHMARK LOCATION
(NPR = 3.5, two jets)

Frequency (Hz)	Lp (dB)
25	50
32	53
40	55
50	59
63	62
80	66
100	69
125	72
160	74
200	76
250	78
315	79
400	79
500	79
630	79
800	79
1000	77
1250	75
1600	71
2000	66
2500	61
3150	56
4000	44
5000	40
6300	27
8000	21

X-32 CALF VTOL Predicted Noise Spectrum at Benchmark

(NPR = 3.5, two jets adjusted to 85 dB)



SOURCE: NASA Ames Research Center.

X-32 CALF
Program Frequency Spectrum

Appendix H
BURROWING OWL QUARTERLY REPORT

■ ■ ■

DATE: October 7, 1996

TO: Sandra Olliges, Assistant Chief
Safety, Health and Environmental Services
NASA/Ames Research Center
Mountain View, CA 94035-1000

FROM: Lynne Trulio, Ph.D., Senior Ecologist
1984 Silverwood Avenue
Mountain View, CA 94043

SUBJECT: NASA Quarterly Report from June 16 September 16, 1996:
Study of the Ecology of the Burrowing Owl, Moffett Field, CA

Background

In May 1995, NASA/Ames Research Center contracted with Dr. Lynne Trulio from San Jose State University to continue her study of the ecology, status and distribution of the western burrowing owl at Moffett Federal Airfield. This study was begun in 1992 at the request of the Navy and NASA's contract continues this research for a fourth year.

This report for the summer quarter in 1996 provides owl locations, numbers, and other activities during the winter months. Recommendations for habitat management which encourages the preservation of the owl population are provided.

Observations and Results

During this quarter, owl locations were checked at least twice per month for the number of owls present and the type of owl activity. Owl burrow locations for the quarter are shown on the map and are given in Table 1. Locations where owls are often seen but had not been observed this quarter are listed in Table 2 and shown on the map.

As of September 15, 45 adult birds were seen at 25 burrow sites. Twenty pairs of owls and 5 apparent single birds were observed. Of 15 pairs which were regularly observed, 12 pairs produced 24 fledged chicks. This reproductive rate per pair was 2.0 chicks fledged per reproductive pair or 1.6 chicks per possible breeding pair. There were no clutches larger than 3 chicks seen. This is quite unusual as clutches of 5 and 6 are regularly seen during breeding season at Moffett. Table 3 shows that 1996 was the least productive year in the last five. However, fledging success was not much lower that in either 1992 or 1993.

Reasons for low fledging production are not clear, but my unquantified observations at other south Bay owl sites, including Sunnyvale Baylands, Shoreline and Mission College, indicate that birds throughout the south Bay were not highly productive this year.

Table 3. *Reproductive Effort of Burrowing Owls at Moffett Field from 1992 to 1996.*

	1992	1993	1994	1995	1996
Number of Observed Pairs	15	19	19	25	15
Number of Pairs Breeding	11	14	15	22	12
Percent of Pairs Breeding	73%	74%	78%	88%	80%
Number of Chicks Fledged	27	34	38	73	24
Number of Fledglings/ Possible Breeding Pair	1.8	1.8	2.0	2.9	1.6

Two banded birds were seen this quarter. The first was a bird banded in 1995 at Lockwood School in Sunnyvale, approximately 2 miles away. This bird was found at the Driving Range. The second bird was found at a burrow between the VTOL pad and the runway and this guy was banded as a chick at "Antique plane" last year, less than a mile away. Both banded birds were seen as members of a pair, but neither were seen with chicks.

Two dead owls were discovered this quarter. The first, an adult, was found next to building T-045 by a NASA engineer who watches the local owls regularly. The reason for death was not apparent. The second dead bird was a chick, found outside its burrow at the "1/2 Torpedo" site. The reason for death may have been starvation.

Foxes were seen on only one occasion. Skunks seemed more numerous this year than any other and they were seen on three evenings. Owls treated skunks as dangerous predators, screaming and diving at any skunk who came near an owl burrow.

The grass on most of the Base was mowed very short this season, a condition which burrowing owls find very attractive as <u>nesting habitat</u>. This management practice is valuable in promoting the presence of owls on the Base. It is not clear how often owls use short versus long grass areas as <u>foraging habitat</u>. Nor are there any data on the relative size of the owl prey base in these two habitat types. Given this uncertainty and given the value of long grass to other species, managing a few areas throughout the Airfield for long grass may be beneficial to both owls and the biodiversity at Moffett.

<u>Other Relevant Activities</u>

During August and September, I worked with staff from the Air National Guard to ensure that owls living in a sand pile between the Guard building and the soil remediation pad were evicted. By mid-September, the owls were evicted and the sand piles removed.

Over the past several years, Jon Talbot (BAMSI) has been putting up distinctive red-topped posts near owl burrows. Since Jon is an excellent owl watcher, most of the owl pairs are now marked with posts. These posts have proven <u>highly effective</u> in alerting Airfield personnel to the presence of owls.

Airfield staff are generally very sensitive to owls and respond to the owl posts by calling Shelly Navarro to ensure that work proceeds without harming birds. I support the continued use of the posts as a method for protecting the birds and indicating sensitive owl areas.

Habitat Management Recommendations

Activities requiring earth moving, such as tank removal, well drilling, grading, and road building, should be coordinated with Lynne if the project will occur in an area where owl burrows have been mapped.

Management recommendations for Moffett Field include the following:

• *Mow grass areas instead of discing.* Discing is very destructive to owls, their burrows and the ground squirrels upon which the owls depend. Mowing is beneficial for owls as it creates the short-grass habitat they prefer.

• *Areas where owls live should be mowed several times a year to keep the grass short.* This is a good way to ensure that owls remain in an area. Mowing with a large mower within 25 feet of active burrows is very acceptable. Areas over owl burrows should also be mowed, but with a small or hand mower. Large equipment may cave in burrows or cause owls to leave.

• *Do not disturb areas within 50 feet of an owl nest, other than to mow.* Pesticide use, land disturbances, digging wells, driving, placing temporary structures or any other land disturbance must be kept at least 50 feet from owl nests.

• *Leave longer grass areas for other species, such as song birds, lizards, rodents and insects, which use this habitat type.* Mowing edges of large fields while leaving the interior long will help promote greater biodiversity. These areas may provide important foraging areas for burrowing owls.

• *Allow a healthy population of squirrels where ever possible.* Squirrels are common throughout Moffett Field and their prevalence is essential to the maintenance of a large and healthy owl colony. Whenever possible, squirrels should not be destroyed.

• *Consult with Lynne on all projects requiring earth moving, squirrel killing or land disturbances in areas where owls are shown on the quarterly owl location map.*

• *Cover all open standpipes, valve tubes, or other open tubes into which owls or other animals could fall and die.*

Summary

NASA is supporting protection of the owls on Moffett Field by allowing Dr. Trulio to study owl ecology, monitor populations and make recommendations for owl protection. The NASA/Ames Research Center Safety, Health and Environmental Services and the Navy Environmental Offices have been most supportive of owl protection and very proactive in their management of owl habitat.

I would like to thank the people listed below for their help and interest in protecting burrowing owls at Moffett Field. Thanks also to John Thayer and Charlie Tonga of the Bentley Engineering Company for their always prompt and accurate GIS maps of current burrowing owl locations. Special thanks to Jon Talbot, whose red-topped posts are highly effective at protecting owl burrows and habitat.

cc. Shelly Navarro, Environmental Specialist, NASA
Gay Howard, Vinnell, Environmental Engineer
Doug Carlton, Moffett Golf Course Manager
Darren Marcus, Moffett Golf Course Superintendent
Jon Talbot, BAMSI
Trish Morrissey, Engineering Office, NASA

Table 1. Moffett Federal Airfield Burrowing Owl Data: June 16 to Sept 15, 1996

Burrow #	Location	Year	# Adults	# Chicks*	Date**	Hab Type	MicroHab	Comments
1	Windtunnel/	1996	2	2	16-May	1	0	Same birds as windtunnel
	Substation	1996				2	3	
2	N-255	1996	1	1	25-Jun	2	1	
3	Runway NW Corner	1996	2	2	19-Aug	1	2	
4	Runway Field	1996	2	ND		1	0	
5	Runway NW Light	1996	2	ND		2	2	
6	VTOL-S	1996	2	0		2	2	
7	Soccer	1996	1	0		1	1	
8	Soccer-S	1996	2	3	14-Jul	1	0	
9	Blimp	1996	2	ND		1	2	Moved out during nest season
10	Antique W	1996	2	1	28-Jul	1	0	
11	Antique 1	1996	2	3	28-Jul	1	0	
12	Antique 2	1996	1	0		1	0	
13	Ballpark	1996	1	ND	0	1	0	Appeared late in season .
14	Runway S	1996	2	1	29-Jul	2	0	
15	Lockheed S1	1996	2	3	17-Jul	1	0	
16	Lockheed S2	1996	2	1	17-Jul	1	0	
17	Sandpile	1996	2	ND		2	1	
18	Lockheed Brushpile	1996	2	3	29-Jul	2	0	
19	Farmer's Field 1	1996	2			1	0	
20	Farmer's Field 2	1996	2	1	31-Jul	1	0	
21	Small Fuel Farm	1996	2	2	9-Aug	2	0	
22	Driving Range	1996	2	0		1	0	
23	Levee-mid	1996	2	ND		2	1	Appeared late in season
24	Torpedo	1996	1	ND		2	2	
25	Half Torpedo	1996	2	1	17-Jul	2	3	One chick found dead Aug 7

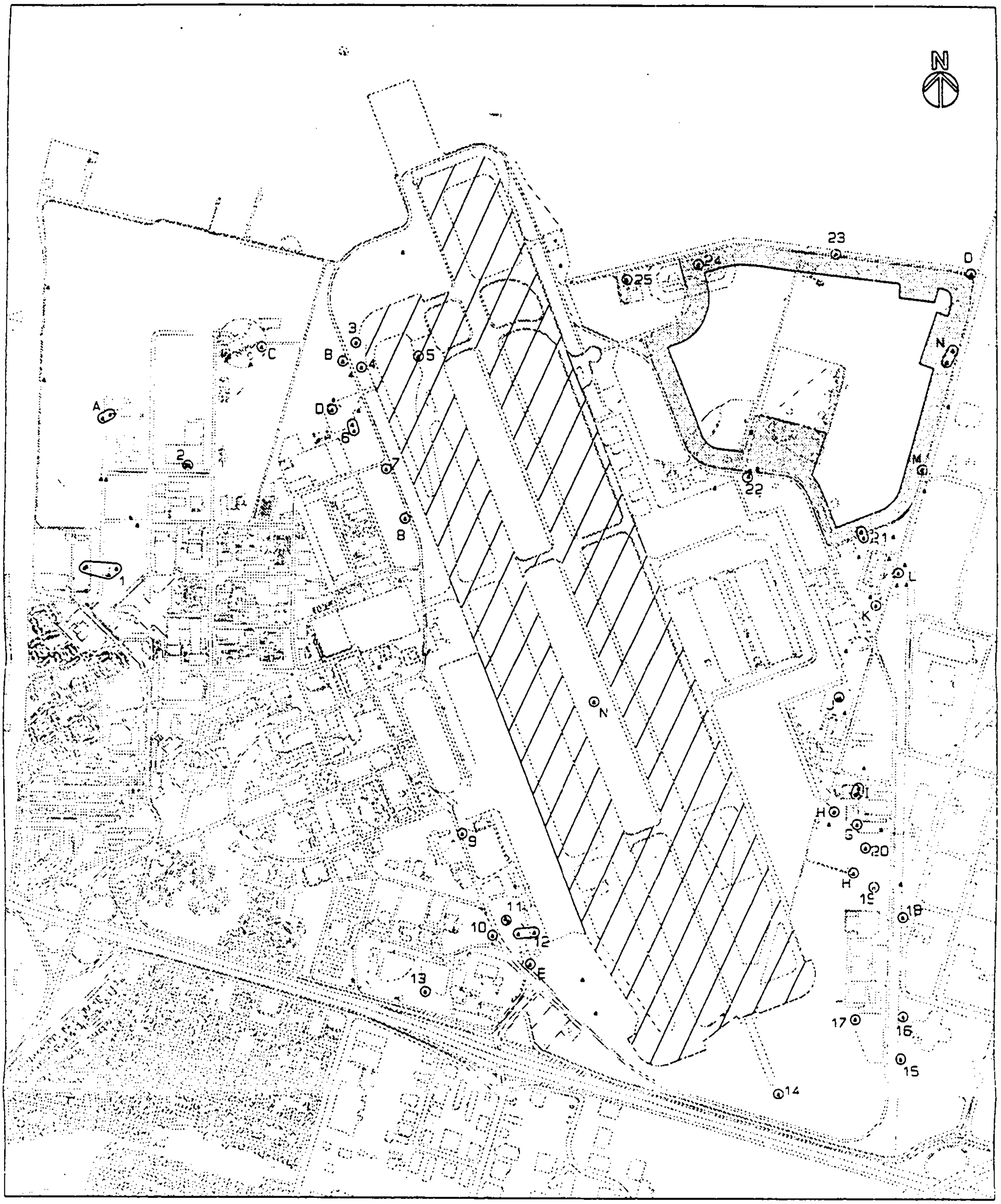
Key to Table 1 Notations:

Habitat type:	* Number of chicks fledged
1 short grass	** Date chicks were first seen at each burrow
2 barren	
3 unmowed	
4 disced	
Micro-Habitat:	
0 none	
1 mound or levee	
2 cement or fence	
3 both 1 and 2	

TABLE 2. Typical Owl Locations at Moffett/NASA where Owls were not seen between June 16 and September 15, 1996. Owls may be seen at these locations in the future.

Burrow Letter[1]	Location	Habitat Type, Microhabitat[2]	Comments
A	T-045	2, 1	
B	VTOL Field N	2, 2	
C	OARF-E	1, 2	
D	VTOL Pad-N	3, 0	Pairs nearby at VTOL-S, Runway Fields
E	Antennae Farm	2, 2	
F	Farmers Field Mound	3, 2	
G	Satellite Dish-S2	1, 1	Pair nearby at Farmer's Field
H	Satellite Dish-S1	2, 2	Pair nearby at Farmer's Field
I	Satellite Dish	2, 3	
J	Former Big Fuel Farm	2, 0	
K	No Smoke	1, 0	
L	Horse Farm	1, 0	
M	Lockheed Gate	2, 2	
N	GC/RR	1, 1	
O	Levee-E	2, 3	

1 Letters correspond to those on Map 1.
2 Habitat type: 1 = mowed, short grass; 2 = barren; 3 = ruderal, unmowed; 4 = disced;
Microhabitat: 0 = none; 1 = mound, levee or berm; 2 = under cement pad or fence; 3 = both 1 and 2



NUMBERS	ACTIVE OWL BURROWS: OWLS SIGHTED.
LETTERS	RECENTLY ACTIVE OWL BURROWS: OWLS NOT SIGHTED THIS QUARTER.
(stippled box)	OWL PROTECTION ZONE: SQUIRRELS NOT TO BE CONTROLLED IN THESE AREAS: NO ACTIVITIES DETRIMENTAL TO OWLS CONDUCTED.
(hatched box)	NOT SURVEYED THIS QUARTER

Geographic Information Systems · Ames Research Center · NASA

NASA Ames Research Center
Moffett Federal Airfield
Moffett Field, California 94035

DATE
9/15/96

TITLE
BURROWING OWL LOCATIONS

Appendix I
CRITERIA FOR THE PROTECTION OF WILDLIFE FROM NOISE IMPACTS

■ ■ ■

A. Permanent Hearing Loss

Wildlife in the vicinity of the NASA Ames Aerodynamics Testing Project will be protected from permanent hearing loss if the following criterion is met:

> *Sound pressure levels shall not exceed 90 dB in habitat that is used on a regular basis throughout the year or for breeding purposes*

Wildlife will be protected against permanent hearing loss by conducting aerodynamic testing so as to prevent exposure to sound pressure levels above 90 dB. This criterion is based on detailed studies of noise-induced deafness in laboratory species such as the guinea pig, chinchilla, and domestic cat. In a representative short-term experiment, cats were exposed to broadband noise of 107 dB for one hour with no damage, although higher sound pressure levels did produce partial deafness (Lindquist, N.E. *et al.*, 1954). A long-term study showed that exposure of canaries to broadband noise of 95-100 dB for periods of 40-200 days resulted in permanent hearing loss (Marler *et al.*, 1973). While this is one of the few animal studies demonstrating permanent hearing loss from sound pressure levels below 110 dB, the fact that long-term occupational exposures in humans to sound pressure levels in the range 90-110 dB can produce adverse effects suggests caution in dealing with long-term exposures of wildlife to noise levels above 90 dB. It would seem that setting the criterion at 90 dB or above for short-term exposure (hours rather than days) should provide a wide margin of safety.

B. Physiological Stress

Wildlife in the vicinity of the NASA Ames Aerodynamics Testing Project will be protected from physiological stress, including interference with reproduction, if the following criterion is met:

> *Sound pressure levels shall not exceed 70 dB in habitat that is used on a regular basis throughout the year or for breeding purposes*

Wildlife will be protected against physiological stress or interference with reproduction by conducting aerodynamic testing so as to prevent exposure to sound pressure levels above 70 dB. This criterion is based on the fact that there has been no demonstration of adverse effects on cardiovascular function, hormonal levels, reproductive success, or embryonic development in laboratory animals and livestock exposed to sound pressure levels below 80-85 dB (EPA, 1971; Fletcher and Busnel, 1978). Because there have been very few studies involving long-term exposure to noise levels between 70 and 80 dB, it is considered prudent to set the criterion at 70 dB, thus ensuring a substantial margin of safety.

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Appendix J
THE EFFECTS OF NOISE ON PROPERTY VALUES

■ ■ ■

A. Literature Summaries

The following presents literature summaries of articles and studies that were used both directly and indirectly in the socioeconomic chapter of this DEIS. These summaries are in chronological order, so order does not imply importance.

- **Aircraft Noise and Residential Property Values: An Artificial Neural Network Approach**
  Alan Collins and Alec Evans
  (1994)

This study uses a new modeling technique, an "artificial neural network" (ANN), to predict the impact of airport noise on property values. Previous studies, including Pennington et al, (1990) and Uyeno et al (1993) argued that airport noise has a small negative but statistically significant effect on housing prices. When the neighborhood and locational characteristics were included, these studies concluded that other factors were more important than noise in determining property values.

Collins and Evans challenged the finding of the previous studies, particularly those of Pennington et al (1990). They argued that the noise impact was more complex than had been previously considered. They proposed the use of the ANN model to determine the effect of airport noise on property values because this model had a very powerful predictive capability.

The central component of the ANN is a neuron, likened to the neuron in the brain. The ANN starts with the input of a number or variables without the effect of the variable being tested. The model is trained through thousands of repetitions to predict the relationship between the variables. The ANN model used in this case use the physical property attributes, neighborhood characteristics and noise as the input variables and the selling price of the house as the output variable.

Collins and Evans used the same data from Manchester Airport that Pennington et al (1990) had used. They analyzed this dataset and took into account the shortcomings that would influence the accuracy of the analysis. Based on the ANN model testing of the data, Collins and Evans found a "significant positive association between the ranked actual and predicted house values at the 1 percent level" (1994:184). After controlling for the housing and property characteristics, the results of the ANN model countered those of Pennington et al (1990). They found that noise levels of 40 NNI had the effect of decreasing property values four to ten percent, depending on the type of units (1994:186). Detached units experienced the greatest impact with reductions in property values from 8.0-9.5 percent (1994:185). When noise levels increased to 50 NNI, the reduction in property values increased approximately five percent (1994: 185).

The results of this study, using the same data contradict the finding of Pennington et al (1990). This analysis showed that when neighborhood characteristics are taken into account, there is still a negative relationship between airport noise and property values.

- **Modeling the Effect of Airport Noise on Residential Housing Markets: A Case Study of Winnipeg International Airport**
  Terrence J. Levesque
  (1994)

This article is a critical look at the models that use a single index to represent noise, such as the Noise Exposure Forecast (NEF). This study is the first one to decompose the contribution of noise to property prices into two components: loudness and frequency of events.

Levesque is critical of the previous hedonic studies because they rely on cumulative noise measures which aggregate the noise that is produced by events throughout the entire day. This approach masks the effects of the level of loudness and the frequency of events. Levesque proposes the use of the Effective Perceived Noise Level (EPNL) and the number of events in one day to determine the impact of noise on property values.

Earlier hypotheses proposed that a greater variability in the noise level leads to a lower property value. Levesque did a case study of Winnipeg International Airport and found that when looking at noise in terms of the two separate components, if two houses are located in an area affected by the same number of events and the same noise level, the one with the larger variation in individual noise levels will sell for more. Based on his approach, Levesque concluded that a constant level of background noise is more detrimental to property values than one in which there is variability.

The results of Levesque's study when compared with NEF projections, provide evidence that the decomposition of noise into loudness and frequency is a more effective approach to explain the effects of noise on residential property values.

- **Density of Residential Land Use and the Impact of Airport Noise**
  Dean Uyeno, Stanley W. Hamilton, and Andrew J.G. Biggs
  (1993)

Uyeno, et al conducted the first study that looked in-depth at the impact of airport noise on single family detached homes, multi-unit detached condominiums and vacant land. This analysis was based on a case study of the Richmond Area near Vancouver International Airport. Areas impacted by a 25 NEF level or higher were studied. (The Noise Exposure Forecast (NEF) is the most common measurement of noise in North America, and 25 NEF causes "some" annoyance.)

Uyeno et al found that there was an approximate 0.65 percent decrease in property values per one unit increase in noise, or a 6.5 percent reduction per ten unit increase of noise (1993:9). This finding is consistent with other studies that have been done over the last twenty years which also found a decrease of about six percent per ten unit increase of noise. The consistency of the results within these studies indicates that there has been little change in the valuation of airport noise, even as the impacts have been more publicized.

For multi-unit condominiums, Uyeno et al found that there was a nine percent reduction in property values per each ten unit increase in noise (1993: 12). This result was noticeably higher than the findings for single family homes and contradicted some earlier studies which believed noise had a smaller impact on the property values of multi-unit homes than single family homes.

Lastly, Uyeno et al found that vacant land experienced a 16 percent reduction in property values for each 10 unit increase in noise (1993: 13). The impact of noise on vacant land was substantially higher than both multi-unit and single family homes. The impact of the increased noise on the property values of vacant land has implications for the costs of compensation plans for land affected by airport noise.

- **Aircraft Noise and Residential Property Values Adjacent to Manchester International Airport**
  G. Pennington, N. Topham and R. Ward
  (1990)

This study looks at the variation in housing prices around Manchester International Airport. Pennington et all (1990) used a hedonic (multiple) regression model for their analysis of 3,472 property sales over an eleven-year period. The analysis includes such variables as type of residential unit, number of bedrooms, and other characteristics such as presence of a garage, garden or central heating.

The initial study showed there is a low negative, but weak relationship between aircraft noise and property values. The authors found that property in the worst noise affected areas had a reduction in value of about six percent (1990:52). However, the negative effect of the higher noise level could be potentially offset by the benefits of being located close to a major airport. Some of the benefits include greater accessibility to a major employment center which may in turn have a positive impact on housing prices.

After further study and model revision, Pennington et al concluded that the decrease in property values that was originally attributed to noise could, in fact, be attributed to other locational characteristics. The authors found that similar homes in non-noise affected areas consistently commanded lower prices. His final conclusion was that the whole of the difference in property values around Manchester Airport could be accounted for by the neighborhood and other characteristics of the properties.

- **The Effect of Aircraft Noise and Airport Activity on Residential Property Values: A Survey Study**
  Marvin Frankel
  (1988)

This study looked at a variety of airports throughout the United States and abroad. Airports are seen as both a negative and positive entity within a community. On the positive side, as an economic center, airports generate economic activity and property demand. On the negative side, they increase congestion and are noisy.

Frankel found that neighborhoods impacted by a moderate level of aircraft noise found noise to be a less important factor in determining property values than the quality of the neighborhood, the schools, or property taxes. Frankel surveyed both realtors and appraisers to determine the impact of noise on property values. Among the realtors he surveyed, Frankel found that for single family dwelling units, a moderate noise level (65-70 dBA) decreased property values by 3.9 to 7.7 percent. Substantial noise (70-75 dBA) decreased property values 9.6 to 13 percent. Severe noise (75-80 dBA) decreased property values 11.2 to 21.6 percent (1988:ii). The appraisers surveyed agreed that aircraft noise reduced property values, but their reduction estimates were generally 30 percent lower than that of the realtors. Both the realtors and the appraisers agreed that there was a smaller reduction in property values for multi-family dwelling units than single family units.

While the airport is an employment center, both the realtors and the appraisers believed that a decline in airport activity would have little impact on business or jobs, but would increase residential property values.

- **The Influence of Highway Environmental Effects on Residential Property Values**
  Institute for Research on Land and Water Resources
  (1974)

This study looked at the effect of regional accessibility and highway generated disturbances on property values. It concluded that highways generate adverse effects such as noise, pollution and scenic disamenities that impact residential areas more heavily than non-residential areas. On the other hand, the regional accessibility provided by the highway could increase property values. A major highway can increase the value of property, if the property is located near interchange sites. If the property abuts the highway, but it is not near a major interchange, then the adverse effects of the highway decrease property values more than they do for property further away from the highway. The study concluded that noise is the most disturbing effect of highways, but that a level of noise above average is more important than the actual noise level.

- **The Impact of Traffic on Residential Property Values and Retail Sales in Champaign-Urbana**
  Paul T. Kinney
  (1966)

According to Kinney, Champaign-Urbana is an atypical study area. The methodology used in his study is applicable to other studies, but the results were more particular to the Champaign-Urbana study area.

In this study, Kinney found that land that was zoned strictly residential did experience a slight decrease in property values with an increase in traffic. However, other factors such as neighborhood demographics and schools had a stronger influence on property values than traffic.

Kinney concluded that in Champaign-Urbana, there is no significant relationship between traffic conditions and residential property values. The "status quo" traffic environment is unimportant, but when a change in patterns is proposed or affected, the residents are potentially influenced. However, after the residents adapt to the change, further influence of the new traffic pattern would be reduced.

Kinney conducted a series of interviews with residents in the study area which supported that findings of his study were accurate. While the residents did find noise to be a nuisance, they did not relate it strongly to a reduction in property values. The residents also claimed that an improvement in traffic conditions would not generate an increase in property values.

- **A Study of the Impacts of Airports on the Market Value of Real Estate in the Adjacent Areas**
  H.O. Walther
  (1960)

In 1960, Walther did a study of the impact of airports on real estate around three airports and two air stations. Based on his study, Walther concluded that airports have no adverse effects of the market value of real estate. He looked at areas immediately adjacent to the airport and comparable areas further away and observed that the market behavior was the same in both areas. He looked at issues such as the number of homes sold and the number of homes built in airport areas and found that no more homes were sold and no less built in airport areas than in non-airport areas. Lastly, Walther found that there was not a large difference in market value in areas in the flight path versus other airport areas. Walther concluded that while airports do create nuisances, such as noise, these are offset by benefits of the airport such as increased employment, increased demand for housing, and new industries.

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Appendix K
SINGLE FAMILY SALES TRANSACTION DATABASE

Single Family Sales Transaction Database: January 1993 to March 1995 in Mountain View, CA
NASA Ames Aerodynamic Testing Program

										Miles from	
		Lot	Sales	Closing	Unit Size	Price per	Year	Number of:		Moffett	
No.	Adress	Size	Price	Date	(SqFt)	SqFt	Built	Bdrms	Baths	Field	Hwy 101
1	1001 BURGOYNE ST	5,200	$193,000	04/12/94	1,344	$143.60	1951	na	0.5	1.29	0.98
2	1067 BURGOYNE ST	5,200	$196,500	03/24/93	1,398	$140.56	1951	4	1.0	1.27	0.97
3	1102 WRIGHT AVE	4,900	$204,000	05/04/94	980	$208.16	1955	2	1.0	1.52	1.06
4	1103 BURGOYNE ST	5,200	$216,000	10/26/93	832	$259.62	1951	2	1.0	1.25	0.96
5	1158 BURGOYNE ST	5,040	$197,500	11/16/93	832	$237.38	1951	3	1.0	1.25	0.97
6	1224 BURGOYNE ST	5,400	$207,000	06/16/94	882	$234.69	1950	3	1.0	1.22	0.96
7	1310 SAN DOMAR DR	6,174	$310,000	06/13/94	1,950	$158.97	1964	5	2.5	1.22	0.80
8	1388 SAN DOMAR DR	6,000	$284,000	06/28/94	1,415	$200.71	1965	3	2.0	1.27	0.86
9	139 FARLEY ST	5,150	$235,000	08/17/93	882	$266.44	1950	3	1.0	1.72	1.32
10	141 BONNY ST	6,480	$205,000	11/01/94	882	$232.43	1950	3	1.0	1.73	1.33
11	142 BONNY ST	5,200	$245,000	01/22/93	1,036	$236.49	1950	3	2.0	1.72	1.33
12	148 FARLEY ST	9,375	$179,500	06/29/94	832	$215.75	1950	2	1.0	1.72	1.32
13	155 BEATRICE ST	5,980	$82,000	03/14/94	1,290	$63.57	1950	3	1.0	1.66	1.24
14	1580 SPRING ST	5,824	$195,000	01/19/94	1,182	$164.97	1956	3	2.0	1.05	0.97
15	1617 MORGAN CT	6,700	$262,000	01/08/93	1,234	$212.32	1976	3	2.0	1.05	0.90
16	1618 MORGAN ST	5,300	$250,000	08/05/94	1,258	$198.73	1956	3	2.0	1.03	0.91
17	1647 SPRING ST	5,300	$238,000	12/03/93	1,648	$144.42	1956	3	2.0	1.07	0.97
18	165 BONNY ST	6,264	$180,000	03/16/93	832	$216.35	1950	2	1.0	1.72	1.32
19	1650 SPRING ST	6,160	$219,000	05/25/94	1,182	$185.28	1956	3	2.0	1.07	0.98
20	1658 MORGAN ST	5,300	$260,500	11/24/93	1,498	$173.90	1956	3	2.0	1.07	0.95
21	1710 SPRING ST	5,445	$203,000	12/17/93	1,182	$171.74	1956	3	2.0	1.11	1.02
22	173 FARLEY ST	6,222	$208,000	12/16/93	860	$241.86	1950	3	1.0	1.71	1.31
23	1739 SPRING ST	5,247	$210,000	03/01/94	1,104	$190.22	1955	3	2.0	1.14	1.04
24	1758 SPRING ST	5,247	$208,000	04/05/94	1,104	$188.41	1955	3	2.0	1.15	1.06
25	1770 HACKETT AVE	5,757	$205,000	02/17/95	1,092	$187.73	1950	2	1.0	1.57	1.16
26	1774 PEACOCK AVE	5,400	$228,000	09/10/93	1,152	$197.92	1950	3	1.0	1.50	1.13
27	179 BEATRICE ST	5,980	$246,000	01/21/93	877	$280.50	1950	3	1.0	1.65	1.23
28	179 GRANADA DR	5,760	$260,000	05/17/94	1,421	$182.97	1974	3	2.0	1.58	1.12
29	1793 ELSIE AVE	5,600	$187,500	10/25/94	1,068	$175.56	1950	3	1.0	1.45	1.10
30	1794 SAN LUIS AVE	6,380	$240,000	05/19/94	832	$288.46	1951	2	1.0	1.37	1.06
31	1826 SAN LUIS AVE	5,995	$30,000	09/03/93	860	$34.88	1951	3	1.0	1.38	1.07
32	1837 DREW AVE	6,328	$173,500	12/01/94	832	$208.53	1951	2	1.0	1.32	1.05
33	1837 W MIDDLEFIELD RD	7,000	$200,000	08/18/93	1,108	$180.51	1924	2	1.0	1.22	1.00

Single Family Sales Transaction Database: January 1993 to March 1995 in Mountain View, CA
NASA Ames Aerodynamic Testing Program

No.	Adress	Lot Size	Sales Price	Closing Date	Unit Size (SqFt)	Price per SqFt	Year Built	Number of: Bdrms	Baths	Miles from Moffett Field	Hwy 101
34	1844 VASSAR AVE	5,200	$201,000	10/27/94	860	$233.72	1950	3	1.0	1.56	1.18
35	1846 ELSIE AVE	5,400	$235,000	04/12/94	1,222	$192.31	1950	4	2.0	1.45	1.11
36	1849 WAGNER AVE	5,300	$200,000	12/29/93	882	$226.76	1950	3	1.0	1.42	1.10
37	1856 DREW AVE	5,356	$264,500	06/29/93	877	$301.60	1951	3	1.0	1.32	1.05
38	1856 VASSAR AVE	5,200	$200,000	09/07/94	1,632	$122.55	1950	2	1.0	1.56	1.19
39	1861 WAGNER AVE	5,300	$225,000	05/25/94	1,102	$204.17	1950	3	2.0	1.43	1.10
40	1875 SAN LUIS AVE	5,700	$225,000	01/14/94	1,101	$204.36	1950	3	2.0	1.40	1.09
41	1939 COLONY ST	11,761	$235,000	04/14/94	630	$373.02	1950	na	na	1.29	1.24
42	203 FARLEY ST	5,940	$190,000	12/23/93	860	$220.93	1950	3	1.0	1.69	1.30
43	205 BEATRICE ST	5,980	$210,000	06/17/94	1,604	$130.92	1950	3	2.0	1.64	1.22
44	208 LAUELLA CT	5,270	$240,000	06/17/93	1,262	$190.17	1959	3	2.0	1.88	1.45
45	226 SHERLAND CT	na	$70,500	08/31/93	1,794	$39.30	1990	3	2.5	1.06	0.62
46	268 BEATRICE ST	6,060	$185,000	02/16/95	877	$210.95	1950	3	1.0	1.62	1.21
47	310 WILDFLOWER PARK	4,290	$415,000	12/14/93	2,030	$204.43	1988	3	2.5	1.27	0.74
48	314 BURGOYNE ST	6,840	$180,000	06/30/93	860	$209.30	1950	3	1.0	1.54	1.13
49	335 STIERLIN RD	4,290	$425,000	03/19/93	2,264	$187.72	1988	4	3.0	1.38	0.85
50	357 BURGOYNE ST	5,400	$189,000	12/14/93	832	$227.16	1950	2	1.0	1.52	1.11
51	404 STIERLIN RD	4,290	$372,000	01/10/95	1,755	$211.97	1988	3	3.0	1.33	0.81
52	478 FARLEY ST	6,150	$175,000	11/15/94	1,288	$135.87	1950	2	1.5	1.57	1.21
53	579 FARLEY ST	5,940	$212,000	05/27/93	860	$246.51	1950	3	1.0	1.53	1.18
54	589 BURGOYNE ST	6,000	$203,000	06/17/94	877	$231.47	1950	3	1.0	1.44	1.06
55	660 SIERRA AVE	4,791	$300,000	03/31/94	1,390	$215.83	na	3	1.5	2.15	1.60
56	711 FARLEY ST	6,300	$232,000	02/10/95	860	$269.77	1950	3	1.0	1.48	1.15
57	734 TELFORD AVE	5,586	$207,000	04/29/94	1,104	$187.50	1955	3	2.0	1.21	1.08
58	745 SAN LUCAS AVE	9,246	$253,000	12/30/94	1,060	$238.68	1962	3	2.0	0.84	0.30
59	758 SAN CARLOS AVE	6,200	$264,000	03/09/94	1,688	$156.40	1962	4	3.0	0.82	0.31
60	763 TELFORD AVE	6,600	$227,000	06/18/93	1,104	$205.62	1955	3	2.0	1.19	1.09
61	770 SAN CLEMENTE WAY	6,000	$272,000	03/31/94	1,415	$192.23	1965	3	2.0	1.19	0.81
62	778 SAN CARLOS AVE	6,000	$255,000	07/29/93	1,302	$195.85	1962	3	2.0	0.82	0.32
63	778 SAN LUCAS AVE	6,100	$325,000	04/28/94	1,732	$187.64	1962	4	2.0	0.86	0.34
64	800 VAQUERO DR	6,700	$240,000	01/24/94	1,576	$152.28	1965	4	2.0	1.13	0.72
65	826 SAN LUCAS CT	6,464	$242,000	06/08/94	1,576	$153.55	1962	4	2.0	0.86	0.32
66	830 SAN PABLO DR	7,440	$225,000	11/09/93	1,022	$220.16	1962	3	2.0	0.77	0.32

Single Family Sales Transaction Database: January 1993 to March 1995 in Mountain View, CA
NASA Ames Aerodynamic Testing Program

No.	Adress	Lot Size	Sales Price	Closing Date	Unit Size (SqFt)	Price per SqFt	Year Built	Number of: Bdrms	Baths	Miles from Moffett Field	Hwy 101
67	836 SIERRA VISTA AVE	9,375	$240,000	08/12/94	1,237	$194.02	1957	3	2.0	1.37	1.31
68	837 SAN LUPPE DR	11,832	$160,000	08/29/94	1,576	$101.52	1962	4	2.0	0.80	0.26
69	851 SAN LUPPE DR	6,262	$265,000	06/30/94	1,624	$163.18	1962	3	2.0	0.79	0.25
70	851 SIERRA VISTA AVE	16,117	$180,000	12/14/94	3,144	$57.25	1983	na	na	1.36	1.32
71	869 LINDA VISTA AVE	8,239	$220,000	01/28/94	1,060	$207.55	1962	3	2.0	0.88	0.45
72	875 SAN RAFAEL AVE	7,125	$239,000	06/30/94	1,202	$198.84	1962	3	2.0	0.79	0.32
73	877 SAN ARDO WAY	6,144	$235,000	04/26/94	1,302	$180.49	1962	3	2.0	0.87	0.42
74	877 SAN LUCAS AVE	6,200	$305,000	08/27/93	1,488	$204.97	1962	3	2.0	0.89	0.42
75	880 SAN ARDO WAY	6,000	$244,000	09/30/93	1,022	$238.75	1962	3	2.0	0.85	0.42
76	882 SAN CARRIZO WAY	6,175	$248,000	06/17/94	1,302	$190.48	1962	3	2.0	0.75	0.27
77	883 SAN SIMEON DR	6,300	$261,000	10/13/94	1,302	$200.46	1962	3	2.0	0.82	0.36
78	889 CENTRAL AVE	3,000	$182,000	06/17/93	792	$229.80	1946	2	1.0	1.39	0.86
79	893 CENTRAL AVE	3,120	$164,500	08/18/93	782	$210.36	1946	2	1.0	1.39	0.86
80	910 SAN CLEMENTE WAY	7,000	$295,000	06/22/93	1,411	$209.07	1964	3	2.0	1.15	0.78
81	920 SAN CLEMENTE WAY	6,400	$290,000	10/28/93	1,576	$184.01	1964	4	2.0	1.15	0.78
82	936 VAQUERO DR	7,056	$265,000	12/13/93	1,574	$168.36	1964	4	2.0	1.09	0.70
83	940 SAN MARCOS CIR	6,000	$290,000	01/04/95	1,415	$204.95	1964	3	2.0	1.26	0.94
84	952 JACKSON ST	7,100	$288,000	09/22/93	1,727	$166.76	1980	3	2.0	1.44	0.93
85	954 JACKSON ST	6,800	$390,000	10/26/93	1,485	$262.63	1980	2	2.0	1.44	0.93
86	960 SAN CLEMENTE WAY	6,336	$313,000	12/29/94	1,576	$198.60	1964	4	2.0	1.14	0.78
87	970 SAN PIERRE WAY	7,128	$275,000	05/27/94	1,576	$174.49	1964	4	2.0	1.15	0.81
88	975 SAN PIERRE WAY	6,200	$290,000	05/17/93	1,574	$184.24	1964	4	2.0	1.14	0.80
89	983 LINDA VISTA AVE	9,500	$210,000	08/09/94	1,030	$203.88	1956	2	1.0	0.78	0.44
	Averages	6,261	$232,601	NA	1,247	$195.94	37				

Note: na means not available; NA means Not Applicable.

Sources: DataQuick; Economic & Planning Systems, Inc.

Duplex and Apartment Sales Transaction Database: January 1993 to March 1995 in Mountain View, CA
NASA Ames Aerodynamic Testing Program

No.	Adress	Lot Size	Sales Price	Closing Date	Total Size/ (SqFt) or No of Units	Price per Unit	Year Built
Duplexes							
1	1990 Rock St.	24,829	$295,000	05/21/93	2,739	$147,500	1955
2	1854 Villa St.	11,300	$378,850	08/31/94	1,432	$189,425	1910
3	1297 Mountain Shadows Dr	8,276	$249,600	12/15/93	2,380	$124,800	1965
4	526 Piazza Dr. A	na	$255,000	01/29/93	na	$127,500	na
5	560 Lambert Way	na	$155,000	12/08/93	na	$77,500	na
6	28 Sherland Ave.	na	$69,911	01/12/95	na	$34,956	na
	Averages		$233,894	NA	2,184	$153,908	52 years old
Apartments							
1	1919,1939 Rock St.	58,022	$1,925,000	3/12/93	19	$101,316	1963
2	406 N. Rengstorff Ave.	36,068	$1,045,000	5/28/93	12	$87,083	1964
3	511 Walker Dr.	18,861	$625,000	7/30/93	14	$44,643	1960
4	1901 Rock St.	104,980	$3,260,000	9/21/93	46	$70,870	1964
5	1315 San Domar Dr.	11,195	$460,000	9/16/94	3	$153,333	1969
6	429 N. Rengstorff Ave.	37,505	$1,146,500	11/10/94	15	$76,433	1968
	Averages	44,439	1,410,250	NA	18	$88,946	30 years old

Note: na means not available; NA means Not Applicable.

Sources: DataQuick; Economic & Planning Systems, Inc.

Industrial and Commercial Sales Transaction Database: January 1993 to March 1995 in Mountain View, CA
NASA Ames Aerodynamic Testing Program

No.	Adress	Type of Use	Lot Size	Sales Price	Closing Date	Bldg. Size (SqFt)	Price per SqFt of Space	Year Built
Industrial Uses								
1	1968 Leghorn St.	Industrial Bldg.	65,993	$910,000	11/23/93	18,200	$50.00	1975
2	1280 Space Park Way	Industrial Bldg.	39,988	$800,000	3/11/94	17,500	$45.71	1959
3	650 Clyde Ct.	R & D Bldg.	99,317	$2,050,000	3/1/94	32,664	$62.76	1977
4	1250 Space Park Way	Industrial Bldg.	27,007	$450,000	5/27/94	11,000	$40.91	1964
5	1600 N. Shoreline Bl.	Industrial Bldg.	27,051	$470,000	8/15/94	15,552	$30.22	1953
6	1914 Plymouth St.	Multi-Tenant Ind. Bldg.	32,931	$810,000	9/16/94	11,111	$72.90	1983
7	630 Clyde Ct.	R & D Bldg.	97,139	$2,256,000	10/14/94	31,030	$72.70	1977
	Averages		55,632	$1,106,571	NA	19,580	$53.60	25 years old
Commercial Uses								
1	870 Leong Dr.	Restaurant	50,530	$375,000	8/12/93	3,800	$98.68	1972
2	1804 N. Shoreline Bl.	Low-Rise Office	39,117	$1,150,000	6/10/94	13,559	$84.81	1983
	Averages		44,824	$762,500	NA	8,680	$91.75	18 years old

Note: na means not available; NA means Not Applicable.

Sources: DataQuick; Economic & Planning Systems, Inc.

Mobile Home Park Sales Transactions: January 1990 to March 1995, Santa Clara County, CA
NASA Ames Aerodynamic Testing Program

No.	Adress	City	Lot Size (Acres)	Sales Price	Closing Date	No. of Spaces	Price per Space	Price per Acre	Year Built
Mobile Home Parks									
1	2150 Almaden Rd.	San Jose	12.75	$6,175,000	04/29/94	172	$35,901	$484,314	1963
2	1350 Panoche Ave.	San Jose	13.55	$1,277,000	10/30/92	120	$10,642	$94,244	1977
3	1955 Quimby Rd.	San Jose	23.18	$7,450,000	08/31/94	187	$39,840	$321,398	1980
	Averages		16.49	$4,967,333	NA	160	$28,794	$301,172	22 years old

Note: na means not available; NA means Not Applicable.

Sources: DataQuick; Economic & Planning Systems, Inc.

Appendix L
BCDC CONSISTENCY DETERMINATION

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STATE OF CALIFORNIA PETE WILSON, Governor

SAN FRANCISCO BAY CONSERVATION AND DEVELOPMENT COMMISSION
THIRTY VAN NESS AVENUE, SUITE 2011
SAN FRANCISCO, CALIFORNIA 94102-6080
PHONE: (415) 557-3686

April 25, 1995

Ms. Sandy Olliges
Assistant Chief
Safety, Health and Environmental Services Office
Ames Research Center
Moffett Field, California 94102-6080

SUBJECT: BCDC Consistency Determination No. CN 7-94
(BCDC Inquiry File No. MF.SC.7901.1)

Dear Ms. Olliges:

Thank you for your April 19, 1995, letter regarding the proposed X-32 Aerodynamic Testing Program to be undertaken at the NASA Ames Research Center at Moffett Field, in Santa Clara County. We have reviewed the information provided in your letter with BCDC Consistency Determination No. CN 7-94 and have determined that no further consistency determination will be required for this proposed project.

If you have any questions, please call me.

Very truly yours,

STEVEN A. McADAM
Assistant Executive Director

SAM/mm

Appendix M
CDFG MEMORANDUM

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State of California

Memorandum

To : Kathleen Kovar
NASA Ames Research Center
Mail Stop N19-1, Room 2005
Moffett Field, CA 94035-1000

Date : May 9, 1995

From : **Department of Fish and Game**
Jeannine M. DeWald, Associate Wildlife Biologist

Subject : Aerodynamic Testing Proposal

I apologize for the delay in answering your letter. With regard to the project's potential effects on burrowing owls, I would agree with Dr. Trulio that the effects will probably be minimal. Wildlife in general tend to habituate to noises which occur frequently. While the owls may respond to the noise when operations start, I would expect them to return to their normal behavior patterns as they become accustomed to the situation.

If I can be of further assistance, please call me at (408)429-9252.

Sincerely,

Jeannine M. DeWald

Jeannine M. DeWald
Associate Wildlife Biologist