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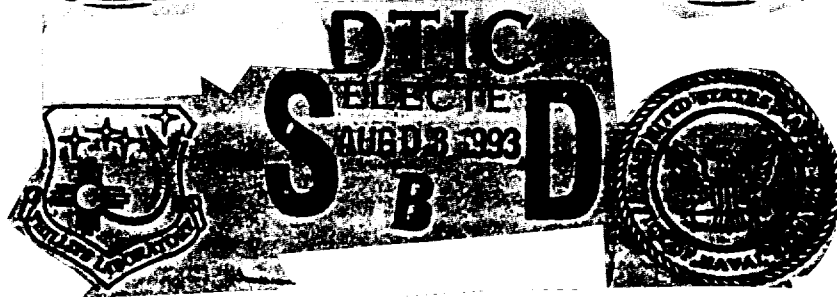
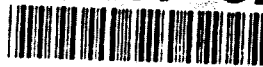
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# Environmental Impact Analysis Process

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Volume II

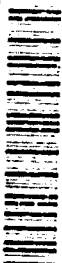
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July 1993

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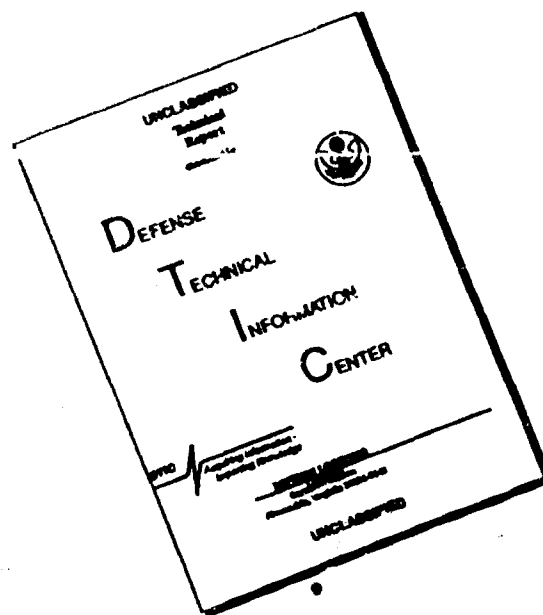
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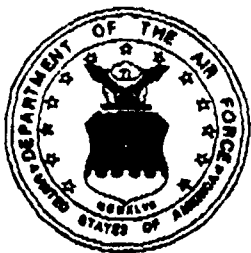
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## COVER SHEET

- (a) **Lead Agency:** U.S. Air Force.  
**Cooperating Agency:** U.S. Navy.
- (b) **Proposed Action:** Construction and operation of the High-frequency Active Auroral Research Program (HAARP) facility in Alaska.
- (c) **Further information may be obtained by contacting:**  
Mr. John Heckscher  
PL/GPIA  
Hanscom AFB, MA 01731-5000  
(617)377-5121
- (d) **Designation:** Final Environmental Impact Statement (FEIS).
- (e) **Abstract:** This FEIS consists of two volumes. Volume I represents a corrected version of the Draft Environmental Impact Statement (DEIS) and Volume II presents the results of public comment on the DEIS. The FEIS describes the potential environmental impacts of constructing and operating a proposed ionospheric research facility in interior Alaska. The system is referred to as HAARP (High-frequency Active Auroral Research Program), and would be used primarily for conducting pioneering studies of ionospheric properties. This proposed facility would be the most technologically advanced in the world. The program could lead to a better understanding of the ionosphere and enable researchers to develop methods for enhanced communications for both civilian and defense applications. The HAARP system consists of a powerful high frequency radio transmitter, referred to as the ionospheric research instrument, and a number of scientific data gathering (diagnostic) instruments.  
  
Through the application of both research and siting constraints, two potential candidate sites were identified in Alaska; Clear and Gakona. This document addresses three alternatives associated with the construction of the HAARP facility; namely, construction at either Clear or Gakona, and the no action alternative. Issues and resources that were examined for both of the sites include land and minerals, vegetation and wetlands, mammals, birds, aquatics, hydrology and water quality, air quality, socioeconomics, cultural resources, subsistence, recreation, aesthetics, possible bioeffects of radio frequency radiation, electromagnetic environment and radio frequency interference, atmosphere, threatened and endangered species, hazardous materials and wastes, and irretrievable commitment of resources. Based on comments received on the DEIS, an additional analysis relating to acoustical noise was added to this document. Key concerns for the Gakona site include radio frequency interference, cost of construction, permafrost degradation and subsidence issues, impacts on migrating birds, and the availability of and access to gravel sources. Key concerns for the Clear site include land ownership and wetlands issues, disturbance of cultural resources, radio frequency interference, aesthetic impacts, and the near-term reclamation of the Gakona site.
- f) **Released to the public on** July \_\_, 1993

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## **LIST OF ABBREVIATIONS**

|                   |  |
|-------------------|--|
| <b>AAAQS</b>      | <b>Alaska Ambient Air Quality Standards</b>                        |
| <b>AAC</b>        | <b>Alaska Administrative Code</b>                                  |
| <b>ABR</b>        | <b>Alaska Biological Research</b>                                  |
| <b>ACHP</b>       | <b>Advisory Council on Historic Preservation</b>                   |
| <b>ADEC</b>       | <b>Alaska Department of Environmental Conservation</b>             |
| <b>ADF</b>        | <b>Automatic Direction Finder</b>                                  |
| <b>ADFG</b>       | <b>Alaska Department of Fish and Game</b>                          |
| <b>ADG&amp;GS</b> | <b>Alaska Division of Geologic and Geophysical Surveys</b>         |
| <b>ADL</b>        | <b>Alaska Department of Labor</b>                                  |
| <b>ADNR</b>       | <b>Alaska Department of Natural Resources</b>                      |
| <b>ADOT</b>       | <b>Alaska Department of Transportation</b>                         |
| <b>AEIDC</b>      | <b>Arctic Environmental Information and Data Center (now ENRI)</b> |
| <b>AFR</b>        | <b>Air Force Regulation</b>  |
| <b>AFS</b>        | <b>Air Force Station</b>   |
| <b>AGL</b>        | <b>Above Ground Level</b>  |
| <b>AHRS</b>       | <b>Alaska Heritage Resource Survey</b>                             |
| <b>ANCSA</b>      | <b>Alaska Native Claims Settlement Act</b>                         |
| <b>ANILCA</b>     | <b>Alaska National Interests Lands Conservation Act</b>            |
| <b>ANSI</b>       | <b>American National Standards Institute</b>                       |
| <b>APTI</b>       | <b>ARCO Power Technologies, Inc.</b>                               |
| <b>ARS</b>        | <b>Alaskan Radar System</b>  |
| <b>BACT</b>       | <b>Best Available Control Technologies</b>                         |
| <b>BIA</b>        | <b>Bureau of Indian Affairs</b>                                    |
| <b>BLM</b>        | <b>Bureau of Land Management</b>                                   |
| <b>BMP</b>        | <b>Best Management Practices</b>                                   |

|               |  |
|---------------|--|
| <b>BP</b>     | <b>Before Present</b>  |
| <b>CB</b>     | <b>Citizen Band</b>  |
| <b>CEQ</b>    | <b>Council of Environmental Quality</b>                                      |
| <b>CERCLA</b> | <b>Comprehensive Environmental Response, Compensation, and Liability Act</b> |
| <b>CFR</b>    | <b>Code of Federal Regulations</b>   |
| <b>CFS</b>    | <b>Cubic Feet per Second</b>   |
| <b>CO</b>     | <b>Carbon Monoxide</b>   |
| <b>CVEA</b>   | <b>Copper Valley Electric Association</b>                                    |
| <b>CW</b>     | <b>Continuous Wave</b>   |
| <b>DEIS</b>   | <b>Draft Environmental Impact Statement</b>                                  |
| <b>dB</b>     | <b>Decibel</b>   |
| <b>DOD</b>    | <b>Department of Defense</b>   |
| <b>DOE</b>    | <b>Department of Energy</b>  |
| <b>E</b>      | <b>Electric Field</b>  |
| <b>EA</b>     | <b>Environmental Assessment</b>  |
| <b>EED</b>    | <b>Electro-Explosive Device</b>  |
| <b>EFR</b>    | <b>Effective Radiated Power</b>  |
| <b>EIS</b>    | <b>Environmental Impact Statement</b>  |
| <b>ELF</b>    | <b>Extremely Low Frequency</b>   |
| <b>EMD</b>    | <b>Electro-Motor Division</b>  |
| <b>ENRI</b>   | <b>Environmental and Natural Resources Institute</b>                         |
| <b>EPA</b>    | <b>Environmental Protection Agency</b>                                       |
| <b>ETAC</b>   | <b>Environmental Technical Applications Center</b>                           |
| <b>FAA</b>    | <b>Federal Aviation Administration</b>                                       |
| <b>FCC</b>    | <b>Federal Communications Commission</b>                                     |
| <b>FEIS</b>   | <b>Final Environmental Impact Statement</b>                                  |
| <b>FM</b>     | <b>Frequency Modulation</b>  |
| <b>FSI</b>    | <b>FELEC Services Inc.</b>   |
| <b>GMU</b>    | <b>Game Management Unit</b>  |
| <b>GPS</b>    | <b>Global Positioning System</b>   |

|                        |  |
|------------------------|--|
| <b>GSA</b>             | <b>General Services Administration</b>                   |
| <b>GVEA</b>            | <b>Golden Valley Electric Association</b>                |
| <b>H</b>               | <b>Magnetic Field</b>                                    |
| <b>HAM</b>             | <b>Amateur Radio Operator</b>                            |
| <b>HAARP</b>           | <b>High-frequency Active Auroral Research Program</b>    |
| <b>HCCP</b>            | <b>Healy Clean Coal Project</b>                          |
| <b>HF</b>              | <b>High Frequency</b>                                    |
| <b>HP</b>              | <b>Horsepower</b>  |
| <b>IEEE</b>            | <b>Institute of Electrical and Electronics Engineers</b> |
| <b>IRAC</b>            | <b>Interdepartmental Radio Advisory Committee</b>        |
| <b>IRI</b>             | <b>Ionospheric Research Instrument</b>                   |
| <b>ISR</b>             | <b>Incoherent Scatter Radar</b>                          |
| <b>ITT</b>             | <b>International Telephone and Telegraph</b>             |
| <b>KOP</b>             | <b>Key Observation Point</b>                             |
| <b>kV</b>              | <b>Kilovolts</b>   |
| <b>LID/ R</b>          | <b>Light Detection and Ranging</b>                       |
| <b>LORAN</b>           | <b>Long Range Navigation</b>                             |
| <b>M&amp;E/H&amp;N</b> | <b>Metcalf &amp; Eddy, Inc/Holmes &amp; Narver, Inc</b>  |
| <b>MGCI</b>            | <b>Master Ground Control Intercept</b>                   |
| <b>MHz</b>             | <b>Megahertz</b>   |
| <b>MW</b>              | <b>Megawatt</b>  |
| <b>MOA</b>             | <b>Military Operations Area</b>                          |
| <b>MRC</b>             | <b>Mission Research Corporation</b>                      |
| <b>MSL</b>             | <b>Mean Sea Level</b>                                    |
| <b>NAAQS</b>           | <b>National Ambient Air Quality Standards</b>            |
| <b>NASA</b>            | <b>National Aeronautics and Space Administration</b>     |
| <b>NCDC</b>            | <b>National Climatic Data Center</b>                     |
| <b>NEC</b>             | <b>Numeric Electromagnetics Code</b>                     |
| <b>NEPA</b>            | <b>National Environmental Policy Act</b>                 |
| <b>NHPA</b>            | <b>National Historic Preservation Act</b>                |



|                        |   |
|------------------------|---|
| <b>NOAA</b>            | <b>National Oceanic and Atmospheric Administration</b>            |
| <b>NO</b>              | <b>Nitric Oxide</b>   |
| <b>NO<sub>2</sub></b>  | <b>Nitrogen Dioxide</b>   |
| <b>NO<sub>x</sub></b>  | <b>Nitrogen Oxides</b>  |
| <b>NPS</b>             | <b>National Park Service</b>                                      |
| <b>NPDES</b>           | <b>National Pollutant Discharge Elimination System</b>            |
| <b>NRHP</b>            | <b>National Register of Historic Places</b>                       |
| <b>NRL</b>             | <b>Naval Research Laboratory</b>                                  |
| <b>NSPS</b>            | <b>New Source Performance Standards</b>                           |
| <b>NTIA</b>            | <b>National Telecommunications and Information Administration</b> |
| <b>NWS</b>             | <b>National Weather Service</b>                                   |
| <b>OTH-B</b>           | <b>Over-The-Horizon Backscatter</b>                               |
| <b>PEL</b>             | <b>Permissible Exposure Limit</b>                                 |
| <b>PL</b>              | <b>Phillips Laboratory</b>  |
| <b>PM<sub>10</sub></b> | <b>Particulate Matter less than 10 microns in diameter</b>        |
| <b>PSD</b>             | <b>Prevention of Significant Deterioration</b>                    |
| <b>RCRA</b>            | <b>Resource Conservation and Recovery Act</b>                     |
| <b>RFR</b>             | <b>Radio Frequency Radiation</b>                                  |
| <b>RPM</b>             | <b>Revolutions Per Minute</b>                                     |
| <b>RV</b>              | <b>Recreational Vehicle</b>                                       |
| <b>SAR</b>             | <b>Specific Absorption Rate</b>                                   |
| <b>SHPO</b>            | <b>State Historic Preservation Office</b>                         |
| <b>SO<sub>2</sub></b>  | <b>Sulphur Dioxide</b>  |
| <b>SO<sub>x</sub></b>  | <b>Sulphur Oxides</b>   |
| <b>SPCC</b>            | <b>Spill Prevention, Containment and Counter-measure</b>          |
| <b>SWDA</b>            | <b>Solid Waste Disposal Act</b>                                   |
| <b>TLV</b>             | <b>Threshold Limit Value</b>                                      |
| <b>TMOA</b>            | <b>Temporary Military Operations Area</b>                         |
| <b>TSP</b>             | <b>Total Suspended Particulates</b>                               |
| <b>UAA</b>             | <b>University of Alaska Anchorage</b>                             |

|               |  |
|---------------|--|
| <b>UAF</b>    | <b>University of Alaska Fairbanks</b>      |
| <b>UHF</b>    | <b>Ultra-High Frequency</b>                |
| <b>US</b>     | <b>United States</b>                       |
| <b>USACOE</b> | <b>U.S. Army Corps of Engineers</b>        |
| <b>USDOC</b>  | <b>U.S. Department of Commerce</b>         |
| <b>USFWS</b>  | <b>U.S. Fish and Wildlife Service</b>      |
| <b>USGS</b>   | <b>U.S. Geologic Survey</b>                |
| <b>USSCS</b>  | <b>U.S. Soil Conservation Service</b>      |
| <b>USSR</b>   | <b>Union of Soviet Socialists Republic</b> |
| <b>VHF</b>    | <b>Very High Frequency</b>                 |
| <b>VIS</b>    | <b>Vertical Incidence Sounder</b>          |
| <b>VOR</b>    | <b>VHF Omni-Range</b>                      |
| <b>VRM</b>    | <b>Visual Resource Management</b>          |
| <b>WACS</b>   | <b>White Alice Communication System</b>    |

**SUMMARY**

**FINAL ENVIRONMENTAL IMPACT STATEMENT (FEIS)**

**CONSTRUCTION AND OPERATION OF AN IONOSPHERIC RESEARCH  
FACILITY FOR THE HIGH FREQUENCY  
ACTIVE AURORAL RESEARCH PROGRAM**

**Purpose and Need for Action**

The High-frequency Active Auroral Research Program (HAARP) is a scientific endeavor aimed at studying basic properties and behavior of the ionosphere, with particular emphasis placed on being able to better understand and use it to enhance communications and surveillance systems for both civil and defense purposes. The HAARP system, if constructed, would allow a significant advance in man's ability to investigate the upper atmosphere.

The environmental analysis and impact study for this action focuses on the following resources and issues: land and minerals; vegetation and wetlands; mammals; birds; aquatics; hydrology and water quality; air quality; cultural resources; subsistence; bioeffects of radio frequency radiation; electromagnetic environment and radio frequency interference; atmosphere; threatened and endangered species; hazardous materials and wastes; and, irretrievable commitment of resources. In addressing these subject areas, the FEIS is divided into three main sections: proposed action and alternatives; affected environment; and environmental consequences and mitigation.

**Description of Proposed Action and Alternatives**

The government proposes to construct the HAARP facility in Alaska. At the HAARP facility research that cannot be accomplished within traditional ground-based laboratories would be conducted on the earth's upper atmosphere and within the ionosphere. The main element of the research facility would be a large radio wave transmitter. Similar, though less capable, research facilities exist at many locations throughout the world and are operated routinely for the purpose of scientific investigation of the ionosphere. In the U.S. its territories such systems are located at Arecibo, Puerto Rico and Fairbanks, Alaska. Other installations are at Tromsø, Norway; Moscow, Nizhny Novgorod and Apatity, Russia; Kharkov, Ukraine and Dushanbe, Tadzhikistan. None of these existing systems, however, are effective enough to perform the experiments planned for HAARP. Users of the HAARP research facility would include universities, the U.S. Air Force, the U.S. Navy, and other government agencies such as the National Science Foundation and Advanced Research Projects Agency.

HAARP site selection criteria were developed from both research requirements and siting constraints. Research constraints stipulated that the selected site must fall in the range of latitudes between 61 and 65 degrees, either north or south. This latitude provides the proper mix of active and inactive auroral states. Siting constraints included that the site must be: on U.S. soil, on Department of Defense (DOD) land to the maximum extent practical, near a major highway, away from densely settled areas, of sufficient acreage to allow for equipment siting and separation space, on relatively flat terrain, and of realistic and reasonable environmental impacts and construction and operation costs.

Numerous alternatives were initially considered for location of the HAARP facility, including upgrading of existing ionospheric research facilities or a totally new construction effort. Upgrading an existing facility near Fairbanks was initially considered, but it was determined that the upgraded system would cause large numbers of interference problems in this relatively developed area. At that point, new areas were examined for the siting of HAARP. Of the sites considered, only three made it through the application of the selection criteria. The three sites were: Clear AFS, Gakona [at a partially constructed Over-the-Horizon Backscatter (OTH-B) radar site], and Fort Greely, Alaska. Siting HAARP at the Clear site could be accomplished only by locating some of the diagnostic equipment on a separate parcel due to interference between the Clear AFS Ballistic Missile Early Warning System (BMEWS) and a critical HAARP instrument. Conflict with military operations at Fort Greely was determined irreconcilable, and Fort Greely was dropped from further consideration. As a result, the Gakona and Clear sites were deemed the only two sites meeting the criteria of the program.

In addition to examining geographical siting alternatives, two design alternatives were also considered; a dual array and a stacked array ionospheric research instrument. The dual array would consist of a high-frequency and a low-frequency antenna mast system located adjacent to one another. In the stacked array system, the two arrays would be mounted on the same antenna masts. The result is that the stacked array system would involve roughly half the level of disturbance to the environment and lower construction costs. Since the stacked array was obviously preferable, the dual array was dropped from further consideration.

The HAARP equipment would consist of the following major items: an Ionospheric Research Instrument (IRI); an Incoherent Scatter Radar (ISR); a Vertical Incidence Sounder (VIS); an Optical Imager and Magnetometer; and a Light Detection And Ranging (LIDAR) unit. Each of these separate items would have support buildings, equipment and facilities associated with them. The IRI would be the main component of the HAARP system and would consist of 180 antenna masts approximately 70 feet above the ground, laid out in a 12 by 15 grid format, with each mast set 80 feet on center. The ISR would be the most critical diagnostic equipment and would consist of a large parabolic dish antenna measuring 115 feet in diameter and mounted on an approximately 35-foot high pedestal. The VIS would consist of both a transmit and a receive unit. The transmitter would consist of five antenna masts; four 50-foot high masts arranged in a square configuration, with a 100-foot high mast in the center. The optical imager and magnetometer instruments would be enclosed in a three-foot by three-foot by one and half-foot high box surrounded by a restriction fence. The receiver would consist of four elements each

four to five feet high and mounted in a triangular configuration with one unit in the center. A LIDAR is an optical instrument which would be located in an enclosed module with a transparent dome on the roof. The physical appearance and layout of these instruments would be similar at each of the sites, with the exception of the ISR and VIS units at the Clear site. These would be located 10 miles south of Clear AFS to avoid interference with the BMEWS.

Construction at the Gakona site would involve the importation of substantial quantities of gravel (approximately 160,000 cubic yards) to minimize the melting of the ice-rich permafrost. The Clear site is underlain by a large glacio-fluvial outwash plain consisting of well drained sand and gravel allowing for simplistic construction approaches. Construction at the Clear site would be somewhat simpler, less expensive, and less risky than at the Gakona site due to the better subsurface conditions. Total quantity of gravel required for construction at the Clear site is estimated at 32,000 cubic yards.

The preferred alternative is to construct and operate the HAARP facility at a site in Gakona, Alaska.

### **Public Concerns**

The program has solicited input from the local communities on several occasions. Early in the environmental impact analysis process two scoping meetings were held, one in Glennallen and one in Anchorage to determine the local concerns. These concerns were used to identify subject areas analyzed in the environmental impact statement. After publishing the DEIS, the program held public hearings in Glennallen and Anderson to solicit further input from the public and answer any questions they might have about the DEIS. Additionally, citizens and state and federal agencies were asked to submit written comments on the DEIS. Comments received and responses to comments are published in the FEIS.

Below is a brief synopsis of the areas of concern raised during the public review process:

- Electromagnetic interference with various electronic systems, especially with communications and aviation systems
- Bioeffects from radio frequency radiation on both humans and wildlife
- Utilization of local labor for HAARP construction and operation
- Level of detail in the DEIS, public review period, and notification of DEIS publication and public hearings
- Impacts on fish and wildlife associated with gravel mining activities near the Copper River and Tulsona Creek

- Bird collisions with the IRI and VIS antenna masts
- Noise impacts associated with construction and operation
- Impacts on the upper atmosphere, and particularly the ozone layer

Other issues raised less frequently have also been discussed and answered within this FEIS.

### **Comparison of Environmental Consequences of Alternatives**

The Gakona site's primary positive attributes are lower aesthetic impacts to tourists and area residents, less wetlands to be filled, less disruption of homesteaders, and no land acquisition. The Clear site's primary positive attributes relate to a lower increment in air pollution generation, base utilities systems available for HAARP use, easier construction techniques and the Gakona site reclamation. The no action alternative would be environmentally preferred as it would result in the existing Gakona site being reclaimed, with a net positive environmental effect.

### **Identification of the Preferred Alternative**

The preferred alternative is to construct the HAARP facility at the Gakona site. Utilization of the Gakona site allows for the entire HAARP system to be constructed on one parcel of land currently owned by the Air Force, with minimal disruption to existing residents of the area. Re-use of the Gakona site and its facilities would preclude the near-term and costly reclamation effort associated with the demolition of the large powerplant building and the removal of drainage culverts from the access road. Impacts to wetlands would be minimized by siting HAARP at Gakona rather than Clear.

### **Affected Environment**

Information on the affected environment was obtained from local, state and federal government agencies, as well as from local individuals and private businesses in the region and site visits. In the case of Gakona, much of the information was obtained from the OTH-B program studies. The Gakona site is near mile 11.2 of the Tok Cut-Off Highway in the Copper River Basin. All of the land to be used at the Gakona site is owned by the Air Force. A one-mile access road and a large building exists at Gakona for use by HAARP. The Clear site is in the Tanana-Kuskokwim Lowland region in the Nenana River drainage. The majority of the land to be used at the Clear site is owned by the Air Force, although some property on a separate parcel would have to be acquired from the state of Alaska or private individuals for siting of the ISR and VIS instruments.

The Gakona site is primarily open conifer forests and wetlands. The installation would use a total of about 51 acres at the Gakona site. The Clear site is primarily black spruce forest and wetlands, with some young mixed deciduous/conifer areas. The installation would use a total

of about 78 acres at the Clear site. Each of the sites provides habitat for moose, bears (black and brown), wolves, and other furbearers. The Gakona site is used by the Nelchina caribou herd, while the Clear site is in an area not considered prime caribou range. Birds at each of the sites include waterfowl, song birds, and raptors. Although arctic and american peregrine falcons (listed as threatened and endangered species respectively) migrate through the Clear site region, no evidence of falcon breeding in the immediate areas has been documented. Neither of the sites contain any significant aquatic resources. River systems in the areas of the sites do have both resident and migratory fish.

Both sites are located near major rivers: the Gakona site near the Copper River; and, the Clear Site near the Nenana River. The potential for flooding at both of the sites is minimal. The Gakona site is characterized by a low yield poor quality aquifer while the Clear site has a high yield high quality aquifer. The climate at each of the sites is typical for interior Alaska; warm pleasant summers and long cold winters with light winds being the norm. Typical precipitation for the sites range from 10 to 15 inches per annum. Both airsheds are classified as Class II by state standards. A diesel powerplant would be completed at the Gakona site to supply HAARP with the majority of the required power. At the Clear site electrical power would either be provided by the existing (possibly modified or expanded) Clear AFS coal-fired plant, and/or by the commercial power source in the area.

Both the Clear and Gakona sites are located in regions that would be classified as rural by most standards. The largest town in the Gakona region is Glennallen (450 residents), while the largest towns in the Clear region are Anderson and Healy at 628 and 487 residents, respectively. Both areas provide excellent room and board services for communities their size. The Clear region is very rich in archeological sites, while the Gakona site is less important from an archeological perspective. Ongoing subsistence activities are important within each of the site's region of influence. Recreational issues are of concern in the Clear region because of the nearby Nenana River and Denali National Park. Recreational issues at the Gakona site are possibly of less concern, although a U.S. Bureau of Land Management (BLM) hunting and fishing trail extends through the area and Wrangell - St. Elias National Park is within one mile of the site. Aesthetic concerns at the Clear site may be significant because the ISR/VIS site could be visible from the highway, river and train tracks. Views of the Gakona site are obscured by thick vegetation.

Both the Gakona and the Clear regions contain electromagnetic equipment that could be affected by the operation of the HAARP facilities.

Minimal amounts of hazardous materials are used and generated at the Gakona site through the existing caretaking activities of the powerplant building. This would include petroleum based products and paints, solvents, and janitorial-type supplies. There are no known hazardous materials at the Clear site in the areas being proposed for HAARP equipment. Clear AFS has numerous hazardous substances associated with operation and maintenance of a installation of its type.

## **Environmental Consequences and Mitigation**

The consequences of constructing the HAARP facility at each of the sites is summarized here, along with suggested mitigative measures. Three alternatives are considered here, including Clear, Gakona, and no action. The consequences of selecting either the Clear site or the no action alternative include having to conduct the reclamation effort at the Gakona site.

Constructing the facility at the Clear site would require the acquisition of land from either the state or private individuals for the siting of the VIS and the ISR. Impacts would be minimized by final siting modifications at the location to limit the disturbance to private landowners, and the use of aesthetic engineering to minimize visual impacts. The major consequence to land and minerals from constructing at the Gakona site include the mining of large amounts of gravel, and the thermal disturbance of surrounding terrain. Mitigation of these consequences can be achieved by sound planning of the gravel mining operation and possible winter construction to minimize damage to the vegetative mat. The impact to land and minerals of the no action alternative (reclamation at Gakona) includes the transfer or sale of the government property at the Gakona site.

Vegetation loss at the Clear and Gakona site would be biologically and socially insignificant. About 51 acres of black spruce would be affected at the Gakona site and approximately 78 acres of black spruce and mixed deciduous conifer forest would be affected at the Clear site. About 18 acres of wetlands would be impacted at the Gakona site, while at the Clear site about 36 acres of wetlands would be impacted. The wetlands that would be filled at the Clear site are *considered more important than those at the Gakona site* because they produce more and better forage. Mitigation at both of the sites could be accomplished by modifying siting of equipment such that wetlands are avoided and by revegetating areas that are impacted. The impacts on vegetation of the no action alternative (reclamation at the Gakona site) include a slight positive impact at Gakona by the revegetation on the previously disturbed areas by native species.

No significant impact to mammals would result from the construction of the HAARP facility at either of the sites. Some loss of moose browse would result from the construction of HAARP at either the Gakona or Clear sites. However, at neither of the sites is moose browse a limiting factor. Impacts on mammal populations as a result of direct human caused mortality is considered insignificant. The selection of the no action alternative would result in a long-term creation of a small moose browse area as the gravel areas revegetate as uplands.

No significant impacts to birds would result from the construction of the HAARP facility at either of the sites. Habitat loss would be insignificant. Collision potential between the birds and the HAARP equipment is considered minimal regarding geese, ducks, raptors, shorebirds, and passerines, with the potential for swan collisions being low to moderate. Mitigation could include curtailing activities away from nesting and brood raising periods. Visibility of guy wires could be enhanced to minimize bird collisions. The no action alternative would have a slight positive impact. The large powerplant building would be removed, thereby eliminating the potential of collisions.



Aquatic impacts would be insignificant at either sites. The low potential impact on aquatics would come from erosion and siltation associated with the mining of gravel at the Gakona site. Other impacts could result from the accidental discharge of petroleum based products during construction or operation of HAARP facilities. Mitigation of the possible adverse consequences could include mining gravel from an area that will not cause erosion and siltation problems, construction of berms to contain runoff from overburden and gravel stockpiles, and through the use of contingency plans and spill prevention and detection systems. The no action alternative would have no significant impact on aquatics. There would be a slight potential for small petroleum spills during the reclamation effort outlined above.

Hydrological impacts at the Clear and Gakona sites would be insignificant and local water supplies would not be affected. Degradation of permafrost at Gakona could cause subsidence of the ground and alter the surface flow patterns. This could cause accelerated erosion in some areas. Disposal of waste products and accidental release of petroleum based products at either of the sites could cause a degradation of surface and sub-surface water quality. Mitigation could include limiting disturbance of vegetation during construction and operation, implementing a petroleum spill prevention and detection program during construction and operation, and the limiting of on-site disposal of waste products. The hydrologic impact of the no action alternative could include the further disruption of the permafrost at the Gakona site, thereby creating emerging drainage channels. Mitigation in this regard could include careful reclamation construction efforts, and the insertion of numerous drainage channels across the existing roadway to allow for more natural site drainage.

Air quality impacts at each site would result from construction activities and powerplant operations. At the Clear site, power would be provided by modifying or expanding an existing powerplant to increase output, and/or by purchasing power from a commercial grid. Either of these options would result in a nominal increase in air pollution. Use of the Gakona site would require the construction of a powerplant with an output capacity of about 15 megawatts. Depending upon the duration of powerplant operation, the PSD threshold for air quality potentially could be exceeded. Internal combustion engine emissions during construction and generation of fugitive dust is also a concern. Air quality impacts associated with the reclamation effort at Gakona for the no action alternative includes those limited to construction activities described above.

Socioeconomic impacts of the HAARP construction at either of the sites would result in short-term positive impacts to the region associated with construction. Local area labor would be used as much as possible to limit the number of imported workers to the areas. The required number of imported workers for the Gakona site would be larger than at the Clear site, since there is no nearby large populous areas, such as Fairbanks, from which to draw construction expertise. About 80 imported workers would be required for the Gakona site, and about 10 would be required for the Clear site. There is enough housing in each of the areas to easily accommodate the influx of construction workers. Mitigation could include maximum possible use of local labor at each of the sites. The no action alternative would result in a small positive economic impact in the Gakona area associated with the Gakona site reclamation effort, but the level of

impact would be much less than with the full construction alternative due to the scope of the activity. Mitigation of negative impacts could include use of local area labor to the greatest extent possible. Impacts to aircraft following nearby air traffic routes would be avoided through the incorporation of an aircraft detection system (included in the design). The system would turn off the appropriate emitters if an aircraft approaches the site.

Potential impacts on cultural resources associated with the construction of HAARP at the Clear site are much greater than at the Gakona site. Neither of the two National Register of Historic Places (NRHP) sites in the Clear area would be impacted. It is highly likely that archeological sites would be uncovered during construction at the Clear site, while the probability of discovery at the Gakona site is negligible. The Section 106 process of the National Historic Preservation Act (NHPA) would be complied with to minimize any potential impacts to cultural resources. The no action alternative would have no impact on cultural resources since construction reclamation efforts at the Gakona site would be limited to recent gravel fill areas.

Impacts on subsistence at both the sites include some short-term game redistribution as a result of construction activities, and minimal loss of habitat for subsistence species such as moose. The projected larger construction crew at the Gakona site could increase recreational hunting and fishing pressure in the area which could have an indirect impact on subsistence harvest rates. Mitigation would include the use of local area labor to minimize an increase in recreational pressure, and minimization of construction disturbance through management practices. Impacts on subsistence brought about by the no action alternative would be similar to those described above for the construction action.

Recreational impacts at the Gakona site would be relatively minor, being limited to aesthetic impacts as viewed from aircraft and the possible displacement of the BLM trail which runs through the site. Recreational impacts at the Clear site would result from conflicts with tourism and traveling on the highway, railroad, or floating on the Nenana River. Mitigation at the Gakona site would include maintaining access to lands north of the site either by allowing continued use of the BLM trail or by finishing the alternate access pathway previously started by the OTH-B program. Mitigation at the Clear site could include minimizing aesthetic impacts as described below. The no action alternative would have very little short-term impact on recreation, and the long-term impact would be positive in that the site clearing could be used to access areas previously difficult to reach for recreational purposes.

Aesthetic impacts of the proposed action at the Gakona site would be insignificant. Aesthetic impacts at the Clear site are more of an issue due to the scenic appeal of the proposed location of the ISR and VIS and their impacts on the natural vista as viewed from the Parks Highway, Alaska Railroad tracks and the Nenana River floating corridor. Mitigation at the site could include the use of trees or vegetation to minimize visual impact.

The bioeffects of radio frequency radiation (RFR) are expected to be non-existent, regardless of the site selected. Humans and animals are not expected to be affected outside of the exclusion fence being placed around the facilities. There would also be no expected effects to birds that

fly over or roost on top of the array. Bird migratory navigational systems are not anticipated to be affected by the operation of HAARP. There would be no RFR bioeffects from the no action alternative.

Electromagnetic systems that could be affected by HAARP operations at either of the sites could include high-frequency communications, mobile VHF radios, wildlife trackers, citizen band radios, hand held transceivers, UHF communications equipment, and television. Mitigation could include design modifications to minimize low angle radio emissions and out-of-band radio frequency energy, hardware modifications to the affected user system, avoidance of interfered frequencies and shutdown of appropriate HAARP emitters.

Atmospheric impacts include temporary (a few seconds to a few hours) changes in the density, temperature, and structure of the ionosphere. Those impacts would be negligible in comparison to those produced by the sun. The ozone layer would not be affected, and ozone would not be depleted. No mitigation would be necessary in regard to atmospheric impacts.

Hazardous materials required for HAARP operation at the Gakona site would include numerous petroleum based products, solvents, cleaners, paints, and janitorial-type supplies. Approximately 200,000 gallons of diesel fuel would be stored on-site for consumption by the power generation system. Hazardous materials at the Clear site would be similar to those mentioned above for the Gakona site, but the large quantities of diesel fuel would not be required since power would be obtained from the existing Clear AFS coal-fired powerplant and/or from a commercial source. Mitigation at each of the sites would include compliance with all applicable regulations, permits, and standards relating to the handling, transport, storage, and use of hazardous materials and wastes.

Irretrievable commitment of resources for the construction of the HAARP facility include fuel (primarily diesel fuel at the Gakona site and probably coal at the Clear site) for construction and operation, and construction products such as gravel, aggregate, sand, cement, metal, and wood. In addition, about 51 acres of land (18 acres of wetlands) at the Gakona site and 78 acres of land (37 acres of wetlands) at the Clear site would be occupied. The use of any of these resources is insignificant in comparison to the regional or national consumption. No mitigation in this subject area is appropriate.

Noise analysis performed on the construction and operation of the HAARP facility indicates that only minimal impacts would result from the operation of the six diesel engines and from the development of the borrow pit(s). Minimal impacts would result from haul truck noise or from site proper construction activities. Noise impacts from the operation of the six diesel engines would be mitigated by design modifications such as high volume, low pressure drop mufflers, or noise shields on the exhaust stacks. Borrow pit noise impacts on eagles would be mitigated through scheduling modifications to avoid critical periods and through the use of buffer zones around nests.

## **Conclusion**

After the publication of the FEIS, the Air Force will decide which alternative identified in the FEIS should be selected. This decision follows a required minimum 30 day waiting period as specified in the regulations governing the environmental impact analysis process. At the end of that period, the Air Force will prepare a Record of Decision (ROD) to document its choice of the alternative. As an addendum to the ROD, the Air Force will prepare a mitigation plan which outlines the mitigation action to be taken to minimize any significant environmental impacts. An extensive study of the impacts has been completed and is incorporated in Volume I of this FEIS. This study covered a wide range of operational scenarios and concluded that some mitigation may be warranted.

It is anticipated that the Record of Decision will be signed in early August, 1993. Notification of the ROD will be made in the Federal Register and the local Alaska media similar to past program announcements. Copies of the ROD will be mailed to all individuals included on the FEIS distribution list. Additional copies of the ROD can be obtained by contacting the program office.

## **9.0 INTRODUCTION**

### **9.1 Guide to the Final Environmental Impact Statement**

The Final Environmental Impact Statement (FEIS) consists of two Volumes. Volume I represents a corrected version of the Draft Environmental Impact Statement (DEIS) and Volume II presents the results of public comment on the DEIS. Volume I is substantively the same as the DEIS, with only minor changes. A tabulation of these changes is included in both Volume I and Volume II. Volume II includes the transcripts of the public hearings, comments and questions submitted to the government, responses to those submittals, changes to the DEIS, the FEIS distribution list, and the FEIS notice letter list. In addition, the Summary from Volume I is also included in Volume II and incorporates the corrections and changes arising from the public review of the DEIS.

In completing the FEIS, the government has addressed the public and agency comments. Each comment, whether the comment is contained in a hearing transcript, a letter, or a telephone call, has been assigned a number in the margin showing where the comment is addressed. The assigned number corresponds to the subsection in Volume I and to the number of the concern. For example, an assigned number 4.11-33 page 12-50 identifies that the concern relates to the consequences section of Volume I (section 4), recreation subsection (11), and is the 33rd concern received on recreation. The response to those concerns is found on page 12-50 in Section 12. Comments or information that arrived after the closing date for public comment have been incorporated in the FEIS when possible.

### **9.2 Near-Term Milestones**

On publication of the FEIS, the Air Force will make its decision after waiting the 30 days required by the regulations. At the end of that period, it will produce a Record of Decision (ROD) to document its decisions about whether or not to proceed with the proposed action and if so, any mitigation measures that may be necessary.

The ROD will describe the mitigation strategy the Air Force will employ. In general, the strategy will be to avoid or minimize potential impacts by careful design, placement, and operation of the High Frequency Active Auroral Research Program (HAARP) facilities and equipment. When possible, specific measures may be identified as well. However, many of the mitigation measures will not emerge until coordination with local, state and federal agencies has taken place. The mitigation measures selected for application will be documented in a mitigation plan.

## 10.0 PUBLIC HEARING TRANSCRIPT

Public Hearings on the HAARP DEIS were held on 6 April 1993, in Glennallen, and 8 April 1993, in Anderson, Alaska. The proceedings of those hearings were recorded and transcribed by a professional court reporter and follow in their entirety. The Air Force and Navy responded to questions posed at the hearings. If further clarification or supplementary information was judged appropriate to the questions asked during the hearings, additional responses were developed and can be found in Section 12 of this document. Those questions that require response are numbered in the margin of the transcripts according to the procedures outlined in Section 9.

1

1                   DEPARTMENT OF THE AIR FORCE  
2                   IN COOPERATION WITH THE  
3                   DEPARTMENT OF THE NAVY  
4  
5   IN THE MATTER OF                   )  
6   HIGH-FREQUENCY ACTIVE AURORAL   )  
7   RESEARCH PROGRAM (HAARP)        )  
8  
9                   PUBLIC HEARING ON  
10                  DRAFT ENVIRONMENTAL IMPACT STATEMENT  
11                  Pages 1 - 82, inclusive  
12  
13                  Taken Tuesday, April 6, 1993  
14                  Commencing at 7:00 p.m.  
15  
16  
17                  Hearing Held at  
18                  GLENNALLEN HIGH SCHOOL  
19                  Glennallen, Alaska  
20  
21   Reported by:  
22   Carol A. McCue, RPR-CM

ORIGINAL

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## A P P E A R A N C E S

Chairperson:

COLONEL WILLIAM C. THOMPSON  
CHIEF AIR FORCE TRIAL JUDGE  
WESTERN UNITED STATES

Also Present:

MR. JOHN HECKSCHER  
DR. STEVE PETRON

Taken by:

Carol A. McCue, RPR-CM  
Registered Professional Reporter

The following public hearing proceedings occurred  
before Colonel William C. Thompson at the time and  
place heretofore mentioned.

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## P R O C E E D I N G S

COLONEL THOMPSON: Ladies and gentlemen,  
good evening. I think that we probably have just  
about everybody who is going to attend, so I'm going  
to go ahead and call the public hearing to order.

It's my pleasure to welcome you here  
tonight to the public hearing on the Draft  
Environmental Impact Statement for the High-Frequency  
Active Auroral Research Program. In this program, the  
Navy and Air Force proposal to build a world class  
ionospheric research facility here in Alaska.

First let me tell you who I am, and who the  
other two gentlemen are with me tonight. I'm Colonel  
Bill Thompson, I'm the Chief Air Force Trial Judge for  
the Western United States. I've been asked by the  
Judge Advocate General of the Air Force to serve as  
the chairperson of this public hearing. I'm here in a  
neutral capacity just as I would be if I were serving  
as a trial judge in a court-martial, which is what I  
usually do.

My job here is simply to insure that this  
is an orderly and a fair hearing, and that all of you  
as concerned citizens or as representatives of private  
organizations or government organizations have an  
opportunity to express yourself concerning this

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1 particular program. And that's something, I think the  
2 most important thing that we'll do here tonight is  
3 first to tell you a little bit about what the program  
4 is, and some of its possible environmental effects,  
5 but more importantly, to hear from you, as to what you  
6 think is of concern to you.

7           The United States does want to be a good  
8 neighbor in planning and building and operating this  
9 particular facility. An important part of being a  
10 neighbor is to hear from you, since you live in this  
11 area, and you can tell us about effects or problems  
12 which may be caused by the program that we may have  
13 overlooked in assessing it and planning for the  
14 particular program.

15           We're here as a part of the National  
16 Environmental Policy Act which I refer to as NEPA.  
17 NEPA procedures were established to ensure that  
18 environmental information is available to public  
19 officials and to citizens before decisions are made,  
20 and before actions are taken.

21           To implement NEPA, the Air Force and the  
22 Navy have also passed the internal regulations that  
23 contain policies and responsibilities and procedures.  
24 This hearing on the Draft Environmental Impact  
25 Statement is a part of the NEPA process. Public

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1     comments and questions about the program, including  
2     any of them that you bring to us tonight, will be  
3     incorporated into the final Environmental Impact  
4     Statement, either in the text or the report itself, or  
5     in the response to comments section.

6             Now, we do have a court reporter with us  
7     tonight, and it's going to be her job to make a  
8     complete record of this proceeding, to make sure that  
9     everything that we say and everything that you tell us  
10    goes into the final Environmental Impact Statement,  
11    and that a good record is made of what your concerns  
12    are and the questions that you may have about this  
13    particular program.

14            It's important for you to remember that we  
15    are keeping a record and we regard your comments as  
16    being important. I would ask you to assist us by when  
17    I call on you to speak, if you decide that you would  
18    like to speak, to please stand up, and to speak as  
19    clearly and as slowly as possible. And I've asked her  
20    to interrupt you if she can't hear you or understand  
21    you because again, we do want to make sure that we  
22    have what you have to say to us accurately in the  
23    record of the proceedings.

24            We're going to begin by presenting to you  
25    an overview of the program, and that will be followed

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1 by an explanation of the environmental analysis that  
2 has been done on the proposed action and the  
3 alternatives. I may then, depending on how long that  
4 takes, take a short break to let me collect the  
5 comment and question sheets so that I can recognize  
6 you and call on you to speak if you want to speak.

7           However, I would like to stress to you that  
8 it's not necessary for you to speak here tonight in  
9 order for your comments or your questions to be  
10 considered, to be considered in the final of the  
11 Environmental Impact Statement. You were furnished  
12 both with an attendance record and with a comment  
13 sheet, which looks like this (indicating). If you  
14 find that you don't want to talk tonight but you would  
15 like to submit comments to be considered in the final  
16 draft of the Environmental Impact Statement, you can  
17 submit written comments. The address to which you  
18 should send those comments is shown on the bottom of  
19 that comment sheet, but you will need to make sure  
20 that you send in those comments no later than the 25th  
21 of April of this year.

22           We do have two scientists here tonight that  
23 you will be hearing from. They are Mr. John  
24 Heckscher, and Dr. Steve Petron. Mr. Heckscher is the  
25 program manager of the High-Frequency Active Auroral

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1 Research Program, and he will describe the program and  
2 also tell you about the purposes of the program.

3 Mr. Heckscher is a physicist with the  
4 Phillips Laboratory, geophysics director at Hanscom  
5 Air Force Base in Massachusetts; and Dr. Steve Petron  
6 is the environmental manager of the program. After  
7 Mr. Heckscher is finished, he will provide you with an  
8 overview of the environmental analysis that has been  
9 conducted on the project. Dr. Petron is a biologist  
10 with Metcalf & Eddy Corporation which is an  
11 environmental engineering and consulting firm.

12 I now ask John Heckscher to give you a  
13 brief description of the proposed action and  
14 alternatives, and if you would please hold your  
15 comments and questions, we will have a separate  
16 comment and question period after both of the  
17 presentations have been made to you. John?

18 MR. HECKSCHER: Thank you, Colonel  
19 Thompson. Good evening, folks, and thanks for taking  
20 time to be here tonight. As Colonel Thompson  
21 explained, I'm the program manager for this  
22 High-Frequency Active Auroral Research Program, which,  
23 there you go, High-Frequency Active Auroral Research  
24 Program, which I'm going to refer to tonight as HAARP.  
25 It's hard for me to say that whole mouthful all at

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1       once so whenever I say HAARP, I hope you will remember  
2       that that's what I mean.

3               HAARP began in 1990, when U.S. Congress  
4       voted funds to enhance and consolidate arctic  
5       ionospheric research programs being conducted by the  
6       Air Force, Navy, and National Science Foundations.  
7       The director of Defense Research and Engineering, our  
8       boss in the chain of command, determined that HAARP  
9       would be a joint program administered by both the Air  
10      Force and the Navy.

11             The immediate goal of the HAARP program is  
12      to build a facility to enable scientists to study the  
13      part of the atmosphere known as the ionosphere. The  
14      ionosphere is created naturally when sunlight hits the  
15      top of the atmosphere and reacts strongly with  
16      individual atoms, stripping electrons, negatively  
17      charged electrons from the positively charged ions.

18             As shown here, the atmosphere might seem to  
19      be a calm, placid medium, structuring itself into  
20      layers, and indeed, that view is fairly representative  
21      of what it looks like over the Lower 48. In Alaska,  
22      however, the picture is quite different. The  
23      ionosphere is very turbulent, contains regions of  
24      strong electric currents known as electrojets, and  
25      experiences bombardment by high energy particles to

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1 create the aurora which is shown here at the bottom of  
2 the ionosphere. The ionosphere is important because  
3 it affects radio waves passing through it, or  
4 reflecting from it. Those of you who have experienced  
5 radio communications difficulties during times when  
6 the aurora is active know firsthand about some of  
7 those effects. I see nodding in the audience.

8           The ionosphere also influences surveillance  
9 radars, like the Over the Horizon Radar. And it can  
10 induce blackouts on satellite to ground links. This  
11 has happened during Desert Storm, for instance. The  
12 more we know about how this medium is formed and what  
13 its structure and composition are like, the better we  
14 will be able to design radio systems to make use of  
15 it.

16           Studying the ionosphere is not a new  
17 science. Over the last 30 to 40 years there have been  
18 many facilities built to improve our knowledge of it.  
19 This map shows the location of some of the world's  
20 existing facilities for studying the ionosphere.  
21 These facilities have yielded data on topics of  
22 scientific importance, including detection of a solar  
23 wind, which is an outflow of particles from the sun,  
24 detailed mapping of structures of the aurora, of the  
25 structure of the aurora, and discovery of the auroral

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1     electrojets, and how they generate atmospheric gravity  
2     waves, which are waves just like on the surface of the  
3     ocean, except they exist high up in the atmosphere.

4                 This is a picture of one of those  
5     facilities. This one is known as Tromso. It's  
6     currently the most advanced ionospheric research  
7     facility in the world for the study of the arctic  
8     ionosphere. It's built in a valley in northern  
9     Norway. It can generate up to 1.2 million watts of  
10    continuous radio power in its transmitters, which then  
11    is concentrated into a narrow radio beam by a  
12    transmitting antenna, consisting of 144 horizontal  
13    dipole antennas held above the ground as you can see  
14    in this picture, by wooden poles approximately 50 feet  
15    high.

16                Thirty miles outside Fairbanks, Alaska, in  
17    this circular area here in the center foreground is a  
18    facility known as HIPAS. That's an acronym for High  
19    Power Auroral Stimulation. This is the only U.S.  
20    facility located to study the arctic ionosphere. And  
21    although it is comparable in transmitter power to  
22    Tromso, HIPAS lacks the large antenna array that  
23    Tromso has, needed to create a narrow, steerable radio  
24    beam which is critical to the state of the art for the  
25    study of the ionosphere.

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1           This next diagram compares the capabilities  
2 of existing HF ionospheric facilities in the green,  
3 these stations are existing ones, and what is proposed  
4 for HAARP, the red one up here (indicating).  
5 Incidentally, high-frequency, or HF, means frequencies  
6 between 3 and 30 megahertz, which is between the  
7 standard AM broadcast band which is about a half to  
8 one half megahertz, and the FM broadcast band, which  
9 is 88 to 108 megahertz.

10           If HAARP is constructed, the U.S.  
11 capability would go from the present middle of the  
12 pack here at HIPAS, to a world leadership position.  
13 And would have about three times the power of Tromso,  
14 and would have the capability of operating on  
15 frequencies over a wider range than Tromso can do.  
16 Most importantly, because it's located in Alaska, it  
17 will be able to study part of the ionosphere that is  
18 critical for our knowledge of the ionosphere.

19           As now planned, the antenna array that we  
20 would like to construct, which I'm going to call the  
21 ionospheric research instrument, would occupy an area  
22 measuring about a thousand feet by 1300 feet, and  
23 would consist of 180 antenna masts, or poles, 70 feet  
24 high, supporting cross dipole antennas. It's not our  
25 intention to fill that entire area with gravel;

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1     instead, narrow roads as indicated by the yellow lines  
2     there would be built along the rows of antenna masts.  
3     This facility would generate up to 3.6 million watts  
4     of continuous power in the transmitters, which would  
5     then be concentrated by that big antenna array, with a  
6     narrow radio beam having three or four times the power  
7     of Tromso. The beam would be electronically steerable  
8     in a cone about the vertical, plus or minus 30 degrees  
9     in any direction, like this (indicating). By design,  
10    it would never be able to be radiating horizontally,  
11    it would be limited to that plus or minus 30 degrees.

12               When this beam reaches the ionosphere, it  
13    interacts and creates localized changes within this  
14    narrow beam. To observe and study those changes, we  
15    plan to install a number of scientific data gathering  
16    instruments. Incidentally, many of these instruments  
17    that I'm about to tell you about have uses even when  
18    this high power beam is not operating. The primary  
19    data gathering instrument is called an Incoherent  
20    Scatter Radar. This is a radar that generally  
21    operates at frequencies of several hundred megahertz,  
22    or higher, and produces very narrow radio beams, which  
23    can sense the structure and motion of natural  
24    ionospheric turbulence, and it can also look at the  
25    electrojets, and even the localized changes which we

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1 hope to produce by our high powered Ionospheric  
2 Research Instrument.

3 The picture shows a radar with a  
4 reflecting, parabolic reflecting dish that was used  
5 for many years at a place called Chatanika, which is  
6 near Fairbanks. Another antenna sometimes used in  
7 these kinds of radars is a phased array. Which of  
8 those two forms of antenna will be used has not been  
9 decided.

10 Another important data gathering  
11 instrument, a vertical incidence ionosounder, or VIS  
12 for short, senses the distribution of charged  
13 particles in the ionosphere overhead. It also emits a  
14 radar like signal in the 1 to 30 megahertz band, but  
15 it has a much broader beam, and senses the electrons  
16 and ions over a very large area. The version here has  
17 a 40 foot pole supporting a transmitting antenna, and  
18 has receiving antennas, an array of receiving  
19 antennas, two of which are shown in those positions.  
20 This is a common instrument in use over -- all over  
21 the world. There's one in College, Alaska.

22 Many of you probably recognize this as a  
23 LIDAR. This is a device which emits visible light  
24 instead of radio energy, and can measure such  
25 properties as air density and temperature. This

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1 picture shows a LIDAR operating in Alaska,  
2 investigating changes in atmospheric chemistry  
3 associated with the aurora. We also plan to have  
4 optical and infrared cameras, which will photograph  
5 the aurora, and sense ionospheric emissions.

6 After the director of Defense Research and  
7 Engineering instructed the Navy and Air Force to begin  
8 the program, we started searching for a suitable site.  
9 This site was preferably on DOD owned land. Now to  
10 meet the scientific objectives of this program, a  
11 latitude band from 61 degrees to 65 degrees was  
12 selected, and the reason it was selected was because  
13 in that band, the aurora is known to occur frequently.

14 Based on being accessible from roads, which  
15 would be maintained and open year around, two sites  
16 were identified. One near Clear Air Force Station,  
17 near Anderson at Clear Air Force Station, and the  
18 other at Gakona, near Glennallen. These two sites,  
19 plus the possibility of not building the facility at  
20 all, have been considered as options in the Draft  
21 Environmental Impact Statement, which many of you have  
22 here tonight. These options I'm going to call the  
23 Clear alternative, the Gakona alternative, and the no  
24 action alternative. As will be shown later, the  
25 government's preference is the Gakona alternative.

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1           If the Clear alternative is chosen, parts  
2   of the HAARP facility will be built within the  
3   confines of Clear Air Force Station, which is outlined  
4   by this dashed line (indicating). The location, the  
5   entrance road is here, and here are the three missile  
6   early warning radars sitting in this position  
7   (indicating). The location of the Ionospheric  
8   Research Instrument is proposed to be here, this shows  
9   where our optics imager and magnetometer and infrared  
10  cameras would be.

11           I guess if I tilt it down a little bit, the  
12  LIDAR we propose to be put up in this corner right  
13  here (indicating). Only part of our system can be  
14  there, though, because of the possibility of  
15  interference between these existing radars and our  
16  Incoherent Scatter Radar which operates very much on  
17  the same frequencies as those radars, therefore you  
18  can't locate them too close together so we need to get  
19  them farther away than they are able to do so inside  
20  the boundaries of Clear Air Force Station.

21           So we found a location down here at Bear  
22  Creek, which is far enough away from this, and is  
23  behind a ridge, which you can perhaps see as the high  
24  density lines here, I can show you a picture of that  
25  ridge from the Bear Creek location. And this acts as

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1 a very effective electromagnetic barrier between the  
2 two sets of radars.

3 If Clear is chosen, we would be relying on  
4 the support of Clear Air Force Station. Now there,  
5 there are two options for the supply of electrical  
6 power. Clear has a coal fired steam turbine plant  
7 with excess capacity, or there is a high voltage  
8 transmission line nearby belonging to Golden Valley  
9 Electric. And the choice would be made between those  
10 two after the August decision.

11 We believe HAARP could offer only a modest  
12 enhancement of the economic base of the Anderson  
13 community. The construction contractor would hire  
14 qualified local residents, and after the facility  
15 becomes operational, we would need four to eight site  
16 maintenance and security personnel. Four or five  
17 times each year the local economy would expect to host  
18 up to a dozen or so scientists, many of international  
19 reputation, supplying food, lodging, and other  
20 necessities during campaigns typically lasting two  
21 weeks.

22 More to you folks' interest, this map shows  
23 the proposed layout of the Gakona alternative, at the  
24 idle OTH-B site. At the lower right is the entrance  
25 to the site off the highway. The existing gravel road

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1 passes the vacant power plant building and extends  
2 about a mile west. These are mile, these grids are at  
3 mile distances. We're showing the transmitting array  
4 in this position just south of the road. That  
5 particular position minimizes wetlands filling in this  
6 particular area. The positions of some of the other  
7 data gathering instruments are shown in the yellow  
8 squares.

9           And many of you recognize that as the OTH  
10 building. That was to contain a steam turbine and  
11 backup diesel generators. Now, if Gakona is selected,  
12 we would plan to finish installing the six diesel  
13 generators, and complete an operations center for the  
14 HAARP facility inside this building. We would bring  
15 in commercial power for housekeeping, and operation of  
16 the supporting equipment. The diesels themselves  
17 would be used only during campaigns and only to power  
18 the high powered transmitting array. Any site  
19 personnel would be working primarily inside this  
20 building.

21           Just as in the case of Anderson, we believe  
22 that HAARP offers only a modest economic enhancement  
23 in the Glennallen and Gakona area. Qualified local  
24 residents would be hired during the construction  
25 phase, and after the facility becomes operational, we

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1 foresee needing four to eight site maintenance and  
2 security personnel.

3 If the decision in August is to go to Clear  
4 Air Force Station, or if they tell us not to build it  
5 at all, the government will be required to tear down  
6 that building, reclaim the gravel road, and do other  
7 reclamation activities at this site. And this  
8 activity was agreed to by the government in the OTH-B  
9 termination plan if we can't find another use for this  
10 site.

11 This is the schedule for the environmental  
12 assessment process. Although work began as soon as  
13 funds were allocated in 1990, the EIS, or the  
14 Environmental Impact Statement process began  
15 officially in May, 1992. Public scoping meetings were  
16 held here and in Anchorage last August. You received  
17 the Draft Environmental Impact Statement last month.  
18 The public hearings are occurring right now, and the  
19 public comment period concludes April the 25th, that's  
20 the 25th of this month. The final Environmental  
21 Impact Statement, which will address any additional  
22 concerns raised here tonight, or received by us by the  
23 25th of April is due to be published in June, and  
24 finally the record of decision, which is the selection  
25 of one of those three alternatives, is due in August.

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1           If the decision is to build the facility at  
2 Clear, or is the no action alternative, reclamation of  
3 the Gakona site would begin promptly.

4           We are well aware that associated with the  
5 alternatives, there are areas of environmental  
6 concern. I would now like to introduce to you  
7 Dr. Stephen Petron, who will now give an overview of  
8 the environmental analyses conducted for this project.

9           MR. PETRON: Thank you, John. Good  
10 evening, folks. Thanks for all coming. I've  
11 mentioned my name is Steve Petron, and one of my jobs  
12 on this project was to conduct and prepare the  
13 environmental analysis for which we're talking about  
14 tonight. As was mentioned, the EIS or Environmental  
15 Impact Statement documents this analysis and the  
16 impacts that would be associated with this project.  
17 When we get to the stage of making a decision on this  
18 project, and that's called the record of decision, the  
19 decision maker will take into account all the impacts  
20 that are documented in this EIS, the comments that we  
21 receive from you folks tonight, or in writing, or over  
22 the telephone, and also the possible benefits of the  
23 research station to the general public. And putting  
24 all those together, then, the decision maker will  
25 decide to either build the HAARP facility at Gakona,

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1     build it at Clear, or not to build the HAARP facility,  
2     or in other words, take no action.

3             For the next few minutes, I'm not going to  
4     spend a lot of time with you because most of you have  
5     a copy of the EIS. If you don't, we have a few extras  
6     in the back of the room, you can take one. But I'm  
7     going to go through the EIS a little bit and just let  
8     you know what we thought were the major impacts of the  
9     project, if it were to be built.

10            And I want you to be also aware that one of  
11    my purposes up here is to get your comments. We  
12    really do need to know your comments, in case we did  
13    overlook a particular aspect in terms of consequences,  
14    so that we can take care of that in the final EIS.

15            Most environmental impact statements have  
16    these four primary sections. The first section is  
17    called the purpose and need for action. And that is  
18    the explanation of why the government thinks they  
19    should build the project. The second section is a  
20    description of proposed action alternatives. That's  
21    where we describe what the government views as the  
22    alternatives of the project. That includes how the  
23    government would go about building the HAARP facility.  
24    It also includes the no action alternative.

25            The third section is called the affected

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1 environment. That's documentation of the existing  
2 environment at the sites that were selected for the  
3 possibility of installing the HAARP facility. This is  
4 essentially the base line from which the environmental  
5 consequences are evaluated.

6 And then section four is the environmental  
7 consequences. This is where we document what we feel  
8 will be the impacts of the project. Section four has  
9 in it an evaluation for about 18 environmental  
10 categories. These environmental categories were  
11 selected somewhat from comments we received during the  
12 scoping process, when we were up here earlier, and  
13 also from professional experience. The environmental  
14 process, as you know, is a lengthy process, and we're  
15 not making a decision tonight, but I again want to  
16 emphasize we are really interested in getting comments  
17 from you so we know what you folks are thinking and  
18 what your concerns are.

19 This is a slide of some of the categories  
20 of which we did the environmental analysis. There's  
21 another slide that looks just like it that has the  
22 other one. This slide is possibly somewhat confusing,  
23 so let me explain what I meant by this slide.  
24 Essentially, this slide represents our conclusions.  
25 As you know, impacts can be either positive or

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1 negative, and also impacts in EIS are judged to be  
2 either nonsignificant or significant, or negligible or  
3 no impact. I tried to represent that on this slide.  
4 An N means that we felt that there would be a  
5 negligible impact. An S means we felt it would be a  
6 significant impact. A zero means that we felt there  
7 would be a negligible or no impact for that particular  
8 category. A negative on this slide means there would  
9 be -- the impact would be negative, and a positive  
10 would be positive.

11 I'm going to go through now and highlight  
12 some particular categories, which primarily represent  
13 where we felt there would be significant impacts. And  
14 I'm doing that to be sure that you folks are aware of  
15 where we feel the majority of the impacts are going to  
16 lie. If I skip over a particular impact that you want  
17 me to bring up, be sure to ask the question, I'll talk  
18 about it during the question and answer period. I'm  
19 just doing this so I don't keep you here all night.

20 We felt, to start out, that there would be  
21 a significant impact to vegetation and wetlands, but  
22 that impact would be at the Clear alternative. That's  
23 primarily due to the filling of some scrub wetlands,  
24 about 37 acres. At Gakona, we are also going to be  
25 filling some wetlands, but it would be considerably

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1 less and they would all be black spruce wetlands, so  
2 we felt that Gakona did not warrant a significant  
3 impact rating.

4 We do feel that there would be a  
5 significant impact or a potential for a significant  
6 impact to air quality at the Gakona site. And this is  
7 because we recognize that we're using six diesel  
8 fueled generators. However, we feel that this impact,  
9 this significant impact would never be realized  
10 because first of all, the generators are going to only  
11 be run intermittently, on a campaign basis, and even  
12 during a campaign, they may not be run in the entire  
13 time. And second of all, we do have to comply with  
14 the Clean Air Act, which requires us to insure that  
15 there is no significant impact to air quality.  
16 However, we just wanted to be sure that everybody knew  
17 that we were aware of that potential.

18 Just about missed one. We also feel there  
19 could be a significant impact to cultural resources at  
20 Clear Air Force Station. We know that Clear Air Force  
21 Station has a fairly high density of cultural and  
22 archaeological resources, and that includes also the  
23 Bear Creek location. We do not feel we have that type  
24 of situation at the Gakona site. There has already  
25 been a cultural survey for the site, and we know that

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1       there are very little cultural resources on the site.

2               This is a list of the rest of the  
3       categories, and we feel that there could be a  
4       significant impact to recreation at the -- if we chose  
5       the Clear Air Force Station. And this is linked  
6       almost solely to the placement of the Incoherent  
7       Scatter Radar, one of the diagnostics at that Bear  
8       Creek location. That location is immediately below  
9       the highway, it's also right adjacent to the Nenana  
10      River, and it's also right across the river from the  
11      railroad tracks, and it would be highly visible to the  
12      general public. So that's why we felt that it would  
13      have a significant impact to both recreation and  
14      aesthetics. We did not feel that we would have a  
15      great impact to those categories at the Gakona site.  
16      We will have some impacts, and we're aware of those.  
17      Our feeling was that we can avoid most of them at the  
18      Gakona site.

19              We also felt that we would have a  
20      significant impact to radio frequency interferences.  
21      And that's independent of the site we choose. We  
22      appreciated the comments we got during the scoping  
23      process on this topic, and with those in mind, we took  
24      a special look at that, and in the EIS we produce a  
25      fairly detailed description of how we feel those

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1 impacts could be mitigated. By mitigation, we mean we  
2 can avoid the problem, or minimize it in some manner,  
3 or do something to help out the situation. I  
4 encourage you to look through those details in the EIS  
5 because we are well aware of the importance of  
6 communication in the area, especially in the Bush.

7 I want to mention a couple of mitigation  
8 items are that we can shut off the transmitter if we  
9 find out that an airplane is going to come through the  
10 transmitting area. We will be able to shut off the  
11 transmitter before the airplane gets there.

12 Basically, we want to be sure to let you  
13 know that we want to work with you all on these  
14 problems, and that we want to be a good neighbor, and  
15 we will work with you.

16 In conclusion, we feel that generally  
17 speaking, the building of the HAARP facility will  
18 mostly have nonsignificant negative impacts to the  
19 environment as a whole. The only positive impacts we  
20 feel would be associated with socioeconomics, which is  
21 the local economy. That's excluding the no action.  
22 The no action has positive impacts associated with a  
23 number of categories, due to the reclamation.

24 I want to mention, again, that we want to  
25 be a good neighbor, we want your comments, and as I

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1     said, you can either give them to us tonight, you can  
2     send them in the mail to the address on the briefing,  
3     on the chart that you've been given, or you can call  
4     us on the phone.

5                     With that, that's the end of my little  
6     talk. I'm going to now turn the meeting back over to  
7     Colonel Thompson, and thanks very much. Colonel  
8     Thompson.

9                     COLONEL THOMPSON: That concludes basically  
10    what we have for you in the way of a presentation. We  
11    would now like to hear from you. I would solicit your  
12    help, if I could, please. All of you got an  
13    attendance sheet when you came in. I would like to  
14    use those attendance sheets to recognize those people  
15    who want to speak, so if you have already turned in an  
16    attendance sheet at the back and checked the block  
17    that indicated that you wanted to speak, Ralph, could  
18    I have those, please? Anybody else that has not  
19    turned one in who does want to speak, if you will just  
20    raise your hand, he will collect those and give them  
21    to me so that I can use those to call on you.

22                     (Pause.)

23                     COLONEL THOMPSON: Couple things that would  
24    help us, too, if I do call on you and I'll call on  
25    everybody who indicates that they want to talk, if you

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1     could stand up so that we could make sure that we all  
2     see and hear you. I don't think we've got that many  
3     folks who will want to speak. It might be a good idea  
4     if you try to limit your remarks so that everybody has  
5     an opportunity to speak and we're not here all night.  
6     If there is time at the end when folks have finished  
7     speaking and somebody wants to go back to a topic that  
8     they have talked about before, I'll certainly let you  
9     do that.

10            Again, don't forget that you have got a  
11     comment sheet as well. If you don't feel like you  
12     want to talk tonight but you would like to submit a  
13     letter or written comment, by all means, use that  
14     comment sheet, send it to the address shown on the  
15     comment sheet, but it has to be in before the 25th.

16            Let's see, first, Mr. John L. -- is that  
17     Coates or Goates?

18            MR. GOATES: It's John Goates.

19            COLONEL THOMPSON: Okay, Mr. Goates.

20            MR. GOATES: Yes. Thank you for coming  
21     this afternoon. My main concern probably more than  
22     the environment, since I've had an opportunity to work  
23     on this project since the early stages when it was  
24     going to be for the Backscatter, it's my opinion that  
25     there's been a significant impact to the people in

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1     this area that not only worked on it but the  
2     contractors that were involved with, with the main  
3     contractor. And I guess the thing I'm curious about  
4     is if you're concerned at this time with any comments  
5     in that area?

6                 COLONEL THOMPSON: Sure. Any comments that  
7     you've got that will affect the program, I would like  
8     to hear.

9                 MR. GOATES: I guess to be brief, I was  
10    really struck by your comment about wanting to be a  
11    good neighbor. And I can recall attending a meeting  
12    very similar to this a number of years now ago, where  
13    my main concern was whether or not contractors in this  
14    area might be given any preference over anybody else  
15    in terms of hiring local people, and promoting work in  
16    the area. Well, what we got was Hobs Industries slant  
17    Energy or Alaska Steam and Diesel, all cut out of the  
18    same cookie sheet, and the effects are still being  
19    felt around here today from that.

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20                I note there is contractors in the area  
21    that probably still haven't been paid and there's a  
22    lot of litigation concerned. I myself, as an employee  
23    for Hobs Industries was involved with USA wage and  
24    hour through Mr. Jack Hardy in Anchorage twice for  
25    failure to pay proper wages. The end result of that

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1 was that myself and all the other people, and there  
2 were many that were caught in that little thing,  
3 received less than 50 percent of the wages due us,  
4 with no penalty or impact whatsoever to Hobs.

5 Of course, that contract was terminated, and  
6 there was a request for proposal put out by the Air  
7 Force subsequently for a care -- a caretakers service  
8 to be performed up there, so that the site could be  
9 maintained and security maintained. In that request  
10 for a proposal, it listed all the specifics that was  
11 supposed to be incorporated by the contractor, minimum  
12 wage, of course overtime compensation, paid vacations,  
13 holidays, everything was submitted, and right now what  
14 we have is a situation up there where the contractor  
15 has two people up there working 7 days a week, 24  
16 hours a day with no overtime, no benefits, and again,  
17 the community around here is feeling a little stung by  
18 that. Not that anybody in this area might have done a  
19 better job, but the minimum requirements that the Air  
20 Force set out for themselves in their own proposal  
21 were not met, and their comment back to the community  
22 was that it's not their job to see that contractors  
23 pay proper wages. We got that through the contracting  
24 office on a -- in Elmendorf in Anchorage there, and  
25 also through the general accounting office in

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1 Washington.

2 And I guess I'm concerned that in the  
3 future, if this thing goes ahead, and I hope  
4 personally that it does because it can be something  
5 for this area, that those kinds of concerns and  
6 problems might be at least mitigated if not  
7 eliminated. Thank you.

8 COLONEL THOMPSON: Thanks, Mr. Goates.  
9 That certainly will bring it to the attention of folks  
10 and let us know that that's happened before, so we can  
11 try to avoid doing it again.

12 Melissa Reed?

13 MS. REED: No, I didn't care to speak.

14 COLONEL THOMPSON: I had your sheet here  
15 but I see you didn't check it. How about Alan Reed?

16 MR. REED: Well, I've got a couple of small  
17 things here, put a big number one against, right next  
18 to that question as to whether or not there's any  
19 assurances for local hire. Personally I represent an  
20 electrical contractor who has the scope of being able  
21 to accomplish a project like this, and you know, as I  
22 spoke to some of you earlier, we are really concerned  
23 as to whether or not we would be included in, you  
24 know, such a construction project. But would like to  
25 know if there are any assurances, because this has a

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1 tendency to happen, we all saw what happened last  
2 time, basically there was a lot of Lower 48  
3 electricians working on this project, and now there  
4 are qualified local people for that, as well as the  
5 operation and maintenance of the generators when they  
6 do go in.

7 I was wondering also how many megawatts you  
8 were talking about generating with those six diesels.  
9 Just wondering how much generator presence you're  
10 going to have on site.

4.14-1

p. 12-69

11 COLONEL THOMPSON: Do you know, John?

12 MR. HECKSCHER: The total capability each  
13 diesel generator can generate approximately two and a  
14 half megawatts, so about 15.

15 MR. REED: You're talking about 15 megs?

16 MR. HECKSCHER: 15 megs, yes.

17 MR. REED: And just like I said, a couple  
18 other things here that I wanted to mention. Again,  
19 I'm not adverse to the project in any way, but I do  
20 have some concerns in regard to for one, in regards to  
21 these gravel sites. I think a lot more people would  
22 understand maybe possibly better where they are  
23 located if they were referenced with mileposts. I  
24 personally have done my best to try to figure out  
25 exactly where some of these are, and from my

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1 understanding, the preferred gravel site of P-1  
2 located around the confluence of Tulsona Creek and  
3 Copper River. I had some concerns with that but I  
4 think need to be addressed basically in that if I'm  
5 correct in my understanding, that one also has a  
6 significant impact on the local landowner at 14 mile.  
7 I'm not sure if that's the gravel pit but I know one  
8 of them has a significant landowner in his view.

4.5-1  
p. 12-25

4.11-1  
p. 12-55

9 I also wanted to add that the Copper River  
10 itself is becoming more used for recreational rafting  
11 and boating, and I myself run a raft trip from nearly  
12 Chistochina down to Gakona and we have used that site  
13 for lunch stops per se, and I recently noticed last  
14 time out there the track vehicles, the marking survey  
15 stakes that were out there, there was actually already  
16 some impact in that area. I just wanted it to be  
17 known that the confluence of the Tulsona and Copper is  
18 a good fishing hole, it's frequented by bears a great  
19 deal and there's an eagle's nest right in the middle  
20 of the site. I don't know if that was addressed in  
21 there, but these are just things that have to be known  
22 about that site.

4.5-2  
p. 12-25  
4.3-1  
p. 12-17

4.4-1  
p. 12-19

23 And I was also wondering which pit that was  
24 at six mile, that was the one they started to take the  
25 gravel out of last time. And I am under the

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1 impression that that has some impact to some of the  
2 local construction firms as well, and was wondering  
3 what the status was on that.

4 Also, I wanted to mention in regards to the  
5 recreational impact at Gakona that was listed as not  
6 having any recreational impact. It doesn't seem that  
7 the winter tourism aspect of it has been addressed.  
8 The area is frequented by dog sledding, in particular  
9 there's a major dog sled race that runs right through  
10 the site. Probably in the last four years there's  
11 been over 200 teams through there alone with the race.  
12 I myself use the area as well as some other dog teams,  
13 and we -- the predominant one we are forced to use is  
14 the Fox Lake access trail to access all of the state  
15 land north of the site. There is really only two ways  
16 to get across the native allotments and that is one  
17 and also one at 7 mile that leads south.

4.11-2  
p. 12-56

18 I wanted to make the proposition that the  
19 Womcats Trail and the Eagle Trail is accessible at  
20 about 6 and a half mile with a gravel pull-off already  
21 existing on the road. And the other access south is  
22 at 7 mile, that gravel pull-off would basically access  
23 both the Eagle Trail and the existing southern access.  
24 It might be a better place to relocate that. It has a  
25 combination of two historical trails, and is possibly

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1 a historical trail following the east bluff of the  
2 Gakona River. So as far as relocating the  
3 recreational use, that might be a better choice.

4 But also, you know, again, it goes to the  
5 recreational impact to that gravel pit, and any other  
6 gravel pits that are located within the site of the  
7 river. There are now two rafting outfits that are  
8 offering that stretch of water. And we would both be  
9 concerned as to whether or not there would be a  
10 vegetative cover, corridor between the affected areas  
11 and the rivers.

4.11-3  
p. 12-55

12 Also, another small thing I wanted to  
13 mention was that I'm not sure exactly how big you  
14 consider your affected area to aircraft, but as any  
15 pilot knows, when the weather gets bad, you follow the  
16 bluff back to Gulkana Airport, or Gakona or wherever  
17 you're going. And a lot of pilots do really depend on  
18 that and they fly right at the edge of the bluff.

4.8-3  
p. 12-52

19 I don't know what your affected area is,  
20 but if you're planning on shutting this thing off when  
21 pilots come to a certain area, you may have a problem  
22 with that during bad weather. I live on the bluff and  
23 we notice that very noticeably. Flying right over our  
24 house to get home on a rainy day. So I just thought  
25 you ought to know that and address it yourselves.

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1 COLONEL THOMPSON: Thanks, Mr. Reed. Joel  
2 Elrod?

3 MR. ELROD: I'm a local ham radio net,  
4 WL7BHL is my call and I was sent out by some of the  
5 hams to see how this was going to impact  
6 communications in general. I think real practically  
7 speaking, if I live within five miles of Gakona can I  
8 operate my two-way radio? We are in a weak signal  
9 area for TV, will I have to give up my TV, my dish?  
10 Little practical questions like that, you can think of  
11 dozens of them if you thought about it, but that's  
12 basically what I'm asking is from your own experience,  
13 how close could you have, run these kind of electronic  
14 apparatuses within a mile or two, or five miles of  
15 this, of the 3.6 million? Quite a large amount.

4.14-2  
p. 12-65

16 MR. HECKSCHER: You're right and I share  
17 those concerns, and we've done an awful lot of  
18 investigation in that particular area. You get too  
19 close to it, and you won't be able to, obviously.  
20 You'll be overwhelmed by it. We have in the, in this  
21 document, there are tables that show for particular  
22 kinds of equipment, and some of them may be the ones  
23 you use, some of them may not be the ones you use, we  
24 have calculated where and what distances from this  
25 array you can operate those things. And it may be in

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1 your particular case, we may have a problem. It's  
2 entirely possible. I mean this is a very strong  
3 emitter in the HF band, there are other emitters, the  
4 ISR emits, the vertical sounder emits, we have a lot  
5 of additional emissions in many bands.

6 We are taking particular pains when we  
7 purchase these things, we have specified that the  
8 harmonic and the spurious emissions are to be  
9 exceptionally low, much more so than would be if you  
10 just bought something off the shelf. There are a  
11 number of -- that's included in some of the  
12 mitigating, list of mitigations that we are proposing  
13 to do.

14 It would be helpful if you could provide us  
15 with the types of equipment that you're particularly  
16 concerned with, and we could look at those and address  
17 those in the final as well.

18 MR. ELROD: When you showed the spectrum  
19 there, you would be operating in looked like roughly 3  
20 to 10 megahertz?

4.14-3  
p. 12-68

21 MR. HECKSCHER: Yes, sir; that's correct.  
22 That is the -- let me just explain, that is the region  
23 over which the equipment can operate.

24 MR. ELROD: Operate, but it doesn't  
25 necessarily have a band with that wide?

4.14-4  
p. 12-68

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1 MR. HECKSCHER: No. No. Only going to be  
2 operating in certain specific frequencies in that  
3 band.

4 MR. ELROD: Our concern, some of us, we  
5 have about four emergency nets operating in the ham  
6 bands in Alaska right now, and like locally, we just  
7 wonder how that's going to affect our equipment, and  
8 just thought we would voice that.

4.14-5  
p. 12-65

9 MR. HECKSCHER: Okay. We would be  
10 sensitive to that. We would, if we haven't already,  
11 we would know those frequencies and lock them out of  
12 any possibility of our sitting on that particular  
13 frequency.

14 MR. ELROD: Okay. Thank you.

15 COLONEL THOMPSON: Jeremy Weld?

16 MR. WELD: I have some general questions, I  
17 guess. This would be more than comments. One is on  
18 the total cost of the project to the federal  
19 government. Do you have the figures on total cost,  
20 and what percentage would actually be or what  
21 percentage of that monies would actually be spent  
22 either in the construction here or in the maintenance  
23 of that facility.

4.8-4  
p. 12-27

24 MR. HECKSCHER: The program is funded each  
25 year by Congress. We have an idea of what the total

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1 program should cost. We don't know what the  
2 Congressional funding line will be for this program at  
3 each year. As to the percentages, I'm not sure that I  
4 know the answer to that directly tonight. The  
5 contract for building this thing has not been  
6 finalized yet, it's in the process, so maybe in a  
7 month or so, we could come up with those figures, if  
8 need be. As a gross estimate, the program is of the  
9 order of a hundred and fifty million dollars.

10 MR. WELD: \$150 million?

11 MR. HECKSCHER: That's the size that we  
12 have in mind.

13 MR. WELD: Okay. What percentage of that  
14 would be spent on actual construction within the  
15 Copper River region? Is a lot of that going to  
16 software development, and that kind of support the  
17 interpretation of the data you receive, or --

4.8-5  
p. 12-27

18 MR. HECKSCHER: I don't have a specific  
19 answer to that question, sir.

20 MR. WELD: Do you know how much the  
21 construction of the facility would cost?

22 MR. HECKSCHER: I'm sorry?

23 MR. WELD: You must have some idea of what  
24 the cost of the facility would be, building the  
25 facility.

4.8-6  
p. 12-27

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1           MR. HECKSCHER: Well, I have an idea of  
2 what the power plant will cost to do, how much the, to  
3 make the whole building an operation center, I could  
4 probably give you an estimate of the cost of the  
5 antenna array, the transmission lines, the  
6 transmitters. Is that what you had in mind?

7           MR. WELD: Well, yeah, I guess. If you  
8 have a figure of \$150 million, thinking back on your  
9 chart, you say it's basically a minimal economic  
10 impact to the area. That's how you addressed it.

11          MR. HECKSCHER: Yes.

12          MR. WELD: And what I was getting at, what  
13 was the total cost of under -- of \$150 million, that's  
14 a lot of money. How much is being spent here, how  
15 much is being spent -- as I recall the Backscatter, a  
16 lot of monies actually went into software development.  
17 I just wondered.

4.8-7  
p. 12-27

18          MR. HECKSCHER: Yeah. I'm not sure I can  
19 tell you that right now, I really honestly don't know  
20 the percentages.

21          MR. WELD: So you don't know how much money  
22 would be spent.

23          MR. HECKSCHER: But we can come up with  
24 some numbers for you.

25          MR. WELD: I guess my concern in that area,

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1 as a citizen, is concerned with the national debt, and  
2 the general problems of, financial problems of the  
3 federal government would be a consideration, the total  
4 cost of the project of this, as citizen of the United  
5 States, looking at it that way. What are the possible  
6 benefits to the United States, not just this local  
7 area.

1.2-1  
p. 12-2  
p. 12-31

8 The other questions that occur to me are in  
9 the Environmental Impact Statement, and I assume this  
10 is to you, you show negligible or no bio-effects of  
11 RFR. In other words, in your chart there, you showed  
12 that there -- you were saying that there are no  
13 impacts on humans to these RFR. Well, that's actually  
14 in question, isn't it? Is that a solid -- can you  
15 make a solid statement that there aren't?

4.13-1  
p. 12-61

16 MR. PETRON: Essentially, you're asking, I  
17 think, about will there be an impact biologically to  
18 people from RFR. And is that correct?

19 MR. WELD: Right.

20 MR. PETRON: Okay. What we did is we  
21 commissioned the society to evaluate all the research  
22 or as much as we could find of the current state of  
23 the art because you are correct, there are some  
24 differences of opinions on that. And the  
25 preponderance of evidence we got showed that there was

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1 no need to be concerned.

2 Now, we're aware of the problem, and  
3 particularly the perception, we understand your  
4 concerns. Because you read things too. Furthermore,  
5 we are building this to be within the federal  
6 standards for RFR emissions, and inside that standard,  
7 there will be a fence, an exclusion fence, so no one  
8 will be able to get that close to it.

9 MR. WELD: Well, just from a local  
10 standpoint, then, I would think it would be a concern  
11 of the health of our children and grandchildren just  
12 as in the Nevada test sites, when people were  
13 reassured that the atomic testing wouldn't have any  
14 adverse impacts, and it was subsequently shown. Since  
15 RFR is currently under question extensively right now,  
16 for instance about cellular telephones, the safety of  
17 cellular telephones, which is the same, uses the same  
18 device that's under question right now, I just  
19 wondered how a scientist can really put down -- I mean  
20 you would think you would put down a question mark on  
21 your chart. It's really sort of an unknown.

4.13-2  
p. 12-61

22 MR. PETRON: No, we didn't feel a question  
23 mark would be appropriate. We felt that there would  
24 be a negligible risk, and that as long as you're  
25 outside of that exclusion fence, there would be no

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1     problem.

2                   MR. WELD: Right. But you really can't say  
3     with any -- can you say as a scientist with certainty  
4     that people living in the neighborhood or, you know,  
5     within a certain radius?

4.13-3  
p. 12-61

6                   MR. PETRON: This is a technical area, not  
7     my expertise, so I really can't -- we do have someone  
8     here that does, is their expertise, Dr. John  
9     Klaunenberg is with the Air Force, and he does do  
10    research on this. John, can you add anything to this  
11    discussion?

12                  DR. KLAUNENBERG: Yes. This is one of the  
13    copies of part of what we put together that reviewed a  
14    lot of the literature. All that didn't go into the  
15    EIS; as a matter of fact, that reduced to just a  
16    couple lines. And I know what you're, where you're  
17    coming from and I share your concerns. I read the  
18    same newspaper articles that you're reading about, 60  
19    hertz power lines possibly causing cancer, but we are  
20    not talking about 60 hertz power lines here, we are  
21    not talking about ionizing radiation, we are talking  
22    about frequency radiation.

23                  And I work at the Armstrong Lab, formerly  
24    the School of Airspace Medicine for the Air Force, and  
25    Armstrong was the first to establish radio frequency

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1 radiation standards back in the '50s. There was some  
2 public concern that microwave ovens might interfere  
3 with pacemakers. And Armstrong Lab looked into that,  
4 issued the first standards, they have issued and  
5 reissued various frequency standards through the  
6 years.

7 We are not the only ones. Industry,  
8 universities worldwide have been working on standards.  
9 As a matter of fact, just last December, the IEEE  
10 released a new standard for radio frequency radiation  
11 which covers this range, for a new standard, new  
12 guidelines, for health and occupational safety. And  
13 it was just in time that we could put that into this.

14 So these guidelines are within the new  
15 standard. And that standard took seven years to  
16 develop, deliberation of 14 different biological  
17 working groups, over 120 scientists, engineers,  
18 physicians, any members of the general public, again  
19 of a group of 120 that reviewed all of the literature,  
20 and came up with a consensus. The consensus has  
21 varying opinions but they developed a consensus.

22 The best guidance is to follow the  
23 standards. As long as you follow the standards, I'm  
24 confident that my family, myself, my co-workers, and  
25 you the general public are going to be safe as long as

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1     they follow the standards. A radio frequency can be  
2     dangerous. It heats your microwave. It has heating  
3     potential and that's why, precisely why we need these  
4     standards. As long as you follow the standards and  
5     stay outside of the fence, then you're going to be  
6     safe.

7                     And I've been doing this for 15 years, and  
8     I work around RF. And I can't speak to the 60 hertz  
9     issue because first of all, that's not used, it's a  
10    different physical mechanism, as is ionizing  
11    radiation, different mechanism. This is in the  
12    radiation frequency of the RFR spectrum. Anything  
13    else I can do?

14                    MR. WELD: Well, I'm just saying as a  
15    person who lives in Gakona, I can't help but wonder  
16    when you build a device that's much bigger than any  
17    that's been built before, that, and then, reassure us  
18    that that won't have any negative health impacts on  
19    the community, and assure us it's perfectly okay to  
20    live right by it, we're depending on, then, on --  
21    we're assuming that there's never going to be a  
22    malfunction of the equipment. In other words, that  
23    the radar beam will never vary from the 30 degrees cff  
24    center, or that, you know, there's in some way that  
25    equipment won't malfunction. And also that these

4.13-4  
p. 12-61

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1 guidelines, and they are really under question right  
2 now if cellular phones are under study.

3 DR. KLAUENBERG: There is a new standard  
4 that was released on cellular phones also.

5 MR. WELD: But they really, according to  
6 news reports I've heard, people are worried about even  
7 very small amounts of that must occur in cellular  
8 phones.

4.13-5  
p. 12-61

9 DR. KLAUENBERG: You have got to try and  
10 separate out the science that people have been working  
11 on for ten years, 20 years, 30 years, and what you're  
12 seeing on TV because most of that initiated from the  
13 case in Florida where unfortunately, a man's wife  
14 developed brain cancer. People develop brain cancer  
15 for all kinds of reasons. And it's a sad thing. I've  
16 talked to a lot of people who have major health  
17 problems and they are searching for something to  
18 explain why they have brain cancer. And something  
19 esoteric is nice to grab ahold of. But there is no  
20 evidence. There's been a lot of research, animal  
21 research, epidemiology, human research, and there is  
22 absolutely no evidence of it. And we're continuing to  
23 do research. And we have revised standards. They  
24 have already started looking into revising the new  
25 standards.

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1           MR. WELD: Is there any possible way that  
2 equipment could malfunction and expose --

3           DR. KLAUENBERG: That is not a biological  
4 question, so I can't tell you that. I can't tell you  
5 about the health effects from it.

6           MR. WELD: Is there a way that equipment is  
7 produced capable of producing a -- if it did  
8 malfunction, or an exposure level that would --

2.3-1  
p. 12-11

9           DR. KLAUENBERG: I don't know a thing about  
10 the equipment. I would have to defer to the people  
11 that are putting the equipment together. All I can  
12 tell you is that the way it's designed, we analyzed  
13 it, and with the radiation patterns as designed, that  
14 we made recommendations where to put up exclusion  
15 fences, and if there's a change in the design, then we  
16 will make a change in our recommendations.

17           COLONEL THOMPSON: Mr. Weld, I think maybe  
18 your question about the possibility of malfunction is  
19 a good one, but one that should perhaps be addressed  
20 in the final Environmental Impact Statement, and it  
21 will now, of course, be part of the record. I don't,  
22 I doubt that any of us could envision all the  
23 different possibilities that might occur, certainly,  
24 in the brief time that's allotted to us here.

2.3-2  
p. 12-11

25           MR. WELD: I guess my line of questioning

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1 is directed along these lines, it's because you're  
2 coming into a very poor community that is looking for  
3 any economic benefits it can get, and I think that we  
4 should, as a community, question, maybe make sure that  
5 we aren't being lured by an economic stimulus into  
6 making decisions that have long-term impacts either on  
7 the nation as a whole, you no, or on our local health.

8 And not to talk too long, but I also saw  
9 about the birds, that you showed know significant  
10 impact on the birds. I guess in particular, what  
11 occurs to me as a layman, is the sight of seeing a lot  
12 of flocks of migrating birds going through the area  
13 along the Copper River corridor, and wondering if it  
14 isn't, the antenna array isn't awfully close to that  
15 migration corridor, without no impact on them.

4.4-2  
p. 12-20

16 MR. PETRON: That question, I do, that is  
17 my area of expertise. The antenna heights are, the  
18 maximum antenna height of the array is 70 feet, which  
19 protrudes above the tree line a minimal amount. And  
20 you might be aware of the extensive bird studies that  
21 have been done on that site previously, and the  
22 preponderance, the far preponderance of birds fly well  
23 above that 70 feet altitude. So that's why we  
24 determined that there would be no significant impact.

25 COLONEL THOMPSON: Thank you. That

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1 exhausts all the comment sheets that I had. If  
2 there's anybody else. Okay, there's one there. And  
3 certainly if anybody else would like to talk, I would  
4 be happy to recognize you.

5 MR. REED: Are we going to have a chance  
6 for opening comment at the end on some of the other  
7 topics that other people bring up, or is it going to  
8 be limited to our presentation on the sheets?

9 COLONEL THOMPSON: No. If there is still  
10 time at the end and if you would like to talk a little  
11 bit more, sure, we can do that.

12 MR. REED: It's just that other people are  
13 bringing up other ideas as we hear them, you know.

14 COLONEL THOMPSON: Again, don't consider  
15 yourself limited to what goes on here tonight either.  
16 As I mentioned a couple of times, you can send  
17 letters, you can fill out the comment sheets, and send  
18 those in. Even if something occurs to you after the  
19 meeting is over.

20 Let's see. Okay, Mr. Lawrence Kajdan?

21 MR. KAJDAN: I'm Larry Kajdan, I live at  
22 Mile 14, I'm two miles east of the site, and during  
23 the construction of what's there it got pretty noisy,  
24 especially in quiet evenings. And construction  
25 continued through good parts of the night. I'm

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4.8-8  
p. 12-32

1 concerned about the sound from the generators once  
2 it's in operation. You say it campaigns 14 days, but  
3 the EIS says another 10 days of startup and 4 days of  
4 shutdown, now we are up to 28 days with the generators  
5 running, possibly 5 times a year, that's almost 6  
6 months. That would be running almost halftime,  
7 especially in the winter when it's quiet. I hope  
8 there's something you can do about the noise of those  
9 machines.

10 Concerns of power, maybe the phrases here  
11 pertain to different types of power, but you were  
12 talking 3.6 million watts, the EIS mentions it will be 4.14-6  
13 over 1 billion watts affected radiated power. That's p. 12-69  
14 a factor of over a thousand there. Can you explain  
15 that? Is there a channel focused of --

16 MR. HECKSCHER: The 3.6 million watts is  
17 the capability of the transmitters. The antenna  
18 concentrates that energy into a very narrow beam. And  
19 if the energy in that beam were over the whole  
20 horizon, over the whole hemisphere, the amount of  
21 power you would have had to put into that whole  
22 hemisphere is your higher figure, your thousand times.  
23 But it's only in this one spot in this very narrow  
24 beam.

25 MR. KAJDAN: As long as you don't fly  
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4.13-6  
p. 12-61

1 through it, you're probably safe.

2 MR. HECKSCHER: That's correct. That's  
3 correct.

4 MR. KAJDAN: Okay. The trail that comes  
5 along where your site is indicated, you have a fence I  
6 think right up near the -- if I remember the drawing.  
7 Is the trail going to be rerouted, or is the trail  
8 going to be developed into a road to get to your other  
9 sites and used also for public access? Is that the  
10 plan right now?

4.11-4  
p. 12-56

11 MR. PETRON: Right now, we are looking at  
12 how to preserve the access to those northern lands  
13 that we know. The option right now that we're  
14 considering is providing an alternative routing that  
15 would take you around the site.

16 MR. KAJDAN: I was concerned you might  
17 shut it down if airplanes approach, but not maybe for  
18 a dog team or snow machine that will be right  
19 alongside those transmitters. And that's a real  
20 concern of mine.

4.13-7  
p. 12-61

21 Several places in the document it mentioned  
22 concern about putting it up in densely populated  
23 areas. And it mentioned a few of the things, but I'm  
24 wondering what the real concerns are and if it effects  
25 a lot of people, what about the few of us, and what

2.3-3  
p. 12-14

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1 will be done to mitigate whatever these things are  
2 that can't be done around a populated area? And what  
3 are they? Is it the radiation? Is it the  
4 interference? Is it the noise? Is it the lights  
5 that's going to block out our view of the aurora when  
6 we go up the Tok cutoff? What are the things that  
7 bother a populated area that perhaps won't bother  
8 those of us who live right next to it?

9 MR. PETRON: Primarily, the reason we had  
10 to avoid densely populated areas is because of the  
11 interference problem. And the interference, believe  
12 it or not, was primarily from the RF generated in  
13 population centers on our diagnostic equipment.  
14 That's primary. Secondary was it is much easier to  
15 work if we do have some interference problems with our  
16 neighbors, it's much easier to work with a group of  
17 people such as represented here than a huge population  
18 of people.

19 MR. KAJDAN: There was one other difference  
20 in figures I noticed, you said the antennas are 73  
21 feet high, the EIS says they are 99 feet high, you put  
22 them on 5 or 10 feet of gravel, you're above 100 feet,  
23 which is at least 25 percent higher than you're  
24 planning on there. The same with the buildings, at 73  
25 feet, that's 25 feet of gravel under it, it sticks up

4.12-1  
p. 12-57

1     above the roadway from the north. It's locally known  
2     as the Temple of Doom. It's lit up all winter long  
3     and you come down this beautiful stretch looking at  
4     the moon, the stars, whatever, and there's the Temple  
5     of Doom. You see it for about two miles north of the  
6     site. It's not screened by vegetation.

7             MR. PETRON: In reference to your question  
8     about the antenna heights, the 99 foot high antenna is  
9     the ionosounder.

10            MR. HECKSCHER: There's one antenna.

11            MR. PETRON: And it's one antenna. The  
12     array which is the multiple antennas, that is the  
13     primary, the Ionospheric Research Instrument, the high  
14     power array, those antennas are about 70 feet high.  
15     And your question about the gravel, you're correct, we  
16     will have to put some gravel down and that will raise  
17     it, but we do not anticipate building a gravel pad  
18     like that power plant was put on. Okay.

19            MR. RASMUSSEN: If I could make one  
20     comment. John Rasmussen. I'm with the Phillips Lab  
21     of the Air Force, we are in charge of that building,  
22     and we can get those lights shut off.

23            COLONEL THOMPSON: Mr. Al Sanders?

24            MR. SANDERS: I would like to thank you for  
25     the opportunity to put in my 2 cents worth. Last time

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1 I had a question on being able to contact somebody if  
2 we did have problems. And I noticed that you said  
3 that if there was an airplane coming in, whatever, you  
4 can shut the system down. My question is how much  
5 advance notification would you have to have on  
6 something like that in order to turn it down, and is  
7 it going to be readily available access to where we  
8 can call and say hey, we have got something happening  
9 here that we need you to shut down, and we can get it  
10 done.

11 Because I noticed in your interference on  
12 frequencies, I don't think it's going to be a real  
13 large thing, but on aircraft, 50 miles, when you're  
14 doing your ionosphere penetration on 118 and 137, VOR  
15 has got 20 miles, and is this, when this thing is in  
16 operation, are we going to have some airspace  
17 restrictions, where people won't meander off into this  
18 on a radio and have VOR problems, because our main VOR  
19 for the area here is Gulkana. And you're only about  
20 20 miles, I would say, as the crow flies out there to  
21 that. What's that going to do to somebody overflying  
22 the area? We've got some mountains over here that has  
23 aided a few.

4.8-9  
p. 12-50  
p. 12-54

24 MR. HECKSCHER: Would you like me to try to  
25 respond to that?

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1                   MR. SANDERS: Well, yeah. And another  
2    thing, how much, you say it says we have an impact.  
3    Okay. An impact is an impact but what kind of impact  
4    can I expect on my television where it says it would  
5    be impact on HF communications, two-way radio paging  
6    systems, or whatever, I mean is this just like the  
7    Russian woodpecker thing where it's an obnoxious beep  
8    beep in the background? Is it really going to cut out  
9    voice and like on the aircraft coming in here for  
10   approach in bad weather type things, we have EMS  
11   flights, medevacs going in and out, what's it going to  
12   do if this is on and let's say that we can't get the  
13   message to you to shut it down?

4.14-7  
p. 12-65

14                  MR. HECKSCHER: Well, we, obviously, we're  
15   not to the point where we know exactly what we're  
16   going to be able to do. I think the idea of a  
17   telephone number you can call is a good one. I think  
18   we'll try to do that when we go into operation. We're  
19   very sensitive to those issues that you're raising.  
20   We are in contact with the -- had many discussions, in  
21   fact, with the FAA, both in Washington and in  
22   Anchorage. The how to resolve the airspace issue and  
23   how quickly it will take to -- we have some idea of  
24   how long it's going to take us to shut it off, if we  
25   say we have got to shut it off now, we are going to

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1 try to get that down to a couple of seconds.

2 MR. SANDERS: What I was getting at is like  
3 we get somebody smashed up in an auto accident out  
4 here, drowning or whatever, and there has to be a  
5 medevac flight made, sometimes that doesn't take --  
6 you know, as soon as they scrape them up off the  
7 highway, get them to the hospital, get them out to the  
8 airfield they are in a plane getting out of here. And  
9 that was my concern is what kind of lead times do we  
10 have. If we have a --

4.8-10  
p. 12-50  
p. 12-54

11 MR. HECKSCHER: Well, we plan to have a  
12 radar with sufficient sensitivity to allow us to find  
13 an airplane that's going to be coming over our array.

14 MR. SANDERS: We don't have to, you'll see  
15 the plane coming, whatever.

16 MR. HECKSCHER: We'll see it coming.

17 MR. SANDERS: On radar.

18 MR. HECKSCHER: On radar; that's correct.  
19 And as soon as we see it's going to come over it we  
20 will shut it off.

21 MR. SANDERS: What I'm saying is this thing  
22 said like for 20 miles, for a VOR?

4.14-8  
p. 12-95

23 MR. HECKSCHER: Well, okay. I there are  
24 some folks here that have done some of these  
25 calculations, and if they would like to comment, I

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1 would be happy to have them. Ed Kennedy from the  
2 Naval Research Laboratory.

3 MR. SANDERS: I just have a question.  
4 There was no answers, you showed the problem, that's  
5 what I wanted was answers. If I'm one of them in the  
6 airplane, I want to know that I'm going to get to  
7 Anchorage. Banged up worse than I am.

8 MR. KENNEDY: I appreciate that. The VORs  
9 operate on specific frequencies and it will be  
10 operating on subharmonics of these frequencies,  
11 meaning that maybe the 8th or 10th harmonic where we  
12 are may land in the VOR operating band. Our  
13 mitigation procedure would be to lock out those  
14 frequencies that would create a harmonic on the VOR,  
15 so just simply by avoiding the harmonic, we can fix  
16 the problem.

17 MR. SANDERS: So you would select  
18 frequencies to transmit on that would not affect  
19 115.6?

4.14-9  
p. 12-95

20 MR. KENNEDY: That's correct.

21 MR. SANDERS: And the frequencies  
22 associated with it.

4.14-10  
p. 12-95

23 MR. KENNEDY: That's correct, and in fact,  
24 any interference between the user in the spectrum  
25 could cause, or probably would cause us to lock out

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1     that part of the spectrum out of our normal selection  
2     of frequencies for operating, in addition to our  
3     regular assignment process with the FCC, so the FCC is  
4     going to tell us where we can operate to begin with,  
5     and if it turns out we have additional interference  
6     problems, we would then go in and lock those out,  
7     further restricting a spectrum that we could operate  
8     in.

9                 MR. SANDERS: Okay. And this is something  
10    that somebody locally here during the two weeks or  
11    four weeks of operations that like if one of my users  
12    call up and say my communications on HF, the sound, I  
13    can't get through from here to them any longer, I've  
14    got interference shutting this radio down, then we can  
15    call someone locally and we can deal with them locally,  
16    or do we have to deal with Washington?

2.3-4  
p. 12-13

17                MR. KENNEDY: No, there will be people to  
18    deal with that locally. In fact, the situation is  
19    that we have a number of measures that we would try to  
20    use to solve the problem, one of which is locking  
21    frequencies out, one is working directly with the user  
22    to see if we could solve the problem.

23                MR. SANDERS: Just like to get it solved,  
24    if you have to do a research analysis and engineers  
25    prove that I have a problem to somebody, nobody can

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1     afford that. And that's what I'm saying is if we  
2     could talk to somebody one on one. And I will have to  
3     say I had a question on all this, and out of all  
4     fairness, I spent an hour on the telephone with one of  
5     the engineers that was in charge of the radio  
6     spectrum. I don't know whether he's here or where he  
7     is, but they did call back and spent an hour on the  
8     phone with me. Six months ago or more, on the  
9     concerns with the frequencies in this area, so I  
10    was -- I'm not adverse to it, I just think we need to  
11    be able to work with what you folks are talking about.

12               COLONEL THOMPSON: Okay. Mr. Elrod, I have  
13    got one person I haven't recognized, then I'll come  
14    back and pick up the folks that want to talk again.

15               MR. ELROD: Okay. Thank you.

16               COLONEL THOMPSON: I have got one more  
17    person, Mr. Hai Phung.

18               MR. PHUNG: My name is Hai Phung, and I'm  
19    with Alyeska Pipeline, and of course, there we use a  
20    lot of RF in our operation for control operations and  
21    maintenance. And in of course the area we have  
22    concerns on is the EMI and IFI area. And in your EIS  
23    here you have indicated that we will have some impacts  
24    on those systems, and I just want to know if there is  
25    a prepared document that shows what you are doing

4.14-11  
p. 12-84

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1 right now to mitigate that problems. Or there will be  
2 some prepared documents to show that.

3 MR. PETRON: Yes. The question about the  
4 mitigation of the problems, and whether we would be  
5 putting together a document, the mitigation process is  
6 evolving, and this is one of the steps we go through  
7 is to find out where we might have concerns so that we  
8 can develop mitigation to take care of them. And we  
9 will be developing mitigation.

10 At a very minimum, the mitigation will be  
11 spelled out in the record of decision. And it also  
12 could be spelled out in a mitigation plan itself would  
13 be an assembly of documents. That's a decision that  
14 the decision maker might make, he may, at that point  
15 in time. So that will be the document at that point  
16 in time.

17 MR. PHUNG: Is that something the project  
18 team will be preparing for the people who make the  
19 decision, or is that something that you will determine  
20 and mitigate when the problem occurs?

4.14-12  
p. 12-84

21 MR. PETRON: It could be both. If we -- if  
22 a problem occurs which we did not foresee after the  
23 decision is made, and you raise it to the attention,  
24 I'm sure, you know, they are going to try to work it  
25 out with you, and especially with this RFI issue,

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1     which is very difficult to grasp at this stage of our  
2     knowledge about the system.  So just because the  
3     record of decision is done, and for instance, there's  
4     a decision made to go build this thing, it doesn't  
5     mean you don't -- you can't still call up and say I'm  
6     being interfered with here now, now that you're here,  
7     and I don't see any recourse.  And I'm sure they are  
8     going to want to work that out with you.

9                 MR. PHUNG:  I understand.  I hear what  
10    you're saying there but I'm still not clear, is  
11    that -- will we be contacted on these points, or is  
12    that something that will be prepared and presented to  
13    the public that we will have a copy of it, or is that  
14    just something that you will deal with it as it  
15    occurs?

4.14-13  
p. 12-84

16                MR. PETRON:  All of the ones mentioned, we  
17    will evaluate in the final EIS, so it will be  
18    documented.  Okay.  And we're going to -- we will make  
19    our best estimation of what will work.  Now, on this  
20    issue it's going to be hard to predict.  And you still  
21    can work with us after that process.  But the final  
22    EIS, and the record of decision should go considerably  
23    further to document the methods that we can use.  
24    Okay?

25                MR. PHUNG:  Again, a last question, I

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1 appreciate that. The last question, will we be  
2 getting the final EIS in time for us to review or -- I  
3 just only received this here last week, and it is very  
4 short time for us to prepare, I mean to read it over  
5 and prepare a response statement.

6 MR. PETRON: I can appreciate that. It's  
7 thick. I don't know whether your particular name was  
8 on the original mailing list or whether you asked for  
9 a copy later. Which was it? Do you know?

10 MR. PHUNG: I was not on the original list.

11 MR. PETRON: You had to call up and ask for  
12 a copy?

13 MR. PHUNG: Yes, I got it from --

14 MR. PETRON: Okay. What you need to do is  
15 make sure we know you want a copy of the final and we  
16 will get you one out as soon as it's off the press.

17 MR. PHUNG: Can I say it now or how do I do  
18 it?

19 MR. PETRON: You just said it.

20 COLONEL THOMPSON: And assuming this is the  
21 address is the one that will be sent to you.

22 MR. PHUNG: Yes, it is. Okay.

23 COLONEL THOMPSON: I've got one more person  
24 who has not spoken already. Okay. That would be Bob  
25 Neeley.

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1                   MR. NEELEY: Yeah, I would like to know  
2     about the jobs and employment, what you mean by  
3     qualified personnel. Back during the Backscatter  
4     going to like a meeting like this, some promises were  
5     made but they were empty. They were never kept. Went  
6     to a two year college degree program in electronics,  
7     and it was funded by the Air Force, but I got the  
8     degree but I didn't get no job. I just want to know  
9     what your job relations for qualified personnel.

4.8-11  
p. 12-27

10                  MR. HECKSCHER: The contract to do the  
11     construction and build the facility is with a company  
12     in Washington, D.C. They are the ones that have to  
13     determine the qualifications, they or their  
14     subcontractors are the ones that have to determine the  
15     qualifications of the people they hire. I as the  
16     government can only put into the contract document the  
17     federal regulations governing how those contracts are  
18     administered. Some of them in there are regulations  
19     that say that you have so many percent of local hiring  
20     to do. I think there's a Davis-Bacon Act, I'm not  
21     sure of all of them. I'm not a contract specialist.  
22     But the government itself can make no guarantees or  
23     promises, it's the contractor, whoever gets the  
24     contract is the one that is responsible for doing the  
25     appropriate hiring.

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1 COLONEL THOMPSON: All right. Anybody else  
2 who has not had a chance to speak and would like to?  
3 Okay.

4 MR. WOLLINGTON: My name is Jim Wollington.  
5 I've got kind of a question on from table 3.14-1  
6 regarding, it says potential off-site systems, has a  
7 table regarding wildlife trackers, and it says  
8 distance to the closest receiver is nine-tenths of a  
9 mile. It also lists the same distance for VHF radios  
10 and CB radios, but we do quite a bit of wildlife  
11 tracking from anywhere to 7 to 10,000 feet in the air  
12 through aircraft, and is there anybody who can address  
13 are we going to have problems with our radio telemetry  
14 equipment tracking wildlife in this area because both  
15 State Fish and Game and the National Park Service has  
16 some fairly extensive projects going on using the  
17 radio collars and whatnot.

4.14-14  
p. 12-86

18 MR. PETRON: Your question about  
19 interfering with the radio track, wildlife trackers,  
20 that was brought up in scoping, we did look at it.  
21 The nine-tenths you see there references the distance  
22 from the highway to what we would view as the IRI. In  
23 other words, the closest you could get to it, to our  
24 IRI, so that's why we put it down as the closest  
25 distance we perceived as you with your receiver could

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1 be to our transmitter.

2 MR. WOLLINGTON: Does the problem intensify  
3 with distance in the air? Is it going -- if you're  
4 down on the ground, if the signal is going up, you may  
5 be shadowed somehow, but as you get 10,000 feet up in  
6 the air, even if you are 20 miles away from it, are we  
7 going to have problems?

4.14-15  
p. 12-86

8 MR. PETRON: These numbers in this chart  
9 were done on a worst case line of sight basis. But as  
10 far as whether in the air it would be worse, I'm going  
11 to defer back to one of our RFI fellows, Dr. Lee  
12 Snyder with the MITRE Corporation.

13 MR. SNYDER: Yes, the calculations were  
14 made for line of sight distance of nine-tenths of a  
15 mile, assuming that your wildlife tracker receiver was  
16 on the ground, since it's a line of sight calculation,  
17 being in the air, which is still information to me  
18 personally, the calculation would be no different from  
19 what was made from nine-tenths of a mile, and the  
20 electric field that the receiver would experience with  
21 various, the square radius of the distance from the  
22 antenna, our Ionospheric Research Instrument to your  
23 receiver would decrease, if it went over our square.  
24 Such that if you can give us a distance, we can make a  
25 better calculation for the areas that you do the

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1 majority of your wildlife tracking.

2 MR. WOLLINGTON: The reason we track them  
3 is because they keep moving.

4 MR. SNYDER: What's the nearest you would  
5 expect?

6 MR. WOLLINGTON: To the site?

7 MR. SNYDER: Yes.

8 MR. WOLLINGTON: I don't know, might be  
9 standing next to the fence for all I know. We track  
10 caribou and wolves and other animals. And they move  
11 through that area.

12 MR. SNYDER: The key, though, is where is  
13 your receiver, where is your receiver in the airplane?  
14 Would you be right above the animal? Would you be  
15 five miles from the animal?

16 MR. WOLLINGTON: We might be 20 miles from  
17 the animal we are trying to home in on. That's why if  
18 we have interference, we can't determine where it's  
19 at. That's the reason why we are radio tracking is to  
20 go to and find out where they are at. And if we go up  
21 and make a circle around trying to pick up the signal,  
22 that's what I'm concerned about interference. If  
23 there's -- if we can't get a clear signal, or if in  
24 one direction a signal is masked for some reason, then  
25 it throws us off.

4.14-16  
p. 12-86

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1                   MR. SNYDER: I would ask Steve that I think  
2 we should treat wildlife trackers and aircraft as  
3 another case in the Environmental Impact Statement.

4                   MR. PETRON: The other opportunity for  
5 solving a problem is be sure we know your frequencies,  
6 because it gets back to our frequencies selection  
7 also, and a possibility to just avoid your  
8 frequencies.

9                   MR. WOLLINGTON: At what point do we give  
10 that input?

11                  MR. PETRON: I would just send them in the  
12 mail to us. I already got some of them from a fellow  
13 by the name of Russ Galipeau with the Park Service. I  
14 don't know if he's in the room tonight. He is. So  
15 we're aware of the situation.

16                  MR. WOLLINGTON: It would be similar  
17 frequencies. The other comment as Al brought up about  
18 whether there would be an on-site person to contact if  
19 there's problems and whatnot, on the telephone, does  
20 that mean if we call up and say hey, there's a  
21 problem, does that mean you're going to shut it off?

22                  MR. HECKSCHER: I would in general say yes,  
23 if there's -- if somebody has a problem with us, we're  
24 going to shut it off.

25                  MR. WOLLINGTON: What degree of a problem?

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1 MR. HECKSCHER: That's perception, isn't  
2 it?

3 MR. WOLLINGTON: Yeah.

4 MR. HECKSCHER: To be honest, we are not a  
5 critical operational site that has to go 24 hours a  
6 day. If there's a real problem somewhere, we're going  
7 to shut it off and find out what it is. On the other  
8 hand, if we have a dozen scientists up here who are,  
9 came here expecting to do an experiment, and it's down  
10 for a week for some reason or other, that's going to  
11 impact us too. So there's going to have to be some  
12 give and take here, it seems to me.

13 MS. HAPPEY: Patty Haphey. In the same  
14 light with what Jim is saying, we might have a  
15 conflict because several of us also have research  
16 projects going on at the same time, and we have narrow  
17 windows where we have to work, and then quite often  
18 there's also the weather window, so you know, like we  
19 need to get this work done within this month and we  
20 can only fly on certain days, and who is going to  
21 just -- being researchers ourselves, and you folks are  
22 doing research, who gets the priority? How is that  
23 going to be addressed? I can see a real problem here  
24 unless you can mask everything out between 150 and  
25 153.

4.14-17  
p. 12-86

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1                   MR. KENNEDY: We are not operating any  
2   more.

3                   MS. HAPPEY: Then we are fine.

4                   COLONEL THOMPSON: The reporter is having  
5   trouble hearing your answer. You're saying you're not  
6   going to operate between 150 and 153?

7                   MR. KENNEDY: As John pointed out on his  
8   viewgraph, the operating frequency is 2.8 megahertz.

9                   COLONEL THOMPSON: All right. Mr. Elrod,  
10   you had indicated that you wanted to add something to  
11   what you said before?

12                  MR. ELROD: I'm really impressed by all the  
13   expertise that you brought to our little community  
14   here. I really think it's neat. As a ham operator, I  
15   have to face this, not right now because I'm so far  
16   away from people, but if I bother somebody, I have to  
17   contact them and find out why they are being  
18   interfered with, is it my fault or their fault. So  
19   this is something that can be corrected. And when  
20   it's caused me to become sharper and get better  
21   equipment, one way that's helped, so there's still  
22   hope even if there is interference.

23                  Is there somebody that could reassure us,  
24   we have never been around a 3.6 megawatt transmitter.  
25   I run about 60, but now we hear these scare stories

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1 about troopers that have these hand-held radar guns  
2 that they have to be careful not getting it close to  
3 their body, you know, is there some experts here that  
4 could reassure us? There must be lots of transmitters  
5 operating well over a million watts. I know, I think  
6 VIF for some reason, isn't that over a million watts  
7 sometimes? Isn't there someone that could reassure us  
8 there's lots of transmitters in the world that are  
9 operating and people aren't dropping dead and cars  
10 aren't crashing and planes aren't falling out of the  
11 sky? I mean --

4.14-18  
p. 12-65

4.13-8  
p. 12-61

12 COLONEL THOMPSON: The answer is yes. We  
13 have someone.

14 DR. KLAUENBERG: I can reassure you as long  
15 as we follow the standards, you will be safe. We have  
16 researchers out there that ignore the standards  
17 sometimes, stick their head in the wave guides, get  
18 cataracts in their eyes, but they are frying their eye  
19 balls. As long as you follow the standards, which are  
20 just as I said, reissued, revised last December, four  
21 months ago, five months ago, and these are brand new  
22 standards, as long as you follow the standards, you're  
23 going to be safe.

24 There is a large safety margin in the  
25 standards. First, we find a value that all the

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1 scientists can agree upon that it is the lowest  
2 possible biological field, and then for occupational  
3 safety standards, they put a factor of ten on it. And  
4 then for public they put a factor of 50 on it so you  
5 have a large confidence or conservative zone in there.  
6 And it's as long as you follow the standard that's  
7 issued, then you're going to be safe.

8 I'm confident in it. There are some people  
9 out there that have concerns, like I said, it's a  
10 consensus and consensus means you pull in varying  
11 opinions and everybody agrees to come to an agreement.  
12 We have standards for everything that we come in  
13 contact with.

14 MR. ELROD: Thank you.

15 COLONEL THOMPSON: Mr. Reed, I think you  
16 indicated maybe that there was something else that you  
17 would like to state, you would certainly have an  
18 opportunity to do that.

19 MR. REED: Well, a lot of things came to  
20 mind here. I'll start off where I did before, too, in  
21 regards to the local and regional labor, I see all  
22 over this thing, you know, that they could compromise  
23 up to 90 percent, and in all likelihood, and all this  
24 stuff, and it doesn't seem like there really is any  
25 addressing that as far as local hire, you seem to be

4.8-12  
p. 12-27

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1 passing the buck to the contractors, and you did  
2 mention something about a percentage. Is there any  
3 existing law in regards to percentages of local hire?

4 MR. HECKSCHER: Not that I'm -- there may  
5 be, I'm not aware of what it is.

6 MR. REED: I wasn't aware of it either but  
7 I seem to see it all over the place here to make us  
8 think about it. As well as it mentions four to eight  
9 positions would in all likelihood be hired from the  
10 local area. What are those four to eight positions?  
11 Specifically I would suspect power plant operators,  
12 janitors, security?

4.8-13  
p. 12-27

13 MR. HECKSCHER: Yes.

14 MR. REED: Any tech positions, there is a  
15 person here who came very qualified for a tech  
16 position, that wasn't available to him even though he  
17 was local. Will that be addressed in the next  
18 statement basically what those positions are and what  
19 the chances are of local hire? Because I would  
20 believe then that would be for the Air Force then  
21 rather than a second or third party contractor.

4.8-14  
p. 12-27

22 MR. HECKSCHER: I think our intention is to  
23 have it contracted out. It is not an Air Force  
24 position. These would not be Air Force positions, per  
25 se.

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1                   MR. REED: So basically we are going to  
2 have to deal with the same people who are now in  
3 litigation with say John Goates who basically had  
4 problems with the wages and stuff. I mean not the  
5 same people, but see it was another contractor that  
6 they had a lot of problems with the first phase of  
7 this. It seems we may be setting ourselves up or  
8 having the same problems with the next group of  
9 contractors. You mentioned 50 to 70 construction  
10 workers during the first phases and stuff in here.  
11 And in regards to these construction workers, that  
12 happened last time, and again, they weren't paying  
13 their Davis-Bacon wages, and there's been a lot of  
14 lawsuits involved. So since it has the history, I  
15 think that has to be looked at pretty closely.

4.8-15  
p. 12-27

16                   But also, in regard to the last scoping  
17 meeting, I'm a resident within that two mile radius, I  
18 brought up officially last time that there was  
19 approximately seven or eight families in this area.  
20 That was not addressed. Mostly the socioeconomic  
21 benefits or detriments were directed towards Gakona or  
22 Glennallen, and actually places that are quite removed  
23 from this site. I believe only two of those families  
24 are represented here tonight, only two of them got the  
25 Draft Environmental Impact Statement, although I did

4.8-16  
p. 12-27

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1 mention there were others in that area before. And  
2 none of our socioeconomic effects had been dealt with  
3 basically.

4 The big concern is, you know, as Larry  
5 Kajdan brought up is the noise of the thing, the truck  
6 traffic and the two years of construction, as well as  
7 what would be the limits of the mitigation for  
8 problems that we have. Personally, I hooked up my FM  
9 stereo to my TV antenna and I get five FM radio  
10 stations. You guys are the scientists, that's not  
11 supposed to happen from what I understand, but we get  
12 perfectly clear reception. However, we are 70 miles  
13 line of sight from the TV transmitter and I can't even  
14 plug in my phone recorder and watch TV, I get so much  
15 interference from a phone recorder.

4.14-19  
p. 12-65

16 So I am interested with what the limits of  
17 the mitigation is. And if it's going to be documented  
18 through a long series of basically phone calls  
19 documenting that I'm having problems, do you have it  
20 on? Okay, you have it on, whatever, I mean is this  
21 really going to be a long and arduous process to get  
22 some kind of mitigation and will there be a limit to  
23 it?

24 I know you're trying to put it in an area  
25 where you don't have too many squeaky wheels to deal

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1 with. But I would like to be more informed what that  
2 process is going to be because as an electrician and  
3 as somebody who can't even put his phone recorder on,  
4 I have a hard time believing we are not going to be  
5 severely impacted and probably just about every family  
6 in that radius. So I would just like to know the  
7 limits of your help for us in that mitigation.

4.14-20  
p. 12-84

8 COLONEL THOMPSON: Okay. Thank you.  
9 Anybody else? Yes, sir.

10 MR. KAJDAN: Larry Kajdon again. One  
11 assumption that may lead to problems is in the  
12 introduction here it says there will be 80 imported  
13 workers, and there's enough existing housing for these  
14 workers. You got an 80 man camp in the backyard? Or  
15 I don't know how that statement could be made. 80  
16 homes available in this area right now?

4.8-17  
p. 12-30

17 MR. PETRON: I'm not familiar with the 80,  
18 the number 80 in the document, but let me not worry  
19 about that, let me address your question, which I  
20 think is where or how are the people going to be  
21 lodged during construction. That's, that's basically  
22 your question, I think. Is that correct?

23 MR. KAJDAN: Bringing it up so you will  
24 avoid a surprise here. If this assumption is assumed  
25 true, it's certainly not.

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1 MR. PETRON: Okay. We felt that there  
2 would be lodging available. We're not planning to put  
3 a construction camp out or anything like that. Okay.

4 COLONEL THOMPSON: Okay. Yes, sir?

5 MR. WELD: Jeremy Weld again. I was  
6 wondering, to ask you to repeat a question, about the  
7 costs, and you were sort of vague. \$150 million, you  
8 weren't sure. Now, I just wonder why you're not sure  
9 of how much, and then you said well, it depends on  
10 Congressional funding. I'm, I would think, for  
11 instance, that you would have done a cost analysis of  
12 the Clear site versus Gakona. How much it would cost  
13 to build the facility in Clear, and how much it would  
14 cost to build it in Gakona. You really don't have any  
15 idea?

4.8-18  
p. 12-31

16 MR. HECKSCHER: Let me tell you why I made  
17 the statement. There was a proposal that came in that  
18 the Air Force -- well, several proposals came in, the  
19 Air Force evaluated them, the Navy evaluated them as a  
20 joint program, and on the basis of those proposals, we  
21 established a cost. Now, when this contract, which is  
22 in the final throws of being definitized is  
23 definitized, what will be, what the government will be  
24 buying will be a specification, so many -- so much  
25 power being radiated into a beam which can be pointed

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1 upward, can be steered electronically, can do what we  
2 want. The ability of us to do that is now not  
3 dependent upon the actual proposal, but on the  
4 specifications. And it may be that the cost will vary  
5 because the contractor will find a different way of  
6 doing it that might cost less, might cost more.

7 We haven't defined some of the  
8 characteristics of the data gathering instruments. If  
9 we get more Congressional funding, it will enable us  
10 to buy more of these data instruments. If we don't  
11 get the funding, we won't be able to buy as many of  
12 them.

13 So the program is not well defined in terms  
14 of its total overall cost. That's kind of where I'm  
15 coming from. We don't have a firm figure that we  
16 know. In pieces, as we go along, we will know, but  
17 it's not, it's not really fully defined, what total  
18 amount we're going to have.

19 MR. WELD: Will the funding of the  
20 operation, assuming it is constructed, will that vary  
21 from year to year, depending on Congressional funding?

4.8-19  
p. 12-49

22 MR. HECKSCHER: I think if we postulate that  
23 we will have four or five campaigns, we'll be  
24 operating, we'll need so much fuel, we'll need O & M  
25 of a certain amount, I think that can be predicted

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•

1 pretty well. Those costs, well, we escalate them, of  
2 course, for inflation, but you could get a pretty good  
3 idea of what the O & M costs will be.

4 MR. WELD: Have you been assured of the, of  
5 funding to actually construct the project, or is that  
6 intended?

7 MR. HECKSCHER: No, sir. No. The  
8 contract, as it is now going to be definitized, is in  
9 phases, it's in options. If we don't get the funding  
10 we will only complete it to a certain phase. We've  
11 designed this so that at the end of each phase, we  
12 only exercise those options when we have the money,  
13 there will be some instrument or some capability at  
14 the end of each phase. It won't have been wasted  
15 money. But we won't -- if we don't get enough money  
16 to do the complete thing that we described tonight,  
17 but only part of it, then that's all we will build.  
18 And we will have a system which has less capability  
19 than we had hoped. I wish I could be a little more  
20 specific with you, but the way the funding is, it's  
21 not known.

22 COLONEL THOMPSON: Do I have anyone else?  
23 Yes, sir.

24 MR. GALIPEAU: My name is Russell Galipeau,  
25 and I have a couple of questions. One is I would like

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1 to volunteer some information we have with the  
2 National Park Service on bald eagle nests. As  
3 Mr. Reed has noted, we have been doing annual surveys  
4 on bald eagles throughout the whole area where you  
5 propose to get gravel from for the last three years,  
6 and I think the last data that was collected on bald  
7 eagle nesting there is 1989, so we have it up to 1992,  
8 and then we will do more surveys starting next month.  
9 So we could tell you more precisely where the active  
10 nests are in that area, to minimize impacts.

4.4-3  
p. 12-22

11 That's one piece of information. The other  
12 is I would like to sit down with somebody on the  
13 section in subsistence. There is some inaccuracies  
14 that were made about the federal program that I think  
15 we need to straighten out. One of the ones that's  
16 glowing is it says the federal program has  
17 jurisdiction over unconveyed native allotments, and  
18 that's not true. That's a selective process and the  
19 federal government has no jurisdiction over selected  
20 lands in the federal subsistence program. And there's  
21 a couple other pieces of subsistence information that  
22 needs to be clarified.

23 The other one is dealing with the  
24 Incoherent Scatter Radar, or the off-site diagnostics,  
25 my understanding is it's not clear at this time how

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1 many off-site diagnostic stations would have to be  
2 constructed. It would depend on the type of research  
3 that's going to go on. And then you have numbers that  
4 associate amount of ground area that could be taken up  
5 by arrays of antenna. It's not clear if that would  
6 actually be ground disturbance, and if that is quite a  
7 distance from your transmit location, and it's in the  
8 national park, even if you were to do environmental  
9 analyses, you probably would not get that clearance to  
10 do ground disturbance in the national park. So that  
11 would impact the researcher on how they could do a  
12 certain research investigation because they couldn't  
13 put an off-site diagnostics inside the park. I think  
14 you ought to consider that before locating that site  
15 at the Gakona location.

16 And the other one is I think you did real  
17 good, did real well at addressing some of our concerns  
18 in the scoping, especially with the idea of informing  
19 the public on when the station would actually be  
20 active, and I think you did real well in addressing  
21 that mitigation. However, I would like to see that  
22 expanded so that working with Fish and Game and  
23 ourselves, that maybe we could provide you with  
24 opportunities in which it's really critical for us to  
25 do radio tracking so that you would know our window of

2.3-5  
p. 12-13

4.14-21  
p. 12-86

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1 opportunity, especially during tracking seasons and  
2 then you would not plan research activities to put the  
3 ionosphere into effect.

4 And the other one is maybe considering  
5 looking at satellite telemetry. We are in a stage now  
6 where it may be cost effective to use satellite  
7 transmitters and have them on 24 hours a day, and we  
8 would like to know exactly where those animals are  
9 moving throughout time. And once we got those we  
10 would like to know if there is a potential effect of  
11 satellite transmitters and also how we could mitigate  
12 that problem. And we will be providing these comments  
13 in writing. Thanks.

4.14-22  
p. 12-86

4.14-23  
p. 12-77

14 COLONEL THOMPSON: Thank you. Let me  
15 remind you again since that seems to be about it for  
16 what you would like to give us, that you're, again,  
17 not limited to what you've said here tonight. I would  
18 suggest that you may want to take your comment sheet  
19 with you so that you can have it. As long as you mail  
20 those comments in by the 25th of April to the address  
21 that's shown on the form, they will be considered in  
22 developing the final Environmental Impact Statement.  
23 And I believe Steve, you said that anybody who fills  
24 out an attendance form you plan to have on the mailing  
25 list for the final Environmental Impact Statement.

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1                   Okay. If there is nothing else, then I'll  
2 declare the hearing to be adjourned. Thanks for  
3 coming.

4                   (Proceedings concluded at 8:55 p.m.,  
5 April 6, 1993.)

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## REPORTER'S CERTIFICATE

I, CAROL A. McCUE, RPR-CM, hereby certify:

That I am a Registered Professional Reporter  
and Certificate of Merit writer for Midnight Sun Court  
Reporters and Notary Public for the State of Alaska;  
that the foregoing proceedings were written by me in  
computerized machine shorthand and thereafter  
transcribed under my direction; that the transcript  
constitutes a full, true and correct record of said  
proceedings taken on the date and time indicated  
therein;

Further, that I am a disinterested person to  
said action.

IN WITNESS WHEREOF, I have hereunto subscribed  
my hand and affixed my official seal this 13<sup>th</sup> day of  
April, 1993.

Carol A. McCue  
CAROL A. McCUE, RPR-CM  
Registered Professional Reporter

My Commission Expires: February 15, 1994

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1  
2  
3 IN RE:  
4 Public Hearing on High-Frequency  
5 Active Auroral Research Program  
6 (HAARP)  
\_\_\_\_\_ /

7  
8  
9  
10 Volume 1, Pages 1 - 41, inclusive

11 Taken April 8, 1993  
12 Commencing at 6:30 p.m.

13 at  
14 Anderson Combined High School  
15 Anderson, Alaska

16  
17  
18  
19 Reported by: Lisa G. Eslinger, CM  
20 Registered Professional Reporter  
21  
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23  
24  
25

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A P P E A R A N C E S

COLONEL WILLIAM C. THOMPSON, Chairman  
JOHN HECKSCHER  
DR. STEVE PETRON  
ARNOLD SNYDER

Public Speakers:

Mary Beth Michaels  
William Miller  
Larry Flanagan  
Frank Maggio

\* \* \* \* \*

BE IT KNOWN that the proceedings in the above-named  
case were taken this date in the foregoing action  
before Lisa G. Eslinger, Registered Professional  
Reporter and Notary Public within and for the State of  
Alaska.

\* \* \* \* \*

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P R O C E E D I N G S

COLONEL THOMPSON: It is my pleasure to welcome you here tonight to the public hearing on the draft environmental impact statement for the High-frequency Auroral Research Program. In this program, the Navy and the Air Force propose to build a world class ionospheric research facility in Alaska.

I'm Colonel Bill Thompson. I'm the chief Air Force trial judge for the western United States. I've been asked by the Office of the Judge Advocate General in Washington to serve as the chairperson at this particular public hearing. I'm here serving in a neutral capacity just as when I serve as a trial judge in an Air Force criminal case.

My job here is simply to ensure that this is an orderly and a fair hearing and that all of you as concerned citizens or representatives of various private associations or government organizations do have an opportunity to express yourself concerning this particular program.

The United States does want to be a good neighbor in planning and building and operating this particular program. An important part of being a good neighbor is for us to hear from you about your concern since you live in this area, and you can tell us about

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1 some of the effects or problems that may be caused by  
2 this particular proposal that might have been  
3 overlooked in the process of preparing this particular  
4 draft environmental impact statement.

5 We are here tonight as part of the National  
6 Environmental Policy Act process. I'll refer to that  
7 National Environmental Policy Act as NEPA. Now, the  
8 NEPA procedures were established to ensure that  
9 environmental information is available to public  
10 officials and to citizens before decisions are made and  
11 before actions are taken which might affect the  
12 environment.

13 To implement the NEPA, the Air Force and  
14 Navy have also passed internal regulations that contain  
15 policies and responsibilities and procedures. This  
16 hearing on the draft environmental impact statement is  
17 a part of the NEPA process. Public comments and  
18 questions about the program, including any comments  
19 that you make to us tonight, will be incorporated into  
20 the final environmental impact statement, either in the  
21 text of that statement or in the section which is  
22 called response to comments.

23 Now, we do have a reporter with us tonight,  
24 who is going to make a complete record of the entire  
25 hearing including any comments that any of you may make

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1     tonight. It's important that we do have those comments  
2     and that those comments be included in the record so  
3     that those comments can be available to the  
4     decisionmaking authority who will ultimately make a  
5     decision on whether this particular project is to  
6     continue and if the project is to continue, where the  
7     project will be located.

8                 I would ask you to assist us in making sure  
9     that we do have a complete and accurate record. I  
10    would ask you particularly to speak as slowly as you  
11    can and as distinctly as you can. I think we're going  
12    to have some problems tonight because of the accoustics  
13    in this particular auditorium. But, if I can't hear  
14    you or if the reporter can't hear you when you are  
15    making a comment, please excuse us if we interrupt you  
16    and ask you to speak up or to clarify something for  
17    us.

18                We're just trying to make sure that we do  
19    have an accurate understanding of what you're saying  
20    and that that particular comment will be accurately  
21    reflected in our record of the proceedings.

22                We're going to begin the proceedings by  
23    presenting to you an overview of the program. That  
24    will be followed by an explanation of the environmental  
25    analysis done on the proposed action and the

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1 alternatives to the proposed action. After you have  
2 heard from the two gentlemen who are with me here  
3 tonight, we will have a comment period available to you  
4 to make comments.

5 When the presentations are over, I'll  
6 explain to you a little bit more about the procedures  
7 and how we will proceed during that comment period. I  
8 would like to mention to you now that you have been  
9 provided with a comment sheet.

10 Even if you choose not to make comments  
11 tonight or even if you do make comments tonight and  
12 something occurs to you that you'd like to be  
13 considered in the final draft of the environmental  
14 impact statement, you can use that comment sheet simply  
15 by writing out your comment or question or whatever it  
16 is and mailing it to the address that's shown down at  
17 the bottom of the sheet itself. But please do that  
18 before the 25th of April. That's the day that we're  
19 going to close out the receipt of those particular  
20 comments.

21 Now, you were also given a record of  
22 attendance of this particular public hearing. It's a  
23 sheet that looks like this (indicating). If any of you  
24 didn't get one and you want one, some are available on  
25 the table. When we do finish the presentations, I'm

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1 going to ask that those sheets be given to me. If  
2 anybody has checked indicating that they wish to make a  
3 statement, I'll use that attendance record to call on  
4 you and recognize you so that you can make your  
5 statement.

6 If you decide that you want to make a  
7 statement or if during the hearing you decide you've  
8 got a question, just go and get one of those sheets and  
9 fill it out and indicate that. That's something that  
10 I'm going to use to let me know who wants to talk so I  
11 can call on you in a sort of random order.

12 We do have two scientists tonight to make  
13 presentations to you; Mr. John Heckscher and Dr. Steve  
14 Petron. Mr. Heckscher is the program manager of the  
15 High-Frequency Active Auroral Research Program, and he  
16 will describe to you the program and its purpose.  
17 Mr. Heckscher is a physicist with the  
18 Phillips Laboratory, Geophysics Directorate at Hanscom  
19 Air Force Base in Massachusetts.

20 Dr. Steve Petron is the environmental  
21 manager of the program. He'll present to you an  
22 overview of the environmental analysis that was  
23 conducted for this project. Steve is a biologist with  
24 Metcalf and Eddy which is an environmental engineering  
25 and consulting firm.

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1           John, if you would please present the brief  
2 overview and the description of the proposed action and  
3 its alternatives.

4           MR. HECKSCHER: Thank you, Colonel Thompson.  
5 Good evening, folks. As Colonel Thompson indicated,  
6 I'm the project manager for HAARP. I'm going to use  
7 that acronym instead of saying this mouthful up here.  
8 Ever time I say HAARP, you folks know I mean  
9 High-Frequency Active Auroral Research Program.

10           HAARP began in 1990 when Congress voted  
11 funds to enhance and consolidate arctic ionospheric  
12 research activities being conducted by the Navy, the  
13 Air Force, and the National Science Foundation. The  
14 director of Defense Research and Engineering -- that's  
15 our boss in the chain of command -- determined that  
16 HAARP would be a joint program administered by both the  
17 Navy and the Air Force.

18           The immediate goal of the HAARP program is  
19 to build a facility to enable scientists to study the  
20 part of the atmosphere known as the ionosphere. That's  
21 a region that extends from approximately 37 miles out  
22 to 600 or more miles. It is created naturally when  
23 sunlight hits the top of the Earth's atmosphere and  
24 reacts strongly with individual atoms separating the  
25 negatively-charged electrons from the positive ions.

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1           As shown here, the ionosphere might seem to  
2 be a calm, placid medium. And, indeed, that's really  
3 what it looks like over the Lower 48, but here in  
4 Alaska the ionosphere doesn't look like this. It's  
5 very turbulent. It contains regions of strong electric  
6 currents. They are known as electrojets, and they  
7 experience bombardment by high energy charged particles  
8 from the sun.

9           Those tiny little energy particles come in  
10 and create the aurora here in the bottom of the  
11 ionosphere. The ionosphere is important because it  
12 affects the radio waves which pass through it or are  
13 reflected from it. Some of you here may have  
14 experienced communication difficulties when the aurora  
15 is active, so you perhaps know first hand about some of  
16 those effects.

17           The ionosphere also influences surveillance  
18 radar, like this over-the-horizon backscatter radar  
19 which causes the ionosphere to reflect from it. And  
20 occasionally, satellite-to-ground radio links going  
21 through the atmosphere experience blackouts. Things  
22 like this happened during Desert Storm. So, the more  
23 we know about how this medium -- what it's like and how  
24 it's formed, the better we can design radio systems to  
25 make use of it.

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1           Studying the ionosphere is not a new  
2 science. Over the last 30 or 40 years, there have been  
3 a number of facilities built all over the world to  
4 study it. And this map shows locations of the  
5 existing -- the presently existing ionospheric research  
6 facilities. They deal with data on a whole variety of  
7 topics, including the detection of the solar wind which  
8 is an outflow of particles from the sun.

9           We've done detailed mapping of the aurora,  
10 and we've discovered the auroral electrojets and how  
11 these electrojets create gravity waves which are just  
12 like waves on the ocean except they occur up high in  
13 the air instead of on the surface of the water.

14           This is a picture of a facility known as  
15 Tromso in northern Norway. It currently is the most  
16 advanced ionospheric research facility in the world.  
17 It's built in a valley, as you can see. It can  
18 generate up to 1.2 million watts of radio energy which  
19 is concentrated by a big antenna array with a narrow  
20 radio beam which is pointed upwards and can send energy  
21 up into the ionosphere. These antennas are held on top  
22 of 50-foot high wooden poles. You can see in this  
23 picture.

24           Thirty miles outside Fairbanks in this area  
25 here is a circular array of eight transmitting antennas

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1 fed by up to 1.6 million watts of RF energy, the  
2 transmit ability. This station is called HIPAS which  
3 stands for High-Powered Auroral Stimulation. It's the  
4 only U.S. facility at the moment which studies the  
5 arctic ionosphere. Although it's comparable in  
6 transmitter power to Tromso, it doesn't have the large  
7 array needed to concentrate the energy into a powerful  
8 radio beam. That is what's critical to state-of-the-  
9 art studies of ionospheric phenomena.

10 This diagram compares the capabilities of  
11 existing ionospheric facilities. In green, these are  
12 the existing ones. This is what's proposed for HAARP.  
13 Incidentally, HF which are these frequencies between 1  
14 and 15 MHz mean these are between the AM broadcast band  
15 which is about a half a MHz to 1.5 right down in here,  
16 and the FM broadcast band which is up here in 88 to 108  
17 MHz.

18 If HAARP is constructed, the U.S. capability  
19 would go from here where HIPAS is up to here. Its  
20 radio beam would be more intense and could operate --  
21 more intense than anything now existing and would  
22 operate over a frequency range essentially greater than  
23 any existing station.

24 Importantly being located here in Alaska, it  
25 will be able to study the arctic ionosphere. As now

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1 planned, the HAARP antenna array, which we call the  
2 Ionospheric Research Instrument, would occupy an area  
3 of a 1000 feet by about 1300 feet which is about 30  
4 acres. It would have 180 crossed dipole antennas, each  
5 about 70 feet high. We would not fill this entire area  
6 with gravel, but we would lay narrow gravel roads along  
7 which we would place the 12-by-15 array of antennas.

8               This facility would generate from the power  
9 plant up to 3.6 million watts of radio energy which is  
10 about three times the power of Tromso which then is  
11 concentrated by this antenna array through a very, very  
12 narrow beam pointed upwards. It would be steerable  
13 within a cone, plus or minus 30 degrees vertically. By  
14 design, it would not be able to point in a horizontal  
15 direction; only in the vertical.

16              Now, when that beam reaches the ionosphere,  
17 it creates localized changes right in the vicinity of  
18 the beam. And to observe and study those changes, we  
19 plan to install around this instrument a number of  
20 scientific data gathering instruments. Incidentally,  
21 many of these would have uses even when this beam is  
22 not turned on.

23              The primary data gathering instrument is  
24 called an incoherent scatter radar. These radars  
25 generally operate at frequencies of several hundred MHz

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1 or even higher. They produce very narrow diagnostic  
2 beams which can sense the structure and motion of  
3 natural ionospheric turbulence. They can sense the  
4 electrojets and localized changes produced by our  
5 narrow beam.

6 This is a picture of a radar that was used  
7 for many years at Chatanika. Another antenna sometimes  
8 used and doesn't look like this is called a phased  
9 array antenna. Which antenna we are going to use our  
10 program has not yet been decided.

11 Another important data-gathering instrument  
12 is called a vertical incidence sounder. This is a  
13 picture of one. It uses a 40-foot pole and supports a  
14 horizontal antenna that transmits a very broad beam  
15 upwards and senses the charge distribution over a large  
16 area. The beam that's sent up is reflected back, and  
17 it is sensed by receiving antennas, two of which are  
18 located here. This instrument is commonly used all  
19 over the world. There's one near College.

20 This is a LIDAR which emits visible light  
21 instead of radio waves. It can measure such properties  
22 as air density, temperature. In this particular  
23 picture which is operating in Alaska in the aurora  
24 sensing the atmospheric chemistry changes associated  
25 with that aurora. We also plan to have both optical

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1 and infrared cameras which will photograph the aurora  
2 and sense ionospheric emissions.

3 After our boss, the director of Defense  
4 Research and Engineering instructed Navy and Air Force  
5 to begin this program, we started searching for a  
6 suitable site, preferably to be on Department of  
7 Defense owned land.

8 To meet the scientific objectives of this  
9 program, a latitude band from 61 degrees to 65 -- is  
10 that visible to everybody. Within this band, it is  
11 well known that auroras occur frequently. Based on  
12 being accessible from roads which are open year round,  
13 two sites chosen as suitable is one at Clear Air Force  
14 Station near Anderson. The other is the old over-the-  
15 horizon backscatter site at Gakona here in Glenallen.

16 These two sites, plus the possibility of not  
17 doing this thing at all, not building this, have been  
18 considered in the draft environmental impact statement  
19 which many of you have received. These options that  
20 I'm going -- that are discussed in this are called the  
21 Clear alternative, that is, build a site here in Clear;  
22 the Gakona alternative, build it at the over-the-  
23 horizon-radar backscatter site; or no action  
24 alternative, don't build it.

25 If we choose -- if Clear is chosen, parts of

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1 the facility will be built within the existing  
2 boundaries of Clear Air Force Station. One possible  
3 location for this large transmitting array is right  
4 here, just before the gate. Another location is for an  
5 optical RF infrared and magnetometer which would be  
6 here and then the LIDAR, the atmospheric chemistry  
7 instrument, would possibly be put up here.

8           There is a problem with interference between  
9 the existing early warning radars in this position and  
10 our primary diagnostic instrument which is the  
11 incoherent scatter radar. They operate on about the  
12 same frequency. So, for electromagnetic compatibility,  
13 we have to get these off of this site. So, we've  
14 identified a site down here at Bear Creek.

15           The reason it's down there, first of all, we  
16 can get a good distance between these two. And  
17 secondly, the line of sight between that and this  
18 location passes over a ridge at this point. I have a  
19 picture of that ridge taken from that site. There's  
20 that ridge.

21           That ridge is a very effective barrier for  
22 electromagnetic waves of the frequencies used on those  
23 radars. That's why we're proposing to put the  
24 incoherent scatter radar at that location. If Clear is  
25 selected, we would be relying on the support of -- go

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1 back.

2           If Clear is selected, we would be relying on  
3 the support of Clear Air Force Station. There are two  
4 options for the supply of electrical power. Clear has  
5 a coal-fired steam turbine plant with excess capacity  
6 or there's a high-voltage transmission line running  
7 nearby belonging to Golden Valley Electric. A choice  
8 between these two would be made, if the choice is to go  
9 to Clear after the decision is made in August.

10           We believe HAARP could offer only a modest  
11 enhancement of the economic base of this community.  
12 The contractor would be hiring qualified local  
13 residents. And after the facility becomes operational,  
14 we would expect to employ from four to eight permanent  
15 site personnel performing site maintenance and  
16 security.

17           The use of this by the scientists would  
18 occur four or five times each year in which the local  
19 economy would expect to host perhaps a dozen or so  
20 scientists, many of international reputation, supplying  
21 food, lodging, other necessities for campaigns lasting  
22 two to three weeks.

23           This map shows the proposed layout of the  
24 Gakona alternative at the now idle OTH-B site. The  
25 entrance to the site is off a highway to the right and

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1 passes an existing shell of a building. There's a  
2 gravel road that extends in this direction about a mile  
3 to this point where it ends.

4 They propose to put the transmitting array  
5 in this position which in this particular site  
6 minimizes the filling of wetlands. Other places that  
7 we would put our instruments is perhaps the back  
8 scatter radar here and the LIDAR. You have to build  
9 access roads in here and put the (inaudible) in the  
10 opposite. These lines are a mile apart in both  
11 directions.

12 The OTH building was to contain a steam  
13 turbine and back-up diesel generators. If this site is  
14 selected, we plan to finish installing the six diesel  
15 generators that were to go in that building and  
16 complete an operations center for the facility inside.

17 We would bring in commercial power for  
18 housekeeping and operations of the supporting  
19 equipment. Those diesels would be used only during  
20 campaigns to power the high-powered transmitters. Any  
21 site personnel would be working primarily inside this  
22 building.

23 Just as in the case of Anderson, we believe  
24 that this program can offer only a modest enhancement  
25 of the economic base of the Glennallen-Gakona area.

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1 All five local residents would be hired, as here,  
2 during construction. And during the operation part of  
3 this, we again foresee the need for permanent site  
4 personnel for security and maintenance.

5 The same campaign scenario we observed here.  
6 Four or five times a year, scientists would come in and  
7 perform a two- or three-week campaign and then leave.  
8 If the decision be made in August is to go here at  
9 Clear or if the decision is that we won't build it at  
10 all then the Government has to tear that building down,  
11 has to reclaim the gravel road and do all other  
12 reclamation activities at that site.

13 This activity was agreed to by the  
14 Government when the OTH-B backscatter program was  
15 terminated, if we couldn't find another use for this  
16 site.

17 This is the schedule for the environmental  
18 assessment process that we're going through right now.  
19 Although it officially began in May of 1992, we started  
20 work as soon as funds were voted in 1990. The public  
21 scoping meetings on that proposed facility were held  
22 last year in Glennallen and in Anchorage.

23 You received -- many of you received the  
24 draft environmental impact statement last month. And  
25 public hearings are right now. The public comment

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1 period is from now until the 25th of this month.

2 The final environmental impact statement,  
3 which will address any concerns raised by you folks  
4 here tonight or received by us to the mailing address  
5 in this document by the 25th of April, will be  
6 addressed. That document is due to be published in  
7 June. And the record of decision which is a selection  
8 of one of the three alternatives is due in August.

9 If the decision is to build the ionospheric  
10 research facility at Gakona, construction could begin  
11 as early as spring of 1995 and be completed in late  
12 1997. If the decision is to build the facility at  
13 Clear or is the no-action alternative, we would almost  
14 immediately begin the reclamation activity at Gakona.

15 We are well aware that associated with these  
16 three alternatives there are areas of environmental  
17 concern. I would now like to introduce you now to  
18 Dr. Stephen Petron, who will give you an overview of  
19 the environmental analyses connected for these three  
20 alternatives.

21 DR. PETRON: My name is Steve Petron. Thank  
22 you, John. My name is Steve Petron, and one of my jobs  
23 on this project is to oversee the preparation of the  
24 environmental impact statement process. That includes  
25 the draft environmental impact statement which we have

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1 prepared and is available for your comments.

2 If you haven't received one, we brought a  
3 few extras here and you can pick one up. If we run  
4 out, let us know and we'll be sure to send you one as  
5 quickly as we possibly can.

6 The draft environmental impact statement has  
7 as its primary purpose to be sure that all the  
8 environmental impacts that might be associated with an  
9 action are fully disclosed to both the decisionmaker  
10 and also the general public. And the decisionmaker  
11 will take that information in that environmental impact  
12 statement.

13 It will take information it receives from  
14 comment from the general public like you folks may  
15 give us tonight, and then it also -- the decisionmaker  
16 will look at the program and make the decision to  
17 either built the program at either Clear Air Force  
18 Station, build the program at the Gakona site or take  
19 no action and not build the program at all.

20 In case you haven't had a chance to read  
21 this environmental impact statement, this impact  
22 statement has four primary sections. The first section  
23 is called the purpose and need for action. That's  
24 essentially where the government tells you why they  
25 think we should build this project or why they want to

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1 go forward with this project.

2           The second section is called the description  
3 of proposed action and alternatives. This is where the  
4 government describes to the people what it means by the  
5 alternatives to the project, what it's proposing to do  
6 and what are the alternatives on this project. One of  
7 those alternatives is the no-action alternative.

8           The third section is called the affected  
9 environment. This section was completed for each of  
10 the categories of different environmental aspects.  
11 This represents the base line of the status quo before  
12 project is built.

13           The fourth section is environmental  
14 consequences. This is the analysis of what we feel the  
15 impacts would be of the project. The consequences were  
16 evaluated for the 18 environmental categories. These  
17 18 environmental categories were selected based on  
18 comments we received during scoping but also from our  
19 professional judgment and experience.

20           What we'll be doing is in the environmental  
21 consequences, it concludes with a comparison of the  
22 consequence. It looks at the various impacts  
23 associated with each of the alternatives.

24           This chart -- it's a confusing chart, but I  
25 tried to squeeze probably a little bit too much

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1 information on it. I'm just going to go through it for  
2 a minute. As you know, impacts can be good or bad,  
3 positive or negative. Impacts in a NEPA sense can be  
4 nonsignificant or significant. They can also be  
5 negligible or no impact.

6 I tried to represent that on this chart so  
7 people can easily see how the Clear alternative is  
8 compared to the Gakona alternative as compared to the  
9 no-action alternative. On this chart, an "N" refers to  
10 a nonsignificant impact. A negative sign means that  
11 impact would be negative. An "S" means we feel there  
12 would be a significant impact, and a zero means that we  
13 feel it would be negligible or no impact. A plus sign  
14 means that we felt that impact would be positive.

15 Generally speaking, most of the impacts for  
16 either alternatives, we felt, would be nonsignificant,  
17 albeit, negative. I'm not going to go through every  
18 category, but what I plan to do is highlight where we  
19 felt the most important impacts are so that I can make  
20 sure that you all know where we feel the most impacts  
21 would be on you. If you do want me to pick one out and  
22 talk about one that I do skip over, just ask me during  
23 the comments session, and I'll certainly go through our  
24 reasoning on it.

25 First of all, we felt there would be a

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1 significant impact to vegetation wetlands if we were to  
2 select the Clear Air Force Station site. Our reasoning  
3 is primarily based on the fact that we would be filling  
4 about 36 acres of wetlands at what we have called the  
5 Bear Creek location which Mr. Heckscher showed you  
6 previously. These wetlands would be primarily shrub  
7 wetlands which have fairly high value to wildlife.

8 At the Gakona site, we would also fill some  
9 wetlands, but much less. Those wetlands would be black  
10 spruce wetlands.

11 We also feel there would be a potential for  
12 a significant impact to air quality if we choose to go  
13 to the Gakona site. This is associated with our  
14 planned use of six diesel fuel generators to power this  
15 facility.

16 We really don't believe we would end up  
17 having a significant impact because, first of all, as  
18 mentioned, the research is done in campaigns. The  
19 generators would only be run intermittently. Second of  
20 all, we would have to abide by the Clean Air Act which  
21 will require us to make sure we don't have a  
22 significant impact to air quality. However, we are  
23 including it as a potential impact to make sure that  
24 people know that we are aware of the type of equipment  
25 we're proposing to you and its potential impacts.

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1           We feel we have a potential for a  
2   significant impact, either cultural or archeological  
3   resources, if we were to go to the Clear Air Force  
4   Station site. This is based on the fact that we're  
5   well aware that the region surrounding Clear Air Force  
6   Station, including the station itself and also  
7   including Bear Creek, has a high density of culture and  
8   archeological sites.

9           Obviously, if we do come to this site, we  
10   would be sure to do a cultural resources survey. We  
11   would also coordinate with the local Native American  
12   groups. And also, we would obviously coordinate with  
13   the State historic preservation officer and make sure  
14   we're in full compliance with the National Historic  
15   Preservation Act which governs effects on these types  
16   of sites.

17           I want to just point out because it's  
18   probably worth pointing out that we feel that we have a  
19   slight positive impact to socioeconomics which is the  
20   local economy. However, we do feel it would be a  
21   nonsignificant impact, or, in other words, not a great  
22   impact.

23           This is a list of the remaining categories  
24   that we evaluated. And as you can see, we felt that  
25   there is a potential for a significant impact to both

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1 recreation and aesthetics if we were to go to the Clear  
2 Air Force Station for this facility. And that is  
3 linked exclusively with our proposed placement of the  
4 incoherent scatter radar, the diagnostic at the Bear  
5 Creek location.

6 As you all probably know, that area right  
7 there is highly visible to the road. It's highly  
8 visible to the stream. It's also highly visible to the  
9 train tracks. It's also -- on the south southern end  
10 of it, there is a proposed campground by the State.  
11 So, we do recognize the potential for that impact at  
12 that area.

13 Finally, we feel we have a potential for a  
14 significant impact from radio frequency interference.  
15 This is independent of which site we choose. It would  
16 be a similar situation at either site, Clear or  
17 Gakona. This was brought up in scoping.

18 Recognizing that, we've laid out in our EIS  
19 a fairly thorough mitigation approach in a manner in  
20 which we feel we can minimize any impacts. We're going  
21 to plan to work with the local people, the local  
22 community, on this issue to work and make sure that we  
23 are a good neighbor on this project.

24 I encourage you to look through that  
25 section, if you are interested in that, and give us any

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1 comments you might have on the mitigation approach that  
2 we've proposed. We are well aware of the importance of  
3 communication and radio communication, particularly in  
4 these areas. We're very sensitive to it. We will  
5 work -- do our best to work with everybody.

6 In general, the impacts from constructing  
7 this project at either site are generally going to be  
8 nonsignificant negative impacts. I pointed out a few  
9 significant impacts which would be negative. The only  
10 positive impacts we expect would be to the local  
11 economy. However, that excludes the fact of the  
12 no-action alternative which has a number of positive  
13 impacts, albeit they are quite slight. And most of  
14 these are to the biotic environment. That's from the  
15 reclamation.

16 Once again, I want to encourage you to give  
17 us the comments. That's why we're here. We want your  
18 comments so that the decisionmaker, when they are  
19 trying to evaluate whether to go forward with this  
20 project, can have your thoughts, also. With that, I'll  
21 finish my presentation and I'll turn the meeting back  
22 over to Colonel Thompson. Thank you very much.

23 COLONEL THOMPSON: Thank you, Steve. Ladies  
24 and gentlemen, I'm going to let you take about a  
25 ten-minute break. I think the best course for us will

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1 be perhaps to try to set up a mike so that those of you  
2 who want to talk will have a mike available. We can  
3 make sure that everybody can hear everyone that wants  
4 to talk.

5 So, if you would, please, go ahead and feel  
6 free to take about 10 minutes. We'll let you know when  
7 we're ready. If you haven't already filled out an  
8 attendance sheet, please do that. If you want to make  
9 a statement, indicate that by checking the block on the  
10 attendance sheet that you do want to make a statement.  
11 I'm going to collect those, and I'll use the sheets to  
12 call on you when we reconvene. Thanks.

13 (BRIEF RECESS.)

14 COLONEL THOMPSON: If I could have your  
15 attention please, ladies and gentlemen. I'd like to  
16 move into the second phase of the hearing tonight. I  
17 do want to stress to you that this is an important  
18 phase of the hearing. It's at least as important as  
19 what you've heard already.

20 As I indicated when we began, part of the  
21 process is for us to hear from you because you are the  
22 residents in the local area. You are likely to know a  
23 lot more about the effects of this proposed project if  
24 it comes to Clear, and we do want to know what those  
25 effects would be. We want to put those effects on the

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1 record and to be able to take them into consideration  
2 when the decision is made with regard to this  
3 particular project.

4 A couple of things that I would ask of you,  
5 those of you who do decide to make a statement --  
6 first, please use the microphone, I think that we've  
7 already seen that it may be a little bit difficult to  
8 hear. I've moved the microphone out there. So, if you  
9 would come up to the mike and adjust it to a level  
10 that's comfortable to you and try to speak to it. You  
11 might try to talk to me rather than trying to talk to  
12 the audience. If you do that, then I think it will be  
13 picked up by the microphone.

14 I'll ask you, if you would, to try to limit  
15 your comments if you would. I think we'll have plenty  
16 of time for anybody to comment who wants to comment,  
17 but if you could start with the idea of talking for  
18 about five minutes or less, that would be helpful in  
19 ensuring that everybody has a chance to talk and that  
20 we're not here beyond the length of time that we're  
21 allowed to stay in the room.

22 First, I'll recognize Mr. Larry W.  
23 Flanagan. Mr. Flanagan.

24 MR. FLANAGAN: I just wondered if you could  
25 describe the type of signal this station would be

4.14-24  
p. 12-69  
↓

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1 putting out and would there be any times promulgated  
2 when they'll be doing it. Is it going to be done full  
3 time?

2.3-6  
p. 12-12

4 MR. HECKSCHER: The plan is to have  
5 campaigns four or five times a year of approximately  
6 two to three weeks duration. During those two or three  
7 weeks duration, you can expect fairly continuous use of  
8 all the equipment. The modulations could be continuous  
9 wave, amplitude modulation, pulse modulations.

10 We are building into this a very high  
11 capability for allowing the scientists to do any types  
12 of research that they wish. So, we are building in a  
13 lot of flexibility into this system.

14 MR. FLANAGAN: That means it would be  
15 constant on the air for two or three weeks at a run?

2.3-7  
p. 12-12

16 MR. HECKSCHER: Not likely. But if the  
17 aurora experiment --

18 MR. FLANAGAN: What duration? A guess.

2.3-8  
p. 12-12

19 MR. HECKSCHER: Like 24 hours?

20 MR. FLANAGAN: And then the next day or the  
21 day after or what?

22 MR. HECKSCHER: That's correct, sir, yes.

23 MR. FLANAGAN: Every other day. You mean 24  
24 hours a day for three weeks?

25 MR. HECKSCHER: Not likely.

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1                   MR. FLANAGAN: What is likely? That's what  
2 I'm trying to find out.

3                   MR. HECKSCHER: Well, I'm not a ionospheric  
4 physicist.

5                   MR. FLANAGAN: I'm a ham operator. Night  
6 before last, evidently there was an official bulletin 4.14-25  
7 that was put out and it appeared on the Ham Teletype p. 12-69  
8 Network. The duration wasn't given. The type of  
9 signal wasn't given, and they mentioned a gigawatt of  
10 power. And also they said you'd be operating in the 4.14-26  
11 440 meg range and plus a couple of other bands; is that p. 12-68  
12 correct?

13                  MR. HECKSCHER: Yes, sir, there are  
14 instruments that will --

15                  MR. FLANAGAN: So, it's not going to be from 4.14-27  
16 the 2500 to the 15 meg range. It's going to be a lot p. 12-69  
17 higher.

18                  MR. HECKSCHER: The powerful instrument  
19 itself is from 2.8 to 10 MHz. A possible -- that's  
20 where it can operate. It won't operate all over that.  
21 It will be -- the frequency will be selected.

22                  MR. FLANAGAN: Would the periods of 2.3-9  
23 operation be during high aurora events? p. 12-12

24                  MR. HECKSCHER: The periods of operation are  
25 tending to be at night. We have optical instruments

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1 which don't work too well in the daytime. So, it's  
2 more towards the night than during the daytime,  
3 although there will be daytime experiments as well.

4 MR. FLANAGAN: But we get the aurora up here  
5 during the day anyhow. We know when it's there. Will  
6 these tests be tied in somehow or another with the  
7 Alaska emergency service so if there is an emergency  
8 you can shut down so we can communicate?

2.3-10  
p. 12-13

9 MR. HECKSCHER: Absolutely. If we are  
10 causing interference to people, we need to know that  
11 and we will shut down if that's the case.

4.14-28  
p. 12-69

12 MR. FLANAGAN: Then my last question will be  
13 the 300 megawatts you intended -- that would be your  
14 highest power output?

15 MR. HECKSCHER: Well, we have -- I'll  
16 describe it in a little detail. We have 360 ten  
17 kilowatt transmitters. That's a total of 3.6 million  
18 watts that would be applied to the antenna, but that  
19 antenna concentrates the energy into a narrow beam, and  
20 points it upward. The concentrated energy in that beam  
21 is equivalent to a much larger transmittor. It's the  
22 antenna gain, as you probably know.

23 MR. FLANAGAN: I do have one -- would you  
24 ever be operating in the microwave frequency ranges?

4.14-29  
p. 12-68

25 MR. HECKSCHER: Not with this instrument,

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1     sir.

2                   MR. FLANAGAN:  Thank you.

3                   COLONEL THOMPSON:  Next is Mr. William R.  
4     Miller, Jr.

5                   MR. MILLER:  I was interested in asking  
6     about the power which the gentleman already asked  
7     about.  My concern is how much splatter would you  
8     have?  For instance, when you radiate, you have side  
9     lobes off of some types of equipment.  That's what I'm  
10    interested in.

4.14-30  
p. 12-81

11                  MR. HECKSCHER:  The side lobes are very  
12    low.  The instrument is -- well, the transmitters  
13    themselves are being specially ordered to have very,  
14    very low spherous and harmonic emissions.  We're paying  
15    more for those transmitters than we would if we were to  
16    buy them off the shelf.  So, the frequency purity, the  
17    spectral purity, is very, very good.

18                  The antenna does have side lobes, yes.  You  
19    can adjust the side lobes depending on how you phase  
20    the various elements of the transmittor, of the array.  
21    It can go from as low as 13 DB down to 60 or 70 DB or  
22    more.  The low-angle side lobes are very low.

23                  MR. MILLER:  So, for instance, a quarter  
24    mile away, there would be no impact?

4.14-31  
p. 12-81

25                  MR. HECKSCHER:  A quarter mile away on the

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1 ground -- we have calculations of what the fields are  
2 at various distances on the ground. Some of them are  
3 in the book you have. There will be an exclusion fence  
4 at a distance which will prevent animals and people  
5 from getting any closer than the Federal standards  
6 allow.

7 MR. MILLER: What kind of transmission -- is  
8 it pulse or what?

4.14-32  
p. 12-68

9 MR. HECKSCHER: As I said to the other  
10 gentleman, we're building a lot of flexibility into  
11 this instrument. We're going to have the capability of  
12 pulse, AM modulation, FM modulation and continuous wave  
13 or no modulation.

14 MR. MILLER: All right. So, it's  
15 changeable.

16 MR. HECKSCHER: Depends on what the  
17 particular experiment that the particular scientists  
18 are doing would like to have.

19 MR. MILLER: Thank you.

20 COLONEL THOMPSON: Mary Beth Michaels.

21 MS. MICHAELS: I have a question. The first  
22 one is the Bear Creek site. This is generally mostly a  
23 residential and recreational area. I wondered if other  
24 sites were considered and looked at, and, if they were,  
25 why that one was chosen.

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1 DR. PETRON: We tried to place that  
2 diagnostic on the Air Force station. That was our  
3 first -- we could not get enough electromagnetic  
4 isolation from the beam used radar to ensure that they  
5 were both compatible with each other. So, we had to  
6 find a ridge to use as a shield between the two because  
7 that radar can only be so far apart.

8 So, essentially, we had a radius around the  
9 Air Force station that we could put this in. The Bear  
10 Creek location is the only spot that we found that  
11 provided a ridge of adequate size that would provide  
12 the electromagnetic shielding between the beam used and  
13 that location. So, that's why it's there.

14 MS. MICHAELS: Okay. My second question  
15 which you've partially answered already is the health  
16 effects of the radiation from the project.

4.13-9  
p. 12-61

17 DR. PETRON: We expect there would be no  
18 health effects either to people or to animals from this  
19 facility. We designed the facility, and we are putting  
20 an exclusion fence around it that will be placed at the  
21 distance required by the newly-implemented standards  
22 for radio frequency radiation.

23 MS. MICHAELS: Thank you.

24 COLONEL THOMPSON: Those are the only sheets  
25 that I've got that indicate that someone wants to make

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1 a statement. Is there anybody else who has not filled  
2 out a sheet that I haven't recognized? Anybody else  
3 who has changed his mind?

4 Mr. Miller, you wanted to say something  
5 else?

6 MR. MILLER: Yes. Initially, I was thinking  
7 when you said 3.6 million watts, I was -- I'm used to a  
8 pulse of energy, 3.6 million or something like that was  
9 no big thing, but then you said that it would be CW.  
10 If it was CW, does that mean it's going to be 3.6  
11 million watts continuous for hours and hours?

4.14-33  
p. 12-69

12 If that's the case, has this worked  
13 anywhere? Is there a model or station like this  
14 working anywhere in the world?

15 MR. HECKSCHER: There is a station somewhat  
16 like it which I showed a picture of in my briefing in  
17 northern Norway at a place called Tromso. It has 1.2  
18 million watts into an antenna approximately of this  
19 size. So, it has -- it can operate CW at 1.2 million  
20 watts.

21 MR. MILLER: Okay. What has been the  
22 experience of this 1.2 million watts operating on  
23 people's communications or electronics in their house?  
24 For instance, the equipment here puts out a pulse of  
25 something like that in that range, and it can interfere

4.14-34  
p. 12-65

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1 with your television or your radio at home on occasion  
2 if it's pointing at you.

3 So, I'm assuming that that much energy would  
4 have to have a heck of an impact. What has been the  
5 experience?

6 MR. HECKSCHER: Well, I am not aware of  
7 interference that the station at Tromso causes to the  
8 local communities in northern Norway. They have not  
9 reported interference. Now, I'm sure that just as they  
10 are sensitive to the local community, we are going to  
11 be sensitive to the local community as well.

12 We understand that if you live nearby, you'd  
13 still like to listen to your radio or watch your TV.  
14 That is why when we are purchasing this instrument, we  
15 are specifying the spectropurity built into the  
16 transmitter so that there will not be interference on  
17 frequencies other than the one we wish to transmit on.

18 Now, we will select those particular  
19 frequencies that don't interfere with other people's  
20 recreation and communications. We will lock out  
21 frequencies which have the possibility of doing that.  
22 Certainly, the emergency communications frequencies,  
23 the time distribution frequencies -- they are all be  
24 locked out. They will not be operated on.

25 MR. MILLER: Thank you.

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1 COLONEL THOMPSON: Do we have anyone else  
2 who would like to make a comment or ask a question?

3 MR. MAGGIO: I think you will be able to  
4 hear me. My name is Frank Maggio. I had a question  
5 concerning the communications. I live close to Bear  
6 Creek, and we use a radio phone to communicate. We  
7 don't have ground lines in the area. I don't know the  
8 frequency or what radio phones operate at. Is there a  
9 possibility that it would interfere with that radio  
10 communication?

4.14-35  
p. 12-89

11 MR. HECKSCHER: Yes. We would -- it would  
12 be helpful to us to know the frequency of that radio  
13 and the type of radio so that we could, if we happen to  
14 be operating on a frequency that might have a harmonic  
15 or subharmonic depending on what the frequency is of  
16 that, we would not operate on that. So, if you could  
17 supply us with the characteristics of the equipment, we  
18 will take that into consideration.

19 MR. MAGGIO: I guess some people use  
20 cellular phones in the area, too. I mean, would this  
21 interfere with the cellular phones?

4.14-36  
p. 12-89

22 MR. HECKSCHER: Well, I know that some  
23 cellular equipment has been looked at in this  
24 document. Is there someone that knows the details of  
25 that yesterday?

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1 DR. SNYDER: We did an analysis of the  
2 cellular telephone that would operate on the frequency  
3 band of 870 to 890 MHz. We found that there would be  
4 the potential for an impact. It's dependent upon the  
5 location relative to the MHz from HAARP. If you  
6 operate it behind a ridge, you are likely not to  
7 receive the interference that we predict here or worst  
8 case of being in line of sight and operating on the  
9 Parks Highway close to the facilities that we've  
10 analyzed.

11 DR. PETRON: That was Dr. Lee Snyder with  
12 the Mida (phonetic) Corporation. He's on our team.

13 MR. MAGGIO: Then I had the question about  
14 area restrictions. A lot of people have airplanes that  
15 they fly around. Would there be any overhead  
16 restrictions to anything that was flying by that Bear  
17 Creek site?

4.8-20  
p. 12-53

18 MR. HECKSCHER: It's possible. We are  
19 having on-going conversations with the FAA right now.  
20 I believe it will be some kind of determination between  
21 the FAA in Anchorage and Washington in discussions with  
22 us. You'll find out how we go about. There may be a  
23 restricted area. It may be NOTAM. I'm not sure what  
24 the final outcome will be. We are in conversation with  
25 the FAA on that issue.

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1           MR. MAGGIO: My final question is you  
2 mentioned that perhaps having a phased array equipment,  
3 utilizing it or having it at the site. You mentioned  
4 several different radar sites. There's a tentative  
5 proposal for installing the phased array equipment at  
6 Clear. If that were to come about, would any projects  
7 be coordinated with their efforts in the phased array  
8 equipment?

9           MR. HECKSCHER: Well, I don't know about  
10 what you speak. At the moment, there is no  
11 coordination, but if you have information on what that  
12 is, we would -- we'd like to hear it.

13           MR. MAGGIO: Just rumors. Okay. Thank you  
14 very much.

15           COLONEL THOMPSON: Anyone else? I do thank  
16 you for coming and for your interest in the project and  
17 your attending the meeting. Let me remind you that you  
18 can still use the comments sheets that were furnished  
19 to make any written comments or to ask any written  
20 questions that you would like to see answered in the  
21 final environmental impact statement.

22           If you didn't get one of the comment sheets  
23 already, please pick one up on the way out. Send it to  
24 the address that is shown on the comment sheet. Please  
25 also remember that the period for receiving those

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1    comments will close out on the 25th of April.    This  
2    hearing is adjourned.

3                    (PROCEEDINGS CONCLUDED AT 8:10 P.M.)

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## REPORTER'S CERTIFICATE

I, LISA G. ESLINGER, RPR-CM, hereby certify:

That I am a Registered Professional Reporter and Certificate of Merit writer for Midnight Sun Court Reporters and Notary Public for the State of Alaska; that the foregoing proceedings were written by me in computerized machine shorthand and thereafter transcribed under my direction; that the transcript constitutes a full, true and correct record of said proceedings taken on the date and time indicated therein;

Further, that I am a disinterested person to said action.

IN WITNESS WHEREOF, I have hereunto subscribed my hand and affixed my official seal this 20th day of April, 1993.

  
LISA G. ESLINGER, CM  
Registered Professional  
Reporter

My Commission Expires 7/3/96.

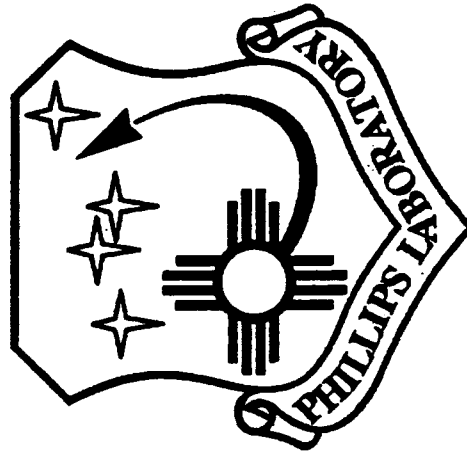
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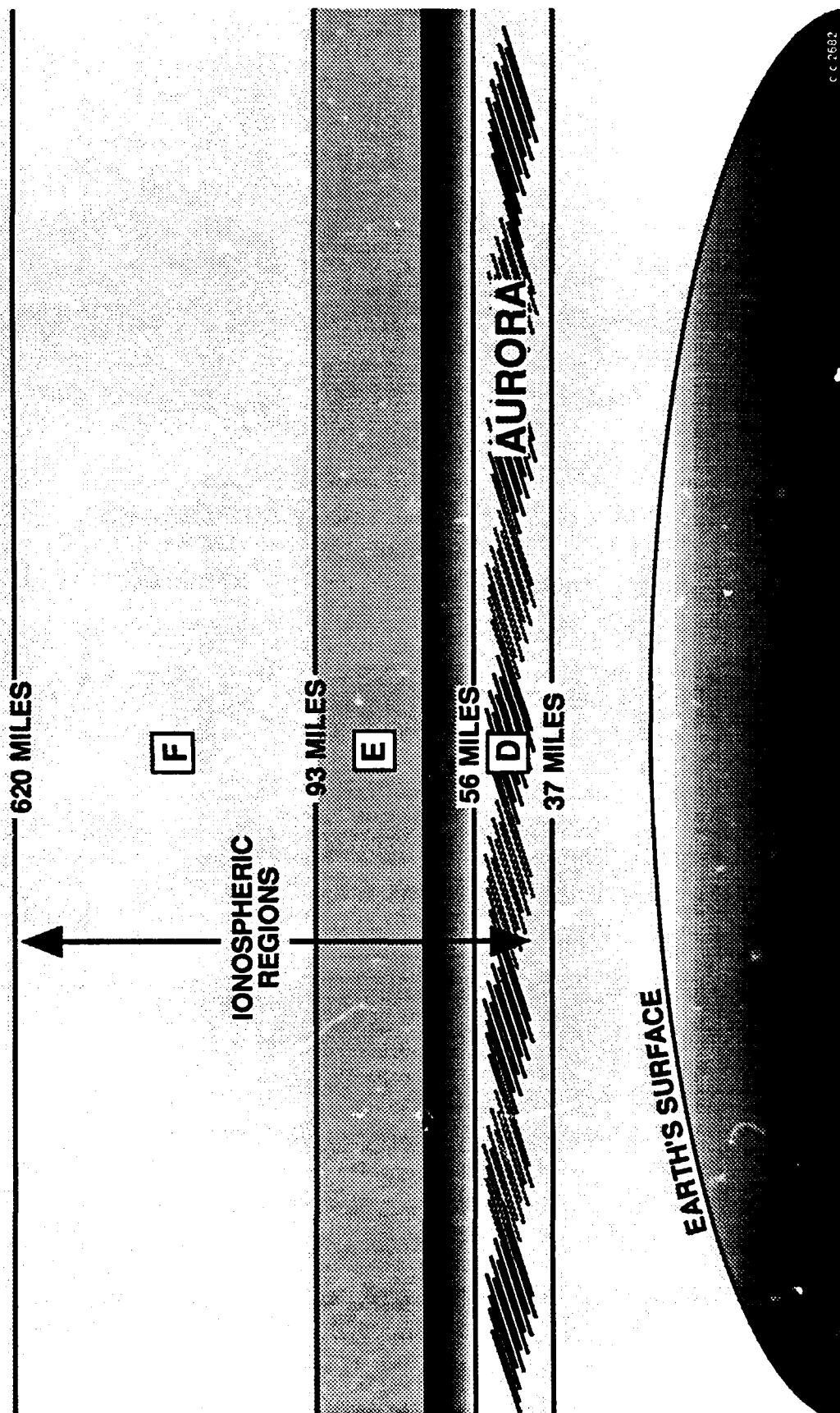
# HIGH FREQUENCY ACTIVE AURORAL RESEARCH PROGRAM (HAARP)

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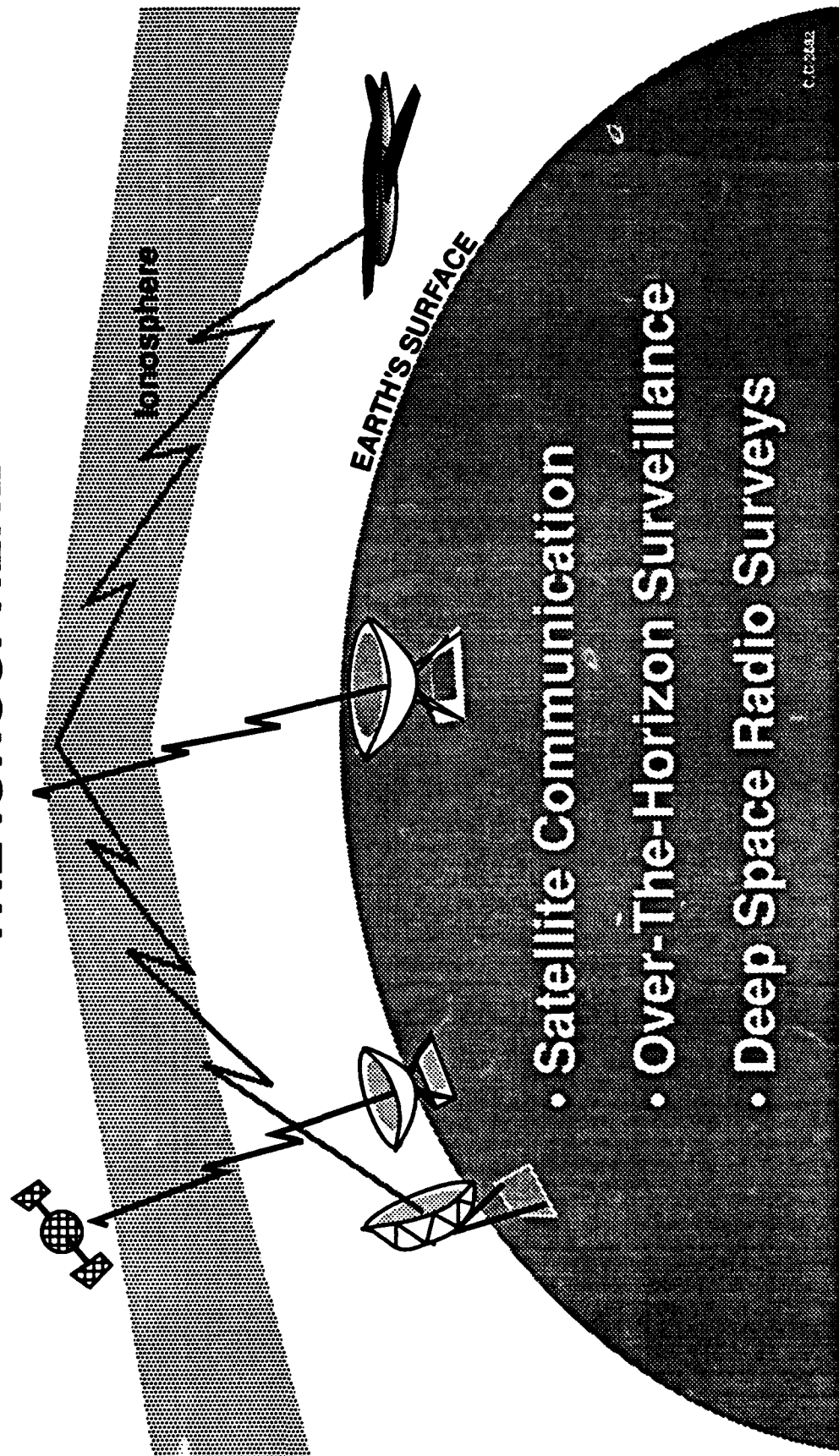
PROPOSED WORLD - CLASS FACILITY  
TO STUDY THE ARCTIC IONOSPHERE



# IONOSPHERE

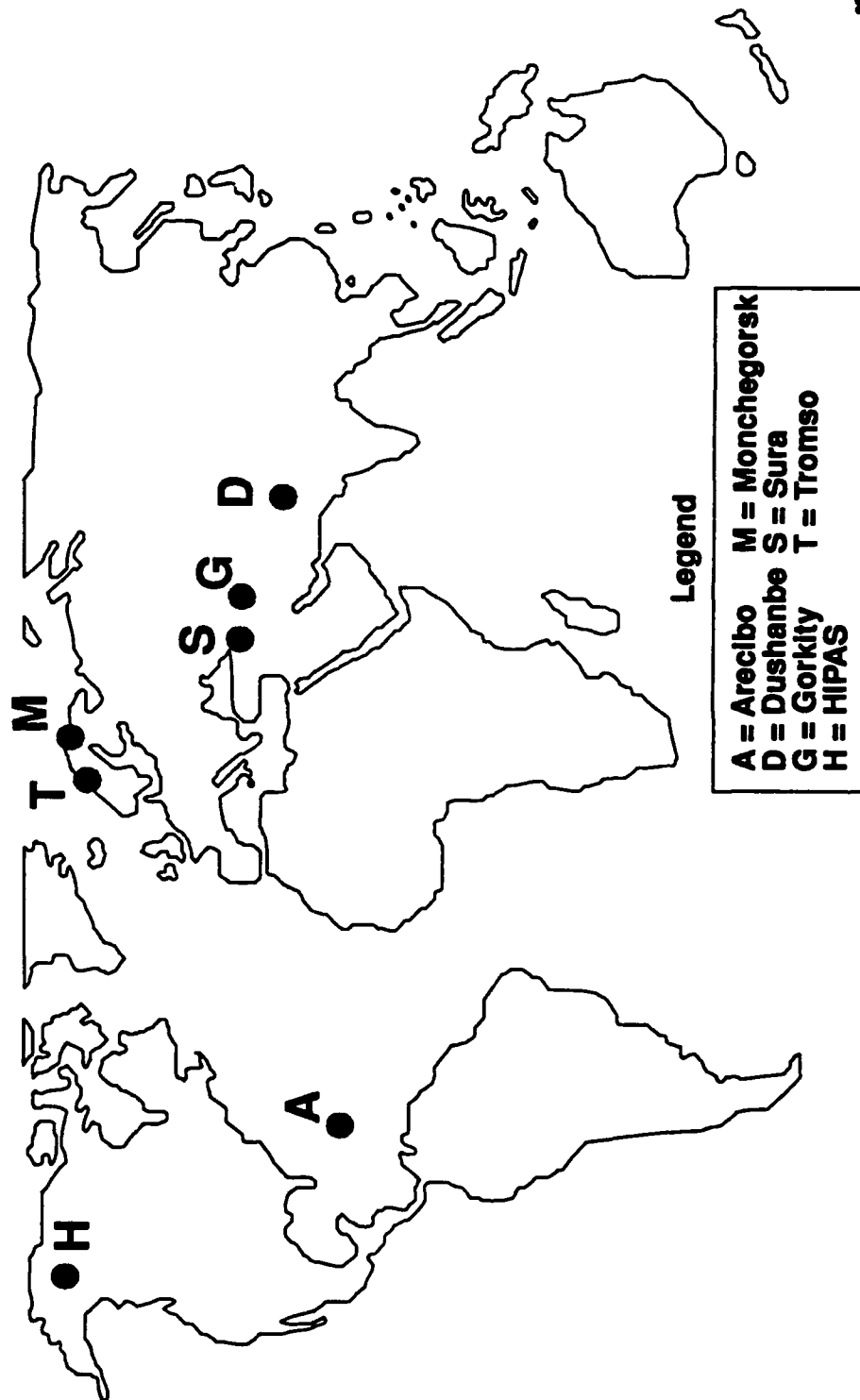


# SOME RADIO WAVE PATHS THROUGH THE IONOSPHERE

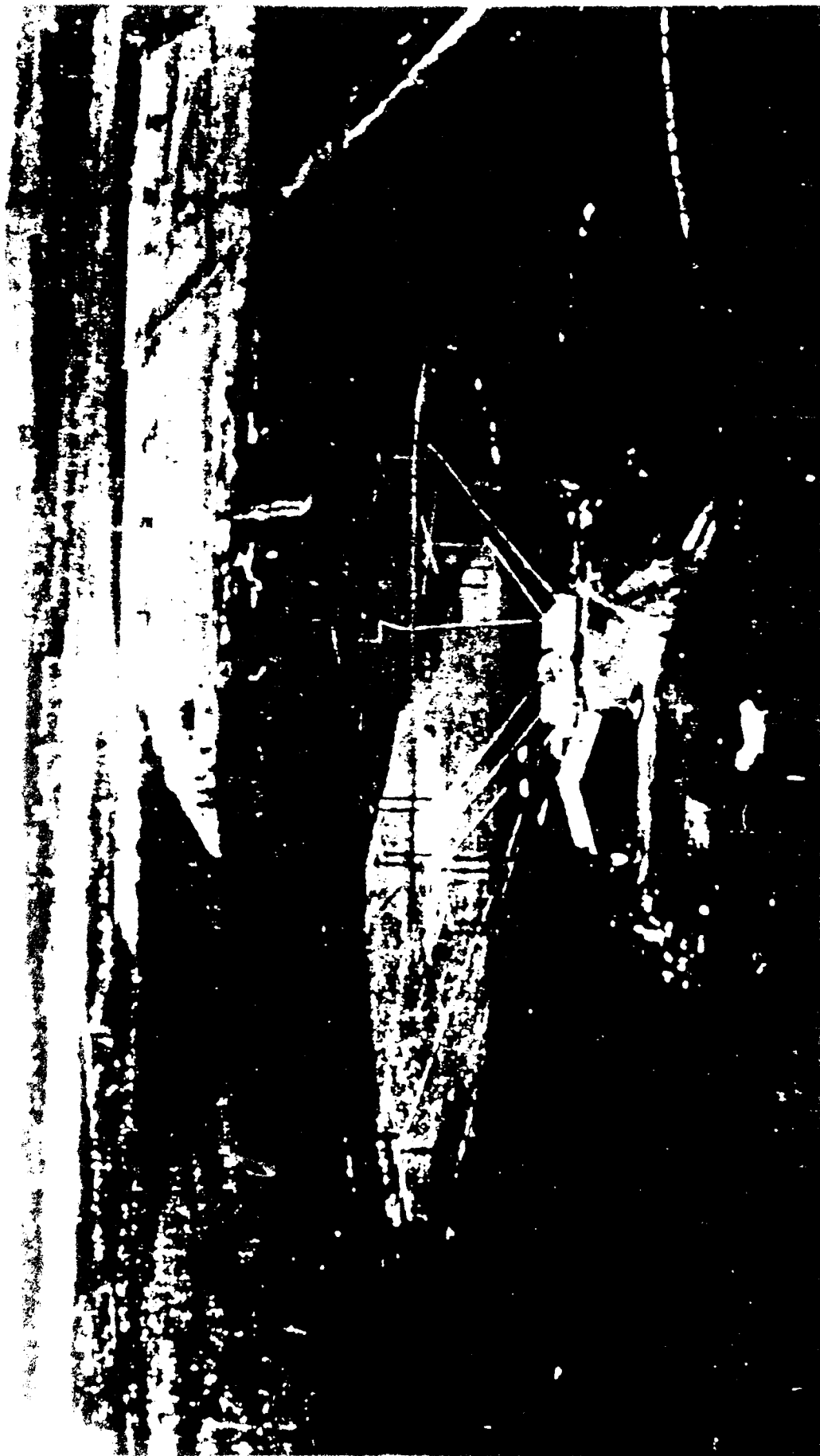


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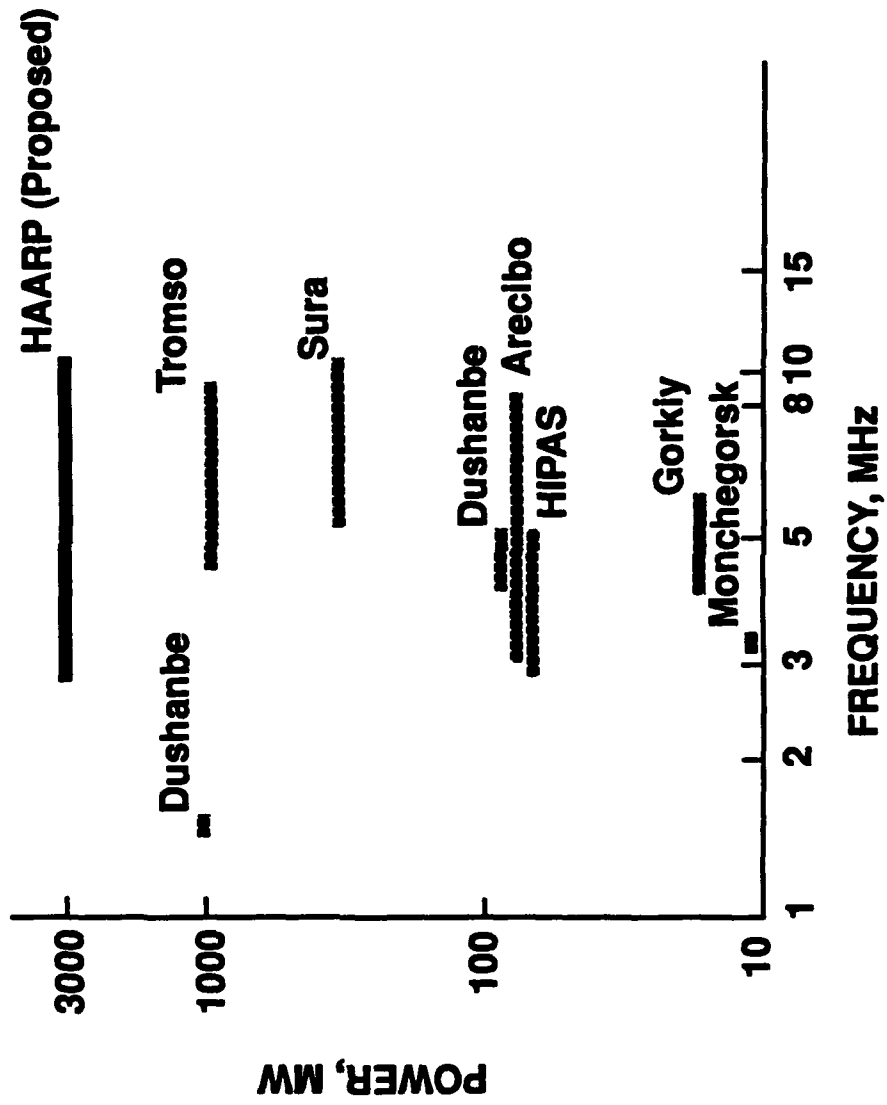
# WORLD-WIDE IONOSPHERIC RESEARCH FACILITIES





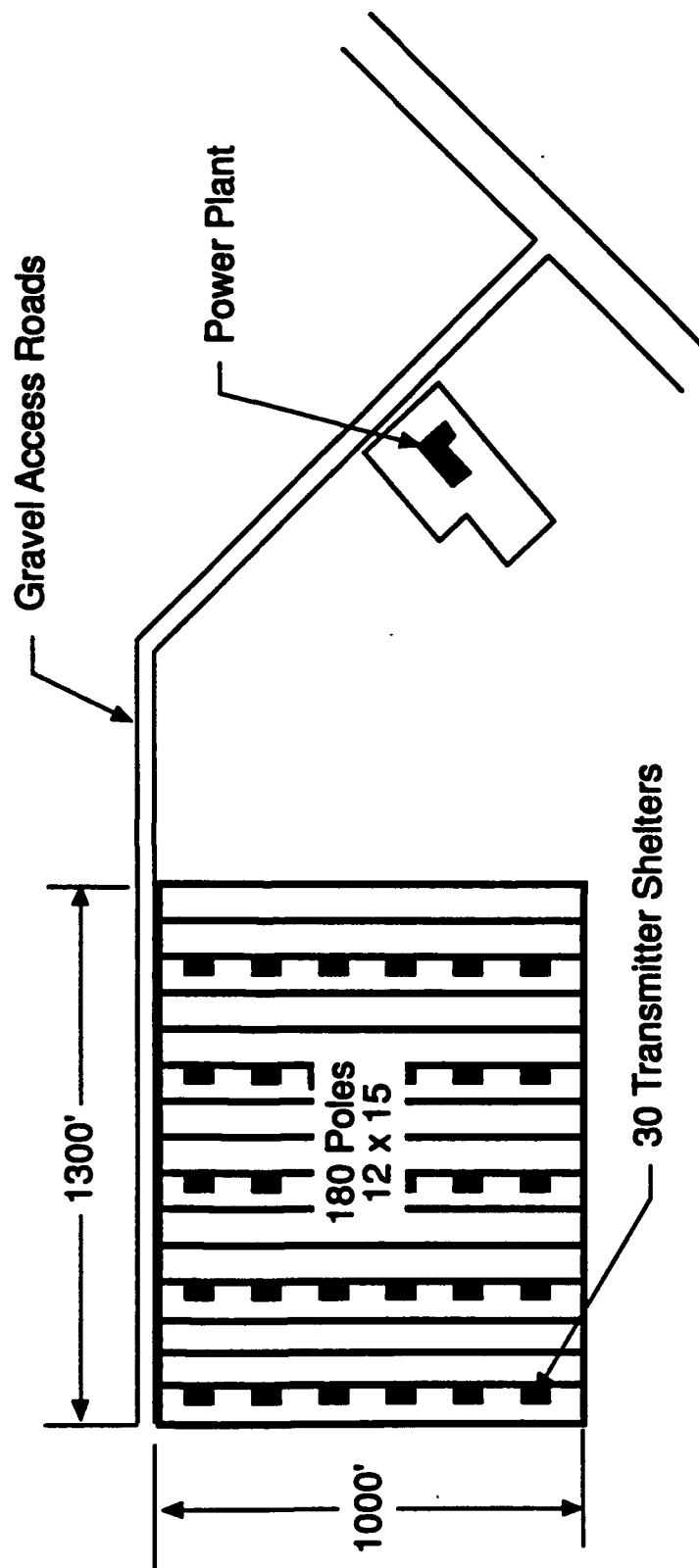


# HF IONOSPHERIC RESEARCH FACILITIES

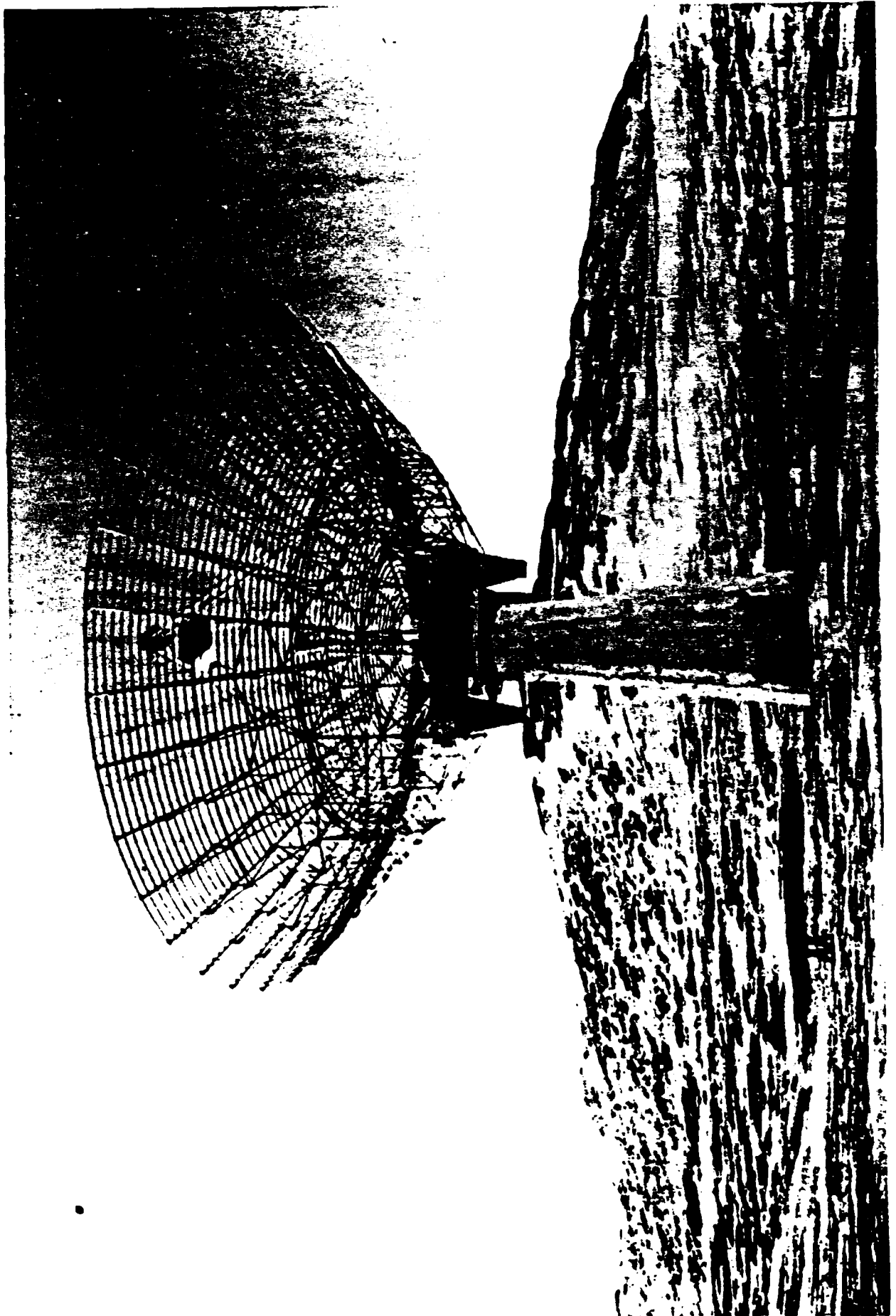




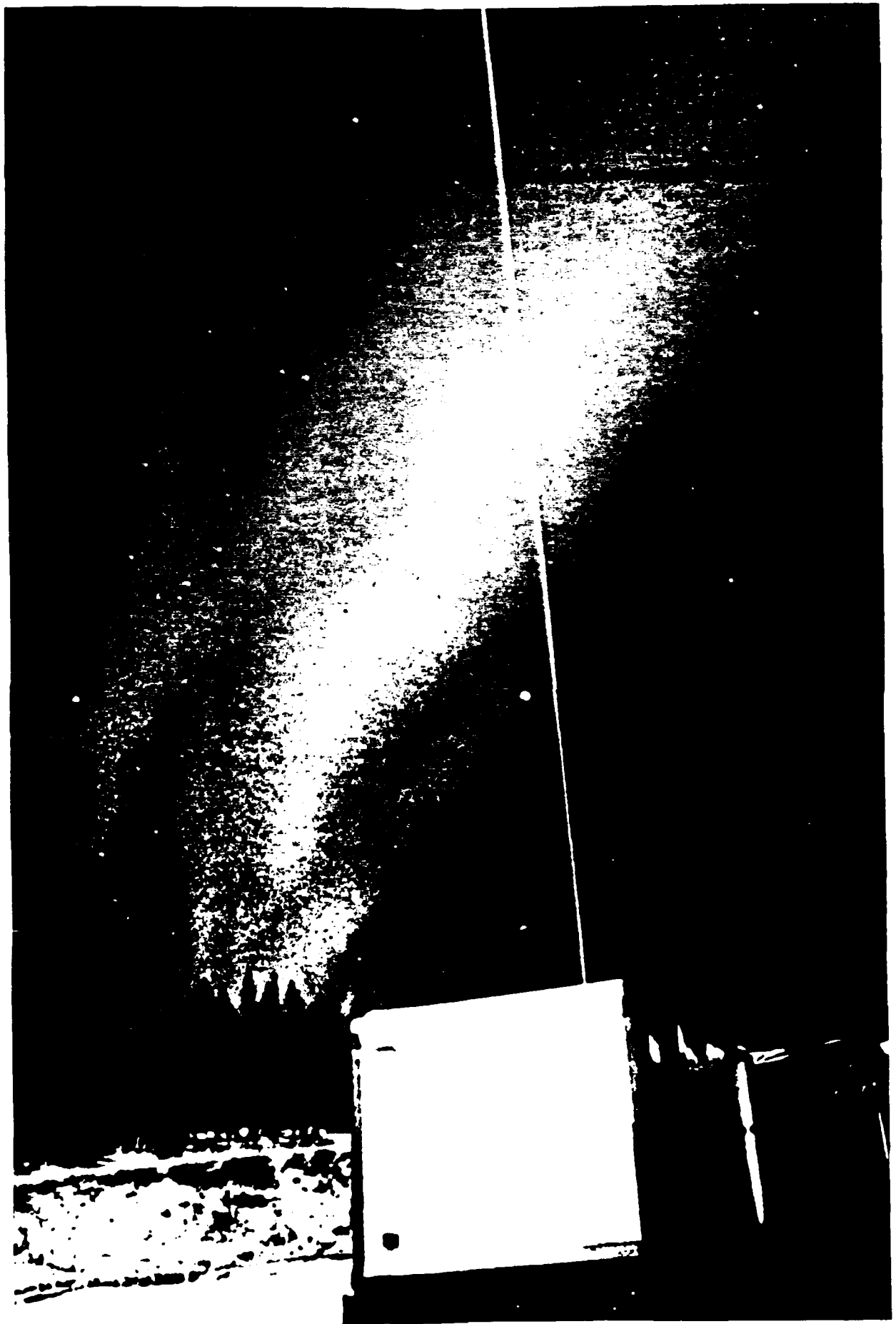
# IONOSPHERIC RESEARCH INSTRUMENT SITE LAYOUT CONCEPT



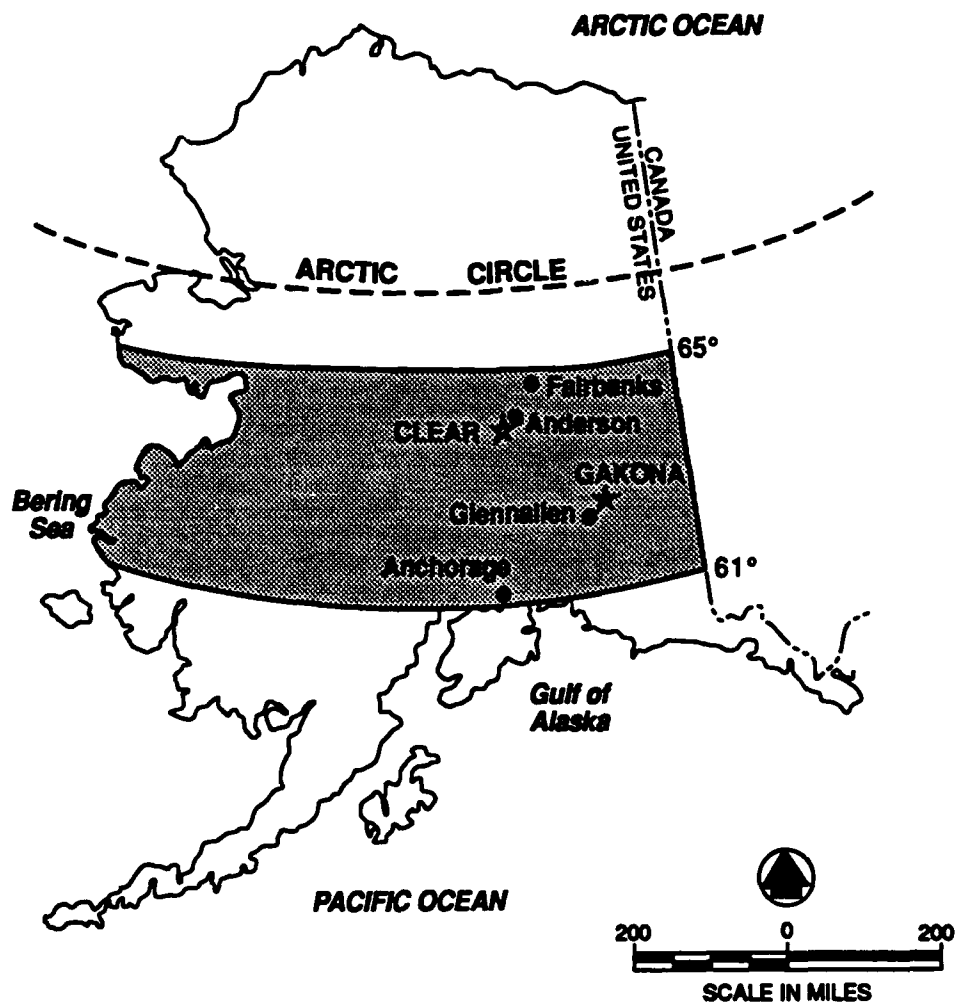
sheet 2



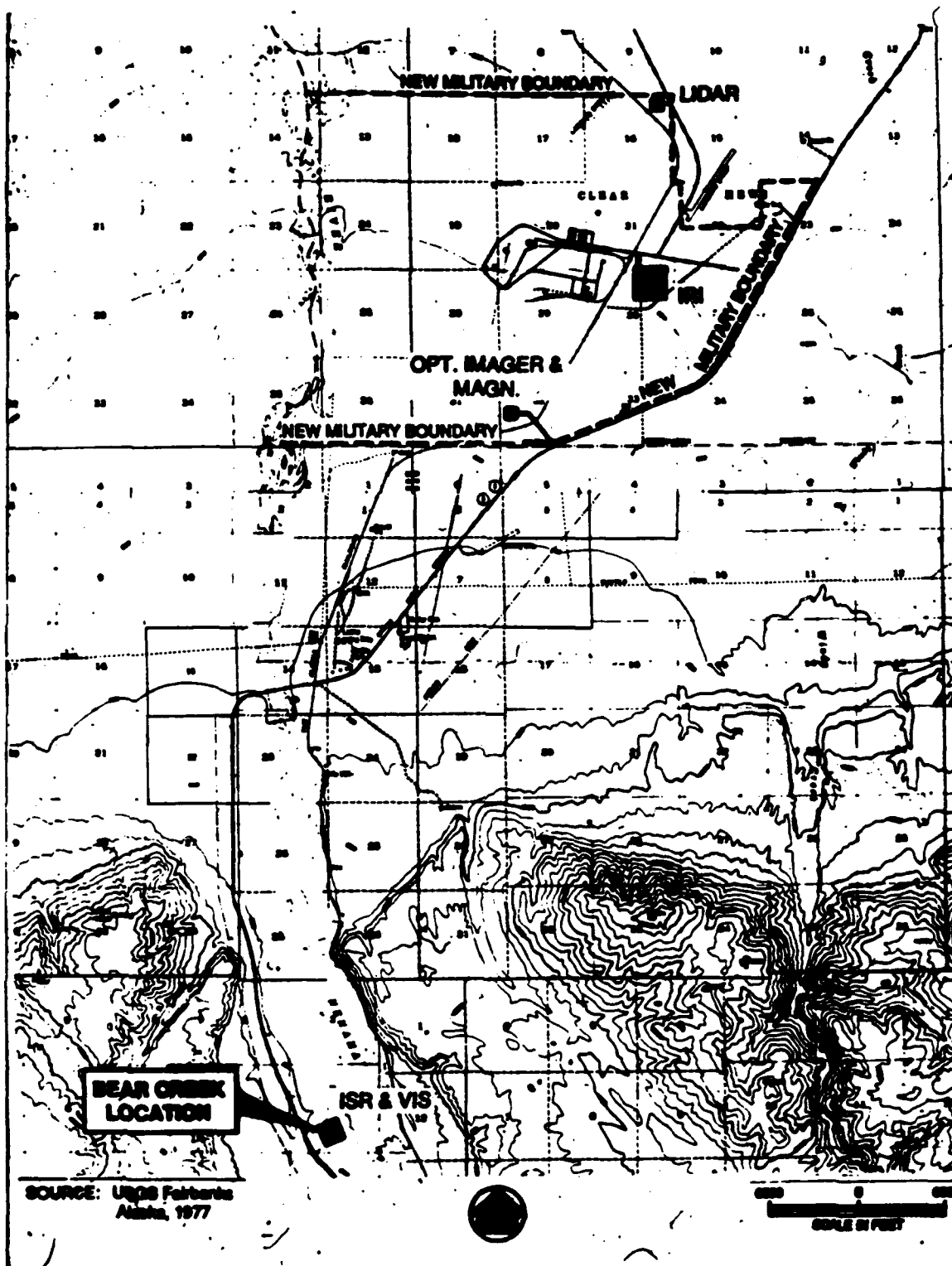




## GAKONA AND CLEAR, ALASKA SITES

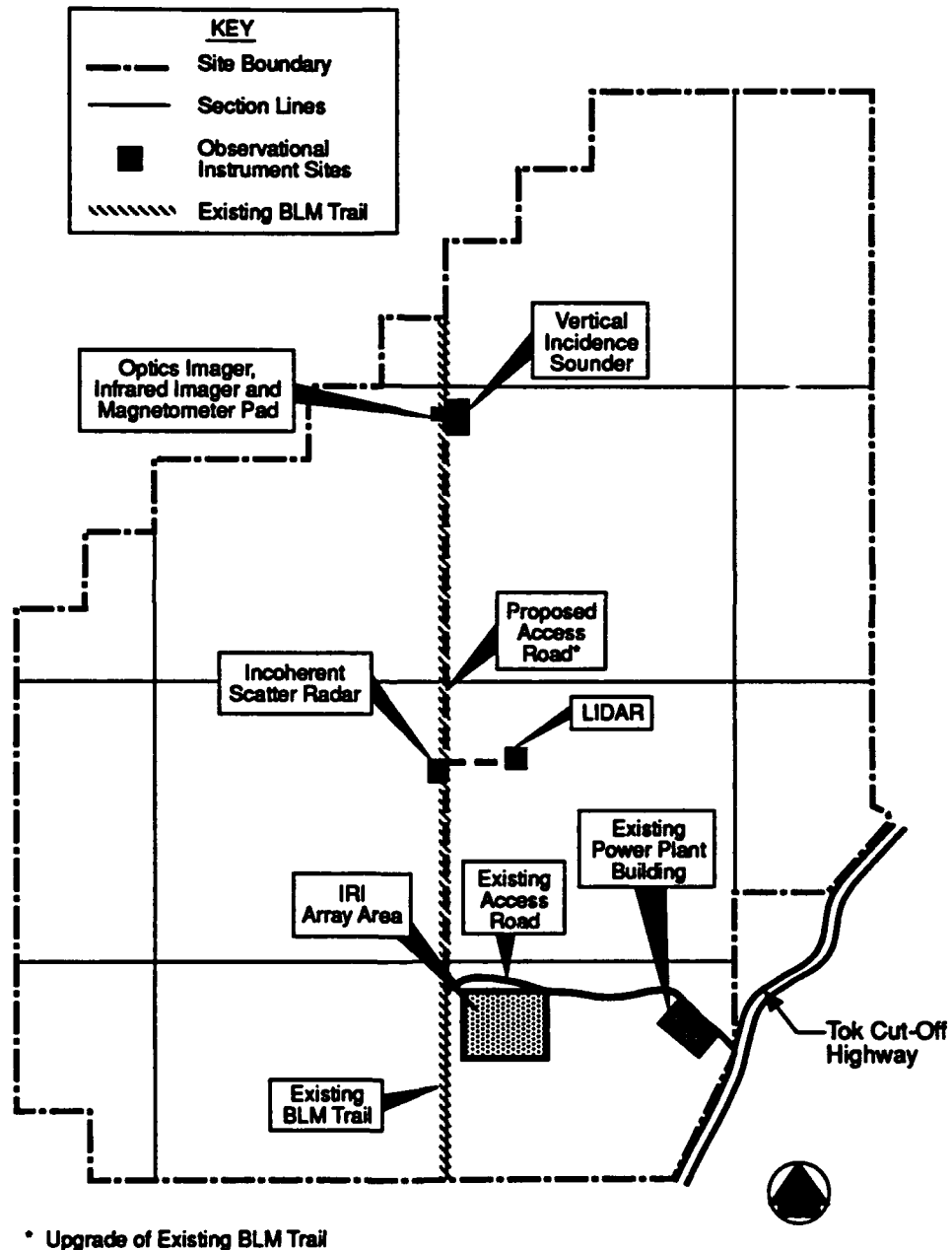


30887-5





# PROPOSED FACILITY LAYOUT AT GAKONA



3088cc-04





# **ENVIRONMENTAL IMPACT ANALYSIS SCHEDULE**

|   |             |
|---|-------------|
| Public Notice of Proposed Environmental Impact Analysis | May 1992    |
| Public Scoping Meeting on Proposed Facility             | August 1992 |
| Publication of Draft Environmental Impact Statement     | March 1993  |
| Public Hearings on Draft Environmental Impact Statement | April 1993  |
| Publication of Final Environmental Impact Statement     | June 1993   |
| Record of Decision                                      | August 1993 |

# **ENVIRONMENTAL IMPACT STATEMENT**

**1. Purpose and Need for Action**

**2. Description of Proposed Action and Alternatives**

**3. Affected Environment**

**4. Environmental Consequences**

## POTENTIAL ENVIRONMENTAL IMPACTS

| SUBJECT                   | GAKONA | CLEAR | NO ACTION |
|---------------------------|--------|-------|-----------|
| Land and Minerals         | N -    | N -   | N +       |
| Vegetation & Wetlands     | N -    | S -   | N +       |
| Mammals                   | N -    | N -   | N +       |
| Birds                     | N -    | N -   | N +       |
| Aquatics                  | N -    | 0     | 0         |
| Hydrology & Water Quality | N -    | N -   | N -       |
| Air Quality               | S -    | N -   | 0         |
| Socioeconomics            | N +    | N +   | N +       |
| Cultural Resources        | N -    | S -   | 0         |
| Subsistence               | N -    | N -   | 0         |

S = Significant Impact; N = Non-significant Impact; 0 = Negligible or No Impact; + = Positive Impact; - = Negative Impact

## POTENTIAL ENVIRONMENTAL IMPACTS (cont.)

| SUBJECT                               | GAKONA | CLEAR | NO ACTION |
|---------------------------------------|--------|-------|-----------|
| Recreation                            | 0      | S -   | 0         |
| Aesthetics                            | N -    | S -   | 0         |
| Bioeffects of RFR                     | 0      | 0     | 0         |
| Radio Frequency Interference          | S -    | S -   | 0         |
| Atmosphere                            | 0      | 0     | 0         |
| Threatened & Endangered Species       | 0      | N -   | 0         |
| Hazardous Materials & Wastes          | N -    | N -   | 0         |
| Irretrievable Commitment of Resources | N -    | N -   | 0         |

S = Significant Impact; N = Non-significant Impact; 0 = Negligible or No Impact; + = Positive Impact; - = Negative Impact

# HIGH FREQUENCY ACTIVE AURORAL RESEARCH PROGRAM (HAARP)

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PROPOSED WORLD - CLASS FACILITY  
TO STUDY THE ARCTIC IONOSPHERE



**Comments and questions should be addressed to:**

**Mr. John L. Heckscher**

**PL/GPIA**

**Phillips Laboratory**

**29 Randolph Road**

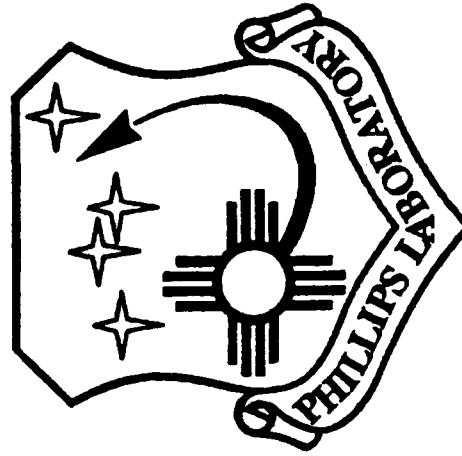
**Hanscom AFB, MA 01731-3010**

**Public comment period ends April 25, 1993**

# HIGH FREQUENCY ACTIVE AURORAL RESEARCH PROGRAM (HAARP)

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PROPOSED WORLD - CLASS FACILITY  
TO STUDY THE ARCTIC IONOSPHERE





## **11.0 COMMENTS**

**This section contains copies of written comments received at the public hearings and by mail, and memorandums of telephone conversations with concerned individuals. At the public hearings, comment sheets were distributed to all attendees and provided space in which to write comments for inclusion in the FEIS. Written comment sheets were received at the public hearings and during the public review period. Comments received after the public comment deadline were considered in the FEIS and included in this section. Telephone memorandums and written requests for copies of the DEIS were not included in the FEIS.**

**All comment sheets, letters and telecons are listed in chronological order. concerns for which responses have been deemed appropriate are numbered in the margin according to the procedure outlined in Section 9. Responses to those concerns can be found in Section 12.**

MEMO FROM J. HECKSCHER

Date: 19 Mar 93

To: Lee Snyder, (207) 825-3379

Info:

Subject: Telephone call from FAA Anchorage Center

Remarks: I received a call from Donna Tracy (907) 269-1121. She is a Military Operations Specialist. She had received the DEIS and had some concerns related to safety and communications:

1) What is the effect on a/c computer systems (i.e., not fly-by-wire), LORAN, UHF communications and NDBs (non-directional beacons)? In particular she was concerned about the "Luxembourg" effect.

4.14-37  
p. 12-65  
4.14-38  
p. 12-95

2) What is the range of the aircraft warning radar, what does the range need to be, and how high does an aircraft have to be to be safe?

4.8-21  
p. 12-50

3) FAA is planning to install ANICS (a satellite communications terminal) at Gulkana airport to transmit to Anchorage and several other points. She is concerned that the IRI might interfere with this net.

4.14-39  
p. 12-77

I told her that I thought most if not all these issues were addressed by reference to your MITRE study. Also I told her we had met with the FAA in Washington in December 1992.

MEMO FROM J. HECKSCHER

Date: 29 Mar 93

To: All HAARPers

Info: HAARP Read File

Subject: Telcon with John Pratt, Field Director, Seaplane Pilots Association, 1557 Sunrise Drive, Anchorage AK 99508, telephone (907) 274-2990.

Remarks: This person has problems with the building of HAARP. He feels that all radio systems will be affected, especially those related to a/c. He asked about the safety radar, whether it could detect the "rag & tube" type aircraft prevalent in Alaska. He said most a/c do not have beacons, since they are used only when approaching the major cities. He asked what we would do if the calculations proved to be inadequate and when we turned on, everything in Alaska was affected. I responded that our license was experimental and on a non-interference basis; if we were interfering, we would be bound by the terms of the license.

4.8-22

p. 12-51

We are sending him a copy of the DEIS.

RECEIVED  
N 10/23/93

Carl Hild  
1238 F St.  
Anchorage, AK 99501

Mr. John Heckscher  
PL/GPIA  
Hanscom AFB, MA 01731-5000

Dear Mr. John Heckscher and to whom it may concern:

I am writing in response to the Draft Environmental Impact Statement (EIS) for the Construction and Operation of the High-frequency Active Auroral Research Program (HAARP) facility in Alaska. I have some general comments first and then specific comments on the draft which I will identify by page number.

Nikola Tesla, built huge facilities early in this century to study electricity and the earth's ability to transmit that energy through its surface and atmosphere. There was great public outcry when his man-made lighting bolts caused fires and "ball-lighting" to flash around his buildings. The reaction was not to different than from the town's people when Dr. Frankenstein attempted to harness electricity to bring life to the dead in the fictional story. The lessons that have been learned include that it pays to inform the public of what you are planning to do. EIS is now required by the government for projects so that the public is not caught unaware. The HAARP Draft EIS is an attempt to do just that but I believe you have left out some critical points which the public will want to have answers to before construction and operation begin.

Like Tesla, you have not told the community how much power you will be using. On page 1-4 there is a comment about the power of the Norway facility being roughly one billion watts (1 gigawatt) effective radiated powers (ERP), and that the HAARP facility would "have an ERP above one gigawatt." How much above? On page 4-93 it states that the IRI in Norway is one of the world's largest but "is roughly one-quarter as powerful as the proposed HAARP IRI." Do these two statements add up to the correct conclusion that the HAARP will be running at roughly 4 gigawatts of ERP? If this is correct then the statement "have an ERP above one gigawatt" is very misleading and should be clarified. If the IRI is to be four times as large, but the ERP is not, then that needs to be clarified.

4.14-40  
p. 12-69

Environmental Impact Statements (EIS) are to be written to be easy to understand by the lay public. Please state clearly in the first section both how much energy this facility will be using and how much it will be putting forth as ERP. It should also be noted how much power each component of the facility will consume and for what lengths of time. As the BTU may be the unit of measuring efficiency in the future (based on the proposed tax laws), then it would be helpful to have a BTU equivalent for the facility and its components as well.

Like Tesla, the HAARP will be breaking new ground due to the level of energy used and the types of experiments that will be attempted. It is a research facility and by definition will be probing the unknown. To state that there are no bio-effects nor upper atmospheric standing impacts is presumptuous. You do not know for sure what the effects will be at this time. That is partly why you are building this facility. However, you need to cite concerns up front if there are any. The recent set of articles in Science (1) on the effects of Electromagnetic Fields (EMF) states quite clearly and accurately that we just do not know at this time what the effects may or may not be. The American Medical Association has come out with a position that physicians should inform pregnant women not to use electric blankets due to negative health impacts on the fetus. This one statement is enough to cause some mention of concern in this EIS even if there is no other solid statistically significant proof of the health impacts of EMF. The Office of Technology Assessment produced a report on EMF and the biological concerns (2), on which Senator Ted Stevens of Alaska (who is quite interested in the aurora) participated.

4.13-10

p. 12-60

Please rephrase the last paragraph on page 3-150 to reflect the concerns which are being researched and do not white-wash the biological effects with such language as "there is no credible scientific evidence that exposures to levels below maximum levels specified in IEEE exposure standard will in any way be hazardous to health." This is not an appropriate statement in light of the current research in this controversial field.(3) The entire document should be reviewed for such statements that seem to be condescending to those who may have concerns over such high powered electrical devices. Combining the lack of a clear statement of how much power will be used and this biased comment on the biological effects the draft EIS is painting a tainted picture.

The study that is planned at HAARP is not a passive look at the ionosphere. It is to be prodded and poked with lots of energy. I would suggest some diagrams showing a beam going up and which sensors will record what responses on which reverberation. I believe that another such drawing would help explain the cone area for each of the components and how and where they could be targeted. The visual impact of the invisible rays of energy that are being proposed will help the local community understand the overall impact of the HAARP.

The diagram will bring up a conflict in the EIS. It is stated on page 2-6 that the ISR should be 2 ~ 10 miles from the IRI. In the plan for Gakona, the ISR is 4000 feet from the IRI according to page 2-28. The property is large enough that if the ISR is placed in the northeast corner then there would be the minimum 2 miles separation of the IRI and ISR. Why has this basic requirement not been followed? The final EIS should be prepared to meet the minimum requirements of the project and place the ISR at least 2 miles from the IRI and include the appropriate costs of additional road construction and habitat impact.

4.14-41

p. 12-83

I also wonder why there is not comment on the other impacted phenomenon at the same time. "Whistlers" are radio band energy that travel along the natural geomagnetic field lines from the one magnetic pole to the other. Will there be a "whistler" listening device in southern New Zealand to record the experiments, as it is at the other end of the geomagnetic field line from central Alaska? Will there be constant recording of the geomagnetic field at the HAARP facility and or in New Zealand to record how the earth's magnetic field reacts to having its ionosphere poked? These two aspects of the experiments could contribute significantly to work begun by others looking at the transmission of energy over geomagnetic lines as well as the close association between auroral activity and geomagnetic flux.

4.14-42  
p. 12-70

If these components can be documented and measured the value of the entire project would be increased with very little additional expense. At the same time to fully understand what is proposed it would be prudent to observe these effects to have a better understanding on the impact of both the local magnetic field and therefore other biological or physical processes, as well as the types of harmonics or energies that are transmitted over the geomagnetic field lines from one pole to the other of our global magnet.

If the geomagnetic flux does vary with the use of the HAARP then the impact on local business may be increased. It is theorized that changing geomagnetic flux may cause localized increases in corrosion.(4)(5) This has been evidenced and may soon be documented along the Trans-Alaska Pipeline System (TAPS). As the TAPS runs within a few miles of the proposed HAARP facility in Gakona there may be increasing corrosion of the pipe in that region as well as where the geomagnetic flux occurs naturally.

4.14-43  
p. 12-84

In addition listening to the earth's naturally occurring radio frequencies has shown to be a potential indicator of seismic activity (6). As both proposed sites for the HAARP are in higher seismic areas, then recording the geomagnetic flux and listening to these earth frequencies may provide insight to earthquake prediction as well as the impact of solar storms on such events.

I relate both these observations to an umbrella. If the IRI pushes up from the underside what happens to the far side of the umbrella and also what happens to the handle? They both are moved. Is this true for the ionic umbrella which is held up by our earth's magnetic field? If we poke it or stimulate it here, what is happening on the other side of the world at the region of the magnetic reverse pole. It has been shown from space that the aurora occurs in mirror images at the two poles. If you are creating an artificial aurora here would one be produced in the south as well via the energy carried by the geomagnetic field line? If there were background readings made prior to any experiments then long term impacts could also be interpreted if there are any. However, without doing the baselines we will never know if the magnetic field was impacted. Likewise, we will not know if

4.14-44  
p. 12-70

4.14-45  
p. 12-75  
p. 12-78

ionospheric heating that was not to cause any problem really did.

John Muir said that if you look at any one thing you will see that it is tied to everything else. The EIS looks at the local community, the wildlife, and many aspects of the surrounding environment. It fails however, to look at the associated environment of the subject of the study, the ionosphere. No where in the EIS is the impact on the stratosphere mentioned even though some number of gigawatts will be beamed through it and its clouds. No where is the geomagnetic impact discussed. If this energy pushes or heats the ionosphere, what will that do to the magnetic field on the ground and to those working around the area? What will happen to the radios in southern New Zealand as a result of the known "whistler" effects? The lack of detail or even suggestion as to what may happen to radios, EEDs, or pacemakers is certainly not reassuring if you happen to work with explosives in the area, or wear a pacemaker and need to call for an ambulance on your cellular telephone. If there is possible impact, what does that mean to the user? Specifics should be mentioned such as static on radio telephones for fifteen minutes during the early morning hours every-other week on Thursdays; total lack of television transmission and reception functions; or specific types of EEDs that are most sensitive to IRI or ISR use.

4.15-1  
p. 12-101  
4.14-46  
p. 12-70  
4.14-47  
p. 12-70  
4.14-48  
p. 12-74  
4.14-49  
p. 12-74  
4.14-50  
p. 12-74

The EIS is to be a comprehensive review of potential impacts of the project. It is unfortunate that more effort has not gone into the explanation of how the HAARP will impact the areas most closely related to the study subject, associated electromagnetic fields and phenomenon. There have been studies done by the Navy on transmitting communications a certain levels of the ocean where transmission is more readily propagated. How do those studies compare to the proposed HAARP energies, systems, and related impacts of the geomagnetic fields? There appears to be much more information available than was cited in this draft.

I would like to receive copies of the references AUSA 1992 a, b, and c which were completed as part of the EIS. Referencing them is appropriate but as this is a particular interest of mine I would like to see the original reports so that I may comment on them as they are support materials to the overall draft.

page x. The comment that atmospheric impacts will be negligible in comparison with those produced by sun is condescending considering that all energy on the earth has come from the sun at one time. The forces of nature are quite large but when building a dam one does not refer to the amount of water in the ocean to show that there will be no significant impact. Compare the impact to some other event that is quantified. This is the largest impact on the atmosphere that has ever been attempted may be a true statement and needs to be known if it is correct.

4.15-2  
p. 12-101

page 2-30. Magnetometer use is unclear. What measurements will be taken? When will they be taken? For what areas will they be taken? Why will they be taken?

4.14-51  
p. 12-75

|   |                             |
|---|-----------------------------|
| <p>page 2-50. Correct chart to cite the controversy over the possible bio-effects of RFR.</p>   | <p>4.13-11<br/>p. 12-60</p> |
| <p>page 3-4. The temperature of the permafrost is relatively warm at Gakona. Could this be cause for additional concern for the possible shifting and movement of antenna? (see comments below)</p>   |                             |
| <p>page 3-150. The reference that no credible scientific evidence of bio-effects exists needs to be changed. In addition some mention of the current controversy needs to be made that there is not scientific agreement at this time. It is unknown what the long term effects may be and they may vary due to duration, intensity, and frequency.</p>   | <p>4.13-12<br/>p. 12-60</p> |
| <p>page 3-152. Natural Contributors should include material on "whistlers" and geomagnetic flux concerns.</p>   | <p>4.14-52<br/>p. 12-70</p> |
| <p>page 3-155. The last paragraph should describe how other electrical equipment will be impacted in more detail. If it is unknown what the impact will be, then at least propose or theorize what the potential impact may be in some terms. Leaving the potential impact open or unstated can lead the public to believe that all radio, telephone, and television will be totally interrupted for entire days while experiments are being run.</p>   | <p>4.14-53<br/>p. 12-65</p> |
| <p>page 4-3. It is stated that roads will be constructed using geotechnical stabilization fabric and closed-cell insulation overlying the permafrost. This or the best available technology (BAT) for building on permafrost should be done for all construction areas at the Gakona site. This would include the IRI to stabilize antenna and reduce chance of shifting. BAT should be used for all construction as the site has such warm permafrost temperatures. In addition, I believe, that by using these stabilization techniques that there will be far less maintenance in the long run as the road and pads will not heave as much during break-up each year.</p>  |                             |
| <p>page 4-90. Exposure to Humans. This first paragraph is terrible. Concerned citizens will be looking here first to learn if this sky-beam will harm them. This should be extremely clear and very easy to read. It is currently too long and should be broken into at least three (IRI, ISR, VIS) paragraphs with a general introduction. It should include a drawing for the cones of impact and potential exposure times for aircraft. It should include associated exposures as the waves bounce back and forth from ground to ionosphere and tangential exposures. There will be questions that if there will be warning signs that HAARP can set off EEDs that are not in metal containers, then what is it doing to me and my family?</p> | <p>4.13-13<br/>p. 12-61</p> |
| <p>page 4-93. The Index does not note this page as a citation for Norway. It does cite 4-91, but there is no reference there. This should be corrected.</p>   |                             |



page 4-114. How much heating of the ionosphere is expected for HAARP? It is reported that an 80 degree increase is measured in Norway. Does that mean, from the above confusion on the amount of ERP that the site will have, that four times as much heat will be produced. Will there be an increase of roughly 240 degrees? What is expected? What is the proposed impact of such an increase as compared to Norway's experience?

4.15-3  
p. 12-101

page 4-115. It is stated that the effects of "decreased electron densities induced within the effected conical volume of the F layer could last anywhere from a few hours to an entire polar night." In layman's terms, what does this mean? Will a hole or depression in the electrons of the F layer allow increased radiation passage? If the F layer is there and acts as a partial shield to cosmic radiation then what will this experiment do? How long is the polar night? Are you stating that the effect will last until sun rise, until a particular intensity of sun shine or number of lumen is reached (which may take some longer time period), or colloquially will it last for 6 months?

4.15-4  
p. 12-102

References cited in my comments are as follows:

1. Pool, R. (1990 A). "Is There an EMF-Cancer Connection?", Science. 249, pages 1096-1098.

Pool, R. (1990 B). "Electromagnetic Fields: The Biological Evidence", Science. 249, pages 1378-1381.

Pool, R. (1990 C). "Flying Blind: The Making fo EMF Policy", Science. 250, pages 23-25.

2. Office of Technology Assessment. (1989). Biological Effects of Power Frequency Electric and Magnetic Fields. Department of Engineering and Public Policy, Carnegie Mellon University, Pittsburgh, PA.

3. Papatheofanix, F.J. (1987). Bioelectromagnetics: Biophysical Principles in Medicine and Biology. Karger, Basel, Switzerland.

4. Hild, C.M. (1990). Presentation at American Association for the Advancement of Science - Arctic Division Meeting. "Geomagnetic Influence on Ice Crystals and Water at Freezing: The Need for Research for Human Implication", Anchorage, Alaska.

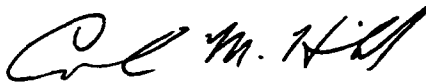
5. Yamamoto, T., et.al.. (1988). "Auroral Activities and Long-Period Geomagnetic Pulsations: 2 Ps5 Pulsations Following Auroral Breakup in the Premidnight Hours," J. Geomag. Geoelectr. 40, pages 571-582.

6. Kerr, R.A. (1989). "Loma Prieta Quake Unsettles Geophysicists", Science. 246, pages 1562-1563.

As a number of items in this EIS could have significant impact to the TAPS I have taken the liberty to contact Alyeska Pipeline Service Company. They are not listed among those receiving copies of the draft EIS for comment and yet their maintenance communications may be impacted, and their pipeline is subject to corrosion and runs within a few miles of the propose Gakona site. I have allowed them to borrow my copy and I understand they have now reproduced it on their own for their internal review.

Thank you for this opportunity to comment on this draft EIS for HAARP. I look forward to receiving copies of AUSA 1992 a,b, and c. for review in the near future.

Naturally;

A handwritten signature in cursive script, appearing to read "Carl M. Hild".

Carl M. Hild, M.S.Sci.Mgmt.

cc: Senator Ted Stevens  
Ken Peacock, Alyeska

MEMO FROM JOHN HECKSCHER

Date: 2 April 1993

To: HAARP Read File

Info:

Subject: Phone call from Gerald Brookman

Remarks: Phone call received from Gerald Brookman requesting information on the HAARP program. After some discussion I agreed to send him additional information in the form of the System Specs which govern the performance of the IRI. Additionally, I would also like to send him a copy of the HAARP "Fact Sheet".

Gerald Brookman  
715 Muir Ave.  
Kenai AK 99611-8816

RECEIVED  
6 April 93

PUBLIC HEARING WRITTEN COMMENT SHEET

WRITTEN COMMENT SHEET

HIGH FREQUENCY ACTIVE AURORAL RESEARCH PROGRAM (HAARP)

Thank you for attending this public hearing. Our purpose for hosting this meeting is to give you an opportunity to comment on issues analyzed within the HAARP Draft Environmental Impact Statement. Please use this sheet to comment on any environmental issues that you feel should be clarified in the HAARP Final Environmental Impact Statement.

Date: 4/6/93

JOB: what is a qualified person  
who get these jobs

4.8-23  
p. 12-27

Name: Bob NEELY #4

Address: 3515 Thompson

Please hand this form in or mail to:  
Mr. John L. Heckscher  
PL/GPIA  
29 Randolph Road  
Hanscom AFB, MA 01731-3010

RECEIVED  
16 April 93

HAARP  
Attn: John Heckscher  
PL/GPIA  
Hanscom AFB, Massachusetts 01731-5000

Re:HAARP EIS Comments

Please add me to the list of those in opposition to HAARP. Though I can be considered fairly progressive in regards to scientific research, this project will create more hazards than benefits.

First, the comment period for this project is ridiculously short and there was a shortage of EISs at the Glennallen Ak. meeting. Hence, the ability for the public to inspect this 300 page document by the 25th of April and submit comments was made virtually impossible.

1.3-1  
p. 12-3

Next, what little I could see of a borrowed copy showed the intentional vagueness of a project that couldn't stand on it's merits to the communications industry and the scientific community, let alone the public who will be affected.

1.3-2  
p. 12-7

I have a major concern with the effective radiated power. With the known hazard to humans of non-ionizing radiation in the RF spectrum, Placing this site in a known Migratory Waterfowl flyway and a protected Trumpeter Swan nesting area is not only unconscionable but demonstrates a callous disregard for wildlife in general. With the radar detection and transmitter switching interface to protect aircraft operators and passengers from RF exposure, your EIS has admitted the hazard of this project. With the radars inability to disable the transmitter for migratory waterfowl, it appears obvious that the birds exposure is what you term to be a necessary evil for the benefit of a questionable project. This becomes even more acute when it is realized that most migratory birds in this flyway segment rarely fly higher than 400-500 feet above ground level.

4.13-14  
p. 12-61  
4.13-15  
p. 12-61  
4.13-16  
p. 12-61  
4.13-17  
p. 12-61

It took little number crunching to determine that with modern design and construction techniques, the transmitter would be able to hold Spurious and Harmonic emissions down 50 dB. This sounds real good until you realize that 1 Gigawatt down -50dB still gives a 7,000 watt effective radiated power. With the 440-450 MHz band being 1/5th of the frequency of the household microwave oven, this would present an appreciable exposure hazard to any organism.

4.14-54  
p. 12-79

I then looked at the probable sidelobe radiation and figured that with sound design and correct phasing this non-primary lobe radiation would be about 30 dB down. This translates to a fairly stiff effective radiated power of 1 megawatt. This becomes especially disconcerting due to it's divergence from the designed beamwidth.

Careful consideration of the HF emissions revealed that HF communications throughout the region will be adversely impacted. Perhaps your project leadership is unaware of the need for HF communications in rural Alaska. With at least half the population having Citizens Band or Amateur Radio and our statewide HF emergency net frequency being 5167.5 KHz, any interference would be intolerable. With the possible increased activity of the aurora, F layer near vertical communications would be impossible. Any potential use of auroral curtain communications in the Low and High VHF business bands would make interference intolerable to those businesses and agencies.

4.14-55  
p. 12-65

Further, the extremely high effective radiated power virtually guarantees receiver front-end desensing and receiver IF overloading. This presents an additional problem to avionics used by our aviation orientated population. With the tremendous amount of air traffic in the State of Alaska, this additional hazard can't be tolerated

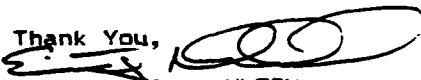
4.14-56  
p. 12-90

The Gakona site is right next to the most active airport in the entire Copper River Basin (Gulkana). Further, it lays directly in a major air traffic corridor from Gulkana to Delta and Fairbanks. It also lays in the middle of the Anchorage to Tok air corridor. Neither the Air Carriers nor the passengers can afford the required deviation from these designated corridors. This doesn't include the costs of redesignating new aircraft corridors and the reprinting of thousands of Aircraft Sectional Maps and Alaska Supplements.

4.8-24  
p. 12-30  
p. 12-49

I sincerely hope this project will be reconsidered and scrapped in its present form. I would appreciate a copy of the EIS and comments.

Thank You,

  
Eric Nashlund NL7ZW  
HC 60 Box 271  
Copper Center, Ak. 99573

**TRIDENT**

*HF-SSB Common Carrier Radio Service  
Engineering, Sales & Technical Services*



■ P.O.BOX 111158  
■ ANCHORAGE, ALASKA 99511  
■ - (907)345-1170 FAX 345-0614

March 30, 1993

Mr. John Heckscher  
PL/GPIA  
Phillips Laboratory  
29 Randolph Road  
Hanscom AFB, MA 01731-5000

Subject: HAARP Draft Environmental Impact Statement

Dear Mr. Heckscher:

I am the owner of Trident, a Common Carrier HF SSB communications service based in Anchorage, Alaska. Trident provides service to users throughout the state of Alaska in accordance with CFR 47 Section 80.387. I do not feel the HAARP DEIS provides the necessary information to determine the level of impact to our operation or other stations operating under Section 80.387.

On the surface it appears that HAARP will produce radio signals of over 1 GW directed to the ionosphere in central Alaska at various unspecified times and durations. The results of these signals will have catastrophic effects on the safe and economic conduct of business in Alaska where HF radio is used for either the primary or emergency form of communications. In the case of Trident we could be put out of business and be confronted with added costs during a campaign..

4.14-57  
p. 12-65

Specifically, I need at the minimum the following information before I can evaluate the impact of the HAARP Program on our operations.

1. Information on the duration, periods and other operational details of the research campaigns. As presented in the *HAARP FACT SHEET*, communications could be impacted up to 10 weeks a year.
2. LUF and MUF variations to be expected during the campaigns.
3. Ambient RF noise level contour variations during the campaigns.
4. Influenced skywave signal perturbations to be expected during the campaign.
5. HF communications degradation to be expected within 600 nautical miles of the HAARP facilities during a campaign. The HF system degradations should be based on 10 watt portable and 150 watt fixed transmitters, 0.5 microvolt 12 dB SINAD receivers and 1/2 wavelength horizontal dipole antennas located 1/4 wavelength above ground.

2.3-11  
p. 12-12

4.14-58  
p. 12-73

4.14-59  
p. 12-71

6. Planned coordination details with HF users prior to and during a campaign for routine and emergency communications.

2.3-12  
p. 12-13

An alternate to the Clear and Gakona sites could be the AFS site at Northeast Cape on Saint Lawrence Island.

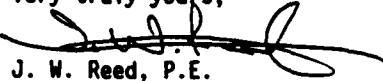
2.1-1  
p. 12-10

The main impact will be on the miner in the bush calling in for a medivac, a mother calling a doctor about a sick child, a USGS team on a glacier calling in for a helicopter and hundreds of other users of HF communications in the bush. On January 1993 the FCC has 2330 licensed HF stations in Alaska that could be impacted with HAARP and should be addressed in an impact statement.

4.14-60  
p. 12-65

I will appreciate any information that you can send and if you have any questions please contact me.

Very truly yours,



J. W. Reed, P.E.



RECEIVED  
20 April 93

PUBLIC HEARING WRITTEN COMMENT SHEET

WRITTEN COMMENT SHEET

HIGH FREQUENCY ACTIVE AURORAL RESEARCH PROGRAM (HAARP)

Thank you for attending this public hearing. Our purpose for hosting this meeting is to give you an opportunity to comment on issues analyzed within the HAARP Draft Environmental Impact Statement. Please use this sheet to comment on any environmental issues that you feel should be clarified in the HAARP Final Environmental Impact Statement.

Date: 4/20/97

Dear Mr. Heckscher,

The ham community became aware of this project just last week. It is my opinion that the folks up here responsible for the PR work have a very poor job... They have not made any effort to contact and give folks up here involved with emergency work any opportunity to speak on this...

This is evidenced in my opinion by the fact that the public meetings in Glen Allen and Clear... the info in the impact statement seems misleading and wrong in several areas... Your people at both meetings were not very forth coming with information. Further there is a rumor that the bid on this has already been let...

Alot of people up here are asking the question and wondering just how it is a research group can make use of all several frequency ranges without prior approval of the FCC... Had this channel been followed the ham community and other comm. interests up here would have known about this long ago...

Communications are difficult enough up here and alot of folks that live out in the villages and homestead depend on HF/HF communications... I am sure that you will soon be getting more statements regarding this matter soon...

Of course I'd as soon see you scrap the whole project as I live in Anderson, Ak. next to Clear AFB, and Amateur Radio is my retirement project. I moved here a year ago, buying a house because it looked like Clear was shutting down & I'd have a nice quiet area to enjoy my hobby... I intend to contact my representatives and ask them to do just that...

Name: Larry W. Flanagan NL7XG  
LARRY FLANAGAN  
Address: POB 3167  
ANDERSON, AK  
99744 - USA

Please hand this form in or mail to:  
Mr. John L. Heckscher  
PL/GPIA  
29 Randolph Road  
Hanscom AFB, MA 01731-3010

done 1.3-3  
p. 12-3

1.3-4  
p. 12-8

4.14-61  
p. 12-65

RECEIVED  
20 April 93

Dear Mr. Heckler, 13 Apr 93

Today I heard about the HARP proposed for the Bear Area. Given it was during an operation when your advertising campaign and meetings took place. Some of my concerns follow:

If you transmit in the CB, TV and Ham Radio range of frequencies will our communications and entertainment systems be affected? I know the transmitters at Bear, the narrow band, can be heard at the very low end of the AM band. Probably just off the normal AM scale.

4.14-62  
p. 12-65

As you grow and decide to increase the transmitted power what physiological effects could we expect in this area? I live at mile post 271.3 Parks Hwy. Just a mile from the Bear Creek location.

4.13-18  
p. 12-61

Very few of the land owners that I have talked with have heard of HARP being interested in this area.

1.3-5  
p. 12-3

RECEIVED

We will try to spread the work around  
in the next few days. For some  
of the properties south of me your  
Bear Creek faulting will be in their  
view of the Alaska Range.

Now a positive thought:

You mention a small substation  
near Bear Creek. Our state representative  
wanted to provide power for this area.

A larger substation would provide  
power 5 miles north and 10 miles  
south to a great many homesteads.

Also you will need communications  
on Bear Creek. There some homesteads  
are without telephone. I think  
the gap is about two miles north  
and 10 miles south.

At this time I am not for or  
against HARRP in this area. Let's  
talk some more about it.

Sincerely,

Audrey D. Johnson

A. Dale Johnson  
HC 1 Box 4000  
Healy, AK 99743  
Parks Hwy. MP 271-3

2.3-13

p. 12-14

---

P.S. By moving the  
Bear Creek facility north  
2 miles ± and siting it  
on the old river bottom  
the ancient river bank  
would shield it from  
BDFEWS backscatter.

2.3-14

p. 12-15

**TRIDENT**

*HF-SSB Common Carrier Radio Service  
Engineering, Sales & Technical Services*

■ P.O.BOX 111158  
■ ANCHORAGE, ALASKA 99511  
■ (907)345-1170 FAX 345-0614

**RECEIVED**  
20 April 93

April 5, 1993

Mr. John Heckscher  
PL/GPIA  
Phillips Laboratory  
29 Randolph Road  
Hanscom AFB, MA 01731-5000

Subject: HAARP Draft Environmental Impact Statement

Reference: a) Trident/ J.W. Reed Letter dated March 30, 1993  
b) Trident Meeting 1130 April 5, 1993 with John Heckscher  
PL/GPIA, John Rasmussen PL/GPIA, Ed Kennedy NRL and  
Arnold Snyder MITRE

Dear Mr. Heckscher:

I am submitting the following comments based on a draft letter, Reference a), furnished to you at our recent meeting, Reference b). As a licensee in both the Alaska Public Fixed and Alaska Private Fixed radio services I feel that HAARP will impact Alaska HF communications in the two following main areas.

1. SAFETY: Over 90% of the HF users in the bush do not have any medical services available except for the occasional person with first aid training. Often times during an emergency situation communications is at best very difficult and to introduce a major ionospheric event at that time could be life threatening. Logging, construction, mining and aviation are the most accident prone occupations in the bush. OSHA requires the logging and construction industries to have communications to the medical care centers. Mining, aviation and the others maintain communications for self preservation. Bush locations that do not have access to the public switched network rely on HF communications for the needed medical communications.
2. ECONOMICS: The ordering and transport of supplies and personnel is very important to the economic vitality in the pioneer bush areas of Alaska. Any delays in the short summer work season can be costly and a missed schedule in transporting a perishable product to market can be disastrous. The necessary communications to coordinate these activities is provided by HF radio.

4.14-63  
p. 12-65

4.14-64  
p. 12-65

4.14-65  
p. 12-65

Until I receive answers to questions posed in my previous letter, Reference a), it is difficult plan an operational strategy to meet the HAARP impact on HF communications in Alaska. Based on the assumption that the HAARP impact will be isolated to a small region of the ionosphere without degradation to the Anchorage noise floor and the effects of

HAARP are predictable the following aspects should be considered.

- |   |                    |
|---|--------------------|
| 1. SCHEDULE DISSEMINATION: The HAARP Campaign schedules should be sent to FCC, FAA and to major HF users such as Trident. A good idea would be to include the HAARP schedules in the daily FCC propagation report. The schedules should give as much prior notice as practicable and include all items of impact to the HF user.        | 2.3-15<br>p. 12-13 |
| 2. EMERGENCY COORDINATION: Prior to and during a HAARP Campaign provisions should be made for emergencies where organizations such as Trident are checked to make certain that no emergencies are in progress. Should an emergency be in progress then alternate HF routes can be established to avoid the disturbed ionospheric areas. | 2.3-16<br>p. 12-13 |
| 3. SCHEDULING: The HAARP Campaigns should be scheduled to take advantage of low HF traffic periods where possible; for example, during the night or in the winter.  | 2.3-17<br>p. 12-13 |

Trident supports the HAARP Project in principle; however, Trident is concerned about an excessive catastrophic impact resulting from lousy planning or coordination.

I will appreciate any information that you can send and if I can be of help or if you have any questions please contact me.

Very truly yours,

  
J. W. Reed, P.E.

RECEIVED  
20 April 93

WHAT ?  
PUBLIC HEARING WRITTEN COMMENT SHEET

WRITTEN COMMENT SHEET

HIGH FREQUENCY ACTIVE AURORAL RESEARCH PROGRAM (HAARP)

Thank you for attending this public hearing. Our purpose for hosting this meeting is to give you an opportunity to comment on issues analyzed within the HAARP Draft Environmental Impact Statement. Please use this sheet to comment on any environmental issues that you feel should be clarified in the HAARP Final Environmental Impact Statement.

Date: 4-14-93

I am irate that you held an  
~~unpublicized~~ public hearing. I found out about  
the meeting the day after.

I live at mile 26 of Parks Hwy - 9 miles from the  
Bear Creek site - I have asked my neighbors, hand  
or saw any announcement of this meeting.

I expect that you will be holding another public  
hearing - one that is correctly publicized!

My written comments on this EIS will be mailed  
separately.

I am on the Denali Borough Land Use Planning  
Committee and can tell you that the borough received no  
notice.

Name: GINA SOLTIS *Gi*

Address: BOX 253  
HEALY, AK 99743

Please hand this form in or mail to:  
Mr. John L. Heckscher  
PL/GPIA  
29 Randolph Road  
Hanscom AFB, MA 01731-3010

CC: REP JAMES  
SEN MILLER  
GOV HICKEL

1.3-6  
p. 12-3

RECEIVED  
21 April 93

PUBLIC HEARING WRITTEN COMMENT SHEET

WRITTEN COMMENT SHEET

HIGH FREQUENCY ACTIVE AURORAL RESEARCH PROGRAM (HAARP)

Thank you for attending this public hearing. Our purpose for hosting this meeting is to give you an opportunity to comment on issues analyzed within the HAARP Draft Environmental Impact Statement. Please use this sheet to comment on any environmental issues that you feel should be clarified in the HAARP Final Environmental Impact Statement.

Date: April 16, 1993

Dear Mr. Heckscher,  
Although I'm generally in favor of scientific research; I find this information on the HAARP program very disturbing if true. You state an enhancement of communications is the objective of the program, but apparently high levels of interference to many radio spectrum users is also probable thus having severe and detrimental impact on public safety in Alaska. Alaska is highly dependant on radio communication and can not afford to lose this vital mode of communication.

Name: MERLE L. BELLER

Address: 4341 TIKISHLA ST  
ANCHORAGE AK  
99504

4.14-66  
p. 12-65

Please hand this form in or mail to:  
Mr. John L. Heckscher  
PL/GPIA  
29 Randolph Road  
Hanscom AFB, MA 01731-3010



**MEMO FROM C. FORSBERG**

**Date:** 21 April 1993

**To:** John Heckscher

**Info:** HAARP Read File

**Subject:** Phone call from Larry Gondek, Gakona, AK (20 April 93)

**Remarks:** Phone call received from Larry Gondek requesting information on the HAARP program. He was not at the Public meeting and had some questions. I listened and suggested that I send him a Fact Sheet, which I did today.

Mr. Larry Gondek  
Box 275  
Gakona, AK 99586

**MEMO FROM C. FORSBERG**

**Date:** 21 April 1993

**To:** John Heckscher

**Info:** HAARP Read File

**Subject:** Phone call from Walt Wilcox, Juneau AK

**Remarks:** Phone call received from Walt Wilcox, administrative assistant to Alaska State Representative Jeannette James, Alaska district 34. Clear AF Station is in her district. He expressed her desire to be kept in the loop for all information on HAARP. Her office has been receiving calls and letters about HAARP. She heard a radio broadcast indicating HAARP would be used for research and Navy communications. I replied that HAARP would be used for basic research and no military use is contemplated, but research into a theory of how to use high power radio transmitters for communication would be tested at some time after the station is operational. I sent her the Fact Sheet. She will be in Juneau from January to May and in her district from June to December.

Honorable Jeannette James  
State of Alaska  
501 Capital Building  
Juneau, AK 99801

P.O. Box 56622  
North Pole, AK 99705

She received the DEIS.

RECEIVED  
APR 16 1993

## Alyeska pipeline

SERVICE COMPANY

1835 SOUTH BRAGAW STREET, ANCHORAGE, ALASKA 99512. TELEPHONE (907) 278-1811. TELEX 080-25-127

April 16, 1993

Mr. John L. Heckscher  
PL/GPIA  
29 Randolph Road  
Hanscom AFB, MA 01731-3010

Letter No. 93-1282-G

Dear Mr. Heckscher:

Alyeska Pipeline Service Company ("Alyeska"), hereby, submits its comments regarding the proposed Ionospheric Research Instrument (IRI), Incoherent Scatter Radar (ISR) and Vertical Incidence Sounder (VIS) site at Gakona, Alaska, for the Final Environmental Impact Statement. Alyeska appreciates the opportunity to comment on the High Frequency Active Auroral Research Program (HAARP) Proposal and requests that these comments be forwarded to all applicable entities involved in this project.

Alyeska designed and constructed, operates and maintains the Trans-Alaska Pipeline System (TAPS). Alyeska is owned by seven owner companies, BP Pipeline (Alaska) Inc., ARCO Transportation Alaska, Inc., Exxon Pipeline Company, Mobile Alaska Pipeline Company, Amerada Hess Pipeline Corporation, Phillips Alaska Pipeline Corporation, and Unocal Pipeline Company. Alyeska operates and maintains approximately 800 miles of pipeline, part of which is approximately 7 miles from the Gakona HAARP site.

Although the agencies involved assured Alyeska during the Glennallen April 6, 1993, Public Hearing that interference problems have been studied and mitigated, Alyeska still has a great concern that the proposed transmitters may cause radio frequency interference (RFI) and electromagnetic interference (EMI) to the pipeline operation. Alyeska operates various radio frequency (RF) transmitters and receivers and electrical instruments within a 20 mile radius of the proposed HAARP Gakona site. These transmitters/receivers are being used to open and close gate valves, for intrusion detection, for surveillance video, and for mobile communications. Attachments A & B indicate the locations and frequencies of the RF transmitters and receivers.

Very High Frequency (VHF) is being used to send commands to open and close pipeline gate valves and also to receive temperature and pressure status from the gate valves. Gate valve control is critical to pipeline operations because it allows Alyeska to isolate pipeline sections in the

4.14-67  
p. 12-84

event of pipeline upsets or oil spills. Radio frequency interference could cause our Operations Control Center to lose communication with the gate valves.

Microwave frequencies are being used for both intrusion detection and video surveillance at two critical sites along the pipeline. E-Field equipment is also being used as part of the intrusion detection system. These systems are very important to the security and integrity of the pipeline operation. Any radio frequency or electromagnetic interference could affect our capability to monitor these sites.

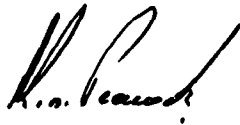
Alyeska monitors the performance of its cathodic protection systems with sensitive electrical instruments as part of its Grant of Right-of-Way from the Federal Government and as required by the U.S. Code of Federal Regulations. Localized distortion of these readings already pose a problem from naturally occurring phenomena such as Telluric currents which are a bi-product of auroral activity. Radio frequency and electromagnetic interference from a variety of man made sources can also impact the accuracy of these readings. The HAARP installation at Gakona represents yet one more source of interference that will have to be accounted for and mitigated in order to receive meaningful data from our corrosion monitoring efforts. In order to minimize the impact of this interference on Alyeska some form of staged testing should be required of the HAARP system in order to quantify the impact of the transmitters on corrosion monitoring.

4.14-68  
p. 12-85

We also use VHF and UHF for operation and maintenance communications. Mobiles and mobile repeaters are located within a 15 mile radius of the proposed HAARP transmitters site.

We urge that the agencies take these comments and suggestions into consideration in the final HAARP site selection. Alyeska requests that the Gakona site have no impact or minimal impact on our pipeline operations and will work with the agencies involved to reach this goal. Please call me if you have any questions or if you need additional information.

Sincerely,



Kenneth M. Peacock  
Manager, Pipeline

HP/KMP:mt  
Attachments

cc: John Dayton - VP Operations  
Jerry Brossia - Joint Pipeline Office

## **ATTACHMENT A**

**Alyeska's RF equipment located within a 20 mile radius of the proposed Gakona HAARP site:**

### **Remote Gate Valves control system VHF**

**161 MHz**

**157 MHz**

### **Mobile VHF**

**Mobile repeater sites: Roundtop Mountain,  
Glennallen and Stuck Mountain.**

**152 MHz**

**153 MHz**

**158 MHz**

### **Mobile UHF**

**Pump Station 11**

**451 MHz**

**456 MHz**

### **Air/Ground VHF**

**Gulkana Airport**

**122 MHz**

### **Intrusion Microwave**

**Gulkana River Crossing**

**Tazlina River Crossing**

**10.512 GHz**

**10.525 GH**

### **Video Surveillance Microwave**

**Gulkana River Crossing**

**Gakona**

**Glennallen**

**957 MHz**

**6.745 GHz**

**4.14-69  
p. 12-84**





U.S. Department  
of Transportation  
Federal Aviation  
Administration

Alaskan Region

222 W. 7th Avenue #14  
Anchorage, Alaska  
99513-7587

RECEIVED  
22 April 93

APR 20 1993

Mr. John Heckscher  
PL/GPIA  
Hanscom AFB, MA 01731-5000

Dear Mr. Heckscher:

We are submitting the following comments to the Draft Environmental Impact Statement Proposed High Frequency Active Auroral Research Program dated February 1993.

We have several concerns with the referenced document as written:

Threshold Used to Establish Safe Exposure Levels. The study indicates that the "operation of IRI and ISR, whether separately or simultaneously, could result in some potential hazards to aircraft avionics" (page 4-54). To keep aircraft away from the hazardous area, the study states that, "pilots will be warned to avoid flying within 9,000 feet of the IRI and below an altitude of 16,000 feet," and to "avoid flying within 2,500 feet of the ISR and below an altitude of 4,000 feet." Presumably, the study is talking about establishing a restricted area. As further protection, the study states that the HAARP will employ an "aircraft detection and tracking radar. When this radar detects aircraft on a track that would carry them through the warning area, the radar will automatically turn off the HAARP emitters."

Our concern is that the study does not indicate what threshold was used to define the "hazardous" area around the HAARP transmitters. At a meeting on April 5, 1993, several of the technical experts who helped prepare the draft document met with FAA personnel to answer questions about the study. (Attached is a list of attendees at that meeting.) When asked what threshold values were used to establish the hazardous area, we were given the value 115 volts per meter. Apparently that comes from a newly-established government standard for avionics manufacturers. In the future, all avionics equipment must be protected to withstand radio interference to a level of 115 volts per meter. We expressed our concern at the meeting that the new standard has just recently been established; there were no standards in place when most of the in-use avionics equipment was manufactured. No one could tell us what values would be safe for older equipment. If there are no established guidelines, we recommend that a study be conducted to establish them.

4.8-25

p. 12-50

Restricted Area/Controlled Firing Area. As discussed above, your study indicates that pilots will be warned to stay away from the hazardous area. Presumably, this is referring to the establishment of a restricted area,

4.8-26

↓ p. 12-51

similar to the one established to protect pilots from the Ballistic Missile Early Warning System (BMEWS) radar operating at Clear Air Force Station, Alaska. Restricted areas are established through a formal rule-making process that involves public notices and requests for comments. The flying public would strongly object to a new restricted area at Gakona, or an expansion of the existing restricted area at Clear, if it interfered with the use of heavily used visual flight rules (VFR) flyways or established instrument airways. The Glenn and Richardson highways, which pass very close to the two proposed sites, serve as the ground reference point for two of the busiest VFR flyways in Alaska.

Depending on the siting of the IRI and ISR antennas, a restricted area with a 9,000 foot radius and extending up to 16,000 feet, would interfere to varying degrees with existing airways and VFR flyways. If the protected area had to be increased because incorrect threshold levels were used in the study, as we suggested above, then the impact on current routes would be even greater.

Another option would be to establish a controlled firing area. But that would require that the using agency guarantee that HAARP operations would be halted immediately if an aircraft got near the hazardous area around the antennas. Normally, this requires ground and airborne spotters. The study indicated that HAARP will employ an "aircraft detection and tracking radar," that will automatically shut down the HAARP emitters when an aircraft approaches. Our concern is that radar by itself would not detect low-flying VFR aircraft that are flying adjacent to the highway. Your study indicated that ceilings below 3,000 feet are common in the Gakona and Clear areas, which would force VFR aircraft to fly at low levels, possibly below the detection level of the radar. If it is determined that a radar will not guarantee that low-flying aircraft will be detected, then ground and/or airborne spotters would be required. If that were the case, then the HAARP could only be used during daylight hours.

4.8-27  
p. 12-50

Aircraft Accidents Involving High-powered Transmissions. Mr. Robert Wilson, of our Airway Facilities Division, has informed us that there have been several accidents caused by aircraft flying close to high-powered HF antennas, most notably two Army helicopters that flew into the ground after flying over Voice of America antennas in Europe. The aircraft were flying nap of the earth using on-board automation systems, when radio interference from the antennas caused their systems to malfunction. Mr. Wilson also indicated that several accidents and incidents in the U.S. were attributed to radio interference (see attached briefing sheet by Mr. Wilson). The next draft of your study should address the causes of those accidents. I'm sure the accidents generated a lot of studies and investigations. A review of that data could possibly help us determine the potential hazards associated with the HAARP system.

4.14-71  
p. 12-90

Potential Frequency Problems Not Covered in the Study. Attached is a memorandum from Dennis Powell, the manager of the Alaskan Region Telecommunications & Spectrum Engineering Branch, AAL-480, that describes some frequency ranges used by the FAA that are not addressed by the study. This includes the UHF radio band from 960 MHz to 1215 MHz (the Gulkana and Nenana TACANs operate on frequencies 1192 MHz and 1190 MHz, respectively), the VOR

4.14-72  
p. 12-96



spectrum from 108 to 117.95 MHz, the ADF spectrum from 190 kHz to 535 kHz (the Gulkana Non-Directional Beacon [NDB] operates on 248 kHz and the Nenana NDB on 525 kHz), and the Mobile VHF radio band between 45 MHz to 175 MHz (both the Gulkana and Nenana areas will have FAA mobile radios operating on frequencies between 166.175 MHz and 172.4375 MHz). Mr. Powell also had a concern that the study did not adequately address the full impact that the HAARP would have on LORAN C navigation systems. Both the memorandum by Mr. Powell and the briefing sheet from Mr. Wilson express a concern that the HAARP will produce a phenomenon called the "Luxembourg Effect". This effect causes the ionosphere to become a nonlinear reflector, which could cause interference on low frequency navigation aids, such as NDBs and LORAN C.

Hazard from LIDAR. Mr. Wilson's briefing sheet also mentions a possible hazard with the LIDAR (power optical transmitter, light radar) that could cause blindness if pilots should happen to look into the generally invisible beams. That possibility is not discussed in the study.

4.13-19  
p. 12-63

Possible Impact on Satellite Communications. The Alaskan Region is installing an FAA-owned satellite system that will provide communications throughout Alaska, including the Nenana and Gulkana areas. Our Telecommunications & Spectrum Engineering Branch, AAL-480, has advised us that the ionosphere disturbances created by the HAARP could adversely affect those satellite communications. That possibility should also be addressed in the study.

4.14-73  
p. 12-77

Public Concern About the Project. We have already received a number of calls from the public expressing concerns about the proposed project. Attached is a letter from Mr. Eric Nashlund that expresses his concern that the environmental impact study understates the hazards to aircraft and waterfowl.

If you have any questions, please contact Trent Cummings, AAL-530, at 907/271-5470.

  
Henry A. Elias

Attachments

cc: AAL-1, AAL-480, AAL-460, ATM-400, AAL-400, AAL-200, ASM-500, ASM 510, ATP-100

ATTENDEE LIST FOR HAARP PLANNING MEETING WITH FAA  
APRIL 5, 1993

| Name           | Organization              | Phone Number |
|----------------|---------------------------|--------------|
| Paul Valihura  | Holmes & Narver, Inc      | 617-377-3141 |
| John Rasmussem | Air Force Phillips Lab    | 617-377-2458 |
| Joseph Rollins | FAA Air Traffic Division  | 907-269-1107 |
| Trent Cummings | FAA Air Traffic Division  | 907-271-5470 |
| Jim Tvrdy      | FAA Frequency Management  | 907-243-4399 |
| Calvin Hoggard | FAA Spectrum Management   | 907-271-5328 |
| Ed Kennedy     | Naval Research Lab        | 202-767-2761 |
| Arnold Snyder  | The MITRE Corporation     | 617-377-2892 |
| Guy McConnell  | Alaska Corps of Engineers | 907-753-2614 |
| Jim Hostman    | 11th Air Force/D00Q       | 907-552-4151 |
| John Schommer  | FAA Air Traffic Division  | 907-271-5903 |
| Robert Wilson  | FAA Airway Facilities     | 907-271-5304 |

**SUBJECT:** Gleavatt high frequency experiment in Alaska

**BACKGROUND:** An extremely high power long term transmitter experiment (HAARP) may be set up at Gakona or Clear, Alaska. It has potential to jam most aircraft electronics in many ways. Comments are required by April 25, 1993. Ref: John Heckscher, PI/GPIA, Hanscom AFB, MA 01731-5000. Public Hearing, Glennallen High School, Tuesday, April 6, 1993, 7 PM.

A transmitter operating between 2.78 to 10.0 MHz with a power level of over 1,000 Megawatts will radiate vertically with a 60 degree wide beam.

A second transmitter will operate between 1.0 to 15.0 MHz at a "lower level".

A third transmitter will transmit in the 440-450 MHz band from Bear Creek (which Bear Creek is not specified).

A forth super power optical transmitter (LIDAR, light radar) would be located somewhere in Alaska.

**COMMENTS:** All of these devices have caused known and documented deadly and problem situations elsewhere in the world. It is believed that the stimulated atmospheric ionization experiment causes a noteworthy navigational hazard to all aircraft operating between Anchorage and Fairbanks, certain high level transpacific aircraft, aircraft operating common routes between Anchorage and the Canadian border, and aircraft operating in the Fairbanks local area.

1) Such radio signal intensities have jammed "fly by wire" helicopters with loss of life near Munich, Germany and caused recorded crashes of several computer mediated U.S. aircraft.

4.14-74  
p. 12-90

2) It is well known that this intensity of signal will cause Radio Frequency Interference (RFI) in all sorts of normal aircraft control and navigational equipment. High frequency RFI has potential to jam any sort of aircraft electronics.

4.14-75  
p. 12-90

3) Signals of this intensity will cause the well documented "Luxembourg Effect". This effect causes the ionosphere to become a non-linear reflector. Subsequently HAARP signals will be modulated onto all Non Directional Beacon (NDB) signals and broadcast station signals used for navigation over a wide area.

4.14-76  
p. 12-96

4) An artificial ionosphere will be created which will disturb, or prevent, transmissions of high frequency aircraft communications and other Alaskan bush communications.

4.14-77  
p. 12-65

5) Pilots have been blinded for long time periods by similar high power laser type devices in Los Angeles and elsewhere. LIDAR is a super power laser radar system which has the potential to permanently burn the retina's of people accidentally looking into the generally invisible beam.

4.13-20  
p. 12-63

Robert Wilson  
AAL-461A  
271-5304



U.S. Department  
of Transportation  
Federal Aviation  
Administration

# Memorandum

Subject: **INFORMATION:** Comments to Draft  
Environmental Impact Statement Proposed  
High Frequency Active Auroral Research  
Program dated February 1993.

Date: APR 2 1993

From: Telecommunications & Spectrum  
Engineering Branch, AAL-480

Reply to  
Attn of:

To: System Management Branch, AAL-530  
ATTN: John Schommer, AAL-532

We offer the following comments to the referenced document.

The report does not address specific frequency interference investigations for currently operating systems. In Table 3.14-1 on pages 3-156 and 3-157 the potential off-site systems do not cover all the avionics bands that could potentially be effected by this system. Specifically the UHF radio band from 960 MHz to 1125 MHz is listed. The aeronautical UHF radio band extends from 960 MHz to 1215 MHz. Specifically the FAA operates TACAN facilities in Gulkana and Nenana outside the listed band. Gulkana TACAN operates on a center frequency 1192 MHz and Nenana TACAN operates on a center frequency of 1190 MHz. Civilian aircraft utilize the distance measuring equipment (DME) portion of the TACAN in normal VOR/DME navigation.

4.14-78  
p. 12-95  
4.14-79  
p. 12-97  
4.14-80  
p. 12-95 p. 12-97

The VOR spectrum listed covers only the 115-116 MHz portion of the band. The VOR spectrum covers 108 to 117.95 MHz. However, the VOR's located at Gulkana and Nenana do fall within the band listed. Gulkana VOR operates on a center frequency of 115.6 MHz and the Nenana VOR operates on a center frequency of 115.8 MHz.

4.14-81  
p. 12-98

The ADF receivers are potentially more susceptible to interference from the proposed HAARP emissions than other frequencies discussed above. Table 3.14-1 list ADF spectrum of consideration to be 250-400 kHz. Aeronautical ADF frequencies are distributed from 190 kHz to 535 kHz. Specifically Gulkana Non-Directional Beacon (NDB) operates on a center frequency of 248 kHz and the Nenana NDB operates on a center frequency of 525 kHz.

4.14-82  
p. 12-98  
4.14-83  
p. 12-95  
4.14-84  
p. 12-99  
4.14-85  
p. 12-99

Table 3.14-1 lists the Mobile VHF Radio band of consideration to be 45 - 161 MHz. FAA is installing VHF repeaters and base stations at most manned facilities in Alaska. Both Gulkana and Nenana will have radios installed that transmit and receive on frequencies between 166.175 MHz and 172.4375 MHz. The principal communications with these repeaters will be with mobile and hand held transceivers.

4.14-86  
p. 12-99

4.14-87  
p. 12-99

Many aircraft both private and commercial as well as some military use LORAN C (90 kHz to 110 kHz) for some phases of aircraft navigation and position verification. The impact of the HAARP on LORAN C is not discussed in any depth. Further LORAN C is not considered in Table 3.14-1 and impact to LORAN C is not listed on Tables 4.14-2 or 4.14-3.

4.14-88  
p. 12-96

The Luxemburg effect is described as a nonlinear effect in the ionosphere by which modulation on a strong carrier wave is transferred to another carrier passing through the same region. The report fails to discuss this effect as it may have been observed at other HAARP facilities and its potential impact to low frequency navigation aides, ie. ADF and LORAN C.

4.14-89  
p. 12-96

Thank you for considering our concerns about the HAARP system. Our Spectrum Manager, Calvin Hoggard, will attend your planned meeting on April 5. Please contact him at 243-7246 if you have any questions concerning this response.

  
Dennis H. Powell

15 APR 83 15 17

Federal Aviation Administration  
222 W. 7th Avenue  
Anchorage Ak. 99501

I am sincerely hoping that the FAA is taking a critical look at the auroral research project HAARP. The environmental impact study appeared to be seriously flawed in favor of the project.

My major concerns are the hazards to aircraft and migratory waterfowl. The environmental impact study (EIS) states that a Radar will be used as a fail-safe switch to disable the site if an aircraft were to stray into the 1 Gigawatt beam area. First, it has been my experience that fail-safe systems will fail. This protective system will not be tripped by migratory birds. If, the hazards to human life are so great as to warrant this safety system, obviously there is an appreciable hazard.

4.8-28  
p. 12-50

This hazard is compounded by the Gakona site, first choice, being in very close proximity to Gulkana Airport and very close to the main traffic route from Gulkana to the interior Airports of Delta and Fairbanks. Bio-hazards not with standing, the major disruption and probable damage to avionics must be considered. With today's increased aircraft traffic, communications must not be compromised to insure the safety of the flying public.

4.8-29  
p. 12-49  
4.14-90  
p. 12-65

Please consider that one of the band of frequencies that this project will use is only 1/3th of the frequency of the household microwave oven. Please consider that the effective power will be over 1.15 million times the power of an 850 watt household microwave oven. The other band of frequencies show a definite hazard to harmonic interference of aircraft radios in the VHF band. Modern design can reduce this secondary interference by 50 decibels. With 1 Gigawatt effective radiated power, this reduction will lower the harmonics and spurious emissions to about 7 Kilowatts. This is more than enough to disrupt aircraft communications especially during the periods of pulse modulation. Further, the EIS states that the secondary sidelobe radiation from the antennas will be down about 30 decibels. That still leaves a fairly respectable 1 megawatt effective radiated power.

4.14-91  
p. 12-79  
4.14-92  
p. 12-79  
4.14-93  
p. 12-79

There has been abundant amounts of legislation to protect consumers from the risk of microwave radiation. We need the same protection of the flying environment from the reckless use of this same hazard in the name of dubious research.

4.13-21  
p. 12-61

How many pilots and passengers must be exposed to this astronomical amounts of Radio Frequency radiation before we act? Please witness previous microwave accidents at Clear AFB.

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APR 16 1993

Perhaps, I am over-reacting. With the obvious hazards, I haven't been able to see the potential rewards to society in going ahead with this project. Even the EIS was pretty vague as to the value of this line of research. Please don't get me wrong, I am all for research in communications and all sciences. I am just afraid of hazards of this magnitude.

1.2-2  
p. 12-2

Your agency can consider the ANSI standards ANSI C95-1 and the NCRP report No.86 from Bethesda Md 1986 for the hazards of this magnitude of RF radiation. Other reports can be found in Bioelectromagnetics 1983;4, 1984;5, 1988;9, 1989;10.

The comment period ends the 25th of April 1993. Comments can be sent to

John Heckscher  
PL/GPIA  
Hanscom AFB, Massachusetts 01731-5000

Thank you for your time.



Eric Nashlund  
HC 60 Box 271  
Copper Center Ak. 99573





RECEIVED  
22 April 93

PUBLIC HEARING WRITTEN COMMENT SHEET

WRITTEN COMMENT SHEET

HIGH FREQUENCY ACTIVE AURORAL RESEARCH PROGRAM (HAARP)

Thank you for attending this public hearing. Our purpose for hosting this meeting is to give you an opportunity to comment on issues analyzed within the HAARP Draft Environmental Impact Statement. Please use this sheet to comment on any environmental issues that you feel should be clarified in the HAARP Final Environmental Impact Statement.

Date: April 17, 1993

I wish like to take this time  
to comment about this project. I thank the  
meeting at Anderson High School and thought  
it was presented very well to the public and  
am in full support of this project.

Name: Randall Wille

Address: Box 3046  
Anderson, AK 99744

Please hand this form in or mail to:  
Mr. John L. Heckscher  
PL/GPIA  
29 Randolph Road  
Hanscom AFB, MA 01731-3010

RECEIVED  
23 April 93

Arctic Amateur Radio Club Inc.  
P.O. Box 81389  
Fairbanks, AK 99708

April 20, 1993

Mr. John Heckscher  
PL/GPIA  
Hanscom ABF, MA 01731-5000

Dear Mr. Heckscher:

There are over 2000 licensed radio amateurs in the state of Alaska. The largest population of "hams" in the United States on a per capita basis. The Arctic Amateur radio club has been in existence in Fairbanks since 1939 and currently has about 100 members. The Federal Communication Commission licenses each of us to use radio spectrum for many uses. These range from health and welfare traffic during times of emergency (eg. The Great Alaskan Earthquake of 1964), to idle chit chat to experimentation. We use frequencies from 1.8 Mhz to 450 Mhz and some experimentation has taken us up to 10 Ghz.

4.14-94  
p. 12-65

A few examples of current organized daily activities include the Snipers net (3920 khz 6pm local), Motley Group (3933kHz 9pm local), Bush Net (7087 khz, 8pm local), Longwire Net (1847 khz, 10pm local), Alaska Pacific Net (14.292 Mhz, 8am local). We are active in Amateur Radio Emergency Service (ARES) and participate in local emergency services drills. We operated a network of six VHF/UHF voice repeaters with coverage from Tok on the east, Manley to the west, Livingood to the north and Denali Park to the south. We have plans this summer increase our coverage perhaps to the Gakona area. We also help operate a UHF amateur television repeater and a portion of the state-wide packet radio network in Fairbanks. We have numerous actives throughout the year which utilize both the HF and VHF/UHF spectra.

4.14-95  
p. 12-72

As experimenters we have observed with interest the HIPASS project. HIPASS has been a good neighbor to us. We are also interested in HAARP. We want HAARP to be a good neighbor too, but we do have some concerns.

Below are written comments concerning the Draft Environmental Impact Statement Proposed High Frequency Active Auroral Research Program February 1993, that Arctic Amateur Radio Club is concerned about:

1) The IRI could cause front end overload on amateur radios operating in adjacent HF bands, not only from the ground wave in the nearby areas of Clear or Gakona sites, but at distances on up to several hundred kilometers do to the reflected/refracted waves. Front end overload occurs when a very large signal reduces a receivers ability to distinguish small signals. Like bright lights "overload" the eyes ability to see the stars in the cities at night.

4.14-96  
p. 12-71

|   |                      |
|---|----------------------|
| P4-108 "The government is committed to achieve compatibly with the users surrounding Gakona and Clear....". Are users in Fairbanks, or while mobile on the Parks/ Tok cutoff Highways included? Who will pay for the mitigation? How many dollars are committed to achieve this compatibly? How fast will the mitigation steps be preformed? How and how fast will the appropriate hardware and procedural modifications take place? What does a user do if he/she is not satisfied with the results? | 4.14-97<br>p. 12-78  |
| 2) P4-99: DEIS states that "HAARP IRI (is) to operate on a "clear channel, noninterference basis" within specific bands of high frequency (HF) portion of the radio spectrum. .... Amateur Radio Services (i.e. Hams) ..... (frequencies) will be forbidden to HARRP IRI" It does not state the same thing for the ISR.   | 4.14-98<br>p. 12-76  |
| The ISR is to operate in the 440-450 Mhz band. The 70cm amateur band, covers 420-450 Mhz. The BEMEWS at Clear makes 420-440 Mhz nearly unusable now. It also puts specific power limitations on our operations (FCC Rules and Regulations Part 97.67 (h)(7)). The ISR would destroy the remainder of the band.  | 4.14-99<br>p. 12-88  |
| There is a repeater on Ester Dome now, in line of sight of Clear and possibly the ISR, which operates 444.8/449.8 Mhz. There is a 70cm ATV repeater on a Bender Mountain near Fairbanks. Also some operators are using this band for linking stations together and remote base operations.  | 4.14-100<br>p. 12-88 |
| 3) Page 4-100: "The IRI would have the capability to operate simultaneously on any two distinct frequencies within its operating range". There is no discussion of intermodulation distortion products created by these two simultaneous transmissions. What products would be expected? What interference would be created?  | 4.14-101<br>p. 12-76 |
| 4) Page 4-101, Table 4.14-1, Distress, Calling, and Guard Frequencies: 5167.5 khz is <u>not</u> included in the table. "This band may be used by Amateur stations in the State of Alaska or within fifty nautical miles of the State of Alaska for emergency communications....", FCC Rules and Regulations Part 97.7(d) and (g)(2).  | 4.14-102<br>p. 12-65 |
| 5) The IRI could induce unwanted currents in nearby power lines which in turn could be re-radiated and cause interference. What steps are provided to mitigate this?  | 4.14-103<br>p. 12-69 |
| 6) What will the effects be to satellites, particularly amateur radio satellites, when they cross the beam path of either IRI or the ISR. Some examples are RS10/11, Oscar 13 & Fuji. These operate HF transponders and/or 70cm band transponders.  | 4.14-104<br>p. 12-77 |
| 7) We find it disturbing that neither "Amateur Radio" nor "Hams" were included in the index. They were mentioned in the text a number of times, and could be severely impacted by HAARP.  |                      |

8) We are further disturbed that no Amateur Radio Club in the State of Alaska, The American Radio Relay League (ARRL) nor even the Federal Communication Commission (FCC) was included on the distribution list for the DEIS. It has been a hotly discussed issue in the last week since it became common knowledge in the amateur radio community.

1.3-7  
p. 12-3  
p. 12-9

We feel that these issues have not been adequately discussed within the amateur community and therefore we request that the comment period be extended.

1.3-8  
p. 12-3

Sincerely



Kevin Abnett, NL7WO, President, Arctic Amateur Radio Club

cc:

Sen. Ted Stevens, Federal Bldg, Box 4, 101 12Th Ave., 99701-6236  
Sen. Frank Murkowski, Federal Bldg, 101 12Th Ave., 99701-6236  
Rep. Don Young, Federal Bldg, 101 12Th Ave., 99701-6236  
John B. Johnston, Private Radio Bureau, Federal Communication Commission,  
2025 M St. NW room 5322, Washington DC 20554  
Ralph A. Haller, Private Radio Bureau, Federal Communication Commission,  
2025 M St. NW room 5002, Washington DC 20554  
David Sumner, Executive Vice President ARRL  
225 Main St., Newington, CT 06111  
Mary Lewis, Northwestern Division Director ARRL  
10352 Sand Point Way NE, Seattle, WA 98125  
Merle Beller, AL7LD, AARL Alaska Section Manager  
4341 Tikishla, St. Anchorage AK 99504  
President, Anchorage Amateur Radio Club, 3828 Turnagain Parkway,  
Anchorage, AK 99517  
Frederick Hoskinson, WA6AXO, President Juneau Amateur Radio Club  
Kirby Wheeler, NL7VK, President, Borealis Amateur Radio Club, POB 56859,  
NP 99705  
Christopher D. Imlay, Booth Feret Imlay, 1233 20Th St NW suite 204,  
Washington DC 20036  
Fred Brown, POB 71718, Fairbanks, AK 99707  
Helen Connor NL7DW, AARC newsletter editor  
Al Near, AL7ND, PO BOX 80847, Fairbanks, AK 99708  
Neal Laugman, NL7VL, Box 47, Healy, AK 99743  
Mike Rice AL7MI

1.3-9  
p. 12-9

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WRITTEN COMMENT SHEET

HIGH FREQUENCY ACTIVE AURORAL RESEARCH PROGRAM (HAARP)

Thank you for attending this public hearing. Our purpose for hosting this meeting is to give you an opportunity to comment on issues analyzed within the HAARP Draft Environmental Impact Statement. Please use this sheet to comment on any environmental issues that you feel should be clarified in the HAARP Final Environmental Impact Statement.

Date: 4/20/93

1. What is effect on ozone layer
2. Will the energy poured into the ionosphere have any effect on climate?
3. Have experiments already started from the GMAI site in their base

4.15-5  
p. 12-100  
4.15-6  
p. 12-101  
1.3-10  
p. 12-9

Name: A. W. Baker

Address: 1850 Fitzhugh Drive  
Fairbanks, AK 99709

WL7BFX

Please hand this form in or mail to:  
Mr. John L. Neckscher  
FL/GPIA  
29 Randolph Road  
Hanscom AFB, MA 01731-3010

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26 April 93

PUBLIC HEARING WRITTEN COMMENT SHEET

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HIGH FREQUENCY ACTIVE AURORAL RESEARCH PROGRAM (HAARP)

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Date: 4/16/93

I am very concerned about the way the report, in my opinion, glossed over the effects of EMIRFI. The use of power in the levels proposed can have devastating effects on communications — not just locally, at the site, but throughout the state of Alaska and beyond.

4.14-105  
p. 12-65

I urge that HAARP be reconsidered only after thorough study of the impact on the citizens of the state of Alaska. At a minimum HAARP should have a pilot study before launching into a 20 year program.

I also urge that the public comment period be extended.

1.3-11  
p. 12-3

Name: Bill Beach

Address: 1711 George Ball Circle

Anchorage, Alaska 99515

Please hand this form in or mail to:  
Mr. John L. Heckscher  
PL/GPIA  
29 Randolph Road  
Hanscom AFB, MA 01731-3010

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26 April 93

WRITTEN COMMENT SHEET


HIGH FREQUENCY ACTIVE AURORAL RESEARCH PROGRAM (HAARP)

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Date: \_\_\_\_\_

THE POTENTIAL DISRUPTION OF H.F.  
COMMUNICATIONS BY THIS PROGRAM IS NOT  
IN THE BEST INTEREST OF MY WIFE AND I  
WE UTILIZE H.F. FREQUENCIES FOR  
COMMUNICATIONS ON A REGULAR BASIS. WITH  
ADDITIONAL INTERFERENCE FOR THE LENGTH  
OF TIME THIS TESTING WILL TAKE IS  
NOT ACCEPTABLE. MORE TIME IS NEEDED  
TO REVIEW + RESPOND  
TO THIS PROGRAM

Name: JOHN BORG WL7 AUG  
Address: BETTY BORG WL7 AUF  
PO Box #1  
EAGLE AK 99728

 JOHN BORG  
P.O. BOX 1  
EAGLE, AK 99728-0001

Please hand this form in or mail to:  
Mr. John L. Heckscher  
PL/GPIA  
29 Randolph Road  
Hanscom AFB, MA 01731-3010

4.14-106  
p. 12-65



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GERALD R. BROOKMAN  
715 MUIR AVENUE  
KENAI, ALASKA 99611

18 April, 1993

Mr. Heckscher:

I am writing to you at this time concerning the Draft Environmental Impact Statement on the proposed high frequency active auroral research program, dated February 1993, concerning the two alternative sites near Gakona and Anderson, Alaska.

I am concerned, as a citizen concerned about the environmental impact of any project of this magnitude on the natural environment, and migratory birds, etc., and as a radio amateur (KL7CMN, Advanced class license) and short wave listener. I recognize the need for further auroral research, and would be willing to accept some interference to my reception of high frequency signals from time to time, in the interest of greater scientific knowledge of the auroral zone and of auroral activity. However, I am not sure that the benefits to be gained from this proposal would be commensurate with it's inevitable negative consequences.

4.14-107  
p. 12-65

1.2-3  
p. 12-2

If I had to cast a vote on whether this project should proceed, based on the justification I have seen for it to date, I would have to vote no. I could be convinced to vote yes, but only on the basis of further information, both on it's benefits, and on it's lack of detrimental effects. The draft environmental impact statement to which I refer, above, does not convince me that the proposed project's benefits would outweigh it's irreducible negative consequences. Therefore, I must respectfully ask that the project be terminated, or relocated to some other location, outside Alaska, where it's negative impacts might be less. The New England states might be a better location; I recall having seen a news report on an Over-The-Horizon high frequency radar site there, that was being put on a reduced operational schedule due to the end of the cold war. This suggests, to me, a better alternative. The latitude of this site might not be quite as far north as Gakona or Anderson, but it is, I believe, due to the location of the magnetic north pole, still reasonably close to the zone of maximum auroral occurrence.

1.3-12  
p. 12-7

I hope that my comments on this proposal are helpful to you. I will appreciate being kept informed on the decision made as a result of the public comment period, and the public hearings which were conducted at locations closer to the proposed alternative sites than my own. If the draft E.I.S. is modified, I would appreciate receiving a copy of the revised document, for review and comment. Thank you.

Sincerely,

*Gerald R. Brookman*

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26 April 93

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WRITTEN COMMENT SHEET

HIGH FREQUENCY ACTIVE AURORAL RESEARCH PROGRAM (HAARP)

Thank you for attending this public hearing. Our purpose for hosting this meeting is to give you an opportunity to comment on issues analyzed within the HAARP Draft Environmental Impact Statement. Please use this sheet to comment on any environmental issues that you feel should be clarified in the HAARP Final Environmental Impact Statement.

Date: 4-20-93

~~Please have more public meetings  
of information. I need to know more  
as I see it now you will wipe out  
emergency communications as well as  
ham bands not in favor of HAARP.~~

4.14-108

p. 12-65

~~Request more studies - public  
information & input.~~

1.3-13

p. 12-7

Name: \_\_\_\_\_

Address: \_\_\_\_\_

Mama (Mr. Cundy)  
16707 HILANDER ST  
EAGLE RIVER, ALASKA 99527

Please hand this form in or mail to:  
Mr. John L. Neckscher  
PL/GPIA  
29 Randolph Road  
Hanscom AFB, MA 01731-3010

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WRITTEN COMMENT SHEET

HIGH FREQUENCY ACTIVE AURORAL RESEARCH PROGRAM (HAARP)

Thank you for attending this public hearing. Our purpose for hosting this meeting is to give you an opportunity to comment on issues analyzed within the HAARP Draft Environmental Impact Statement. Please use this sheet to comment on any environmental issues that you feel should be clarified in the HAARP Final Environmental Impact Statement.

Date: 4/21/93

As an Amateur Radio Operator General Class License  
-W17BQH, I am concerned about the Hi-Frequency Active  
Auroral Research Program (HAARP) proposed for installation  
Alaska. I feel the effects of this program on H.F. mobile &  
handheld VHF-VHF should have further discussion & studies  
Especially so as there is a good chance the Sigant signals  
could completely wipe out our dipole & V antennas.

4.14-109  
p. 12-65

The "ham" in Alaska are widely spread out, many of us  
live "out in the bush". We rely on ham radio to keep in  
touch, counting on it during emergencies. It would be a  
bad day if a little (or worse) were lost because a ham in the  
bush is unable to contact another ham for help) during  
a time Sigant signals were wiping out all communication  
on our band HF frequencies. During a state wide emer-  
gency we would be helpless.

Before going forward with this program, please afford the  
the public comment period to allow further input & more  
study on the potentially devastating effects the HAARP permits  
might cause on the Electromagnetic Environment here in  
Alaska.

1.3-14  
p. 12-3

Name: Patricia A. Daft

Address: P.O. Box 274  
Willow, Alaska 99688

Please hand this form in or mail to:  
Mr. John L. Heckscher  
FL/GPIA  
29 Randolph Road  
Hanscom AFB, MA 01731-3010

PUBLIC HEARING WRITTEN COMMENT SHEET

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26 April 93

WRITTEN COMMENT SHEET

HIGH FREQUENCY ACTIVE AURORAL RESEARCH PROGRAM (HAARP)

Thank you for attending this public hearing. Our purpose for hosting this meeting is to give you an opportunity to comment on issues analyzed within the HAARP Draft Environmental Impact Statement. Please use this sheet to comment on any environmental issues that you feel should be clarified in the HAARP Final Environmental Impact Statement.

Date: April 20, 1993

Having just received this info 2  
days ago, please extend the comment  
period by 30-60 days.

But for now, I don't want any  
HAARP system implemented in this  
state. Put your money to more useful  
projects. Thank you

Name: CHRIS DYROFF

Address: 2606 McRae Rd.

ANCHORAGE, ALASKA 99517

Please hand this form in or mail to:  
Mr. John L. Neckscher  
PL/GPIA  
29 Randolph Road  
Hanscom AFB, MA 01731-3010

1.3-15  
p. 12-3

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M 26 April

United States Department of the Interior

OFFICE OF THE SECRETARY  
Office of Environmental Affairs  
1600 C Street, Room 129  
Anchorage, Alaska 99501-6126

**TELEFAX**

TO: John Heckscher  
(617) 337-3550

FROM: Paul D. Gates

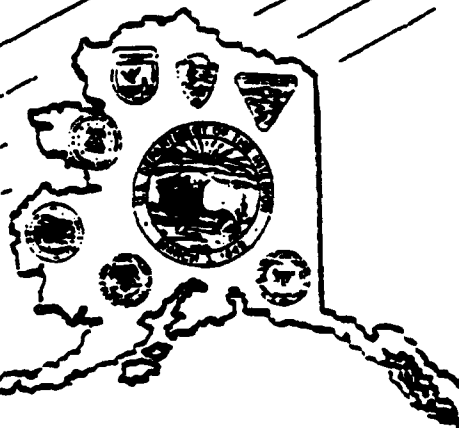
Verification Number: (907) 271-5011

Telefax Number: (907) 271-4102

Number of Pages to Follow: 4

Date: 4/26/93

Time: 12n.





## United States Department of the Interior

### OFFICE OF THE SECRETARY

Office of Environmental Affairs  
1400 C Street, Room 110  
Anchorage, Alaska 99501-6130

April 23, 1993

HR 93/0260

Mr. John Hochschoer  
PL/671A  
Nasdaq Air Force Base  
Massachusetts 01731-6000

Dear Mr. Hochschoer:

In response to your request, the Department of the Interior has reviewed the Department of the Air Force Draft Environmental Impact Statement (DEIS) for the High-Frequency Active Auroral Research Program (HFAARP) and provides the following comments.

#### General Comments

Construction of the HFAARP project, as proposed at the Saksaa site, would require 160,000 cubic yards of gravel fill. Several potential material sites were discussed in the document. Gravel extraction at site P1 could impact significant fish and wildlife habitat including areas used by bald eagles, tundra swans, and anadromous fish. The final Environmental Impact Statement (FEIS) should be expanded to address the expected impact on these resources.

We believe additional information should be provided in the FEIS regarding lighting at the facility, fencing the facility, removal of entrapped wildlife, and monitoring of project operations on wildlife populations.

We are concerned that the proposed project may have impacts on communications systems. Communication systems within the National Park and Preserves include park radio systems, park telephones, visitor information radio systems, various wildlife telemetry projects, and a new visitor transportation operation radio system. Interference with these systems could adversely affect emergency operations (emergency medical services, wildland fire response, search and rescue operations, law enforcement activities, etc.) as well as routine operations (flight following, road maintenance, visitor orientation, wildlife research, and others). These systems must be free of interference to assure public and park employee safety. Enclosed is a list of radio sites and frequencies used by the Park Service. We recommend that the FEIS address mitigation of adverse communications impacts.

The DEIS states that alternative locations were rejected because of the relative high density of people and communications systems in these locations. In locations where the density of people and communications systems are lower, it is equally if not more critical that the integrity of those systems be maintained. Peoples' lives and welfare depend on these systems and no alternative means of communications may be available to them. We suggest the FEIS further address this matter.

Radio telemetry operations are essential for monitoring wildlife populations. We understand that calculations used to determine possible effects on radio telemetry operations were based on a ground-based rather than on aerial operations. Possible interference to aerial or satellite radio telemetry

4.14-110  
p. 12-65

4.14-111  
p. 12-65

4.14-112  
p. 12-65

4.14-113  
p. 12-86

should be addressed. It is our understanding that radio frequencies can be blocked out, thus avoiding interference. If so, we recommend that the frequencies within 150-154 MHz and 163 MHz, the ranges most commonly used for radio telemetry operations, be blocked out. It is also our understanding that we could recommend periods of time (during which radio telemetry operations were critical) to shut down HARP. We request that the Department of the Interior be given the opportunity on an annual basis to identify these critical periods to assure minimal impact to critical operations.

4.14-114  
p. 12-86

The State of Alaska Scenic Travel Enhancement Program is in the process of selecting highways to be included in Alaska's Scenic Byway System. The existing 73-foot tall generator building is already a major distraction on a scenic highway offering outstanding views of the Wrangell Mountains. Since the area between the proposed ionospheric Research Instrument (IRI) site and the highway is quite open, there is a good chance that part of the antenna array will be visible from the highway, further detracting from a possible scenic byway designation for the Tok cut-off highway. We suggest that the Air Force assess alternatives which would lessen the visual impact of the antenna array.

4.12-2  
p. 12-57

We are concerned about the safety of trail users who may stop along the public trails to view the HARP facilities at the Galena site and be exposed to prolonged radio frequency radiation (RFR). We recommend the alternative of rerouting the trail as far away from the HARP facilities as possible on Air Force managed lands be addressed in the FEIS.

4.13-22  
p. 12-61

The Gulkana National Wild River ends at Sourdough. Please note this is the FEIS.

Any cut spruce or spruce slash left from site preparation could contribute to the spruce bark beetle infestation that is now extending into this area. All cut spruce or spruce slash should be buried or burned on site. We suggest the Air Force commit to this mitigation measure in the FEIS.

2.3-18  
p. 12-16

The impacts of noise to nearby recreationists as a result of generator and other machinery use should be addressed in the FEIS.

4.8-30  
p. 12-32

The DEIS includes the rerouting of a Bureau of Land Management easement through the proposed site. The Air Force should work closely with Bureau personnel from the Glennallen District in determining the new route of this easement.

4.11-5  
p. 12-56

#### Specific Comments

Section 2.1. Alternatives Identified for Further Analysis. Ionospheric Scatter Radar (ISR). The DEIS states that ISR stations may be remote from the HARP project area (off-site diagnostics); please note, however, that ISR stations may not be located on National Park and Preserve Lands.

Section 2.4.1. Birds - Galena Site. The information provided in the text on eagle nesting is not current and should be updated.

4.4-4  
p. 12-22

Section 3.10.2. Regulatory Management of Subsistence. The second full paragraph on page 3-113 fails to properly summarize existing federal and state authorities for subsistence management and should be replaced with the following language. "The subsistence program in Alaska is currently regulated by a dual system. Activities on federal public lands are regulated by the federal subsistence program pursuant to Title 8 of ANILCA. Federal lands account for approximately 65 percent of the total area of Alaska. The federal program is jointly administered by the U.S. Forest Service (36 CFR 242) and Fish and Wildlife Service (50 CFR 100). The state subsistence program is not in compliance with Title 8 of ANILCA."

Page 3

**Section 3.10.3. Gahona site.** The third paragraph on page 3-114 fails to accurately explain the federal eligibility requirements. We recommend the following language in its place. "The Copper River Basin communities are presently classified as rural under the federal subsistence program. Rural residents that comply with federal customary and traditional use determinations are eligible to participate in subsistence activities on federal public lands. In addition, National Park Service regulations govern which communities or individual residents qualify for subsistence uses within national parks and preserves."

**Section 3.11.1. Recreation - Gahona site.** The partial sentence at the top of page 3-112 should be changed to read, "... near Slane, and by the McCarthy Road off the Old Skagway Highway near Chitina."

**Figure 3.11-1, Recreation Resources in the Vicinity of the Gahona site** shows two Bureau of Land Management campsites in the vicinity of Sourdough. The campsite east of the Richardson Highway is a small, temporary campground which will be closed after the 1993 summer season. Consequently, we request that this campsite be deleted from the figure.

The third paragraph on page 3-114 should be moved to the subsistence section. The Tier II Subsistence Permit system only pertains to Alaska residents and is not considered recreational hunting. Federal subsistence hunting also occurs in this area and is regulated by the federal subsistence program.

**Section 3.4.1.4. Barrow Area.** The DEIS presented five potential material sites for the Gahona alternative. The site designated P1 appears to be the most promising source for gravel, but it also has the greatest fish and wildlife habitat values. The site lies near the braided channel of the Copper River. Gravel extraction could cause significant erosion and siltation. The area is characterized as at least 21 percent riverine, riverine emergent and scrub-shrub wetlands (page 4-10). Bald eagle nesting trees and a tundra oven nesting site have been identified within one mile of this material site. The DEIS states that in order to extract gravel from this area, it may be necessary to divert Tuloma Creek, a stream containing documented spawning and possibly rearing habitat for resident and anadromous fish. We recommend against diverting the creek due to the potential for adversely impacting spawning habitat. The P1 area provides important habitat to a wide variety of fish and wildlife, and we recommend you eliminate it from consideration.

4.5-3  
p. 12-25

**Section 4.3.1. Mammals - Gahona site - Mitigation.** The proposed project includes construction of a fence around the Ionospheric Research Instrument (IRI) array. Although a contingency plan for releasing animals is mentioned on page 4-18, no details are included. The FEIS should include a discussion of the type of fence/gate system and the likelihood of wildlife to become trapped. Such information would dictate the details of a contingency plan.

4.3-2  
p. 12-18

**Section 4.4. Birds.** We believe additional information on the effects of project lighting on birds and migration be included in the FEIS. Although the DEIS includes a thorough discussion of various species and their degree of nocturnal migration habits, we found no discussion on the method of lighting or potential impacts. Intense lighting could attract migrating birds into the antenna array, increasing the likelihood for collisions with guy wires and antenna elements. This issue is a potentially important one if the NARS project is to operate during migratory peaks.

4.4-5  
p. 12-23

**Section 4.4.1. Birds - Gahona site.** The size and extent of this facility appears to present a significant potential for bird collisions, particularly for birds migrating during bad weather or poor light. The DEIS summary states that the collision potential between the birds and the NARS equipment is considered minimal for geese, ducks, raptors, shorebirds, and passerines, and

4.4-6  
p. 12-20



Page 4

low to moderate for swans. This evaluation is at odds with Table 4.4-1, which lists the susceptibility to collisions factor as being moderate to high for half of the species groups evaluated. Consequently, we are not convinced that the risk of bird collisions is low and believe that a monitoring effort for a minimum 5-year period should be undertaken to truly evaluate the impacts of this facility on migrating birds. The monitoring effort should focus on migratory periods. The Fish and Wildlife Service would be willing to work with the Air Force in developing parameters for the program and reviewing annual reports to determine if there is a bird collision problem. If bird collisions are a problem, measures must be taken to rectify the situation.

**Section 4.11. Significance of DTH.** Experts in radio wave transmission and reception assure us that the EARS operation would have no significant adverse impacts on fish and wildlife resources. The EARS project will be the world's largest and most powerful facility of its kind and to our knowledge wildlife populations have not been monitored at other similar project sites. Since impacts may not be recognizable by laymen or even experienced biologists unfamiliar with the technology, it would be prudent to design and initiate a long-term monitoring program that would track mammal and bird populations in the immediate vicinity of the facility. Potential population characteristics for monitoring include productivity, growth, and the incidence of cancerous cell growth and genetic mutations within the populations. Resident species should be the focus of the long-term monitoring program. The Fish and Wildlife Service is available to work with Air Force technical personnel in designing such a program. This program would help settle questions regarding the impacts of this technology on wildlife populations in the area.

Of the two sites evaluated, we believe the Gakona alternative would result in the fewest conflicts, the potential for birds colliding with the antenna array is lower, and the site would be sufficiently isolated to allow a more valid monitoring program.

The DTH indicates a Corps of Engineers Section 404 permit would be required. The Fish and Wildlife Service would likely not object to issuance of this permit provided that mitigation measures outlined in the DTH and this letter are included in the final project plans and specifications.

Thank you for the opportunity to comment.

Sincerely,

  
Regional Environmental Officer  
Alaska

Enclosure

4.13-23  
p. 12-61

| NATIONAL PARK SERVICE ALASKA REGION RADIO SITES |   |                        |                       |
|---|---|------------------------|-----------------------|
| PARK  | SITE NAME<br>FREQUENCIES                              | LATITUDE/<br>LONGITUDE | STATION<br>TYPE       |
| BERING LAND<br>BRIDGE<br>NATIONAL<br>PRESERVE   | DENDELEBEN MTN.<br>TX 164.750 MHZ<br>RX 166.900 MHZ   | 65 11 46<br>164 05 15  | VHF/UHF LINK/REPEATER |
|   | MIDNIGHT MTN.<br>TX 166.825 MHZ<br>RX 168.500 MHZ     | 65 49 11<br>164 32 22  | VHF/UHF LINK/REPEATER |
|   | GRANITE MTN.<br>TX 169.550 MHZ<br>RX 170.100 MHZ      | 65 25 52<br>161 15 58  | VHF/UHF LINK/REPEATER |
| DENALI NATIONAL<br>PARK                         | DALE MTN.<br>TX 166.750 MHZ<br>RX 168.575 MHZ         | 62 23 40<br>149 45 15  | VHF REPEATER          |
|   | MT. HEALY<br>TX 166.300 MHZ<br>RX 166.300 MHZ         | 63 45 40<br>149 04 45  | VHF/UHF LINK          |
|   | THOROFARE<br>MTN.<br>TX 164.750 MHZ<br>RX 166.900 MHZ | 63 26 56<br>150 16 48  | VHF/UHF LINK/REPEATER |

4.14-115  
p. 12-86

| NATIONAL PARK SERVICE ALASKA REGION RADIO SITES |  |                       |                               |
|---|--|-----------------------|-------------------------------|
|   | WICKERSHAM<br>DOME<br>TX 166.825 MHZ<br>RX 168.500 MHZ | 63 33 10<br>150 59 00 | VHF/UFV LINK/REPEATER         |
|   | SAVAGE MTN.<br>TX 166.300 MHZ<br>RX 168.225 MHZ        | 63 44 22<br>149 17 16 | VHF REPEATER                  |
| GLACIER BAY<br>NATIONAL PARK                    | BEARTRACK POINT<br>TX 166.300 MHZ<br>RX 168.225 MHZ    | 58 37 25<br>135 53 10 | VHF REPEATER                  |
|   | POINT ALTHROP<br>TX 166.300 MHZ<br>RX 168.575 MHZ      | 59 06 55<br>138 10 41 | VHF REPEATER                  |
| KATHAI NATIONAL<br>PARK/PRESERVE                | DUMPLING MTN.<br>TX 166.300 MHZ<br>RX 168.225 MHZ      | 58 34 50<br>155 51 20 | VHF REPEATER                  |
|   | RASPBERRY MTN.<br>TX 166.825 MHZ<br>RX 168.500 MHZ     | 58 04 00<br>153 22 45 | VHF REPEATER                  |
|   | PILAR MTN.<br>TX 166.825 MHZ<br>RX 166.825 MHZ         | 57 47 24<br>152 26 00 | VHF REMOTE<br>CONTROLLED BASE |
| KENAI FJORDS<br>NATIONAL PARK                   | EXIT GLACIER<br>TX 166.825 MHZ<br>RX 168.500 MHZ       | 60 11 10<br>149 07 15 | VHF REPEATER                  |
|   | MCARTHUR PASS<br>TX 166.300 MHZ<br>RX 168.225 MHZ      | 59 28 03<br>150 21 23 | VHF REPEATER                  |

| NATIONAL PARK SERVICE ALASKA REGION RADIO SITES                  |  |                       |                        |
|--|--|-----------------------|------------------------|
|  | RUGGED ISLAND<br>TX 168.575 MHz<br>RX 166.750 MHz    | 59 51 38<br>150 21 23 | VHF/UHF LINK/REPEATER  |
|  | SEAL ROCKS<br>TX 166.750 MHz<br>RX 168.575 MHz       | 59 31 12<br>149 37 19 | VHF REPEATER           |
| KLONDIKE GOLD<br>RUSH NATIONAL<br>HISTORIC PARK                  | CHILKOOT PASS<br>TX 166.300 MHz<br>RX 166.900 MHz    | 59 41 46<br>135 15 24 | VHF REPEATER           |
| LAKE CLARK<br>NATIONAL PARK<br>AND PRESERVE                      | UPPER LAKE CLARK<br>TX 166.300 MHz<br>RX 168.225 MHz | 60 26 25<br>153 44 16 | VHF/UHF LINK, REPEATER |
|  | BOWANZA HILLS<br>TX 166.750 MHz<br>RX 168.575 MHz    | 60 49 03<br>154 22 28 | VHF/UHF LINK/REPEATER  |
| NORTHWEST AREAS<br>NATIONAL PARKS,<br>PRESERVES AND<br>MONUMENTS | MT. NOAK<br>TX 166.300 MHz<br>RX 168.225 MHz         | 67 09 55<br>163 02 50 | VHF/UHF LINK/REPEATER  |
|  | OLD MAN<br>TX 166.750 MHz<br>RX 168.575 MHz          | 67 44 30<br>159 26 55 | VHF/UHF LINK/REPEATER  |
| SITKA NATIONAL<br>HISTORIC PARK                                  | SITKA<br>TX 166.300 MHz<br>RX 166.300 MHz            | 57 03 03<br>135 19 25 | VHF BASE               |

| NATIONAL PARK SERVICE ALASKA REGION RADIO SITES |  |                       |                       |
|---|--|-----------------------|-----------------------|
| WRANGELL ST-<br>ELIAS NATIONAL<br>PARK          | TERRACE POINT<br>TX 166.750 MHZ<br>RX 168.575 MHZ      | 59 56 00<br>139 45 20 | VHF REPEATER          |
|   | ICY BAY<br>TX 168.500 MHZ<br>RX 166.825 MHZ            | 61 40 00<br>141 25 30 | VHF REPEATER          |
|   | KLAWASI<br>TX 166.750 MHZ<br>RX 168.575 MHZ            | 62 04 45<br>144 00 24 | VHF REPEATER          |
|   | COBB POINT<br>TX 168.225 MHZ<br>RX 166.300 MHZ         | 62 43 40<br>145 27 12 | VHF REPEATER          |
|   | BOYDEN HILLS<br>TX 166.300 MHZ<br>RX 168.225 MHZ       | 62 28 30<br>142 57 28 | VHF/UHF LINK/REPEATER |
|   | DECEPTION<br>HILLS<br>TX 166.300 MHZ<br>RX 168.225 MHZ | 59 06 47<br>138 10 40 | VHF/UHF LINK/REPEATER |
|   | RUCIRE MT.<br>TX 166.750 MHZ<br>RX 168.575 MHZ         | 62 03 15<br>142 11 15 | VHF/UHF LINK/REPEATER |
|   | VERDE PEAK<br>TX 166.825 MHZ<br>RX 168.500 MHZ         | 61 20 50<br>141 42 30 | VHF/UHF LINK/REPEATER |
|   | PATTY PEAK<br>TX 166.300 MHZ<br>RX 168.225 MHZ         | 61 13 35<br>143 27 15 | VHF/UHF LINK/REPEATER |



| NATIONAL PARK SERVICE ALASKA REGION RADIO SITES |   |                       |                       |
|---|---|-----------------------|-----------------------|
| YUKON-CHARLEY<br>RIVERS NATIONAL<br>PRESERVE    | HILLARD PEAK<br>REPEATER<br>TX 161.300 MHZ<br>RX 161.225 MHZ    | 64 53 35<br>141 03 40 | VHF/UHF LINK/REPEATER |
|   | TWIN MOUNTAIN<br>REPEATER<br>TX 166.750 MHZ<br>RX 168.575 MHZ   | 65 04 20<br>143 28 09 | VHF/UHF LINK/REPEATER |
|   | KATHUL MOUNTAIN<br>REPEATER<br>TX 161.750 MHZ<br>RX 161.900 MHZ | 65 36 30<br>143 26 57 | VHF/UHF LINK/REPEATER |





RECEIVED  
26 April 95

April 20, 1995

Mr. John Hesketh

We have lived here in  
Salona for 28 years. We  
would like to tell you  
we are in favor of your  
project!

People everywhere seem  
to think every thing that  
comes to their area has  
to mean millions of dollars.

I'd like to know just  
when we Americans become  
so greedy?

Welcome to Salona!!

George + Darlene

Herman

2.5 Tak Hwy.



RECEIVED  
26 April 1973

PUBLIC HEARING WRITTEN COMMENT SHEET

WRITTEN COMMENT SHEET

HIGH FREQUENCY ACTIVE AURORAL RESEARCH PROGRAM (HAARP)

Thank you for attending this public hearing. Our purpose for hosting this meeting is to give you an opportunity to comment on issues analyzed within the HAARP Draft Environmental Impact Statement. Please use this sheet to comment on any environmental issues that you feel should be clarified in the HAARP Final Environmental Impact Statement.

Date: 4/16/73

- (1) Audio noise pollution was not addressed in the D.E.I.S. I live at mile 14 Tak Cutoff and I hear the sound of the small equipment operating intermittently there now. Please design adequate mufflers or sound enclosures on your power plant.
  - (2) I believe the IRI antennas will be quite visible from the highway prior to the 73 foot building there now. It is visible from several miles off road both north and south. The trees are short & sparse between the IRI site and the highway.
  - (3) The existing pit at P-1 was opened up more than 15 years ago and is still an open scar. I don't believe that a new pit will heal over in 5 years. This site is right out on front windows.
  - (4) Right now I get excellent AM & FM radio reception and also TV reception. We would really miss these amenities, especially during the long dark winters.
  - (5) I am real concerned about the effects of more than a gigawatt of effective radiated power.
- Name: Lawrence J. Kajdan
- Address: Mile 14 Tak Cutoff, Box 243  
Gakona AK 99586

4.8-31  
p. 12-32

4.12-3  
p. 12-57

4.14-116  
p. 12-65

4.13-24  
p. 12-61

Please hand this form in or mail to: No. 14c 4/73  
Mr. John L. Heckscher  
PL/GPIA  
29 Randolph Road  
Hanscom AFB, MA 01731-3010



~~on myself~~ myself & family over a long period of time. We also use the trail through the site which would put us in close proximity to the source of all this power. It would take more than 6 minutes or even 30 minutes to get by it. What danger would we be putting ourselves in?

(6) Just how will our radio & TV interference be mitigated?

4.14-117

p. 12-78

(7) It appears that the generators will be running about 6 months per year. What will be the total duration per year of radio frequency radiation? Will the trail be closed to use during these periods of operation?

(8) What is the real purpose of this project? Is it a left over Star Wars project intended to develop a means to scramble communications or control of satellites, enemy planes or ICBM's? If it's a military weapon then it's also a military target. Not very reassuring when you live 2 miles away. Or is it worse - pure pork barrel to channel taxes to industry. Why do we really need this project when our National debt is so huge.

1.2-4

p. 12-2

(9) I support the No Action Alternative. That would be best for our community and our Nation.

Thank you for allowing me to comment.

(10) Please protect Tulsa Creek if P-1 is used. It's a very good grayling fishing stream.

Laurence J. Kujala

4.5-4

p. 12-25

PUBLIC HEARING WRITTEN COMMENT SHEET

RECEIVED  
2 April 93

WRITTEN COMMENT SHEET

HIGH FREQUENCY ACTIVE AURORAL RESEARCH PROGRAM (HAARP)

Thank you for attending this public hearing. Our purpose for hosting this meeting is to give you an opportunity to comment on issues analyzed within the HAARP Draft Environmental Impact Statement. Please use this sheet to comment on any environmental issues that you feel should be clarified in the HAARP Final Environmental Impact Statement.

Date: 4-19-93

My wife and I are both Amateur Radio operators, and also have an Alaska Private Fixed HF 558 B license. We live out in the Bush near Mt. McKinley, and rely on HF Radio Communication as our sole contact with the outside world.

Reading what I have on this project it seems that our communications will be severely disrupted at times, and will at times prevent HF communications between us and Fairbanks or Anchorage, possibly even in times of emergency.

We just found out about this recently, and strongly believe that more study is needed, and more importantly that the public comment period needs to be extended!!! Many people I know who will be affected by HAARP were unaware of it, and need to be informed.

Please extend the public comment period and conduct more impact studies, especially in the area of HF disruption in a state who relies heavily on that type of communication.

Name: Tom and Debbie Kerns AL7WK & WL7FH

Address: PO Box 240824  
Anchorage AK 99524

Please hand this form in or mail to:  
Mr. John L. Heckscher  
FL/GPIA  
29 Randolph Road  
Hanscom AFB, MA 01731-3010

4.14-118  
p. 12-65

1.3-16  
p. 12-3

P.O. Box 47  
MP 260 Parks Hwy  
Healy, AK 99743  
April 19, 1993

Mr. John L. Heckscher  
PL/GPIA  
29 Randolph Road  
Hanscom AFB, MA 01731-3010



Dear Mr. Heckscher,

By this time your office has started receiving comment sheets from Alaskan amateur radio operators voicing their concerns about the Hi-frequency Active Auroral Research Program (HAARP). In addition to the haas, most everyone I've come into contact with in the last 2 weeks has not heard of the program at all, including the homesteaders at Bear Creek, MP 269 Parks Hwy, some of whom could be "displaced" by HAARP.

My problem is a lack of accurate information about the program. The news media has now gotten the story, and facts are surfacing that seem to differ with those presented in the Draft Environmental Impact Statement. For example, in a Fairbanks newspaper article, a UAF professor was quoted as saying that HAARP power levels could go as high as 5 gigawatts; this is a slightly different figure than the 1 gigawatt figure reported by the DEIS. I'm concerned about this.

4.14-119  
p. 12-69

Also, some additional comment is needed on the system generating capabilities of ELF (Extremely Low Frequency) wave generation (regarding submerged submarine communication), and how large levels of ELF have been shown in studies to cause erratic animal behavior and herd migration problems with insects, as well as mammals.

4.13-25  
p. 12-62

And perhaps the public should also be made aware that one of the results of HAARP ionospheric heating would be the formation of plasma waves over our heads. I'm sure that fact will make people sleep much better on cold winter nights, too.

4.15-7  
p. 12-101

I am neither for nor against HAARP, and I will admit a certain technical curiosity. But right now, it scares the heck out of me. Please free me from my ignorance. Tell me how a transmitter system that you say is not nearly as powerful as the aurora, can have the power to control it or simulate it. And please tell me how, by increasing the densities of the D and E layers in the ionosphere to the levels suitable for auroral activity, HAARP operation will not degrade high angle/short skip high-frequency communications used by radio amateurs, emergency, and commercial services alike.

4.14-120  
p. 12-81

There needs to be much more discussion and disclosure of project specifics than the vague explanations offered in the DEIS. This is why I have urged all, as I urge the project operators, to PLEASE EXTEND THE PUBLIC COMMENT PERIOD.

I await your reply.

Sincerely,

Neal Laugman, NL7VL

Distribution:

US Senator Ted Stevens  
US Senator Frank Murkowski  
US Representative Don Young  
AK Senator Mike Miller  
AK Representative Jeanette James  
Alaska Sierra Club  
National Wildlife Federation, Anchorage

April 19, 1993

GP1A  
HAARP

RECEIVED  
26 April 93

Mr. Ken Vickery  
Chief, Ionospheric Effects Division  
Phillips Laboratory  
29 Randolph Road  
Hanacom Air Force Base, MA 01731-3010

Dear Mr. Vickery,

I would like to express my opposition to the High Frequency Active Auroral Research Program (HAARP) proposed for installation near either Anderson or Gakona, Alaska. When the Over-the Horizon Backscatter radar installations were canceled, I had assumed that the construction of such mega-transmitters was a thing of the past. Apparently, the project was just modified and now surfaces with VERY little publicity with plans to begin construction as early as this summer.

1.3-17  
p. 12-3

I suppose that in the name of national defense, I would have a hard time opposing an installation such as the Backscatter Radar, given the world political situation at the time it was proposed, however there would seem to be no such compelling rational behind HAARP. At a time when studies are underway to determine the health hazards of high voltage power lines it would not seem wise to install mega-watt transmitters anywhere. In addition, since the antenna configuration would form a beam antenna, the resulting signal in the vertical is expected to exceed a billion watts. The resulting potential for health risks, risks to aviation, risks to wildlife, and the potential for disruption of communications of all types is simply too great to offset any possible benefit to either defense or auroral science. It is beyond me why such an expenditure is even seriously considered. I DO NOT WANT MY TAX MONEY SPENT ON SUCH A PROJECT!

4.13-26  
p. 12-60

4.14-121  
p. 12-90

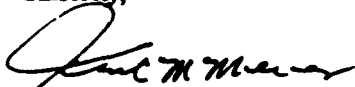
4.13-27  
p. 12-61

4.14-122  
p. 12-65

Please register my OPPOSITION to the HAARP project!

Thank you for considering my opinion.

Sincerely,



Jack M. Mercer  
490 Valley View Drive  
Fairbanks, AK 99712

PUBLIC HEARING WRITTEN COMMENT SHEET

RECEIVED  
26 April 93

WRITTEN COMMENT SHEET

HIGH FREQUENCY ACTIVE AURORAL RESEARCH PROGRAM (HAARP)

Thank you for attending this public hearing. Our purpose for hosting this meeting is to give you an opportunity to comment on issues analyzed within the HAARP Draft Environmental Impact Statement. Please use this sheet to comment on any environmental issues that you feel should be clarified in the HAARP Final Environmental Impact Statement.

Date: 4/21/93

Notice of this program was not well publicized and many people who it could affect have not been given the chance to review and respond. As indicated on the back of this sheet an extension of the comment and review periods seems appropriate.

1.3-18  
p. 12-3

I am an fly-in camp at Mendenhall Lake, north of Fairbanks. I rely on HF radio as my only means of communication. I am that location and am concerned that this research transmitter will disrupt HF radio for me. This could pose a life threatening situation.

4.14-123  
p. 12-65

Also, I notice in the EIS that VHF radio reception in the Denali area will be affected to a radius of some 50 miles. I am in this area and with communication and navigation aids located at the Fairbanks airport.

4.14-124  
p. 12-97

What about aircraft using GPS navigation in the area?

I think that the questions regarding these concerns must be addressed before proceeding with the project.

Sincerely, - - - Albert L. Near

Name: AL NEAR

Address: PO Box 80847  
FAIRBANKS, AK 99708

Please hand this form in or mail to:  
Mr. John L. Neckscher  
FL/GPIA  
29 Randolph Road  
Hanscom AFB, MA 01731-3010

16 March 1993

RECEIVED  
26 Apr 1993

Mr. John Hecksher  
PL/GPIA  
Hanscom AFB, Ma 01731-5000

Reference: HAARP

Sir,

I request your consideration of delay of the HAARP program until further information is available to professionals and the general public.

1.3-19  
p. 12-3

A similar program was used in Colorado during the 1960s. Although the tests were for different reasons, that program also utilized extremely high power rf transmitters. The results were disastrous for the high frequency spectrum causing blackouts for the entire period of the transmissions.

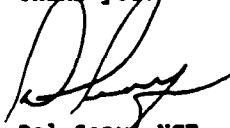
Alaska is unique in as much as the frequency bands involved in the HAARP project are used for bush communications, both routine and emergency in nature. If the information I have is correct, the hf bands could be unusable for 5 months out of the year. This is not acceptable to any sensible person.

4.14-125  
p. 12-65

While we sympathize with the scientific data that would be gained, the costs are far too great.

I am hoping that this project will be delayed without intervention from higher authorities, but rest assured, all steps necessary will be taken to protect our high frequency spectrum in Alaska.

Thank you.



Del Seay, NCE  
8425 Jupiter  
Anchorage, Ak 99507

RECEIVED

APR 26 1993

# STATE OF ALASKA

DEPARTMENT OF NATURAL RESOURCES

DIVISION OF LAND

WALTER J. HICKEL, GOVERNOR

NORTHERN REGION  
3700 AIRPORT WAY  
FAIRBANKS, ALASKA 99709-4800  
PHONE: (907) 451-2700

April 23, 1993

John Heckacher  
PL/GPIA  
Hanscom AFB, MA 01731-5000

Re: DEIS - High-frequency Active Auroral Research Program (HAARP)

Dear Mr. Heckacher:

On April 8, 1993, Bob Craig, of this office, attended the HAARP Environmental Impact Statement Resource Agency Meeting held at the Division of Land, Northern Regional Office. At that meeting, Mr. Craig brought to your attention concerns regarding the location of the ISR and VIS units at the Clear AFS site.

Figure 3.1-1 on Page 3-7 of the DEIS shows homesteading claims at the Bear Creek location. The approximate location of the site is within Section 11, Township 9 South, Range 9 West, Fairbanks Meridian, and contains a portion of the Healy Homestead Area (#10054) which was opened to homesteading in 1984, and closed in 1989. The State also has a "Bear Creek Homestead Area", which, referring to your caption of Figure 3.1-1, was thought to be the subject homestead area. I recommend you specify the "Healy Homestead Area" within the accompanying text and caption to Figure 3.1-1.

As you indicate on Figure 3.1-1, there are several conflicts with homesteads in the immediate vicinity of the ISR and VIS units, which are of major concern to the State. There is also a conflict with an active material site, which is currently under contract to the State of Alaska Department of Transportation and Public Facilities (DOT/PF).

The following active permits/contracts are in conflict with the proposed site in the Healy Homestead Area:

|            |   |
|------------|---|
| ADL 24846  | Material Sale Contract to DOT/PF          |
| ADL 413360 | Patented Homestead to Kerla S. Barricklow |
| ADL 413780 | Homestead contract to Christopher Frey    |
| ADL 414151 | Homestead permit to Lynda McRee           |
| ADL 414282 | Homestead permit to Mary Bodde            |
| ADL 414282 | Homestead permit to Joseph Saunders       |

I have enclosed for your reference a copy of the Land Abstract for Section 11, Township 9 South, Range 9 West, Fairbanks Meridian, which indicates the names, addresses and current easelle status of the permit/contract holders mentioned above. Also enclosed for your reference is a current state Status Plat of the subject area. The subject area has been enlarged and potential conflicts have been highlighted in blue.

Also enclosed is a Supplemental Status Plat for Sections 14, 15, 22 and 23, Township 9 South, Range 9 West, Fairbanks Meridian. Within Section 14, just south of the proposed site, there is a 112 acre parcel of unappropriated State land, designated as Tract A. There are no third-party interests on the site, except for a 10 foot right-of-way permit application (ADL 412335). This application is for access to a homestead site that has been closed. As the homestead easelle has been closed, this right-of-way is no longer needed and

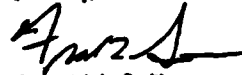
2.3-19  
p. 12-16

John Heckacher  
April 23, 1993  
Page 2

will also be closed. We recommend that you consider this site as an alternative to the current site within Section 11. ↑

Thank you for the opportunity to comment on the proposed DEIS. Should you have any questions or need further information, please contact Bob Craig or Susan Melan at 451-2700.

Sincerely,



Frederick L. Smith  
Regional Manager





U.S. Department  
of Transportation  
Federal Aviation  
Administration

Alaskan Region



222 W. 7th Avenue #14  
Anchorage, Alaska  
99513-7587

APR 23 1993

Mr. John Heckscher  
FL/GFIA  
U.S. Air Force  
Hanscom AFB, MA 01731-5000

Dear Mr. Heckscher:

We have completed our review of the Draft Environmental Impact Statement (DEIS) developed for the proposed High Frequency Active Auroral Research Program (HAARP) program. We have many unanswered concerns relative to electromagnetic and radio frequency interference impacts on Federal Aviation Administration (FAA) navigational aids, the users, and their radio equipment. The following is provided for your consideration.

The Gulkana Airport is owned by the State of Alaska, Department of Transportation and Public Facilities (DOTPF), Northern Region. There are approximately 67 aircraft based at the airport. The airport has been improved over the years through the various Federal Airport Grant Programs administered by the FAA. The airport has one 5,000 foot paved runway, capable of supporting C-130 aircraft used in forest fire suppression support, as well as a VOR which provides enroute aid and terminal approaches.

The Clear Airport, discussed on page 3-89, is also owned by the State of Alaska, DOTPF, Northern Region. It has approximately 17 based aircraft, and the airport sponsor has plans on file to improve the airport by means of the federal Airport Improvement Program (AIP). The Clear IRI site is located 3,300 feet southwest of the Clear Airport. Since the critical area radius of the IRI is 2,500 feet, the edge of the critical area would only be approximately 800 feet from the threshold of runway 19. The minimum traffic pattern airspace required to accommodate arrival and departure operations is 1 nautical mile. Thus, the statement on page 4-54, "[a]dditional restrictions on aircraft operations at the airstrip would not be necessary," is incorrect. There would be no method to allow departures from runway 19, or arrivals to runway 1, and avoid the restricted area around the IRI. This would effectively cause Clear Airport to cease being a viable airport, and could actually necessitate its relocation.

The bioeffects of RFR presented in 3.13 identifies five groups with established standards of human exposure to the radio band mentioned. However, only the nonmedical or electronic engineers standard is shown in detail. The other standards should also be presented in equal detail. Further, the bioeffects of the radio frequency transmissions are denied

4.8-32  
p. 12-52

4.13-28  
p. 12-60

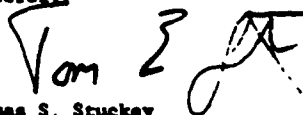
outside of the exclusion fence. In short, what is the human impact if an aircraft inadvertently intrudes in to the critical area, particularly if the radar does not automatically turn off the HAARP emitters? What are the human exposure levels and what are their durational limits? In addition, we found no discussion on a backup aircraft detection and tracking radar that would automatically cue the HAARP emitters and shut them down, if the primary radar failed. Is there a backup system, and if so, what is it?

What is the basis for the critical impact (safety) areas supporting the IRI and ISR facilities? Is it based on human safety or electronic equipment interference? What is the impact on equipment if the critical area is penetrated? What happens to the equipment, if impacted? Is that impact strictly interference or can equipment damage result, particularly in older equipment that may not be adequately shielded? Can emitter energy electronically follow transmitted Nav-Aid energy back to the Nav-Aid, thereby causing some level of damage?

In summary, the document identifies the emitted radiation (energy) as "potentially hazardous" to GPS, VHF, UHF, VHF (VOR receiver), Loran, and ADF. Yet, there is nothing in the document to indicate or define what those potential hazards are to the equipment or what, if any, the impacts of human exposure are to that energy.

In the interest of providing a timely response based on the Alaskan Region's receipt of the DEIS document, we are also attaching comments from the Alaskan Region Airway Facilities environmental engineers.

Sincerely,



Thomas S. Stuckey  
Manager, Flight Standards Division

Attachment

cc:  
AAL-1  
AAL-400  
AAL-500  
AAL-600  
ASH-500

4.14-126  
p. 12-93  
4.14-127  
p. 12-94  
4.14-128  
p. 12-95  
4.13-29  
p. 12-61

|                 |   |
|-----------------|---|
| SPEED MEMO      | DATE<br>April 21, 1993  |
| TO:<br>AAL-612B | ORIGINATOR SIGNATURE<br><i>Henry F. Cord</i>                                  |
|                 | TITLE                      ROUTING<br>Environmental<br>Engineer      AAL-450F |

**SUBJECT:**

Comments, Draft EIS, High Frequency Active Aurora Research Program (HAARP)

**INITIAL MESSAGE:**

Attached are our comments on the above referenced project. Request you incorporate them with your comments and those recently delivered from Flight Standards Division by Jim Perham. Apparently, Air Traffic Division has already sent their comments to Mr. Heckscher at Hanscom AFB, MA. I think it is important that FAA respond to this matter from a central point of contact. Thanks.

If you have any questions on this matter, please give me a call at 2893.

**REPLY MESSAGE:**

|       |                                    |
|-------|------------------------------------|
| FROM: | DATE                               |
|       | ORIGINATOR SIGNATURE               |
|       | TITLE                      ROUTING |

## **ALASKA BRIEFING SHEET**

### **SUBJECT:**

- o The impact of the proposed High-frequency Active Auroral Research Program (HAARP) on Alaskan air travel.

### **BACKGROUND:**

- o The Department of the Air Force, with cooperation from the Department of the Navy, is proposing to construct and operate a facility at either Clear Air Force Station, or at Gakona near Gulkana.
- o This facility plans to conduct ionospheric research with the aid of a series of radars operating in the 3 to 450 MHz range, and which will be emitting nearly one billion watts (1 GW).
- o A Draft Environmental Impact Statement (DEIS) has been released for comment.

### **STATUS:**

- o I have reviewed the comments of Robert Wilson, AAL-461A, and another briefing sheet.

### **COMMENTS:**

- o The DEIS devotes much space to the consequences and mitigation of such things as vegetative loss, and socioeconomic and recreational factors.
- o The impact on radio-frequency equipment is summarized by listing the affected systems (including VHF and UHF radios), and then stating, "[t]he exact impact and the extent of the area impacted is difficult to predict..." The summary goes on to state that these impacts would be "mitigatable."
- o Off-site diagnostic equipment, including HF/VHF radar, was "not evaluated in detail" since locations for this equipment have not been determined, and because this equipment is "not required for basic HAARP operation."

1.3-20  
p. 12-8

- o Any bioeffects of the radio-frequency transmissions are denied outside the exclusion fence. Research suggesting the contrary is dismissed as "not universally accepted" by the research community, and the potential effects on pilots are neither summarized nor referenced. | 4.13-30  
p. 12-60
- o Five groups which establish standards of human exposure, including pilots, to the radio band are mentioned. But only one standard for this biological effect is shown in detail, that of the electronics engineers. | 4.13-31  
p. 12-60
- o The section on the electromagnetic environment and radio frequency interference lists the primary man-made contributors of noise at the Gakona site are the Alascom tower and vehicles on the Tok Cut-Off highway. The Clear site has the additional source of the Ballistic Missile Early Warning System (BMEWS). No mention is made of the possible interference with Mobile Communications services, which includes aircraft, and no plans for mitigation are suggested. | 4.14-129  
p. 12-78
- o Aircraft are explicitly mentioned only on page 3-154, and no mitigation of any effects is mentioned.
- o The hazards to navigation posed by this equipment to aircraft in other parts of the world have been summarized by Robert Wilson in his briefing sheet.

#### CONCLUSIONS:

- o The HAARP DEIS is woefully incomplete regarding the impacts on the Federal Aviation Administration's monitoring and communication equipment, and on the flying public. | 4.14-130  
p. 12-90
- o The hazards mentioned by Robert Wilson should be addressed.
- o Whether the impacts on radio equipment are "mitigatable" remains to be shown, since the impacts and extents of the impacts are not currently known. | 4.14-131  
p. 12-78
- o The off-site diagnostics equipment, while not basic to the program, are important, and should be included in the DEIS so that the impacts may be known. | 1.3-21  
p. 12-8
- o Since aircraft pilots and passengers will be flying through the area, the conclusions of all research into the biological effects of the radio-frequency transmissions should be presented, together with reasons for acceptance or dismissal. | 1.3-22  
p. 12-7

- o For the same reason, all the standards and guidelines for human exposure to radio frequencies should be presented, and should not be limited to those from non-medical professionals.

4.13-32  
p. 12-60

*Steve Wilson*

Stephen J. Wilson, PhD  
AAL-452T/AAL452/AAL-450/AAL-400  
15 April, 1993

RECEIVED  
26 April 93

PUBLIC HEARING WRITTEN COMMENT SHEET

WRITTEN COMMENT SHEET

HIGH FREQUENCY ACTIVE AURORAL RESEARCH PROGRAM (HAARP)

Thank you for attending this public hearing. Our purpose for hosting this meeting is to give you an opportunity to comment on issues analyzed within the HAARP Draft Environmental Impact Statement. Please use this sheet to comment on any environmental issues that you feel should be clarified in the HAARP Final Environmental Impact Statement.

Date: 20 April 93

I urge the extension of the comment  
period as many private and public radio  
communication users have not had a chance  
to evaluate this project.

1.3-23  
p. 12-3

More information is necessary to understand  
the impact of HAARP on this heavily  
used communications medium in Alaska.

4.14-132  
p. 12-65

Human and animal exposure to the  
high-power signals coupled with  
disrupted ionospheric reflection properties  
are some of the concerns we have.

4.13-33  
p. 12-61

Name: C. Zickuhr Clare Zickuhr  
Address: 5316 Shorecrest Dr.  
Anchorage, AK 99515

Please hand this form in or mail to:  
Mr. John L. Heckscher  
FL/GPIA  
29 Randolph Road  
Hanscom AFB, MA 01731-3010

April 21, 1993

RECEIVED  
27 April 93

Mr. John L. Heckscher  
PL/GPIA  
29 Randolph Road  
Hanscom AFB, MA 01731-3010

Dear Mr. Heckscher,

I am writing you concerning the proposed High Frequency Auroral Research Program (HAARP), with suggested siting at either Clear AFB/Bear Creek, Alaska, or Gakona, Alaska.

Our family's permanent residence is located in Ferry, at approx. mile 260 Parks highway. We rely heavily on electromagnetic wave propagation for communications, as do many other families in this area. . We are concerned that the research project proposed will interfere with CB radio, ham radio, radiotelephone, AM, FM, and VHF and UHF TV signals, all vital links to the outside world in our remote rural lifestyle. In addition, my job requires frequent operations of an aircraft in and out of Clear Air Force Base, and associated frequent communications with the FAA in Nenana and Fairbanks on VHF aircraft frequencies. These communications are vital for safety as I pursue my official duties.

4.14-133  
p. 12-65

It is a common misperception of people not familiar with the Tri-Valley area that the area is "empty and basically deserted." This is NOT the case. There are hundreds of families in the area who rely exclusively on various radio links to the outside world, families whose quality of life would be disastrously affected by radio interference. Any research project must ensure that such interference does not occur or, if that is not possible, must be relocated to a more remote site.

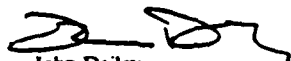
4.14-134  
p. 12-65

I urgently request that more time be allowed for study and review of the possibly serious communications problems that might be caused by the HAARP emitters, that questionnaires be circulated to those who will be potentially affected, that more local meetings be held, and technical issues be dealt with more completely. If these issues are not dealt with to our satisfaction, it is the general sense of the neighborhood that legal remedy must be sought.

1.3-24  
p. 12-7

Thank you for your consideration.

Sincerely,

  
John Dailey  
HC1 Box 3102A  
Healy, AK 99743-9604



# STATE OF ALASKA

## ALASKA DEPARTMENT OF FISH AND GAME

April 22, 1993

DIVISION OF SUBSISTENCE

WALTER J. HICKEL, GOVERNOR

1300 COLLEGE ROAD  
FAIRBANKS, ALASKA 99701-1599  
PHONE: (907) 452-1531 ext. 256  
FAX: (907) 456-3081

Mr. John Heckscher  
FL/GPIA  
Hanscom AFB, MA 01731-5000



Dear Mr. Heckscher:

We have reviewed the draft EIS for the Proposed High Frequency Active Auroral Research Program dated February 1993, and wish to submit the following comments regarding the sections of the plan addressing subsistence.

The draft EIS reviews selected information describing subsistence activities in the vicinity of the Clear and Gakona sites, but does not thoroughly assess the possible effects of the project on local subsistence patterns. For example, available maps depicting subsistence activities conducted in and near the proposed facility sites and potential gravel locations are not presented to affirm the subsistence land use patterns of local communities.

4.10-1  
p. 12-54

The third paragraph on page 3-114 incorrectly links Wrangell-St. Elias National Park resident zone communities to eligibility for subsistence activities in the Wrangell-St. Elias National Preserve. Conducting subsistence activities in the park preserves currently is not restricted only to members of resident zone communities.

Section 3.11 discusses recreational activities in the vicinity of the Gakona and Clear sites. Much of what is discussed should at least be referenced in the subsistence section of the EIS. For example, the Tier II caribou hunt is properly cited as not being a recreational activity but still is presented in the recreation section. Similarly, big game hunting regulations for the Gakona site presented in Table 3.11-1 also apply in part to subsistence hunters. This table would be most accurate if the state and federal regulations both were cited. The EIS also should note that harvest regulations are subject to change from year to year; consequently, readers should not assume that regulations discussed in the EIS are accurate and up to date.

4.10-2  
p. 12-54

At page 3-118, the EIS refers to the boom-and-bust economic pattern as being commonplace in the areas surrounding the proposed HAARP sites. An excellent reference for looking at the socioeconomic and cultural impacts of the Trans-Alaska Oil Pipeline System project on Alaska Natives in the Copper River Basin is:

Reckord, Holly, 1979. A Case Study of Copper Center, Alaska. Alaska OCS Socioeconomic Studies Program, Technical Report No. 7. U.S. Bureau of Land Management, Anchorage.

April 22, 1993

The .EIS discusses very generally the current state and federal subsistence regulatory management programs. A few points of clarification are in order. The second full paragraph on page 3-113 states in part, "Activities on federal lands, non-navigable waters on federal lands, and unconveyed Native allotments are regulated by the federal subsistence program." In fact, the federal government manages only subsistence activities on federal public lands. Thus, a detailed map depicting land status in the vicinity of HAARP sites would be instructive and would facilitate an assessment of existing regulations in the context of the proposed project.

4.10-3  
p. 12-54

The EIS does not consider the possible displacement of subsistence users from the facility sites to be a substantive impact (e.g., page 4-64). The analysis presented is insufficient to support such a conclusion. Although a relatively small area is involved and a limited number of households conduct subsistence activities in or near the various HAARP sites, the EIS does not discuss whether viable alternative subsistence harvest areas are available to these individuals and families that will be directly affected. Similar concern was raised by Copper River Basin residents during the planning phase of the proposed OTH-Backscatter project--that is, hunters and trappers displaced from Backscatter sites displace other local hunters and trappers if they moved their activities to alternative areas. In some instances, doing so would not be in keeping with traditional norms governing land use.

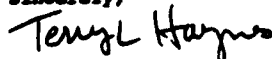
4.10-4  
p. 12-54

We support the policy calling for utilization of "local labor resources to the greatest extent possible" (page 4-68), and agree that such a policy would reduce the influx of newcomers to the region in which the HAARP facilities are constructed. Will contractors be held to this policy? Non-local contractors often utilize their own work crews and rely less on local residents. If specialized training is needed to enable local residents to qualify for construction and operational positions, will it be provided in timely fashion? These are important matters that must be addressed sufficiently in advance of the project, if local residents are to be the beneficiaries.

4.8-33  
p. 12-274.8-34  
p. 12-27

This concludes our comments. Thank you for providing an opportunity to review this EIS. If you have any questions or need further information, please contact me at your convenience.

Sincerely,



Terry L. Haynes,  
Statewide Coordinator

cc: Rob Boeworth  
Elizabeth Andrews  
Jim Fall/Jody Seitz

To John Heckscher

RECEIVED  
27 April 1993

## ALASKA SURVIVAL

Box 320 Talkeetna, Alaska 99676 (907) 733-1413 or 733-2703

4/17/93

This regards HAARP the high power long term transmitter experiment to be at Wainwright or Clear, Alaska.

We are opposed to this gigawatt high frequency experiment because it is a safety hazard.

These devices have caused known and documented deadly & hazard situations around the world.

- Caused crashes of helicopters & other U.S. aircraft in Munich, Germany
- Caused Radio Frequency Interference that can jam aircraft electronics
- Causes the well documented Luxembourg Effect which interferes with Non Directional Beacon & navigation signals
- Can disturb or prevent transmission of Alaska bush communications and AM, FM & TV

4.14-135  
p. 12-90

4.14-136  
p. 12-90

4.14-137  
p. 12-96

4.14-138  
p. 12-65

Alaska Survival members depend on navigation aids, use plane transportation alot, & are dependant on radio & bush communications.

This experiment is stupid.

1.2-5  
p. 12-2

Becky Long

RECEIVED  
27 April 93

PUBLIC HEARING WRITTEN COMMENT SHEET

WRITTEN COMMENT SHEET

HIGH FREQUENCY ACTIVE AURORAL RESEARCH PROGRAM (HAARP)

Thank you for attending this public hearing. Our purpose for hosting this meeting is to give you an opportunity to comment on issues analyzed within the HAARP Draft Environmental Impact Statement. Please use this sheet to comment on any environmental issues that you feel should be clarified in the HAARP Final Environmental Impact Statement.

Date: APRIL 19, 1993

I WOULD LIKE TO VOICE MY DISAPPROVAL OF THE HIGH FREQUENCY  
ACTIVE AURORAL RESEARCH PROJECT FOR THE SIMPLE MATTER  
THAT NO MATTER HOW "CLEAN" THE GENERATED SIGNALS ARE  
YOU CAN NOT ESCAPE THE MULTIPLE HARMONIC SIGNALS. THESE  
STRAY EMISSIONS WILL DISRUPT MOST ALL RADIO COMMUNICATIONS  
AIRCRAFT, SHIPS AT SEA & IN ALASKAN WATERS, STATE TROOPERS,  
ETC. ALSO THE LOCAL RFI EXPOSURE WOULD INTERFERE  
WITH TELEPHONE, TV, AND OTHER HOME ENTERTAINMENT DEVICES.  
FINALLY LOCALS TO THE SITES COULD EXPERIENCE A SIGNIFICANT  
HEALTH RISK.

4.14-139  
p. 12-65

4.13-34  
p. 12-61

I ALSO URGE FOR AN EXTENSION OF THE PUBLIC COMMENT  
PERIOD.

1.3-25  
p. 12-3

Name: Robert P. Lemke ROBERT P. LEMKE  
Address: P.O. 2657  
VALDEZ ALASKA 99686  
(907) 835-2160

Please hand this form in or mail to:  
Mr. John L. Heckscher  
PL/GPIA  
29 Randolph Road  
Hanscom AFB, MA 01731-3010

RECEIVED  
27 April 93

PUBLIC HEARING WRITTEN COMMENT SHEET

WRITTEN COMMENT SHEET

HIGH FREQUENCY ACTIVE AURORAL RESEARCH PROGRAM (HAARP)

Thank you for attending this public hearing. Our purpose for hosting this meeting is to give you an opportunity to comment on issues analyzed within the HAARP Draft Environmental Impact Statement. Please use this sheet to comment on any environmental issues that you feel should be clarified in the HAARP Final Environmental Impact Statement.

Date: 4/2/93

I concur fully w/ the comments  
made by Neal Laughman. N6TVL

Sharon A. Dean - N6TVL  
POB 1815  
Palmer AK 99645  
7315

(Sharon H. Dean)

Name: Sharon A. Dean

Address: POB 1815  
Palmer, AK 99645

Please hand this form in or mail to:  
Mr. John L. Reckscher  
FL/GPIA  
29 Randolph Road  
Hanscom AFB, MA 01731-3010

# SYNOPSIS of GIGAWATT AURORAL RESEARCH PROGRAM

HAARP (Hi-frequency Active Auroral Research Program) is a proposed ionospheric research program in Interior Alaska. It will take three years to construct and has an operational life of 20 years. Construction and operational costs have not been disclosed. It will be jointly operated by the US Air Force, Navy, DARPA, and other US Federal agencies.

The preferred site (of the operators) is Gakona, AK. The second choice is Clear (BMEWS) AFS at Anderson, AK, with one of the transmitters located at Bear Creek (MP270 Parks Hwy, Between Anderson and Healy). The third choice, in the event of no Congressional funding and/or overwhelming public disapproval would be the "No Action" alternative.

The purpose of HAARP is to study the ionosphere with emphasis on enhancement of communications and surveillance systems for civil and defense purposes. The research facility would be used to understand, simulate, and control ionospheric processes that might influence communications and surveillance. This would enhance Dept of Defense capabilities, and also provide research for submerged submarine communication.

A 15MW powerplant is required to operate: 1) a 2-system stacked antenna array (each capable of 3.2MW input, 1000+MW ERP) operating between 2.8 and 10 Mhz; 2) a sounding transmitter (16KW ERP) operating from 1 to 15 Mhz that scans its frequency range; and 3) a UHF transmitter that is used as a diagnostic instrument. Operational "campaigns" would be up to 5 per year, 28 days per campaign (38% of time/year).

EMI and RFI will result from the operation of these systems. Communication systems with impacted operation include: HF communications, cellular telephone, TV, AM-FM broadcast, mobile and handheld VHF-UHF, radio telephone, CB radio, wildlife trackers, avionics, and also electro-explosive devices. Some of the different modes of EMI and RFI could be caused by adjacent channel interference, direct spurious emissions, out of band emissions causing "IF birdies" and receiver overloading/desensitization.

As far as propagation is concerned, thermal heating of the ionosphere will cause increased electron densities in the D and E Layers, resulting in increased signal absorption levels. Since the launch angle of the Gigawatt signal(s?) will be anywhere from 60°-90°, low dipole and V antennas used for low band statewide HF communications should be "perfect" for capturing large portions of interference. Also, if two separate Gigawatt signals were to be transmitted at the same time, hetrodyning on the aurora itself, the  $F_1F_2$  products would be staggering.

Worst cast senario is locating the facility at the Clear/Bear Creek Site, disrupting communications up and down the Parks Hwy and potentially cutting off an Anchorage-Fairbanks propagation path on low band HF frequencies during its operation.

There are several hundred HF active hams and even more VHF-UHF active hams in the state that could possibly be disrupted by the operation of this project, many of whom depend on HF operation out in the bush, especially in the winter.

About 150 copies of the Draft Environmental Impact Statement (DEIS) have been distributed throughout the state of Alaska during the first two weeks of March 1993. I would urge all amateur radio operators and other concerned parties to locate an existing copy and examine it very carefully. Copies may be found at most local and university libraries, and copies have been sent to the BLM, FAA, DNR, EPA, ADEC, IBEW, USF&W, NWF, and the Sierra Club, to name a few organizations. Also, major newspapers and TV stations have received copies.

After quickly, but carefully reviewing the DEIS, I was left feeling very unsatisfied with the "rhetorized" technical explanations, their vageries, conflicting statements of operation, and the admitted effects of system operation.

More time is needed for study and review by more people with a technical perspective on the potentially devastating effects that the HAARP emitters might cause on the Electro-magnetic Environment throughout the state of Alaska.

Please fill out the official public comment sheet on the reverse side (hand-written, with a hand-addressed envelope, please) stating your opinion, choices, and comments. PLEASE ALSO URGE AN EXTENSION OF THE PUBLIC COMMENT PERIOD, to allow further study of this program by some of us who, very suspiciously I might add, have been left "out of the loop" until about 2 days before the end of the public meeting process within the state of Alaska.

Construction may begin as early as August 1993

3718, 3920, 3933, and 7087 Khz

PUBLIC COMMENT PERIOD ENDS APRIL 25, 1993

Tnx & 73's,

Neal Laugman, NL7VL  
Box 47  
Healy, AK 99743

4.14-140  
p. 12-65  
p. 12-82

1.3-26  
p. 12-7

4.14-141  
p. 12-65

1.3-27  
p. 12-3

1.3-28  
p. 12-3

RECEIVED  
28 April 93

PUBLIC HEARING WRITTEN COMMENT SHEET

WRITTEN COMMENT SHEET

HIGH FREQUENCY ACTIVE AURORAL RESEARCH PROGRAM (HAARP)

Thank you for attending this public hearing. Our purpose for hosting this meeting is to give you an opportunity to comment on issues analyzed within the HAARP Draft Environmental Impact Statement. Please use this sheet to comment on any environmental issues that you feel should be clarified in the HAARP Final Environmental Impact Statement.

Date: 4-22-93

TO WHOM IT MAY CONCERN:

I WOULD LIKE TO REQUEST AN EXTENSION TO THE PUBLIC COMMENT PERIOD.

IT SOUNDS LIKE THIS NEW FACILITY WOULD BE USED FOR PRACTICAL PURPOSES, ELIMINATE H.F. COMMUNICATIONS DURING TEST PERIODS. AMATEUR RADIO IS USED NOT ONLY FOR COMMUNICATIONS BY RURAL RESIDENTS WHO HAVE NO OTHER MEANS OF COMMUNICATIONS BUT IS USED EXTENSIVELY DURING EMERGENCY COMMUNICATIONS.

AGAIN I URGE AN EXTENSION OF THE PUBLIC COMMENT PERIOD

1.3-29  
p. 12-3

4.14-142  
p. 12-65

Name: Howard H. Shepherd AL7BP

Address: PCB 414  
ESTER AK 99725

Please hand this form in or mail to:  
Mr. John L. Heckscher  
PL/GPIA  
29 Randolph Road  
Hanscom AFB, MA 01731-3010

RECEIVED  
28 April 93

Regina C. Soltis  
P.O. Box 255  
Healy, AK 99743  
(907)683-1255  
April 23, 1993

Mr. John L. Heckscher  
PL/GPIA  
29 Randolph Road  
Hanscom AFB, MA 0731-3010

RE: High Frequency Auroral Research Program

Dear Mr. Heckscher,

The military is asking Alaska residents to sacrifice much to build this project without a clear need in this post Cold War Era.

I live at Mile 261 Parks Hwy, very near to the Bear Creek location. I apparently would be greatly affected by the Haarp project if built at the Clear location. I have been told by civilian workers at Clear Air Force Site "not to worry because the HAARP facility is going to be built at Gakona." It appears that this EIS and the "public hearing" (no residents near the Bear Creek site were notified of the hearing) is an attempt of the military to appear to be following procedures on a preordained decision.

1.3-30  
p. 12-3

There are a number of apparent reasons why the facility should not be built, among them are:

- Interference with emergency service.
- Interference with communications of local residents.
- Degradation of wildlife habitat.
- Impact on wetlands.
- Loss of private property.
- Loss of land potentially selectable by the Denali Borough at the Bear Creek site.
- Unacceptable air pollutants produced at the Gakona site.

4.14-143  
p. 12-65

4.7-1  
p. 12-26

There are also a number of impacts not detailed in the EIS including:

- The extent of interference to communications.
- The extent of thermal effects. According to the EIS, ambient temperature will be raised 80 degrees Farenheit in the ionosphere. The EIS states that the temperature will be raised in lower elevations but does not indicate by how much and what

4.14-144  
p. 12-65

4.15-8  
p. 12-101



the effects would be.

I have heard this project described as a "pork barrel" project. If this is the case, the few jobs provided come at a very high price. I would rather have the reclamation of the Gakona site be the pork barrel project.

Thank you for your help.

Sincerely,

A handwritten signature in dark ink, appearing to read "Regina C. Soltis", written in a cursive style.

Regina C. Soltis

RECEIVED  
29 April 93

PUBLIC HEARING WRITTEN COMMENT SHEET

WRITTEN COMMENT SHEET

HIGH FREQUENCY ACTIVE AURORAL RESEARCH PROGRAM (HAAFP)

Thank you for attending this public hearing. Our purpose for hosting this meeting is to give you an opportunity to comment on issues analyzed within the HAAFP Draft Environmental Impact Statement. Please use this sheet to comment on any environmental issues that you feel should be clarified in the HAAFP Final Environmental Impact Statement.

Date: 23 APR 93

Dear Mr Heckscher,

During a recent quaterly meeting with the FAA up here in Anchorage, your HAAFP was briefly mentioned in the course of other business. I was amazed that a program of this scale was so close to construction without any real measure of public input. I stay pretty abreast of any items up here that might affect air safety and feel that probably less than one percent of the aviators in the State of Alaska are aware of this proposed operation and its potential ramifications. I am Captain with Alaska Airlines (based and living in Anchorage) and also the Local Chairman for our Airline Pilots Association (ALPA) and just received the DEIS three days ago. All findings seem to be based on the quater strength operation at Tromso, Norway and could be considered speculative at best. Recent articles in Aviation Week and Space Technology (AWST) have shown how commercial flights have experienced COMM/NAV problems related to spurious signals. I have enclosed a copy of our Flight Ops Manual section on PAX Electronic Devices and suffice it to say that if the FAA and Alaska Airlines are this concerned about that person in seat 22D using any of these everyday items inflight, maybe a project of this size needs a little more study. Impacting the use of my FM radio is one thing, but any transmissions that could set off explosives, negate a pacemaker or jam GPS/Fly By Wire aircraft is more than a routine operation. I have forwarded the DEIS onto the Safety Department at ALPA National and AWST for further study. Please extend this comment period and let's have some input.

Name: JIM ANTISDEL

Address: 5308 SHORECREST DR.

ANCHORAGE, ALASKA 99515  
(907) 248-4007

Please hand this form in or mail to:  
Mr. John L. Heckscher  
FL/GPIA  
29 Randolph Road  
Hanscom AFB, MA 01731-3010

1.3-31  
p. 12-3

1.3-32  
p. 12-9

4.14-145  
p. 12-95

4.14-146  
p. 12-90

RECEIVED  
29 April 93

PUBLIC HEARING WRITTEN COMMENT SHEET

WRITTEN COMMENT SHEET

HIGH FREQUENCY ACTIVE AURORAL RESEARCH PROGRAM (HAARP)

Thank you for attending this public hearing. Our purpose for hosting this meeting is to give you an opportunity to comment on issues analyzed within the HAARP Draft Environmental Impact Statement. Please use this sheet to comment on any environmental issues that you feel should be clarified in the HAARP Final Environmental Impact Statement.

Date: 9 APR 93

To Whom it May Concern:

many of the Amateur Radio operators currently operating in Alaska are concerned about the possible effects the HAARP will have upon their radio reception of the various communication nets conducted daily in the State of Alaska. There are at least 3 nets I know of which operate daily on 3.930 MHz, 3.933 MHz, 2.091 MHz & possibly others. One of the purposes is to be available to put emergency traffic in the event of a disaster. Many of the Ham operators are wondering what can be done if the HAARP transmitter interferes with Amateur radio activities to the degree that prevents communication on the various FCC allocated Amateur Radio Frequencies.

4.14-147  
p. 12-65

4.14-148  
p. 12-65

Name: JOEL D. ELrod, WLT BHL

Address: P.O. BOX 696  
Glennallen, AK 99558

Please hand this form in or mail to:  
Mr. John L. Heckscher  
PL/GPIA  
79 Randolph Road  
Hanscom AFB, MA 01731-3010



C.L. Wareham  
Vice President  
Network Services



April 21, 1993

Mr. John Heckscher  
PL/GPIA  
Hanscom. AFB  
MA 01731-5000

Dear Mr. Heckscher:

First of all let me thank you for your quick response to my request of the Environmental Impact Analysis Process.


After careful review of the material provided by you, we were unable to come to any conclusion about the technical aspect of the transmitter system you propose to build. We found the documentation was lacking the type of technical specification, we would need to make a technical analysis. | 1.3-33  
p. 12-7

The information we would like to see includes the frequencies, type of modulation, radiation pattern of the antenna, final filter specification, RF power output, antenna gain, harmonic information specific to the transmitter/HPA. | 4.14-149  
p. 12-86

Without this information we are unable to make a technical assessment of the system proposed. Please provide more information from a technical prospective. Thank you for keeping Alascom informed of your plans.

If we could be of assistance, do not hesitate to contact me.

Sincerely,

  
C. L. Wareham  
Vice President  
Network Services

RECEIVED

APR 30 1993

PUBLIC HEARING WRITTEN COMMENT SHEET

WRITTEN COMMENT SHEET

HIGH FREQUENCY ACTIVE AURORAL RESEARCH PROGRAM (HAARP)

Thank you for attending this public hearing. Our purpose for hosting this meeting is to give you an opportunity to comment on issues analyzed within the HAARP Draft Environmental Impact Statement. Please use this sheet to comment on any environmental issues that you feel should be clarified in the HAARP Final Environmental Impact Statement.

Date: 4-22-93

I Am ~~opposed~~ To the HAARP program because  
it will harm communication & propagation all over  
Alaska - as well as an extension of the Nuclear  
Commitment period.

We JUST NOW RECEIVED THIS INFORMATION  
ON THE HAARP PROGRAM!

J. Hunkeler

Name: THOMAS L. BRUNER

Address: 216 SLATER STREET  
FAIRBANKS, ALASKA 99701

Please hand this form in or mail to:  
Mr. John L. Heckscher  
FL/6FIA  
29 Randolph Road  
Randolph AFB, TX 78131-2010

4.14-150  
p. 12-65

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APR 30 1993

PUBLIC HEARING WRITTEN COMMENT SHEET

WRITTEN COMMENT SHEET

HIGH FREQUENCY ACTIVE AURORAL RESEARCH PROGRAM (HAARP)

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Date: Apr 23-93

Extend Public Comment Period

1.3-34  
p. 12-3

Possible interference to military and Defense

4.14-151  
p. 12-65

Communications and detection radar

Not of importance - Possible Human and

Environmental impact. Budget considerations

Name: Thos. M. Corbett

Address: H.S. 89 - Box 125

Willow, VT

97688 - 1-902-495-6533

Please hand this form in or mail to:

Mr. John L. Heckscher

FL/GPIA

29 Randolph Road

Hanscom AFB, MA 01731-3010

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APR 30 1993

Raymond E. Gary  
P.O. Box 255  
Healy, AK 99743  
(907)683-1255  
April 23, 1993

Mr. John L. Heckacher  
PL/GPIA  
29 Randolph Road  
Hanscom AFB, MA 0731-3010

RE: High Frequency Auroral Research Program

Dear Mr. Heckacher,

I am employed as an Alaska State Trooper and therefore I must protest the building of this Haarp project anywhere in Alaska due to the impact it would have on local emergency services. 4.14-152  
p. 12-65

As a resident at Mile 261 Parks Hwy, I would be greatly affected by construction at the Clear site and so object even stronger to the Clear Alternative.

As an Alaskan resident the reclamation of the Gakona Site is the only alternative that I see as having long term benefit for Alaska.

Sincerely,



Raymond E. Gary

RECEIVED  
APR 30 1993

PUBLIC HEARING WRITTEN COMMENT SHEET

WRITTEN COMMENT SHEET

HIGH FREQUENCY ACTIVE AURORAL RESEARCH PROGRAM (HAARP)

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Date: 4-21-93

I OBJECT TO HAARP IN EVERYWAY BUT MUST  
ESPECIALLY TO THE EFFECT IT WILL HAVE ON THE  
HF FREQUENCIES WHICH I PERSONALLY USE DAILY  
AND DEPEND ON FOR COMMUNICATIONS OUT IN THE  
BUSH

4.14-153  
p. 12-65

Name: DARRELL SCOTT K27KV

Address: P.O. BOX 36  
MANLEY HOT SPRINGS  
ALASKA 99756

Please hand this form in or mail to:  
Mr. John L. Heckscher  
PL/GPIA  
29 Randolph Road  
Hanscom AFB, MA 01731-3010



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21 APR 65

PUBLIC HEARING WRITTEN COMMENT SHEET

WRITTEN COMMENT SHEET

HIGH FREQUENCY ACTIVE AURORAL RESEARCH PROGRAM (HAARP)

Thank you for attending this public hearing. Our purpose for hosting this meeting is to give you an opportunity to comment on issues analyzed within the HAARP Draft Environmental Impact Statement. Please use this sheet to comment on any environmental issues that you feel should be clarified in the HAARP Final Environmental Impact Statement.

Date: 4-21-63

I OBJECT TO HAARP IN EVERYWAY, BUT MOST  
ESPECIALLY TO THE EFFECT IT WILL HAVE ON THE  
HF FREQUENCIES WHICH I PERSONALLY USE DAILY  
AND DEPEND ON FOR COMMUNICATIONS OUT IN THE  
BUSM.

4.14-154  
p. 12-65

Name: DUNNIA SCOTT, K2LIF

Address: A.D. BOX 36  
MADDERLY HOT SPRINGS  
ALASKA 99756

Please hand this form in or mail to:  
Mr. John L. Heckscher  
PL/GPIA  
29 Randolph Road  
Hanscom AFB, MA 01731-3010

RECEIVED

APR 30 1993

PUBLIC HEARING WRITTEN COMMENT SHEET

WRITTEN COMMENT SHEET

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Date: 4/23/93

TO WHOM IT MAY CONCERN:

I fully agree with the comments in the letter on the reverse side by Mr. Neil Thompson.

The potential for interference to other sources seems very great and believe much more testing needs to be done before the HAARP program is implemented and do urge an extension of the study and comment period.

Name: Clayton D. Smith

Address: 450 N. BAILEY ST  
DANVER MA 01924

4.14-155  
p. 12-65

1.3-35  
p. 12-3

Please hand this form in or mail to:  
Mr. John L. Heckscher  
FL/GPIA  
29 Randolph Road  
Hanscom AFB, MA 01731-3010

RECEIVED  
APR 30 1993

PUBLIC HEARING WRITTEN COMMENT SHEET

WRITTEN COMMENT SHEET

HIGH FREQUENCY ACTIVE AURORAL RESEARCH PROGRAM (HAARP)

Thank you for attending this public hearing. Our purpose for hosting this meeting is to give you an opportunity to comment on issues analyzed within the HAARP Draft Environmental Impact Statement. Please use this sheet to comment on any environmental issues that you feel should be clarified in the HAARP Final Environmental Impact Statement.

Date: 4.23.93

AFTER CAREFUL CONSIDERATION I FEEL THAT

THE DRAFT EIS FOR THIS PROJECT DOES  
NOT ADEQUATELY ADDRESS THE FOLLOWING  
TOPICS:

1) BIOEFFECTS OF THE PROJECT ON  
RESIDENTS. IT IS NOT ENOUGH TO SIMPLY SAY  
THERE WILL BE NO IMPACT. MONITORS MUST  
BE SET UP TO CHECK IF THE PROJECT IS PUT  
IN OPERATION

4.13-35  
p. 12-61

2) COST/BENEFIT ~~Ratio~~ RATIO OF  
PROJECT IN TERMS OF WHAT THE PROJECT  
WILL GIVE BACK TO THE NATION, THE STATE,  
THE COMMUNITY. \$150 MILLION DOLLAR INVESTMENT HAS  
GOT TO BE CONSIDERED AS BOTH A NEGATIVE  
(CONTRIBUTING TO THE NATION'S DEBT) AND A POSITIVE  
(GIVING BACK TO THE NATION DATA). ANY RESPONSIBLE  
BUSINESS WOULD REQUIRE SUCH DATA FROM ITS R&D  
BRANCH.

1.2-6  
p. 12-2

3) EFFECTS ON BIRDS MUST BE MONITORED  
ESPECIALLY DURING SPRING + FALL MIGRATION. BIRD  
NAME: COUNTS MUST BE DONE AND MADE PUBLIC

4.4-7  
p. 12-20

Address: V WELD  
30X224  
GARONA 99586

Please hand this form in or mail to:  
Mr. John L. Heckscher  
PL/GPIA  
29 Randolph Road  
Hanscom AFB, MA 01731-3010

4) OVERALL THE EIS SEEMS SO GLOSSED OVER  
AND SUPERFICIAL THAT IT MAKES ONE VERY  
SUSPICIOUS OF THE MOTIVES AND THE REAL PURPOSE  
OF THE MILITARY.

1.3-35  
p. 12-7

1.2-7  
p. 12-2

OVER →  
PLEASE

5. Steps must be taken to make the project meaningful to the community within which it exists. Projects like this cannot go longer be viewed as existing outside of or independent from the community in which they are built.

2.3-20  
p. 12-11

Steps might include -  
interaction with the school district  
to allow advanced students the  
opportunity to interact on a meaningful  
level with scientists.  
interaction with the University of Alaska.

Stipulation in the contract with the main contractor that local people be hired and trained to participate in the project at skilled levels and not merely as security guards and maintenance staff.

4.8-35  
p. 12-27

RECEIVED

MAY 0 - 1993

Clare Zickuhr  
5316 Shorecrest Drive  
Anchorage, AK 99515

PL/GPIA (J. L. Heckscher)  
29 Randolph Road  
Hanscom AFB, MA 01731-3010

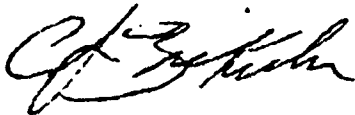
TO  
←

Thanks for acknowledging receipt of my comments regarding the DEIS for the HAARP project. My concerns however will not be served, as your letter suggests, by the Final EIS addressing my comments

More time and information is needed for Alaska radio communications users to give us a chance to draw our own conclusions. The lack of disclosure to date is not helping. If you truly want to address our concerns, help us get a copy of the MITRE materials referenced throughout the HAARP DEIS and extend the comment period with additional meetings. Only through actions such as these will our concerns be addressed.

1.3-36  
p. 12-7

Sincerely,



C. J. Zickuhr

Copy: Vice President Al Gore  
Honorable Frank Murkowski  
Honorable Ted Stevens  
Honorable Donald Young

## PUBLIC HEARING WRITTEN COMMENT SHEET

RECEIVED

## WRITTEN COMMENT SHEET

MAY 07 1993

## HIGH FREQUENCY ACTIVE AURORAL RESEARCH PROGRAM (HAARP),

Thank you for attending this public hearing. Our purpose for hosting this meeting is to give you an opportunity to comment on issues analyzed within the HAARP Draft Environmental Impact Statement. Please use this sheet to comment on any environmental issues that you feel should be clarified in the HAARP Final Environmental Impact Statement.

Date: 3-31-93

Dear Mr. Heckscher,

Your HAARP project was recently brought to my attention by another pilot that I work with. I find it amazing that this project has had so little public attention. After hearing about the HAARP I have asked other pilots if they heard of this project...not one of them had!

Being the Regional Safety Coordinator for the Airline Pilots Association and a concerned pilot of the effects that the radiation from the HAARP project would emit into the atmosphere causing problems the both health and the possibility of loss of navigation equipment (the FAA will not even allow electronic devices on board the aircraft) I find it amazing that a project of this size would be allowed without much of a study to find out all effects on the people using the airspace and area around the project (ie...fly by wire aircraft, loran and GPS navigations, pacemakers).

I strongly feel the comment period should be extended to allow more comment.

Name: Duane Sheehan

Address: 2602 Curlew Cir  
Anchorage, AK 99515

(907) 248-5994

Please hand this form in or mail to:  
Mr. John L. Heckscher  
PL/GPIA  
29 Randolph Road  
Hanscom AFB, MA 01731-3010

1.3-37  
p. 12-34.13-36  
p. 12-61  
4.14-156  
p. 12-901.3-38  
p. 12-3



U.S. Department  
of Transportation  
Federal Aviation  
Administration

RECEIVED  
11 May 93

800 Independence Ave. S.W.  
Washington, D.C. 20591

APR 30 1993

Mr. John Heckscher  
PL/GPIA  
Hanscom Air Force Base, MA 01731-5000

Dear Mr. Heckscher:

Reference the Department of the Air Force letter, dated February 25, which forwarded the Draft Environmental Impact Statement (DEIS) for the construction and operation of the High Frequency Active Auroral Research Program (HAARP) facility in Alaska. The Federal Aviation Administration (FAA) Spectrum Engineering and Policy Division, ASM-500 has the following comments concerning this proposed facility:

a. In order for the FAA to more fully evaluate the system, this office will require more technical information. Data needed includes operating parameters of HAARP equipment as well as information from past studies which the Department of Defense has done of high energy effects to aircraft.

1.3-39  
p. 12-7

4.14-157  
p. 12-90

b. As required by Office of Management and Budget Regulations, the HAARP will need to be evaluated by the Spectrum Planning Subcommittee of the Interdepartment Radio Advisory Committee in order for it to receive spectrum supportability. After spectrum supportability is obtained, a specific frequency assignment will need to be approved for actual operation. As indicated in the DEIS, this process has already begun.

c. As indicated in Table 4.14-2, THEORETICAL MAXIMUM RADIO FREQUENCY INTERFERENCE TO RECEIVING SYSTEMS BY HAARP TRANSMISSIONS IN THE GAKONA AREA, there are several types of interference which FAA systems will experience. This list does not include all frequency bands which are of interest to aviation. In addition, some of the bands which will be affected support aeronautical radionavigation and are not allowed to experience intentional interference. Interference which can be expected includes:

4.14-158  
p. 12-91

(1) Interference to navigational aids, such as non-directional beacons, very high frequency (VHF) omnidirectional range, global positioning system, and instrument landing system marker beacons.

4.14-159  
p. 12-91

(2) Interference to VHF and ultra high frequency air traffic control communications.

4.14-160  
p. 12-91

(3) Interference to high frequency (HF) communications.

c. High power effects to aircraft are indeterminate from information given, however, they are probable within distances of at least 20 nautical miles from the HAARP facility.

d. The high HF power transmitted into the ionosphere could result in the Luxembourg Effect (that is, HF signal cross-modulation in the ionosphere) causing wide-scale radio frequency interference to critical FAA HF communications in the Alaskan area.

In general, we do not concur with the operational concept for the HAARP facility as proposed in the DEIS. The high probability of radio frequency interference to critical air traffic control frequencies and the possibility of high energy effects to aircraft flying nearby indicate that the facility may present a hazard to air safety. In order for the FAA to remove its objections, strict operational procedures will need to be formalized to control its use. Among the possible restrictions which can be expected include:

a. Limitations on the time of day during which the HAARP will be allowed to operate.

b. Limitations on the total transmission time allowed during any one operation.

c. Positive controls so that the HAARP transmits only to zenith.

d. Positive communications capability to notify HAARP operators to "cease transmission" in the event of interference.

We appreciate the opportunity to comment on this DEIS. If you have questions, please contact Don Willis, Spectrum Assignment and Engineering Branch, ASM-510, (202) 267-9715.

Sincerely,



Gerald J. Markey  
Manager, Spectrum Engineering and  
Policy Division

4.14-161  
p. 12-65

1.3-40  
p. 12-7  
4.14-162  
p. 12-90

4.14-163  
p. 12-96

4.14-164  
p. 12-92





UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION 10  
1200 Sixth Avenue  
Seattle, Washington 98101

RECEIVED  
11 May 93

MAY 06 1993

REPLY TO  
ATTN OF: WD-126

John Heckscher  
U.S. Air Force  
PL/ GPIA  
Hanscom AFB, MA 01732-5000

Dear Mr. Heckscher:

The Environmental Protection Agency (EPA) has reviewed the proposed Air Force-Navy Draft Environmental Impact Statement (DEIS) for the High Frequency Active Auroral Research Program (HAARP) in Alaska. Our review is provided pursuant to the National Environmental Policy Act, and Section 309 of the Clean Air Act.

The Draft Environmental Impact Statement provides an adequate description of the potential adverse environmental consequences associated with the project and proposes appropriate mitigation measures for the reduction and/or elimination of adverse environmental impacts on the eco-systems at the preferred project site. We therefore have no substantive comments to offer on the proposed project.

Based on the information in the DEIS and proposed mitigation measures, we have rated the DEIS, LO (Lack of Objections). A copy of our rating system is enclosed for your use.

Thank you for the opportunity to review and comment on the proposed project. We look forward to receiving the Final Environmental Impact Statement and Record of Decision when available.

Sincerely,

  
Kathy Veit, Chief  
Program Coordination Branch

 Printed on Recycled Paper

SUMMARY OF THE EPA RATING SYSTEM  
FOR DRAFT ENVIRONMENTAL IMPACT STATEMENTS:  
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 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 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.

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 public health or welfare or environmental quality. 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 recommended for referral to the 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 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 or the purposes of the NEPA and/or Section 109 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

MAY-14-1993 13:40

PL/GPIA HANCOM AFB MA

617 377 3550 P.81

REPRESENTATIVE  
JEANNETTE JAMES

P.O. Box 50022  
North Pole, Alaska 99705  
(907) 488-0862

House District 34

## Alaska State Legislature



Wade H. Jensen  
State Capitol  
Juneau, Alaska  
99801-1182  
(907) 465-3745

House Of Representatives

FILE COPY

Department of the Air Force  
PL/GPIA (J.L. Heckscher)  
29 Randolph Road  
Hanscom AFB, MA 01731-3010

May 10, 1993

RE: HAARP

Dear Mr. Heckscher,

The generalized nature of the concerns from public input have to do with radio transmission/reception and video interference. I share the concern of my constituents because 1. my constituents concerns are my concerns. District 34, which I'm elected to represent, includes the area surrounding Clear AFB and Anderson, and 2. I do not fully understand the project.

My concerns also relate to things I'm unfamiliar with, such as: creation of plasma in the auroral level, beam antennas and gigawatt radio transmissions. What are the health risks associated with such installations? What are the risks to aviation, wildlife and long term impact on the environment?

If the concerns of my constituents regarding the receptions/transmissions are satisfied and the answers of the above questions are answered, I will support the project unless other significant issues are raised.

Thank you very much for your prompt response to my request. Please keep me on the mailing list as this project progresses.

Sincerely,

*Jeannette James*  
Rep. Jeannette James  
JJ/kmh

4.8-35  
p. 12-51  
4.13-37  
p. 12-61  
4.14-165  
p. 12-65  
4.15-9  
p. 12-101

## 12.0 RESPONSES TO COMMENTS

Public comments to the DEIS are contained in Section 10.0 Public Hearing Transcripts and in Section 11.0 Comments. In both Section 10 and Section 11 specific comments have been identified and are labeled with a reference number in the right hand margin. Also in the right hand margin is a reference page number that corresponds to the location that the particular comment is answered in Section 12.

The comments have been divided by section and subject in the same manner in which Volume I of the FEIS is configured. For example, questions regarding the Purpose and Need for Action are included in Sub-Section 1 of this Section 12. Similarly, Sub-Section 2 contains comments relating to the Description of Proposed Action and Alternatives, and so on.

Often the same questions or comments were raised by numerous individuals, albeit with slightly different language or nuances. To avoid needless duplication of the same responses, these similar questions have been grouped and a paraphrased comment has been formulated which summarizes a particular question or concern. The paraphrased question is in bolded print. Above the paraphrased question is a list of the specific comments to which it refers and the page on which these comments can be found in Sections 11 or 12 of this document. By referencing back to those pages, the literal comments can be read from either the public hearing transcripts, from the written comments received, or from the telecon memorandum assembled after a phone conversation. Each particular paraphrased comment or question is preceded by a bold type Q. Similarly, each answer is preceded by a bold type A.

## **12.1 PURPOSE AND NEED FOR ACTION**

### **12.1.1 Purpose**

The following comment(s) contributed to the paraphrased question below:

| <u>Comment</u> | <u>Page</u> | <u>Comment</u> | <u>Page</u> |
|----------------|-------------|----------------|-------------|
| 1.2-1          | 10-40       | 1.2-5          | 11-83       |
| 1.2-2          | 11-40       | 1.2-6          | 11-99       |
| 1.2-3          | 11-49       | 1.2-7          | 11-99       |
| 1.2-4          | 11-65       |                |             |

**Q. What is the purpose of HAARP? Will the HAARP facility be a military target?**

**A.** The program's goal is to provide a state-of-the-art U.S. owned ionospheric research facility readily accessible to U.S. scientists from government, the private sector and universities. This facility would be the most advanced in the world and would attract scientists from around the world and foster international cooperative research efforts. The program's purpose is to provide a research facility to conduct pioneering experiments in ionospheric phenomena. The data obtained from the proposed research would be used to analyze basic ionospheric properties and to assess the potential for developing ionospheric enhancement technology for civilian and DOD communications and surveillance purposes.

Civilian applications from the program's research could lead to improved local and world-wide communications. Furthermore, and possibly more significant, the potential exists for new technology that could be developed from a better understanding of ionospheric processes.

Radio frequency surveillance and communication systems are the eyes and the connectivity for modern defense forces. The HAARP facility will provide the Department of Defense the tools to investigate and define ionospheric processes that enable and affect these systems. The research results from HAARP may suggest new approaches for improving friendly surveillance

and communication system performance e.g., communications to submerged submarines and satellite communications free of signal dropout caused by ionospheric irregularities. The research results may also be used to reduce the effectiveness of comparable enemy systems.

HAARP will be a scientific research and development facility and will possess no war-making potential. HAARP will be a world-class research facility and will be available for use by foreign scientists. For these reasons, it is concluded that HAARP will not be a military target.

---

### **12.1.2 Scope of Environmental Analysis**

The following comment(s) contributed to the paraphrased question below:

| <u>Comment</u> | <u>Page</u> | <u>Comment</u> | <u>Page</u> |
|----------------|-------------|----------------|-------------|
| 1.3-1          | 11-13       | 1.3-19         | 11-70       |
| 1.3-3          | 11-17       | 1.3-23         | 11-79       |
| 1.3-5          | 11-18       | 1.3-25         | 11-84       |
| 1.3-6          | 11-23       | 1.3-27         | 11-86       |
| 1.3-7          | 11-45       | 1.3-28         | 11-86       |
| 1.3-8          | 11-45       | 1.3-29         | 11-87       |
| 1.3-11         | 11-47       | 1.3-30         | 11-88       |
| 1.3-14         | 11-51       | 1.3-31         | 11-90       |
| 1.3-15         | 11-52       | 1.3-34         | 11-94       |
| 1.3-16         | 11-66       | 1.3-35         | 11-98       |
| 1.3-17         | 11-68       | 1.3-37         | 11-102      |
| 1.3-18         | 11-69       | 1.3-38         | 11-102      |

**Q. Why was the public review period so short? Why wasn't everyone who has a concern notified?**

**A. The environmental impact statement process for HAARP is regulated through the National Environmental Policy Act, federal regulations, and Navy and Air Force environmental regulations. Each step of the process is specified, including procedural requirements. Public notice, length of public review period, timing of notices, release of documents, and public comment and involvement are only some of the aspects specified. The HAARP program has abided by all these regulations and in most cases has gone beyond the requirements to encourage public involvement in this process. The following is an overview of the HAARP environmental impact analysis process public notification and involvement effort.**

**The initial public notice that the HAARP environmental impact process was to begin was published in the Federal Register on May 20, 1992. Other public notices concerning HAARP were placed in the Federal Register each time a significant event (such as scoping meetings, publishing of a document, and public hearings) occurred. In addition to public notifications in the Federal Register, notices indicating opportunities for government officials and the public to comment on the proposed project were also placed in the local news media.**

**Involvement by government officials and the public can take place at any time during the environmental impact analysis process. However, there are two specific times when public involvement is actively solicited; scoping meetings and public hearings. The scoping meetings are held prior to preparing the EIS to determine what issues are of concern to the public. The scoping process helps determine the extent of issues to be addressed and to help identify the significant issues for the DEIS. The public hearings are held at least 15 days after the DEIS has been made available to the public for review. The comments received at the public hearings and during the mandated 45 day public comment period are considered in the FEIS. The FEIS generally consists of two volumes: Volume I is an updated version of the DEIS with minor corrections and revisions and Volume II includes all questions and comments received during the public review period as well as detailed answers to the questions and concerns. These documents are used by the decision makers to help decide on the final course of action.**

During the HAARP scoping process, a paid notice was placed in the following newspapers indicating the time, date, and location (Anchorage and Glennallen) where the public scoping meetings were to take place, intent of the project, and the person to contact for additional information:

|   |               |
|---|---------------|
| Anchorage Daily News                      | August 9 & 16 |
| Fairbanks Daily News-Miner                | August 9 & 16 |
| The Frontiersman (Wasilla)                | August 7 & 14 |
| Copper River Country Journal (Glennallen) | August 6      |
| Valdez Vanguard                           | August 13     |

In addition to the paid newspaper announcement on the scoping meetings, a press release package (containing a two page press release announcement and six page, single-spaced, fact sheet) was sent to the Anchorage Daily News, Copper River Journal, Fairbanks News-Miner, The Frontiersman, Associated Press, Valdez Vanguard, KTUU-TV, KIMO-TV, KTVA-TV, KTVF-TV, KATN-TV, KIAM-AM, and KUAC-FM to be considered for public release. The media determines what is newsworthy and acts on these announcements at their discretion.

The comments received during the August 1992 public scoping meetings were considered in the DEIS and helped determine what was to be analyzed in the EIS. Those individuals and organizations who came forward and indicated their interest were placed on the mailing list to receive a copy of the DEIS.

During March 1993 over 150 DEIS's were sent to individuals who attended the scoping meetings, interested individuals, concerned private agencies, government agencies, libraries, and Alaska TV and radio stations. The mailing list was assembled with the help of the Alaska District Army Corps of Engineers and the 11th Air Force 3rd Wing Public Affairs Office, Elmendorf AFB, AK, who both have considerable experience with public notification of such programs in Alaska. Along with the DEIS, a letter was enclosed asking for comments and the time, date, and location of the public hearings.



In addition to those individuals receiving a copy of the DEIS, a mailing list was compiled of 140 individuals who may be interested in the project, but had not shown interest thus far. Those individuals were sent a notice letter indicating the DEIS was available, asking if they would like to receive a copy, and informing them of the time, date, and location of the Public Hearings and the 25 April public comment deadline.

A notice was placed in the following newspapers indicating the time, date, and location (Anderson and Glennallen) where the public hearings were to take place, the intent of the project, contact person, and the 25 April public comment deadline:

|                              |               |
|------------------------------|---------------|
| Anchorage Daily News         | March 28      |
| Fairbanks Daily News-Miner   | March 26      |
| Anderson Valley Advocate     | March 18 & 25 |
| Copper River Country Journal | March 18      |

In addition to the paid newspaper announcement concerning the public hearings, a press release package (containing a 2 page press release and a 6 page, single spaced, fact sheet on HAARP) was sent to Alaska Public Radio Network, Anchorage Daily News, KTUU-TV, KTVA-TV, KIMO-TV, Alaska Business Monthly, KCAM-AM, Copper River Country Journal, Valdez Vanguard, The Frontiersman, and the Fairbanks Daily News-Miner to be considered for public release.

All persons or agencies requesting copies of the DEIS or reference materials were sent the appropriate documents. Comments and concerns received at the Public Hearings and through the mail were considered in the FEIS. In addition to those already on the DEIS mailing list, all attendees of the Public Hearings, people who have corresponded with the HAARP Program Office, and those requesting to be placed on the mailing list for the FEIS will be mailed a copy of the FEIS. Throughout the entire environmental assessment process every effort was made to

notify and include concerned individuals through newspaper advertisements, press releases, Federal Register notices, Scoping Meetings and Public Hearings.

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The following comment(s) contributed to the paraphrased question below:

| <u>Comment</u> | <u>Page</u> | <u>Comment</u> | <u>Page</u> |
|----------------|-------------|----------------|-------------|
| 1.3-2          | 11-13       | 1.3-33         | 11-92       |
| 1.3-12         | 11-49       | 1.3-35         | 11-99       |
| 1.3-13         | 11-50       | 1.3-36         | 11-101      |
| 1.3-22         | 11-77       | 1.3-39         | 11-103      |
| 1.3-24         | 11-80       | 1.3-40         | 11-104      |
| 1.3-26         | 11-86       |                |             |

**Q. The DEIS was not technically detailed. Why wasn't more detailed technical information placed in the document?**

**A. The Council of Environmental Quality's (CEQ) regulations govern the writing of EIS. These regulations give specific instructions that the documents must be written in "plain language...so that decision makers and the public can readily understand them." The document should be analytical and not encyclopedic. It should normally be less than 150 pages and for proposals of unusual scope or complexity it should normally be less than 300 pages. Data and technical analyses should be incorporated by reference to cut down on bulk. The HAARP DEIS has been purposely written for the general public and has incorporated by reference volumes of supporting technical data and analyses to avoid becoming a purely technical and encyclopedic discussion of the issues. Those individuals or agencies wanting more technical information and detail on a specific subject can request it from the HAARP office.**

---

The following comment(s) contributed to the paraphrased question below:

| <u>Comment</u> | <u>Page</u> | <u>Comment</u> | <u>Page</u> |
|----------------|-------------|----------------|-------------|
| 1.3-20         | 11-76       | 1.3-21         | 11-77       |

**Q. Off-site diagnostic equipment, including HF/VHF radar, was "not evaluated in detail" since locations for this equipment have not been determined, and because this equipment is "not required for basic HAARP operation". Shouldn't these off-site diagnostics be included in the DEIS?**

**A. Off-site diagnostics are not being considered for construction at this time and are not critical to the successful operation of the proposed HAARP facility. In addition, the exact type of off-site diagnostics that may be required are unknown due to the unidentified experiments they may be intended to support. Thus, it would be premature and purely speculative to include specific off-site diagnostics as part of the proposed project. These off-site diagnostics are mentioned in the EIS to indicate that this program is scientific and evolutionary in nature and additional monitoring and data gathering equipment could be proposed in the future. It is clearly understood that if any off-site diagnostics are proposed in the future, they would be required to comply with the NEPA process and be subject to the same environmental protection regulations as HAARP.**

---

The following comment(s) contributed to the paraphrased question below:

| <u>Comment</u> | <u>Page</u> |
|----------------|-------------|
| 1.3-4          | 11-17       |

**Q. How can a research group make use of several frequency ranges without prior approval of the FCC? If the FCC had been notified and consulted then the HAM community and other communication interests in Alaska would have known about this project long ago.**

**A. FCC approval will be required prior to operation of HAARP. Approval by the FCC to use frequency ranges occurs after the HAARP environmental assessment process is completed. This approval through the FCC to use several frequency ranges has not yet been granted.**

---

The following comment(s) contributed to the paraphrased question below:

| <u>Comment</u> | <u>Page</u> | <u>Comment</u> | <u>Page</u> |
|----------------|-------------|----------------|-------------|
| 1.3-7          | 11-45       | 1.3-32         | 11-90       |
| 1.3-9          | 11-45       |                |             |

**Q. Can the Alaska Amateur Radio Club, American Radio Relay League, Arctic Amateur Radio Club, Borealis Amateur Radio Club, Juneau Amateur Radio Club, Anchorage Amateur Radio Club, and Airline Pilots Association be placed on the mailing list to receive the FEIS?**

**A. Yes. All organizations that have requested to be part of the HAARP environmental assessment process will be placed on the mailing list to receive the FEIS. In addition, all those individuals, agencies, and organizations that attended the Scoping Meetings, Public Hearings, received a copy of the DEIS, and who have corresponded with the HAARP Program office will also be on the FEIS mailing list.**

---

The following comment(s) contributed to the paraphrased question below:

| <u>Comment</u> | <u>Page</u> |
|----------------|-------------|
| 1.3-10         | 11-46       |

**Q. Have any experiments already started from the Clear AFS site?**

A. No experiments associated with HAARP, either directly or indirectly, have begun at either the Clear or Gakona sites. By law, HAARP construction cannot begin until a record of decision is signed by the Air Force decision makers, which is contingent upon this EIS.

---

## **12.2 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES**

### **12.2.1 Criteria Used to Identify Feasible Alternatives**

The following comment(s) contributed to the paraphrased question below:

| <u>Comment</u> | <u>Page</u> |
|----------------|-------------|
| 2.1-1          | 11-16       |

**Q. Was the Air Force Station at Northeast Cape on Saint Lawrence Island considered as a site for HAARP?**

A. As stated in Section 2 of the document, many different sites were considered throughout the state of Alaska, and the siting criteria were applied fairly to all potential sites. In the end, three sites were found to meet the requirements of the criteria, namely: Gakona; Clear; and. Fort Greely. Fort Greely was later dropped due to irreconcilable mission conflicts with existing Army operations.

Saint Lawrence Island was eliminated from consideration based on the criteria to be near a major highway, and to be in a region that was logistically convenient to facilitate operation and construction. The extreme remoteness of St. Lawrence Island would add an unacceptable level of cost, complexity, and uncertainty to the construction and operation of HAARP.

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### **12.2.2 Alternatives Identified for Further Analysis**

The following comment(s) contributed to the paraphrased question below:

| <u>Comment</u> | <u>Page</u> |
|----------------|-------------|
| 2.3-1          | 10-46       |
| 2.3-2          | 10-46       |

**Q. Is it possible for the HAARP equipment to malfunction and expose people to levels of RFR above and beyond what was analyzed?**

**A.** There is no guarantee that some component of the HAARP facility, or any facility, will not malfunction. Machines can malfunction and people can make mistakes. It is important to note that this facility will be continually manned by knowledgeable technical staff and some of the most renowned scientific investigators in the world. It would at no time be operated in an unattended mode. It is to be designed to operate safely and efficiently to achieve clear and concise scientific objectives.

The HAARP ionospheric research instrument will be constrained, by software, to operate with an angle not greater than 30 degrees from the vertical. If a beam steer angle greater than 30 degrees from the vertical is requested, the software will not understand the command and will not implement the request. In addition, if a beam angle greater than 30 degrees from the vertical is requested, an audible alarm will be sounded alerting the operator to the erroneous request. Furthermore, the array is inherently incapable of operating at an angle of greater than 60 degrees from the vertical.

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The following comment(s) contributed to the paraphrased question below:

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|----------------|-------------|
| 2.3-20         | 11-100      |

**Q. Can you allow local and University of Alaska students an opportunity to interact with the HAARP scientists?**

**A. The HAARP program would welcome involvement with local science and University of Alaska students. There are many situations where assistance would be welcomed and educational opportunities could be gained. Furthermore, interacting with foreign scientists would provide unique cultural opportunities in addition to scientific interaction. Having a world-class research facility in Alaska could be an advantage to nearby University of Alaska students. The HAARP program office encourages an active involvement with local science students and University of Alaska students.**

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The following comment(s) contributed to the paraphrased question below:

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|----------------|-------------|
| 2.3-9          | 10-112      |

**Q. Will the periods of operation be during aurora events?**

**A. The purpose of HAARP is to understand the ionosphere during all different phases of ionospheric activity, including aurora events. During an aurora the ionosphere is at a very active level causing various communication problems that HAARP hopes to study and potentially solve. HAARP will also be operating during non-auroral periods.**

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The following comment(s) contributed to the paraphrased question below:

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|----------------|-------------|----------------|-------------|
| 2.3-6          | 10-111      | 2.3-8          | 10-111      |
| 2.3-7          | 10-111      | 2.3-11         | 11-15       |

**Q. Can you be more specific as to when the system will operate and the duration of operation?**

**A. The duration and frequency of operation will be predicated on the research work to be proposed by the scientific community utilizing the HAARP facility. At this time there are no specific proposals that identify frequency or duration of operation. Since there are no known proposals, the only way to identify duration and frequency is to estimate them using historical operational information from similar ionospheric research facilities. Based on research work at facilities elsewhere, it is estimated that the HAARP facility would be operating 4 to 5 campaigns per year with each campaign lasting 14 days. In addition to the 14 days of operation, 10 days of preparation and 4 days of shutdown procedures would be required. It can not be estimated, with any level of certainty, what portions of the research campaign will be continuous. However, during the preparation and shutdown days the operation will not likely continue 24-hours per day for the duration of the period.**

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**The following comment(s) contributed to the paraphrased question below:**

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|----------------|-------------|----------------|-------------|
| 2.3-4          | 10-57       | 2.3-15         | 11-22       |
| 2.3-5          | 10-79       | 2.3-16         | 11-22       |
| 2.3-10         | 10-113      | 2.3-17         | 11-22       |
| 2.3-12         | 11-16       |                |             |

**Q. Could the operation schedule be disseminated to concerned agencies? Could the information include operational details on frequency, duration, and other practical details? Could the HAARP research campaigns be scheduled to take advantage of low HF traffic periods? Could the HAARP emitters be turned off during emergency conditions?**



A. By request, HAARP will provide proposed research campaign details to individuals, agencies and organizations at least two weeks prior to operation of the IRI. HAARP will have a telephone at the operations center available to report any interference or emergency conditions. All practical efforts will be made to use periods of low HF traffic for research campaigns. HAARP operations will stop immediately if interference could be a potential conflict with emergency communications and transport.

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The following comment(s) contributed to the paraphrased question below:

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|----------------|-------------|
| 2.3-3          | 10-50       |

**Q. Why does the HAARP facility need to be away from major metropolitan areas?**

A. There are several reasons for locating the HAARP facility away from densely populated areas. The first reason for locating the HAARP facility away from populated areas is to avoid the background electromagnetic interference generated from those areas. The second concern is the excessive light generated by populated areas. The elevated levels of light associated with urban areas would have an adverse affect on the sensitive diagnostic instruments. Simply, the HAARP facility can not operate near a populated area because of the interference from the populated area on HAARP. Avoidance and mitigation of RFI is practical in an area with a low density of users.

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The following comment(s) contributed to the paraphrased question below:

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|----------------|-------------|
| 2.3-13         | 11-19       |

**Q. Could a larger substation be installed at Bear Creek so it would provide power 5 miles north and 10 miles south to a great many existing households?**

**A. Opportunities for cooperation between HAARP and residents are always welcome. Obtaining a larger substation to help the residents near Bear Creek would be considered if HAARP is constructed at the Clear AFS site. Logistics and planning sessions with the local power company would begin as early as the summer of 1993, if the Clear alternative is chosen.**

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The following comment(s) contributed to the paraphrased question below:

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| 2.3-14         | 11-20       |

**Q. Could the ISR at Bear Creek be moved north 2 miles and placed in the old river bottom where the ancient river bank would shield it from BMEWS?**

**A. Moving the Bear Creek ISR two miles north to the old river bottom would not be practical for two reasons. The predominant feature that shields the ISR from BMEWS is a large ridge on the opposite side (north-east) of the river. Moving the ISR location north reduces the effectiveness of the ridge at shielding HAARP equipment from BMEWS generated interference. The ISR would need to be placed well out of any potential flood prone areas. Placing it closer to the existing river and down into the old river bottom could place it where it could be affected by flooding. In addition to these factors, other considerations that hinder the existing Bear Creek site (aesthetics, land ownership, airspace concerns, etc.) may not be alleviated by the move.**

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The following comment(s) contributed to the paraphrased question below:

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|----------------|-------------|
| 2.3-18         | 11-55       |

**Q. Will spruce timber and spruce slash resulting from clearing of the site be burned or buried to prevent further infestation by the spruce bark beetle?**

**A. The program cannot commit to burying or burning all timber and slash material. As part of the land sale agreement when the government purchased the land from Ahtna, it was agreed that "all forest resources, such as timber, which the Air Force intends to clear and remove from the OTH-B site which is subject to this sale, shall be made available to Ahtna for disposition." This would include the larger timber materials cleared from the site. As for the slash material, much of it would be chipped and buried beneath the gravel access roads that will be associated with the construction of the IRI. Other small quantities of brush will be burned or buried, at the contractor's and government's discretion and in accordance with applicable regulations.**

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The following comment(s) contributed to the paraphrased question below:

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|----------------|-------------|
| 2.3-19         | 11-71       |

**Q. In regard to the Clear Alternative, were siting locations for the ISR other than Bear Creek examined, and why was that site chosen?**

**A. It was the preference of the program to site the ISR and the VIS instruments on existing DOD property, but due to the interference problems with the existing BMEWS emissions it was necessary to use natural topographic features (e.g. ridges, valleys, etc.) to "hide" the ISR from the BMEWS emissions. In addition, keeping the separation distance between the IRI and ISR less than 10 miles is also a requirement. Coupling these requirements with the desire to be near**

a highway, near a commercial power source, and on terrain that is conducive to construction, the Bear Creek site was selected.

Note that in the DEIS it is recognized that the layout has been conducted irrespective of existing homesteading claims. If the Clear Alternative is chosen by the decision makers, then the exact location of the ISR and VIS in the Bear Creek area would be modified to limit the impact on area residents and homesteaders. The Alaska Department of Natural Resources has reviewed the DEIS and suggested slight changes in siting to avoid many of the potential problems at this site.

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## **12.3 CONSEQUENCES**

### **12.3.1 Mammals**

The following comment(s) contributed to the paraphrased question below:

| <u>Comment</u> | <u>Page</u> |
|----------------|-------------|
| 4.3-1          | 10-32       |

**Q. The confluence of Tulsona Creek and the Copper River is frequented by bears during the fishing season. Was this addressed in the EIS?**

**A.** The presence of bears near the confluence of Tulsona Creek and the Copper River is acknowledged. The EIS discusses the presence of both black and brown bears at the site. The Gakona site provides moderate quality habitat for black bears, and poor quality habitat for brown bears. Because of this, the overall density of both species is relatively low in comparison to other regions of Alaska. The individual bears that are in the immediate area of the site and the borrow pit locations along the river could be temporarily impacted by the construction activities. However, these impacts would be limited to short term avoidance behavior during the one or

two seasons of outdoor construction activity. The impacts would not be significant to the area bear populations.

Additionally, it should be mentioned that due to potential impacts on nesting eagles that could be realized as a result of gravel mining near the mouth of Tulsona Creek, the contractor will be required to maintain a buffer zone of at least 660 feet from the nests and possibly further, depending on topography and vegetation characteristics in the region. The contractor will be further directed to maintain a 300-foot buffer zone from the Copper River. This buffer will also help in reducing impacts on individual bears.

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The following comment(s) contributed to the paraphrased question below:

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|----------------|-------------|
| 4.3-2          | 11-56       |

**Q. Please provide additional information on the design of the fence and gate that is to be constructed around the IRI array, and the likelihood of wildlife becoming trapped in these areas. Also, a more detailed contingency plan for removing animals that do become trapped inside is required.**

**A.** The design and the environmental efforts associated with the program are proceeding in parallel. Therefore, at this time we do not have a detailed design for the fence and gates that will surround the IRI. However, the government will be offering the state and federal agencies a chance to consult on and review the design of the fence and gates prior to construction. The contingency plan is to be assembled as part of the general operations and maintenance plan to be submitted by the contractor prior to site turnover to the government. The content of the contingency plan is dependent to some degree on the design of the gate and fence system. Again, the program will ask the appropriate federal and state agencies to review the contingency plan when it is submitted.

The program has no information on the likelihood of large mammals getting trapped inside the IRI array area. Again, this will be dependent on the fence and gate design. However, it is the program's intent to limit the chance of entry by moose, caribou, and bear to the greatest extent practical. Large mammal entry to the fenced area is expected to be a very infrequent occurrence.

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### **12.3.2 Birds**

The following comment(s) contributed to the paraphrased question below:

| <u>Comment</u> | <u>Page</u> |
|----------------|-------------|
| 4.4-1          | 10-32       |

**Q. There is an eagle nest located at the confluence of Tulsona Creek and the Copper River. Are you aware of the presence of eagles and will there be an impact associated with the gravel mining near the P-1 area.**

**A. The EIS acknowledges the presence of several active and inactive eagle nests in the vicinity of the confluence of Tulsona Creek and the Copper River. Information provided by the USFWS, entitled "Bald Eagle Basics"<sup>1</sup>, provides guidance and recommendations regarding land use around bald eagle nesting sites in Alaska, such as along the Copper River. The plan recommends a primary zone be established around the nesting sites that extends out 330 feet from the nest location. Most activities, particularly relating to construction, are to be avoided in this primary zone. A secondary zone generally extends from the edge of the primary zone out to 660 feet, or as far out as necessary up to a maximum of 1/2 mile to ensure visual screening of the nest site. The final distance would depend upon site specific conditions such as height of nest, tree height and density, topography and the eagles tolerance for human activities.**

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<sup>1</sup> Telefax transmittal from Erv McIntosh - USFWS, "Bald Eagle Basics", 1993.

Generally speaking, construction activities within this zone are allowed, but only during certain times of the year (August through March) when eagles are the least susceptible to disturbance. Beyond the secondary zone only the most obtrusive activities (e.g. blasting) are of concern and need to be considered.

For HAARP, a buffer zone of at least 660 feet would be maintained around each eagle nest, regardless of the borrow pit site selected. The buffer zone could increase to a larger distance (up to 1/2 mile) if the terrain surrounding the nest was particularly flat and lacked vegetation. Each situation regarding gravel mining and eagle nests would be evaluated on a case-by-case basis. The USFWS would be consulted regarding the appropriate level of buffer zone protection for nests in the area of gravel mining operations.

Inactive nests would be afforded the same protection as active nests during the nest selection period of eagles. If no eagles occupied the nests during the nest selection period, construction could proceed without necessary avoidance past the 660-foot radius. HAARP intends to work with the USFWS and the NPS on the protection of nesting eagles.

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The following comment(s) contributed to the paraphrased question below:

| <u>Comment</u> | <u>Page</u> |
|----------------|-------------|
| 4.4-2          | 10-47       |
| 4.4-6          | 11-56       |
| 4.4-7          | 11-99       |

**Q. The statement that the potential for bird collisions with the IRI antennas is low at the Gakona site does not seem to be well supported. Could you restate how you arrived at this conclusion. Also, is a bird fatality monitoring program going to be carried out as part of this program?**

**A. A significant amount of research has been conducted on birds at the Gakona site, specifically relating to their abundance, population status, flight path and altitude, flying ability, visual acuity, migration periods and times, and other information relevant to assessing their susceptibility to collisions with HAARP facilities and equipment. Table 4.4-1 of the FEIS, Volume I provides relative susceptibility of collision as compared to the species listed, but does not suggest actual number or significance of potential bird strikes.**

**The major structures that would affect birds would be the IRI and the VIS. The IRI is comprised of 180 guyed antenna elements (each member 2" in diameter), each extending 70 feet above the surface. The VIS is comprised of one 100 foot-high antenna, surrounded by four 50 foot high guyed elements. It can be envisioned that the vertical area that may cause bird collisions of both the IRI and the VIS is relatively small.**

**Upon considering those factors which influence the collision risk potential for birds in Figure 4.4-1 of the FEIS, Volume I, it can be scientifically concluded that the impacts to birds at the Gakona site are insignificant. The relative susceptibility to collisions of ducks, passerines, and swans is considered high, and for shorebirds, the relative risk is considered moderate.**

**Shorebirds are known to primarily migrate at high altitudes at night and in addition have great in-flight maneuverability which would help them avoid the obstructions during the day. Both of these factors reduce the chances for collision. Additionally, a fairly low number of shorebirds actually migrate through the Gakona region.**

**Some collisions with antenna guying wires by ducks and passerines could occur, particularly during inclement weather when the tendency for low altitude migration is greatest. However, studies in the area in the late 1980's indicate that ducks fly at altitude in excess of 100 feet more than 90 percent of the time during the day, and in the range of 300 to 500 feet most of the time during the night. This will decrease their chances of collisions (see Figure 3.4.1 and Table 3.4.1 of the FEIS, Volume I). Passerines typically fly closer to the ground, with about 60**



percent of their flights being at altitudes greater than 100 feet. However, they are very maneuverable and have small wing profiles.

Swans are acknowledged to have the highest relative risk for collisions with antennas and guying wires. This is due to their tendency to migrate even during poor weather conditions, and at lower altitudes, and because a fairly large number of swans breed through-out the region. Young immature swans will likely be more susceptible to collisions as they learn to fly. Table 3.4.1 of the FEIS, Volume I points out that swans in the region are known to fly at altitudes greater than 100 feet more than 85 percent of the time. Although some collisions are expected, the number should be small and would not be significant to the swan population as a whole.

Mitigation for impacts to birds includes the use of yellow aviation marker balls on all perimeter wires greater than 50 feet above ground level. This action has been used successfully elsewhere to minimize the number of bird collisions with wires and power lines, particularly during daylight hours.

Based on the above analysis using detailed bird information from the area, it is concluded that although bird collisions will occur, they will be insignificant with no population effects and do not warrant a bird fatality monitoring program.

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The following comment(s) contributed to the paraphrased question below:

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|----------------|-------------|
| 4.4-3          | 10-78       |
| 4.4-4          | 11-55       |

**Q. The information in the EIS on the location of bald eagle nests is taken from a 1989 survey. The National Park Service has performed more recent studies and this information should be included in the FEIS.**

A. It is acknowledged that the information presented in the DEIS is not the most recent eagle survey data. The attached figure (Figure 12.4-1) presents the most recent information on eagle nesting in the Gakona site region. This information was presented to HAARP by the National Park Service (Wrangell-St. Elias National Park and Preserve - Mr. Russell Galipeau) in a letter dated April 26, 1993. This additional information does not change the conclusions drawn from the analysis in the DEIS. The National Park Service or the Fish and Wildlife Service will be consulted on a yearly basis during the construction period to obtain the most recent information on eagle use patterns in the potential gravel source areas.

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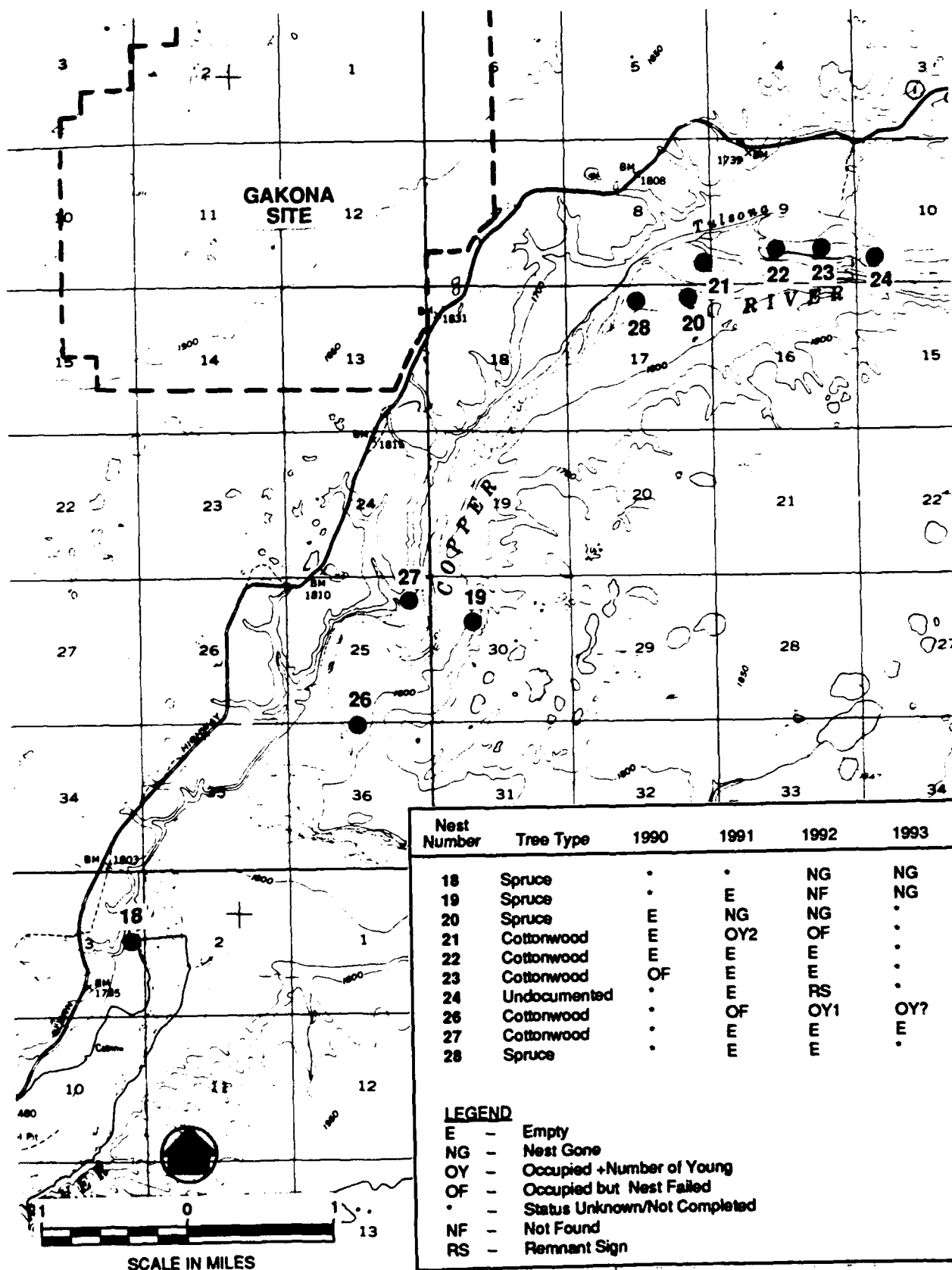
The following comment(s) contributed to the paraphrased question below:

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|----------------|-------------|
| 4.4-5          | 11-56       |

**Q. Please address the potential impacts of lighting on migrating birds. Could this attract migrating birds to the IRI area, thereby increasing the chance of collision.**

A. It is the desire of the scientific program to keep light pollution in the area to an absolute minimum. Therefore, there are no plans to light HAARP IRI or VIS antenna masts. Furthermore, there are no plans to light the ground surface around the masts. The only way that the program would change their position on the lighting of the IRI, VIS, or other equipment would be if the FAA or another agency insisted upon it for safety reasons. The requirement for lighting the IRI or VIS antenna masts is not anticipated due to their relatively low height (less than 100 ft). If lights are required for safety or aviation reasons, then the appropriate government agencies, including the Fish and Wildlife Service and FAA, would be consulted on the lighting intensity, color, type, etc. to minimize the bird attraction potential.

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**FIGURE 12.4-1. UPDATED EAGLE NEST LOCATIONS AND STATUS ALONG THE COPPER RIVER**

### **12.3.3 Aquatics**

The following comment(s) contributed to the paraphrased question below:

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|----------------|-------------|
| 4.5-1          | 10-32       |
| 4.5-2          | 10-32       |
| 4.5-3          | 11-56       |
| 4.5-4          | 11-65       |

**Q. Is site P-1 the preferred gravel source site? Gravel extraction at site P-1 (located on the banks of Copper River, located slightly upstream from the power plant site) could impact significant fish and wildlife habitat, including areas used by bald eagles, tundra swans, and anadromous and resident fish. The FEIS should address these impacts and possibly eliminate area P-1 from consideration.**

**A. Gravel borrow area P-1 (as identified in DEIS) is not considered by the program to be the "preferred" site, as it was for the large quantities of material required for the construction of the OTH-B site. Gravel borrow area P-1 is simply to be considered one of several possible borrow sites. In fact, gravel borrow site possibilities are not limited to those discussed in the DEIS. The contractor can propose any borrow site, but will be responsible for securing the proper environmental permits prior to use.**

The program is aware of the use of the Copper River area by eagles, swans, and both resident and anadromous fish. Proper precautions and permitting with appropriate state and federal agencies will be required prior to commencement of gravel extraction. However, the program will not eliminate P-1 from consideration at this point.

#### **12.3.4 Air Quality**

The following comment(s) contributed to the paraphrased question below:

| <u>Comment</u> | <u>Page</u> |
|----------------|-------------|
| 4.7-1          | 11-88       |

**Q. Would there be an unacceptable amount of air pollutants produced at the Gakona site?**

**A.** An analysis of the amount of emissions from the proposed power plant at the Gakona site indicate that the generators can operate continuously for approximately 38 days without exceeding the Alaska Department of Environmental Conservation prevention of significant deterioration (PSD) limit of 250 tons per year of any one EPA regulated pollutant. Potential exceedence of the this limit requires a PSD review.

Based on the operational scenario that the scientific community has planned for the HAARP facilities, it is estimated that the power plant would be operating about 12 hours per day for the 14 day campaign duration, or about 35 days of operations per year. That is, the power plant emissions based on the present operational scenario would not exceed the level required for PSD review. If additional campaigns were added, or if the total duration of the power plant operation were otherwise extended, then either a PSD review would be required, or some form of emission control would be added to the stack to reduce the emission levels. The pollutant of particular concern for a diesel engine power plant is NO<sub>x</sub>.

HAARP would ensure that the powerplant facility emissions would not significantly degrade the air quality of the Gakona region by requiring that the power plant meet all required federal and state regulations (including PSD requirements, if necessary) on air emissions.

The Federal Clean Air Act was significantly amended in 1990. How amendments will affect HAARP is still uncertain because at the time of this writing the state has not yet adopted many of the necessary regulations implementing the amendments. Title V of the amendments

established a new permitting structure that requires all major sources of air pollution to obtain a permit pursuant to the new requirements of the title. Title V required the EPA to develop regulations that define the requirements for state programs to implement title. Each state then had three years to develop a new operating permit program and submit it to the EPA for approval. ADEC has submitted to their legislature proposed changes to address Title V permitting requirements, but these changes are still pending. Therefore, at the present time, and until the State of Alaska adopts the new permitting requirements, the existing regulations apply.

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### **12.3.5 Socioeconomics**

The following comment(s) contributed to the paraphrased question below:

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|----------------|-------------|----------------|-------------|
| 4.8-1          | 10-28       | 4.8-13         | 10-71       |
| 4.8-2          | 10-30       | 4.8-14         | 10-71       |
| 4.8-4          | 10-37       | 4.8-15         | 10-72       |
| 4.8-5          | 10-38       | 4.8-16         | 10-72       |
| 4.8-6          | 10-38       | 4.8-23         | 11-12       |
| 4.8-7          | 10-39       | 4.8-33         | 11-82       |
| 4.8-11         | 10-62       | 4.8-34         | 11-82       |
| 4.8-12         | 10-70       | 4.8-35         | 11-100      |

**Q. Can the government require that the contractor use local labor, and will there be a program for locals to be trained by the government to fill skilled HAARP positions? In addition, please state the percentage of the money that will be spent locally on the HAARP project.**

**A. The government cannot require that the contractor hire local individuals. The Request for Proposals (RFP) issued by the government has several stipulations that encourage the**

contractor(s) to utilize local labor. Among the Federal Acquisition Regulations (FAR) that will function to help area businesses are:

|     |           |  |
|-----|-----------|--|
| FAR | 52.219-08 | Utilization of Small Business Concerns and Small Disadvantaged Business Concerns |
| FAR | 52.219-09 | Small Business and Small Disadvantaged Business Subcontracting Plan              |
| FAR | 52.219-13 | Utilization of Women-Owned Small Businesses                                      |
| FAR | 52.220-4  | Utilization of Labor Surplus Area Concerns                                       |

The regulations relating to small and disadvantaged businesses certainly do not guarantee that local businesses receive subcontracts for electrical, mechanical, clearing, gravel hauling and other tasks, but it does require that the contractor develop subcontracting plans that considers small, women-owned, and disadvantaged businesses. This subcontracting plan must be submitted to the government for review. The contractor is also required to keep records on each subcontract solicitation (> \$100K) that indicates whether small business concerns were solicited and if not, why not, and why the small or disadvantaged business enterprise was not selected. Additional requirements are laid out in FAR 52.219-09 which is available at community libraries or by contacting the Department of Labor.

The Copper River and Nenana River Basins - indeed much of the state of Alaska - are classified as labor surplus areas by the Department of Labor. This designation, along with the requirements of FAR 52.220-4, requires the construction contractor to do several things to encourage local subcontractor participation in the project. Among these requirements are: encourage labor surplus area (LSA) concerns to compete for subcontracts; designate a liaison officer to interact with the government on LSA issues; provide adequate and timely consideration of LSA concerns on all "make or buy" decisions; ensure that LSA concerns have an equitable opportunity to compete for subcontracts; include LSA concerns clause in all subcontracts that offer LSA subcontracting opportunities; maintain records indicating how LSA issues were

handled and accounted for; and, insert in any subcontracting agreement over \$500,000 terms that conform substantially to the LSA clause (FAR 52.220-4).

The operation of the HAARP program will require 4 to 8 full-time staff to act as caretakers, power plant mechanics, and security staff. It is anticipated that these individuals will be hired from the local community. During the four to five scientific campaigns per year, a dozen to twenty individuals from universities or research institutions will converge on the site to perform experimentation. Aside from the 4 to 8 individuals who will act as the O&M staff, there are no other jobs for local residents anticipated. Thus, it is not anticipated that HAARP will be providing training for local residents to fill slots such as electronics technicians, etc. The extent of training would be limited to the 4 to 8 O&M staff and cover such topics as safety training, first aid and CPR, firefighting, and O&M training school for the diesel engines and other such hardware.

The HAARP program is currently estimated at approximately \$150 million. This figure covers a myriad of tasks and services ranging from the environmental and planning work on the governments part, to the construction of the design prototype in the lower 48, to the actual construction and testing of the HAARP facility in Alaska. Much of the construction cost relates to the design and construction of sophisticated hardware and software that controls and operates the high-tech HAARP equipment. We estimate at this early stage of the program that about 10% of the construction money (\$15 million  $\pm$ ) will be spent directly in Alaska for facility design and construction. We are unable to reliably predict the amount of construction money that will be spent in communities of either the Copper River or the Nenana River Basin. Operational cost for the facility are estimated at roughly \$3 million per year, including fuel, O&M jobs, commercial electrical costs, snow plowing, security contracts, water and wastewater utilities and disposal, etc. It is envisioned that all the operational services would be purchased from local concerns. In addition, it is anticipated that roughly 12 to 20 people would spend 7 to 14 days for each campaign in the region surrounding the HAARP site living off the local economy (e.g.



room, board, gas, services, etc.). Unscheduled maintenance and repair contracts on HAARP facilities will be let to area concerns on an as needed basis and are impossible to reliably predict.

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The following comment(s) contributed to the paraphrased question below:

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| 4.8-17         | 10-74       |

**Q. Is there enough available housing for the construction workers near the Gakona site?**

**A.** There is no plan for the building of a construction camp to house workers during the construction of the HAARP facilities. It is anticipated that a number of the construction workers will be local hires who reside in the region and therefore will not require temporary lodging. For those workers that do require temporary housing in the region, since vacancies range from 21 to 42 percent in the area, there are more than ample vacancies within commuting distance of the site for the size construction crew that is being planned.

Temporary housing/lodging is available in the nearby surrounding communities for the research scientists and technicians that will be using the HAARP facilities during the research campaigns.

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The following comment(s) contributed to the paraphrased question below:

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| 4.8-24         | 11-14       |

**Q. Do you realize the great cost that will result from redesigning new aircraft corridors and reprinting thousands of aircraft sectional maps and Alaska supplements that will result**

**from construction at the Gakona site and the ensuing change in air traffic at the Gulkana airfield?**

**A. The HAARP program is not requesting to relocate existing aircraft corridors in Alaska. The HAARP facility may require redesignating air space, but not the realignment of existing air corridors. Air traffic arriving and departing Gulkana airport will not be required to be rerouted, thus air traffic should continue to be the same as prior to HAARP. The requested air space designation will require aircraft maps and supplements to be updated. The upgrade can be accomplished at minimal cost by placing the new information on the next scheduled periodic update of those reference materials. This method should be easily accomplished since the HAARP facility will not be operating for several years. Thus, the cost of redesignating the air space above the Gakona site will be minimal.**

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**The following comment(s) contributed to the paraphrased question below:**

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**Q. Has a cost/benefit analysis been performed on this project? Is it worth the \$150 millions dollars that are projected to be spent?**

**A. A cost benefit analysis has not been preformed for HAARP. However as is often the case for projects funded with public money, it is difficult to perform a meaningful cost benefit analysis. The costs typically are well known, but benefits may be difficult to quantify, particularly with scientific projects. Although the initial capital investment may seem high for the potential benefits of improved communication for civilian and defense purposes, the fundamental knowledge gained relating to the aurora, ionospheric properties and behavior could result in other important unforeseen benefits. The Scientific Community, Department of Defense**

and our elected representatives review many proposals each year, and they have identified HAARP as a worthwhile endeavor for the scientific advancement of the United States and the world.

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The following comment(s) contributed to the paraphrased question below:

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**Q. There are several families that currently live within about two miles of the Gakona site. There is a general concern among area residents that noise may become a problem during construction and operation of the HAARP facility. In addition, there is concern that noise may impact on animals, and specifically eagles that nest along the Copper River. Please elaborate on the noise issue and what could be done to mitigate the negative impacts, if any.**

**A. There are two general concerns relating to noise at the HAARP facility; noise generated during construction of the facility, and noise generated during operation. These two concerns are addressed separately below.**

#### Noise Overview

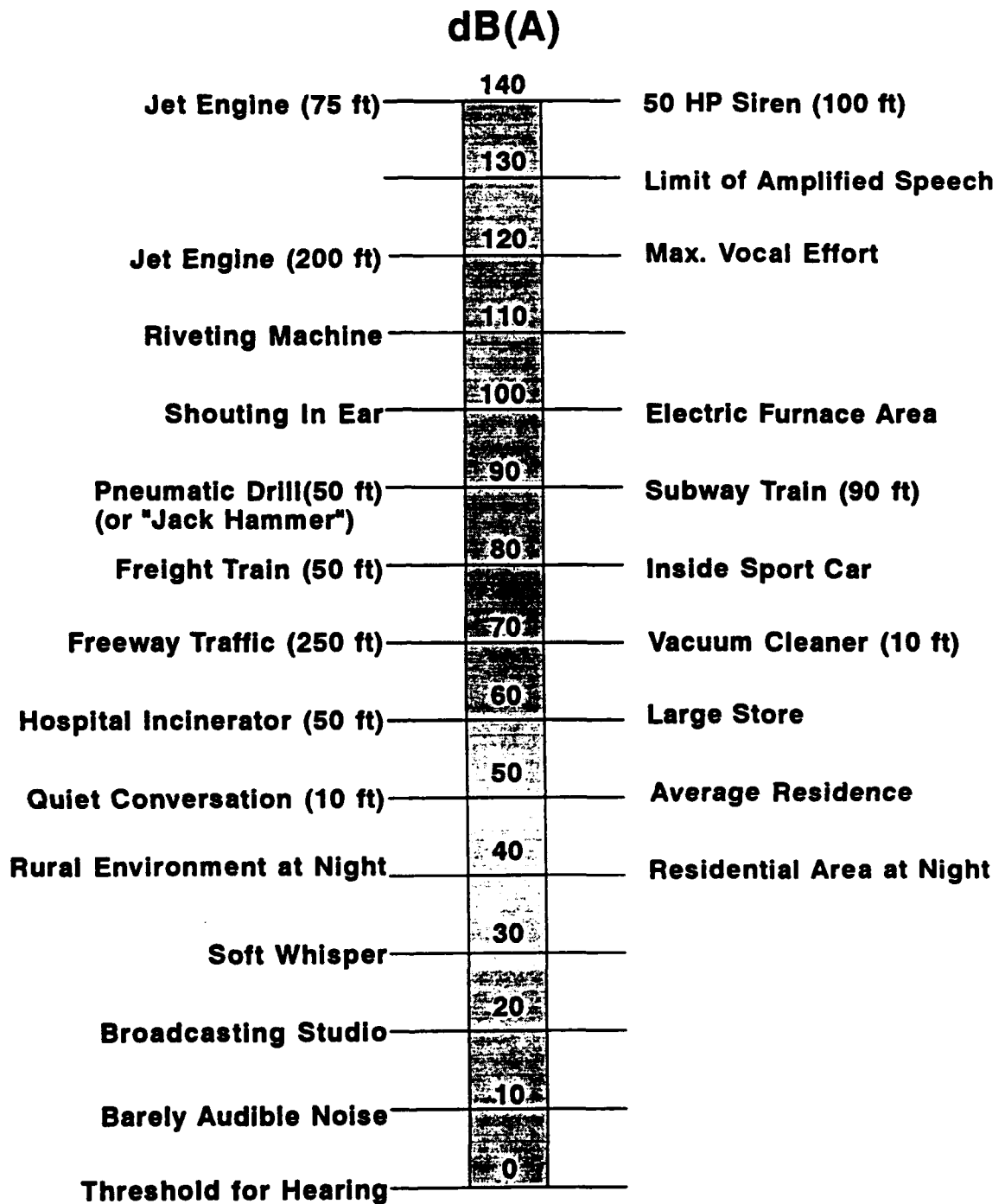
Before proceeding with answering these questions, it is appropriate to give a general overview on noise, how it is measured, and how it attenuates (becomes less) with distance from a source. Generally speaking, noise is created when an object vibrates rapidly and causes pressure waves to be created in the air. The elastic nature of air allows the molecules to respond to the pressure change by bumping into those molecules next to them

and causing displacement. It is this successive "bumping" mechanism that causes sound to travel through the air.

The human ear is very sensitive and is capable of detecting a wide range of sound power. It is for this reason that a logarithmic scale is used to classify sounds (the logarithmic scale condenses widely varying values such that they can be more readily dealt with and interpreted. For example, if a certain value increases by ten times on the "regular" scale, it increase by one on the log scale). The unit of sound loudness commonly used is the decibel (dB). A value of 0 dB is defined as the threshold of hearing, and the value of 120 dB is the threshold of pain of hearing for a human being. Note that the 0 dB level does not indicate an absence of sound, but the level of sound that is barely audible by the human ear at a frequency of 1000 Hz.

If the pitch (or frequency) of the sound varies from 1000 Hz, the sensitivity of the human ear tends to decrease. Thus, if we are concerned with sounds from a wide range of frequencies we would want to give less "weight" to those at the extremes of the frequencies than to those around the 1000 Hz range. It is common for sound levels to be given in a range called the A-weight range, which approximates the sensitivity of the normal human ear. The designation dB(A) is typically used to signify the A-weight range used. Figure 12.8-1 gives noise levels generated from typical activities and work environments.

Because environmental noise levels normally fluctuate with time, a time averaged noise level, in dB(A) is often used to characterize the acoustic environment at a given site. One time-averaging scheme results in an index of environmental noise known as the energy equivalent noise level,  $L_{eq}$ , that reduces a full range of noise in the environment to the steady-state equivalent sound level for any given measurement period. Similarly, the  $L_{dn}$  transforms the spectrum of noise into a "day-night equivalent noise level" and puts extra weight (10 dB(A)) on noises occurring between 10 p.m. and 7 a.m. State and federal



Sources: Peterson, 1980;  
Honour, 1979;  
Cunniff, 1979; ESA, 1990

**FIGURE 12.8-1. TYPICAL A-WEIGHTED SOUND LEVELS**

standards for noise levels are frequently given as  $L_x$ , where x is the percentage of time the noise level can exceed a certain level over a 1-hour period (e.g.  $L_{10} = 55$  dB(A) indicates that the noise level can exceed 55 dB(A) only 10% of the time for any 1-hour period).

### Background Noise Levels

In assessing the level of noise impact of a certain activity, it is important to determine the level of existing noise at the site. The existing ambient noise level at the site determines the level of increased noise that is perceivable, and therefore, acceptable. For instance, persons living in a windy location on a river might not be disturbed by traffic to the degree that a person would who was living in a windless quiet environment, but an equal distance from the highway.

The background noise level can be determined either by direct measuring in the field, or by classifying the area and then using published information to give the level of background noise that exists in such environments. The Gakona and the Clear sites would be classified as rural environments and published data and information for areas such as this suggest that the expected background noise levels would be a minimum of 30 dB(A) during the daytime, and 25 dB(A) during the nighttime. This is a conservative estimate assuming no wind, no effect from the rivers in the area, no impact from the natural world (birds, insects, wolves, etc.), no traffic noise from the Tok Cut-Off, and no residential type noise pollution. Many state and federal agencies set guidelines and maximum permissible levels of noise for both interior and exterior situations for both residential, commercial, and industrial land usages. These values vary from state to state, and agency to agency, but as a point of reference the EPA identifies 55 dB(A) as the maximum permissible outdoor noise level for residential land use. However, it is the intent of HAARP to keep the noise levels at the existing dwellings in the area such that it is near or less than the existing background noise levels (25 dB(A) at night, 30 dB(A) during the day).

Note that we are focusing our attention here on the outdoor noise levels in the vicinity of the nearest dwelling to the HAARP site. The indoor noise levels are typically also of concern, particularly when the outdoor permissible value of 50 to 60 dB(A) is to be approached. This, for instance, would be the case in a urban environment where population density would not allow for the outdoor criteria to be met. However, in recognition of the Gakona area being rural and the privacy and quietude being important to area residents who may spend much of their time outdoors, the noise criteria for an outdoor location will be used. Because it is the intent of HAARP to keep the noise level at resident's outdoor locations near the background noise levels, the indoor noise levels with the extra shielding and attenuation effects of the doors and windows, coupled the increased dwelling noise, would make any noise generated by the HAARP power plant (2 miles away) imperceptible.

### Operational Noise

The operation of the HAARP facility would be episodic in nature. Four to five research campaigns are planned for each year, with the total duration of each campaign being about 24 days (10 days start-up, 14 days of experimentation, and 4 days of shut-down). This transforms to a maximum of about 4 months of total operation per year. The operation of HAARP is expected to begin in 1997.

The main noise sources associated with the operation of HAARP would be via the simultaneous operation of the six diesel generators, each with a rated output of 2.5 megawatts. Each generator engine is 20-cylinder and rated at 3600 horsepower. Other sources of noise at the site would be pick-ups and other light-duty vehicles operated infrequently around the site, and various other small noise emitters. However, these sources would be small during the operation stage and are overshadowed by the diesel engine generators. Using manufacturers information and published data from Air Force Manual 88-20, Power Plant Acoustics, estimates have been made regarding the noise generated by the engines operating in parallel. Although a final design for the engines has not yet been completed and several issues that have a bearing on acoustics have not yet been resolved

(e.g. will the engines be equipped with turbochargers, length and orientation of exhaust pipe, muffler types, etc.), the position was taken in this analysis to always assume a conservative, or "worst case", scenario.

Figure 12.8-2 shows a simplified cross section of the Gakona site, showing the locations of the power plant, and several prominent features around the site, including the Tok Cut-Off, the BLM trail, the Copper River, and the nearest residences to the site. Above the cross-section is a curve which shows the way in which the sound from the generators would attenuate with distance. Note that assumptions were made regarding the forest density and attenuation effect, the temperature, humidity, and atmospheric pressure at the site, the topography (assumed flat as a worst case), and the direction of the sound. The figure indicates that, for this worst case situation with no mitigation or special mufflers on the generators, the noise would be marginally detectable under the best of sound propagation conditions at the nearest dwelling. At the Copper River distance and BLM trail distance, the noise level from the power plant would be about 38 and 39 dB(A) respectively, which is slightly less than the typical sound level from a "rural residential area at night". The value at the closest point on the Tok Cut-Off is estimated at 60 dB(A), which is equivalent to noise level in a large department store.

We have also considered the effect of power plant generated noise on the areas around the power plant to account for the construction of houses in the area at a future date. Calculations show that the noise level would exceed a typical rural background noise level of 40 dB(A) at a distance of about 3500 feet from the power plant. For a residential area, the EPA recommends a outside noise level be below 55 dB(A). Some states and agencies allow for higher values at the property boundaries of adjacent land owners. However, the 55 dB(A) level is exceeded approximately 1200 to 1500 feet from the source. The Occupational Safety and Health Administration (OSHA) recognizes 90 dB(A) as a safe



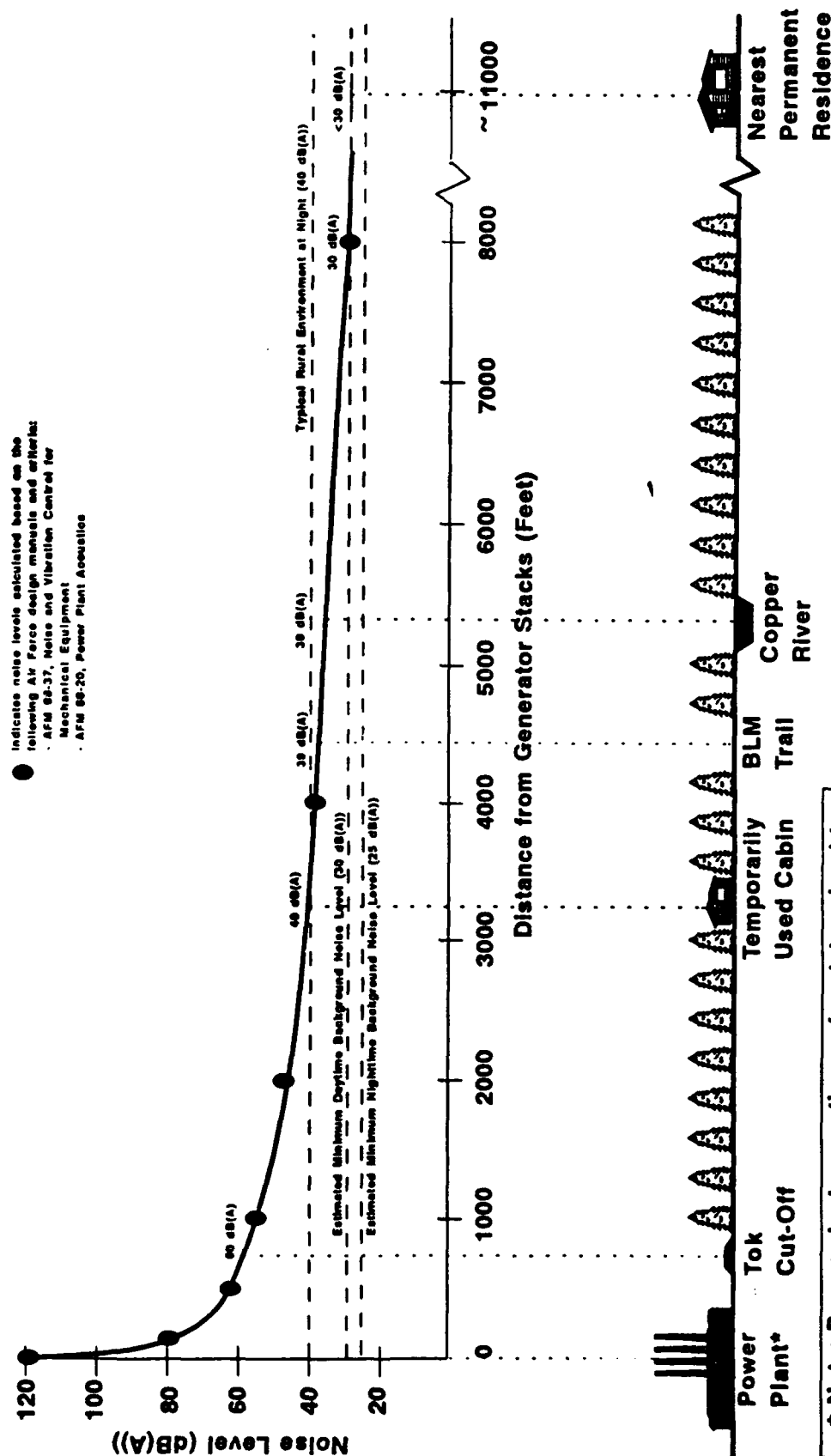


FIGURE 12.8-2. NOISE ATTENUATION WITH DISTANCE AT THE GAKONA SITE, 120 dB(A) @ SOURCE.

## Simplified Cross-Section - Gakona Site

Noise Attenuation with Distance

exposure level for a duration of 8 hrs sustained. For HAARP, this would coincide with a distance of less than 100 feet. For values below 90 dB(A), there is no OSHA exposure standard. However, the National Institute for Occupational Safety and Health (NIOSH) recommends that exposure levels for 16 hours continuous duration be limited to a level of 85 dB(A). The 85 dB(A) level of noise is achieved at a distance of 100 feet from the source.

The affects of temperature on sound propagation have been investigated to determine if noise attenuation will be appreciably less in cold Alaska conditions than for the warmer standard day conditions in the analysis. In general, sound travels better in cold, dry air than in warm, wet air. This is particular true for high frequency noise. For lower frequency noise the difference in attenuation is small, and in fact the warmer air even possibly transmits the sound better. The noise from the exhaust of the diesel generators is primarily skewed toward the low frequency end of the spectrum. Thus, effects of temperature and humidity on noise attenuation are kept to a minimum for the power plant situation. Note that for high frequency noise (like the "whine" of tires on a roadway surface) would travel noticeably better in the cold Alaska night than on a warm summer day.

In summary, it is concluded that the noise generated by the proposed power plant would attenuate to a typical rural environments level at a distance of about 3500 to 4000 feet from the power plant (with slight variations depending on atmospheric and landscape conditions). If we assume that the Gakona region is especially quiet at certain times, we can estimate that the minimum background noise level during the day would be 30 dB(A), and about 25 dB(A) at night. The distance required to reach this level is about 8000 to 12000 feet (2 miles  $\pm$ ). Thus, the existing residences at the site are on the margin where under certain circumstances and conditions, they may be able to hear the faint sound of the engines in the vicinity of their home. They would not be able to hear the power plant engines from within their houses.

New residences could be constructed within roughly 4000 feet of the power plant and only hear it occasionally at an outdoor location. A house could be constructed literally across the road (Tok Cut-Off) from the power plant and still be with the maximum permissible outdoor standard. The noise level at the existing BLM trail will be below the typical rural environment level at night, and therefore the power plant noise would be discernable only on occasion. The noise level at the closest point on the Copper River would be below the 40 dB(A) rural environment level. Moreover, the noise from the flowing river would increase the background noise level to the point where it would be impossible to detect the power plant generated noise, particularly in the spring, summer, and fall.

#### Construction Generated Noise

Construction of the HAARP facility would generate high noise levels both on and adjacent to the site. These noise levels would be intermittent in nature and seasonal as well, with most of the outdoor "noisy" construction being generated over a couple of seasons. Additionally, most of the noise from construction would be generated during the day when the background noise is typically highest and people are less apt to be affected by it. The activities will begin with clearing and constructing roads and work pads, drilling and setting piles, mining and hauling gravel, and miscellaneous earthmoving activities. No blasting is currently proposed in association with this construction activity. This phase will be followed by additional earthwork, the setting of modular scientific shelters, erection of antennas and guying wires, and work on the power plant/operations building. Although the work outlined above is scheduled to take place over a total period of 36 months, the vast majority of the "heavy" outdoor construction activities will take place in the twelve month period of 1995. Based on an assumed average mix of industrial construction, noise levels for different types of construction are approximated in Table 12.8-1.

Three different conditions for the construction activities must be considered for a complete analysis. The first is the construction activities at the site proper, and the second is the gravel mining activities at one of the gravel borrow areas, and the third is the noise

generated by the trucks hauling from the gravel borrow source to the site. For the assumed site proper noise levels during construction it is necessary to combine the noise levels from two different sources to obtain the appropriate worst case condition, namely excavation and foundation levels (Recall that the addition of noise levels is not arithmetic, but logarithmic in nature). For the assumed noise levels associated with gravel mining, only the excavation noise levels are assumed. Due to the distances these two activities are apart, it is not necessary to consider the contributory effect of the two activities. The assumed values are outlined in Table 12.8-2.

On-Site Construction Noise. The location of the construction activities would be in the vicinity of the power plant as analyzed under operations above. Although the absolute value of the noise level at the source is higher than for the power plant operation, several conditions make this situation less of an issue. The location of the noise sources for the construction activity will be near the ground surface and, therefore, the attenuation effect from the vegetation and the topography is much greater. Also, the construction effort would be intermittent, and probably only occur during the daylight hours when the background noise tends to be higher. Thus, we can determine that the continual operation of the power plant with its noise source originating at a elevated point, is discernable at greater distances than a somewhat louder noise level being generated intermittently at ground level.

Borrow Pit Noise. The location of the borrow pit location for the mining of gravel has not been determined as of the date of this writing. Several borrow sources on the Copper River were identified during the construction planning for OTH-B. However, that program was canceled prior to developing the sources. The construction of HAARP will require much less gravel than OTH-B, and therefore the construction contractor may wish to investigate alternate sources in the area. At any rate, the location of the pit will be several thousand feet away from the power plant and the construction area, and therefore there would be no additive contributory effect associated with noise. Regardless of the site selected it is

**TABLE 12.8-1 APPROXIMATE NOISE LEVELS FOR  
VARIOUS CONSTRUCTION ACTIVITIES**

| Activity (@ 50 ft)                 | Noise Level |
|------------------------------------|-------------|
| Ground Clearing                    | 87 dB(A)    |
| Excavation/Gravel Mining           | 89 dB(A)    |
| Foundation/Piles                   | 89 dB(A)    |
| Erection/Setting Modular Buildings | 84 dB(A)    |
| Finishing                          | 84 dB(A)    |
| Haul Trucks (50 mph)               | 85 dB(A)    |

Sources: ESA, 1990; Bolt, Brananeck, and Newman, 1971

**TABLE 12.8.2 ESTIMATED NOISE LEVELS AT VARIOUS SITE LOCATIONS**

| Activity (Worst Case)   | Noise Level                                |
|---|--|
| Site Proper Noise Level from Construction<br>(Excavation and Foundation activities proceeding<br>in parallel) | 92 dB(A) - @ 50 ft<br>124 dB(A) - @ source |
| Borrow Pit Noise Level<br>(Excavation activities only)  | 89 dB(A) - @ 50 ft<br>121 dB(A) - @ source |
| Haul Truck Noise Level (50 mph)   | 85 dB(A) - @ 50 ft<br>73 dB(A) - @ 200 ft  |

envisioned that pit activities will be limited to the use of trucks and loaders. No gravel crushing operations have been proposed as of this date, and are not considered in this analysis.

The noise generated by mining of gravel is anticipated to be roughly 120 dB(A) at the source (89 dB(A) @ 50 ft), and will carry roughly as far as that of the power plant as described above. However, the attenuation rate of the noise will be greater at the borrow pit due to location of the vegetation being above the source emitter, and the topographic effect caused by the equipment operation at a point typically below the surrounding grade. In addition, the gravel mining operation will be carried out on an intermittent, seasonal, and ephemeral basis which will also reduce its obtrusiveness to humans and wildlife.

The area of concern for the borrow pit lies in the disturbance of eagles and other raptors that nest and raise their young on the banks of the Copper River. Large amounts of noise and disturbance in the area could serve to disrupt the breeding habits of the eagles, resulting in an impact that could violate the Bald Eagle Protection Act. For distances close in to the source, it is appropriate to approximate the attenuation by reducing it by 6 dB(A) for every doubling of distance from the source (e.g. 50 ft from source = 89 dB(A), 100 ft = 83 dB(A), 200 ft = 77 dB(A), etc.). Using this approximation and information from the power plant operation analysis outlined above, it can be determined that to reduce the gravel pit noise to an acceptable level for surrounding eagles and other birds, a buffer zone would be required. In addition, efforts could be made to avoid the sensitive habitat areas during specific times of the year such as breeding, incubation, or brood-rearing periods.

At the time of this writing the source of the 160,000 cy of gravel required to construct the site has not been determined. The location of the gravel mining area(s) will determine the level of impact noise would have on human populations, as well as on mammal and animal life. The final selection of the gravel borrow site will take into account proximity to residences, and local bird nesting and brood-rearing areas. In instances where bird nesting areas can not be avoided geographically, the most critical times of the year will be avoided

for creating noise. Yet, regardless of the borrow sources used, impacts are not expected to be significant.

**Haul Truck Noise.** Truck traffic to and from the site will also generate noise. Trucks carrying gravel to the sites will make frequent trips from the pit location to the facility area. This gravel hauling activity will be seasonal in nature, and could potentially be extended over three years. The total number of haul trips is estimated at 7300 (assuming a 22 cubic yard capacity dump truck). The average number of truck trips per day would be about a dozen over the construction period, but peaks in gravel and earthmoving could increase this up to 100 per day or more for short periods of time. This would be particularly true in the summer of 1995 when site development and IRI construction is scheduled.

Although the haul truck traffic on the area roads would represent an increase over existing traffic noise, the increase would be partially spread throughout the rural area. Because the final location of the borrow pit(s) has not yet been selected, it is not possible to estimate the exact noise impact on residents and wildlife. The haul distances will be kept as short as possible to minimize hauling impacts and costs. If area P1 or P2 were chosen, the haul distances would be only a few miles maximum and almost none of it on the Tok Cut-Off Highway (and none past residences on the highway). Other pits (including those discussed in the EIS) would involve longer haul distances, some approaching 10 miles. The route could potentially lead past about eight residences constructed off of the Tok Cut-Off Highway at about mile 9.

Individual trucks traveling at a speed of about 50 mph would cause a peak noise level of about 85 dB(A) at houses located 50 feet from the road for the few seconds it takes the truck to pass. Using the "rule of thumb" that sound attenuates by 6 dB(A) for each doubling of distance, the sound at 100, 200, and 400 feet would be 79, 73, and 67 dB(A), respectively. These values would certainly be maximum since the "rule of thumb" makes no allowance for vegetation attenuation, topography and other factors. Most houses in the areas to be impacted are typically about 250 feet or more from the highway.

Thus, the noise  $L_{10}$  standard (approx. 65 dB(A) max. daytime, outdoor) would be violated by the truck noise. However, this is frequently the case for large trucks using roads with adjacent residences. In spite of the noise level exceeding the recommended maximum, the noise would be too sporadic to significantly effect average noise levels. No significant impact from the haul trucks would be realized by the construction of HAARP at either of the sites.

There would also be a slight increase in traffic brought about by the commuting of construction workers (maximum 60) traveling to and from the site either from their homes or from their temporary living quarters in the area. However, the commuting vehicles would predominantly be small passenger cars and light-duty trucks with similar noise emission levels. Noise levels from a typical car traveling at 50 mph is less than 70 dB(A) at 50 feet, or about 58 dB(A) at 250 feet which is well within the  $L_{10}$  criteria stated above for both nighttime and daytime use. No significant impact would be brought about by this activity.

### Mitigation

Power Plant. Mitigation for increased noise levels brought about by the operation of the power plant is warranted. Current estimates for the noise level emitted from the operation of the six engines suggest that the power plant will be barely audible outdoors at the nearest residence under some transmission conditions. Nonetheless, it is the government's desire to completely eliminate this potential impact. Calculations indicate that if the sound power level at the source (generator stacks) is limited to about 115 dB(A) in the direction of the residences, then the power plants would not be audible at the residences. Recall that the estimated maximum omni-directional sound power level is 120 dB(A) for the power plant.

Several mitigation actions could be used to limit the amount of noise in the direction of the sensitive receivers (residences). Two of these involve modifications at the power plant source. The first modification would be the use of special large volume, low-pressure-drop



mufflers, either in singly or in series, to provide greater insertion loss than has been included in the analysis for the conventional grade of mufflers. These mufflers have been used by the Air Force and others to locate large generating engines as close as 600 to 800 feet from residential areas. A second alternative would be to construct an L-shaped outdoor barrier wall above the level of the exhaust pipe openings. This wall would reflect the sound coming out of the exhaust pipes away from the residences, river, and road.

**On-Site Construction.** No mitigation is required for on-site construction as the sound is to be only sporadic in nature and occurring principally during the daytime hours (7 a.m to 11 p.m.).

**Borrow Pit Noise.** Mitigation will be required at the borrow pit to ensure that eagles that reside on the banks of the Copper River are not significantly impacted through the generation of noise. Buffer zones around active nesting sites shall be maintained in accordance with the USFWS recommendations spelled out in the "Bald Eagle Basics"<sup>2</sup> plan. This plan calls for a primary zone around eagle nests of 330-foot radius, and a secondary zone extending out 660 feet radius. Borrow pit development within both zones must consider eagle nesting periods. The plan also states that where line of sight to the nest is possible, the buffer zone may need to be extended out to a one-half mile radius. The actual size of the buffer zone will depend on site conditions and the eagles' tolerance to human activity.

It is recommended within the "Bald Eagle Basics" plan that activities such as road construction near inactive nests begin after June 15 of any year to allow opportunity for nesting. In a general sense, for both active and inactive nests the plan recommends scheduling all activities occurring within the secondary zone to avoid the nesting season March through August. The plan limits only the most obtrusive activities (e.g., blasting) beyond the secondary zone.

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<sup>2</sup> Telefax transmittal from Erv McIntosh - USFWS, "Bald Eagle Basics", 1993.

**Haul Truck/Vehicle Noise.** Haul truck and vehicle noise associated with the construction of the HAARP facility is not expected to be significant. Thus, no mitigation is planned.

### **Summary**

Table 12.8-3 summarizes the findings of the noise analysis and the mitigation that is planned. Although the question on noise and the analysis above was performed for the Gakona site, much of the analysis and conclusions can be transferred to the situation at the Clear site. For instance, the level of construction noise associated with gravel mining operations, construction of the IRI, setting of the shelters and other tasks will be approximately the same. Additionally, haul truck noise and the associated impacts will be approximately the same, although the potential for very short haul distances and less gravel being required (due to numerous gravel pits and favorable subsurface conditions) could substantially reduce the haul truck noise. Moreover, the potential to disrupt humans and wildlife is less at the Clear site since gravel would be mined from a nearby pit, and it would not be necessary to mine bank-run material from a major river as is the case at Gakona. Noise at the Bear Creek location could be an issue during construction due to the nearby dwellings (less than 1 mile away). However, this noise would be temporary in nature and construction of the ISR and VIS could be scheduled to avoid sensitive periods of the day. There would be very little noise generated during the operation of the HAARP facility at the Bear Creek location and this noise would not be audible at the nearby residences.

The absence of a requirement for a dedicated HAARP power plant facility further decreases the noise issue at the Clear site. It is anticipated that the power required for operation at Clear could be obtained through some combination of the Clear AFS power plant and the commercial grid in the area. The increased noise associated with increasing the output of an existing power plant to meet HAARP's demands would not be detectable or significant.

**TABLE 12.8-3. NOISE ANALYSIS SUMMARY - GAKONA SITE**

| Noise Source             | Noise Level  | Impacted Receiver   | Mitigation   |
|--------------------------|--|---|--|
| Power Plant Operation    | 120 dB(A) @ source<br>60 dB(A) @ highway<br>39 dB(A) @ BLM Trail<br>38 dB(A) @ Copper R.<br><30 dB(A) @ Nearest Residence  | Residences located approx. 11000 feet from source could hear noise on occasion. | 1) Use of large volume, low-pressure-drop mufflers on engines or, 2) L-shaped sound reflection wall on top of PP extending above top of exhaust pipe openings to reflect sound away from sensitive receivers.<br><br>Goal: 115 dB(A) at source |
| On-Site Construction     | 124 dB(A) max @ source (92 dB(A) 50 feet away), but generated at near ground level so attenuation from vegetation would be greater. Only sporadic noise, not typically at night. | No impact   | No mitigation  |
| Borrow Pit Location      | 121 dB(A) max @ source (89 dB(A) 50 feet away), but generated at near ground level so attenuation from vegetation would be greater. Only sporadic noise, not typically at night. | Potential impact on eagles nesting in area of gravel mining operation.          | 1) 2600 foot buffer around active nests, and 2) avoid period of breeding and incubation.   |
| Haul Truck/Vehicle Noise | Short duration noise, 75 dB(A) 200 feet from road  | No impact   | No mitigation  |

In general, the noise impacts at Clear would be less of an issue than at Gakona. In neither case, would there be a significant impact.

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The following comment(s) contributed to the paraphrased question below:

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**Q. Will the money for the overall operation of the HAARP facility be contingent on Congressional approval?**

**A. HAARP is a government sponsored project with both construction and operation expenditures based on congressional approval.**

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The following comment(s) contributed to the paraphrased question below:

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**Q. The Gakona site is right next to the most active airport in the entire Copper River Basin. It is in a major air traffic corridor from Tok to Anchorage. The operation of the IRI and ISR will prevent planes from using the Gulkana airfield and the major Anchorage-Tok air corridor. Will operation of the HAARP facility interfere with navigation aids located at the Gulkana airport?**

**A. These questions collectively pertain to the potential for HAARP impacting airways, airports, radio navigation aids and communication systems used in Alaskan flight operations. As**

discussed in subsection 4.14 Electromagnetic and Radio Frequency Interference of Volume I of the FEIS, it is pointed out that HAARP as deployed must not compromise flight safety. HAARP operating procedures and mitigative measures will be developed, cooperatively with the FAA and other interested federal and state agencies, and tested to ensure compatibility with Alaskan flight operations. The major flight corridor from Tok to Anchorage and the Gulkana airfield will continue to be used after the HAARP facility is in operation.

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The following comment(s) contributed to the paraphrased question below:

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**Q. Existing FAA guidelines indicate a field strength of 115 Volts/meter for new aircraft as the acceptable limit of interference to aircraft communication and instrumentation. Is there a standard for older equipment? Will the HAARP facility be operated if an aircraft passes within FAA established limits of interference? What precautions are proposed to prevent aircraft from operating within the FAA limits? What back-up systems, if any, are provided to assure aircraft are not affected? Will the proposed precautionary systems detect low-flying aircraft?**

**A. It is HAARP's understanding that the FAA is establishing standards for the manufacture and shielding of critical flight systems to protect against high power RF electric fields that might cause computer malfunctions. The geometric space where the HAARP generated electric fields would exceed an established FAA standard can be computed with reasonable confidence. However, HAARP recommends an experimental test program, to be undertaken cooperatively with the FAA, to establish the actual boundaries and to determine impacts, if any, on other noncomputer-based, unshielded avionic systems thought to be more common in older, general**

aviation aircraft. It is believed that the actual geometric space, defined during the test program from actual field measurements, would be less than the computer-based worse case scenario used in the EIS.

An aircraft detection radar system would be employed even though HAARP may be shown to generate RF fields that do not exceed an established standard. The radar would detect aircraft (including those flying at the FAA minimum 500 feet altitude) on routes that would carry them through the space where high RF fields exist. The detection of such aircraft would cause the HAARP ionospheric research instrument to cease transmissions until the aircraft clears the space. If the aircraft detection radar were to become inoperative, HAARP emitters would be shut down until the aircraft detection radar is returned to an operational state.

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The following comment(s) contributed to the paraphrased question below:

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| 4.8-22         | 11-3        |
| 4.8-26         | 11-31       |
| 4.8-35         | 11-107      |

**Q. Both alternative sites are in major aircraft flyways and near airfields. The DEIS suggests a hazard area be identified around the IRI and ISR to prevent interference to aircraft. Is a Restricted Area, a Controlled Firing Area, or other designated area be required to operate?**

**A. The Clear site is in an established airway and the Gakona site is near an established airway. Both are near airfields. HAARP would prefer that the initiative rest with the pilot to avoid airspace(s) where RF electrical fields exceed an established standard. Such a "special use airspace" designation has been authorized for use in conjunction with several defense facilities. The alternative to the special use airspace is the employment of an aircraft detection radar and**

the subsequent shutdown of HAARP emitters until an aircraft clears the area in which HAARP generated RF electric fields exceed an established standard.

The proposed proximity of the HAARP IRI to the Anderson airfield would require HAARP procedural actions to enable landing and takeoffs. See response to comment 4.8-32 for further elaboration. The larger separation of the Gulkana airfield from the Gakona HAARP site is not expected to impact landing and takeoffs.

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The following comment(s) contributed to the paraphrased question below:

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| 4.8-3          | 10-34       |

**Q. In bad weather pilots follow the bluff back to the Gulkana Airport, or Gakona or wherever they may be going. Will the operation of the HAARP system prevent the use of the bluff for poor weather navigation?**

**A. It is recognized that during bad weather there may be an increase in the frequency of occurrences in which aircraft fly close enough to the HAARP site to require that the IRI and ISR cease operation. In those instances the IRI and ISR will be shut down in accordance with procedures established in accordance with the FAA. Therefore, HAARP would not prevent the use of the bluff for poor weather navigation.**

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The following comment(s) contributed to the paraphrased question below:

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| 4.8-32         | 11-73       |

**Q. "The Clear IRI site is located 3,300 feet southwest of the Clear Airport. Since the critical area radius of the IRI is 2,500 feet, the edge of the critical area would only be approximately 800 feet from the threshold of Runway 19. The minimum traffic pattern airspace required to accommodate arrival and departure operations is 1 nautical mile." How can the airfield continue to be operated if the restricted area around the IRI prevents use of the airfield? Would locating the IRI and the suggested restricted airspace effectively cause Clear Airfield to cease being a viable airfield and actually necessitate its relocation?**

**A. The theoretical maximum interference radius is estimated to be 9,000 feet for the IRI (see Table 4.14-3, in Volume I). If this number is confirmed to be the real case, movement of the IRI at the Clear site within the government property boundary to achieve the minimum nautical mile traffic airspace would not be possible. However, the airfield could continue to operate by implementing procedures to ensure HAARP ceases to transmit during takeoffs and landings. This would require HAARP operational personnel to communicate with aircraft using the Anderson airfield. Any operational procedures would be cooperatively established by HAARP, the State of Alaska Department of Transportation and Public Facilities, and the FAA. If the Clear alternative is chosen to construct the HAARP facility, final siting of the IRI further south would be explored. The extra distance gained on final siting could help mitigate interference with takeoffs and landings.**

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**The following comment(s) contributed to the paraphrased question below:**

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|-----------------------|--------------------|
| 4.8-20                | 10-120             |

**Q. What overhead restrictions will be required for the Bear Creek area?**

**A. If the ISR is located at the Bear Creek alternate site near Brown, AK, the overflight restrictions summarized in Table 4.14-3, Vol I of the EIS will apply. More specifically, aircraft**



should avoid a cylindrical region 4,000 feet in altitude and 5,000 feet in diameter centered on the ISR. This restriction is based on a 2,000 V/m (peak) safety threshold for flight control systems established by the FAA. The  $\pm 30^\circ$  scan capability of the ISR is taken into account.

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The following comment(s) contributed to the paraphrased question below:

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| 4.8-9          | 10-53       |
| 4.8-10         | 10-55       |

**Q. In an emergency situation aircraft may need to fly over the IRI, restrictions or no restrictions, will you turn the emitters off?**

**A.** A telephone call to the operations center indicating an emergency situation exists is all it will take to have the emitters turned off. If the emergency situation does not allow time to notify the HAARP operations center, simply flying toward the site at or above the FAA established minimum flight altitude of 500 feet will trigger the aircraft detection radar to turn the emitters off. Either way, HAARP will cooperate and turn the appropriate emitters off.

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#### **12.3.6 Subsistence**

The following comment(s) contributed to the paraphrased question below:

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| 4.10-1         | 11-81       |
| 4.10-2         | 11-81       |
| 4.10-3         | 11-82       |
| 4.10-4         | 11-82       |

**Q. Can you elaborate on your statement in the EIS that impacts to subsistence in the areas are not substantive? The analysis appears insufficient to support the conclusion in the EIS. Maybe it would be helpful to include maps depicting subsistence uses in the area of the site.**

**A. The FEIS, Volume I concludes that there would be no substantive impacts to subsistence. This conclusion is based upon the fact that there would be minor and only temporary impacts to subsistence resources, access for subsistence activities, and competition for subsistence resources. Regional subsistence uses in the alternative sites were evaluated as part of the analysis, and were used as the baseline from which to compare potential impacts. Much of this information was obtained from previous studies and was incorporated by reference. Compared to this background information, the project impact from construction and operation would be relatively minimal and short in duration. Furthermore, during construction it is expected that many of the workers will be from the local labor pool, thereby reducing the number of workers coming into the area. Therefore, it must be concluded that there would be no significant impact to subsistence.**

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#### **12.3.7 Recreation**

The following comment(s) contributed to the paraphrased question below:

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| 4.11-1         | 10-32       |
| 4.11-3         | 10-34       |

**Q. Will the use of the Gravel Source Site P-1 cause an impact to Copper River recreational rafting and boating?**

**A. The use of Gravel Site P-1 will not cause an impact to recreational rafting and boating on the Copper River. It is expected that the actual mining operation will occur back from the edge**

of the river, and with the implementation of good mining practices there should be insignificant or no physical impacts on the river. Buffer zones required around active bald eagle nests will also help to keep the mining operation from being seen from the river. Noise generated from either construction or operation of HAARP would not be detectable from the river area.

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The following comment(s) contributed to the paraphrased question below:

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| 4.11-2         | 10-33       |
| 4.11-4         | 10-50       |
| 4.11-5         | 11-55       |

**Q. Will the BLM trail be relocated as planned for the OTH-B project? Will access to the existing BLM trail at the Gakona site continue to be allowed? Will winter access of the trail continue for recreational use? HAARP should work closely with the Glennallen District of the Bureau of Land Management to ensure proper rerouting of the BLM trail.**

**A. HAARP would finish the alternate access route and trailhead parking arrangement started under the OTH-B plan. This alternate access route would consist of a trailhead parking area located off of the Tok Cut-Off Highway, and a cut-line following the perimeter of government property which intersects with the existing trail at a location on the northern boundary of the property. The cut line was previously made as part of the OTH-B project, and the trailhead parking area would be constructed as part of the HAARP construction effort. All issues surrounding access and rerouting of the BLM trail will be coordinated and approved by the Glennallen District of the BLM.**

In addition, access through the site via the existing BLM trail would continue to be allowed at the discretion of the government. The government asks that local sponsors of large recreational/sport events, such as dog races (e.g. The Copper Valley 300), request use of the

trail from the site manager. Fencing would be placed around the IRI and diagnostic equipment on the side of the existing BLM trail, but would not barricade or restrict access.

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### **12.3.8 Aesthetics**

The following comment(s) contributed to the paraphrased question below:

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| 4.12-1         | 10-51       |
| 4.12-2         | 11-55       |
| 4.12-3         | 11-64       |

**Q. Can you address alternatives to placing the antenna array in its proposed location so it does not detract from a possible scenic byway designation for the Tok Cut-Off.**

**A.** Below is a simplified cross-section of the HAARP facilities at the Gakona site (Figure 12.12-1). The large power plant/operations center building is visible from the road, only because of the clearing that has been formed by the access road. Were it not for the existing access road, the power plant would be barely visible from the Tok Cut-Off. The power plant building is about 750 feet from the road and currently is about 70 feet in height. Trees in the Gakona site region vary widely in height (8 to 25 feet) and average about 15 feet, and the forest is typically medium density conifer stands (spruce) with intermixed small clearings and deciduous groves. Examination of aerial photographs shows that most of the area along the Tok Cut-Off is wooded and views are obstructed by the vegetation along the sides of the road right-of-way.

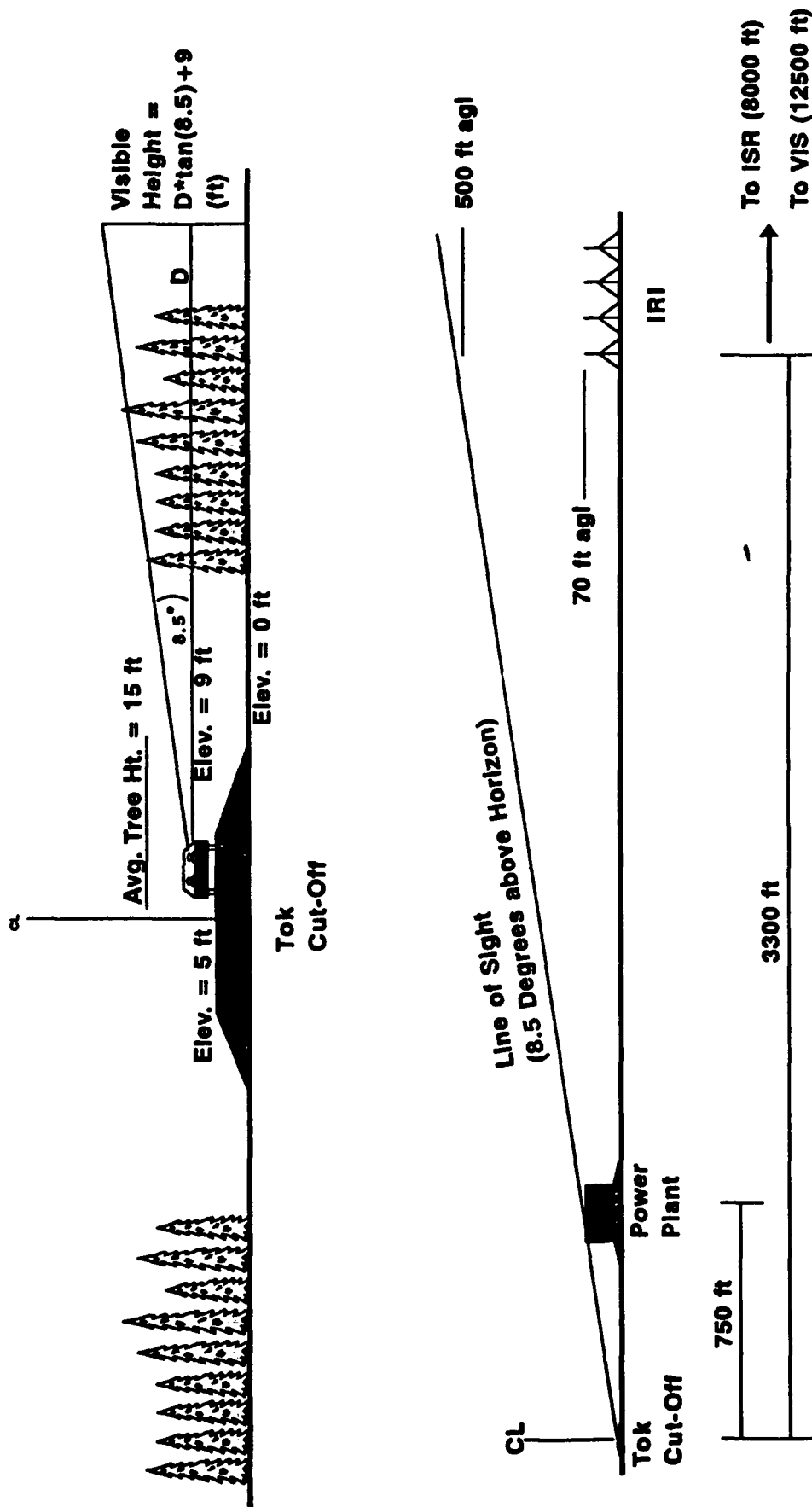
Location of the IRI would be about 3300 feet off of the road. The IRI would consist of 180 antenna elements (extending about 70 feet above ground) that are guyed for support. There are no plans to illuminate these IRI antenna masts. In addition to antenna elements, there would be

approximately 35 small shelters positioned along the base of the antenna grid. These shelters would be approximately the size of typical shipping containers (8 ft high by 8 feet wide, by 32 feet long, supported on piles or a post-and-pad foundation system). Because these shelters would only extend about 10 feet above the surface, they would not be visible from the highway.

The other equipment associated with HAARP that is large enough to be aesthetically of concern is the ISR (8000 feet from the highway) and the VIS (12500 feet from the highway). The ISR would consist of a large parabolic dish antenna about 115 feet in diameter, supported on a 25 foot diameter support structure, about 35 feet above the ground. The ISR would be normally pointed toward the zenith (straight up), with a maximum deviations of 30°. This translates into a maximum satellite dish lip height of 80 feet above surface. The VIS would consist of two major pieces: a transmit portion and a receive portion. The transmitter would be comprised of five antenna masts, four 50 foot high portions arranged in a square, with a center antenna of about 100 feet in height. The receiver would consist of four elements only about four to five feet in height. All other equipment associated with HAARP would be small in nature and of little consequence from an aesthetic standpoint.

The attached figure indicates that from a car traveling on the Tok Cut-Off, the vegetation on the side of the road (average height of 15 feet) would obscure the view at an angle of about 8.5 degrees from the horizontal. This assumes a five foot roadway elevation above the natural surface, and a viewing elevation of 4 feet above the road surface. It was also assumed that the average cut-width for the highway is 100 feet (verified by aerial photographs). Variations from the above assumptions would make the antenna more visible, for instance: large clearing along the side of the road in the direction of the IRI, truck or camper vantage point raising eye level, or a roadway surface more than five feet above local grade.

The IRI currently is planned to be approximately 3300 feet from the nearest point on the Tok Cut-Off Highway. At this distance, it is calculated that an object would have to be on the order of 500 feet high to be visible from the highway. Since IRI antenna masts would be a maximum



## Simplified Cross-Section - Gakona Site

### Line of Sight Visibility

FIGURE 12.12-1. TYPICAL LINE-OF-SIGHT VIEWING ABILITY FROM THE TOK CUT-OFF.

of 70 feet high, they would not be visible from the highway even under the best of viewing conditions (high vantage point and large clearing in the direction of the IRI).

The ISR is a maximum of about 80 feet high and is 8000 feet from the road and the VIS is a maximum of 100 feet high and would be about 12500 feet from the highway. Both of these structures would be well below the unobstructed sight line.

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### **12.3.9 Bioeffects of RFR**

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| 4.13-12        | 11-8        | 4.13-31        | 11-77       |
| 4.13-26        | 11-68       | 4.13-32        | 11-78       |

**Q. How can anyone be reassured that there will be no health effects from HAARP transmissions without the entire scientific community agreeing on the effects from radio frequency radiation?**

**A. Public health issues are of the utmost concern for any project. The HAARP project is no exception and the health of nearby residents, aircraft occupants, wildlife, and scientists using the facility are of paramount concern. Radio frequency radiation can be dangerous. It has heating potential and that is precisely why standards are needed. However, there is a consensus from the scientific community that if specific safety standards are followed the public will be safe from radio frequency radiation. As long as the standards are followed and people remain outside the designated exclusion areas, they will be safe. The most up to date and generally applied standard for maximum permissible exposure from radio frequency radiation is identified by the**

Institute of Electrical and Electronics Engineers (IEEE). Those safety standards represent a consensus of a committee of engineers, public policy officials, medical doctors, and members from the general public. The committee, Subcommittee IV of Standard Coordinating Committee 28, included fourteen working groups and a total of 120 individuals. The design of HAARP and the analysis presented in Volume I of the FEIS is based on those safety standards.

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| 4.13-4         | 10-44       | 4.13-24        | 11-64       |
| 4.13-5         | 10-45       | 4.13-27        | 11-68       |
| 4.13-6         | 10-49       | 4.13-29        | 11-74       |
| 4.13-7         | 10-50       | 4.13-33        | 11-79       |
| 4.13-8         | 10-69       | 4.13-34        | 11-84       |
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| 4.13-18        | 11-18       |                |             |

**Q. Will the HAARP generated radio waves (including Extremely Low Frequency (ELF)) or the power from these transmissions have an adverse health impact to nearby residents, anyone passing the equipment on the ground, standing beside the equipment, or passing over the site? Will animals or birds have adverse health effects from the transmissions of**



**the HAARP equipment? Will monitoring of the potential health effects take place if the project is placed in operation?**

**A. HAARP systems are to be designed with the most current public health standards. Fenced-in exclusion areas were designated using these established safety standards. As long as residents, visitors, and workers stay outside the exclusion areas they will be safe. To make sure aircraft occupants do not inadvertently fly into unsafe HAARP emissions, the facility will use an aircraft detection system. The detection system will turn off all appropriate HAARP emitters when an aircraft passes near the facility. Thus, aircraft occupants will be safe from HAARP emissions.**

**As in the case for humans, if animals stay out of the fenced-in exclusion areas they will be safe from HAARP emissions. The exclusion fence will be designed to take into consideration indigenous animal species and Alaskan weather conditions. An analysis of the effect on birds passing through the beam show they would not exceed exposure levels. Thus, there would not be a significant health risk to birds flying over the IRI. Further calculations of field strengths at the IRI antennas show that birds roosting on the antenna would not exceed the safety limits.**

**Designing the HAARP facility with the most widely accepted safety standards and using an aircraft detection system will avoid potential adverse health impacts to humans, birds, and animals. Because adverse health effects are not anticipated from HAARP emissions, there are no plans to establish a health monitoring program.**

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| <b>4.13-25</b>        | <b>p. 11-67</b>    |

**Q. Will the ELF HAARP emissions "cause erratic animal behavior, herd migration problems with insects, as well as mammals"?**

**A. Migrating animals use a multitude of directional clues and are able to re-orient themselves following natural or artificial displacements. These clues include celestial, geomagnetic, and local landscape. Of these, local landscape (mountain ranges, rivers, valleys, etc) often serves as the immediate clue. Although a few studies have suggested that animals could be affected by ELF, these studies have generally not been scientifically substantiated and generally are anecdotal in nature. One of the HAARP research goals is to study the generation of ELF signals in the ionosphere. However, the resulting ELF fields at ground level would be much lower than the already existing natural background fields. Therefore, the level would be so low that there would be no impact on animal migration.**

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**Q. Will the LIDAR have an adverse impact on aircraft occupants?**

**A. The LIDAR is a form of concentrated light energy, commonly used as a directed light beam much like a powerful flashlight beam. The emitter will be locked inside a trailer that is enclosed in a security fence. The LIDAR's beam will be emitted through a clear glass dome on top of the trailer toward the sky. The light beam could be potentially harmful to the human eye if it were to be directed into the eye. However, it is not harmful to be viewed from any other perspective (i.e., from the side). In addition, the HAARP facility is designed with a radar system to detect approaching aircraft and shut down all appropriate emitters, including the LIDAR, before an aircraft occupant could look down into the LIDAR beam.**

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### **12.3.10 Electromagnetic and Radio Frequency Interference**

Concern has been expressed on the potential interference to communication and aircraft navigation and instrumentation from the operation of the IRI and ISR. Concerns about communication interference has focused primarily on amateur (HAM) radios, cellular telephones, microwave transmitters, telephones, TV, and AM/FM radio reception. Concerns over aircraft have been focused on interference of navigational devices and the control of aircraft. Concern has been expressed at varying levels of technical detail and geographical preference. To help answer these concerns in an organized format they are divided into two broad categories: Communication and Aircraft Navigation/Instrumentation. Each of the two categories will address their own overall concerns, specific technical concerns, and site specific concerns (Gakona and Clear AFS).

The government acknowledges the public and inter-government agency concerns for electromagnetic and radio frequency interference. This concern has been discussed with the HAARP prime contractor, ARCO Power Technologies, Inc. The purpose of the discussions was to determine if additional steps could be taken using state-of-the-art technology in the design and fabrication of the ionospheric research instrument to reduce the potential for electromagnetic and radio frequency interference. The contractor and the government agreed that it was feasible under existing technology to change the system specification to reduce the harmonic emissions in the 88-200 MHz band by another factor of 1000. This means that the power in the harmonic emissions in the 88-200 MHz band will be suppressed to  $1 \times 10^{-15}$  times the power in the carrier frequency. This will reduce the ionospheric research instrument interference potential for the television broadcast band of 88-200 MHz, FM radio broadcast, mobile VHF radio

communication band of 88-166 MHz, FM radio broadcast, mobile VHF radio communication band of 88-166 MHz, wildlife trackers operating in the 88-200 MHz band and hand held VHF transceivers.

### COMMUNICATION CONCERNS-OVERALL

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| 4.14-18        | 10-69       | 4.14-106       | 11-48       | 4.14-142       | 11-87       |
| 4.14-19        | 10-73       | 4.14-107       | 11-49       | 4.14-143       | 11-88       |
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| 4.14-60        | 11-16       | 4.14-116       | 11-64       | 4.14-152       | 11-95       |
| 4.14-61        | 11-17       | 4.14-118       | 11-66       | 4.14-153       | 11-96       |
| 4.14-62        | 11-18       | 4.14-122       | 11-68       | 4.14-154       | 11-97       |
| 4.14-63        | 11-21       | 4.14-123       | 11-69       | 4.14-155       | 11-98       |
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| 4.14-65        | 11-21       | 4.14-132       | 11-79       | 4.14-165       | 11-107      |
| 4.14-66        | 11-24       | 4.14-133       | 11-80       |                |             |
| 4.14-77        | 11-36       | 4.14-134       | 11-80       |                |             |
| 4.14-90        | 11-39       | 4.14-138       | 11-83       |                |             |

**Q. Amateur radio is often used by rural residents as a sole means of communication including the all important use of responding to emergency medical circumstances (for example, Distress, Calling, and Guard Frequencies). This band is used by Amateur stations in Alaska or within 50 nautical miles of the state for emergency conditions. Over 2,000 HF stations have been licensed by the FCC in Alaska. These stations use frequencies from 1.8 Mhz to 450 Mhz, although some experimentation has taken them up to 10 Ghz. Concern has been expressed that the facility would seriously hinder or eliminate H.F. communications around the state of Alaska.**

**Specific questions include: Will communication be disrupted for most all radio communications, aircraft, ships at sea and in Alaskan waters, and possibly state troopers? Will telephone, radiotelephones, wildlife trackers, TV and other home entertainment devices experience interference. Will all radio, telephone, and television be totally interrupted for entire days while experiments are being run? Will there be an ensuing loss of H.F. communications that could cause delay to the short summer work season and result in the possible loss of economic vitality proper communications provides?**

**A. The Government understands the importance of all modes of RF communication in Alaska. For this reason HAARP will be operated on a clear-channel, noninterference basis within authorized bands. All specific frequencies that serve critical needs, e.g., search and rescue, will be forbidden. During the development testing of the HAARP emitters, the government will measure the emissions at the frequencies of receiver systems operated in the region surrounding the chosen site. The measurement data along with the detailed characteristics of the receive equipment will be the basis for the Government's final design of the mitigation actions needed to help ensure that HAARP will be compatible with user receiver systems. By request, details of HAARP operations will be provided to individuals, agencies and organizations at least two weeks prior to operation of IRI.**

Given the relatively high power of the HAARP emitters, there is concern over indirect (out-of-band) interference via "front-end saturation" of local receivers. In this type of interference, a strong signal far removed from that at which reception is intended overwhelms the receiver's circuitry, effectively blocking or distorting the desired signals. Inexpensive consumer electronics often do not provide the level of prefiltering needed to prevent such out-of-band interference. If interference tests confirm that HAARP is responsible for interference, several mitigation alternatives are available. These include:

- Placement of radiation pattern nulls in the direction of the affected users
- Amplitude tapering of the emitter illumination to reduce antenna radiation pattern sidelobes
- Addition of a preselection filter to the affected user's receiver
- Adoption of a directional or low sidelobe (in the HAARP direction) receive antenna at the user's location

With the cooperation of affected users, interference-free operations will be feasible.

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| 4.14-26        | 10-112      |                |             |

**Q. What is the radio frequency spectrum of the IRI? How many frequencies can the IRI operate on at one time? What is the frequency spectrum of the ISR? How many frequencies can the ISR operate at one time? Will operations be in the microwave frequency ranges? Will the transmissions be pulse, continuous or something else?**

**A. IRI will be capable of transmitting at any carrier center frequency within the frequency band 2.8 to 10.0 MHz, except at prohibited frequency bands, including Distress, Calling and Guarded frequencies, and other authorized bands. The IRI will have the capability to transmit simultaneously at one or two distinct carrier frequencies within the frequency band 2.8 to 10 MHz.**

The ISR will transmit at any carrier center frequency between 444 and 446 MHz. The ISR will receive at any carrier center frequency between 400 and 450 MHz with an instantaneous bandwidth as large as 2 MHz. The ISR will transmit simultaneously at only one distinct carrier frequency and will receive simultaneously at only one distinct carrier frequency within the 400 to 450 MHz bands.

Microwave frequencies are generally defined as frequencies between 1000 MHz (wavelength of 1 meter) and 300 GHz (wavelength of 1 millimeter). The in-band operating frequencies of the IRI (2.8 - 10.0 MHz) and vertical incidence sounder (VIS) (1 -15 MHz) are less than microwave frequencies. The in-band operating frequencies of the ISR (444-446 MHz on transmit) are at microwave frequencies. Impact may occur, but the interference to a microwave receiver depends on the frequency of that receiver.

The IRI will be capable of generating continuous (CW), pulsed, triangular, ramp, and sawtooth waveforms. The CW waveform can be either amplitude modulated (AM) or frequency modulated (FM). The ISR transmitter waveform is pulsed with a duty cycle of 10%, a pulse width of 0.3 ms to 1.0 ms, and a minimum interpulse period of less than 1 ms. The VIS transmitter waveform is pulsed with pulse repetition rates of typically 50, 100, or 200 pulses/s, variable pulse width of typically 66 to 500 microseconds, and duty cycles of typically 10% at 200 pulses/s, 5% at 100 pulses/s, and 2.5% at 50 pulses/s.

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| 4.14-25        | 10-112      | 4.14-103       | 11-44       |
| 4.14-27        | 10-112      | 4.14-119       | 11-67       |

**Q. There are differences in the power of the diesel generators, the IRI, and the IRI beam. Explain the differences in power including the term Effective Radiated Power (ERP). What is the expected duration and power of operation for pulse and CW? Is it true that the IRI could induce unwanted currents in nearby power lines which in turn could be re-radiated and cause interference?**

**A.** The six on-site diesel generators at the Gakona site are three-phase synchronous generators that would be capable of providing a maximum of 15 MW (6 @ 2.5 MW each) of operational power. These generators will normally be operated at 10 MW. The IRI antenna is an 180-element array of dual-polarized, broad-band dipole elements. Each element will radiate a maximum of 10 KW per polarization, yielding a total radiated power of 3.6 MW ( $3.6 \times 10^6$  W) for the IRI except at the highest frequencies where the available transmitter power decreases.



Most of this radiated power, typically 85 to 95 %, is concentrated in the main beam of the IRI, with the balance contained in the sidelobes. The difference between the generator power and transmitter power is due to system inefficiencies.

Effective Radiated Power (ERP) is the power that a uniform, or "isotropic", radiator would have to emit to produce a field as strong as that at the peak of the IRI beam. Thus, ERP is equal to the product of the actual IRI radiated power and array directivity. For the IRI, directivity varies from a low of 124 at 2.8 MHz, to a high of 1,400 at 10 MHz, which leads to maximum ERPs of 447 and 3,160 MW, respectively. To estimate the power density  $W/m^2$  at a given point in the far-field, the ERP is multiplied by the relative (peak-referenced) radiation pattern power gain and divided by the surface area of a sphere with radius equal to the IRI's distance from the point.

Local power lines will act as multi-wavelength antennas in the far sidelobes of the IRI and, therefore, will receive only a minute fraction of the radiated power. The pattern of such an antenna also precludes any significant interaction with ionospherically reflected signals. Fields scattered from such lines will randomly combine and not cause serious interference.

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The following comment(s) contributed to the paraphrased question below:

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| 4.14-42        | 11-6        | 4.14-47        | 11-7        |
| 4.14-44        | 11-6        | 4.14-52        | 11-8        |
| 4.14-46        | 11-7        |                |             |

**Q.** In addition to the concern identified for RFI, there are other phenomenon that should be considered. "Whistlers" of radio band energy that travel along the natural geomagnetic field lines from the one magnetic pole to the other have not been discussed. Will there be a "whistler" listening device in southern New Zealand to record the experiments, as it is at

the other end of the geomagnetic field line from central Alaska? Will there be constant recording of the geomagnetic field at the HAARP facility and or in New Zealand to record how the earth's magnetic field reacts to having its ionosphere poked? In addition, if you are creating an artificial aurora here in Alaska, what is happening on the other side of the world at the region of the magnetic reverse pole?

A. The EIS addresses potential RFI caused by the HAARP emitters to electromagnetic system users. Since the total changes to the ionosphere have been established to be small in the immediate vicinity of HAARP any possible effect expected in the southern hemisphere will be negligible. As stated in the EIS the maximum possible energy dissipated by the IRI due to absorption of the HF transmissions in the F region is less than 1/2000 of that dissipated by an aurora. As such this perturbation to the existing ionosphere cannot be termed the generation of an artificial aurora.

As shown in Figure 2.3-1 of the FEIS a magnetometer to measure changes in the earth's magnetic field is included in the system. It would be operated whenever the IRI and ISR are operated. No recording of magnetic field data in New Zealand or anywhere else in the southern hemisphere is planned for as part of the basic HAARP system.

#### **SPECIFIC TECHNICAL CONCERNS ON COMMUNICATIONS**

The following comment(s) contributed to the paraphrased question below:

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| 4.14-59        | 11-15       |
| 4.14-96        | 11-43       |

Q. To what extent will HF communications be degraded within 600 nautical miles of the HAARP facility during research campaigns? What is the HF degradation based on 10 watt portable and 150 watt fixed transmitters, 0.5 microvolt 12 dB SINAD receivers and 1/2 wavelength horizontal dipole antennas located 1/4 wavelength above ground? Will front

**end overload on amateur radios operating in adjacent HF bands occur, not only from the ground wave, but at distances on up to several hundred kilometers due to the reflected/refracted waves?**

**A. Whether the IRI will degrade specific HF communication users depends on many factors (e.g., antenna size and shape, location, etc.). Users of the system described would be impacted if HAARP were to transmit on the same or adjacent frequency. To avoid possible impact, HAARP will lock out these existing assigned frequencies. While it is not practical to anticipate and ameliorate interference in advance for all specific users, certain segments of the HF band will (e.g., emergency rescue) be off limits to the IRI. HAARP will always operate on a noninterference basis. The reflected/refracted wave fields have been estimated using the array antenna patterns, transmitter power, and a model of the ionosphere (IONCAP). The predicted fields may be strong enough to cause front end overload on certain radios. Should this occur, HAARP could reduce the transmitted power and/or help to modify user equipment to remove the out-of-band signal.**

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**The following comment(s) contributed to the paraphrased question below:**

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| 4.14-95        | 11-43       |

**Q. It is believed that various communication nets may be impacted. Specifically, will 3.920 MHz, 3.933 MHz, and 7.091 MHz be impacted? How will currently organized daily activities such as Snipers Net (3920 KHz 6pm local), Motley Group Net (3933 KHz 9pm local), Bush Net (7087 KHz 8pm local), Longwire Net (1847 KHz, 10pm local), Alaska Pacific Net (14.292 MHz 8am local), and the Amateur Radio Emergency Service (ARES) be impacted?**

**A. The IRI will be operated on a clear-channel, noninterference basis. Those communication nets identified above are already in the bands which will be off-limits to HAARP operation. If**

the interference arises from out-of-band energy, a host of other mitigation approaches are available and would be used to reduce the interference to acceptable levels.

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The following comment(s) contributed to the paraphrased question below:

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| 4.14-58        | 11-15       |

**Q. What are the lowest useable frequency (LUF) and maximum useable frequency (MUF) variations, ambient RF noise level contour variations, and influenced skywave signal perturbations expected during the research campaigns?**

**A.** LUF and MUF are the upper and lower frequency boundaries available to the HF users. The LUF and MUF are governed by the electron density in the ionosphere. As discussed in Section 4.15.2 of Volume I of the FEIS, electron density variations in the D, E, and F regions of the ionosphere could range up to 10-15%. In the lower regions, below 124 miles the IRI transmission should cause a increase in electron density which will return to background levels when the IRI is turned off. At F region heights, above 124 miles the electron density should decrease with IRI transmissions. The operating frequency change expected should always be less than 10% different from those under normal conditions because the plasma frequency and hence the operating frequency is proportional to the square root of the electron density. This variation is smaller than the naturally occurring day-to-day fluctuations in the ionosphere. These changes to the electron density will only occur in the region illuminated by the IRI which is expected to be a region less than 25 miles across at the F region heights. If this illuminated region happened to occur at the midpoint of a long-range HF communications circuit, the MUF and LUF might change by as much as 10%, but if the circuit is more than 25 miles away from this region, no difference from normal operation should be expected. This will also be true of all other performance characteristics of the circuit, e.g., noise and signal strength. Fluctuations in these parameters when propagating through the IRI heated region should be small compared

with those produced by naturally occurring changes. Regardless, the maximum effect would be a 10-15% shift in the LUF and MUF.

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| 4.14-48        | 11-7        |
| 4.14-49        | 11-7        |
| 4.14-50        | 11-7        |

**Q. What is the possible impact to users of EED's, pacemakers, and cellular telephones, and specific types of EED's that are most sensitive to IRI or ISR use?**

**A.** Within approximately 1,300 feet of the IRI and 655 feet of the ISR, ground based use of exposed EED's will require coordination to ensure safe conditions. By request, HAARP will provide proposed research campaign details to individuals, agencies, and organizations at least two weeks prior to operation of the IRI. Appropriate warning signs will be placed along public roads and trails within 1,300 feet of the IRI and 655 feet of the ISR to advise the public not to use exposed EEDs without first coordinating their usage with the HAARP site. The appropriate telephone number will be posted on the signs.

An accepted interference threshold for cardiac pacemakers is 200 V/m or, planewave equivalent to 100 W/m<sup>2</sup> power density. Power density versus azimuth computations for 0.5 mile separation from the IRI yield power estimate of  $1.4 \times 10^{-4}$  W/m<sup>2</sup>, which is well below the accepted threshold. To incur any risk, a pacemaker user would have to approach the very edge of the IRI array. A fence, with appropriate hazard warnings, will discourage this.

The ISR could impact nearby cellular telephone users. The ISR will be designed to suppress the harmonic and spurious emissions that could enter the cellular telephone band.

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| 4.14-45        | 11-6        |
| 4.14-51        | 11-7        |

**Q. What measurements will be taken by the magnetometer? When will the measurements be taken? For what areas will they be taken? Why will they be taken?**

**A.** The magnetometer measures temporal variations (within a frequency band 0 to 10 Hz) of the earth's magnetic field, at the earth's surface along the x, y, z axes. The temporal variations are indications of auroral activity, geomagnetic storms, and ionospheric field line currents. The magnetometer measurements can be correlated with measurements of drifts of electron density in the ionosphere. The magnetometer does not emit electromagnetic radiation. A magnetometer is magnetic loop antenna and associated electronic equipment housed in a 3-foot by 3-foot by 1.5 foot box. Initial magnetometer measurements made when the magnetometer station is established serve as an index of the earth's magnetic field on the surface of the earth where the HAARP facility is located. Measurements of variations of the earth's magnetic field are normalized to this index and are used to correlate geomagnetic activity with measurements of the ionosphere by on-site equipment.

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The following comment(s) contributed to the paraphrased question below:

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| 4.14-98        | 11-44       |

**Q. The HAARP IRI is to operate on a "clear channel, noninterference basis" within specific bands of high frequency portion of the radio spectrum on a noninterference basis with Amateur Radio Services. Will the ISR be operated in a similar basis?**

**A. Yes. The ISR will transmit between 444 and 446 MHz and will operate on officially authorized frequencies.**

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The following comment(s) contributed to the paraphrased question below:

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| 4.14-101       | 11-44       |

**Q. It is believed that the IRI has the capability to operate simultaneously on any two distinct frequencies within its operating range. Will there be intermodulation distortion products created by these two simultaneous transmissions? What interference could be created?**

**A. The IRI has the capability of simultaneously operating on two distinct frequencies either on orthogonal linear polarizations or by splitting the array into two halves. The goals of this intermodulation experiment are to observe products generated by non-linearities in the ionosphere which are expected to be extremely weak. There is a potential to generate third order products in a nearby receiver. Since the IRI is chartered to operate on a non-interfering**

basis, if any interference is observed, the parameters of either or both operating frequencies will be changed until the interference is reduced to acceptable levels.

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| 4.14-23        | 10-80       |
| 4.14-39        | 11-2        |
| 4.14-73        | 11-33       |
| 4.14-104       | 11-44       |

**Q. What will the effects be to satellites, including amateur radio satellites, when they cross the beam path of the IRI or the ISR (ie, RS10/11, Oscar, and Fuji)?**

**A.** The IRI and ISR have maximum ERPs of 3,160 MW and 11,000 MW, respectively. At a nominal altitude of 100 miles (160 km), a satellite that crosses the peak of the main beam would encounter a power density of 0.017 and 0.01 W/m<sup>2</sup> for the IRI and ISR, respectively, apart from any propagation losses, which for the IRI would be considerable because of reflection, refraction, and absorption in the ionosphere. Since satellites must withstand a solar power density of 1.4 KW/m<sup>2</sup>, the heating effect of the HAARP emitters is inconsequential.

The potential for disruption of RF systems aboard the satellites during transit of the IRI or ISR beam will depend on the satellite's antenna and receiver design and will be evaluated on a case by case basis. If analysis or experience indicate that interference is probable, the HAARP emitters can be turned off at such times that a satellite is overhead, as predicted by the ephemeris data.

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The following comment(s) contributed to the paraphrased question below:

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| 4.14-45        | 11-6        |
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| 4.14-117       | 11-65       |
| 4.14-129       | 11-77       |
| 4.14-131       | 11-77       |

**Q. It is stated that the government's objective is to achieve compatibility with radio frequency users surrounding Gakona and Clear. Will users in Fairbanks, or mobile users along the Parks/Tok cutoff Highways be included? Who will pay for the mitigation? How many dollars are committed to achieve this compatibility? How fast will the mitigation steps be performed? How and how fast will the appropriate hardware and procedural modifications take place? What does a user do if they are not satisfied with the results?**

**A. The initial, worst-case analyses indicate that various communication system users may experience interference from the HAARP facility emitters. During the development testing of the HAARP emitters, the government will measure the emissions at the frequencies of receiver systems operated in the region surrounding the chosen site. The measurement data along with the detailed characteristics of the receive equipment will be the basis for the Government's final design of the mitigation actions needed to help ensure that HAARP will be compatible with user receiver systems.**

Hardware and procedural modifications to mitigate impacts can occur immediately, e.g. the orientation of the ionospheric research instrument transmitter array will be placed so as to reduce the antenna sidelobe levels in the direction of major populations centers and hardware design changes can be made to reduce projected interference levels. Some modifications and procedural changes will be made in response to the aforementioned test results and/or in response to public radio frequency interference reports.

Upon receipt of an interference report, action will be taken to confirm HAARP as the source of the suspected interference. Mitigation measures may be implemented in real time in response to the confirmed interference report. If successful mitigative measures can not be found, the HAARP emitters will change to a non-interference operating mode and the interference report will be referred to the Radio Frequency Interference (RFI) Resolution Committee. This will be a standing committee with a community appointed (non-paid) resident member. The community appointed resident member will serve as an ombudsman to ensure community satisfaction with HAARP RFI mitigation measures. This committee will meet as needed to resolve the cause of confirmed interference reports and the adequacy of mitigation approaches.

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| 4.14-54        | 11-13       |
| 4.14-91        | 11-39       |
| 4.14-92        | 11-39       |
| 4.14-93        | 11-39       |

**Q. The effective power is believed to be over 1.5 million times the power of an 850 watt household microwave oven and that one of the bands of frequencies that the project will use is only 1/5 the frequency. What is the impact to communications from these factors? Do the other band of frequencies show a hazard to harmonic interference to aircraft radios in the VHF band? Will aircraft communications, especially during the periods of pulse modulation, be interrupted during operation? Will modern design reduce the secondary interference enough to not interrupt aircraft communications?**

**A. Effective radiated power (ERP) pertains to the energy in the main beam of the antenna and therefore is not applicable to users on the ground. Tables 4.14-2 and 4.14-3 in Volume I of the FEIS present a summary of the HAARP emitter worst-case impacts to communication systems.**

These impacts are based on the assumptions that all systems are operated line-of-sight to the HAARP site(s) and no mitigative measures are employed. The purpose of these Tables is to direct attention to those systems which could be impacted if care is not exercised. The HAARP objective is to achieve compatible operations with other radio spectrum dependent systems. A number of mitigative approaches are presented in Vol I of the FEIS and in these responses to concerns. The successful implementation of the mitigative measures will require the public and federal and state agencies to promptly report suspected interference and to work with government representatives to resolve HAARP caused interference. In addition, during the development testing of the HAARP emitters, the government will measure the emissions at the frequencies of receiver systems operated in the region surrounding the chosen site. The measurement data along with the detailed characteristics of the receive equipment will be the basis for the Government's final design of the mitigation actions needed to help ensure that HAARP will be compatible with user receiver systems.

HAARP has recognized the importance of careful transmitter design, specifically harmonic suppression. The transmitter specification for the IRI requires that the harmonics be suppressed greater than 120 dB above 45 MHz, except between 88-200 MHz, in which case the required suppression is 150 dB. This is considerably in excess of the levels cited in the question and well above what is available in conventional commercial products. The ISR is not expected to produce sub harmonics that would interfere with VHF communication systems.

HAARP must not interrupt the operation of systems vital to flight safety. Ionospheric cross modulation (Luxembourg Effect) is discussed in the answers to questions 4.14-72, 76, 88, 89, 137 & 163. This is most common for frequencies that are relatively close together with the unwanted signal passing through the front end of the receiver and mixing with (intermodulating) the desired signal. Filters can be employed to reject unwanted frequencies and improve performance. Narrowband receiver designs are most effective in rejecting unwanted out-of-band signals.

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| 4.14-30        | 10-114      |
| 4.14-31        | 10-114      |

**Q. What interference to communications will be experienced from the side lobes of the equipment? Will there be an impact from the sidelobes 1/4 mile away from the facility?**

**A.** Given the high radiated powers of the IRI and ISR, sidelobes can be a significant source of interference, particularly at close distances, such as 1/4 mile, which would be located on the HAARP property. Typically, 10 to 15% of the total radiated power is emitted in the sidelobes and peak sidelobes. The sidelobes straddle the main beam and may be approximately 13 dB (a factor of 20) below peak power. Far out sidelobes, which may affect local ground-based receivers, are typically well below isotropic. Sidelobe emissions have been taken into account, where appropriate, in the analyses that underlie the worst case scenario results documented in Tables 4.14-2 and 4.14-3 of Vol I of the FEIS. In cases for which an "impact" is predicted, one or more of the mitigation techniques described on pages 4-109 and 4-110 of Vol I of the FEIS will be implemented.

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The following comment(s) contributed to the paraphrased question below:

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| 4.14-120       | 11-67       |

**Q. "Tell me how a transmitter system that you say is not nearly as powerful as the aurora, can have the power to control it or stimulate it. And please tell me how, by increasing the densities of the D and E layers in the ionosphere to the levels suitable for auroral activity, HAARP operation will not degrade high angle/short skip high-frequency communications used by radio amateurs, emergency, and commercial services alike."**

A. The HAARP system with its power levels in no way "controls the ionosphere". At energy dissipation levels of 1/2000 of the aurora it can only "perturb" the ionosphere in a small local region. HAARP's operation will not increase "the density of the D and E layers in the ionosphere to levels suitable for auroral activity", thus the statement is incorrectly applied to HAARP's operation. HAARP will at most change electron densities by 15% in certain definitive regions which should cause only small changes in LUF and MUF and therefore the operating frequency without significantly degrading HF communications.

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The following comment(s) contributed to the paraphrased question below:

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| 4.14-140       | 11-86       |

**Q. What is the purpose of transmitting two separate Gigawatt signals at the same time, and what would be the possibilities for interference created at multiples of the difference frequency?**

A. One purpose would be to explore the feasibility of generating radio waves at the difference frequency, e.g., at ELF, by non-linear processes in the ionosphere, thus avoiding construction of extremely large antennas on the ground. The first direct observation of two strong HF signals, or "pumps", interacting non-linearly in the ionosphere was performed in 1981 using high power transmitters at the Arecibo, Puerto Rico observatory. When the frequency difference,  $\Delta f$ , between the two strong pumps was greater than 100 Hz, there were no observations of sidebands in the ionospherically reflected signals. When  $\Delta f$  was 50 Hz or less, however, sidebands were almost always observed. For  $\Delta f$  less than 10 Hz, typically the first sideband pair had amplitude 20-40 dB below the main pump signals, with a dependence of power on  $\Delta f$  found to be approximately  $\Delta f^n$ , where  $n$  is somewhere between 1 and 2. The power in sidebands numbers 1-4 decreased rapidly with number, being 50-60 dB below the main pump signals at sideband number 4. The power in higher order sidebands decreased below the detection level

of the receivers<sup>3</sup>. This implies the likelihood that this mechanism can cause interference to other HF users is very small, but because of it's non-linear nature, not completely zero.

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## **COMMUNICATION CONCERNS AT ALTERNATIVE SITES:**

### **Gakona Alternative.**

The following comment(s) contributed to the paraphrased question below:

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| 4.14-41        | 11-5        |

**Q. The ISR operational distance from the IRI is stated to be 2-10 miles. At the Gakona site the ISR is 4,000 feet from the IRI. Why is the basic separation distance not followed when the site is large enough to accommodate the 2 mile minimum distance?**

**A. The positioning of the ISR relative to the IRI is recommended to be located optimally no more than about 10 kilometers from the HAARP [IRI] facility; no minimum separation is recommended. The proposed Gakona facility layout satisfies the recommended ISR positioning relative to the IRI. The Bear Creek siting of the ISR relative to the Clear AFS location of the IRI is deemed acceptable (even though slightly greater than the recommended 10 kilometers) as it is located south of the IRI and where orographic shielding would provide for compatible operations with the BMEWS radars.**

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<sup>3</sup> S. Ganguly and W.E Gordon, "Nonlinear Mixing in the Ionosphere", *Geophysical Research Letters*, Vol 13, No. 6. pp. 503-505, June 1986.

The following comment(s) contributed to the paraphrased question below:

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| 4.14-11        | 10-58       | 4.14-43        | 11-6        |
| 4.14-12        | 10-59       | 4.14-67        | 11-27       |
| 4.14-13        | 10-60       | 4.14-69        | 11-29       |
| 4.14-20        | 10-74       | 4.14-70        | 11-30       |

**Q. Will the changing geomagnetic flux caused by the operation of the IRI result in a localized increases in corrosion to the Trans-Alaska Pipeline System (TAPS) 7 miles from the Gakona site? Alyeska has concern that the proposed HAARP transmitters may cause RFI and EMI to the pipeline operation. The pipeline radio frequency transmitters and receivers are used to open and close gate valves, intrusion protection, surveillance video, and mobile communications. Will there be interference with the pipeline's operation? How will you mitigate the interference problems? What are the procedures to follow if interference is experienced?**

**A. Any changes in geomagnetic flux caused by IRI operation are not expected to be any larger than fluctuations caused naturally. Therefore, increases in corrosion to the Trans-Alaska Pipeline System (TAPS) are not expected. The theoretical worst case radio frequency interference caused by the HAARP IRI and ISR to pipeline radio systems are at levels that are not expected to impact the pipeline systems. The VIS emission may have a minor impact when it operates in the 1-15 MHz range for only a small fraction of the time when the HAARP system is in operation. It is also used to explore the entire 1-15 MHz interval and thus operates in any radio bandwidth for no more than several seconds per hour.**

During the development testing of the HAARP emitters, the government will measure the emissions at the frequencies of receiver systems operated in the region surrounding the chosen site. The measurement data along with the detailed characteristics of the receive equipment will be the basis for the Government's final design of the mitigation actions needed to help ensure that HAARP will be compatible with user receiver systems. The HAARP intends to coordinate

all field testing results with Alyeska to assure the HAARP operations continues to be on a non-interference basis. In addition, hardware and procedural modifications to HAARP and/or user systems would be suggested and implemented. For those situations where a nearby user experiences interference caused by fundamental overload, the use of preselection filters for an affected user receiving system could be installed. A representative from Alyeska would be welcome to participate in the Radio Interference Resolution Committee proposed by HAARP to assure the resolution of interference problems.

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| 4.14-68        | 11-28       |

**Q. The bi-product of auroral activity, such as Telluric currents, cause localized distortion of cathodic protection systems on the pipeline. Radio frequency and electromagnetic interference from a variety of man made sources also impact the accuracy of these readings. It is a concern that HAARP will interfere with receiving accurate data from the pipelines corrosion monitoring efforts.**

**A. Since the auroral effects caused by the IRI heating of the ionosphere are of the order of 1/2000 of that dissipated by a natural occurring aurora (Volume I of the FEIS), no adverse effect to the accuracy of the pipeline corrosion monitoring equipment is expected. In addition, on a long term basis, the IRI will operate on an intermittent basis of 4-5, two week, research campaigns less than 13% of the time, reducing further the potential for any adverse effect.**

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| 4.14-149       | 11-92       |

**Q. An Alascom tower is located adjacent to the Gakona site and could possibly be affected. What are the frequencies, type of modulation, radiation pattern for the antenna, final filter specification, RF power output, antenna gain, harmonic information specific to the transmitter/HPA?.**

**A.** Terrestrial microwave communications supported by the Alascom tower near the IRI Gakona site have been considered in some detail in Volume I, FEIS, Section 4.14 and the referenced supporting studies. Harmonic and spurious signal suppression of 120 and 100 dB respectively are assumed for the IRI and ISR emissions at microwave frequencies. IRI and ISR antenna gains at 6 GHz of 3 dBi and -28 dBi, respectively, were used in the analysis. The IRI will have a radiated power of 3.6 MW, while that of the ISR will be 0.4 MW. It is concluded that there will be no interference to the Alascom tower's operation.

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| 4.14-15        | 10-64       | 4.14-113       | 11-54       |
| 4.14-16        | 10-65       | 4.14-114       | 11-55       |
| 4.14-17        | 10-67       | 4.14-115       | 11-58 to 61 |
| 4.14-21        | 10-79       |                |             |

**Q. Will the operation of the HAARP facility interfere with wildlife telemetry tracking from 7 to 10,000 feet in the air? Will radio telemetry tracking using frequencies between 150 and 153 MHz be interfered with? Would wildlife tracking using satellite telemetry be**

**interfered with? If the HAARP operation was to interfere with wildlife telemetry tracking from satellites, how would the mitigation be accomplished? Can the operation of the IRI be limited not to interfere with radio telemetry tracking on frequencies 150-154 MHz and 163 MHz?**

**A. Harmonics and spurious radiation from the HAARP IRI and VIS operating frequencies have the potential to interfere with wildlife telemetry trackers (including the frequencies cited in the question) regardless of whether the telemetry receivers are ground-based or airborne. Harmonic and spurious emissions of the IRI will be reduced by at least 150 dB between frequencies of 88 and 200 MHz. Airborne trackers will generally be at greater distances from the HAARP facility than the 0.9 mile closest distance assumed in the FEIS, Vol I. Depending upon the geometry, the interference impact on airborne trackers is generally expected to be greater than for ground-based trackers. The IRI is planned to be shut down when aircraft come within a specified range of the IRI and, therefore, would not interfere with airborne trackers within this range.**

**It is unlikely that wildlife telemetry tracking using satellite technology will be impacted by the HAARP emitters, provided that the Earth receiving dish is not pointed in the direction of the HAARP emitters. This conclusion is based on the finding that the HAARP emitters would not appreciably interfere with satellite television if the receiving dishes are not pointed in the direction of the HAARP emitters.**

**The potential interference of the HAARP emitters on wildlife telemetry trackers can be mitigated by adjusting the transmitted frequency or by not operating the HAARP facility when the wildlife telemetry trackers are operating. Since the HAARP facility and the wildlife telemetry trackers do not operate constantly, the cooperative scheduling of operating times for the HAARP facility and wildlife telemetry trackers should not pose a hardship for either operation. Moreover, the exclusion of specific wildlife telemetry frequencies from HAARP emitters is a practical mitigation technique. As a final measure, unsolvable interference with wildlife trackers**

operating at frequencies 150-154 MHz and 163 MHz can be mitigated by shutting down the HAARP emitters when the telemetry trackers are operating.

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#### **Clear AFS Alternative Site.**

The following comment(s) contributed to the paraphrased question below:

| <u>Comment</u> | <u>Page</u> |
|----------------|-------------|
| 4.14-99        | 11-44       |
| 4.14-100       | 11-44       |

**Q. BMEWS at Clear interferes with 420-440 MHz of the 70cm amateur band of 420-450 MHz. The ISR will operate in the 440-450 MHz band. Will the operation of the ISR destroy the remainder of the band for communication. Furthermore, there is a repeater (444.8/449.8 MHz) on Ester Dome, in line of sight of Clear and possibly the ISR, and a 70cm ATV repeater on a Bender Mountain near Fairbanks (as well as some operators are using this band for linking stations together and remote base operations) be interfered with?**

**A. The ISR located at the Bear Creek alternative site would cause in-band, co-channel, and remote interference with amateur radio operating at 420-450 MHz unless the interference is mitigated. For example, the ISR incident power density can be as much as  $5 \times 10^{11}$  times greater than the sensitivity of UHF handheld transceivers operating at the same frequency as the ISR for receivers located at a distance of 0.2 miles from the ISR.**

An earthen mound surrounding the ISR is being planned to reduce the interference by approximately 25 dB between BMEWS at Clear and the ISR at Bear Creek. This same earthen mound should also prove effective in reducing interference of the ISR with amateur radios for those cases where the interference is not too severe. Power density measurements will be

conducted at the site and the government will work with the amateur radio community to mitigate interference resulting from the operation of the ISR.

The interference and mitigation responses above are also applicable to the repeater on Ester Dome, the ATV repeater on Bender Mountain, and other operators using the 420-450 MHz band. It should be noted that the HAARP emitters will only be operating intermittently during the year or approximately 13% of the time.

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The following comment(s) contributed to the paraphrased question below:

| <u>Comment</u> | <u>Page</u> |
|----------------|-------------|
| 4.14-35        | 10-119      |
| 4.14-36        | 10-119      |

**Q. Will the operation of HAARP interfere with radio communications in the Bear Creek area? Will the operation affect radio phone communications or cellular phones at the Bear Creek area?**

**A.** If the Clear alternative site is selected for HAARP, the ISR will be located near Bear Creek, near Browne, Alaska. The potential effects of the ISR on electronics users in this area are summarized in Table 4.14-2 of Volume I, FEIS. Cellular telephones that operate between 870 and 890 MHz could be disrupted, and radio telephones that operated between 454 and 460 MHz will, most likely, be affected. If interference does occur, some hardware modifications may be necessary to reduce ISR emissions (first harmonic). The mitigation employed will be based on actual interference experienced during the testing phase of the HAARP program.

## **AIRCRAFT NAVIGATION/INSTRUMENT CONCERNS-OVERALL**

The following comment(s) contributed to the paraphrased question below:

| <u>Comment</u> | <u>Page</u> | <u>Comment</u> | <u>Page</u> |
|----------------|-------------|----------------|-------------|
| 4.14-56        | 11-14       | 4.14-135       | 11-83       |
| 4.14-71        | 11-32       | 4.14-136       | 11-83       |
| 4.14-74        | 11-35       | 4.14-146       | 11-90       |
| 4.14-75        | 11-35       | 4.14-156       | 11-102      |
| 4.14-121       | 11-68       |                |             |

**Q. There have been several accidents caused by aircraft flying close to high-powered HF antennas, some with loss of life. Does high frequency RFI have the potential to jam any sort of aircraft electronics?**

**A. Some studies have indicated that very high levels of RF fields may affect aircraft computer based avionic systems. HAARP will make use of data obtained from aircraft testing to determine where such fields may occur above the array. The aircraft detection radar will be used to ensure that HAARP is not operated when an aircraft has a potential to intrude into these fields. HAARP will work in close cooperation with the FAA to ensure that all flight safety standards and procedures are fully implemented.**

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The following comment(s) contributed to the paraphrased question below:

| <u>Comment</u> | <u>Page</u> |
|----------------|-------------|
| 4.14-130       | 11-77       |
| 4.14-157       | 11-103      |
| 4.14-162       | 11-104      |

**Q. In order for the FAA to more fully evaluate the system, the Spectrum Engineering and Policy Division, FAA, will require more technical information. Data needed includes operating parameters of HAARP equipment as well as information from past studies the Department of Defense has done on high energy effects to aircraft.**

**A. HAARP has provided the system specifications to the FAA. HAARP will continue to share technical information with all concerned agencies and individuals. HAARP has voluminous technical studies, data and analyses assembled as references to the EIS. The analysis for computer-based aircraft control systems was based on an assumed 115 Volt/meter electric field for the IRI and 2000 Volt/meter for the ISR obtained from the FAA Spectrum Engineering and Policy Division. It is recognized that these standards remain to be codified and that older avionic systems may have a different level of susceptibility to radio frequency generated electric fields. HAARP plans to conduct a test program to substantiate computer based analysis and further evaluate mitigation techniques based on actual site conditions. The result of the field work will be available for all interested parties. A search will be conducted within the Department of Defense to determine if data exists that define high power radio frequency electric field effect on aircraft. If the data exists and there are no release restrictions, the data will be provided to the FAA.**

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**The following comment(s) contributed to the paraphrased question below:**

| <u>Comment</u> | <u>Page</u> | <u>Comment</u> | <u>Page</u> |
|----------------|-------------|----------------|-------------|
| 4.14-158       | 11-103      | 4.14-160       | 11-103      |
| 4.14-159       | 11-103      |                |             |

**Q. According to the FAA some of the bands that may be affected are not allowed to experience intentional interference. There are several types of interference which FAA systems will experience. The list in the DEIS does not include all frequency bands which are of interest to aviation. Will the following experience interference: navigational aids**

**(non directional beacons), VHF omnidirectional range, global positioning system, instrument landing system, VHF and UHF air traffic control communications?**

**A. HAARP will cooperate fully to achieve compliance with all standards and regulations that affect flight operations. The FEIS Volume I documents a worst-case prediction that would occur if no mitigative measures were employed and the user systems were operated in close proximity (line of sight) to the HAARP emitters. Mitigative measures, including HAARP operating procedures, will be employed to achieve compatibility with flight systems. A test program, in cooperation with the FAA, is recommended to ensure that appropriate mitigative measures are adopted and successfully employed.**

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**The following comment(s) contributed to the paraphrased question below:**

| <u>Comment</u> | <u>Page</u> |
|----------------|-------------|
| 4.14-164       | 11-104      |

**Q. Based on the non-technical information provided in the DEIS the FAA, Spectrum Engineering and Policy Division, does not concur with the operational concept for the HAARP facility as proposed. The high probability of RF interference to critical air traffic control frequencies and the possibility of high energy effects to aircraft flying nearby indicate that the facility may present a hazard to air safety. In order for the FAA to remove its objections, strict operational procedures will need to be formalized to control its use. Among the possible restrictions which can be expected are: limitations on the time of day and total transmission time during operation, positive controls to transmit only to the zenith, and positive communication to notify the HAARP Operations Center to stop appropriate emissions in the event of interference.**

**A. HAARP operating periods will be planned at least one month in advance and coordinated with the FAA and other appropriate federal and state agencies. Operations will be limited to**

the coordinated, scheduled periods. Total transmission time will be limited to the coordinated, scheduled periods. Contractor installation and checkout tests of the HAARP ionospheric research instrument, prior to government acceptance, will be coordinated as necessary with appropriate federal and state agencies.

The HAARP ionospheric research instrument will be constrained, by software, to operate within an angle not greater than 30 degrees from the zenith. If a beam steer angle greater than 30 degrees from the zenith is requested, the software will not implement the request. The system is inherently unable to operate at angles greater than 60 degrees from the zenith.

Direct communication between the HAARP Operations Center and an appropriate FAA Control Center will be provided. The purpose of the direct communication is to provide a communication link for the FAA to notify HAARP to "cease transmission" in the event of interference. If failure occurs to the primary communication link, alternative communications or procedures will be used.

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#### **SPECIFIC TECHNICAL CONCERNS ON AIRCRAFT NAVIGATION/INSTRUMENTS**

The following comment(s) contributed to the paraphrased question below:

| <u>Comment</u> | <u>Page</u> |
|----------------|-------------|
| 4.14-126       | 11-74       |

**Q. What is the basis for the critical impact (safety) areas supporting the IRI and ISR facilities? Is it based on human safety or electronic equipment interference? If a critical area is flown into, will the aircraft equipment require repair particularly older equipment without shielding?**



A. The critical impact (safety) areas supporting the IRI and the ISR facilities have not been finalized; however, the size of the areas has been estimated using established standards for biological effects and the FAA suggested electric field level for RF electric field effects.

The HAARP generated electric field levels may affect computer-controlled critical flight systems. For older non-computer controlled avionic system aircraft, the HAARP generated electric fields are not expected to cause any damages that will require repair; a cooperative test program with the FAA is recommended to determine specific mitigation and to ensure that electric field standards and HAARP operating procedures ensure flight safety.

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The following comment(s) contributed to the paraphrased question below:

| <u>Comment</u> | <u>Page</u> |
|----------------|-------------|
| 4.14-127       | 11-74       |

**Q. Can emitter energy electronically follow transmitted Nav-Aid energy back to the Nav-Aid thereby causing some level of damage?**

A. Navigational-aid (Nav-Aid) transmitters will not be affected by HAARP transmitted RF energy. It is possible for HAARP impacts to occur in navigational-aid receivers. HAARP operating and mitigation procedures will be established to preclude such receiver impacts. If testing or experience reveals a navigational-aid receiver based interference, HAARP will adopt operational procedures to preclude the use of modulated waveform frequencies similar to a navigational-aid frequency, e.g. non-directional beacon. It may be found, if the receiver has a wide bandpass, that the HAARP signal may mix with the navigational-aid signal to produce a modulated interference. This can be resolved by restricting the use of bothersome modulation

frequencies and also can be resolved by rejecting the unwanted HAARP signal through improved, receiver filtering.

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The following comment(s) contributed to the paraphrased question below:

| <u>Comment</u> | <u>Page</u> | <u>Comment</u> | <u>Page</u> |
|----------------|-------------|----------------|-------------|
| 4.14-8         | 10-55       | 4.14-80        | 11-37       |
| 4.14-9         | 10-56       | 4.14-83        | 11-37       |
| 4.14-10        | 10-56       | 4.14-128       | 11-74       |
| 4.14-38        | 11-2        | 4.14-145       | 11-90       |
| 4.14-78        | 11-37       |                |             |

**Q. Define the specific impacts to GPS, VHF, UHF, VHF (VOR receiver), Loran and ADF. Will the UHF radio band from 960 MHz to 1215 MHz be affected? Will the Aeronautical ADF frequencies distributed from 190 KHz to 535 KHz be affected from the operation of the HAARP facility? Would you select frequencies to transmit on that would not affect 115.6 MHz and frequencies associated with sub harmonics that could be affected? Will spurious signals cause problems to communication equipment or navigation instruments?**

**A. Potential HAARP impacts to GPS, VHF, UHF (VOR) and ADF are summarized in Vol I, FEIS, Tables 4.14-2 and 4.14-3. The interference is characterized by the distance at which the HAARP emissions have a power density that is equal to that which corresponds to the "noise floor" of the receiving system. The "Avionics" portion of the table is reproduced below in Table 12.14-1 for convenience. The distances noted are estimates, since the actual interference level will depend on details of the radiation patterns. However, it is the intent of the HAARP program to operate on a non-interference basis. HAARP operation will exclude the frequencies impacted and/or take whatever steps are practical to mitigate the potential interference.**

**TABLE 12.14-1. THEORETICAL MAXIMUM INTERFERENCE TO AVIONICS.**

| Frequency Range (MHz) | Theoretical Maximum Interference Distances |              |               |
|-----------------------|--|--------------|---------------|
|                       | IRI  | ISR          | VIS           |
| GPS 1227, 1575        | 95 feet                                    | 500 feet     | < < 3300 feet |
| VHF Radio, 118-137    | 1.6 miles                                  | in main beam | 32 miles      |
| UHF Radio 960-1125    | 6.1 miles                                  | 2.5 miles    | 3.0 miles     |
| VOR 115-116           | 0.6 miles                                  | in main beam | 20 miles      |
| ADF 0.25-0.40         | in main beam                               | in main beam | in main beam  |

Source: HAARP FEIS, Volume I.

This table is based on the harmonic suppression specified. However, there is evidence that the HAARP facility, as built, will be substantially better with the result that the distances in this table will be greatly reduced.

The following comment(s) contributed to the paraphrased question below:

| <u>Comment</u> | <u>Page</u> | <u>Comment</u> | <u>Page</u> |
|----------------|-------------|----------------|-------------|
| 4.14-72        | 11-32       | 4.14-89        | 11-38       |
| 4.14-76        | 11-35       | 4.14-137       | 11-83       |
| 4.14-88        | 11-38       | 4.14-163       | 11-104      |

**Q. It is generally believed that signals of the intensities produced by HAARP may cause a "Luxembourg Effect". Will HAARP produce such an effect? If such an effect is produced what will the impact be on communications and aircraft navigation/instrumentation? Will the "Luxembourg Effect" be modulated onto all Non Directional Beacon (NDB) signals and broadcast station signals used for navigation over a wide area? Will the HAARP operation have an impact from the "Luxembourg Effect" to low frequency navigation aides, including ADF and LORAN C? Many private and commercial aircraft**

use LORAN C (90 KHz to 110 KHz) for some phases of aircraft navigation and position verification. Will the operation of the HAARP facility interfere with LORAN C?

A. One of the research purposes of the HAARP facility is to study the cross modulation effects due to two electromagnetic waves traversing a common ionosphere region. This is known as "the Luxembourg Effect." The system is not expected to affect communications and aircraft navigation instrumentation outside of the small immediate region (less than 50 miles across) illuminated by the IRI through the skywave mode.

LORAN-C navigation operates on a ground wave. The pulse spacing and phase code allows the ground wave to be differential from the varying skywave. Thus, there is no interaction and resulting interference between the local IRI skywave and the LORAN-C ground wave. Therefore, there would be no impact on LORAN C. None of the HAARP systems emit any subharmonic frequencies that would impact a LORAN system or other low frequency navigation aides. Although one of the research objectives of HAARP is to study the Luxembourg effect, it will be done on a non-interference basis with other communication/navigation operations. HAARP will employ an aircraft detection and tracking radar. If this radar detects an aircraft on a track that would carry it through the warning area the radar will cue the HAARP emitters and shut them down.

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#### **AIRCRAFT NAVIGATION/INSTRUMENT CONCERNS AT ALTERNATIVE SITES:**

##### **Gakona and Clear Alternatives**

The following comment(s) contributed to the paraphrased question below:

| <u>Comment</u> | <u>Page</u> |
|----------------|-------------|
| 4.14-79        | 11-37       |
| 4.14-80        | 11-37       |
| 4.14-124       | 11-69       |

**Q. Will the Gulkana TACAN, operating on a center frequency of 1192 MHz be affected from the operation of the HAARP facility?**

**A. HAARP as deployed will not compromise flight safety. HAARP operating procedures and mitigative measures will be developed cooperatively with the FAA and other interested federal and state agencies, and tested to ensure compatibility with Alaskan operations.**

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The following comment(s) contributed to the paraphrased question below:

| <u>Comment</u> | <u>Page</u> |
|----------------|-------------|
| 4.14-81        | 11-37       |
| 4.14-82        | 11-37       |

**Q. Will the Gulkana or Nenana VOR (operating on center frequencies of 115.6 and 115.8 MHz, respectively) be affected by the operation of the HAARP facility?**

**A. There is a potential the HAARP would interfere with the VOR at Gulkana or Nenana. Since the frequency of the VOR is outside of the HAARP operating band any such interference would be from either harmonic or spurious emissions. This interference would be characterized by the distance at which the HAARP emissions have an estimated power density that is equal to the "noise floor" of the VOR receiver. For the Gakona site this distance is estimated to be 0.6 miles for the IRI and ISR; however, this is only a worst-case estimate, since actual interference will be a function of radiation pattern details. The IRI and VIS would interfere with the Nenana VOR up to distances of 0.6 miles. The actual interference experienced will be strongly dependent on details of the emitters' radiation patterns and aircraft position relative to the IRI and the VOR. Mitigation techniques may include avoidance of frequencies**

producing interfering harmonics and the modification of the IRI hardware to reduce spurious emissions when necessary.

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The following comment(s) contributed to the paraphrased question below:

| <u>Comment</u> | <u>Page</u> |
|----------------|-------------|
| 4.14-84        | 11-37       |
| 4.14-85        | 11-37       |

**Q. Will the Gulkana or Nenana NDB (operating on center frequencies of 248 and 525 kHz, respectively) be affected by the operation of the HAARP facility?**

**A. HAARP emitters will not produce appreciable subharmonic spurious radiation that could affect the Gulkana NDB which operates at a center frequency of 248 KHz or the Nenana NDB which operates at a center frequency of 525 KHz. Therefore, the Gulkana or Nenana NDB should not be affected by the HAARP emitters.**

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The following comment(s) contributed to the paraphrased question below:

| <u>Comment</u> | <u>Page</u> |
|----------------|-------------|
| 4.14-86        | 11-38       |
| 4.14-87        | 11-38       |

**Q. The FAA is planning to install VHF repeaters and base stations at most manned facilities in Alaska. If the FAA places a repeater at Gulkana that transmits and receives on frequencies between 166.175 MHz and 172.4375 MHz or Nenana that transmits and receives on frequencies between 166.175 MHz and 172.4375 MHz, will the operation of the HAARP facility affect the repeater operation or the signal it repeats?**

A. It is HAARP's intent to operate on a non-interference basis. Harmonic and spurious signal suppression at the noted frequencies is 150 dB. If interference is observed at a repeater located at Gulkana or Nenana, HAARP operation will exclude those frequencies whose harmonics have caused the interference.

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### 12.3.11 Atmosphere

The following comment(s) contributed to the paraphrased question below:

| <u>Comment</u> | <u>Page</u> |
|----------------|-------------|
| 4.15-5         | 11-46       |

Q. What is the effect of HAARP emissions to the ozone layer?

A. The government commissioned two independent studies which showed there would be no measurable depletion effects on the earth's ozone layer from transmissions of the IRI. The first study used a detailed model of thermal and chemical effects resulting from the deposition of IRI energy in the ionosphere to demonstrate that the production of ozone depleting molecules by the IRI is minuscule compared to the production by natural phenomena, such as aurora, solar extreme ultraviolet and ultraviolet flux, solar flare, and meteor showers. The second, assessment of IRI effects on the upper atmosphere used two different models developed by researchers at the National Center for Atmospheric Research to explore the temperature and composition changes of the coupled thermosphere, ionosphere and mesosphere systems during proposed HAARP experiments. Both National Center Atmospheric Research models showed weak local response and negligible global response in the atmosphere when compared with natural variability, and were nearly identical to the results of the first study. The conclusion is that the IRI will produce no measurable effects on the earth's ozone layer.

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The following comment(s) contributed to the paraphrased question below:

| <u>Comment</u> | <u>Page</u> | <u>Comment</u> | <u>Page</u> |
|----------------|-------------|----------------|-------------|
| 4.15-1         | 11-7        | 4.15-6         | 11-46       |
| 4.15-2         | 11-7        |                |             |

**Q. Will there be an effect on the stratosphere and climate?**

**A.** HAARP facility will not affect the stratosphere and climate. Transmitted energy in the HAARP frequency ranges is subject to negligible absorption in either the troposphere or the stratosphere - the two levels of the atmosphere which produce the earth's weather. Furthermore, the downward coupling from the ionosphere to the stratosphere/troposphere is extremely weak, and no association between natural ionospheric variability and surface weather and climate has been found.

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The following comment(s) contributed to the paraphrased question below:

| <u>Comment</u> | <u>Page</u> | <u>Comment</u> | <u>Page</u> |
|----------------|-------------|----------------|-------------|
| 4.15-3         | 11-9        | 4.15-8         | 11-88       |
| 4.15-7         | 11-67       | 4.15-9         | 11-107      |

**Q. How much heating of the ionosphere is expected, what is the proposed impact from such an increase as compared to Norway's experience? Will the heating of the ionosphere result in the formation of plasma waves above our heads? If so, is the situation dangerous to our health?**

**A.** The maximum relative heating of the ionosphere will occur at altitudes above 124 miles, and in all cases will be substantially less than temperature changes caused by natural process in the auroral region. Nominally, induced temperature fluctuations of the order of 50% are expected in a small spatial volume.



Geophysically, the ionosphere above the proposed HAARP site is very similar to the ionosphere above the facility in Norway. While the effective radiated power for the HAARP facility should be about three times greater than that of the existing facility in Norway, it is expected to produce effects comparable to those observed in Norway. This is because the ionosphere generally doesn't respond linearly to radio wave stimulus.

HAARP transmissions will generate two types of waves in the ionosphere plasma above the facility, neither of which pose any hazard to humans. The first type, known as electrostatic waves, consists of only an oscillating electric field component (i.e., no associated magnetic field). The electric fields present in these waves are much weaker than those supplied by ordinary household batteries, and the waves are damped out in the ionosphere miles above the earth's surface. Electromagnetic (e.g., ELF radio waves) waves comprise the second type of waves. They contain both electric and magnetic field components and may be faintly observable near the earth's surface. When present, they are normally 10 million times weaker than the reflected wave itself, and are much less intense than commercial radio broadcast signals detectable with typical radio receivers. Additionally, the magnetic field fluctuations caused by these waves are orders of magnitude smaller than those induced by natural auroral processes.

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The following comment(s) contributed to the paraphrased question below:

| <u>Comment</u> | <u>Page</u> |
|----------------|-------------|
| 4.15-4         | 11-9        |

**Q.** It is stated that the effects of "decreased electron densities induced within the affected conical volume of the F layer could last anywhere from a few hours to an entire polar night." In layman's terms, what does this mean? Will a hole or depression in the electrons of the F layer allow increased radiation passage? If the F layer is there and acts as a partial shield to cosmic radiation then what will this experiment do? How long is the polar

**night? Are you stating that the effect will last until sunrise, until a particular intensity of sunshine or number of lumens is reached, or colloquially will it last for 6 months?**

**A. During certain experiments HAARP transmissions may cause a fractional reduction of the electron density in a small volume in the F layer illuminated by the HF wave. The decreased density is primarily caused by simply the thermal expansion of the electron gas within the transmitter's beam. After the transmitter is turned off, expansion ceases and the effect normally disappears within minutes as electrons fuse back into the affected volume; under certain conditions, the reduced electron density could persist for several hours or until sunrise. At locations near Clear Air Force Station, this would be a maximum of about 20 hours (winter). In any case, the neutral background density of the atmosphere remains unaffected, and these neutral particles are responsible for the radiation shielding provided in the F layer. Electrons are actually just the by-product of the energetic collisions between the radiation and the neutral particles. Therefore, a reduction in electron density will have no effect whatsoever on the shielding properties of the ionosphere.**

**As with other effects caused by the HAARP research facility, the induced electron density depletions are much smaller than those caused by natural processes. The so called "F region trough" refers to a daily natural ionospheric feature originating at high latitudes characterized by electron density depletions of 50% or more covering hundreds of square miles. No adverse geophysical or biological effects are associated with this phenomenon.**

### 13.0 CHANGES TO THE DEIS

The following changes pertain to the DEIS issued in February 1993. The changes are the result of comments received from agencies and personal reviewers and in most cases represent minor clarifications or word changes. In addition, several typographical errors have been discovered and are corrected as part of this section. None of these changes altered the intent, meaning or analysis provided in the DEIS and reviewed by the public.

The DEIS revised as indicated below will constitute Volume I of the FEIS.

The reference to the portion of the DEIS containing the errata will be made by page number, paragraph number, and sentence or line number. Fragmented paragraphs at the top of pages are considered paragraph No. 1 for that page.

#### General

All Pages

Replace the term "*Draft EIS*" with the acronym "*DEIS*".

#### Cover Sheet

Page i

Replace existing with the Cover Sheet in the beginning of Volume II. This revised Cover Sheet now also incorporates the results of public comments and represents both Volume I and Volume II.

#### Summary

Pages iii to x

Replace existing with the Summary presented on pages xi to xx of Volume II. This revised summary now also incorporates the results of public comments and summarizes both Volume I and Volume II.

Page xi

Paragraph 2. Replace existing with the following:  
*"Electromagnetic systems that could be affected by HAARP"*

*operations at either of the sites could include high-frequency communications, mobile VHF radios, wildlife trackers, citizen band radios, hand held transceivers, UHF communications equipment, and television. Mitigation could include design modifications to minimize low angle radio emissions and out-of-band radio frequency energy, hardware modifications to the affected user system, avoidance of interfered frequencies and shutdown of appropriate HAARP emitters."*

List of Abbreviations

- |            |  |
|------------|--|
| Page xxiii | Sixth entry, change "AFD" to "ADF".  |
| Page xxiv  | Third entry, change "Economic" to "Environmental".                         |
| Page xxiv  | Insert "DEIS Draft Environmental Impact Statement" between "dB" and "DOD". |
| Page xxiv  | Thirteenth entry, change "Electric" to "Electric Field".                   |
| Page xxiv  | Insert "FEIS Final Environmental Impact Statement" between "FCC" and "FM". |
| Page xxv   | First entry, change "Magnetic" to "Magnetic Field".                        |

Section 1

No changes

## Section 2

- Page 2-28 Paragraph 3. Add the following after Sentence 5: *"The total pad size for the transmitter array is approximately 250 feet square."*
- Page 2-28 Paragraph 3. Add the following at the end of the last sentence: *"The total pad size for the receiver array is approximately 210 feet square."*
- Page 2-30 Paragraph 1, sentence 3. Change "9000" to "9500".
- Page 2-36 Paragraph 1, Line 3. Change "burrow" to "borrow."
- Page 2-38 Modify Figure 2.3-5 to indicate that the scientific equipment located on the southern portion of Clear AFS would be an optical and infrared imagers and magnetometer.
- Page 2-51 Table 2.4-1. Gakona Site Alternative block of the table. Change "58 acres" to "51 acres".

## Section 3

- Page 3-70 Paragraph 1 (below Table 3.7-4), 5th line. Delete second "and".
- Page 3-113 Paragraph 3. Replace the existing paragraph with the following: *"The subsistence program in Alaska is currently regulated by a dual system. Subsistence activities on federal public lands are regulated by the federal subsistence program pursuant to Title 8 of ANILCA. Federal lands account for approximately 65 percent of the total area of Alaska. The federal subsistence program is jointly administered by the U.S. Forest Service (36 CFR 242) and the U.S.*

*Fish and Wildlife Service (50 CFR 100). The state subsistence program is not in compliance with Title 8 of ANILCA. "*

Page 3-114

Paragraph 3. Replace the existing paragraph with the following:  
*"The Copper River Basin communities are presently classified as rural under the federal subsistence program. Rural residents that comply with federal customary and traditional use determinations are eligible to participate in subsistence activities on federal public lands. In addition, National Park Service regulations govern which communities or individual residents qualify for subsistence uses within national parks and preserves. "*

Page 3-121/122

Paragraph 4, Sentence 2. Replace existing sentence with the following: *"Access to the interior of the park is provided by the Nabesna Road off the Tok Cut-Off near Slana, and by the McCarthy Road off the Old Edgerton Highway near Chitina. "*

Page 3-122

Paragraph 2, Sentence 1. Replace existing with the following:  
*"The BLM oversees the Gulkana National Wild and Scenic River (extending from Paxson to Sourdough) as well as several campgrounds in the vicinity of the Gakona site (Figure 3.11-1).*

Page 3-123

Modify Figure 3.11-1 to indicate that the Gulkana Wild and Scenic River ends at Sourdough. Campsite across from Sourdough has been removed to indicate closure in 1993.

Page 3-124

Paragraph 3. Move entire paragraph to page 3-115, between existing paragraphs 2 and 3.

Page 3-125

Table 3.11-1. Add a note below the table that states the following:  
*"Table represents state regulations for recreational hunting, although these regulations may apply in part to subsistence hunters. Harvest regulations stated are for 1992 and are subject to change from year-to-year."*

Section 4

Page 4-19

Paragraph 2. Add the following after the last sentence in the paragraph: *"Because this area is only infrequently visited by caribou and the region is not considered prime range, the lost browse impacts to caribou are not significant."*

Page 4-39

Paragraph 3, line 2. Change *"will the HAARP"* to *"will affect HAARP"*.

Page 4-50

Paragraph 3, line 9. Change *"emmissions"* to *"emissions"*.

Page 4-50

Paragraph 3, last line. Change *"HAARP emitters"* to *"appropriate HAARP emitters"*.

Page 4-51

Paragraph 1, line 1. Change *"IRI system"* to *"appropriate emitters"*.

Page 4-91

Paragraph 1, line 3. Change *"transmissions"* to *"appropriate emitters"*.

Page 4-91

Paragraph 2, Sentence 2. Change *"length)"* to *"length"*.

Page 4-91

Paragraph 3, line 6. Change "emissions" to "appropriate emitters".

Page 4-103

Paragraph 2, Sentence 3. Replace existing with the following:  
*"From Tables 4.14-2 and 4.14-3, it is concluded that the systems potentially affected by IRI interference could include HF Communications, mobile VHF radios, TV, wildlife trackers, hand held transceivers, citizen band radios, and cellular telephones".*

Page 4-104

Table 4.14-2. Add reference "MITRE 1993c". Replace existing portions of the corresponding cells with the following:

| RECEIVING SYSTEMS      | FREQUENCY RANGE (MHz)   | <sup>1</sup> THEORETICAL MAXIMUM INTERFERENCE                  |   |   |
|------------------------|---|--|---|---|
|                        |   | IRI  | ISR   | VIS   |
| Television Broadcast   | 60 - 88<br>88 - 200<br>200 - 216  | inconclusive<br>no impact<br>inconclusive                      | no impact<br>no impact<br>no impact                                   | impact<br>impact<br>impact  |
| FM Radio Broadcast     | 92.9 - 106.7  | no impact  | no impact   | no impact   |
| <sup>2</sup> Avionics  | GPS 1227, 1575<br>VHF Radio 118 - 137<br>UHF Radio 960 - 1125<br>VOR 115 - 116<br>ADF 0.25 - 0.40 | 95 feet<br>1.6 miles<br>6.1 miles<br>0.6 miles<br>in main beam | 500 feet<br>in main beam<br>2.5 miles<br>in main beam<br>in main beam | < <3300 feet<br>32 miles<br>3.0 miles<br>20 miles<br>in main beam |
| Mobile VHF Radio       | 38 - 88<br>88 - 161   | impact<br>inconclusive   | no impact<br>no impact  | impact<br>impact  |
| Wildlife Trackers      | 30 - 88<br>88 - 200<br>200 - 222  | impact<br>inclusive<br>impact                                  | no impact<br>no impact<br>no impact                                   | impact<br>impact<br>impact  |
| Hand Held Transceivers | VHF 118 - 174<br>UHF 403 - 470  | inconclusive<br>impact   | no impact<br>impact   | impact<br>impact  |



Table 4.14-3. Add references "MITRE 1993b" and "MITRE 1993c". Replace existing portions of the corresponding cells with the following:

| RECEIVING SYSTEMS      | FREQUENCY RANGE (MHz)   | ' THEORETICAL MAXIMUM INTERFERENCE                             |   |   |
|------------------------|---|--|---|---|
|                        |   | IRI  | ISR   | VIS   |
| Television Broadcast   | 60 - 88<br>88 - 200<br>200 - 216  | inconclusive<br>no impact<br>inconclusive                      | no impact<br>no impact<br>no impact                                   | impact<br>impact<br>impact  |
| FM Radio Broadcast     | 92.9 - 106.7  | no impact  | no impact   | no impact   |
| <sup>2</sup> Avionics  | GPS 1227, 1575<br>VHF Radio 118 - 137<br>UHF Radio 960 - 1125<br>VOR 115 - 116<br>ADF 0.25 - 0.40 | 95 feet<br>1.6 miles<br>6.1 miles<br>0.6 miles<br>in main beam | 500 feet<br>in main beam<br>2.5 miles<br>in main beam<br>in main beam | < <3300 feet<br>32 miles<br>3.0 miles<br>20 miles<br>in main beam |
| Mobile VHF Radio       | 38 - 88<br>88 - 161   | impact<br>inconclusive   | no impact<br>no impact  | impact<br>impact  |
| Wildlife Trackers      | 30 - 88<br>88 - 200<br>200 - 222  | impact<br>inclusive<br>impact                                  | no impact<br>no impact<br>no impact                                   | impact<br>impact<br>impact  |
| Hand Held Transceivers | VHF 118 - 174<br>UHF 403 - 470  | inconclusive<br>impact   | no impact<br>impact   | impact<br>impact  |

Paragraph 3 (labelled "4."). Replace existing with the following:

*"4. Provide a convenient, real-time method for the reporting and confirmation of interference occurrences. By request, HAARP will provide proposed research campaign details to individuals, agencies, and organizations at least two weeks prior to operation of the IRI. HAARP will have a telephone at the operations center available to report any interference or emergency conditions. HAARP personnel receiving the telephone call will work with the individual to confirm the interference and to isolate the source of the interference."*

Page 4-110

Paragraph 4 (labelled "6."). Replace existing with the following:  
*"6. Within approximately 1,300 feet of the IRI and 655 feet of the ISR, ground based use of exposed EED's will require coordination to ensure safe conditions. By request, HAARP will provide proposed research campaign details to individuals, agencies, and organizations at least two weeks prior to operation of the IRI. Appropriate warning signs will be placed along public roads and trails within 1,300 feet of the IRI and 655 feet of the ISR to advise the public not to use exposed EED's without first coordinating their usage with the HAARP site. The appropriate telephone number will be posted on the signs."*

Page 4-110

Paragraph 5 (labelled "7."), line 3. Change *"HAARP emitters"* to *"appropriate HAARP emitters"*.

Page 4-113

Paragraph 3, Line 3. Before the words *"electron densities"* insert the words *"decreases in."*

Page 4-119

Paragraph 4, Line 4. After *"powerplant"* add *"or the commercial power grid"*.

## Section 5

No changes

## Section 6

Page 6-18

Add the following reference: *"MITRE, 1993c. The MITRE Corporation. Electromagnetic Interference Impact of the Proposed Emitters for the High Frequency Active Auroral Research Program (HAARP), Revision A. July, 1993"*.

Section 7

No changes

Section 8

Page 8-4

Insert between "*Gulkana River*" and "*Hazardous Materials*" the following line:

*"HAM (Amateur Radio): 3-147, 3-152, 3-154, 4-94, 4-99"*

Page 8-5

*"Norway"* listing, change *"4-91"* to *"4-93"*.

Appendix A

No changes

Appendix B

No changes

Appendix C

No changes

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Postmaster  
Nenana, AK 99760-9998

Postmaster  
Healy, AK 99743-9998

Postmaster  
Denali National Park, AK 99743-9998

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Box 192  
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P.O. Box 60268  
Fairbanks, AK 99706

Robinson, Donna J.  
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Anderson, AK 99744

Robinson, Wayne L.  
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Clear, AK 99704

Roginsic, JA  
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Sauve, Chantal  
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Clear AFS, AK 99704

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8425 Jupiter  
Anchorage, AK 99507

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P.O.B. 414  
Ester, AK 99725

Sierra Club Legal Defense Club, Inc.  
Barnett, Phillip  
325 Fourth Street  
Juneau, Alaska 99801

Smith, Nathan O.  
450 N. Bailey St.  
Palmer, AK 99645

Soltis, Regina C.  
P.O. Box 255  
Healy, AK 99743

Speacklin, Terry  
Box 174  
Glennallen, AK 99588

State Representative  
Honorable Jeannette James  
c/o Sharon Clark  
Route 2  
Nenana, AK 99760

State Senator  
Honorable Dick Schultz  
P.O. Box 511  
Tok, AK 99750

State Senator  
Honorable Mike Miller  
119 N. Cushman St.  
Suite 101  
Fairbanks, AK 99701

Stemp, Mark  
P.O. 206  
Copper Center, AK 99573

Stimac, Randy  
18823 Sachef Loop  
Eagle River, AK 99507

Tanana Chiefs Conference, Inc.  
Doyon Building  
201 First Avenue  
Fairbanks, Alaska 99701

The Frontiersman  
Pouch M  
Wasilla, Alaska 99687

The Wilderness Society  
Miker, Pam  
430 W. 7th Ave. Suite 210  
Anchorage, AK 99510

Thompson, Eidon  
P.O. Box 16233  
Two Rivers, AK 99716

Tri-Valley Community Library  
P.O. Box 400  
Healy, AK 99743

Trident  
Reed, J.W., P.E.  
P.O. Box 111158  
Anchorage, AK 99511

Trustees for Alaska  
725 Christensen Drive, Suite 4  
Anchorage, Alaska 99501-2101

U.S. Army Engineer District, Alaska  
Regulatory Branch  
Leeds, John  
Pouch 898  
Anchorage, AK 99506

U.S. Dept. of Interior  
Mineral Management Services  
OCS Survey GP.  
MD #625  
P. O. Box 25165  
Denver, Colorado 80225-0165

U.S. Dept. of the Interior  
Gates, Paul  
Office of Envir. Affairs  
1689 C Street, Room 119  
Anchorage, AK 99501-5126

U.S. Environmental Protection Agency  
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222 West Seventh Avenue, Box 19  
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U.S. Fish & Wildlife Service  
Assistant Area Director  
Area Office Ecological Services  
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Anchorage, Alaska 99503-6119

U.S. Fish & Wildlife Service  
Bright, Larry  
1412 Airport Way  
Fairbanks, AK 99701

U.S. Fish & Wildlife Service  
Diters, Mr. Chuck E.  
Cultural Resources Division  
1011 E. Tudor Road  
Anchorage, AK 99507

U.S. Fish & Wildlife Service  
605 W. 4th Avenue, Room G-62  
Anchorage, Alaska 99501-2231

U.S. Geological Survey  
Water Resources Library  
4230 University Drive, Suite 201  
Anchorage, AK 99508-4664

United States Canoe Assoc.  
Mack, Jim (Executive Director)  
606 Ross Street  
Middleton, Ohio 45044

University of Alaska  
Envir. and Natural Resources Inst.  
707 A Street  
Anchorage, AK 99501-3625

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Institute for Social and Economic Research  
3211 Providence Drive  
Anchorage, AK 99508

University of Alaska, Anchorage  
School of Engineering  
3211 Providence Drive  
Anchorage, AK 99504

University of Alaska, Fairbanks  
Institute of Water Resources  
College, AK 99701-1044

University of Alaska, Fairbanks  
School of Engineering  
College, AK 99701

University of Alaska, Fairbanks  
Document Collection  
Elmer Rasmussen Library  
Fairbanks, Alaska 99775-1007

University of Alaska, Fairbanks  
Government Documents  
Elmer E. Rasmuson Library  
Fairbanks, Alaska 99701-1044

University of Alaska Library  
Government Documents Collection  
3211 Providence Drive  
Anchorage, AK 99504-4616

Valdez Public Library  
Box 609  
Valdez, Alaska 99686

Valdez Vanguard  
Hecht, John C. (Editor)  
P.O. Box 157  
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Clear, AK 99704

Weker, Charmi  
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Woolington, Jim  
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Wyckoff, Dolores  
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Fort Wainwright, Alaska 99703

Zickuhr, Clare  
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Anchorage, AK 99515



## 15.0 FEIS NOTICE LETTER LIST

Because no response was received on the DEIS, from the following individuals, they were not included in the FEIS mailing list. They are to be mailed notices that the FEIS is available for public review.

---

A. C. Hoyle Company  
103 E. "H" Street  
P. O. Box 580  
Iron Mountain, Michigan 49801-0580

AARIG Terminal Systems, Inc.  
Route 9  
Box 606  
Gulfport, Mississippi 39503

ABAM Engineers, Inc.  
Rusten, Arnie  
33301 9th Avenue South  
Federal Way, Washington 98003-6395

Alaska Construction & Oil  
Harris, Mark  
3000 Northrup #300  
Bellevue, Washington 98004

Alaska Industrial Resources  
Wooten, Dave  
P. O. Box 190529  
Anchorage, Alaska 99519-0529

Alaska Interstate Construction, Inc.  
P. O. Box 233769  
Anchorage, Alaska 99523-3769

Alaska Tug & Barge  
Unserfer, Tony  
18242 Tonsina Court  
Eagle River, Alaska 99577

Alaskan Barge & Salvage, Inc.  
Box 1387  
Seward, Alaska 99664-1387

Amak Towing Company  
Cowan, Clyde  
2110 Second Avenue  
Ketchikan, Alaska 99901-6034

AMMCO  
P. O. Box 100923  
Nashville, Tennessee 37210-0923

Anjun, Shehla  
950 Coral Lane  
Anchorage, Alaska 99515

Arctic Slope Consulting Engineers  
Mortensen, Tom  
6700 Arctic Spur Road  
Anchorage, Alaska 99518

Arvidson, Robert M.  
Box 258  
Cordova, Alaska 99574-0258

Bellingham Marine Industries  
P. O. Box 8  
Bellingham, Washington 98227-0008

Big Sky Engineers and Constructors  
5511 Spellman  
Houston, TX 77096

C.F. Bean Corporation  
Bean Dredging Corporation  
619 Engineers Road  
P. O. Box 237  
Belle Chasse, Louisiana 70037

C.F.I., Inc.  
336 Main Avenue  
De Pere, Wisconsin 54114-2203

C.F.I., Inc.  
1917 Lake Street  
Algoma, Wisconsin 54201

Central Paving Products  
Giammalva, Sam  
11301 Lang Street  
Anchorage, Alaska 99515-3006

Chevron USA, Inc.  
Thoeni, J. E.  
P. O. Box 7-839  
Anchorage, Alaska 99510

Collins Company  
Collins, Joan  
16604 N.E. 30th Street  
Bellevue, Washington 98008

Construction & Rigging, Inc.  
Box 230070  
Anchorage, Alaska 99523-0070

Crowley Maritime Corporation  
Peterson, Steve  
4300 "B" Street, Suite 507  
Anchorage, Alaska 99503-5997

Cuthill, John  
12610 N.E. 141st Way  
Kirkland, Washington 98034

Diving Services International, Inc.  
P. O. Box 2853  
Hammond, Louisiana 70404

Dredge & Marine Corps  
P. O. Box 876  
Mt. Juliet, Tennessee 37122

Dunlap Towing Company  
2702 Federal Avenue  
Everett, Washington 98201-3411

Earthmovers of Fairbanks  
Thurman, James L.  
925 Aurora  
Fairbanks, Alaska 99701-2197

Enright, Miles  
P. O. Box 1103  
Ward Cove, Alaska 99928

Exxon USA  
Dragnich, Robert  
P. O. Box 196601  
Anchorage, Alaska 99519-0601

Ficek, Joe  
P. O. Box 3320  
Portland, Oregon 97208-3320

Foss Maritime Company  
660 W. Ewing Street  
Seattle, Washington 98119-1587

Foss Maritime Company  
201 East Third Street, Suite 205  
Anchorage, Alaska 99501-2571

Gastineau Contractors  
Box 34437  
Juneau, Alaska 99803

General Construction Company  
Blessing, E. L.  
P. O. Box  
24506, Seattle, Washington 98124-0506

Goldbelt, Incorporated  
Dwyer, Rich  
801 West 10th  
Street, Suite 300  
Juneau, Alaska 99801

Goodyear Tire & Rubber Company  
P. O. Box 95002  
Auburn, Washington 98071

Graystar Technical Services  
Grabacki, Stephen T. (President)  
P. O. Box 100506  
Anchorage, Alaska 99510-0506

Great Lakes Dredge & Dock Company  
2122 York Road  
Oak Brook, Illinois 60521-1972

Great Lakes Dredge & Dock Company  
2100 Embarcadero, Suite 205  
Oakland, California 94606

Green Construction Company  
125 W. 5th Avenue  
Anchorage, Alaska 99501-2591

Harding Lawson Associates  
McCusker, Andrew J.  
601 E. 57th Place  
Anchorage, Alaska 99518

Howard S. Wright Construction Company  
Carlstrom, Elsa  
P. O. Box 3764  
Seattle, Washington 98124-3764

Hubbell Incorporated  
Bragg, David A.  
P. O. Box 3999  
Bridgeport, Connecticut 06605

HWW Consultants  
1340 W. 23rd Avenue, Suite B  
Anchorage, Alaska 99503-1644

I.M.S.S.  
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Pearland, Texas 77588

I.U.O.E. Local #302  
214 N. Franklin Street  
Juneau, Alaska 99801-1225

Ideal Marketing  
Liebsch, W. L.  
P.O. Box 219  
Grapevine, Texas 76051

International Alaska Enterprises  
Blackwell, Pinky  
550 W. 64th Avenue  
Anchorage, Alaska 99502

International Union of Operating Engineers  
Gore, Warren  
900 W. Northern Lights Boulevard  
Anchorage, Alaska 99503-3714

J. G. Fisher & Associates  
8641 Leeper Circle  
Anchorage, Alaska 99504-4209

Johnson Division  
UOP  
Surface Water Department  
P. O. Box 43118  
St. Paul, Minnesota 55164

Kiewit Construction Company  
721 Sesame Street, Suite C  
Anchorage, Alaska 99503

Kiewit Pacific Company  
Grieb, Chris  
P. O. Box 1769  
Vancouver, Washington 98668

Knouf & Knouf Inc.  
Knouf, Robert E.  
P. O. Box 9912  
Spokane, Washington 99209

Koniag Corporation  
4300 B Street, Suite 407  
Anchorage, Alaska 99503

Larson, Mr. & Mrs. Robert  
Point Baker, Alaska 99927

Lounsbury & Associates, Inc.  
723 W. 6th Avenue  
Anchorage, Alaska 99503

Marina Ventures Internationale, Ltd.  
2501 Boston Street  
Baltimore, Maryland 21224

Martech International  
Burcham, Bob  
300 E. 54th Avenue  
Anchorage, Alaska 99518

Maskell-Robbins, Inc.  
Barclay, Ben  
524 W. International Airport Road, Suite  
200  
Anchorage, Alaska 99502-1305

McElroy, James S.  
7110 Burlwood Drive  
Anchorage, Alaska 99507-2426

Meeco Marinas, Inc.  
Walker, Gene  
P. O. Box 518  
McAlester, Oklahoma 74501-0518

Metz, W. P.  
4610 Edinburgh  
Anchorage, Alaska 99515-1123

Miller, Mike  
7101 DeBarr Road  
Anchorage, Alaska 99504

Morrison-Knudsen Company  
Marine Division  
P. O. Box 7808  
Boise, Idaho 83729

Morrow, Jack  
P. O. Box 507  
Valdez, Alaska 99686-0507

National Marine Fisheries Service  
Meyers, Theodore F.  
Habitat Conservation Division  
P. O. Box 21668  
Juneau, Alaska 99802-1668

National Pipe & Piling, Inc.  
3900 E. Valley Highway, Suite 103  
Renton, Washington 98055-4906

Nicolon Corporation  
3500 Parkway Lane, Suite 500  
Norcross, Georgia 30092-1312

Nome Nugget  
P. O. Box 610  
Nome, Alaska 99762-0610

Nordic Marine Floats  
9324 State #261  
Marysville, Washington 98270-5707

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Davis, Steve (Deputy Director)  
P. O. Box 103136  
Anchorage, Alaska 99510

Northland Services, Inc.  
Johnson, Sandy  
P. O. Box 24527  
Seattle, Washington 98124

Northwest Wire Rope and Equipment, Inc.  
Hamburg, Richard  
P. O. Box 1806  
Tacoma, Washington 98401

Oberts, Leo T.  
Box 458  
Kenai, Alaska 99611-0458

Ocean Beauty Alaska, Inc.  
Evans, Christopher C.  
P. O. Box C-70739  
Seattle, Washington 98107

Otis, Roger  
P. O. Box 518  
McAlester, Oklahoma 74502-0518

OTT Water Engineers  
Ryan, William  
4446 Business Park Boulevard, Building B  
Anchorage, Alaska 99503-7124

Pacific Corrugated Pipe Company  
Turner, Gerald  
18300 152nd Ct. S.E.  
Renton, Washington 98058

Pacific Marine Center/NOS  
Director (N/MOPX4)  
1801 Fairview Avenue East  
Seattle, Washington 98102-3767

Pacific Northwest Waterways Association  
Vanselow, Glenn  
P. O. Box 61473  
Vancouver, Washington 98666-1473

Pelafoam, Inc.  
P. O. Box 36  
Richmond, California 94807

Piledrivers Local #2520  
825 E. 8th Avenue  
Anchorage, Alaska 99501-3820

Plumbers & Pipefitters, LU 262  
Perkins, Dwight  
723 W. 10th Street  
Juneau, Alaska 99801

Puget Sound Tug & Barge  
4300 B Street, Suite 507  
Anchorage, Alaska 99503-5997

Rasmussen Company, Inc.  
8727 5th Avenue, South  
P. O. Box 81206  
Seattle, Washington 98108-1206

Reid Timber, Inc.  
2415 Hemlock #105  
Ketchikan, Alaska 99901

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Newport Beach, California 92663

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S. F. Austin & Lincoln Roads  
P.O. Box 1059  
Brownwood, Texas 76804-1059

Rural Cap  
P.O. Box 200908  
Anchorage, Alaska 99520

Saltwater Productions  
Munro, Nancy  
540 L Street, Suite 202  
Anchorage, Alaska 99501

Samson Tug & Barge Company  
Terminal 115  
6702 W. Marginal Way, Southwest  
Seattle, Washington 98106

Sandau Dredging  
Sandau, Don  
677 78th Avenue, Northeast  
Salem, Oregon 97301

Sea Technology, Ltd.  
P. O. Box 489  
Gloucester, Virginia 23061

Shell Western E&P, Inc.  
Yesland, D. L.  
601 W. 5th Avenue, Suite 810  
Anchorage, Alaska 99501-2257

SKW/Eskimos, Inc.  
P. O. Box 92479  
Anchorage, Alaska 99509

Skyline Steel Corporation  
Bidner, John  
P. O. Box 35  
Corte Madera, California 94925

Slaterry Equipment  
4403 20th Street East  
Fife, Washington 98424

Soros Associates Consulting Engineers  
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Susitna Industries, Inc.  
3700 Spenard Road  
Anchorage, Alaska 99503

Swalling Construction Company  
P. O. Box 101039  
Anchorage, Alaska 99510

Teamster Local 959  
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Teamster Local 959  
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P.O. Box 31936  
Lafayette, Louisiana 70593

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Williams, Bob  
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Burnaby, B.C., Canada V3N 4-T7

Titan Western Corporation  
Bertolucci, Larry  
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Sacramento, California 95825

Toner-Nordling & Associates, Inc.  
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Topper Industries, Inc.  
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17th Coast Guard District (M)  
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Wuestenfeld, Karen  
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Vancouver, Washington 98662-7409