DOE/EA-1127

Environmental Assessment

National Wind Technology Center Sitewide
Golden, CO

Prepared By:
National Renewable Energy Laboratory
1617 Cole Boulevard
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Issued By:
U.S. Department of Energy
Golden Field Office
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November 1996

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DISCLAIMER

FINDING OF NO SIGNIFICANT IMPACT

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FINDING OF NO SIGNIFICANT IMPACT
for
National Wind Technology Center Sitewide
Golden, Colorado

AGENCY: Department of Energy, Golden Field Office

ACTION: Finding of No Significant Impact

SUMMARY: The Department of Energy conducted a sitewide assessment of the National Wind Technology Center (NWTC) to evaluate any potential impacts the current and proposed expanded operation of this facility may have on the environment. The NWTC site is currently used for the development, testing and advancement of wind energy technology and may be used for other small scale renewable energy technology tests. All discussions and findings related to this site are contained in the attached Environmental Assessment and appendices.

COPIES OF THE EA ARE AVAILABLE FROM:

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DETERMINATION: Based on the information in the EA, DOE determines that the current or explanded operations of the National Wind Technology Center does not constitute a major Federal action significantly affecting the quality of the human environment, within the meaning of the National Environmental Policy Act. Therefore, the preparation of an environmental impact statement is not required, and DOE is issuing this Finding of No Significant Imact.

Issued in Golden, Colorado, this 19th day of November, 1996.

Frank M. Stewart
U.S. Department of Energy
Golden Field Office Manager

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EXECUTIVE SUMMARY

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EXECUTIVE SUMMARY

The National Renewable Energy Laboratory (NREL), the nation's primary solar and renewable energy research laboratory, proposes to expand its wind technology research and development program activities at its National Wind Technology Center (NWTC) near Golden, Colorado. NWTC is an existing wind energy research facility operated by NREL for the U.S. Department of Energy (DOE). Proposed activities include the construction and reuse of buildings and facilities, installation of up to 20 wind turbine test sites, improvements in infrastructure, and subsequent research activities, technology testing, and site operations. In addition to wind turbine test activities, NWTC may be used to support other NREL program activities and small-scale demonstration projects.

NWTC has been used for almost 20 years to support wind energy research. As mandated by DOE, NREL has made the site available for testing and research on new turbines designed and developed by industry. Currently, however, not all site facilities are adequate to support testing and research on industry's state-of-the-art, high capacity turbines. Although the site is equipped with existing improvements (including structures, test sites, power supplies, and communication systems), improvements and facilities are not adequate to support planned activities. The proposed action is intended to expand and improve NREL's abilities to conduct renewable energy research and development, to provide support to commercial and industrial sectors, and to promote public awareness concerning renewable energy technology. Increased capabilities at NWTC are essential to accomplish NREL's energy research and development mission.

This Sitewide Environmental Assessment has been prepared in compliance with the National Environmental Policy Act (NEPA) of 1969 and implementing regulations. The DOE environmental assessment process assesses the significance of potential environmental consequences of the proposed action, solicits comments from other agencies and the public, and provides public information to be used in determining whether further NEPA documentation is required and to inform subsequent agency decision making regarding the proposed action. This assessment describes the purpose and need for agency action, addresses alternatives to the proposed action, and evaluates potential impacts of both the proposed action and the no action alternative.

This document assesses potential consequences to resources within the physical, biological, and human environment, including potential impacts to: air quality, geology and soils, water resources, biological resources, cultural and historic resources, socioeconomic resources, land use, visual resources, noise environment, hazardous materials and waste management, and health and safety conditions. Comment letters were received from several agencies in response to our scoping and predecisional draft reviews. The comments have been incorporated as appropriate into the document with full text of the letters contained in the Appendices. Additionally, information from the Rocky Flats Environmental Technology Site on going sitewide assessment of potential environmental impacts has been reviewed and discussed by representatives of both parties and incorporated into the document as appropriate.

Based on this assessment, DOE finds that the proposed action would not result in significant impacts to the physical, biological, or human environments.

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ABBREVIATIONS

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ABBREVIATIONS

A	Agricultural (zone)
APEN	Air Pollution Emission Notice
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
DOE	Department Of Energy
EIS	Environmental Impact Statement
ERDA	Environmental Research and Development Agency
FAA	Federal Aviation Administration
I	Industrial (zone)
IPM	Integrated Pest Management
IUF	Industrial User Facility
M-C	Mineral Conservation (zone)
MCL	Maximum Containment Level
NEPA	National Environmental Policy Act
NREL	National Renewable Energy Laboratory
NWTC	National Wind Technology Center
OSHA	Occupational Safety and Health Administration
P-D	Planned Development (zone)
PMSA	Primary Metropolitan Statistical Area
RFETS	Rocky Flats Environmental Technology Site
RCRA	Resource Conservation and Recovery Act
ROI	Region of Influence
SERI	Solar Energy Research Institute
SHPO	State Historical Preservation Officer
SWECS	Small Wind Energy Conversion Systems
TEH	Total Extractable Hydrocarbons
USDA	United States Department of Agriculture
USFWS	United State Fish & Wildlife Service
USGS	United States Geological Survey
WERC	Wind Energy Research Center

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CHAPTER 1
INTRODUCTION

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CHAPTER 1.0 INTRODUCTION

1.1 INTENDED USE OF THIS ENVIRONMENTAL ASSESSMENT

This Environmental Assessment is an informational document which is intended to provide information to the U.S. Department of Energy (DOE) and other public agency decision makers for use in making informed decisions in connection with the proposed expansion of the National Wind Technology Center (NWTC). This assessment analyzes the potential individual and cumulative environmental impacts associated with the proposed action and identifies proposed measures to minimize those effects.

1.2 ENVIRONMENTAL PROCEDURES

This document has been prepared in conformance with the National Environmental Policy Act (NEPA) of 1969, as amended (42 U.S.C. §§ 4321 *et seq.*); Council on Environmental Quality (CEQ) regulations for implementing the procedural provisions of NEPA (40 CFR Parts 1500-1508); and DOE's implementing procedures for compliance with NEPA (10 CFR Part 1021). The assessment, in accordance with the above requirements, evaluates the potential individual and cumulative effects of the proposed action on the physical, human, and natural environment. This document reflects DOE's independent evaluation of the impacts associated with the proposed project.

1.3 SCOPING

Approximately 50 federal, state, and local agencies were sent scoping letters concerning the proposed action to assist in identifying potential issues. Appendix A contains the text of the scoping letter, a list of recipients, and the written responses received.

Several agencies responded by telephone; however, they did not raise any issues related to the proposed project. These agencies were primarily interested in obtaining information on wind and other alternative energy sources.

The following agencies submitted written responses to the scoping letters: U.S. Department of Agriculture, Natural Resources Conservation Service (formerly Soil Conservation Service); Department of the Army, Corps of Engineers (Omaha District); the Colorado Department of Public Health and the Environment, Air Pollution Control Division; and the U.S. Department of Agriculture, Fish and Wildlife Service. The issues raised by these agencies were related to prime agricultural soils, native grasses and revegetation, raptors (birds of prey), endangered species, wetlands drainages, and the possible need for a Clean Water Act §404 permit or air quality permits. These issues are addressed in the appropriate sections of this document.

1.4 BACKGROUND

The Solar Energy Research, Development and Demonstration Act of 1974, as amended (42 U.S.C. §§ 5551 *et seq.*) authorized a federal program to develop solar energy as a viable source for the nation's future energy needs. In fulfillment of this mandate, DOE established the Solar Energy Research Institute (SERI) in 1977 and the associated DOE site office in May 1978. SERI became the nation's primary research laboratory dedicated to the research, development, and commercialization of solar and other renewable energy technologies. In September 1991, SERI was

designated as the National Renewable Energy Laboratory (NREL). NREL continues to be the nation's primary research laboratory dedicated to the research, development, and commercialization of solar and other renewable energy technologies. Research conducted at NREL has expanded to include photovoltaics, wind energy, biomass power and fuels, advanced transportation technologies, building and energy systems, and basic science and analytic studies. DOE, through its Golden Field Office, has directed NREL to operate the facility known as the National Wind Technology Center (NWTC).

The site of the NWTC was previously used for grazing until purchased by the federal government in 1975. DOE's predecessor, the Energy Research and Development Agency (ERDA), contracted with Rockwell International's Energy Systems Group in 1976 to develop and operate the site for the testing of Small Wind Energy Conversion Systems (SWECS), systems that do not exceed a generating capability of 100 kilowatts.

In 1985, NREL took over the testing program at the site and continues to use the site for testing of small wind turbines and turbine components. In 1993, landlord responsibility for the site was transferred to DOE's Office of Energy Efficiency and Renewable Energy, Golden Field Office.

1.5 PURPOSE AND NEED FOR ACTION

DOE is committed to the continued development of renewable energy technologies and plans to continue the research and development of these technologies. The NWTC is currently dedicated to the development, testing and advancement of wind energy technology that will make wind energy competitive with current technologies. The NWTC provides space and facilities for the operation and testing of turbines and turbine components. Research in other renewable energy areas may utilize space and facilities at the NWTC site to conduct small scale testing.

CHAPTER 2

DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

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CHAPTER 2.0 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

2.1 PROJECT LOCATION

The NWTC is located in northern Jefferson County, Colorado approximately 25 kilometers (km) [16 miles (mi)] northwest of Denver. Figure 2-1 illustrates the site location within Colorado. The site is roughly bounded on the west by Colorado State Highway 93 and on the north by Colorado State Highway 128. The site's northern boundary coincides with the boundary between Jefferson and Boulder counties. Figure 2-2 illustrates the site's proximity to local highways. NWTC's address is 18200 Colorado State Highway 128, Golden, Colorado, 80403.

NWTC consists of 113 hectares (280 acres) of land appearing on the United States Geological Survey's (USGS) Louisville, Colorado, Quadrangle map (revised 1979). The majority of the site lies in the Northeast 1/4 of Section 4, Township 2 South, Range 70 West, 6th Principal Meridian. About 30 hectares (75 acres) of the site lies in the East 1/2 of the Northwest 1/4 of Section 4; Township 2 South, Range 70 West. The access road to the site and about 18 hectares (45 acres) are located in the North 1/2 of the Northwest 1/4 of Section 3, Township 2 South, Range 70 West. The center of the site is located at latitude 39° 54' 15" and longitude 105° 14' 00". Figure 2-3 illustrates the NWTC site layout.

2.2 PROPOSED ACTION

Existing facilities at the NWTC were originally designed to support the smaller-scale turbines consistent with earlier wind energy research requirements. These facilities are functionally inadequate to support testing and research of today's higher capacity turbines. Site inadequacies include limited capacity for simultaneous test operations; inadequate shop, bay, and laboratory facilities; and outdated data acquisition and communication systems. Site and infrastructure upgrades will make it possible for NREL's program staff to continue their mission of research and development of renewable energy technologies in the most efficient and cost effective manner.

2.2.1 Project Description and Scope

NREL proposes to expand activities at the NWTC site by constructing and operating up to 20 new turbine test sites. The NWTC site would continue to be available for testing of innovative turbine and blade designs developed by industry, government, and academia, and for basic research in wind turbine electricity generation. The proposed site development would accommodate testing of high-capacity turbines which may exceed 3 megawatts. Approximately 125 employees, industrial users, and visiting researchers would support the expanded NWTC operation.

While the site is currently equipped with turbine test sites, power supplies, communications systems and support centers to support a wide range of wind research activities, many of the existing facilities were not constructed to support the new turbines with generating capacities that may exceed 3 megawatts. Testing of larger turbines and turbine parts require facilities that can accommodate blade spans in excess of 26 meters (m) (85 feet (ft)), tower heights of 91 m (300 ft), and a minimum ground clearance of 9 m (30 ft). Current turbine components consist of a wide range of materials

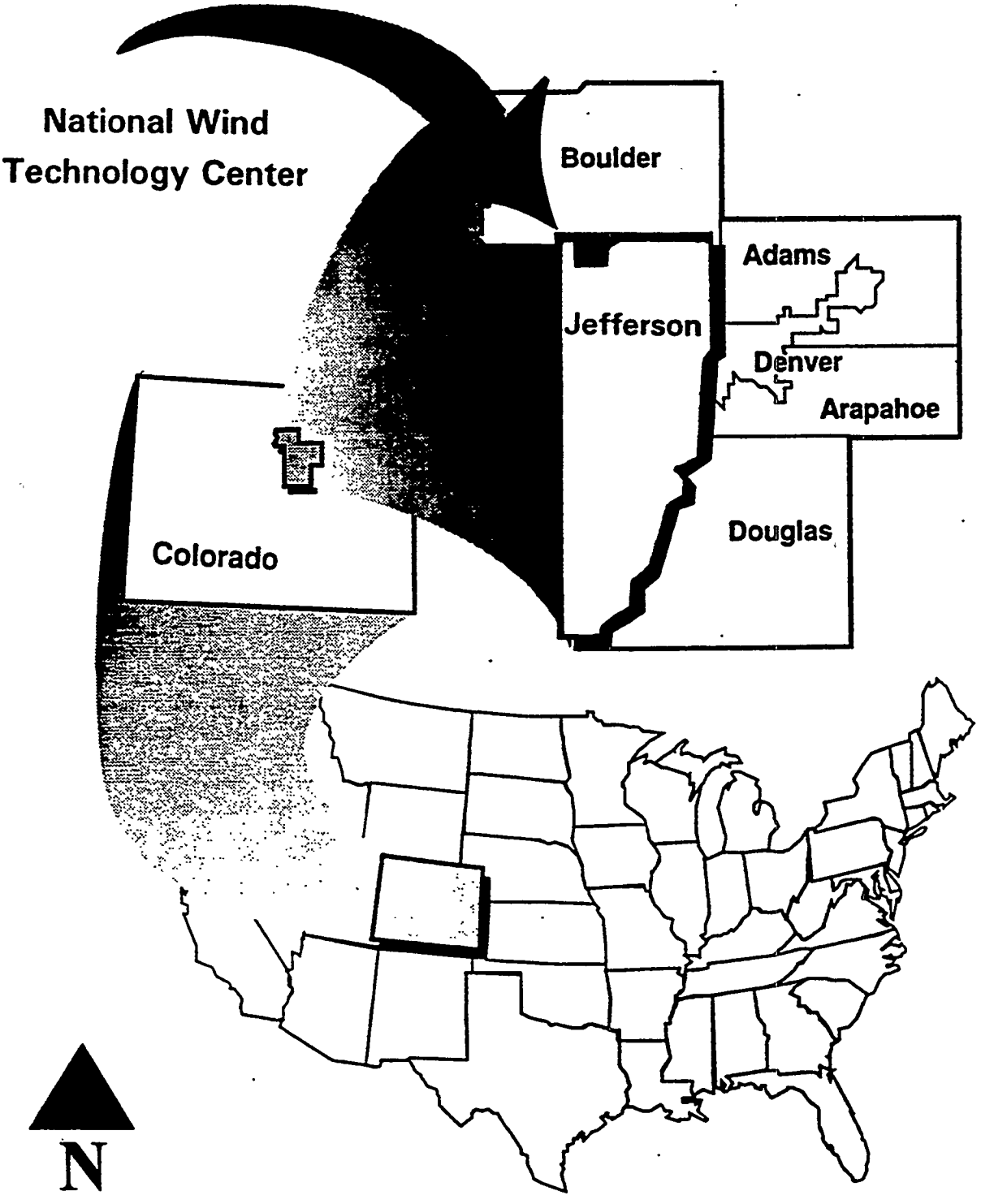

Figure 2-1. Location of the National Wind Technology Center

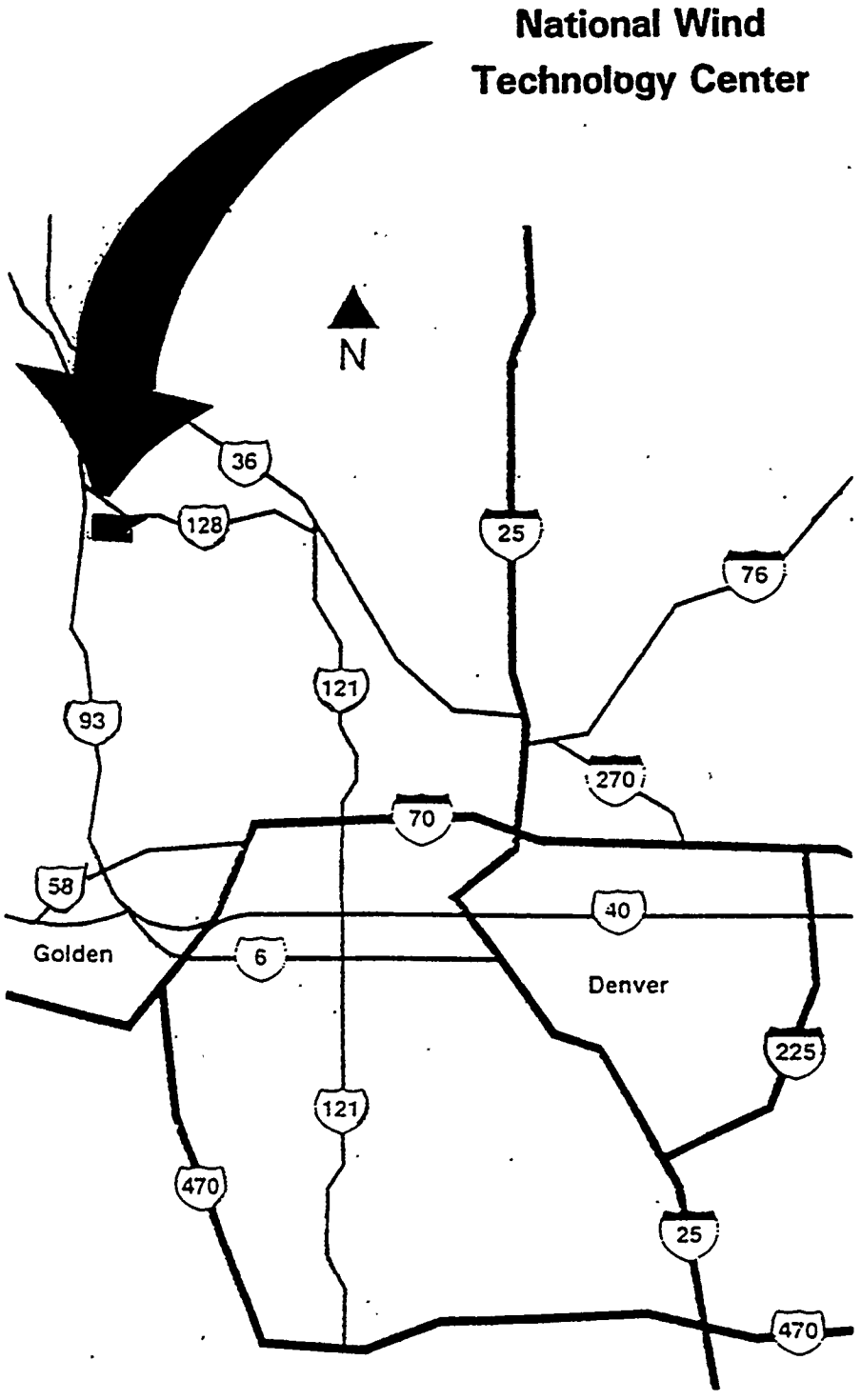

Figure 2-2. Proximity of NWTC to Local Highways

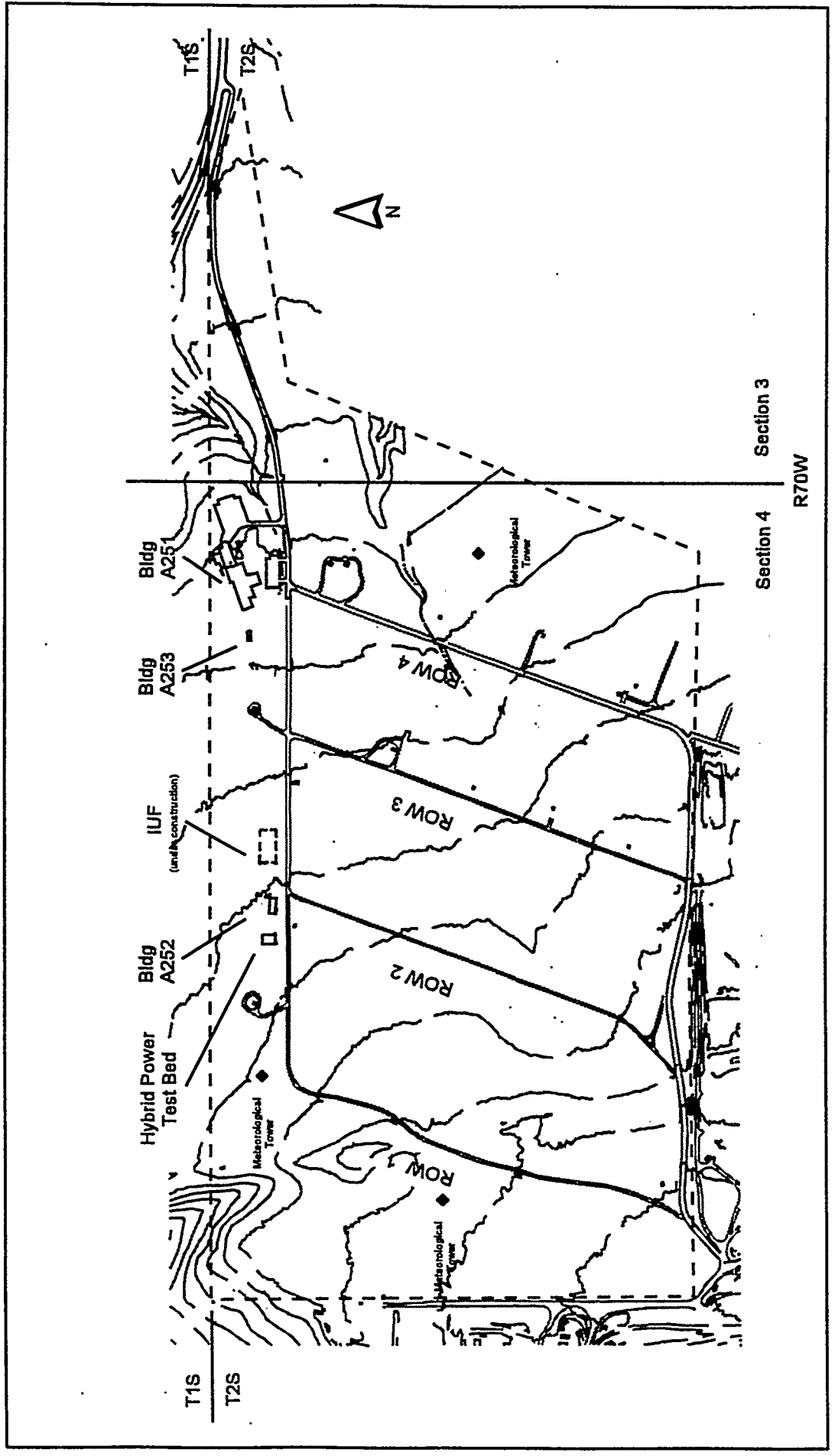

Figure 2-3. NWTC Site Layout

including fiberglass, alloys, and composites which require upgraded maintenance and repair capabilities. The proposed upgrade to the NWTC would allow for a maximum of 20 turbine test sites. Expansion and upgrading of NWTC would provide stronger supporting towers, larger foundation structures, complex instrumentation and sophisticated testing and data gathering capabilities.

Many of the facilities constructed at the site during the 1970s would be reused in the expansion of the NWTC. Use of these existing features significantly reduces the amount of construction and subsequent disturbance that would be experienced in opening a new site. Existing test sites, roads, cable and power line trenches, and two meteorological towers would be used with slight modifications.

In addition to wind turbine test activities, NWTC facilities may be used to support NREL's other program activities. To demonstrate a proof-of-concept, small scale pilot prototypes may be periodically tested at the NWTC. Most activities will be restricted to laboratory and bench scale testing. Pilot activities at NWTC will be limited to those involving only small amounts of hazardous materials. Testing will not involve the use of radioisotopes.

The proposed action includes the following activities:

Concrete Pads for Towers. Concrete foundations for up to 20 new turbine test sites would be constructed. These pads would vary in size, with the foundation size dictated by the size and type of turbine to be tested. Current test plans call for foundations measuring 5.5 m (18 ft) on each side, or 30 m^2 (324 ft^2). Each pad would contain as much as 48 m^3 (1694 ft^3) of concrete. Foundations for meteorological towers are considerably smaller, measuring only 0.5 m (1.5 ft) on a side. Most concrete pads built in the 1970s and 1980s are not suitable for reuse, but would be removed only if necessary to accommodate construction or current activities.

Underground Data and Communication Cables. Buried electrical, telecommunications, and data cables would connect the turbine towers, meteorological instruments, and NWTC monitoring equipment. A single fiber optic network encased in conduit and buried at a depth not to exceed 0.9 m (3 ft) would replace existing data connections housed in above-ground plastic pipe and plastic hose. Connections between test sites and the central computer center located in Building 251 would monitor and control turbine operations and collect meteorological and power generation data. Each interface module of the data system would require a low-voltage power supply, which would in turn require a 120-volt power supply. Data collection and communication devices would be located at the turbine test sites in pad-mounted sheds.

Road Improvements and Parking Lots. Site access roads would be improved with road base and grading, but currently are not scheduled for paving. The existing gravel road leading from Building 251 to the new Industrial User Facility (IUF) may be paved with asphalt to accommodate the anticipated increase in traffic. An asphalt parking area covering approximately 0.16 hectare (0.4 acre) would be constructed adjacent to the IUF, with an additional concrete area of approximately 929 m^2 (10,000 ft^2) planned for storage of equipment and turbine and tower components.

Wind Turbine Operations and Testing. Current operating plans call for as many as 20 wind turbines to be in daily operation. These turbines could be operated for as many as 24 hours per day, and experiments may run from a few minutes to several days, depending on the design. Any combination

of planned capacity (ranging from zero to full) and tower height may be in operation at any one time. Turbine test activities would be supported by activities in the bay areas, shops, computer center, and offices of all NWTC buildings.

Ongoing installation, maintenance, and removal of wind turbines would be interspersed with experimental operations. These activities could include the use of winch trucks, high-lift vehicles, other equipment, and personnel to raise and lower towers, replace and maintain turbines, modify instrument tower configurations, and perform other maintenance, as required.

In addition to wind energy research, the NWTC site may also be used for small-scale tests in any renewable energy program area. Each of these programs and an evaluation of their potential environmental impacts are discussed in *Sitewide Environmental Assessment for the National Renewable Energy Laboratory* (NREL, 1993). The assessment of the other renewable energy technologies found that there were no significant impacts to the environment associated with these programs and a Finding of No Significant Impact was issued on June 19, 1993. Small-scale testing at NWTC would involve no significant environmental impacts, either individually or cumulatively, and thus would be excluded from NEPA documentation under DOE's NEPA implementing regulations (10 CFR § 1021.410 and Appendix B to Subpart D).

In support of existing wind program research, interior building modifications and infrastructure upgrades are currently under way at the site. These upgrades are consistent with prior use. Although these activities are excluded from this proposed action, they are included in the discussion of cumulative impacts for a complete picture of potential impacts of the NWTC expansion. A description of ongoing and future activities at the NWTC site is contained in Appendix B.

2.3 ALTERNATIVES TO PROPOSED ACTION

NREL did not identify any reasonable alternatives to the proposed action that would satisfy the purpose and need for agency action (Section 1.5). Further, no such alternatives were identified during the scoping process. For comparative purposes, and in accordance with applicable NEPA regulations, this assessment did examine the No Action alternative.

2.3.1 No Action Alternative

The No Action alternative would provide no additional upgrades or improvements to the NWTC site and would continue operations using current facilities. Each of the consequences identified in Section 2.3.2 and Table 2-1 would also result from the No Action alternative.

2.3.2 Alternatives Not Considered in Detail

The following alternatives to the proposed action were considered, but eliminated from analysis since they do not support the purpose and need for agency action (Section 1.5).

2.3.2.1 Alternate Site

In addition to the current NWTC site, another site was considered during the initial establishment of the wind research center in 1976. The other site was also located on property owned by the federal government and was within the boundary of the Rocky Flats Environmental Technology Site (RFETS)

buffer zone. The alternate site was situated west of RFETS against the western fence, adjacent to the Denver and Rio Grande railroad right-of-way. However, the NWTC site was chosen for the following reasons:

- There was no potential interference from clay-mining operations
- The site was favorably located relative to the Eldorado Canyon "wind tunnel"
- Greater land area was available for future expansion of the test facility
- There would be no visitor traffic interference with normal plant traffic
- Visibility was considered fairly good from both Highway 93 and Highway 128.

A 1976 environmental assessment of the NWTC site found that "there are no alternative sites locally which provide this unique combination of advantages" (Ecology Consultants, 1976).

Today, after almost 20 years of use as a wind test facility, this site is considered unique because:

> it offers two dominant and predictable wind regimes. These two different flows give the wind energy program the ability to test in westerly winds which are characteristic of the California wind farms, and in easterly winds characteristic of the great plains where most future development is expected to occur. During late fall and winter, high velocity winds sweep across the Continental Divide and funnel down through the canyons of the Front Range. These westerly winds, often reaching velocities greater than 100 miles per hour [444 m/second], allow the testing of wind turbines in the most severe and turbulent of environments. During late winter and spring, low pressure areas flow across the southern Great Plains, spawning thunderstorms and driving plains air from the south and east up against the front ranges and Continental Divide. Since these winds sweep unimpeded across the southern Great Plains, they are stable and provide a smooth flow from the easterly direction. These predicable wind flow regimes enable the site staff to depend on high velocity turbulent west winds for performance, loads and fatigue testing. The eastern flow generates controlled and repeatable conditions that are ideal for conducting certification testing. Despite these predictable wind patterns, winds are not persistent over long periods of time, and frequent periods of calm enable technicians to climb towers and work on man lifts. This is especially important in a turbine test environment, where turbines need to be accessed frequently to enable component reconfiguration and system calibrations. (NREL, 1994 [page 2]).

The continued use of the NWTC site at its existing location combines cost efficiency for the government and optimal meteorological conditions.

2.3.2.2 Different Scale of Operations

NREL also considered alternatives involving a smaller scale of operation. Each had adverse consequences related to NREL's ability to perform the research necessary to promote the advancement of wind energy technologies. The alternatives and their consequences appear in Table 2-1.

Table 2-1
Alternative Actions and Related Consequences

ALTERNATIVE	CONSEQUENCES
1. Fewer test sites	1A. The number of industrial researchers able to work simultaneously would be artificially restricted. 1B. The time required to accomplish studies would be increased.
2. Smaller turbines requiring smaller test sites	2A. High-capacity units with greatest efficiency potential would be eliminated from study.
3. Fewer and/or shorter meteorological towers	3A. The data obtained would be incomplete or inaccurate. 3B. Possible data corruption could result from ground interference.
4. Restriction of operations to wind research only	4A. Allied data supporting wind efforts could be lost. 4B. Other research capabilities could be lost.

CHAPTER 3

EXISTING ENVIRONMENT

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CHAPTER 3.0 EXISTING ENVIRONMENT

This chapter provides a description of the existing environment on and near the NWTC. Facts and data provided in this chapter are used in Chapter 4.0 as the baseline for evaluating potential impacts. Chapter 3.0 focuses on the natural and human environment that may be affected by expanding operations at the NWTC. As stated in 40 CFR §1508.14, the potentially affected human environment is interpreted comprehensively to include both the natural and physical environment and the relationship of people with that environment. The approach to defining the environmental baseline was to first identify potential issues and concerns of the proposed action and No Action alternative. Baseline information presented in this chapter reflects printed source materials, technical reports, scientific studies, and conversations with experts on a variety of subjects.

As discussed in Section 2.1, the NWTC site is located in northern Jefferson County, Colorado, approximately 25 km (16 mi) northwest of Denver (see Figures 2-1 and 2-2). The site is located within the buffer zone for the RFETS, a U.S. government-owned, contractor-operated facility.

3.1 GEOPHYSICAL ENVIRONMENT

The geophysical environment includes air quality, geology, soils, and water resources.

3.1.1 Air Quality

Air quality at a given location is described in terms of the concentrations of various pollutants in the atmosphere. The quality of air is determined by the type and amount of pollutants emitted into the atmosphere, the size and topography of an air basin, and climatological and meteorological conditions.

3.1.1.1 Climate and Meteorology

Climatological conditions are the primary factors that influence air quality in an area. Precipitation, wind direction and speed, temperature, and atmospheric stability are factors that determine the extent of pollutant accumulation or dispersion.

The climate at NWTC is semiarid and is characterized by moderate precipitation, low relative humidity, and large daily and seasonal temperature variations. The site is located at approximately 1800 m (6000 ft) of elevation in dry atmosphere characterized by an average annual humidity of 42%.

Temperatures are generally moderate but sometimes have extreme daily variations. High temperatures in spring (March through May) range from the high teens to the low 20s °C (55-65 °F). Daily lows are normally below zero °C (32 °F). Summer has high daily temperatures in the low 30s °C (80s to low 90s °F), and low temperatures are generally in the teens °C (50s to 60s °F). Autumn consists of warm days with highs in the 20s °C, (low 70s °F) and cool nights. Winter high temperatures average near 8 °C (mid 40s °F), but can reach into the 20s °C (high 60s to low 80s °F). Daily low temperatures average near -6 °C (low 20s °F), but can drop to as low as -32 °C (-26 °F). Annual temperature extremes are 74 °C (102 °F) for the high and -32 °C (-26 °F) for the low.

The area experiences moderate precipitation. The average annual rainfall is less than 50 centimeters (cm) (19.6 inches [in]). About half of the precipitation falls from March to June in the form of rain showers. Precipitation during autumn decreases from the summer maximum and continues to

decrease during the winter months (December through February). Winter precipitation is generally in the form of snowfall. The area can experience at least one significant snowstorm per year, with amounts exceeding 20 cm (7.8 in). Severe thunderstorms occur during the summer which, combined with drought conditions, can lead to prairie fires.

Wind in the area is from the south-west through south-southwest.over 53% of the time. Average wind speeds are near 4.0 meters/second (m/sec) (9 miles/hour [mph]). Approximately 35% of the wind speeds range from 2.5 to 4 m/sec (5.6 to 9 mph). Winds exceed 4 m/sec 34% of the time. An additional 30% of the time wind speeds are from 1.0 to 2.4 m/sec (2.2 to 5.5 mph). Winds are calm (less than 1 m/sec) approximately 1% of the time.. Strong, gusty winds occur occasionally, usually in spring or autumn, and can reach speeds in excess of 44 m/sec (100 mph). While tornados are unlikely, they are theoretically possible.

3.1.1.2 Air Quality Standards

The National Ambient Air Quality Standards define pollutant concentrations that may not be exceeded in a given time period to protect human health (primary standard) and welfare (secondary standard) with a reasonable margin of safety. These standards include maximum concentrations of criteria pollutants. Criteria pollutants are ozone (O_3), carbon monoxide (CO), nitrogen oxides (NO_x), sulfur oxides (SO_x), lead (Pb), and particulate matter with a diameter of 10 microns or less (PM_{10}). All of the criteria pollutants, with the exception of ozone, are primary pollutants released during industrial operations.

Sources of emissions from the NWTC include blowing dust from exposed or disturbed soils; minor construction associated with placing or modifying tower locations and power, data, and telecommunications cabling modifications; use of heavy- and high-lift equipment associated with the replacement and maintenance of experimental systems; and personal and site vehicular traffic.

Fugitive, or uncontrollable, dust occurs when wind of sufficient speed picks up and carries small dirt particles. Construction and other digging and earth moving activities contribute to fugitive dust problems. The 113-hectare (280 acre) site contains areas of disturbed land where approximately 10 km (6 mi) of cabling is buried, approximately 6.5 km (4 mi) of gravel roads exist, and some small disturbed areas resulting from pad construction (past and current) exist. The extent of these disturbed areas is very small in comparison to the total site area.

3.1.2 Geology and Soils

Geological resources include the physical surface and subsurface features of the earth such as topography, geology, seismicity, and soils.

3.1.2.1 Physiography and Topography

The NWTC is located at approximately 1800 m (6000 ft) above mean sea level in the Colorado Piedmont section of the Great Plains Physiographic Province. To the east is the High Plains section of the Great Plains Province and to the west is the Front Range section of the Southern Rocky Mountain Province. The piedmont is underlain by gently dipping sedimentary rocks (Paleozoic to Cenozoic in age), which are folded upward to near vertical orientation parallel to the mountain front (DOE, 1980).

3.1.2.2 Seismicity

The NWTC is located in the Denver Basin of the Great Plains Tectonic Province. The Front Range Uplift, which is part of the Rocky Mountain Tectonic Province, is located immediately west of the site (DOE, 1980). The area surrounding NWTC contains faults, but there are no identified faults underlying the site.

Located approximately 7 km (4 mi) to the west of the NWTC are Precambrian-age faults in the northeast-trending Idaho Springs-Ralston Shear Zone. The Livingston fault is the closest northwest-trending faults located 4.8 km (3 mi) northwest of the site. This fault system is believed to be inactive. The Golden fault is the closest (several kilometers west) major fault to the NWTC. Evidence of movement within the last 2 million years has been documented and the fault is considered to be active. Northeast-trending faults in the Marshall-Superior-Louisville area have been mapped north of the NWTC. The steeply dipping faults have no surface expression and there is no evidence that the faults have been active in recent time. The northwest-trending Eggleston fault has been mapped north of NWTC, and is projected through the northeast corner of RFETS, approximately 1.6 km (1 mi) east of NWTC's northeast corner. The inferred fault trace has no surface expression and there is no evidence of movement since deposition of the shallowest rock unit, the Rocky Flats Alluvium. Movement occurred more than 150,000 years ago (Quaternary Period) along the Valmont fault, located 6 km (10 mi) north of NWTC. Investigations of lineaments and other possible faults in the area have not revealed appreciable displacement caused by faulting.

Historically, the area surrounding the NWTC has experienced minimal seismic activity. The greatest amount of activity occurred between 1962 and 1972 when 1800 earthquakes were experienced in the Commerce City area about 22.5 km (14 mi) southeast of the NWTC. These earthquakes were found to be associated with the deep injection of fluid from the Rocky Mountain Arsenal. The maximum seismic event attributed to the injection occurred in 1967 (a magnitude of 5.2 on the Richter Scale) after injection was discontinued (DOE, 1980). The seismic activity nearest to the site occurred in 1882, with the epicenter believed to be located approximately 22 km (13 mi) east of the NWTC.

3.1.2.3 Geology

The geology of the NWTC area has been documented extensively. The 1980 *Rocky Flats Plant Site Final Environmental Impact Statement* (DOE, 1980) details the entire Rocky Flats area, including the NWTC. The subsequent *Geologic Characterization of the Rocky Flats Plant* (EG&G, 1991a) clarifies points of concern from the 1980 document and provides additional technical detail. The NWTC is located on a mesa-like surface of alluvium. The topography in the immediate vicinity of the site is relatively flat, sloping 2% to the east-northeast. Erosion from the Rocky Mountains has resulted in poor- to moderately-sorted surficial deposits of Quaternary age, including the Rocky Flats Alluvium, which consists of poorly stratified clays, silts, sands, gravels, and cobbles. In the vicinity of the RFETS, the Rocky Flats Alluvium ranges in thickness from 0 to 29 m (0 to 98 ft) and overlies the bedrock formations. At the NWTC site, the alluvium/bedrock contact is at a depth of approximately 12 m (40 ft) (Woodward-Clyde, 1992).

The Arapahoe Formation (Cretaceous age) generally underlies the alluvium at the RFETS site, although this formation is absent at the NWTC site (Woodward-Clyde, 1992). The formation is composed of approximately 45 m (150 ft) of channel, point bar, and floodplain deposits of claystones, siltstones, sandstones, and occasional coal and ironstones. Minor landsliding has occurred along the

steep-sided bluffs of Rocky Flats Alluvium and has been attributed to hydration and lubrication of clay within the Arapahoe Formation (DOE, 1980). The slides are small in extent and are caused by stream erosion of bedrock at the margins of Rocky Flats Alluvial exposures.

The Laramie Formation generally underlies the Arapahoe Formation and consists of two units: a lower unit (approximately 75 m [250 ft] thick) of several sandstone layers and many coal seams; and an upper unit (approximately 165 m (550 ft) thick) composed of deltaic claystones, siltstones, some river sandstones, and an occasional clay layer. The Laramie Formation underlies the alluvium beneath the NWTC site and extends from approximately 12 to 282 m (40 to 940 ft) below the surface. Another Cretaceous formation (Fox Hills Sandstone Formation) underlies the Laramie Formation, and extends from 282 to 304 m (940 to 1015 ft) below the surface at the NWTC site. The Fox Hills Sandstone Formation is a deltaic sandstone approximately 22.5 m (75 ft) thick and is characterized as a sandstone containing thin beds of siltstone and claystone.

3.1.2.4 Minerals

Minerals recovered in the area of the NWTC site include coal, sand and gravel, clay, rock for concrete aggregate and riprap, and uranium. The only active operations are for sand and gravel (one operation is adjacent to the southern boundary of the site), and crushed stone and uranium (approximately 6.4 km [4 mi] from the site) (DOE, 1980). As discussed later in Section 3.4.5, the U.S. government owns only surface rights at the NWTC site. Mineral rights for coal, shale, oil, and natural gas are held by private entities for the western 65 hectares (160 acres). Mineral rights for aggregate are also held by private entities for the eastern 48.5 hectares (120 acres) of the site.

3.1.2.5 Soils

The U. S. Department of Agriculture's *Soil Survey of Golden Area, Colorado* (USDA, 1995) indicated that the soils in the NWTC area are derived from weathering of Quaternary alluvial deposits. The western part of RFETS, which includes the NWTC, has a strongly developed soil defined as a very cobbly, sandy loam. The soil is characterized by a large amount of cobble and gravel in the soil volume, and a subsoil from 33 to 119 cm (13 to 47 in) below the surface dominated by clay (USDA, 1995). The permeability rating of this soil is very low at only 0.15 to 0.51 cm (0.06 to 0.2 in) per hour.

A specially designated soil exists along the northern boundary of the NWTC (east half of the northwest quarter of Section 3). The Valmont clay loam is regarded as a "high potential dry cropland" (USDA, 1995). Irrigation of this soil could result in a rating change to prime farmland.

Sampling and analysis of NWTC site soils have been conducted. One study was initiated for the evaluation of a potential source of water contamination in the on-site well (Woodward-Clyde, 1992). Three borings were drilled to depths of 12.5 to 16 m (41 to 52 ft), with 16 samples taken. Each sample was analyzed for volatile organics; samples from the 0.15 to 0.61 m (0.5 to 2 ft) intervals were analyzed for semivolatiles and metals. Potential contaminants identified included cadmium (the only metal detected above maximum background values), xylene, trichloroethene, methylene chloride, methyl ethyl ketone, acetone, and bis(2-ethylhexyl)phthalate. The cadmium was believed to be associated with cadmium plating on the threads of the sampling unit. Possible explanations for some of the other contaminants included the presence of xylene from adhesive in electrical tape, and the fact that methyl ethyl ketone, methylene chloride, acetone, and bis(2-ethylhexyl)phthalate are common

laboratory contaminants (the latter three were found in this study's laboratory blanks). The suspected laboratory contamination makes the findings of this study inconclusive.

A study was also conducted to characterize the top foot of surface soils at the NWTC site (GTG-Fox, 1994). A 97-hectare (240-acre) area of the site was sectioned into blocks, and sampling locations were selected according to a primary grid system marking approximate 152 m (500 ft) centers. A total of 130 samples, including composite, grab, and split/duplicate samples, were gathered and analyzed for gross alpha and beta radiation; semivolatile organic compounds; benzene, ethylbenzene, toluene, total xylenes (BTEX); oil and grease; and total extractable hydrocarbons (TEH). Approximately 85% (111 of 130) of the samples showed no detectable levels of contamination. The radiation analyses were equivalent to, or below, background levels established in other studies.

Phthalate esters and polynuclear aromatic hydrocarbons were found above instrument detection levels. Both of these compounds occurred near building sites and paved areas and were attributed to degradation of plastics and asphalt, respectively. The TEH detections included sterols that were attributed to degradation of plant matter. One sample was determined to contain oil and grease, but the concentration was only slightly above the detection limit.

The study concluded that the detected compounds were from normal on-site activities, naturally occurring, or of relatively low toxicity and limited extent. No detected compounds exceeded regulatory action levels.

3.1.3 Water Resources

Water resources include surface and groundwater sources, drainage conditions, and subsurface movements. The hydrologic cycle results in the transport of water into various media, such as air, ground surface, and subsurface. Natural and human-induced factors determine the quality and quantity of water resources. The discussion on water resources is subdivided into sections on surface water, groundwater, and water quality.

3.1.3.1 Surface Water

The area surrounding the NWTC site is drained by four ephemeral streams: Rock Creek, North Walnut Creek, South Walnut Creek, and Woman Creek. Rock Creek flows eastward and is located southeast of the NWTC site. Lindsey Pond is along Rock Creek and lies approximately 300 m (1000 ft) east of NWTC at its closest point. North Walnut Creek and South Walnut Creek flow eastward into the Great Western Reservoir, while Woman Creek drains the southern portion of the RFETS site and flows eastward into Standley Lake; both the reservoir and lake serve as municipal water supplies (DOE, 1980). Off-site ditches convey water throughout the area to various reservoirs and lakes. The closest of these is Church Ditch, approximately 3636 m (12,000 ft) southeast of Rock Creek. Section 3.1.1 discussed the precipitation regime in this area. Given the area's low levels of precipitation and high rate of evapotranspiration, there is no significant permanent surface water on the NWTC site. The rate of water erosion and the transport of soil and rock generally is low; during high flow periods a maximum suspended-sediment load is estimated to be about 68 to 91 metric tons (75 to 100 tons) per day (DOE, 1980).

3.1.3.2 Groundwater

The uppermost geologic unit, the Rocky Flats Alluvium, is primarily recharged by precipitation, snowmelt, and water loss from ditches, streams, and ponds located on the alluvium. Groundwater flow within the Rocky Flats Alluvium aquifer is generally from west to east and is controlled by channels and the character of the underlying bedrock (sloping 2 degrees to the east) (Woodward-Clyde, 1992). The infiltration rate is on the order of several centimeters per hour (DOE, 1980) and the hydraulic conductivity is estimated to be about 48 m (160 ft) per year (EG&G, 1994).

Groundwater levels fluctuate with the seasons, with the highest levels in the spring and early summer. A 1983 U.S. Geological Survey map of the depth to water table for eastern Colorado shows this area with a water table depth in unconsolidated alluvium ranging from 1.5 to 6 m (5 to 20 ft). In October and November of 1991, the water table was measured at three monitoring wells at approximately 9 m (30 ft) below ground surface (Woodward-Clyde, 1992). The alluvium contains stringers of clay that can cause perched water tables of limited extent in some areas; temporary ponding can be observed in these areas during spring. At one such site the soil was moist at approximately 4.5 m (15 ft), but the underlying clay-like sand was dry. Groundwater in valley-fill alluvium downgradient of the NWTC site is recharged in part by seeps and springs discharging from the Rocky Flats Alluvium.

The Arapahoe Formation aquifer located directly south of NWTC is recharged by leakage from the Rocky Flats Alluvium and infiltration from streams. The aquifer generally flows from west to east with a hydraulic conductivity of approximately 0.09 to 0.12 m (0.3 to 0.4 ft) per day (DOE, 1980). Groundwater levels rise during spring and early summer and decline for the remainder of the year.

The lower sandstone unit of the Laramie Formation and the upper unit of the Fox Hills Sandstone comprise the Laramie-Fox Hills aquifer. In the western portion of the Denver Basin, these formations are steeply dipping and outcrop west of the NWTC site. Recharge occurs primarily along the exposed bedrock and leakage from adjacent alluvium (DOE, 1980). The groundwater flow is to the east or southeast below the NWTC. The clay layers on the upper portion of the Laramie Formation limit flow between the Laramie-Fox Hills aquifer and the overlying Arapahoe Formation aquifer; both aquifers are confined in the area of the NWTC site.

A 366-m (1200-ft) deep well for potable water was drilled at the NWTC site in 1976 and completed in the Laramie-Fox Hills aquifer. The static water level (potentiometric surface) fluctuates. It has been measured at 37 m (123 ft) (Hamilton Engineering, 1993), and at another time was noted to be less than 30 m (100 ft) (Rust, 1993).

3.1.3.3 Water Quality

Water quality in the area of the NWTC is influenced by natural conditions, as well as minor levels of contamination that may have seeped into the groundwater. Well water quality at NWTC has been the subject of several studies, but data have been inconclusive. Water suitable for drinking exists in numerous reservoirs and lakes surrounding the NWTC site.

Complaints of water quality from the potable well installed on-site led to various studies and treatments. Sampling of well water conducted in 1989 determined detections of benzene, toluene, 1,2,4-trimethylbenzene, xylene, and trihalomethanes; only chloroform (a trihalomethane) exceeded a maximum contaminant level (MCL), however, possible laboratory contamination has rendered the

analytic data suspect (Woodward-Clyde, 1992). Sampling of well water for total coliforms, turbidity, metals, organic chemicals, radiological parameters, corrosivity, temperature, and conductivity was performed in 1993. The concentrations of regulated compounds in water at the tap had decreased since 1989. The only state or federal primary drinking water standards that were exceeded were for turbidity and trihalomethanes in the treatment and delivery system; samples at the tap revealed no substances above regulated levels (Rust, 1993). Trihalomethanes are often by-products of the water chlorination process. Iron levels (0.83 milligrams/liter) exceeded the MCL defined by the State of Colorado for visual clarity and the secondary federal MCL (both at 0.3 milligrams/liter). Secondary drinking water standards set contaminant levels at which aesthetic quality such, as color and smell of water, are affected.

A study conducted in 1993 evaluated several alternatives for supplying water to the NWTC. These included rehabilitating the existing well, drilling a new well, hauling water, or installing a water pipeline from RFETS (Hamilton Engineering, 1993). As a result of this and other assessments, the NWTC site is currently using water supplied via tank truck and stored in water tanks.

Shallow groundwater beneath the NWTC site has been sampled and analyzed to determine possible sources of potable well contamination. Section 3.1.2.5 discussed the installation of three monitoring wells. The study concluded that some of the elevated metal analyses were attributable to natural conditions or were introduced during well installation, and some were attributable to the use of metal-containing cleaning solvents (Woodward-Clyde, 1992). The organic contaminants could have resulted from solvent disposal or leaks. Suspected laboratory contamination make analytic data from this study inconclusive.

Sewage generated by Building 251 is treated in a septic system with a 465 m^2 (5000 ft^2) leach field. Consequently, it is possible that negligible levels of contaminants could infiltrate groundwater through the leach field. The field is designed to adequately treat sewage and preclude contamination of groundwater.

3.2 BIOLOGICAL ENVIRONMENT

Biological resources include the native and introduced plants and animals and the aquatic habitat found on and near the NWTC. The NWTC site is located between 1830 and 1860 m (6000 and 6100 ft) of elevation, with only a 30 m (100 ft) elevation gain from the east to the west. The NWTC site occupies the elevation where plains grassland vegetation meets lower montane forest. The predominantly prairie grassland site is characterized by cobble-covered, dry land pasture that was extensively overgrazed until 1975. The northwest corner of the NWTC site houses an isolated island of Ponderosa pine woodland, common in nearby montane uplands, but found only as small isolated islands in the prairie ecosystem.

A complete list of the plant and animal species identified in the xeric (adapted to a dry environment) mixed grassland and Ponderosa pine woodland communities of the NWTC and adjacent areas appears in Appendix D. Appendix D presents the results of DOE's *Baseline Biological Characterization of the Terrestrial and Aquatic Habitats at the Rocky Flats Plant* (DOE, 1992). The survey area included the NWTC. This list represents species identified in habitats similar to those found at the NWTC site. Not all of the species listed in Appendix D have been sighted at NWTC.

3.2.1 Animals

The extensive coverage of the dry zone by grasses and other plants provides good grazing for large herbivores, and supplies an adequate seed crop for birds and small mammals. The area remains largely snow-free during the winter. A biological characterization inventory of the entire RFETS, including NWTC, was conducted by DOE in 1992 (DOE, 1992). In addition, raptor (bird of prey) surveys were conducted in 1994 - 1995 (Monahan, 1994a, 1994b, 1995).

Mammals. The small mammal population includes deer mice, prairie voles, and thirteen-lined ground squirrels. Medium-sized mammals include desert cottontail rabbits and white-tailed and black-tailed jackrabbits (Monahan, 1994a, 1994b, 1995).

The Mexican woodrat has been identified in denning areas near rock outcrops. Bark stripped from pine trees indicates that porcupines occasionally inhabit the area (DOE, 1992).

Rodent infestations in NWTC data sheds and work areas have caused significant damage, resulting in costly equipment replacement, cable damage, and research downtime. Efforts to control the population are being balanced with efforts to preserve potential habitat native species, including the Preble's Meadow Jumping Mouse, which is a candidate for being Federally listed as an endangered species. The Preble's Meadow Jumping Mouse has not been observed on NWTC property, but has been sighted nearby on the RFETS.

The area provides an important winter feeding ground for mule deer. Coyotes are the most commonly observed carnivores, although NWTC personnel have identified bear signs and mountain lion tracks.

Reptiles. The most frequently observed reptiles in the xeric mixed grassland community are prairie rattlesnakes and short-horned lizards. Racers, bull snakes, and plains garter snakes have also been recorded (DOE, 1992). Although no amphibians were observed on the RFETS during the 1992 inventory and the lack of year-round surface water at the NWTC site precludes the presence of fish, NREL and DOE staff members have observed turtles, frogs and a salamander on the NWTC site in the areas of seeps and intermittent springs.

Birds. Waterfowl observed during recent inventories were limited to species flying over the site, and included mallards and Canada geese. Great blue herons have also been seen over the site. None of these species have been observed actively using the NWTC site as habitat.

The Ponderosa pine woodland community on NWTC's northwest ridge line represents foothills conditions, and supports wildlife not otherwise found in prairie ecosystems. DOE's 1992 baseline survey identified green-tailed towhees, song sparrows, American robins, and dark-eyed juncos in the pines. Junco nesting sites were observed, as were habitats for towhees and song sparrows (DOE, 1992).

On the RFETS site, red-tailed hawks are the most abundant raptor species, although the 1992 inventory also identified turkey vultures, Cooper's hawks, Swainson's hawks, rough-legged hawks, ferruginous hawks, golden eagles, northern harriers, peregrine falcons, prairie falcons, American kestrels, and great horned owls.

Raptor surveys conducted at NWTC in 1994 and 1995 identified rough-legged hawks, prairie falcons, redtailed hawks, American kestrels, golden eagles, great-horned owls, and turkey vultures on or flying above the site (Monahan, 1994a, 1994b, 1995). The raptor population is supported by racer and bull snakes and small mammals.

3.2.2 Plants

The NWTC site is part of the Rock Creek watershed and is primarily dry mixed grassland. The soils, which were formed from Rocky Flats Alluvium, are gravelly to rocky, slightly acidic, and have a low water availability for plants. The 91 or more species of plants growing in this habitat are tolerant of mild acidity and require little water. Plants receive full sun for many hours a day and are subject to the drying effect of wind (DOE, 1992).

A 1980 study of the Rocky Flats area mapped the prairie grassland vegetation, including the NWTC site (Clark, 1980). The NWTC is predominantly characterized by dry pasture vegetation of several varieties. Small occurrences of moist, low scrub and moist meadow appear in the northwest corner and around the drainage near the eastern boundary. The 1980 study identifies two wet areas, one of which corresponds with the drainage mentioned by the U.S. Army Corps of Engineers correspondence in Appendix A.

The NWTC site was once damaged by overgrazing. However, many of the native prairie plants have resurged since grazing was stopped in 1975. Overgrazing encouraged the establishment of numerous cacti and other opportunistic species. The zone is typified by a mixture of perennial grasses and forbs, subshrubs, and cacti. The most frequently observed species are narrow-leaf sedge, blue grama, big bluestem and little bluestem. Mountain muhley and Kentucky bluegrass are also common. Several sage subshrubs, Porter's aster, and trailing fleabane are the most common forbs. The xeric mixed grassland community contains approximately 21 graminoid (grass) species (23%), 65 forbs (72%), 4 cacti (4%) and 1 shrub (1%) (DOE, 1992). Live plants make up an average of 33% of the ground cover; litter covers approximately 55%, and the remaining 12% is bare ground or rock (DOE, 1992).

The NWTC site's northwest elevated ridgeline houses one of the few Ponderosa pine woodlands found in the Rocky Flats area. DOE's 1992 baseline survey identified junegrass, blue grama, and Canada bluegrass in the area. Forbs included pussytoes, spring beauty, and Porter's aster. Skunkbush sumac and wax currant shrubs were interspersed with the trees (DOE, 1992).

3.2.3 Wetlands

Four wet areas have been identified at the NWTC site. Figure 3-1 illustrates the locations of the two largest of the wet areas.

One area is located in the northeast quarter of the site which contains the headwaters of an unnamed northern tributary to Rock Creek. The tributary waters begin at a seep that surfaces in a linear drainage area. The site contains wetland vegetation, moist soils, and wetland hydrology. The wetland area was identified in a 1980 survey (Clark, 1980) and again in a 1990 wetland survey (ASI, 1990). This wetland area is also the subject of correspondence from the U.S. Army Corps of Engineers (included in Appendix A), which contains a map illustrating the location of the site.

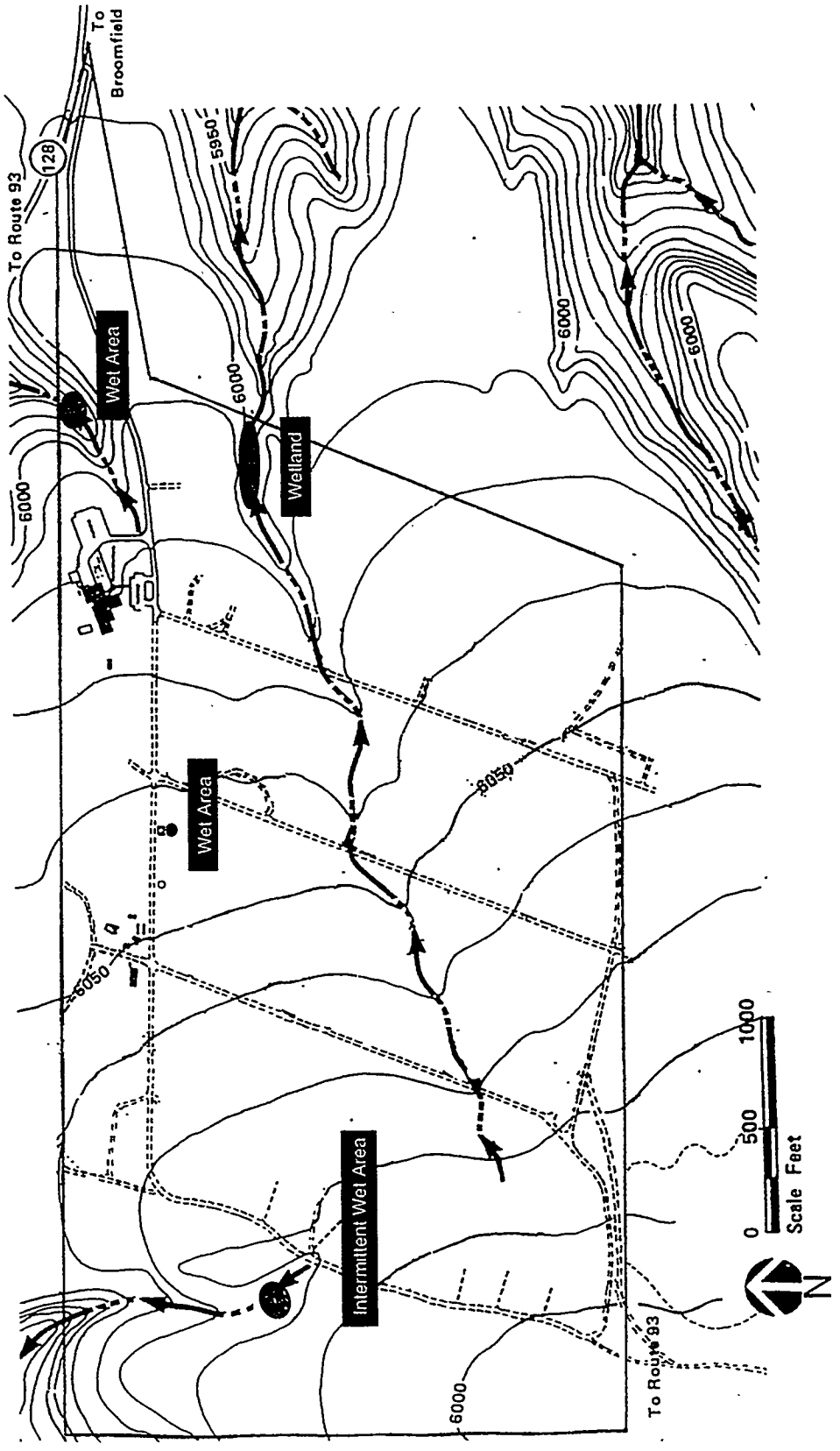

Figure 3-1. NWTC Wetland and Wet Area Locations

Two other areas on the site exhibit one or more characteristics of a wetland environment. The largest of these sites occurs east of Building 251's parking area and extends beyond NWTC onto Boulder City Open Space. The other site is a very small area that has been artificially created by seepage from the water well and pump house just south of the north access road between turbine rows 2 and 3.

A wet area appeared in the spring of 1995 on the west side of the property southwest of the ridgeline. This area has not been identified as a wetland, and the standing water has since evaporated.

Species potentially found in the wetland areas are identified in DOE's *Baseline Biological Characterization Study* (DOE, 1992) (see Sections 3.2.1 and 3.2.2). Prior to beginning any construction work involving the wetland areas, including the entire drainage delineated by the U.S. Army Corps of Engineers, NREL will contact the appropriate regulatory agencies.

3.2.4 Threatened/Endangered/Listed Species

Species of concern are rare plant and animal species that have been listed as endangered or threatened, or are candidates for listing under provisions of the federal Endangered Species Act (1973, as amended), or are designated in the Colorado list of State Species of Special Concern. Federal and state regulations protect both the population and critical habitats of these species. The species that are present on the RFETS just south of NWTC, or have potential habitats in the area, are listed in Appendix D. To date, none of the endangered species have been located at NWTC.

Sightings of each of these threatened or endangered species within the boundaries of the RFETS are discussed in detail in the *Baseline Biological Characterization of the Terrestrial and Aquatic Habitats at The Rocky Flats Plant: Final Report* (DOE, 1992). A 1993 Endangered Species survey of the RFETS failed to find evidence of Ute's Ladies Tresses or the Colorado Butterfly plant within DOE's boundaries (EG&G, 1994). The Preble's Meadow Jumping Mouse was located in riparian zones of Rock Creek east of NWTC. Also in 1993, a pair of bald eagles built a nest southeast of the NWTC site near Standley Lake.

Although peregrine falcons have not been observed at NWTC, at least one, and possibly two, historic nesting sites occur within a 16 km (10 mi) radius of the site. The Peregrine Falcon Recovery Plan calls for the direct protection of peregrines and their habitat. One task within the plan discourages land-use practices and development which may adversely alter the character of the hunting habitat or prey base within 16 km (10 mi) of the nesting cliff, including historical nest sites (ASI, 1991b). One nest site lies 8 km (5 mi) southwest of the RFETS, and the other is 11 km (7 mi) northwest of RFETS.

3.2.5 Weed Control and Abatement

The disturbed nature of large portions of the NWTC site has resulted in ideal habitat for several communities of non-native, invasive plant species. The State of Colorado Weed Management Act and the Jefferson County Undesirable Plant Management Plan list undesirable non-native plants identified as target species. The State species are Leafy spurge, Diffuse knapweed, Russian knapweed, and Spotted knapweed. The Jefferson County species are Canada thistle, Musk thistle, and Purple loosestrife. Of the seven species listed, four are known to occur at the NWTC site (Trenkle, 1995). The four listed species identified on the NWTC site are: Leafy spurge, Diffuse knapweed, Canada thistle and Musk thistle. NREL treats all Colorado and Jefferson County listed species as target species.

NREL also has a secondary target species list that includes Dalmation toadflax, Yellow toadflax, and Alyssum. These species are known to occur at the NWTC site and have been identified by state and county authorities as species "of concern," but not yet formally listed.

3.3 HUMAN ENVIRONMENT

The human environment includes those resources related to human settlement and activity.

3.3.1 Cultural and Historic Resources

Historic and archeological resources are limited, irreplaceable resources whose value may be easily diminished by physical disturbances. Cultural resources include those items, places, or events considered important to a culture, community, tradition, religion, or science.

Cultural resources are generally recognized in four categories: paleontologic, prehistoric, Native American, and historic resources. Paleontological resources are the physical remains, impressions, or traces of plants or animals from a former geological age. Prehistoric resources are physical properties resulting from human activities predating written records. Native American resources are sites, areas, and materials of religious or historical importance to Native Americans. Historic resources consist of physical sites and artifacts that postdate written records and include architectural structures and archeological features such as foundations and trash pits.

Three separate cultural resource investigations have surveyed all or parts of the NWTC site for archeological or historical sites of cultural significance.

In 1989, a limited sample (Class II) survey examined 720 hectares (1780 acres) of RFETS, including selected portions of the buffer zone (Burney, 1989). This survey included the northern portions of the RFETS, including about 295 hectares (120 acres) of the NWTC site, or approximately 40 percent of the NWTC property. The survey encompassed the eastern quarter of the NWTC site and a few acres of the northwest corner.

A comprehensive (Class III) survey was conducted two years later in 1991 that covered the entire RFETS, including previously unsurveyed and undisturbed areas of the NWTC site (Dames & Moore, 1991). The survey encompassed about 68 hectares (170 acres). In 1995, a third survey (limited range Class II) covered approximately 35 hectares (85 acres), including the undisturbed extreme eastern portion of the NWTC site and western areas of higher potential prehistoric sensitivity (Labat, 1995).

Paleontological Resources. No paleontological features or finds have been identified on or near the NWTC site.

Prehistoric and Native American Resources. The three cultural resource surveys of the NWTC site revealed no archeological sites or Native American resources in spite of documented use of the area by Woodland, Upper Republican, and Plains Village groups.

Prehistoric sites have been identified on the properties surrounding the NWTC. East of the NWTC fenceline lies a site consisting of seven stone circles (Jennings, 1976). Sites located north and south of the NWTC property have also produced evidence of late prehistoric occupation. To the north of NWTC, open architectural stone circles have been identified. The same area housed an open camp

containing manos (grinding stones), flakes (stone chips from arrow points), metates (grinding surfaces), and a stone knife (SHPO, 1994). South of NWTC lies a site consisting of eight low, circular rock piles or rings on top of an earthen mound, which was recorded in 1975 (Stuckey, 1975).

The 1995 survey was specifically designed to examine locations of high archeological potential. A potentially sensitive zone exists in the northwestern portion of the NWTC property, where a ridge top houses a stand of Ponderosa pine along a low outcrop of sandstone. The area offers environmental conditions which are significant to the prehistoric site selection process, but visual examination of surface areas revealed no signs of habitation.

Historic Resources. The site's history is typical of the "American West." It is characterized by sporadic visits from prehistoric nomadic hunters and gatherers between 5500 BC and 3000 BC, followed by Native American occupation from AD 1150 to 1800. Euroamerican occupation dates from early Spanish explorations in 1719. Subsequent visitors and occupants of the NWTC area were involved in four activities:

- Exploration and Fur Trade 1719-1858
- Ranching and Agricultural Settlement 1859-Present
- Trails and Transportation 1859-Present
- Mining and Quarrying 1859-Present

The three cultural resource surveys of the NWTC site identified five historical sites or finds. Three more finds were located just outside the eastern NWTC boundary.

The 1991 survey led to the identification of four of the five finds within the NWTC boundaries (two previously unrecorded sites and two isolated finds) and three additional sites adjacent to the eastern fenceline. Identified within the NWTC boundaries were:

- The site of a probable corral
- The remains of a spring house
- The site of a historic foundation
- Two sections of barbed wire with patent dates of 1883 and 1893.

The three finds identified outside of the NWTC boundaries were located east of the fenceline and include two stock ponds and glass fragments.

The 1995 survey resulted in the identification of a previously unrecorded concrete foundation. The function of the foundation is unclear, but appears to be unrelated to other NWTC historical finds.

Each of these finds is consistent with homesteads and domestic activities, water management and ranching during the late 19th and early 20th centuries. None of the sites or finds is considered historically significant, and none is recommended for the *National Register of Historic Places*. The lack of historical features is consistent with the rocky, arid nature of the site.

The 1994 *National Register of Historic Places* lists no sites within the boundaries of the NWTC. A search of the Colorado Office of Archaeology and Historic Preservation database in November, 1994 revealed no additional field eligible or officially eligible cultural sites within NWTC boundaries.

NWTC cultural resource surveys done in 1989, 1991, and 1995 also failed to reveal historically significant sites or finds (SHPO, 1994).

3.3.2 Socioeconomic Resources

Socioeconomic resources are part of the human environment and refer to the economic, demographic, and social characteristics of communities. These resources are generally described using employment, income, and demographic measures, which, in turn, are the key factors influencing housing demand, education, and other community services, land use, and utilities.

Housing, education, and other community services are generally not affected unless the population or income of an area changes significantly. Such changes are not expected to occur as a result of the proposed or alternative actions. For this reason, these resource areas are not discussed in detail in this assessment.

The unit of analysis for this assessment is the Region Of Influence (ROI), which is defined as the area within which most of the potential impacts to this resource are expected to occur. NWTC is located in Jefferson County, Colorado and most current NWTC employees live within that county. Therefore, Jefferson County is defined as the ROI for this analysis.

Employment. Total 1992 employment in Jefferson County was approximately 239,300. The county experienced a 42% increase in employment between 1980 and 1990, compared to 22% for the Denver Primary Standard Metropolitan Statistical Area (PMSA) and 25% for the State of Colorado. Jefferson County's diversification index value of 0.74 reveals a healthy economic diversity.

Income. Incomes in Colorado and the Denver metropolitan area tend to be higher than the national average. Total personal income in Jefferson County was $10.4 billion in 1992, yielding a per capita income of approximately $22,900, almost the same as the per capita income for the Denver PMSA. The local per capita income is approximately 103% of the Colorado average, and 114% of the United States average (U.S. Bureau of Economic Analysis, 1995). Less than 6% of Jefferson County residents live below the poverty level.

Population. The population of Jefferson County in 1992 was approximately 455,600. The county's population increased by more than 17% during the 1980s, compared to an increase of approximately 13% for both the Denver PMSA and the State of Colorado, and of less than 10% for the U.S. as a whole. The average annual growth rate for Jefferson County during this period was 3.6%. Jefferson County's population is 95% caucasian. The largest ethnic minority group is listed in the 1990 census as "other." This group equals less than 3%. The county's African American population is 0.07%; 0.02% is Asian; and less than 0.01% is Native American.

Housing. Jefferson County experienced healthy growth in its housing stock between 1980 and 1990, with a 30% increase in the number of housing units. In 1990, approximately 7% of Jefferson County housing units were vacant. Housing units in the Denver PMSA, in comparison, grew by 24% during the same period, with a vacancy rate of approximately 10% in 1990 (U.S. Bureau of the Census, 1990).

Schools. The Jefferson County School District operates 83 elementary schools, 17 junior high schools, 14 high schools, and four district-wide schools. Total enrollment in the school district in

1991 was 79,325 students. Jefferson County population projections by age indicate an increase in elementary and junior high school enrollments between 1990 and 2000.

3.4 LAND USE AND ZONING

As described in Section 2.1, the NWTC is located near the intersection of Colorado State Highways 93 and 128. The only access to the site is from Colorado Highway 128 about 2.5 km (1.5 mi) east of the junction of Highways 93 and 128. NWTC's 113 hectares (280 acres) lie in Jefferson County's North and Central Plains Subarea.

The area surrounding the NWTC site is predominantly rural and characterized by undeveloped property. Open space to the east and south of the site is part of the RFETS buffer zone. Formal open space managed by the City of Boulder lies to the north of the NWTC site. It is used predominantly for recreation, although at least one grazing lease has been negotiated.

Residential development is sparse. The *Jefferson County North Plains Community Plan of 1990* cites constraints on residential development, including RFETS and the Jefferson County Airport (Jefferson County Planning Department, 1990).

3.4.1 Urban and Other Populated Areas

The closest residence to the NWTC site is a farm complex with a residence and agricultural buildings located on Highway 93 about 2.8 m (1.7 mi) south of the junction of Highways 93 and 128. The nearest residential community is the town of Superior, which recently extended its boundaries to within 2 km (1.2 mi) of the NWTC access road. Superior's Rock Creek Development, north of Highway 128 on McCaslin Boulevard about 4 km (2.5 mi) from the NWTC access road, represents the nearest high-density community. Other nearby communities are illustrated in Figure 3-2 and listed in Table 3-1.

3.4.2 Transportation and Traffic

Transportation resources are defined as the infrastructure and equipment used for the movement of people and materials. Transportation resources include the road network, traffic conditions, and access.

The NWTC site is roughly bounded on the west by Colorado State Highway 93 and on the north by Colorado State Highway 128. The only access to the site is from Colorado Highway 128 about 2.5 km (1.5 mi) east of the junction of Highways 93 and 128. At the present time, the Western Aggregates gravel mining operation (adjacent to the NWTC site) is accessed directly from Highway 93.

3.4.3 Agricultural and Industrial Operations

The NWTC site is considered part of the site designated by the Jefferson County Zoning Department as the Rocky Flats Special Use Area. The "Special Use Area" designation is used to identify areas that do not fall within the established use patterns, such as residential, agricultural, or industrial uses. The Special Use Area in which NWTC is located includes RFETS. This Special Use Area is

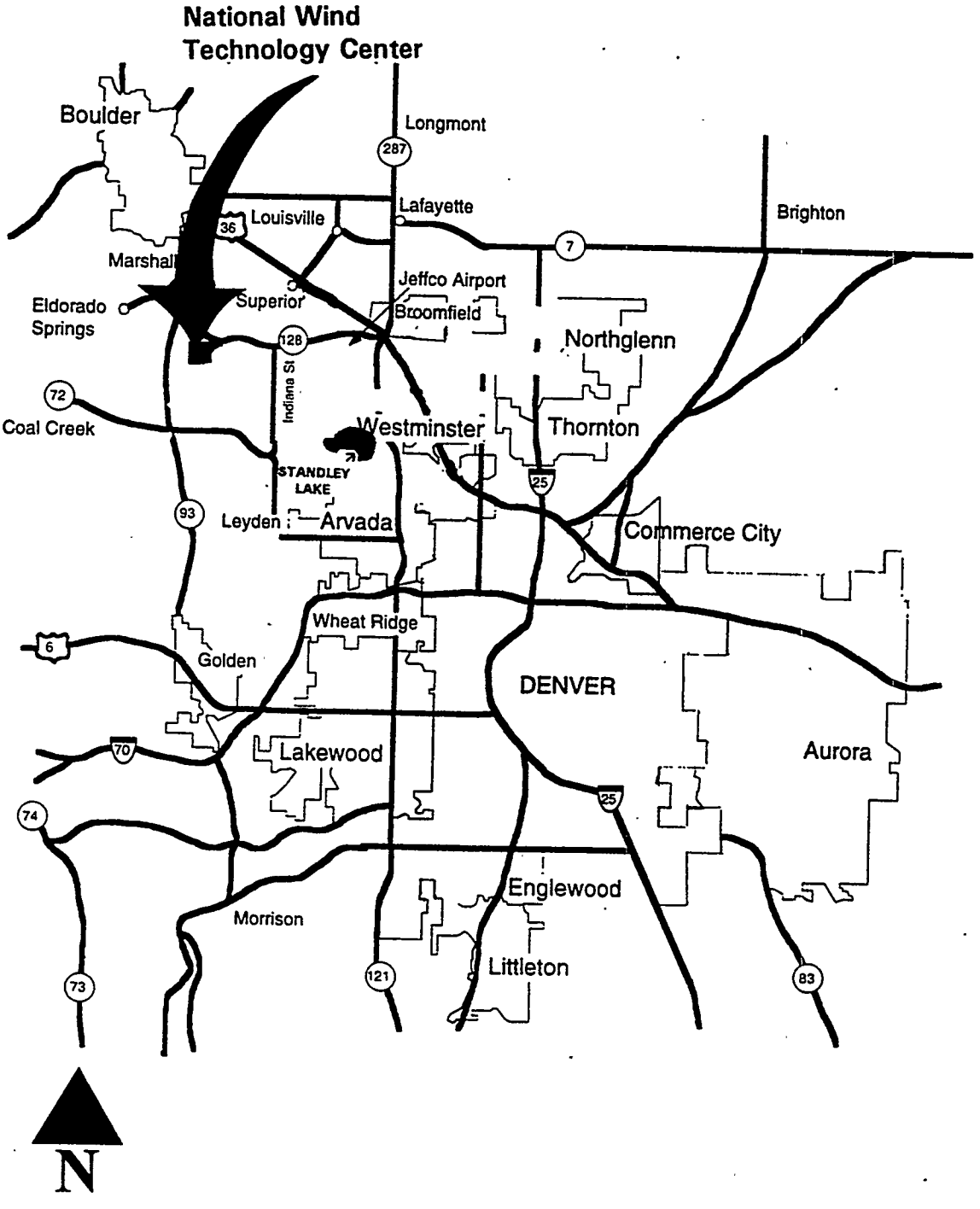

Figure 3-2. NWTC Site and Nearby Communities

Table 3-1
Residential Communities near NWTC

Community	Distance from NWTC	1994 Population
Boulder	6 km (3.6 mi)	89,600
Broomfield	11 km (6.6 mi)	24,638
Eldorado Springs	6 km (3.6 mi)	400
Golden	15 km (9 mi)	13,116
Lafayette	13 km (7.8 mi)	14,548
Leyden	8 km (4.8 mi)	70
Louisville	9 km (5.4 mi)	12,361
Marshall	5 km (3 mi)	NA[1]
Superior	2 km (1.2 mi)	255

[1] Community too small to be included in any available census data.

subdivided into several zoning designations, all of which predate the acquisition of the site by the U.S. government.

The NWTC site bears two zoning designations. In 1965, the western 65 hectares (160 acres) was zoned Industrial Two (I-2), a change from the original Agricultural Two (A-2) designation. The date of this zoning change corresponds with increased quarry activity in the areas near NWTC. The eastern third of the NWTC site has always been zoned A-2.

Property adjacent to NWTC boundaries is zoned for four different land uses: Agricultural (A, A-1, and A-2); Industrial (I-1 and I-2); Planned Development (P-D), and Mineral Conservation (M-C). Figure 3-3 illustrates the zoning designations of properties adjacent to NWTC, including the designations applied to portions of the Rocky Flats Special Use Area and the NWTC site.

Bordering NWTC to the north is Boulder City Open Space, which is zoned "A", or agricultural. Although recreation is the primary property use, leases have been negotiated for grazing and utilization of mineral rights. Portions of the site are currently used to graze cattle. One mineral lease resulted in the 1991 drilling of an oil and gas well on Section 33. The well site is roughly 1.6 km (1 mi) north of the NWTC boundary. Operation of the well is currently in suspension. Mineral rights to this property are held by Rocky Mountain Fuel Company, and are under lease to MartinEx, Incorporated.

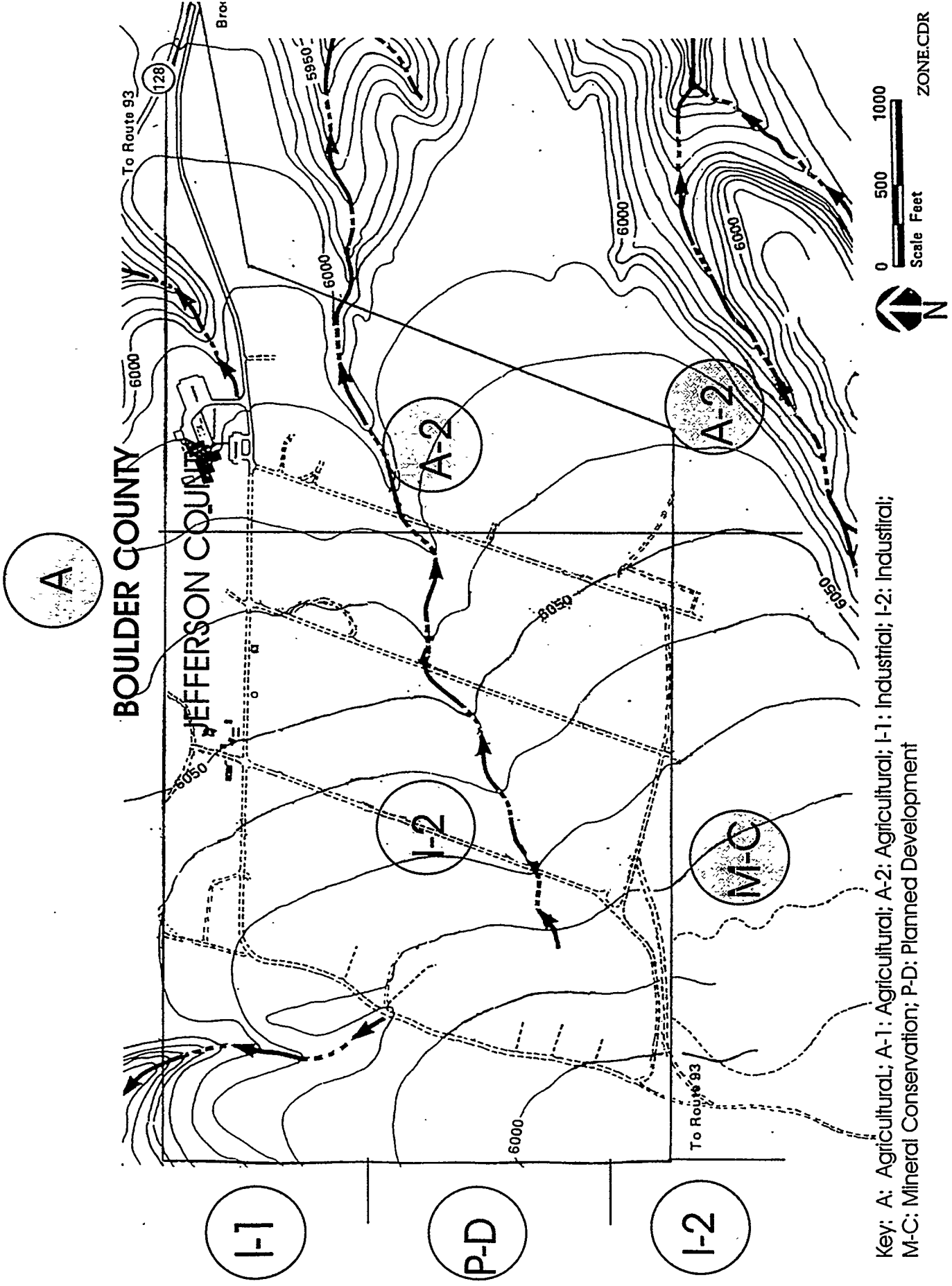

Figure 3-3. Zoning Designations Adjacent to the NWTC

To the east, NWTC borders RFETS, which is part of Jefferson County's Rocky Flats Special Use Area. The zoning designation for all adjacent eastern property is "A-2". This is also true of the eastern third of the southern boundary. Grazing in this area was halted in 1975 when the property was acquired by DOE. The land has been left as open space since that time. The RFETS is a government owned facility encompassing over 28.5 km^2 (11 mi^2), or 2806 hectares (6934 acres). The facility is engaged in the cleanup and closure of the site including the development and application of environmental restoration techniques.

NWTC's entire southern fenceline also adjoins RFETS. The eastern third of the southern boundary borders "A-2" property, while the western two thirds is adjacent to property zoned "M-C." Sand and gravel products are currently being extracted from the site and processed in adjacent facilities by Western Aggregates, Incorporated. A second, larger quarry site exists on the west side of Highway 93, directly west of the NWTC site.

The northwest third of the NWTC site's western boundary is bordered by property zoned "I-1." The property houses a small business facility. The northern portion of the same property has recently been used to graze a small herd of buffalo. The southwest two-thirds of the western fenceline abuts an area designed by the Jefferson County Zoning Commission as a "P-D" zone. The property is owned by Western Aggregates, Incorporated. The site is used to process aggregate materials, predominantly sand and gravel. This area has been approved by the Jefferson County Planning Board for light and medium industrial use.

Ten km (6.2 mi) due east of NWTC is the Jefferson County Airport. Operated under the authority of the Jefferson County government, the airport offers facilities for private aircraft. Scheduled passenger service is under consideration, but is not currently offered. Air traffic averages more than 400 flights per day, with equipment size not to exceed 30 seats. Runways are oriented northwest to southeast and southwest to northeast. Federal Aviation Administration Sectional Charts for the Denver area indicate that airspace above the NWTC site is recommended for flights above 1981 m (6500 ft). This is only a recommendation, and the Jefferson County Airport tower does not restrict use of the space or notify pilots when the 1981 m (6500 ft) limitation has been breached.

3.4.4 Protected Areas

Protected areas include any controlled property formally designated as national, state, or municipal space. For the purposes of this study, protected areas within 10 km (6.2 mi) of NWTC were identified, excluding areas within the City of Boulder.

The NWTC site shares a common boundary with property protected as formal open space by the City of Boulder. NWTC's northern property line, about 1.5 km (0.9 mi) in length, adjoins Boulder City Open Space. Boulder County manages open space adjacent to the eastern boundary of the Boulder City Open Space, but not adjacent to NWTC.

The nearest Jefferson County protected area lies 5.5 km (3.5 mi) southeast of the NWTC site, adjacent to the Rocky Flats Special Use area's eastern boundary. The property is, and will remain, open space, although jurisdiction may shift from the county to the city of Westminster. Jefferson County also manages Asel County Park, a 28-hectare (70 acre) park located in Coal Creek Canyon about 9 km (5.6 mi) west of NWTC. Jefferson County Open Space manages a facility at Standley Lake about 10 km (6 mi) southeast of NWTC.

Eldorado Canyon State Park, managed by the State of Colorado, is located about 6 km (3.7 mi) northwest of NWTC. All other federal, state, county, and municipal protected areas in the region are more than 10 km (6 mi) from the NWTC site.

3.4.5 Mineral Rights

The NWTC site is owned by the U.S. government, exclusive of mineral rights. Mineral rights to NWTC's western 65 hectares (160 acres) are held by Rocky Mountain Fuel. Mineral rights to this section of the NWTC site have been leased on several occasions in the past, although no on-site activity resulted. Leases for cementate shale, coal, oil, and natural gas are currently under negotiation (Anderson, 1994). Rocky Mountain Fuel developed an oil and gas well roughly 1.6 km (1 mi) north of the NWTC site. Western Aggregates investigated the possibility of leasing the mineral rights from Rocky Mountain Fuel, but found that the claim does not specifically identify sand and gravel resources. They have no further plans to pursue a lease.

Mineral rights to NWTC's eastern third, roughly 48.5 hectares (120 acres) are held by the Spicer family, one of the original landowners of the buffer zone property. The sand and gravel rights are currently leased to Western Aggregates. This lease extends beyond the NWTC site to the east, encompassing all of the northwest quarter of Section 3, Township 2 South, Range 70 West. The Spicer family has leased the mineral rights to this section of the NWTC site, and adjacent sections to the east and south of the NWTC site, to Western Aggregates. The company operates an extensive and fast-growing gravel quarry which abuts the southern fenceline of the NWTC site. Quarry operations have engulfed portions of the former SERI wind research test area. Western Aggregate's plans call for a moratorium on development within, and to the east, of the NWTC site in exchange for an easement providing direct access to Colorado Highway 128 along the NWTC eastern property line. The easement agreement was recently approved by NREL. Western Aggregate plans to maintain a "non-mining" buffer zone to the east of the NWTC site (Jones, 1994). Mineral rights ownership is illustrated in Figure 3-4.

3.4.6 Water Rights

The NWTC site is located in Water District 6, as defined by the Colorado State Engineer. In 1969, the Colorado Legislature abolished the water districts and established seven water divisions encompassing the seven major river basins in Colorado. The NWTC site is located in Water Division 1, the South Platte River Basin Division. Although no longer legally recognized, the former water districts are still used by the State Engineer's office for administrative purposes.

Surface water rights are designated by ditch or stream. The NWTC site has no permanent source of surface water. There are no perennial ditches or streams. The site's only surface water results from intermittent storms and other seasonal conditions. The nearest adjudicated ditch is the Upper Church Ditch, which roughly parallels the NWTC site's eastern boundary, crossing Highway 128 at Indiana Street. The drainages of the NWTC site flow into Rock Creek and ultimately into Coal Creek.

The amount of groundwater available to NWTC is dependent upon DOE's use and allocation of water throughout the Rocky Flats site. However, the NWTC currently uses no groundwater for any purpose, and this will not change under the proposed action. The existing water well is no longer used, and will be managed to safeguard groundwater quality until such time as the well is permanently closed.

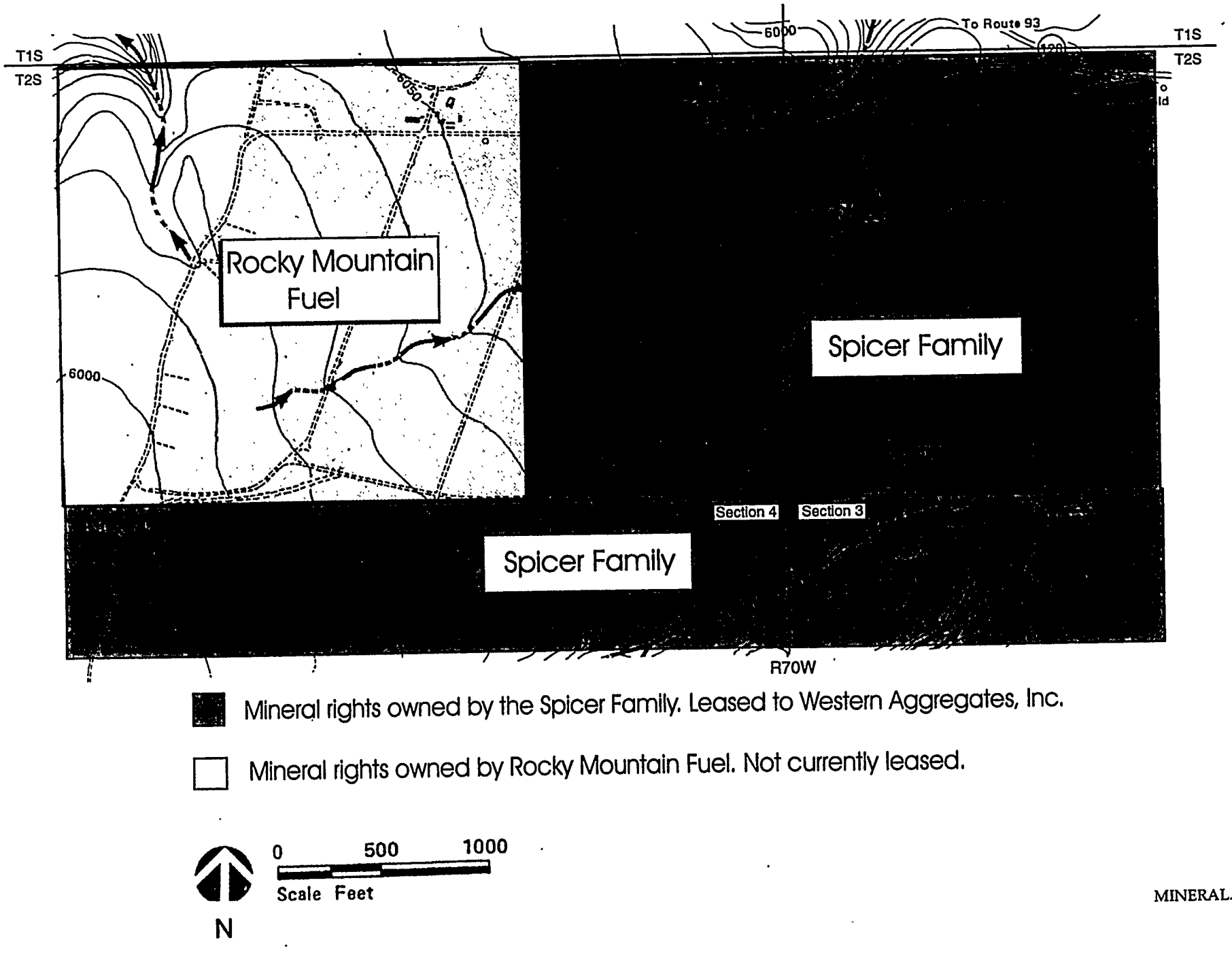

Figure 3-4. Mineral Rights Ownership Surrounding the NWTC

MINERAL.CD

Department of Energy
Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393

November 18, 1996

Reg Tyler
NEPA Compliance Officer
Rocky Flats Field Office
ER/WM Projects Group
P.O. Box 928
Golden, CO 80402-0928

Dear Mr. Tyler:

SUBJECT: NATIONAL WIND TECHNOLOGY CENTER SITEWIDE ENVIRONMENTAL ASSESSMENT - PREDECISIONAL DRAFT COMMENT RESPONSE

Thank you for your comments on our Predecisional Draft Sitewide Environmental Assessment (EA) for the National Wind Technology Center (NWTC). Your comments were appreciated and have been incorporated, as appropriate, into the relevant sections of the final document. A copy of the final document will be forwarded to you once it is published.

Again, thank you for your continued interested in our proposed project. Please direct any comments to myself at (303) 275-4746.

Sincerely,

Deborah A. Turner

Deborah A. Turner
NEPA Compliance Officer

cc:
M. Jordan, NREL
C. McDonough, G/M

acquisition, hazardous chemical training, use monitoring, and disposal tracking. All programs are managed in accordance with federal, state, local, DOE, and NREL regulations, standards, and laws.

3.7.1 Hazardous Materials Management

Hazardous materials are substances that pose a potential hazard to human health and the environment if improperly managed. Examples of hazardous materials are fuels, solvents, some cleaning agents, paints, and other coatings. Hazardous materials, including normal lubricating oils, are centrally tracked through NREL's automated chemical inventory system. This system provides tracking of types, quantities, destination, and users. This system is supplemented by a separate waste management system that documents disposition of wastes. Together the two systems provide complete tracking for NWTC hazardous materials.

NWTC uses only small quantities of a limited number of chemicals. No radioactive materials are currently used at NWTC, and none have been used in the past, and the site is free of polychlorinated biphenyl (PCB) bearing materials (Eickhoff, 1995).

NREL has an aggressive training program that emphasizes waste minimization and pollution prevention to ensure that chemicals are effectively selected, properly used, and disposed of in compliance with applicable laws and regulations. Chemical management training is mandatory, as are annual refresher courses. NREL training focuses on chemical use planning, proper selection of the least hazardous material, safe operating procedures, use of the smallest quantity possible, waste separation, waste reduction, and reuse. Spill contingency plans and reporting procedures are standardized throughout NREL and conform to DOE's directives. Reporting procedures include the preparation of occurrence reports to document incidents involving chemicals.

NWTC's history is free of major spill incidents. The largest reported spill was a 4-5 gallon hydraulic fluid spill from a failed hose assembly that occurred in Building A60 on February 26, 1996.

NWTC spills are tracked in a spill tracking log. Spills exceeding a reporting threshold are reported in the Occurrence Reporting and Processing System, which is part of DOE's emergency notification system. These procedures are integrated into NREL's Emergency Management Program.

3.7.2 Hazardous Waste Disposal

DOE has been issued a waste generator identification number by the Colorado Department of Public Health and Environment for NWTC. The facility is classified as a conditionally exempt small quantity generator. All NWTC waste disposal activities conform to the requirements of the Occupational Safety and Health Administration (OSHA), the Resources Conservation and Recovery Act (RCRA) and DOE/NREL regulations and guidelines for the handling, use and disposal of hazardous wastes. NWTC packages and disposes of hazardous waste through a contract with commercial treatment and disposal firms.

The types of hazardous wastes collected and disposed of at NWTC are corrosive, flammable, oxidizing, toxic, and reactive materials. In 1994, NWTC generated less than 50 kilograms (kg) (110 pounds [lbs]) of hazardous waste. Hazardous material disposal volumes were unusually high in 1994 as a result of disposal of water treatment and testing chemicals, removal and disposal of residual site materials, and the discontinuation and disposal of rodent control chemicals. NWTC's hazardous

material disposal volume decreased significantly in 1995, with no hazardous waste being disposed. Hazardous waste disposal levels are anticipated to remain at less than 50 kg per year (Eickhoff, 1995).

NWTC participates in NREL's formal waste minimization program, which includes an active recycling program. The site currently collects oils (lubricants), fluorescent light bulbs, scrap metals (iron, copper, steel, stainless steel, and aluminum), newspaper, office paper, and batteries for recycling.

3.7.3 Solid Waste Disposal

NWTC solid waste is managed by NREL's Site Operating Center. NREL's activities generate about 6,683 m^3 (235,910 ft^3) of solid waste annually. NWTC's expanded operations are expected to add only a fraction of 1% to that annual figure. Solid waste is deposited in a local landfill through contracts with solid waste handling companies.

3.8 HEALTH AND SAFETY

All NWTC activities are conducted in compliance with OSHA and DOE safety regulations. Construction, equipment operation, and research are all conducted using operating procedures that ensure the safety and well-being of both NWTC staff and site visitors. Tower and turbine designs include safety devices to provide protection from electrical shock and other injuries. Construction is designed to withstand high winds and intensive testing. The NWTC site is completely fenced and the access road is secured with a gate to discourage trespassers. Security guards patrol the site at regular intervals. NREL recently conducted a hazard analysis of the NWTC site and prepared an emergency plan to ensure the safety of workers and visitors.

The NWTC site is not located within the boundaries of any established fire protection district, but a contract for fire and emergency service is always maintained with a local fire department.

CHAPTER 4

ENVIRONMENTAL CONSEQUENCES

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CHAPTER 4.0 ENVIRONMENTAL CONSEQUENCES

This chapter discusses the types of impacts the proposed action could generate on various environmental resource areas at NWTC. The analysis does not include impacts associated with the Industrial User Facility or other ongoing activities described in Appendix B. The general methods of analyzing the impacts to the resource areas are introduced at the beginning of each section and any measures to mitigate potential impacts are discussed. Any adverse environmental impacts or the potential for cumulative effects that cannot be avoided are discussed.

The concept of "significance" used in this chapter includes consideration of both the context and the intensity or severity of the impact, as defined by 40 CFR §1508.27. The criteria used to differentiate between significant and insignificant impacts are discussed, with distinctions made between short-term versus long-term impacts.

This chapter discusses only the environmental consequences of the proposed action. The No Action alternative would have no impacts since there would be no change in any activity level.

4.1 GEOPHYSICAL ENVIRONMENT

This section includes discussions of air quality, geology and soils, and water resources.

4.1.1 Air Quality

Air quality at NWTC would be affected by activities associated with construction, maintenance, and operational activities. Additional operations and construction activities could further degrade site air quality.

The Air Pollution Emission Notice (APEN) and Fugitive Dust Control Plan for Land Development for the NWTC filed in June, 1995 requires watering disturbed areas and roadbeds, enforcing reduced speeds on roadways, minimizing disturbed acreage, revegetation, and soil compaction. Based on the APEN submitted to the state, NREL was granted an initial approval permit for multiple small-scale land development projects at the NWTC in September, 1995. The permit covers all planned projects until January, 2000. Air Emission Permits for Land Development have been issued for both the new Industrial User Facility and NWTC site construction activities.

The assessment of potential effects on air resources focused on site construction emissions , emissions from support operations, and vehicular traffic emissions. Meteorological factors, proximity to metropolitan areas, and sensitive receptors (*e.g.*, schools, hospitals, day-care centers) were also considered.

Reference documents provided pollutant criteria and emission factors for construction dust, vehicles, and high-lift support equipment. Support equipment emissions factors were obtained from tables found in the South Coast Air Quality Management District (SCAQMD), California Environmental Quality Act Air Quality Handbook (SCAQMD, 1992). The California Environmental Quality Act Air Quality Handbook was used because it provides an up-to-date compilation of construction emission factors drawn from numerous U.S. Environmental Protection Agency sources of emission factors. Changes in mobile sources, such as vehicular traffic, were compared to baseline values.

The projected emissions were compared to existing ambient air quality. The effects of climatic conditions and existing air emission sources, as described in Section 3.2.1, were also considered in the assessment. The projected changes to the ambient air quality were then evaluated against the significance criteria to determine the potential impact of the action. The predicted emission levels were compared to allowable amounts to ensure that the proposed action conforms with state or federal implementation plans for air quality.

The significance of impacts to air quality is based on federal and state pollution regulations and standards. A significant impact would be a violation of the National Ambient Air Quality Standards or Colorado ambient air quality standards. Excessive or frequent exposure of sensitive receptors to increased pollutant concentrations due to high emission rates or proximity to such a source could also have a significant impact. Colorado significant rates of emissions for criteria pollutants are shown in Table 4-1. Any annual emissions that would exceed these thresholds are considered potentially significant. A beneficial effect on air quality would be a reduction in baseline emissions.

Table 4-1
Significant Emission Rates for Criteria Pollutants

Pollutant	Emission Rate[1]
Carbon Monoxide (CO)	100 tpy
Nitrogen Oxides (NO_x)	40 tpy
Sulfur dioxide (SO_x)	40 tpy
Volatile Organic Compounds (Ozone)	40 tpy
Particulate Matter <10 microns (PM_{10})	15 tpy

[1] Metric tons per Year
Source: 5 Code of Colorado Regulations 1001-5 (Reg. 3, Part A.I.B, 58)

The potential to affect air quality may be short-term or long-term. Short-term effects are associated with construction, while long-term impacts correlate with support operations and dust problems.

4.1.1.1 Construction

Construction of the tower bases, site access ways, and cable-routing trenches would affect air quality. As much as 1.6 hectares (4 acres) of ground would be disturbed. Moving about 60 m^3 (2130 ft^3) of soils during construction of the tower bases would be required for each tower constructed. Several sources of emissions would be associated with the construction activity. These sources include combustion products from construction equipment (*e.g.*, trucks and loaders), dust from loading and

unloading trucks, trucks traveling on unpaved surfaces, construction work trips, and non-work trips (e.g., lunch, errands).

Construction of new tower mounting pads would occur over a long period and would have little additional effect on air quality. Potential annual emissions from pad construction, assuming construction of four pad sites per year, were estimated and are summarized in Table 4-2. Complete calculations can be found in Appendix C. All criteria pollutants would be generated at amounts lower than the significance thresholds.

Table 4-2
Summary of Air Emissions from NWTC (metric tons/year)

Source	CO	VOC	NO_x	PM_{10}	SO_x
Pad Construction	0.02	0.00	0.05	0.01	0.00
Experiment Support	0.25	0.06	0.62	0.05	0.05
Vehicular Traffic	5.37	0.49	0.80	0.12	0.00
Totals	5.64	0.55	1.47	0.18	0.06

Source: See Appendix C

Numbers have been rounded to the nearest hundredth.

4.1.1.2 Operations

Operations, including modification and maintenance of the tower-mounted wind energy experiments, would cause some minor impacts on air quality. High-lift vehicles and other support vehicles would emit pollutants. Because construction activity at the wind towers would be relatively infrequent, and because much of the activity would not involve long periods of engine operations, additional pollutants would be minimal. Operations will include vehicular traffic to and from the site and intra-site traffic. As many as 125 persons are expected to be active at the site at any given time. A worst-case calculation assumes no car-pooling is used.

Comparing the summary of expected emissions from NWTC shown in Table 4-2 with significant emission rates illustrated in Table 4-1 shows that a conservative estimate of emissions related to the proposed action would not significantly affect air quality at the site.

4.1.2 Geology and Soils

Geological resources are limited earth resources with characteristics that can easily be degraded by physical disturbances. Construction would disturb the soil, and expanding operations could increase the possibility of leaks and spills. Soils could be adversely affected, but not significantly, by construction activities. The geological structure would not be affected. Operations at the site would

special design, site preparation, and construction techniques which have been incorporated in NREL construction plans. The area disturbed during construction will be reseeded and managed to reduce soil loss due to wind and water erosion. If the soils are dry during construction, the area will be periodically watered to control dust.

To determine potential impacts, the analysis focused on the types of activities that could occur, where they would occur, and the importance of the resource in that particular location. Existing publications describing the geological environment were reviewed. Prediction of impacts to the geological environment was conducted based on knowledge of the proposed activities and the magnitude of potential disturbance.

An impact could be significant if it depletes a regional or local resource, triggers a major geological hazard, increases the erosion rates, or changes soil characteristics. Impacts would be insignificant if the resource is not of particular importance to the region. Beneficial impacts could occur if the action offset a geologic hazard, decreased the amount of soil erosion, or restored a resource. If the environment is not noticeably or measurably affected, no impact would occur.

Installation of foundations for turbine test sites and access roads require removal of existing vegetation and excavation of the Rocky Flats Alluvium. Excavation below the alluvium layer would not occur. Because the area is relatively flat, the topography would only incur a short-term, insignificant disruption from excavation prior to the completion of construction. The approximate depth of excavation would vary from 1.5 m (5 ft) for the turbine test sites to a few centimeters for accesses. Installation of underground cables also will require the disturbance of a few meters of top soil and alluvium. The removal of existing vegetation and soil could result in an adverse but insignificant impact to soils from increased wind erosion and possible water erosion. Terrain at all sites is nearly level and any water-borne soil erosion from stockpiled soil or construction excavation would likely remain in the immediate area.

Soil productivity could be affected since revegetation is difficult in arid areas with a high proportion of cobbles in the surface soil. Sections 3.2.2 and 4.2.2 describe the current vegetation and the potential impacts of the proposed action, respectively.

Because the clay in the subsoil has a moderate shrink-swell potential, the foundations for pads that support the turbines and towers must be designed and constructed to ensure the long-term stability of the structures. The subsoil is clay-like, which limits permeability and infiltration. Significant impacts to soils are not expected.

Soil samples show no indication of significant soil contamination, and no special precautionary measures would be required during removal. Spill potential could increase with expanded operations, however, impacts to soils would be insignificant because of the small amounts of hazardous materials that would be used on site. Procedures for managing spills and mitigating their impacts are specified in NREL emergency response plans. The NWTC site implements NREL and DOE spill response requirements.

The area of the NWTC site is relatively stable and would not require special earthquake design consideration for facility construction. Proposed pad construction and the operation of the facility would not affect the seismic environment. Construction activities at the site and operation of the

proposed facilities would not cause landslides or subsurface subsidence. The NWTC site is free of rockfall and landslide hazards.

4.1.3 Water Resources

Water resources are surface and subsurface resources which are considered finite but replaceable. Impacts to water resources (physical disturbances or material releases into surface waters and groundwater) could occur during construction of facilities for the proposed action. Implementation of the proposed action would increase water use, sewage output, and spill potential. Groundwater could be adversely affected, but not significantly, from construction and operation of the proposed facilities. Surface water impacts are not expected to occur.

The analysis evaluated site topography, identified the locations of nearby water resources (both surface water and groundwater), and assessed the proposed activities. Previous NEPA documents, water contamination studies, and the locations of proposed construction were reviewed for the analysis.

An impact to water resources would be considered potentially significant if an aquifer, groundwater well, or surface water body was affected, resulting in a measurable decrease in water supply, or if the quality of water was affected so that it exceeded federal or state Maximum Contaminant Levels (MCL) or state water quality standards for surface waters. An impact would be insignificant if the change in water quality did not exceed an MCL or the change in water quantity was unmeasurable.

Surface Water. The proposed action would not alter surface water hydrology during construction activities or impact surface water quality from discharges (typically dissolved and suspended solids). Particulate matter from construction equipment emissions and erosion could also be wind-deposited, increasing turbidity of downwind surface water bodies. The area affected at the NWTC site would be small, about 1.6 hectares (4 acres), and construction periods would likely be short; therefore, particulate settling would be negligible and impacts are not anticipated. Construction occurring during the wet season could facilitate overland flow of runoff. However, surface water is short-lived at the NWTC site and offsite wind transport is unlikely to occur.

Groundwater. Slightly more than 1.6 hectares (4 acres) of land, less than 2% of the total NWTC site acreage, would be developed and the groundwater recharge would be decreased by the same number of acres. The predominant local aquifers bearing potable water are recharged by rainfall or upgradient streams. Consequently, decreasing the recharge area for the Rocky Flats Alluvial Aquifer would be an adverse, but not significant impact.

Excavation of the alluvium would occur to depths of approximately 1.5 m (5 ft). The unconfined water table can seasonally fluctuate and possibly be intercepted if construction occurred during spring. However, the majority of construction is likely to occur without disturbing groundwater. In the event that the water table is intercepted, the water would be pumped out of the excavation onto the ground and returned to the alluvium via seepage through the soil. There would be no significant impact to the unconfined aquifer.

Minor levels of groundwater contamination are suspected at the NWTC site, but existing data is not conclusive. Based on the depth of excavations that would occur and the depth of the water table, it is unlikely that groundwater would be encountered during routine excavations. The contamination

levels are below levels of concern for worker exposure. Consequently, no significant impacts for groundwater are expected to occur.

Sewage. Sewage output would increase and would be handled by the planned septic systems and leach fields. The poor permeability and slow percolation of the soil is rated as a severe limitation for individual sewage disposal systems. The size of the leach fields were based on anticipated loads and determined to be sufficient considering the low permeability of the soil. Consequently, the groundwater could be affected adversely, but the level of impact would be insignificant.

Water Supply. The water supply for the facility is transported via tank truck. The expanded operations would increase the need for water, consequently increasing the number of truck trips (or higher-capacity tank trucks could be used). No adverse environmental impacts would be associated with the need to procure more water via tank trucks. Closure of the existing well is anticipated and would reduce the potential for introducing contaminants to the deep aquifer system. If a new water source is to be considered, a separate evaluation of impacts based on NEPA regulations will be conducted prior to any construction.

Stormwater Discharge. Construction of turbine pads has the potential to contribute to stormwater discharge problems and fugitive dust. During the construction process, NWTC will implement all mitigation measures that are in place to avoid impacts from stormwater discharge and fugitive dust, and will implement all mitigation measures mandated by the site's stormwater discharge and fugitive dust permits. According to the NWTC Stormwater Pollution Prevention Plan, measures to prevent stormwater contamination and uncontrolled runoff include: erosion and sediment control, revegetation, temporary stabilization, use of silt fences, and vegetation strips. Other pollution prevention mitigation measures include: waste management and disposal, minimizing vehicle tracking of soils, sanitary septic tank pumping, spill response, above ground storage tanks controls, controlled concrete equipment washout, and restricted pesticide and herbicide use.

4.2 BIOLOGICAL ENVIRONMENT

Potential impacts to biological resources are related to the change caused by the proposed action relative to current conditions, and the type of effect that change would invoke. The change may cause either a physical or nonphysical disturbance to vegetation, wildlife, or wildlife habitat. A physical disturbance of the land or habitat could occur during construction activities. A non-physical disturbance might include introduction of noise or visual intrusions into the ambient environment, causing a species to become startled or react adversely. Degraded air quality may cause physical effects on biological resources. In addition, animals could develop physiological responses to pollutants or their habitats could be altered, injured, or stressed by pollutant concentrations.

To assess the impact of turbine testing and other proposed activities on biological resources, federal, state, and county wildlife agencies were consulted. Reference was also made to numerous biological studies that have been completed in the Rocky Flats area. This environmental assessment incorporates the results of an NWTC raptor (bird of prey) use study performed at NREL's request by the University of Denver (Monahan, 1994a, 1994b, 1995). The analysis identified species known to inhabit the area and compared them to federal, state, and local lists of threatened, endangered, or target species.

Impacts to biological resources would be considered significant if the viability of protected animal, bird, or plant species were jeopardized, with little likelihood of re-establishment after completion of the proposed action. Impacts on surface water ecosystems, including wetland areas, would be significant if the proposed project resulted in altered hydrologic flow, drainage of sediment or contaminants into systems inhabited by species of concern, or actual filling or destruction of a valued aquatic habitat. Beneficial impacts would result from an increase in population of threatened or endangered species, or in the control or elimination of noxious and invasive species targeted by local management agencies.

Changes and effects associated with construction and operations as well as changes in other environmental resource areas have the potential to affect biological resources. The changes associated with expanded testing of wind turbines at the NWTC site, and their potential impacts on the biological environment are listed below:

- Taller turbine support towers and meteorological towers could pose obstructions to bird flight.

- Increases in rotor diameter may increase the potential for bird collisions with turbine blades.

- Larger capacity machines could generate higher noise levels that may affect wildlife.

- Increased activity would cause increases in vehicle traffic on unpaved access and maintenance roads, thereby increasing the volume of suspended particulates and dispersal of noxious weed seeds.

- Road grading and site maintenance disturbances could foster the spread of invasive plant species.

- The presence of exposed terminals, energized wires, and electrical conduction components could electrocute raptors and other species.

- Raptors and other bird species could collide with turbines and towers.

- The presence of horizontal grids on towers may invite perching in hazardous areas.

4.2.1 Animals

The principal concerns regarding animals at the NWTC site are the effect of turbine operations on bird communities. Turbine operations and turbine equipment pose risks to raptors (birds of prey), songbirds, and threatened or endangered bird populations.

NREL is an active partner with KENETECH Windpower, the world's largest manufacturer and operator of wind energy systems. KENETECH, with support funds provided by NREL, is engaged in a multi-year research and development program to prevent the collision of birds, particularly raptors, with wind turbines. NREL employs techniques designed to protect and deter bird populations from dangerous locations, and will continue, as funds are available, to support research into turbine collision effects on raptor populations. NREL will provide KENETECH and other research organizations with any relevant bird data collected at NWTC.

To reduce the potential for injury to birds NREL actively employs the following mitigation techniques:

- Turbine operation near biological communities such as riparian and ponderosa pine woodland communities is avoided whenever possible.
- Project designs include insulated wires; covered terminals; use of non-conducive materials and incorporation of raptor protection standards in pole construction; separation of energized wires; and use of underground wiring.
- Minimal use is made of support guy wires.
- Non-lattice type structures are used whenever possible.
- Surveillance and reporting procedures are followed to document bird incidents, including notification of federal and state wildlife officials in the event that an endangered or threatened species is involved.

4.2.2 Plants

Concern over the proliferation of non-native plant species led to the development of an Integrated Pest Management Team within NREL's Environmental Engineering Section. The team includes representatives from facilities, safety and health, and environmental engineering. The team is dedicated to development and implementation of a pest management strategy that focuses on the long term prevention or suppression of pest problems with minimum impact on human health, the environment, and non-target organisms. To date, the team has identified primary and secondary target species, mapped the occurrences of each target weed species at the NWTC site, and participated in cooperative efforts with Jefferson County and adjacent property managers, including Boulder City, RFETS, and Western Aggregates. The team also completed an initial release of root-boring beetles for diffuse knapweed control at NWTC. The NWTC release site has been designated both a "release" and "capture" site by the Colorado Department of Agriculture.

4.2.3 Wetlands

No impacts will occur to any of the potential wetland sites identified at the NWTC since NREL's proposed action does not include construction or operations within close proximity to those sites.

4.3 HUMAN ENVIRONMENT

4.3.1 Cultural and Historic Resources

Cultural and archeological resources are limited, irreplaceable resources with values that may be easily diminished or destroyed by physical disturbances. Impacts to cultural resources at NWTC could be caused by excavation, grading and soil compaction from turbine test operations, and new construction. Significant impacts would occur if resources were physically altered to the extent that the potential for research, religious, or traditional uses, or eligibility for listing on the *National Register of Historic Places* is affected. A beneficial impact would occur if a resource is discovered or protected.

To determine the potential impacts on the cultural resources, the analysis focused on identifying the location of turbine sites and areas of research and operation. The activity areas were then compared to the locations of known and potential resources identified during the NWTC site resource surveys (Burney, 1989; Dames & Moore, 1991; LABAT, 1995).

The proposed action does not include construction or operations in the area identified as "culturally sensitive" or disturbance of the five recorded historic sites.

4.3.2 Socioeconomic Resources

Impacts to socioeconomic resources could result from personnel relocation and from construction activities. Both the economic diversity and the historic fluctuation suggest that the local economy can readily absorb small amounts of employment change without experiencing negative impact. No impacts are expected to population, the housing market, or local schools.

Measures used for impact analysis included employment, population, and housing. County, Metropolitan Statistical Area, state, and U.S. employment data were obtained from the U.S. Bureau of Economic Analysis. Employment diversification measures, multipliers, and rational threshold values were obtained from the Economic Impact Forecasting System operated by the U.S. Army Corps of Engineers Construction Engineering Research Laboratory. Population and housing data were obtained from the U.S. Census for 1980 and 1990.

Significance criteria for socioeconomic resources are determined for a Region Of Influence (ROI) by analyzing long-term fluctuation in elements such as employment population within that ROI. This analysis allows an ROI-specific determination of the appropriate levels, or thresholds, beyond which changes in population or employment would noticeably affect individuals and communities.

Based on this methodology, a significant impact for Jefferson County, the ROI for the proposed action, would be an increase of more than 3.2% or a decline of more than 0.8% in projected population, while the significance threshold for employment would be an increase of more than 3.6% or a decline of more than 2.1% in projected employment. A significant change in population or employment in the short term could noticeably affect local labor and housing markets as well as local services. In the long term, it could change a community's existing structure and organization. An insignificant impact would not noticeably change housing demand, school enrollment, public service demands, or local government revenues or expenditures. Impacts could be adverse or beneficial.

The estimated change in employment and population that would result from the proposed action are measured against the projected ROI employment and population levels for the year in which the increases are expected to occur. The ROI employment and population projections are based on average growth rates for the 1980-1992 period. For the purposes of this analysis, 1995 is assumed to be the year in which the employment occurs, since many of these employees are already in place at NWTC. If a later year were used, the impacts would be slightly smaller, as the projected population against which the change is being measured would be slightly larger.

The following discussions present potential impacts of the proposed action to socioeconomic resources.

Employment. NWTC's permanent employee base consists of employees who were transferred from NREL's Golden facility. Visitors and researchers on temporary assignment to NWTC will bring the site population to about 125. No new positions will be created by the expansion of NWTC activities, therefore the action will have no impact on employment in the ROI. Should additional positions become available in the future they would have a multiplier effect on area employment. Each new position at NWTC would generate approximately 1.6 additional supporting jobs in the local area.

The construction planned as part of the proposed action would have a beneficial but insignificant impact on the local community in terms of employment and income. No adverse impacts to the local construction labor force are expected, as there is an adequate skilled labor force in the region to accommodate this construction. The limited extent of the construction would not attract workers to the area; therefore, no impacts to population, housing, or schools would result from the construction activity.

Population. There will be no significant impact to Jefferson County's population. As noted above, NWTC will be staffed by existing NREL employees who are already residents of the counties near NWTC, predominantly Jefferson County. NWTC is located about 25 km (15 mi) north of NREL's South Table Mountain and Denver West Office Park sites, the current employment sites. In order to significantly impact Jefferson County's population, NWTC's action would have to change the county population by at least 3.2%, or 15,648 people.

Minority and Low Income Populations. Executive Order 12898 "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" requires federal agencies to identify and address environmental impacts of their projects on minority and low-income populations. As detailed in sections 3.3.2, the nearest population to the NWTC site is not predominantly composed of minority or low income groups. Consequently, the proposed project would not be expected to result in unfair or unequal treatment of any low income or impoverished communities or populations.

Housing. It is not anticipated that any of the NREL employees will relocate due to the change in job site. In the unlikely event that all 125 NWTC employees were to relocate, the total demand would represent barely 1% of the available units in the ROI.

Schools and Other Community Services. As noted above, only a few personnel may actually relocate into the ROI. It is assumed that the very small number of incoming personnel would be distributed around Jefferson County and the surrounding areas in a pattern similar to existing employees. Because the incoming population would be such an infinitesimal increase over the

projected population levels, no impacts are expected to local school systems, or to other community services.

4.4 LAND USE AND ZONING

No state, county, municipal, or private activities, either current or proposed, will be adversely affected by the expansion of test operations at NWTC.

Current and proposed use of land near NWTC was investigated to facilitate assessment of the impact of NWTC operations on surrounding business and urban areas. The region of influence includes adjacent industrial property and residences within a 3.5-km (2-mi) radius, and urban communities within 15 km (24 mi). Zoning designations were examined, as were current business and industrial uses, mineral rights ownership, and water rights. Traffic patterns and volumes for surrounding state highways were documented.

Current use of property adjacent to NWTC was examined both visually and through evaluation of land use planning documents. Conversations with county planning offices at both Jefferson and Boulder Counties verified current land use plans and examined future options. The development plans of current mineral rights leaseholders and the Jefferson County Airport were also investigated.

The recommendations made by the Rocky Flats Future Site Use Working Group for the RFETS were also reviewed, which included proposed routes for a northwest transportation corridor. Because the current proposed right-of-way necessary for the construction and use of this transportation linkage lies southeast of the NWTC, cutting through the buffer zone of the RFETS, the proposed action will have no significant impact on the construction and use of this linkage.

Impacts to land resources would be significant if the current or potential future use of adjacent or nearby land was affected in such a way that there was economic loss to the landowner(s) or to the community. There would be beneficial impacts if land values improved as a result of the proposed action.

Evaluation of current and proposed land use plans reveals that expansion of the NWTC turbine testing efforts will have no effect on either existing or future use of surrounding areas. Turbine test activity will have no impact on the agricultural, open space, or industrial properties that are adjacent to NWTC. Although there are residential properties within the ROI, they are situated more than 2.4 km (1.5 mi) from the NWTC site and will be unaffected by testing activities.

4.5 VISUAL RESOURCES

The proposed action includes erecting tall towers with wind turbines which will be visible from nearby highways. Therefore, the proposed action will have an unavoidable impact on visual resources for the area; however, this impact will not be significant.

The potential impacts of the proposed action were assessed by a physical examination, visibility measurements, and the use of photographs.

NWTC will eventually consist of up to 20 wind and meteorological towers of various designs and height. Wind turbines and blades will be of many designs, colors, and sizes. The towers and turbines

will be situated along northeast-southwest rows, with the density and number depending on the number of experiments being conducted at any one time.

The perceived visual impact of the NWTC wind towers is based on subjective human interpretation. The variety of the towers and the turbines may cause some viewers to perceive the site negatively. Others may see some aesthetic value to the project. If viewed as an energy research center, the visual effect may be positive. When viewed in the context of the surrounding man-made structures, the gravel mining operations nearby, and high-voltage power lines, the impact of the wind towers and turbines is negligible.

4.6 NOISE

The noise environment at NWTC would be affected by construction activities, operations, and maintenance activities, and by noise produced by the wind turbine systems themselves. Impacts would occur if the noise generated by the operations or construction activities substantially increased ambient noise levels in the surrounding areas. Considering the noise generated by the neighboring gravel mining and crushing operation, noise generated by temporary construction and wind turbine operation would be negligible. No impacts are anticipated from the construction and operational noise generated at the NWTC.

The analysis of noise impacts included the potential effects on the resident human and animal populations; worker exposure to noise was not evaluated. In analyzing noise effects, qualities such as annoyance, speech interference, sleep disturbance, and health and hearing loss are usually considered. However, these qualities are not a factor in any possible noise impacts at NWTC, and they were not analyzed further because there would not be significant noise impacts resulting from the proposed action.

Wind turbine generators create noise mainly by blade rotation. The blade generated noise is local and of relatively low frequency, the frequency being somewhat dependent on the blade design. Construction noise for pad construction will be minimal and short term. Operations and maintenance noises include blade and turbine noise, high-lift and support equipment noise, and noise associated with normal human activity.

Similar activities at the established wind energy sites have measured sound levels at single-turbine sites at 57.9 decibels-A weighting[1], a value that compares with operation of a household dishwasher or air conditioner (SMUD, 1993). Noise also dissipates as it travels through the air. Additional noise reduction occurs due to the ground surface, foliage, terrain, humidity, and atmospheric stability and cloud cover. Because the towers are situated between 150 m (490 ft) and more than 750 m (2460 ft) from work and office areas and nearby roads, any annoying sound will be decreased by distance. NWTC's close proximity to gravel quarrying activity and rock crushing equipment would further serve to mask turbine noise.

[1] "Decibel-A weighting" is the weighted sound level that more closely approximates the auditory sensitivity of the human ear at particular times of the day.

4.7 HAZARDOUS MATERIALS AND WASTE MANAGEMENT

To assess potential impacts, the analysis focused on the types and quantities of hazardous materials used at NWTC and the hazardous wastes generated. The analysis evaluated existing programs and how much the proposed activities would affect a given program. Sources of information included site inspections, interviews with site personnel, information about past and current practices at NWTC, occurrence reports, pollution prevention programs, and compliance with state and federal laws.

To determine significance, the following were considered: the type and overall quantity of materials or waste being handled or generated; the duration of a particular activity using hazardous materials or generating solid and hazardous wastes; the potential for releases during handling, transport, storage, treatment and disposal activities; and the reduction or minimization of hazardous materials and wastes. An impact would be significant if the quantities of any solid or hazardous waste generated by the action exceeded existing transport or disposal capabilities; if the use of additional hazardous materials or generation of hazardous wastes has a detrimental impact on worker health and safety; or if practices impact environmentally-sensitive areas. A beneficial impact would occur if the types or quantities of hazardous materials or wastes would be reduced or eliminated, or if the potential for leaks, spills, or exposure to hazardous materials would be reduced as a result of the action.

Additional research and testing activities at NWTC associated with the proposed action have little potential to affect the waste management previously described in Section 3.7. The use of hazardous materials for normal routine operations at NWTC has remained stable over the past few years and is expected to remain the same in the near future. As programs expand, a slight increase may occur in the use of chemicals required by special projects. These projects will be limited scale and limited duration. Hazardous waste disposal volumes were abnormally high in 1994, resulting from chemical disposal necessitated by discontinued activities. Other non-routine disposal efforts may occur in the future, but they would be limited in quantity and one-time occurrences.

The use of hazardous materials in expanded testing activities at NWTC is unlikely to affect worker or visitor health and safety or the environment. The programs pose no radiological hazards. Other hazardous materials are handled centrally through NREL and are tracked through an automated tracking system. Aggressive waste minimization training may reduce use of hazardous materials through identification of substitute materials.

Solid waste levels are expected to increase only slightly and in proportion to increased program activity and higher levels of personnel. The increase in solid waste will not affect disposal agreements. Overall, NREL solid waste quantities have increased only slightly during the past few years due to aggressive management and recycling programs.

Impacts associated with the use of hazardous materials and solid waste will be mitigated with existing and planned pollution prevention, waste minimization, and recycling programs already in place at NREL. Impacts related to hazardous materials, hazardous waste and solid waste would be adverse, but not significant.

4.8 HEALTH AND SAFETY

Laboratory and field tests of operating turbines and turbine components represent some risk to NWTC researchers and visitors. Potential risks identified at NWTC include the following: physical hazards,

such as falls, chemical hazards, inclement weather, electrical hazards, electromagnetic fields, and human error.

While increases in test operations will add to cumulative potential risk for accidents, the risk factors at NWTC are mitigated through advance planning, use of sound engineering practices, and the development of safe operating procedures designed to specifically apply to NWTC operations. Mitigation measures are listed below:

- Tower and turbine designs incorporate all available anti-shock devices and are designed to meet all electrical safety codes and national standards. Grounding meets Institute of Electrical and Electronics Engineers standards. Circuit breakers that can be both manually and automatically operated are installed at each turbine site.

- Contingency plans for operating in periods of high wind have been developed which include avoidance of turbine sites during extreme conditions.

- Safe operating procedures exist for all research projects that incorporate Occupational Safety and Health Administration and DOE safeguards for human safety.

- Turbines, towers and foundation units are designed to withstand 56 to 66 meters/ second (120 to 140 mile per hour) winds and designed to meet Zone Uniform Building Code Earthquake Standards.

- NWTC employees are trained and regularly refreshed in NWTC site-specific hazards, emergency preparedness plans, and contingency programs.

In addition, NREL has developed a hazardous communications program. The target audience are those who work with or have the potential to be exposed to hazardous materials, *e.g.*, laboratory workers and emergency response teams. There are six components to the program: training; written program documents; materials data safety sheets; labeling, chemical inventory for each laboratory and work area, and hazard identification and control.

While the risk is greatest to NWTC researchers and visitors, there is some risk to the general public. While the perimeter to NWTC is fenced, the visibility of the turbines and towers from public roadways may attract trespassers. To mitigate public risk, towers and turbines are constructed with the fewest possible exposed ladders or vertical access routes. Signs warning of electrical shock danger are used near towers and at access points, as appropriate.

DOE wind turbine generator research has demonstrated that wind turbines with large metal blades have some effect on television, radio, microwave and other electromagnetic signals. NWTC does not currently use metallic blades, and has no plans to do so in the future. Current blades are either fiberglass or wood composites with very minor metallic content. NWTC turbine test facilities are carefully located to avoid radar, microwave and communication beams. Site selection is especially sensitive to the needs of the Jefferson County Airport communication tower. No interference with electromagnetic frequencies has been experienced.

CHAPTER 5

CUMULATIVE IMPACTS

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CHAPTER 5.0 CUMULATIVE IMPACTS

This section discusses the cumulative impacts of the proposed action in conjunction with ongoing and reasonably forseeable activities on or in proximity to the NWTC site. Cumulative impacts include effects on the environment which result from the incremental effect of the proposed action added to other past, present and reasonably foreseeable future actions. Potential environmental impacts associated with the Industrial User Facility were documented in separate NEPA analysis. However, to adequately assess the cumulative impacts of the NWTC site, the potential environmental impacts from the IUF are also included in this analysis. Potential impacts from current or reasonably foreseeable activities at the Western Aggregate Facility and the Rocky Flats Environmental Technology Site were considered prior to completion of the analysis for this section. All short and long term impacts from our proposed action are negligible and therefore, no cumulative impacts to the surrounding environment are anticpated.

5.1 GEOPHYSICAL ENVIRONMENT

NWTC expansion is expected to have little effect on the geophysical environment considered in this environmental assessment. The construction activities and overall changes in the geophysical environment will be minor, as explained in the following sections. No future cumulative impacts are anticipated as a result of the proposed action.

5.1.1 Air Quality

Air quality could be briefly affected during the construction phase of the proposed action. However, cumulative impacts of the proposed action would be short term, diminishing appreciably when construction is complete. The Air Pollution Control Division of the Colorado Department of Public Health and Environment concurred with our determination that the proposed action will not have an adverse, long-term cumulative impact on the ambient air quality in the immediate area surrounding the NWTC, nor in the Denver Nonattainment Area. Because any emissions will be negligible, they will not contribute significantly to any particulate or carbon monoxide emissions already generated in the area by neighboring Western Aggregate, and RFETS.

5.1.2 Geology and Soils

As stated previously, geological resources are limited and are subject to degradation by physical disturbances. Cumulative impacts associated with the proposed action would be negligible, given the level of existing disturbances and the lack of projected disturbance.

5.1.3 Water Resources

Impacts to water resources associated with surface disturbances and material releases into the surface and subsurface groundwater could occur during construction and operational activities associated with the proposed action. However, cumulative impacts associated with other construction and operational activities at the NWTC would be negligible due to the intermittent construction period and mitigation measures currently in place to reduce impacts to surface water during construction operations. Subsurface impacts would also be negligible due to existing spill response and material handling procedures. Cumulative impacts associated with the proposed action, existing operations, and future development are not anticipated.

5.2 BIOLOGICAL ENVIRONMENT

5.2.1 Animals

There have been no reports of bird strikes or bird mortality on the NWTC site from 1976 to date. Existing raptor (bird of prey) activity data for the NWTC site indicates a relatively low level of use by raptor populations. No data exists on use by other bird populations. Current data is insufficient to accurately predict site use by avian populations across long periods of time. However, NWTC does not use turbine and tower combinations that have a history of bird interaction problems. Bird incidents are expected to be rare.

No significant cumulative impacts on animals are anticipated as a result of the proposed action, existing operations, or future planned activities.

5.2.2 Plants

No cumulative impacts to plants are anticipated as a result of the proposed action and other existing or reasonably foreseeable future actions. Continuation and expansion of NREL's program of noxious weed control at the NWTC site can be considered a benefit of wind research expansion. Active implementation of selective species control programs will help to control the weed problem to the benefit of both NREL and surrounding property managers.

5.2.3 Wetlands

NREL's proposed action is not anticipated to have any cumulative impacts on the potential wetland sites identified at NWTC, nor to the unnamed northern tributary to Rock Creek.

5.2.4 Threatened/Endangered/Listed Species

The U.S. Fish and Wildlife Service concurred with our determination that the proposed action will have no impact on species listed as threatened or endangered.

5.3 HUMAN ENVIRONMENT

5.3.1 Cultural and Historic Resources

There is a possibility of affecting minor registered historical sites, or undiscovered sites. However, because the location for the proposed action will include an existing, pre-disturbed area, it is not anticipated that any historical sites will be disturbed. No cumulative impacts have been identified due to the proposed action.

5.3.2 Socioeconomic Resources

No impacts are expected to population, the housing market, and local schools, therefore there are no anticipated cumulative impacts to socioeconomic resources.

5.4 LAND USE

Because the proposed action has been determined to have no impact on use of surrounding property, no unavoidable and cumulative impacts will occur.

5.5 VISUAL RESOURCES

The perceived visual impact of the NWTC wind towers is based on subjective human interpretation. For this reason, it is anticipated that the cumulative impact of up to 20 wind turbines may have as much positive effect as negative. Perceptions of the wind site value may vary. NWTC's proximity to an industrial area further disguises any adverse visual impact of towers and turbines. The cumulative impacts on visual resources as a result of the proposed action, existing activities, and future planned activities would be negligible.

5.6 NOISE

The noise environment at the NWTC site would be affected by construction activities, operations, and maintenance activities, and by noise generated by the wind turbine systems themselves. Since the NWTC is not located close to any sensitive noise receptors (*e.g.*, residences, schools), no impacts are anticipated from the construction and operational noise generated at the NWTC.

NWTC's close proximity to gravel quarrying activity and rock crushing equipment would further serve to diminish turbine noise. Given the lack of noise impacts anticipated as a result of the proposed action and the existing noise environment, no significant cumulative impacts are anticipated as a result of the proposed action.

5.7 HAZARDOUS MATERIALS AND WASTE MANAGEMENT

The use, storage, and disposal of hazardous materials, hazardous wastes, and solid wastes are expected to remain relatively constant for the foreseeable future. While slight increases in the use of materials and generation of solid waste are expected from short-term construction, additional personnel, and other planned activities, the increase will not have a significant cumulative effect on the environment.

5.8 HEALTH AND SAFETY

Increases in NWTC activities plus the addition of new towers and turbines will increase the cumulative risk of accidents to NWTC personnel and to visitors. Mitigation measures currently in place have significantly reduced the risk to all parties, but a limited cumulative risk remains. Uncontrollable winds of high velocity and wind blown objects pose the greatest threat. While the effect is cumulative, implementation of current mitigation measures will reduce these impacts to below the level of significance.

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CONSULTATION AND COORDINATION

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Boulder County.
Open Space Office. Cindy Owsley. Weed Management.
Zoning Department. Various personnel.

City of Boulder.
Open Space. Lauri Deiter. Pest Management.

Colorado State.
Department of Transportation. Division of Transportation Development.
Office of Archaeology and Historic Preservation. Site Summary Database and Site Forms. Water Division. Records Section.

Jefferson County.
Airport. Tower Operations. Bob Super.
Weed and Pest Management. Jim Lile.
Planning and Zoning Department. Mike Chadwick.

Jones, Martin. Manager, Western Aggregates, Inc.

Kenetech Windpower, Inc. Joan Stewart. Avian Research Program.

National Park Service, National Register of Historic Places Database. Jeanette Wesley. Librarian.

National Renewable Energy Laboratory.
Amidaneau, Deborah. Manager, Environmental Engineering Section.
Berger, Al. Librarian.
Dodge, Darrell. Engineer.
Doran, Jennifer. NWTC Technical Librarian.
Eickhoff, John. Environmental Engineer.
Jordan, Maureen. Staff Environmental Engineer.
Laxson, Alan. Project Leader, Systems Development Branch.
O'Connell, Staci. Staff Environmental Engineer.
Trenkle, David. Environmental Engineer.

Rocky Mountain Fuel Company. Gerald Anderson, President.

U.S. Department of Energy.
Rocky Flats Environmental Library. Sonya Henson.
Rocky Flats Technical Library. Glada Costales.

U.S. Fish and Wildlife Service. Golden Field Office.
Endangered Species Management. Bernardo Garza.

Western Aggregates, Inc. Martin Jones, Vice President and General Manager.

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APPENDIX A

SCOPING AND RESPONSES

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National Renewable Energy Laboratory

1617 Cole Boulevard
Golden, Colorado 80401-3393
(303) 275-3000

May 30, 1995

Addressee
Address
City, State, Zip

ATTN: Environmental Compliance Officer

Under the direction of the Department of Energy, the National Renewable Energy Resources Laboratory (NREL) is proposing to expand the scope of its activities at the National Wind Technology Center (NWTC). In accordance with the National Environmental Policy Act (NEPA), NREL must assess the potential environmental impacts of the proposed action and possible alternatives. The site, located southeast of the intersection of State Highways 93 and 128, was used for wind turbine testing from 1976 to the present. The proposed action calls for the installation and operation of up to twenty wind turbines during the next three years. The electrical generating capability of the wind turbines will range from 10 kilowatts to 3, or more, megawatts, and will be housed on towers ranging from 50 to 300 feet in height. A complete Description of the Proposed Action and Alternatives (DOPAA) is attached.

NREL is requesting that other federal, state and local agencies review the proposed action as stated in the enclosed DOPAA, and identify any areas of concern, or resources under their purview that might be impacted by the proposed action.

NREL has contracted with LABAT ANDERSON, Inc. to prepare an environmental assessment to analyze any potential impacts from the proposed expansion of NWTC turbine testing operations. LABAT ANDERSON would appreciate receiving your information and comments pertinent to the environmental impacts of the attached proposal.

Please forward your comments or information to LABAT ANDERSON, Attn: NREL Team, 165 South Union Blvd., Lakewood, CO 80226, to be received by July 3, 1995.

Your assistance is greatly appreciated. Questions may be directed to me at (303)275-3230, or to David Herrington of LABAT ANDERSON at (303)987-0221.

Sincerely,

Deborah Amidaneau, Manager
Environmental Engineering Section
National Renewable Energy Laboratory

DA:bbm

A Division of Midwest Research Institute

Army Corps of Engineers
Tri Lakes Project Office
9307 State Highway 121
Littleton, CO 80123

Bureau of Land Management
Environmental Compliance Office
2850 Youngfield Street
Lakewood, CO 80215

Department of Energy
Ms. Tricia Powell
NEPA Compliance Officer
P.O. Box 928
Golden, CO 80402-0928

Colorado Coop Fish & Wildlife Unit
201 Wagar Building
Dept Fishery and Wildlife Biology
Colorado State University
Fort Collins, CO 80523-1484

Mr. Larry Lindner
NEPA Compliance, 8WMEA
EPA Region VIII
999 18th Street
Denver, CO 80202-2466

Federal Aviation Administration
Northwest Mountain Office
1601 Lind Avenue SW
Renton, WA 98055

Mr. Duain Johnson
Soil Conservation Service
Room E200C
655 Parfet Street
Lakewood, CO 80215

Mr. Gary Finstead
Soil Conservation Service
655 Parfet Street, Room E300
Lakewood, CO 80215

Mr. Grady Towns
US Fish and Wildlife Service
Denver Regional Office
P.O. Box 25486
Denver, CO 80225

US Fish and Wildlife Service
Colorado Field Supervisor
730 Simms St, Room 290
Golden, CO 80401

Ms. Linda Coulter
CO Dept. of Agriculture
700 Kipling St, Suite 4000
Lakewood, CO 80215

CO Dept. Natural Resources
Office of Environment
1313 Sherman Street
Denver, CO 80203

CDPHE
Air Pollution Control Div.
4300 Cherry Creek Dr. So.
Denver, CO 80222-1530

CDPHE
Water Quality Division
4300 Cherry Creek Dr.So.
Denver, CO 80222-1530

CDPHE
Rocky Flats Program Unit
4300 Cherry Creek Dr.So.
Denver, CO 80222-1530

CDPHE
Office of the Environment
4300 Cherry Creek Dr.So.
Denver, CO 80222-1530

CO Office of Energy
Conservation
Environmental Compliance
1975 Broadway
Denver, CO 80202

Mr. Bob Sturtevant
CO State Forest Service
Colorado State University
Fort Collins, CO 80523

CO State Forest Service
Boulder County Office
936 Lefthand Canyon Dr
Boulder, CO 80302

CO State Forest Service
Golden District Office
1504 Quaker Street
Golden, CO 80401

Mr. Kim Gambrill
Environmental Services
CO Transportation Dept
4201 E. Arkansas Ave
Denver, CO 80222

Governor Roy Romer
136 State Capitol
Denver, CO 80203

Mr. Jim Green
State Historic Pres.
Office
1300 Broadway
Denver, CO 80203

Mr. Michael Sanders
Boulder County Parks
and Open Space
P.O. Box 471
Boulder, CO 80306

Jeff. Cty
Highways and Trans.
100 Jefferson County
Pkwy
Golden, CO 80401

Mr. Troy Stover
Jeff County Airport
11755 Airport Way,
Terminal Building
Broomfield, CO 80021

Jefferson County
Assessor's Office
100 Jefferson County
Pkwy
Golden, CO 80419

ffferson County Dept of Health
vironmental Health Division
0 South Kipling Street
kewood, CO 80226

. Terry Green
ff Cty Emergency Preparedness
0 Jeff Cty Pkwy, Suite 4570
lden, CO 80419

. Bryan Pritchett
ffferson County Open Space
0 Jeff Cty Pkwy, Suite 100
lden, CO 80401

s. Karen Hellner
ff Cty Planning & Zoning Office
0 Jeff Cty Pkwy, Suite 3550
lden, CO 80419-3550

s. Allison Peters
ulder City Manager's Office
O. Box 791
ulder, CO 80306

lorado Springs / Marshall Fire
partment
O. Box 3104
lorado Springs, CO 80025

s. Katie Fendel
lden Public Works Office
ty of Golden
1 10th Street
lden, CO 80401

s. Karen Cumbo
wn Manager
wn of Superior
01 Park Place
perior, CO 80027

udubon Society
cky Mountain Regional Office
150 Darely Avenue
ulder, CO 80303

Coal Creek Canyon Fire
Protection District
Crescent Branch
P.O. Box 7187
Golden, CO 80403

Mr. Glen Anderson
Colorado Association of Soil
Conservation Districts
3000 Youngfield, Suite 163
Lakewood, CO 80215

Colorado Environmental
Coalition, Inc.
777 Grant Street
Denver, CO 80203

Colorado Wildlife Federation
7475 Dakin Street
Denver, CO 80221

Mr. Steve Nesta, T130J
EG&G Environmental
Division
P.O. Box 464
Golden, CO 80402-0464

National Wildlife Federation
2260 Baseline Road
Boulder, CO 80302

Rocky Flats Citizens'
Advisory Board
9035 Wadsworth Parkway
Westminster, CO 80021

Rocky Flats Local Impacts
Initiative
5460 Ward Road
Arvada, CO 80002

DOE Public Reading Room
c/o Front Range Comm
College
3645 West 112th Avenue
Westminster, CO 80030

Rocky Mtn Fuel Co.
910 15th Street
Denver, CO 80202

Sierra Club
Rocky Mountain Chapter
777 Grant Street, Suite
606
Denver, CO 80203

Superior Metropolitan
District
390 Union Blvd.
Lakewood, CO 80228

Western Aggregates,
Enviro Comp Office
11728 Highway 93
Boulder, CO 80303

Rec'd 10/16/95

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Ecological Services
Colorado Field Office
730 Simms Street, Suite 290
Golden, Colorado 80401

ES/CO: DOE/NREL
Mail Stop 65412

OCT 0 2 1995

LABAT ANDERSON
Atention: NREL Team
165 South Union Boulevard
Lakewood, Colorado 80226

Dear members of the NREL Team:

This responds to the Department of Energy (DOE), National Renewable Energy Laboratory's (NREL) letter of May 30, 1995, requesting a compendium of federally listed species and other environmental concerns the U.S. Fish and Wildlife Service (Service) might have for the proposed expansion of activities at the National Wind Technology Center (NWTC). The NREL's letter proposes the installation and operation of up to 20 wind turbines, housed on towers ranging from 50 to 300 feet in height, during the next 3 years at the 280-acre NWTC site located at 18200 Colorado State Highway 128 (NE¼ and E½NW¼ Section 4, Range 70 West, Township 2 South) at the base of the Front Range foothills in northern Jefferson County, Colorado. The Service offers the following comments to the proposal.

The following are the federally listed species that could occur at the project area:

Peregrine falcon, *Falco peregrinus*, listed endangered
Bald eagle, *Haliaeetus leucocephalus*, listed threatened
Whooping crane, *Grus americana*, listed endangered
Ute ladies' tresses, *Spiranthes diluvialis*, listed threatened

The whooping crane is an very rare bird that has been known to migrate through Colorado. A small flock of these birds was reported by a knowledgeable source flying above some small ponds in the city of Northglenn this spring. Severe weather may cause whooping cranes to travel farther west than their traditional migratory routes. The whooping crane could be adversely affected by collision with the proposed towers and turbines if they happened to be migrating above the NWTC site. This possibility of collision is also of great concern to the Service as it may adversely affect the bald eagle and peregrine falcon, as well as other raptors and migratory birds flying at the NWTC site. These bird species are protected under the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C.1531 et seq.). The bald eagle is further protected under the provisions of the Bald Eagle Protection Act of 1940 (BEPA) as amended (16 U.S.C. 668 et seq.), and all migratory birds are protected under the Migratory Bird Treaty Act of 1918 (MBTA), as amended (16 U.S.C. 703 et seq.). Please be apprised of the potential application of the ESA, BEPA, and MBTA to your project.

The MBTA does not require intent to be proven and does not allow for "take," except as permitted by regulations. Section 703 of the MBTA provides: "Unless and except as permitted by regulations . . . it shall be unlawful at any time, by any means or in any manner, to . . . take, capture, kill, attempt to take, capture, or kill, possess . . . any migratory bird, any part, nest, or eggs of any such bird . . . ." The BEPA prohibits knowingly taking, or taking with wanton disregard for the consequences of an activity, any bald or golden eagles or their body parts, nests, or eggs, which includes collection, molestation, disturbance, or killing activities. The ESA also prohibits knowingly taking of listed species, which includes harm, harassment, capture, or collection activities, except when specifically permitted by the Service. We suggest you contact and coordinate closely your project with Jerry Craig of the Colorado Division of Wildlife (CDOW) in Fort Collins to find out if any falcons, eagles, hawks, or other migratory birds will be disturbed by the project. Any foreseeable impacts to raptors and migratory birds should be avoided; but if there might be unavoidable impacts to them, mitigation measures should be discussed with this office.

Consideration should be given to placing the towers and turbines in locations that will make them more visible to flying birds. Preliminary planning should identify potential high-risk areas. Where the towers and turbines must cross natural flight lanes such as drainageways, we recommend the towers be placed in such a way so as to increase the visibility of the turbines. Increasing line visibility may be the most prudent alternative for reducing collision mortality among birds. We recommend consulting Thompson, L.S. 1978. Mitigation through engineering and habitat modification. Pages 51-92 in M.L. Avery, ed. Impacts of transmission lines on birds in flight. U.S. Fish and Wildlife Service, Washington, D.C. for further recommendations on this subject.

The Ute ladies' tresses orchid occurs in seasonally moist soils and wet meadows near springs, lakes, or perennial streams and their associated flood plains below 6,500-feet elevation in Boulder, Jefferson, and Larimer Counties in Colorado. Typical sites include old stream channels and alluvial terraces, subirrigated meadows, and other sites where the soil is saturated to within 18 inches of the surface at least temporarily during the spring or summer growing seasons. This species could be impacted if the project in question has adverse repercussions on wetlands/riparian habitats by filling them or modyfing their hydrology.

The Service also is interested in the protection of species which are candidates for official listing as threatened or endangered species (Federal Register, Vol. 56, No. 225, November 21, 1991; Vol 55, No. 35, February 21, 1990). While these species presently have no legal protection under the ESA, it is within the spirit of the ESA to consider project impacts to potentially sensitive candidate species. It is the intention of the Service to protect these species before human-related activities adversely impact them or their habitats to a degree that they would need to be listed and, therefore, protected under the ESA. Additionally, we wish to make you aware of the presence of Federal candidates should any be proposed or listed prior to the time that all Federal actions related to the project are completed. If any candidate species will be unavoidably impacted by this project, appropriate mitigation should be proposed and discussed with this office.

The candidate species that could be impacted by the project include:

Bird: Mountain plover, *Charadrius montanus*

Mammals: Swift fox, *Vulpes velox*
Preble's meadow jumping mouse, *Zapus hudsonius preblei*

Plant: Colorado butterflyweed, *Gaura neomexicana ssp. coloradensis*, Category 1

Mountain plovers, burrowing owls (*Athene cunicularia hypugea*), and ferruginous hawks (*Buteo regalis*) often occur in association with prairie dog colonies and short grass prairies. These are species are protected by the MBTA. The status of these species is not well known at present, but surveys conducted by the Service point out that at least the mountain plover populations are apparently declining and may warrant listing under the ESA. Impacts to these species could occur if prairie dog colonies are disturbed by the project. The largest known population of mountain plovers in the state and the Nation is found in Weld County. If there is a possibility that your project would impact this candidate species, mitigation measures should be proposed to this office. Your proposed project should be designed and/or timed to avoid "take" of migratory species.

The Preble's meadow jumping mouse is currently under review for possible listing under the ESA. The proposed NWTC expansion site, adjacent to the Rock Creek drainage, rests just above one of the best known and studied Preble's meadow jumping mouse populations. The Rock Creek Preble's Meadow jumping mouse population needs to be protected until a final determination is made as to the final legal and biological status of the mouse is made. Any activities related to the subject proposal that could directly or indirectly impact this rare rodent need to be avoided or modified to ensure the continued survival of this species. According to Rare Plants of Colorado, the Colorado butterflyweed is found "in moist prairie meadows along the mountain Front Range from Castle Rock, Colorado, to Cheyenne, Wyoming, in the transition zone between wet stream bottom and rich floodplain areas."

The Service regards wetlands and riparian habitats as important resources due to their high value for fish and wildlife, erosion control, ground water recharge and water supply, flood control, and others. We recommend that any adverse impacts to wetlands within the NWTC project area be avoided (Section 404 of the Clean Water Act, administered by the Corps of Engineers, regulates the fill of wetlands on public land). If unavoidable impacts to wetlands or riparian habitats are identified, the Service and the Corps should be contacted prior to any operations that would affect wetlands. The Service has National Wetland Inventory (NWI) maps of the project area available. Maps can be obtained by calling 1-800-USA-MAPS.

For more detailed information on animal and plant distribution, habitat needs, and other characteristics contact:

Animals: CDOW Central Regional Office at (303) 291-7227.

Plants: Colorado Natural Areas Program of the Division of Parks and Outdoor Recreation at (303) 866-3437, and/or the Colorado Native Plant Society of the Rocky Mountain Nature Association.

The CDOW should be contacted regarding possible impacts to native fauna, especially State listed endangered or threatened species. The CDOW Central Regional Office contact is Dave Weber at (303) 291-7231. LABAT ANDERSON needs to provide this office with a "may affect" or a "no affect" determination on impacts to federally listed species for the subject proposal. If it is determined that the proposed project "may affect" federally listed species, DOE will need to request initiation of formal ESA section 7 consultation with the Service prior to implementation of the proposal. If LABAT ANDERSON concludes a "no affect" on federally listed species as a result of the implementation of the subject proposal, and the Service concurs with such a finding, then informal consultation between the Service and DOE for the subject project will be terminated. If the Service can be of further assistance, please contact Bernardo Garza of this office at (303) 231-5280.

Sincerely,

LeRoy W. Carlson

LeRoy W. Carlson
Colorado Field Supervisor

cc: CDOW, Central Regional Office, Denver, CO (Attn. Dave Weber)
Reading file
Project file

Reference: JBG*ES\DOENREL1.WPF

United States Department of Agriculture

Natural Resources Conservation Service

Me. J Office
655 Parfet, Room E-300
Lakewood, CO 80215-5517

- Serving Arapahoe, Clear Creek, Denver, Gilpin & Jefferson Counties -

June 30, 1995

LABAT ANDERSON
Attn: NREL Team
165 South Union Blvd.
Lakewood, CO 80226

RE: PROPOSED EXPANSION OF ACTIVITIES AT NREL'S NATIONAL WIND TECHNOLOGY CENTER

NREL Team:

Several things should be examined in some detail during the environmental assessment for this project. These are summarized below.

SOILS

The predominant soil mapping unit on this site is "Flatirons very cobbly sandy loam, 0 to 3 percent slopes." (Soil Survey of Golden Area, Colorado (1984)). Only two other small mapping units are identified on this site. The Flatirons soil is characterized by a large amount of cobble and gravel in the soil volume, as well as a subsoil (from 13 inches to 47 inches below the surface) dominated by clay, which restricts the movement of water and air. The permeability rate is only 0.06 to 0.2 inches per hour, resulting in a "severe limitation" rating for individual sewage disposal systems. Without mitigating engineering design and modification of the earthen filter medium, effluent will not percolate efficiently through the soil and may surface.

The clay in this subsoil is regarded as having "moderate shrink-swell potential." This, of course, has implications for foundations and floor slabs in buildings and for the foundations/pads used to support the turbine test sites. Good design, site preparation, and construction techniques can mitigate this limitation of the natural soil.

Only one soil map unit found on the site potentially qualifies as either "prime, unique, or important farmland." "Valmont clay loam, 0 to 3 percent slopes," found along the northern boundary of this site in the $E_{1/2}$ of the $NW_{1/4}$ of Section 3, is regarded as being "High Potential Dry Cropland," a category of "Farmlands of Statewide Importance." If it were irrigated, it would be rated "Prime."

VEGETATION MANAGEMENT

The climax vegetation on this site is rather unique to this general area. It is a "transition area," combining "tallgrass prairie" species with montane species from the west. The grassland is dominated by big bluestem, little bluestem, yellow indiangrass, switchgrass, prairie dropseed, and mountain muhly. A variety of other grasses and forbs are present in the climax community, too.

Overgrazing and other land disturbing activities have apparently diminished the quality of this grassland, and noxious weeds have become a problem. Chemical and biological tools are proposed to be used to keep these weeds under control. This can be very effective, but ultimately, these tools will prove most effective if desirable grasses are in place to offer competition. Key native grasses can be restored to optimal levels of vigor and plant cover in basically two ways: (1) management of existing plants and (2) revegetation.

Revegetation of some, or all of the site, may not be necessary to restore appropriate species if there are enough remnant plants. Creative management of the grassland can help these remnants recover to the point that they can compete with weeds. I recommend that an evaluation of the vegetation be conducted to determine the potential for key grasses to recover with appropriate management.

Revegetation on this soil is made very difficult because of the cobbles in the surface soil. It is also very expensive, and success is by no means assured. This makes management of any remnant grasses all the more important--including limiting land disturbing activities related to construction of buildings, towers, and access roads. Any revegetation or landscaping that does occur should emphasize the use of native species. This is important for stability of nearby plant communities, indigenous wildlife, and for water conservation.

RAPTORS

Some of the towers supporting the turbines will be 300 feet high. It's not clear from the DOPAA how high the turbines themselves may be, but if these approach 300 feet, what impact, if any, may this have on raptors?

I appreciate the opportunity to comment on this proposal. Please, call if you have any questions.

Sincerely,

Gary Finstad
Resource Conservationist

xc: Deborah Amidaneau, NREL, Golden
Lee Hill, ASST-EQ, NRCS, Lakewood

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, OMAHA DISTRICT
TRI-LAKES PROJECT OFFICE, 9307 STATE HWY 121
LITTLETON, COLORADO 80123-6901

REPLY TO
ATTENTION OF

June 22, 1995

Ms. Deborah Amidaneau
Labat Anderson
Attn: NREL Team
165 South Union Blvd.
Lakewood, Colorado 80226

Dear Ms. Amidaneau:

Reference is made to the National Renewable Energy Resources Laboratory's proposed action to install twenty wind turbines in the Northwest ¼ of Section 4, Township 2 South, Range 70 West, Boulder County, Colorado.

If any work associated with this project requires the excavation in or placement of dredged or fill material, either temporary or permanent, into the wetland drainage shown on the attached map at this location, this office should be contacted for proper Department of the Army permits pursuant to Section 404 of the Clean Water Act.

If there are any questions concerning this matter, please feel free to contact Mr. Terry McKee of this office at 303-979-4120 and reference action ID #199580422.

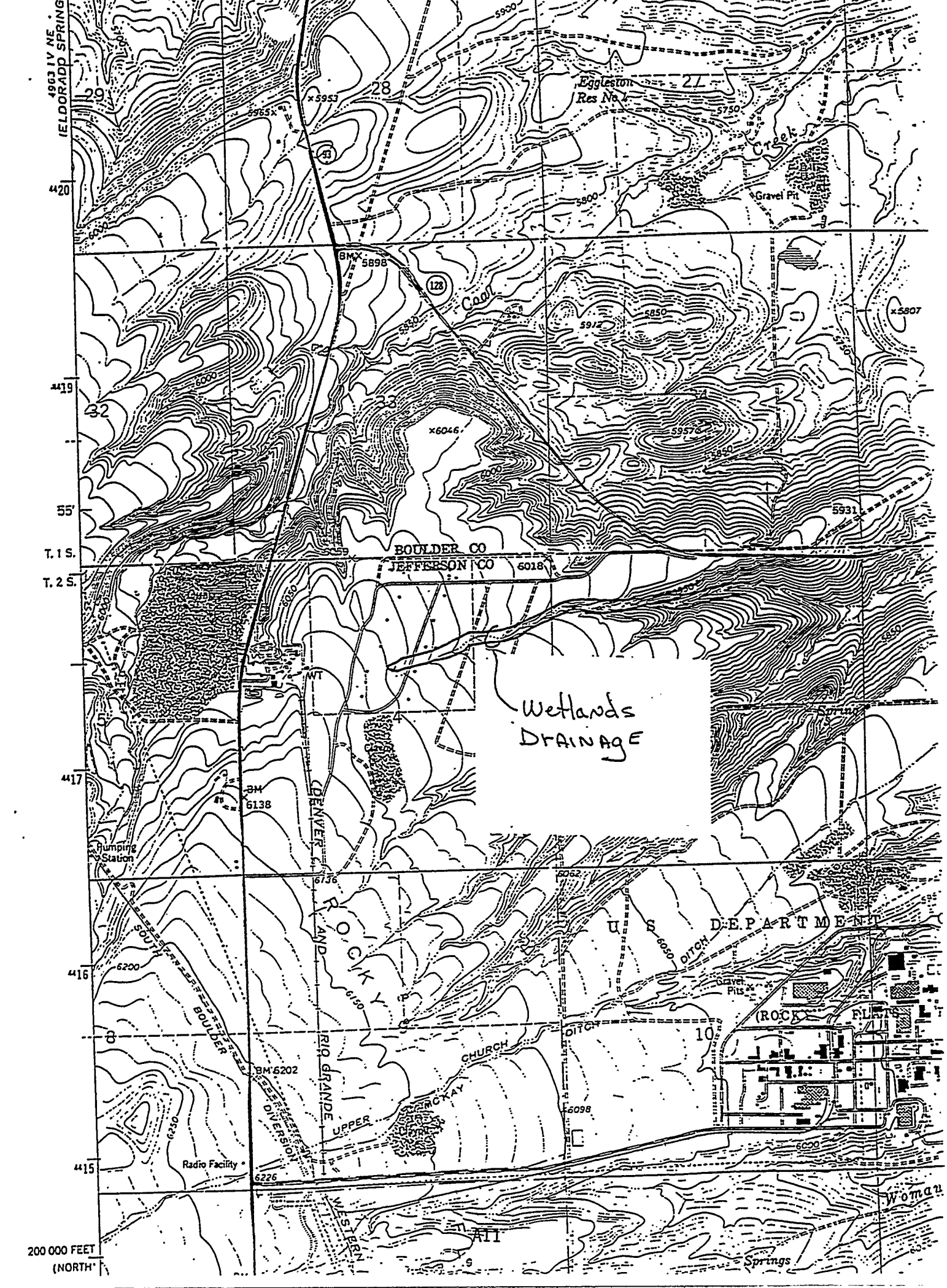
Sincerely,

Timothy T. Carey
Project Manager

Enclosure

Copy Furnished:

NREL
1617 Cole Blvd.
Golden, CO 80401-3393


4963 IV NE
IELDORADO SPRING
Eggleston Res No 1
Creek
Gravel Pit
BMX 5898
Coal
BOULDER CO
JEFFERSON CO
Wetlands
DRAINAGE
Spring
BM 6138
Pumping Station
DENVER
ROCKY
AND
RIO GRANDE
SOUTH BOULDER CREEK DIVERSION
U S DEPARTMENT
DITCH
Gravel Pits
(ROCK) FLATS
CHURCH
McKAY
UPPER
DITCH
BM 6202
Radio Facility
WESTERN
Springs
Woman
T. 1 S.
T. 2 S.
200 000 FEET
(NORTH

STATE OF COLORADO

Roy Romer, Governor
Patti Shwayder, Acting Executive Director

Dedicated to protecting and improving the health and environment of the people of Colorado

4300 Cherry Creek Dr. S.
Denver, Colorado 80222-1530
Phone (303) 692-2000

Laboratory Building
4210 E. 11th Avenue
Denver, Colorado 80220-3716
(303) 691-4700

Colorado Department
of Public Health
and Environment

June 19, 1995

Deborah Amidaneau
National Renewable Energy Laboratory
1617 Cole Boulevard
Golden, CO 80401-3393

Dear Ms. Amidaneau:

This office recently received your request for an air quality determination concerning the proposed expansion of activities by the NREL at the NWTC.

Although Golden is within the Denver Nonattainment Area for PM_{10}, CO and O_3, it appears that this expansion will not have an adverse, long term effect on ambient air quality. However, the Division's Stationary Source Program may require air pollution permits or air pollution emission notices (APENs) for this expansion. Potential requirements include permits or notices if ground disturbance exceeds 25 acres or lasts longer than six months, if construction or demolition dust is produced, if odors are produced which require odor control equipment, or if unpaved roads create traffic levels which exceed certain thresholds defined by Regulation 1. Permits or notices may be required if asbestos demolition or removal is involved; this requirement falls under a separate set of regulations for asbestos. In addition, if natural gas-fired boilers are operated for space heating at a rate above 5-10 MMBTU, then permits or notices are more likely to be required for operation of the boilers. Also, if there is solvent usage at the industrial facilities alluded to in the DOPAA, this increases the possibility of a permit or notice requirement as well. The requirements listed above are not the only requirements listed in the regulations, they are merely examples.

For more information on possible air pollution permits or air pollution emission notice requirements, please contact Dennis Myers in the Stationary Source Program at (303) 692-3176.

Sincerely,

Manisha Davé

Manisha Davé
Air Pollution Control Division

cc: Dennis Myers

Department of Energy
Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393

September 13, 1996

Manisha Dave
Colorado Department of Public Health and Environment
Air Pollution Control Division
4300 Cherry Creek Drive, South
Denver, CO 80222-1530

Dear Mr. Dave:

SUBJECT: PREDECISIONAL DRAFT SITEWIDE ENVIRONMENTAL ASSESSMENT OF THE NATIONAL WIND TECHNOLOGY CENTER (DOE/EA-1127)

The U. S. Department of Energy's Golden Field Office (GO) is releasing the Predecisional Draft Sitewide Environmental Assessment for the National Wind Technology Center (NWTC) for final review. A copy has been enclosed for your review.

On June 19, 1995, you provided comments to our operating contractor, NREL, related to the proposed action description. Your letter confirmed that the NWTC facility was located outside the Denver Nonattainment Area for PM_{10}, CO and O_3. GO would like to confirm that a thorough review of each of the air pollution control regulations will be conducted prior to beginning any activity that may result in air emissions and any necessary permit or notices will be obtained or submitted. There are no known sources of asbestos materials at the site and there are no plans for use of natural gas-fired boilers.

Please direct any remaining comments to Deborah Turner, NEPA Compliance Officer, (303) 275-4746 by September 30, 1996. Thank you for your time and assistance in the development of this document.

Sincerely,

Frank M. Stewart
Manager

Enclosure:
As Stated

Department of Energy
Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393

September 16, 1996

Gary Finstad
Resource Conservationist
U. S. Department of Agriculture
Natural Resource Conservation Service
Metro Office
65 Parfet, Room E-300
Lakewood, CO 80215-5517

Dear Mr. Finstad:

SUBJECT: PREDECISIONAL DRAFT SITEWIDE ENVIRONMENTAL ASSESSMENT OF THE NATIONAL WIND TECHNOLOGY CENTER (DOE/EA-1127)

The U. S. Department of Energy's Golden Field Office (GO) is releasing the Predecisional Draft Sitewide Environmental Assessment for the National Wind Technology Center (NWTC) for final review. A copy has been enclosed for your review.

In your June 30, 1996 response letter, you expressed three main areas of concern for continued or expanded use of the NWTC site. These areas related to soils, vegetation management, and potential impact on raptors. Each of these areas have been considered and discussed in the document in the following sections: Soils - 3.1.2, 4.1.2, 5.1.2; Vegetation Management - 3.2.2, 3.2.5,4.2.2, 5.2.2; and Raptors - 3.2.4, 4.2.1, 5.2.1.

The following is a brief summary of the information related to the three areas you expressed concern over. As you indicated, appropriate engineering controls will be exercised in design of new structures and maintenance of existing structures consist with the soil composition. The site has been impacted by overgrazing and other disturbance to the native vegetation. We are currently working on an integrated weed management plan that will combine the use of chemical, mechanical and biological controls to restore the native vegetation regime. All available data from other wind turbine sites combined with our raptor survey lead us to the conclusion that there would be no impact on any raptor populations that exist in the area. Please review the referenced sections for the full discussion of these areas.

Please direct any remaining comments to Deborah Turner, NEPA Compliance Officer, (303) 275-4746 by September 30, 1996. Thank you for your time and assistance in the development of this document.

Sincerely,

Frank M. Stewart
Manager

Enclosure:
As Stated

cc w/o enclosure:
D. Turner, GO
M. Jordan, NREL
C. McDonough, Gallegos

Department of Energy
Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393

September 16, 1996

Timothy T. Carey
Project Manager
Department of the Army
Corps of Engineers
Omaha District
Tri-Lakes Project Office
9307 State Hwy 121
Littleton, Co 80123-6901

Dear Mr. Carey:

SUBJECT: PREDECISIONAL DRAFT SITEWIDE ENVIRONMENTAL ASSESSMENT FOR THE NATIONALWIND TECHNOLOGY CENTER, GOLDEN CO (DOE/EA-1127)

The U. S. Department of Energy's Golden Field Office (GO) is releasing the Predecisional Draft Sitewide Environmental Assessment for the National Wind Technology Center (NWTC) for final review. A copy has been enclosed for your review.

In your June 22, 1995 response letter, you indicated that any temporary or permanent dredge and/or fill activities would require consultation with your office. As indicated on the map enclosed with your letter and Figure 3-1 NWTC Wetland and Wet Area Locations contained in the document, there are three existing roads that cross the wetland drainage area on the site. There are no plans for changes or construction on the site that would impact the wetland drainage area. Should our plans change, we will contact your office prior to finalization of any plans. For additional information, Section 3.2.3 Wetlands contains a discussion of all the identified Wetland and other wet areas on the NWTC site.

Please direct any remaining comments to Deborah Turner, NEPA Compliance Officer, (303) 275-4746 by September 30, 1996. Thank you for your time and assistance in the development of this document.

Sincerely,

Frank M. Stewart
Manager

Enclosure:
As Stated

Department of Energy
Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393

September 13, 1996

LeRoy W. Carlson
Colorado Field Supervisor
U. S. Department of the Interior
Fish and Wildlife Service
Ecological Field Services
Colorado Field Office
730 Simms Street, Suite 290
Golden, CO 80401

Dear Mr. Carlson:

SUBJECT: PREDECISIONAL DRAFT SITEWIDE ENVIRONMENTAL ASSESSMENT OF THE NATIONAL WIND TECHNOLOGY CENTER (DOE/EA-1127)

The U. S. Department of Energy's Golden Field Office (GO) is releasing the Predecisional Draft Sitewide Environmental Assessment for the National Wind Technology Center (NWTC) for final review. A copy has been enclosed for your review.

In your October 2, 1995 response letter, you expressed concern over potential impacts to listed and candidate species that may be present at the NWTC site. The following paragraphs addresses each of the species your office indicated may be present in the area.

Listed Species

In February 1994, NREL began a raptor study at the NWTC during which field ornithologists collected data on raptor identification, migration, and possible use of the site. This study was concluded in June 1995. Concurrent with the raptor study at the NWTC, a peregrine falcon study was conducted. During the study only one peregrine falcon was sighted. The single peregrine sighting was an immature bird approximately 100 meters north of the NWTC on Boulder County Open Space land. Peregrine falcons are not commonly found near our site. We believe that our proposed activities at the NWTC will have minimal to no impact on the raptor or peregrine falcon populations.

Bald Eagles have been seen flying near our site in an east-to-west pattern during evening hours. Because eagles feed on prairie dogs, and prairie dog colonies occupy areas east of our sites, we believe the eagles are flying near the NWTC in route to evening roost in Eldorado Canyon. There have not been any bald eagle sightings at the NWTC. We believe that our proposed activities at the NWTC will have minimal to no impact on the bald eagle populations.

Whooping Cranes are very rare birds that can migrate through Colorado. We considered the

behavior of whooping cranes, including their flight patterns between summer and winter ranges in Wood Buffalo National Park in Alberta, Canada and Port Aransas, Texas respectively and the altitudes at which they migrate. Our tallest structure is approximately 100 meters, therefore below the normal migratory flight pattern. We believe that our proposed activities at the NWTC will have minimal to no impact on the whooping crane population.

As stated in your letter, Ute ladies' tresses prefer wet areas. The NWTC site has one artificial pond and several natural drainage or wet areas, however none of these areas are proposed for construction or disturbance activities. Additionally, there have never been any recorded sightings of this species on the NWTC. We believe that our proposed activities at the NWTC will have no impact to any potential Ute ladies' tresses population.

Candidate Species

Mountain plovers primary habitat is the short-grass prairie. According to the Colorado Natural Heritage Program the NWTC site consists of vegetation cover that is considered tallgrass prairie. This species is most common in northeastern Colorado and there are no recorded sightings at the NWTC. We believe that our proposed activities at the NWTC will have minimal to no impact on the mountain plover population.

The swift fox is a burrowing animal preferring sandier habitat than the large cobble geology of the NWTC. A wildlife study conducted by DOE of this area did not find any evidence of the swift fox and there are no documented sightings of the swift fox at NWTC. We believe that our proposed activities at the NWTC will have minimal to no impact on the swift fox population.

Preble's meadow jumping mouse has been sighted east of the NWTC. However, any potential habitat areas at the NWTC site are consider to be too small or too fragmented to support a population. There are no documented sightings of this species at the NWTC. We believe that our proposed activities at the NWTC will have minimal to no impact on the preble's meadow jumping mouse population.

According to your letter, the Colorado butterfly weed is found in "...moist prairie meadows ... between wet stream bottom and rich floodplain areas..." The NWTC does not have either of these habitat types. We believe that our proposed activities at the NWTC will have minimal to no impact on the Colorado butterflyweed population.

Burrowing owls use habitat similar to that found on the NWTC site and there have been reports of this species west of our site. However, it should be noted that this species has been known to nest near railroad tracks and airports without behavioral disturbance. We believe that our proposed activities at the NWTC will have minimal to no impact on any potential burrowing owl population.

Ferruginous hawks have been sighted along the Highway 93 corridor. However, there have not been any reported sightings of this species landing or feeding at the NWTC. During our raptor study, there were no sightings. As the NWTC does not have prairie dog or ground squirrel populations that would warrant this species to feed at the site, we believe that our proposed activities at the NWTC will have minimal to no impact on the ferruginous hawk population.

Other

We have contact the Corp of Engineers regarding wetlands or wetland drainage areas on the NWTC. The Corp confirmed that there is a wetland drainage area that crosses the site. However, none of the current or proposed activities are anticipated to impact this area.

We have been in contact with Jerry Craig and Dave Weber of Colorado Division of Wildlife. Neither representative felt there would be a need for a site visit or meeting as they did not anticipate any adverse impacts to the plant or animal populations or natural resources at the site.

Please direct any remaining comments to Deborah Turner, NEPA Compliance Officer, (303) 275-4746 by September 30, 1996. Thank you for your time and assistance in the development of this document.

Sincerely,

Frank M. Stewart
Manager

Enclosure:
As Stated

cc w/o enclosure:
D. Turner, GO
M. Jordan, NREL
C. McDonough, Gallegos

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APPENDIX B

ONGOING AND FUTURE ACTIVITIES AT THE NATIONAL WIND TECHNOLOGY CENTER SITE

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ONGOING ACTIVITIES AT THE NATIONAL WIND TECHNOLOGY CENTER

Building and Facilities Overview

Building 251, the largest structure on the NWTC site, currently provides office space and test facilities for NWTC's staff of scientists and visiting researchers. Completed in 1981 as part of the WERC site and largely abandoned by 1987, the building required extensive interior renovation prior to occupancy. Renovation included upgrades to heating, ventilation, wiring, and plumbing necessary to meet county and state codes. A septic system with leach field was installed to manage building sewage, and a holding tank for domestic use and additional fire system water was installed. Renovation of Building 251 was completed outside the scope of this assessment.

Two other permanent structures remain from the WERC site. Building 252, originally constructed in 1979 to house dynamometer test facilities, will be used by NREL with only minor upgrades to the power feeds. Building 253 will continue to house power components and switchgear.

Several minor modular structures also remain from the 1970s, including storage sheds and trailers. These will be used without modification, relocated, or removed as necessary to accommodate new construction and test activities.

In addition to the renovation of existing Building 251, NREL plans to construct a new Industrial User Facility (IUF) and adjacent building support systems. In accordance with DOE's NEPA implementing regulations, approval of this facility was categorically excluded from NEPA documentation because it will not result in any significant environmental impacts, either individually or cumulatively (10 CFR § 1021.410 and Appendix B to Subpart D). Plans also call for the installation of a large modular structure to house equipment to support wind-hybrid energy tests. This 93 m^2 (1000 ft^2) structure is expected to be located southwest of Building 252.

At one point, WERC had 32 test sites and simultaneously operated as many as 23 wind turbines. By comparison, present plans call for up to 20 wind turbine test sites. Each test site will include a single concrete foundation, one turbine support tower, a data collection shed, and from one to ten supporting meteorological inflow towers. Ten wind turbines are expected to be in place by 1998. Several of the former test sites have been upgraded with the addition of new data and telecommunication cables, upgraded power cables, reinstallation of data collection buildings, and reinstallation of electrical switch boxes. Wind turbines will be supported by towers ranging in height from approximately 15 to 91 m (50 to 300 ft). Original WERC (now NWTC) test sites were designed to accommodate the testing of wind turbines rated from 10 to 100 kilowatts.

Four major meteorological towers are in use at the NWTC site. These range in height from 50 to 80 m (164 to 262 ft). The two 80-m (164-ft) towers have been placed near the east and west property boundaries of the site with approval from the Federal Aviation Administration (FAA). Two smaller towers remain from WERC and are located southeast of Building 251 and west of Building 252. Figure 2-3 illustrates the site layout as of May 1995.

Operations Overview

NWTC's primary functions are the installation, development, and testing of energy generating wind turbines. In addition to testing the performance of complete turbines, component testing will take place1

at several laboratory, test bay, and workshop locations on the site. Examples of these tests include blade fatigue, hub failure and materials testing. Data gathering will be supported by a central computer system linked to each turbine test site and to the laboratories, workshops and office locations.

Construction Activities

The following construction activities are planned at the NWTC. These activities are covered under existing NEPA documentation.

Industrial User Facility. The proposed IUF will be approximately 1210 m^2 (13,000 ft^2). The facility is designed to support the research and test efforts of NREL's staff and visitors. The new building will include:

- A high-bay area for the testing of turbine blades
- Three user bays
- A tear-down area for the testing and repair of turbines
- Wood and metal machine shops, and
- Office area for NREL staff, industrial researchers, and visitors.

This building will be located to the east of the current Building 252. The maximum working height of the high bay is 9 m (30 ft), which is 3 m (10 ft) lower than the high bay in existing Building 251. For building code compliance, the new IUF is considered a single-story unit because it has only one useable level.

Site preparation for the new IUF will require the removal of a variety of small structures. Scheduled for removal are a small modular building; a small closed septic tank; concrete pads; a metal protective cage; and a steel tower and its foundation.

Water System. The NWTC site is not connected to a municipal water system. A 366-m (1200-ft) water well, drilled in 1976, is considered unusable due to low water volume, high mineral content, deteriorating casing, and permitting requirements. Potable and service water for Building 251 is currently trucked to the site and stored in three water tanks supported by two booster pumping stations. The combined capacity of the tanks is 132,000 liters (35,000 gallons), which provides water for both domestic use and for the fire protection system. An additional 196,040-liter (52,000-gallon) capacity is proposed for the new IUF. IUF construction designs currently call for two 94,250-liter (25,000-gallon) tanks for fire protection and one 7540-liter (2000-gallon) tank for domestic water needs. Water will continue to be trucked to the NWTC site until a permanent source of supply can be identified. Numerous off-site water options are currently being investigated. It is anticipated that the existing well will be permanently closed according to state requirements.

Wastewater System. Sewage generated by Building 251 is currently treated in a septic system with a 465-m^2 (5000-ft^2) leach field. Plans call for the development of a second septic system and a smaller leach field to be located south and east of the new IUF. The IUF leach field will be approximately 56 m^2 (600 ft^2) and designed to accommodate a building population of about 25 people. The combined capacities of the sewage systems at Building 251 and the new IUF building will support an overall site population of about 125 people.

Hybrid Research Center. A 93-m^2 (1000-ft^2) modular building is planned to house motors, switch gear, electrical panels, and data acquisition equipment to support a wind hybrid test bed. This facility is

designed to support research on wind systems that use more than one energy source, or a combination of energy sources. The building will be located to the west of Building 252.

A 1900-liter (500-gallon) above-ground diesel fuel storage tank will be installed near the Hybrid Research Center. This fuel will be used for research on wind systems using a combination of energy sources. The storage tank will be steel encased in concrete with provisions for level control and leak detection devices. The tank will be 1.4 m (4.5 ft) wide, 3.4 m (11 ft) long, 1 m (3.3 ft) high and weigh about 5443 kilograms (12,000 pounds).

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APPENDIX C

AIR EMISSION CALCULATIONS

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APPENDIX C
AIR EMISSION CALCULATIONS

The following table summarizes the results of calculations for mobile and stationary sources of air pollutant emissions which could occur as a result of the proposed action at the National Wind Technology Center site.

Construction:

- The time and equipment values were estimated based on the extent of the construction effort and the area to be disturbed. Emission calculations for the equipment used values from the South Coast Air Quality Handbook (SCAQMD, 1992).

- Four tower pads are constructed per year.

Operations:

- Emissions factors were taken from operational emissions estimates for the equipment used. Values come from the South Coast Air Quality Handbook (SCAQMD, 1992).

APPENDIX C
Air Quality Calculations - NWTC Emissions

EMISSION FACTORS

Equipment	SOx	CO	NOx	VOC	PM10	Units	Assumptions and Equations
Excavator	0.016	0.088	0.192	0.008	0.024	Pounds/hour	
Wheel Loader	0.182	0.572	1.900	0.230	0.170	Pounds/hour	
Concrete Truck	0.450	1.800	4.170	0.190	0.260	Pounds/hour	
Crane	0.143	0.675	1.700	0.150	0.140	Pounds/hour	
Truck	0.002	0.006	0.021	0.002	0.002	Pounds/hour	
Personal Vehicle	0.000	5.510	0.820	0.500	0.120	g/mile	* Note -- assumes average speed is 40 mph
Dirt Moving	0.000	0.000	0.000	0.000	0.070	Pounds/ton	* Pound/ton of soil moved

CONSTRUCTION OF TOWER PADS

Equipment Used	No. Veh	veh-hr/day	day/pad	pads/yr			
Excavator	1	8	1	4	32	veh-hr/year	No. Veh x veh-hr/day x day/pad x pad/year
Wheel Loader	1	4	0.5	4	8	veh-hr/year	No. Veh x veh-hr/day x day/pad x pad/year
Concrete Truck	10	0.5	1	4	20	veh-hr/year	No. Veh x veh-hr/day x day/pad x pad/year
Dirt Moving	-	-	-	-	106.5	tons/year	Assumes cubic ft of dirt weighs 25 pounds
							2,130 cubic ft of dirt for each pad x 4 pads/year (see Section 4.1.1.1)
							equals 213,000 pounds/year or 106.5 tons/year

Calculations	SOx	CO	NOx	VOC	PM10		
Excavator	0.51	2.82	6.14	0.26	0.77	Pounds/year	Emission factor x veh-hr/year
Wheel Loader	1.46	4.58	15.20	1.84	1.36	Pounds/year	Emission factor x veh-hr/year
Concrete Truck	9.00	36.00	83.40	3.80	5.20	Pounds/year	Emission factor x veh-hr/year
Dirt Moving	0.00	0.00	0.00	0.00	7.46	Pounds/year	Emission factor x tons
Total pound/year	10.97	43.39	104.74	5.90	14.78	Pounds/year	
Total mt/year	0.00	0.02	0.05	0.00	0.01	mt/year	Pounds/year x 453.59g/pound x mt/1,000,000g
Sample Calculation, Excavator SOx emissions: 0.016 pound/hour x 32 veh-hour/year = 0.51 pound/year							

APPENDIX C
Air Quality Calculations - NWTC Emissions

EXPERIMENTAL SUPPORT

Equipment Used	No. Veh	Use (hr/da	day/pad	pad/yr			
Crane	1	8	5	20	800	veh-hr/year	No. Veh x veh-hr/day x day/pad x pad/year
Truck	1	8	5	20	800	veh-hr/year	No. Veh x veh-hr/day x day/pad x pad/year
Calculations	SOx	CO	NOx	VOC	PM10		
Crane	114.40	540.00	1,360.00	120.00	112.00	Pounds/year	Emission factor x veh-hr/year
Truck	1.60	4.80	16.80	1.60	1.60	Pounds/year	Emission factor x veh-hr/year
Total pound/year	116.00	544.80	1,376.80	121.60	113.60	Pounds/year	
Total mt/year	0.05	0.25	0.62	0.06	0.05	mt/year	Pounds/year x 453.59g/pound x mt/1,000,000g
Sample Calculation, Crane SOx emissions: 0.143 pound/hour x 800 veh-hour/year = 114.40 pound/year							

C-3

VEHICULAR TRAFFIC

Equipment Used	No. Veh	mile/day	day/year				
Personal Vehicle	125	30	260		975,000	veh-miles/year	No. Veh x miles traveled x 260 work days/year
Calculations	SOx	CO	NOx	VOC	PM10		
Personal Vehicle	0.00	5.37	0.80	0.49	0.12	mt/year	Emission factor x veh-hr/year x mt/1,000,000g
Total mt/year	0.00	5.37	0.80	0.49	0.12	mt/year	
Sample Calculation, Personal Vehicle CO emissions: 5.510 g/mile x 975,000 veh-miles/year x mt/1,000,000g = 5.37 mt/year							
Grand Total	0.06	5.64	1.47	0.55	0.18	mt/year	

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APPENDIX D

BIOLOGICAL RESOURCES TABLES

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PLANT SPECIES OCCURRING IN THE VICINITY OF NWTC
Xeric Mixed Grassland Community

Sources: U.S. DOE, 1992. *Baseline Biological Characterization of the Terrestrial and Aquatic Habitats at the Rocky Flats Plant*; U.S. DOE, 1980. *Final Environmental Impact Statement, Rocky Flats Site.*

Common Name	Scientific Name
Trees and Shrubs	
Wild Rose	*Rosa arkansana*
Cactus	
Nipple Cactus	*Coryphantha missouriensis*
Hen-and-chickens	*Echinocereus viridiflorus*
Brittle cactus	*Opuntia fragilis*
Starvation cactus	*Opuntia polyacantha*
Grasses	
Western Wheat-grass	*Agropyron smithii*
Big Bluestem	*Andropogon gerardii*
Bluestem	*Andropogon scoparius*
Three-awn	*Aristida p. robusta*
Side Oats-grama	*Bouteloua curtipendula*
Blue-grama	*Bouteloua gracilis*
Japanese Brome	*Bromus japonicus*
Cheat-grass	*Bromus tectorum*
Buffalo-grass	*Buchloe dactyloides*
Sedge	*Calamovilfa longifolia*
Sedge	*Carex eleocharis*
Sedge	*Carex filifolia*
Canada Wild-rye	*Elymus canadensis*
June Grass	*Koeleria pyramidata*
Mountain Mulhy	*Muhlenbergia montana*

Blue-grass	*Poa canbyi*
Canada Blue-grass	*Poa compressa*
Blue-grass	*Poa pratensis*
Squirrel-tail	*Sitanion hystrix*
Needle-and-Thread	*Stipa comata*
Green Needle-grass	*Stipa viridula*

Forbs	
Yarrow	*Achillea millefolium*
False Dandelion	*Agoseris glauca*
Plains Wild Onion	*Allium textile*
Alyssum	*Alyssum alyssoides*
Alyssum	*Alyssum minus*
Westerm wormwood	*Ambrosia psilostachya*
Pussytoes	*Antennaria parvifolia*
Sandwort	*Arenaria fendleri*
Orange Arnica	*Arnica fulgens*
Field Wormwood	*Artemisia campestris*
Linear-leaved Wormwood	*Artemisia dracunculus*
Pasture Sagebrush	*Arternisia frigida*
Ludiviciana	*Arternisia ludoviciana*
Green Milkweed	*Asclepias viridiflora*
White Aster	*Aster porteri*
Milkvetch	*Astragalus sp.*
Mariposa lily	*Calochortus gunnisonii*
Bushy Evening-Primrose	*Calylophus serrulatus*
Nodding Thistle	*Carduus nutans*
Plains Paintbrush	*Centaurea diffusa*
Aster	*Chrysopsis flucrata*
Aster	*Chrysopsis villosa*

Bull thistle	*Cirsium undulatum*
Colomia	*Collomia linearis*
Bastard toad -flax	*Comandra umbellata*
Hawksbeard	*Crepis runcinata*
Prairie-clover	*Dalea purpurea*
Trailing-Fleabane	*Erigeron flagellaris*
Winged Eriogonum	*Eriogonum alatum*
Western Wallflower	*Erysimum asperum*
Blanket-flower	*Gaillardia aristata*
Scarlet gaura	*Gaura coccinea*
Gumwood	*Grindelia squarrosa*
Snakeweed	*Gutierrezia sarothrai*
Whistlebroom Parsley	*Harbouria trachypleura*
Pennyroyal	*Hedeoma hispidum*
Little Sunflower	*Helianthus pumilus*
no common name	*Hymenopappuus filifolius*
Klamath Weed	*Hypericum perforatum*
Kuhnia	*Kuhnia eupatorioides*
Prickly lettuce	*Lactuca serriola*
Sand Lilly	*Leucocrinum montanum*
Blazing Star	*Liatris punctata*
Toadflax	*Linaria dalmatica*
Salt-and-pepper	*Lomatium orientale*
Mirabilis	*Mirabilis linearis*
False Gronwell	*Onosmodium molle*
Cluster Cancer-root	*Orobanche fasciculata*
Colorado Loco	*Oxytropis lambertii*
Nailwort	*Paronyuchia jamesii*
Penstemon	*Penstemon secundiflorous*

Scorpeon Weed	*Phacelia heterophylla*
Ground cherry	*Physalis heterophylla*
Cinquefoil	*Potentilla gracilis*
Prairie-clover	*Psoralea tenuiflora*
no common name	*Scorzonera lanciniata*
Stone Crop	*Sedum lanceolatum*
Butterweed	*Senecio plattensis*
Broom Ragwort	*Senecio spartioides*
Goldenrod	*Solidago nemoralis*
no common name	*Swertia radiata*
Spiderwort	*Tradescantia occidentalis*
Salisfy	*Tragopogon dubius*
Crow Cockle	*Vaccaria pyramidata*

PLANT SPECIES OCCURRING IN THE VICINITY OF NWTC
Ponderosa Pine Woodlands [1]

Sources: U.S. DOE, 1992. *Baseline Biological Characterization of the Terrestrial and Aquatic Habitats at the Rocky Flats Plant*; U.S. DOE, 1980. *Final Environmental Impact Statement, Rocky Flats Site.*

[1] This plant community covers less than 6 hectares (15 acres) of the NWTC site. The plant community was not comprehensively surveyed.

Common Name	Scientific Name
Ponderosa pine	*Pinus Ponderosa*
Douglas fir	*Pseudotsuga menziesii*
Skunkbrush sumac	*P. Trilobata*
Common juniper	*Juniperus communis*
June grass	*Koeleria cristata*
Blue grama	*Bouteloua gracilis*
Canada Bluegrass	*Poa compresa*
Pussytoes	*Antennaria parvifolia*
Spring beauty	*Claytonia lanceolata*
Porter's aster	*Chrysopsis villosa*
Wax currant	*Ribes cereum*
Ninebark	*Physocarpus monogynus*

WILDLIFE SPECIES OCCURRING IN THE VICINITY OF NWTC
Grassland and Disturbed Habitat

Sources: U.S. DOE, 1992. *Baseline Biological Characterization of the Terrestrial and Aquatic Habitats at the Rocky Flats Plant*; U.S. DOE, 1980. *Final Environmental Impact Statement, Rocky Flats Site.*

Common Name	Scientific Name
Western Painted Turtle	*Chrysemys picta*
Eastern Fence Lizard	*Sceloporus undulatus*
Short-horned Lizard	*Phrynosoma douglassi*
Racer snake	*Coluber constrictor*
Bull snake	*Pituophis melanoleucus*
Plains Garter Snake	*Thamnophis radix*
Prairie Rattlesnake	*Crotalis viridis*
Boreal Chorus Frog	*Pseudacris triseriatus*
Woodhouse's Toad	*Bufo woodhousei*
Merriam's Shrew	*Sorex merriami*
Coyote	*Canis latrans*
Raccoon	*Procyon lotor*
Long tailed weasel	*Mustela frenata*
Badger	*Taxidea taxus*
Striped skunk	*Mephitis mephitis*
Thirteen-lined Ground Squirrel	*Spermophilus tridecemlineatu*
Black-tailed Prairie Dog	*Cynomys ludovicianus*
Silky Pocket Mouse	*Perognathus flavus*
Hispid Pocket Mouse	*Perognathus hispidus*
Plains Harvest Mouse	*Reithrodontomys megalotis*
Deer Mouse	*Peromyscus maniculantus*
Mexican Wood Rat	*Neotoma mexicana*
Meadow Vole	*Microtus pennsylvanicus*
Prairie Vole	*Microtus ochrogaster*

Meadow Jumping Mouse	*Zapus hudsonius*
White-tailed Jackrabbit	*Lepus townsendii*
Black-tailed Jackrabbit	*Lepus californicus*
Desert Cottontail *	*Sylvilagus audubonii*
Porcupine	*Erthizon dorsatum*
Mule Deer	*Odocoileus hemionus*
White-tailed Deer	*Odocoileus virginianus*

* Western Prairie Hognose snake (*Heterodon nasicus*) observed by NREL staff.

BIRD SPECIES OCCURRING IN THE VICINITY OF THE NWTC
Grassland and Disturbed Habitat

Sources: U.S. DOE, 1992. *Baseline Biological Characterization of the Terrestrial and Aquatic Habitats at the Rocky Flats Plant*; U.S. DOE, 1980. *Final Environmental Impact Statement, Rocky Flats Site.*

Common Name	Scientific Name
CORMORANTS	***PHALACROCORACIDAE***
Double-crested Cormorant	*Phalacrocoraz auritus*
HERONS	***ARDEIDEA***
Great Blue Heron	*Ardea herodias*
Black-crowned Night-hero	*Nycticrax nycticorax*
GEESE AND DUCKS	***ANATIDAE***
Canada Goose	*Branta canadensis*
Snow Goose	*Chen caerulescens*
Mallard	*Anas platyrhynchos*
Bufflehead	*Bucephala albeola*
AMERICAN VULTURES	***CATHARTIDAE***
Turkey Vulture	*Cathartes aura*
EAGLES AND HAWKS	***ACCIPITRIDAE***
Sharp-shinned Hawk	*Accipiter striatus*
Cooper's Hawk	*Accipiter cooperii*
Red-tailed Hawk	*Buteo jamaicensis*
Swainson's Hawk	*Buteo swainsoni*
Rough-legged Hawk	*Buteo lagopus*
Ferruginous Hawk	*Buteo regalis*
Golden Eagle	*Aquila chrysaetos*
Bald Eagle	*Haliaeetus lecocephalus*
Northern Harrier	*Circus cyaneus*
FALCONS	***FALCONIDAE***
Prairie Falcon	*Falco mexicanus*
Peregrin Falcon	*Falco peregrinus*
American Kestrel	*Falco sparverius*

GROUSE AND TURKEYS	***PHASIANIDAE***
Ring-necked Pheasant	*Phasianus colchicus*
Wild Turkey	*Meleagris gallopavo*
RAILS AND COOTS	***RALLIDAE***
American Coot	*Fulica americana*
CRANES	***GRUIDAE***
Sandhill Crane	*Grus canadensis*
PLOVERS	***CHARADRILDAE***
Killdeer	*Charadrius vociferus*
PIGEONS AND DOVES	***COLUMBIDAE***
Band-tailed Pigeon	*Columba fasciata*
Rock Dove	*Columba livia*
Mourning Dove	*Zenaida macroura*
OWLS	***STRIGIDAE***
Great Horned Owl	*Bubo virginianus*
Short-eared Owl	*Asio flammeus*
GULLS	***LARIDAE***
Ring-billed Gull	*Larus delawarensis*
NIGHT JARS	***CAPRIMULGIDAE***
Common Nighthawk	*Chordeiles minor*
HUMMINGBIRDS	***TROCHILIDAE***
Broad-tailed Hummingbird	*Selasphorus platycercus*
WOODPECKERS	***PICIDAE***
Northern Flicker	*Colaptes auratus*
Downy Woodpecker	*Picoides pubescens*
SWALLOWS	***HIRUNDINIDAE***
Barn Swallow	*Hirundo rustica*

Threatened and Endangered Species With Potential Habitat On Or Near NWTC		
Common Name	**Scientific Name**	**Status [1]**
Federal Plant Species		
Colorado Butterflyweed [3]	*Gaura neomexicana ssp. Coloradensis*	C-1
Weber monkey-flower	*Mimulus gemmiparus*	C-2
Ute ladies' tresses orchid [3]	*Spiranthes diluvialis*	Threatened
Bell's twinpod [3]	*Physaria bellii*	C-2
Arapien stickleaf (Blazing Star) [3]	*Mentzelia argillosa*	C-2
Colorado Plant Species		
Toothcup	*Rotala ramosiou*	CO-3
Gay-feather	*Liatris ligulistylis*	CO-3
Forktip Threeawn [2]	*Aristida basiramea*	CO-3
Federal Wildlife Species		
American peregrine falcon [2]	*Falco pregrinus*	Endangered
Bald eagle [2]	*Haliaeetus leucocephalue*	Threatened[4]
Eskimo curlew [3]	*Numenius borealis*	Endangered
Ferruginous hawk [2]	*Buteo regalis*	C-2
Mexican spotted owl [3]	*Strix occidentalis lucida*	Threatened
Loggerhead shrike [2]	*Lanius ludovicianus*	C-2
North American wolverine [3]	*Gulo gulo luscus*	C-2
Preble's meadow jumping mouse [2]	*Zapus hudsonius preblei*	C-2

Plains topminnow	*Fundulus sciadicus*	C-2
Regal fritillary butterfly [3]	*Speyeria idalia*	C-2
Pawnee montane skipper [3]	*Hesperia leonardus montana*	Threatened

[1] C-1: USFWS proposed listing; C-2: USFWS has data indicating vulnerability; CO-3: Rare in Colorado
[2] Species has been identified at Rocky Flats Environmental Technology Center
[3] Species has been identified in Jefferson County
[4] Bald eagle status was changed from endangered to threatened effective August 1995.

Source: ASI, 1991b

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APPENDIX E

PREDECISIONAL DRAFT REVIEW COMMENTS

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Department of Energy
Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393

September 16, 1996

Distribution List

SUBJECT: PREDECISIONAL DRAFT SITEWIDE ENVIRONMENTAL ASSESSMENT OF THE NATIONAL WIND TECHNOLOGY CENTER, GOLDEN CO (DOE/EA-1127)

In July 1993, the U. S. Department of Energy's Golden Field Office (GO) began an evaluation of the operations at the National Wind Technology Center (NWTC) as part of strategic planning activities. As a result of this evaluation, GO decided to undertake an environmental assessment of the current and proposed activities at the NWTC. GO through its operating contractor, NREL, began the process of identifying proposed uses of the NWTC and any potential resulting impacts to environment. In May 1995, a description of the proposed activities were circulated to Federal, State and local governing agencies and local citizens that may have an interest. Environmental analyses, comments, and planning issues have all been integrated into the Predecisional Draft Sitewide Environmental Assessment. By this letter, notice is being provided that the Predecisional Draft document is available for review by interested parties. Comments are requested by September 30, 1996.

If you are interested in obtaining a copy of the Predecisional Draft document for review, please contact Deborah Turner, NEPA Compliance Officer, (303) 275-4746.

Sincerely,

John H Keuter
for
Frank M. Stewart
Manager

cc:
D. Turner, GO
M. Jordan, NREL
C. McDonough, Gallegos

Bureau of Land Management
Environmental Compliance Office
2850 Youngfield Street
Lakewood, CO 80215

Colorado Coop Fish & Wildlife Unit
201 Wagar Building
Dept. Fishery and Wildlife Biology
Colorado State University
Fort Collins, CO 80523-1484

Mr. Larry Linder
NEPA Compliance, 8WMEA
EPA Region VIII
999 18th Street
Denver, CO 80202-2466

Federal Aviation Administration
Northwest Mountain Office
1601 Lind Avenue SW
Renton, WA 98055

Mr. Duain Johnson
Soil Conservation Service
Room E20C
655 Parfet Street
Lakewood, CO 80215

Mr. Grady Towns
US Fish and Wildlife service
Denver Regional Office
P.O. Box 25486
Denver, CO 80225

Ms. Linda Coulter
CO Dept. of Agriculture
700 Kipling St., Suite 4000
Lakewood, CO 80215

CO Dept of Natural Resources
Office of Environment
1313 Sherman Street
Denver, CO 80203

CDPHE
Water Quality Division
4300 Cheery Creek Dr. So.
Denver, CO 80222-1530

CDPHE
Rocky Flats Program Unit
4300 Cherry Creek Dr. So.
Denver, CO 80222-1530

CDPHE
Office of the Environment
4300 Cherry Creek Dr. So.
Denver, CO 80222-1530

CO Office of Energy Conservation
Environmental Compliance
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Denver, CO 80202

Mr. Bob Sturtevant
CO State Forest Service
Colorado State University
Fort Collins, CO 80523

CO State Forest Service
Boulder County Office
936 Lefthand Canyon Dr.
Boulder, CO 80302

) State Forest Service
)lden District Office
04 Quaker Street
)lden, CO 80401

)vernor Roy Romer
6 State Capitol
nver, CO 80203

'. Michael Sanders
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ulder, CO 80203

'. Troy Stover
ferson County Airport
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rminal Building
oomfield, CO 80021

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vironmental Health Division
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kewood, CO 80226

'. Bryan Pritchett
erson County Open Space
0 Jefferson County Pkwy, Suite 100
)lden, CO 80401

;. Allison Peters
)ulder City Manager's Office
). Box 791
)ulder, CO 80306

Mr. Kim Gambrill
Environmental Services
CO Transportation Dept.
4201 E. Arkansas Ave.
Denver, CO 80222

Mr. Jim Green
State Historic Pres. Office
1300 Broadway
Denver, CO 80203

Jefferson County
Highways and Transportation
100 Jefferson County Pkwy.
Golden, CO 80401

Jefferson County
Assessor's Office
100 Jefferson County Pkwy.
Golden, CO 80419

Mr. Terry Green
Jefferson County Emergency Preparedness
100 Jefferson City Pkwy., Suite 4570
Golden, CO 80419

Ms. Karen Hellner
Jefferson County Planning & Zoning Office
100 Jefferson County Pkwy., Suite 3550
Golden, CO 80419-3550

Eldorado Springs / Marshall Fire Department
P.O. Box 3104
Eldorado Springs, CO 80025

Ms. Katie Fendel
Golden Public Works Office
City of Golden
911 10th Street
Golden, CO 80401

Ms. Karen Cumbo
Town Manager
Town of Superior
101 Park Place
Superior, CO 80027

Audubon Society
Rocky Mountain Regional Office
4150 Darely Avenue
Boulder, CO 80303

Coal Creek Canyon Fire
Protection District
Crescent Branch
P.O. Box 7187
Golden, CO 80403

Mr. Glen Anderson
Colorado Association of Soil
Conservation Districts
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Lakewood, CO 80215

Colorado Enviromental Coalition, Inc.
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Denver, CO 80203

Colorado Wildlife Federation
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Denver, CO 80221

Mr. Steve Nesta, T130J
EG&G Environmental Division
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Golden, CO 80402-0464

National Wildlife Federation
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Boulder, CO 80302

Rocky Flats Citizens' Advisory Board
9035 Wadsworth Parkway
Westminster, CO 80021

Rocky Flats Local Impacts Initiative
5460 Ward Road
Arvada, CO 80002

Rocky Mountain Fuel Co.
910 15th Street
Denver, CO 80202

Sierra Club
Rocky Mountain Chapter
777 Grant Street, Suite 606
Denver, CO 80203

Superior Metropolitan District
390 Union Blvd.
Lakewood, CO 80228

Vestern Aggregates
nviro Comp Office
1728 Highway 93
oulder, CO 80303

Colorado Single Point of Contact
Division of Local Government
1313 Sherman Street, Rm. 521
Denver, CO 80203

Ianisha Dave
olorado Department of Public Health and Environment
ir Pollution Control Division
300 Cherry Creek Drive, South
enver, CO 80222-1530

Gary Finstad
U.S. Department of Agriculture
Natural Resource Conservation Service
Metro Office
65 Parfet, Room E-300
Lakewood, CO 80215-5517

imothy T. Carey
ept. of the Army, Corps of Engineers
maha District
ri-Lakes Project Office
307 State Hwy. 121
ittleton, CO 80123

LeRoy W. Carlson
U.S. Department of the Interior
Fish and Wildlife Services
730 Simms Street, Suite 290
Golden, CO 80401

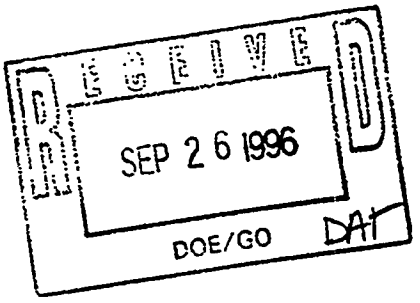
STATE OF COLORADO

DIVISION OF LOCAL GOVERNMENT
Harold A. Knott, Director

Department of Local Affairs

Roy Romer
Governor

Larry Kallenberger
Executive
Director



September 25, 1996

Mr. Frank M. Stewart, Manager
U. S. Department of Energy
Golden Field Office
1617 Cole Boulevard
Golden, CO 80401-3393

Reference: Notice of Predecisional Draft Sitewide Environmental Assessment of the National Wind Technology Center, Golden, Colorado (DOE/EA-1127)

Dear Mr. Stewart:

Please be advised that the Division has **ceased the activities of the Colorado Intergovernmental Review System and ceased serving as the E. O. 12372 Single Point of Contact (SPOC) as of July 1, 1994.** We have joined 16 other states that no longer participate in this federally-mandated intergovernmental review process.

I am returning to you today the documents you recently transmitted to us.

Please do not hesitate to call me at (303) 866-5545 if I can provide any further information.

Sincerely,

Margaret Dubas

Margaret Dubas, Program Assistant
Local Services

1313 Sherman Street, Room 521, Denver, Colorado 80203 (303) 866-2156 FAX (303) 866-4819 TDD (303) 866-5300

KAISER•HILL
COMPANY

October 15, 1996

96-RF-05927

Deborah A. Turner
Department of Energy, Golden Field Office
1617 Cole Blvd.
Golden, CO 80418

REVIEW OF NATIONAL WIND TECHNOLOGY CENTER ENVIRONMENTAL ASSESSMENT -SMN-097-96

Thank you for the opportunity to review the Predecisional Draft of the National Wind Technology Center Environmental Assessment. We apologize for the lateness of our comments. On the whole the document seemed exceptionally well written, thoroughly addressing all relevant topics. We especially noted the establishment of criteria for determining the significance of impacts immediately prior to the discussion of impacts to each resource.

The only suggestion we have is with regard to the discussion of "Cumulative Impacts" in section 5. The section is actually more of a review or summary of impacts already identified in section 4. We suggest that the discussion of cumulative effects should focus more on adding to the effects discussed in section 4 effects from "other reasonably foreseeable projects" in the area that could also affect the NWTC site even though they are not undertaken by DOE. Such projects include continued gravel mining by Western Aggregates immediately south of NWTC and cleanup activities at the Rocky Flats Environmental Technology Site to the southeast.

If you have any questions or need further information, please do not hesitate to contact me at 966-6386.

S. M. Nesta
Program Manager

ses

Org. and 1 cc - D. Turner

Kaiser-Hill Company, L.L.C.
Courier Address: Rocky Flats Environmental Technology Site, State Hwy. 93 and Cactus, Rocky Flats, CO 80007 • 303.966.7000
Mailing Address: P.O. Box 464, Golden, Colorado 80402-0464 E-7

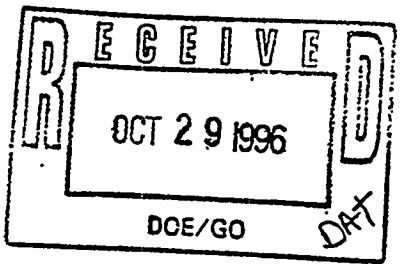
United States Department of the Interior

FISH AND WILDLIFE SERVICE

ES/CO: DOE/NREL
Mail Stop 65412

Ecological Services
Colorado Field Office
P.O. Box 25486
Denver Federal Center
Denver, Colorado 80225-0207

OCT 25 1996



Ms. Deborah Turner
NEPA Compliance Officer
Department of Energy
Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393

Dear Ms. Turner:

In response to your letter of September 13, 1996, the U.S. Fish and Wildlife Service (Service) is providing comments on the Draft Environmental Assessment of the National Wind Technology Center and any effects on listed species by this project. The Service concurs with your determination that there is no effect on any listed species by the proposed expansion of the NWTC. These comments have been prepared under the provisions of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et. seq.).

If the Service can be of further assistance, contact Clay Ronish of this office at (303) 275-2370.

Sincerely,

LeRoy W. Carlson
Colorado Field Supervisor

cc: Reading file
Project file
Reference: Clay\Species\Concur.004

UNCLASSIFIED FAX

U. S. DEPARTMENT OF ENERGY
Rocky Flats Field Office
ER/WM Projects Group
Commercial: 303-966-4728
Confirmation No. 303-966-5927

Date: 9/ 25 /96

From: R. W. Tyler, DOE/RFFO

To: Debie Turner

Receiver's FAX: 275-4788

Confirmation No.

WRITE YOUR MESSAGE BELOW

The SWEA for NWTC is generally a well written document. A few minor comments/corrections follow.

1. Page 3-3, 2nd full paragraph, next to last sentence. This sentence is confusing. I can not tell if the seismic event occurred before or after injection was discontinued.

2. Page 3-8, 4th paragraph. The Preble mouse is proposed for listing. It is not currently endangered.

3. Page 3-21, 1st full paragraph, last sentence. This sentence describes RFETS mission. A more accurate sentence would read something like: "RFETS is engaged in cleanup and closure of the site including development and application of environmental restoration techniques."

4. Page 3-26, 2nd full sentence. The term "poisonous" is generally not used in connection with hazardous waste. Suggest you use "toxic" instead.

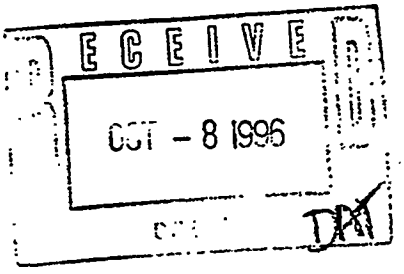
Reg Tyler

Sender's Name & Phone Number: R. W. Tyler 303-966-5927

TOTAL PAGES (including cover sheet) ____

COLORADO
HISTORICAL
SOCIETY

The Colorado History Museum 1300 Broadway Denver, Colorado 80203-2137



October 2, 1996

Frank M. Stewart
Manager
U.S. Department of Energy
Golden Field Office
1617 Cole Boulevard
Golden, CO 80401-3393

RE: Predecisional Draft Sitewide Environmental Assessment - National Wind Technology Center, Golden, CO (DOE/EA-1127)

Dear Mr. Stewart:

We have reviewed the above document provided September 23, 1996, by Deborah A. Turner of your agency.

It is our opinion that cultural resources (historic properties) have been satisfactorily addressed. In addition, we find that the proposed project will have no effect on historic properties. However, in the event that subsurface resources are encountered during ground disturbing activities, it will be necessary to halt the work until such resources can be evaluated in consultation with our office.

Our one area of concern is the specificity of cultural resource locational information contained in both maps and figures. Such information is exempt from the Freedom of Information Act in order to protect fragile cultural resources from vandalism. Since this document is - and should be - available to the public, the usual practice is to provide cultural resource locational information in a separate appendix which is made available to appropriate agency decision makers and qualified professionals who have a legitimate need for this data. In public documents, such as this environmental assessment, it is acceptable to provide general locational information, i.e. "east of the NWTC property" in the narrative and a county or other small-scale map without topographic lines marked to indicate the general areas where cultural resources have been identified or are believed likely to occur.

OFFICE OF ARCHAEOLOGY AND HISTORIC PRESERVATION
303-866-3392 Fax 303-866-4464

If we may be of further assistance, please contact Kaaren Hardy-Hunt, our Intergovernmental Services Director, at (303) 866-3398.

Sincerely,

James E. Hartmann
State Historic Preservation Officer

JEH/KH

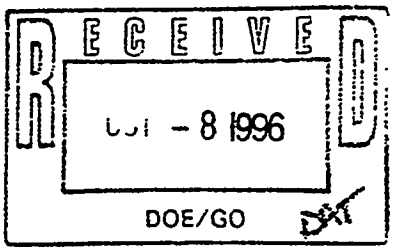
OFFICE OF ARCHAEOLOGY AND HISTORIC PRESERVATION
303-866-3392 Fax 303-866-4464

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, OMAHA DISTRICT
215 NORTH 17TH STREET
OMAHA, NEBRASKA 68102-4978

REPLY TO
ATTENTION OF

October 1, 1996

Planning Division



Mr. Frank M. Stewart, Manager
Department of Energy
Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393

Dear Mr. Stewart:

This office has reviewed your agency's Predecisional Draft Sitewide Environmental Assessment for the National Wind Technology Center, Golden, Colorado (DOE/EA-1127). We have only a few minor comments to offer.

Overall, the environmental assessment has very good organization and content. It flows well and appears to be a well-thought-out document. We believe it is adequate to satisfy NEPA compliance requirements; however, we ask that you consider the following comments:

- Para. 3.2.2, page 3-9 - grama has only one 'm'

- Pages 4-2 and 4-3 - It is not clear whether Table 4-1 values are intended to represent metric tons or English tons.

- Para. 4.2.2, page 4-8 - When we think of "pests" we normally envision animal species. Here, the term pest is used to indicate weeds, possibly including noxious weeds. It is confusing to one not accustomed to this use of the word.

- At the end of page 4-8, we would expect to see additional discussion that states something to the effect that "therefore, no impacts are expected to occur to any wetlands at the site.", rather than to leave it up to the reader to draw that conclusion.

If you have any questions concerning the above comments please feel free to contact Garry Mick at the above address or by telephone at (402) 221-4604.

Sincerely,

for Candace M. Thomas
Chief, Environmental Analysis Branch
Planning Division

Northwest Metro
Chamber of Commerce

7305 Grandview Avenue Arvada, Colorado 80002-9960
(303) 424-0313 • FAX: 424-5370

MEMO

TO: Deborah A. Turner
U.S. Department of Energy
275-4788 Fax

FROM: Luanne Auble
President & CEO

DATE: October 7, 1996

SUBJECT: Comments on Predecisional Draft DOE/EA-1127
Environmental Assessment

As a members of the Rocky Flats Future Site Use Working Group, I would like to refer to two areas of our recommendations, submitted to RFETS in June 1995, which are relative to your EA-1127.

At the time of our recommendations we were unaware of expansion plans, we supported, however, the **National Renewable Energy Laboratory Wind Site: "Although future uses on the current wind site are not officially within the jurisdiction of this Group, the Group endorses current wind technology and other renewable energy uses of the site. Current uses may be increased within the current boundary of the site."**

Secondly, a good portion of the Working Groups time was spent developing our position on a transportation corridor. I am unable to determine whether your proposed expansion impacts the possible future corridor but would ask that this be factored into your decision. **Transportation Corridor: "The working group, as a whole, did not arrive at a consensus about construction of the Northwest Parkway on site. Nothing in the report is intended to advocate for nor oppose the Parkway. However, the working group recognizes the importance of transportation infrastructure for the area's future. The consensus future use map does not prescribe a precise right of way, but does include an illustrative 1000 foot transportation corridor on site adjacent to NREL. Others will determine whether or not this will be used for a parkway."**

OCT-09-96 WED 11:47 AM 3034245370 P.02

Department of Energy
Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393

November 18, 1996

Luanne Auble
President and CEO
Northwest Metro Chamber of Commerce
7305 Grandview Avenue
Arvada, CO 80002-9960

Dear Ms. Auble:

SUBJECT: NATIONAL WIND TECHNOLOGY CENTER SITEWIDE ENVIRONMENTAL ASSESSMENT - PREDECISIONAL DRAFT COMMENT RESPONSE

Thank you for your comments on our Predecisional Draft Sitewide Environmental Assessment (EA) for the National Wind Technology Center (NWTC). Your comments and no effect determination were appreciated and have been incorporated, as appropriate, into the relevant sections of the final document. A copy of the final document will be forwarded to you once it is published.

Again, thank you for your continued interested in our proposed project. Please direct any comments to myself at (303) 275-4746.

Sincerely,

Deborah A. Turner
NEPA Compliance Officer

cc:
M. Jordan, NREL
C. McDonough, G/M

Department of Energy
Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393

November 18, 1996

Candace M. Thomas
Chief, Environmental Analysis Branch
Planning Division
Corps fo Engineers
Omaha District
215 North 17th Street
Omaha, NB 68102-4978

Dear Ms. Thomas:

SUBJECT: NATIONAL WIND TECHNOLOGY CENTER SITEWIDE ENVIRONMENTAL ASSESSMENT - PREDECISIONAL DRAFT COMMENT RESPONSE

Thank you for your comments on our Predecisional Draft Sitewide Environmental Assessment (EA) for the National Wind Technology Center (NWTC). Your comments were appreciated and have been incorporated, as appropriate, into the relevant sections of the final document. A copy of the final document will be forwarded to you once it is published.

Again, thank you for your continued interested in our proposed project. Please direct any comments to myself at (303) 275-4746.

Sincerely,

Deborah A. Turner

Deborah A. Turner
NEPA Compliance Officer

cc:
M. Jordan, NREL
C. McDonough, G/M

Department of Energy
Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393

November 18, 1996

James E. Hartmann
State Historic Preservation Officer
Colorado Historical Society
The Colorado History Museum
1300 Broadway
Denver, CO 80203-2137

Dear Mr. Hartmann:

SUBJECT: NATIONAL WIND TECHNOLOGY CENTER SITEWIDE ENVIRONMENTAL ASSESSMENT - PREDECISIONAL DRAFT COMMENT RESPONSE

Thank you for your comments on our Predecisional Draft Sitewide Environmental Assessment (EA) for the National Wind Technology Center (NWTC). Your comments and no effect determination were appreciated and have been incorporated, as appropriate, into the relevant sections of the final document. A copy of the final document will be forwarded to you once it is published.

Again, thank you for your continued interested in our proposed project. Please direct any comments to myself at (303) 275-4746.

Sincerely,

Deborah A. Turner

Deborah A. Turner
NEPA Compliance Officer

cc:
M. Jordan, NREL
C. McDonough, G/M

Department of Energy
Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393

November 18, 1996

LeRoy Carlson
Colorado Field Supervisor
Fish and Wildlife Service
Ecological Services
Colorado Field Office
P.O. Box 25486
Denver Federal Center
Denver, CO 80225-0207

Dear Mr. Carlson:

SUBJECT: NATIONAL WIND TECHNOLOGY CENTER SITEWIDE ENVIRONMENTAL ASSESSMENT - PREDECISIONAL DRAFT COMMENT RESPONSE

Thank you for your comments on our Predecisional Draft Sitewide Environmental Assessment (EA) for the National Wind Technology Center (NWTC). Your comments and no effect determination were appreciated and have been incorporated, as appropriate, into the relevant sections of the final document. A copy of the final document will be forwarded to you once it is published.

Again, thank you for your continued interested in our proposed project. Please direct any comments to myself at (303) 275-4746.

Sincerely,

Deborah A. Turner

Deborah A. Turner
NEPA Compliance Officer

cc:
M. Jordan, NREL
C. McDonough, G/M

Department of Energy
Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393

November 18, 1996

Steve Nesta
Program Manager
Kaiser-Hill
P.O. Box 464
Golden, CO 80402-0464

Dear Mr. Nesta:

SUBJECT: NATIONAL WIND TECHNOLOGY CENTER SITEWIDE ENVIRONMENTAL ASSESSMENT - PREDECISIONAL DRAFT COMMENT RESPONSE

Thank you for your comments on our Predecisional Draft Sitewide Environmental Assessment (EA) for the National Wind Technology Center (NWTC). Your comments on the cumulative impacts section were appreciated and have been incorporated, as appropriate, into the revleant sections of the final document. A copy of the final document will be forwarded to you once it is published.

Again, thank you for your continued interested in our proposed project. Please direct any comments to myself at (303) 275-4746.

Sincerely,

Deborah A. Turner
NEPA Compliance Officer

cc:
M. Jordan, NREL
C. McDonough, G/M

Department of Energy
Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393

November 18, 1996

Reg Tyler
NEPA Compliance Officer
Rocky Flats Field Office
ER/WM Projects Group
P.O. Box 928
Golden, CO 80402-0928

Dear Mr. Tyler:

SUBJECT: NATIONAL WIND TECHNOLOGY CENTER SITEWIDE ENVIRONMENTAL ASSESSMENT - PREDECISIONAL DRAFT COMMENT RESPONSE

Thank you for your comments on our Predecisional Draft Sitewide Environmental Assessment (EA) for the National Wind Technology Center (NWTC). Your comments were appreciated and have been incorporated, as appropriate, into the relevant sections of the final document. A copy of the final document will be forwarded to you once it is published.

Again, thank you for your continued interested in our proposed project. Please direct any comments to myself at (303) 275-4746.

Sincerely,

Deborah A. Turner

Deborah A. Turner
NEPA Compliance Officer

cc:
M. Jordan, NREL
C. McDonough, G/M