San Juan Basin Action Plan

THREATENED AND ENDANGERED SPECIES TECHNICAL REPORT

for the
Environmental Impact Statement on Public Service Company of New Mexico's Proposed New Mexico Generating Station and Possible New Town

United States
Department
of the Interior

Bureau of Land Management
New Mexico State Office
Santa Fe, New Mexico

October 1982

Report 15 of 22

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
NEW MEXICO STATE OFFICE
P.O. BOX 1449
SANTA FE, NEW MEXICO 87501

IN REPLY REFER TO
NM30840EIS
1792.73(934A)

October 1982

Dear Interested Citizen:

Attached is one of twenty-two technical reports developed as a basis for writing the Environmental Impact Statement on Public Service Company of New Mexico's Proposed New Mexico Generating Station and Possible New Town (NMGS EIS). (A list of the technical reports is attached.)

These technical reports provide detailed information on the existing environment, methods used for the impact analysis, and related data supportive of the analysis and conclusions presented in the EIS. These reports should be retained for use with the Draft and Final EIS and other documents related to BLM's San Juan Basin Action Plan (SJBAP).

The Draft NMGS EIS will be filed with the Environmental Protection Agency and released for public review on November 30, 1982. Comments on the Draft EIS will be due by close of business February 7, 1983, at the BLM New Mexico State Office. Because of the large volume of material presented in the technical reports, the BLM is distributing these reports in advance of the Draft EIS to provide sufficient time for public review. The technical reports will be available for public review at the places indicated on the attached list. Copies will also be available from the BLM New Mexico State Office, U.S. Post Office and Federal Building, Santa Fe, for a copy fee.

Informational public meetings are scheduled for December 1982 to provide a public forum to clarify questions and concerns about the SJBAP proposals and the related environmental documents, which will all have been issued by that time. The meetings are scheduled as follows:

- December 14, Civic Center, Farmington, 3 to 9 PM
- December 14, Convention Center, Albuquerque, 3 to 9 PM
- December 15, Chapter House, Crownpoint, 3 to 9 PM
- December 16, Holiday Inn, Gallup, 3 to 9 PM
- December 16, Kachina Lodge, Taos, 3 to 9 PM

In addition, formal public hearings will be held in January 1983 to solicit public comments on the SJBAP Proposals. These meetings are scheduled as follows:

- January 10, Chapter House, Crownpoint, beginning at 1:00 PM
- January 12, Civic Center, Farmington, beginning at 9:00 AM
- January 14 (and 15th if necessary because of the number of registrants), Four Seasons Motor Lodge, Albuquerque, I-40 and Carlisle Blvd., beginning at 9:00 AM (each day)

Questions on the public meetings, hearings, and the technical reports themselves should be directed to:

Leslie M. Cone
NMGS Project Manager
BLM, New Mexico State Office
P.O. Box 1449
Santa Fe, NM 87501
(505) 988-6184 FTS 476-6184

Sincerely yours,

Charles W. Luscher

Charles W. Luscher
State Director, New Mexico

List of Technical Reports

1. Purpose and Need
2. Project Description
3. Alternatives to the Project
4. Site Alternatives
5. Permit Reconnaissance
6. Air Quality
7. Geologic Setting
8. Mineral Resources
9. Paleontology
10. Soils, Prime and Unique Farmlands
11. Hydrology
12. Water Quality
13. Vegetation
14. Wildlife and Aquatic Biology
15. Threatened and Endangered Species
16. Cultural Resources
17. Visual Resources
18. Recreation Resources
19. Wilderness Values
20. Transportation
21. Social and Economic Conditions
22. Land Use Controls and Constraints

Availability of Technical Reports for Public Review

Individual copies of the technical reports can be obtained for a copy fee. Inquiries should be directed to:

Bureau of Land Management, New Mexico State Office
Title Records and Public Assistance Section (943B)
U.S. Post Office and Federal Building
P.O. Box 1449
Santa Fe, NM 87501
(505) 988-6107 FTS 476-6107

Copies of the reports are available for public review at the locations listed below. [Formal and informal cooperating agencies are denoted by an asterisk (*).]

BUREAU OF LAND MANAGEMENT OFFICES

New Mexico State Office

NMGS Project Staff (934A)
Room 122, Federal Building
Cathedral Place
P.O. Box 1449
Santa Fe, NM 87501
(505) 988-6184 FTS 476-6184

San Juan Energy Projects Staff (911)
Room 129, Federal Building
Cathedral Place
P.O. Box 1449
Santa Fe, NM 87501
(505) 988-6226 FTS 476-6226

Public Affairs Staff (912)
Room 2016
U.S. Post Office and Federal Building
P.O. Box 1449
Santa Fe, NM 87501
(505) 988-6316 FTS 476-6316

Division of Resources(930)
509 Camino de los Marquez, Suite 3
P.O. Box 1449
Santa Fe, NM 87501
(505) 988-6212 FTS 476-6212

Albuquerque District Office
3550 Pan American Freeway NE
P.O. Box 6770
Albuquerque, NM 87107
(505) 766-2455 FTS 474-2455

Farmington Resource Area Headquarters
900 La Plata Road
P.O. Box 568
Farmington, NM 87401
(505) 325-3581

Taos Resource Area Office
Montevideo Plaza
P.O. Box 1045
Taos, NM 87571
(505) 758-8851

Socorro District Office
198 Neel Avenue
P.O. Box 1219
Socorro, NM 87801
(505) 835-0412 FTS 476-6280

Las Cruces District Office
1705 N. Valley Drive
P.O. Box 1420
Las Cruces, NM 88001
(505) 524-8551 FTS 571-8312

Roswell District Office
1717 W. Second Street
P.O. Box 1397
Roswell, NM 88201
(505) 622-7670 FTS 476-9251

Carlsbad Resource Area Headquarters
114 S. Halagueno Street
P.O. Box 506
Carlsbad, NM 88220
(505) 887-6544

OTHER DEPARTMENT OF THE INTERIOR AGENCIES

Bureau of Indian Affairs*
Albuquerque Area Office
123 4th Street
P.O. Box 2088
Albuquerque, NM 87198
(505) 766-3374 FTS 474-3374

Bureau of Indian Affairs*
Eastern Navajo Agency
P.O. Box 328
Crownpoint, NM 87313
(505) 786-5228

Bureau of Indian Affairs*
Navajo Area Office
Box M - Mail Code 305
Window Rock, AZ 86515
(602) 871-5151 FTS 479-5314

Bureau of Reclamation*
Upper Colorado Regional Office
125 S. State Street
P.O. Box 11568
Salt Lake City, UT 84147
(801) 524-5463 FTS 588-5463

Minerals Management Service*
South Central Region
505 Marquette Avenue NW, Suite 815
Albuquerque, NM 87102
(505) 766-1173 FTS 474-1173

Minerals Management Service*
Resource Evaluation Office
411 N. Auburn
Farmington, NM 87401
(505) 327-7397 FTS 572-6254

National Park Service*
Southwest Regional Office
1100 Old Santa Fe Trail
Santa Fe, NM 87501
(505) 988-6375 FTS 476-6375

National Park Service*
Environmental Coordination Office
Pinon Building, 1220 St. Francis Drive
P.O. Box 728
Santa Fe, NM 87501
(505) 988-6681 FTS 476-6681

U.S. Fish and Wildlife Service*
Field Supervisor, Ecological Services
3530 Pan American Highway, Suite C
Albuquerque, NM 87107
(505) 766-3966 FTS 479-3966

U.S. Geological Survey (WRD)*
505 Marquette Avenue, Room 720
Albuquerque, NM 87101
(505) 766-2810 FTS 474-2817

OTHER FEDERAL AGENCIES AND ORGANIZATIONS

Environmental Protection Agency*
Region VI
1201 Elm Street
Dallas, TX 75270
(214) 767-2716 FTS 729-2716

Navajo Tribe*
c/o Division of Resources
P.O. Box 308
Window Rock, AZ 86515
(602) 871-6592

Pueblo of Zia*
General Delivery
San Ysidro, NM 87053
(505) 867-3304

Soil Conservation Service*
424 N. Mesa Verde
Aztec, NM 87410
(505) 334-9437

U.S. Corps of Engineers*
P.O. Box 1580
Albuquerque, NM 87103
(505) 766-2657 FTS 474-2657

USDA, Forest Service*
717 Gold Avenue
Albuquerque, NM 87102
(505) 474-1676 FTS 474-1676

USDA, Forest Service*
District Ranger
Mt. Taylor Ranger District
201 Roosevelt Avenue
Grants, NM 87020
(505) 287-8833

USDI, Bureau of Land Management
Division of Rights-of-Way (330)
18th and C Streets, NW
Washington, D.C. 20240
(202) 343-5441 FTS 343-5441

USDI, Bureau of Land Management
Denver Service Center (D-460)
Technical Publications Library
Denver Federal Center, Bldg. 50
Denver, CO 80225
(303) 234-2368 FTS 234-2368

NEW MEXICO STATE AGENCIES

New Mexico State Environmental Improvement Division*
725 St. Michaels Drive
P.O. Box 968
Santa Fe, NM 87503
(505) 827-5217, ext. 2416

New Mexico Energy and Minerals Department*
525 Camino de los Marquez
P.O. Box 2770
Santa Fe, NM 87503
(505) 827-3326

New Mexico Historic Preservation Bureau*
State Historic Preservation Officer
505 Don Gasper Avenue
Santa Fe, NM 87503
(505) 827-2108

New Mexico Natural Resource Department*
Villagra Building
Santa Fe, NM 87503
(505) 827-5531

New Mexico Public Service Commission*
Bataan Memorial Building
Santa Fe, NM 827-3361
(505) 827-3361

New Mexico State Engineer's Office*
Bataan Memorial Building
Santa Fe, NM 87503
(505) 827-2423

New Mexico State Planning Office*
505 Don Gaspar Avenue
Santa Fe, NM 87503
(505) 827-5191

OTHER ORGANIZATIONS

Public Service Company of New Mexico
Alvarado Square
P.O. Box 2268
Albuquerque, NM 87158
(505) 848-2700

Woodward-Clyde Consultants, Inc.
3 Embarcadero Center, Suite 700
San Francisco, California 94111
(415) 956-7070

PUBLIC AND UNIVERSITY LIBRARIES

Reading copies of the NMGS EIS and associated technical reports will be available at the following public and university libraries:

State and Public Libraries

Albuquerque Public Library
501 Copper Avenue NW
Albuquerque, NM 87102

Aztec Public Library
201 W. Chaco
Aztec, NM 87401

Crownpoint Community Library
c/o Lioness Club, P.O. Box 731
Crownpoint, NM 87313

Cuba Public Library
Box 5, La Jara
Cuba, NM 87027

Farmington Public Library
302 N. Orchard
Farmington, NM 87401

Gallup Public Library
115 W. Hill Avenue
Gallup, NM 87301

Mother Whiteside Memorial Library (Public)
525 W. High Street
P.O. Box 96
Grants, NM 87020

New Mexico State Library
325 Don Gaspar Avenue
Santa Fe, NM 87503

Harwood Foundation Library
(Public)
25 LeDoux
P.O. Box 766
Taos, NM 87571

University/College Libraries

University of New Mexico
General Library
Albuquerque, NM 87131

Navajo Community College Library
Shiprock Branch
P.O. Box 580
Shiprock, AZ 87420

Northern New Mexico Community College
P.O. Box 250
Espanola, NM 87532

New Mexico State University
San Juan Campus
4601 College Blvd.
Farmington, NM 87401

University of New Mexico, Gallup Campus
Learning Resources Center
200 College Road
Gallup, NM 87301

New Mexico State University/Grants
1500 Third Street
Grants, NM 87020

New Mexico Highlands University
Donnelly Library
National Avenue
Las Vegas, NM 87701

College of Santa Fe
Fogelson Memorial Library
St. Michaels Drive
Santa Fe, NM 87501

THREATENED AND ENDANGERED SPECIES TECHNICAL REPORT

for the

Environmental Impact Statement on Public Service Company of New Mexico's Proposed New Mexico Generating Station and Possible New Town

Prepared by

Woodward-Clyde Consultants

for the

U.S. Department of the Interior Bureau of Land Management

CONTENTS

CONTENTS

MAPS AND FIGURE

TABLES

NEW MEXICO GENERATING STATION

1.0 INTRODUCTION

BACKGROUND

Included in the recent Council on Environmental Quality Regulations (1979) are several important objectives to reduce excessive paperwork in the preparation of environmental impact statements (EISs):

- Discuss only briefly issues other than significant ones.
- Emphasize the portions of the EIS that are useful to decision makers and the public and reduce emphasis on background material.
- Prepare analytic rather than encyclopedic EISs.

In order to accomplish these objectives and still provide the depth and background required for an analytic impact statement, this technical report has been prepared for the New Mexico Generating Station (NMGS) project. In this report, impacts that were not identified as significant but which are still considered important by the public or technical specialists are analyzed. Background material is provided for those issues and impacts that were considered necessary for the comparison of alternatives. Impacts that were not identified as significant or important by the public and by technical

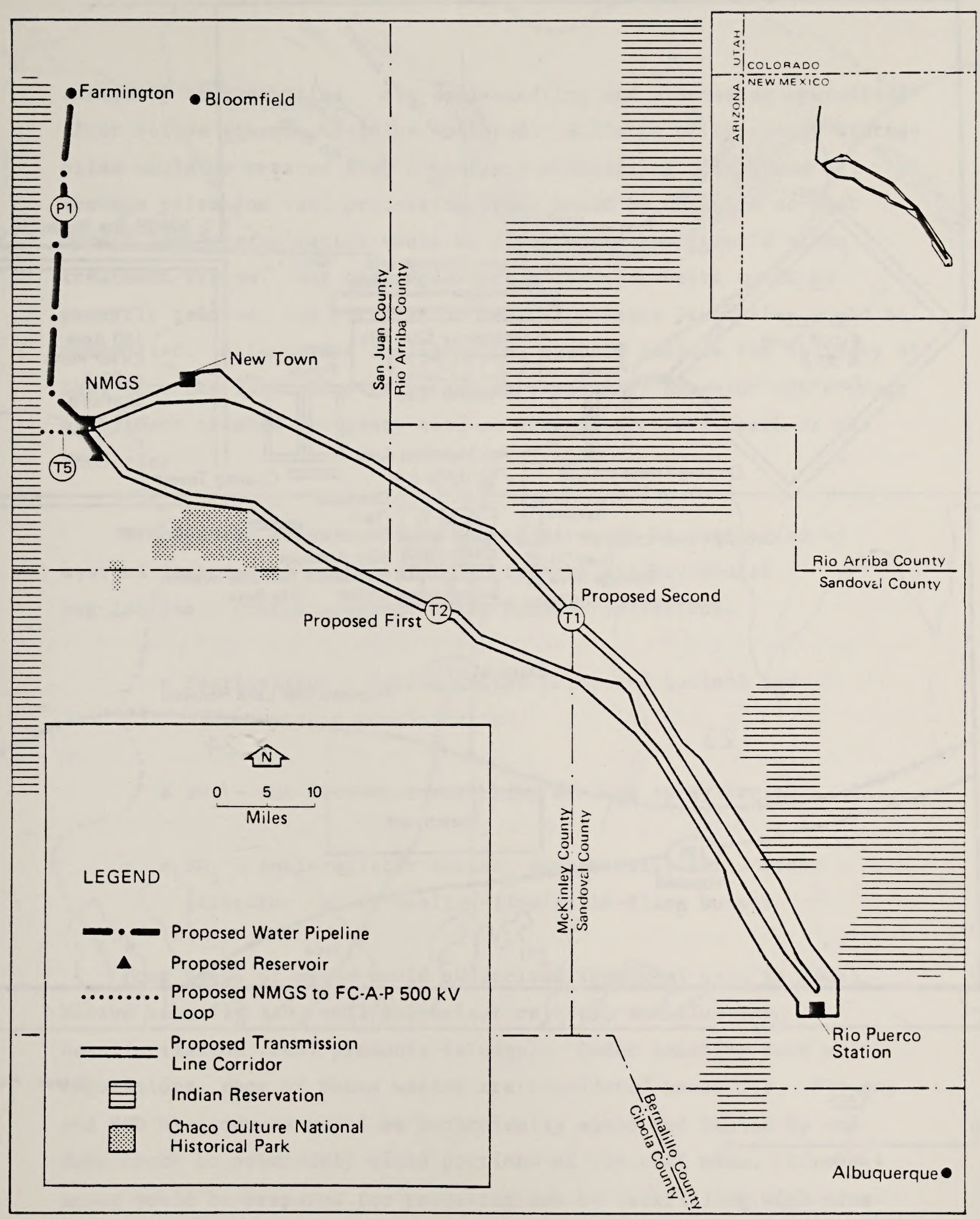
preparers are summarized, and reasons for their elimination from detailed analysis are discussed.

SUMMARY DESCRIPTION OF PROJECT COMPONENTS

Public Service Company of New Mexico (PNM) proposes to construct a 2000-megawatt (MW) coal-fired electric generation plant approximately 35 miles south of Farmington, New Mexico, in San Juan County (Map 1-1). The proposed NMGS, at ultimate development, would have four 500-MW generating units. Each generating unit would include a turbine generator area, coal pulverizer area, boiler area, particulate removal system, SO_2 removal system, and chimney stack. The proposed arrangement of these and other power plant components is shown in Figure 1-1. For the environmental analysis, it was assumed that commercial operation of the first 500-MW unit would begin in 1990 and that other units would start operating during the 1990s.

Coal for NMGS would be acquired through long-term contracts with Sunbelt Mining and Arch Minerals (Proposed Action) or other producers in the San Juan Basin (alternative coal supply). Coal acquired from a joint venture of Sunbelt and Arch Minerals would be supplied from surface mines (referred to as the Bisti mine in this analysis) in the immediate vicinity of the proposed plant site. Coal acquired from other producers in the San Juan Basin would be hauled from mines located as much as 30 miles from the proposed plant site. Coal required for NMGS would average 7.5 million tons per year, or a total of 300 million tons over the 40-year project life.

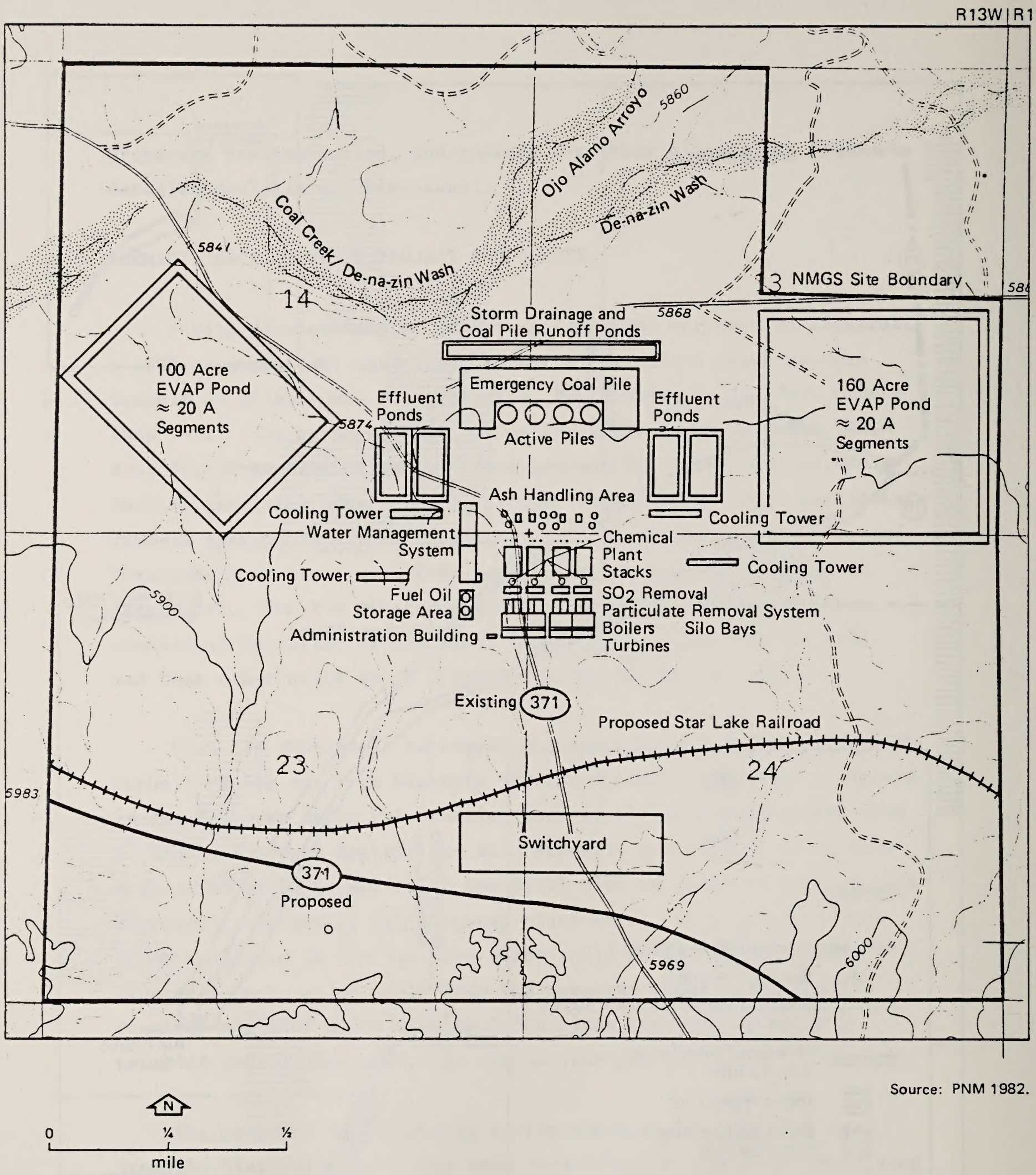
The proposed fuel-handling system would involve hauling coal from the Bisti mine (or other mine locations) by truck to a receiving facility located adjacent to the NMGS site. Coal would then be transferred via conveyor belt from the receiving station to active or



Note: For more information, see the location maps in Appendix G of the EIS.

Source: BLM 1982.

Map 1-1. GENERAL LOCATION OF PROPOSED ACTION



Source: PNM 1982.

N

0 ¼ ½
mile

Figure 1-1. STATION LAYOUT

emergency storage piles. All coal-handling and processing operations after active storage would be enclosed. Surfaces of emergency storage piles would be treated with a nontoxic stabilizing agent, and all storage piles and coal-processing areas would be designed so that runoff from precipitation would be diverted to the plant's water treatment system. Any coal spills from conveyor belts would be promptly removed, and percolation beneath on-site stockpiles would be controlled. Alternative fuel-handling systems include the delivery of coal from the Bisti mine to receiving station by conveyor and storage of primary crushed emergency coal on Sunbelt property north of the NMGS site.

Atmospheric emissions from the plant would be controlled by systems designed to meet applicable federal and New Mexico regulations. Control systems being considered include:

- Particulates - fabric filter (Proposed Action) and electrostatic precipitator
- SO_2 - wet limestone scrubbing or lime spray drying
- NO_x - dual-register burner, tangentially fired steam generator, or controlled-flow/split-flame burner

Four types of waste would be derived from coal used in NMGS: bottom ash, fly ash, coal pulverizer rejects, and flue gas desulfurization (FGD) products (sludge). Under existing laws and regulations, none of these wastes are considered hazardous. Fly ash and FGD by-products would be mechanically mixed and hauled by end-dump truck to previously mined portions of the coal mine. Disposal areas would be prepared for receiving ash by backfilling with mine overburden. Ash would then be dumped and spread in layers over the

mine overburden. After the ash was placed and spread, it would be covered with layers of overburden and surface soil or topsoil and then a vegetative cover would be established. Bottom ash and pulverizer rejects would be collected for disposal in dewatering bins and then hauled by end-dump trucks for disposal into previously mined portions of the coal mine. Procedures for disposal would be the same as for fly ash.

The water management system would contain all equipment necessary to treat and supply all the plant makeup water and potable water. The power plant would be designed and operated as a zero-discharge plant; wastewater would be reused by cascading it to uses requiring successively lower water quality. Used water, degraded to the extent that it could not be economically treated for further in-plant use, would be used for transport and disposal of plant-generated wastes or would be discharged to evaporation ponds (Figure 1-1). Evaporation ponds would be lined with impervious material to limit seepage losses.

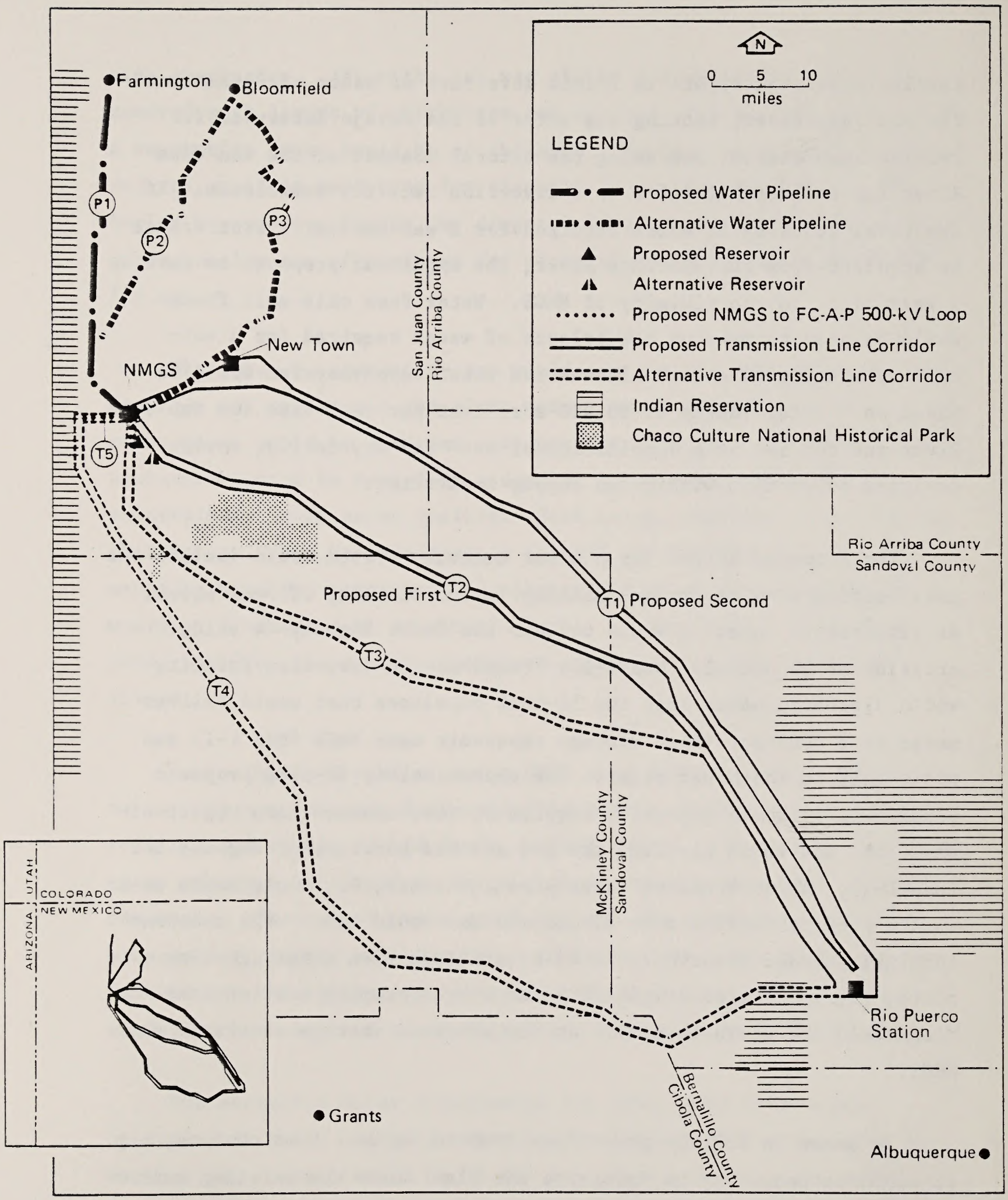
Water supplies available for NMGS are believed to be sufficient to construct an all-wet heat-rejection system, based on evaporative cooling, and to use forced-draft cooling towers (Figure 1-1). Cooling-tower makeup water would be drawn from the nearby raw-water storage reservoir. The makeup water would replace the tower losses from evaporation, drift, and blowdown. If sufficient water could not be secured for a totally evaporative system, a water-cooling system employing both dry and conventional wet towers might be required.

The estimated water requirement for NMGS, with four units operating at rated capacity and a heat-rejection system equipped with wet-cooling towers, would be 35,000 acre-feet per year. In order to supply this quantity of water to NMGS, the Proposed Action would

involve acquiring rights to 35,000 acre-feet of water per year from the San Juan River, storing the water in the Navajo Reservoir for release upon demand, and using the natural channel of the San Juan River for delivery of water to a diversion facility downstream. If the total quantity of water required for a wet-cooling system cannot be acquired from the San Juan River, the applicant proposes to develop a well field in the vicinity of NMGS. Water from this well field would be used to make up the balance of water required for a wet-cooling system. A second alternative water supply system would be based on a total supply of 20,000 acre-feet per year from the San Juan River and the use of a combination of wet- and dry-cooling towers designed to perform within the supply constraint.

The Proposed Action for a water delivery system would include the construction of a diversion facility in the vicinity of Farmington; an alternative location would be near the State Highway 44 bridge crossing at Bloomfield (Map 1-2). Pumps at the diversion facility would discharge water into two 36-inch pipelines that would deliver water to a 4000-acre-foot storage reservoir near NMGS (Map 1-1) and ultimately to the power plant. The approximately 40-mile proposed pipeline (P1) would generally require 90-foot construction rights-of-way (ROW) and would parallel the new and old portions of Highway 371 (Map 1-1). An alternative water pipeline route, P2, would begin at an intake pumping station near Bloomfield and would end at the proposed terminal storage reservoir. A 49-mile alternative water pipeline route, P3, would also originate at an intake pumping station near Bloomfield and would terminate at the proposed storage reservoir near NMGS.

In order to deliver power from NMGS to various load centers, it would be necessary to integrate the plant into the existing bulk



Note: For more information, see the location maps in Appendix G of the EIS.

Source: BLM 1982.

Map 1-2. GENERAL LOCATION OF ALTERNATIVES INCLUDING THE PROPOSED ACTION

transmission systems of PNM and neighboring utilities. Thus the proposed transmission system would consist of a 500-kilovolt (kV) loop linking NMGS with PNM's approved 500-kV Four Corners-Ambrosia-Pajarito (FC-A-P) line, located approximately 5 miles west of NMGS, and two 500-kV lines linking NMGS with the Albuquerque distribution and load center at the proposed Rio Puerco Station (Map 1-1). The NMGS-Albuquerque system would be installed in phases: the 500-kV loop in 1990 with commencement of commercial operation of Unit 1, the first 500-kV line with Unit 2 in 1993, and the second 500-kV line with Unit 4 in 1998.

Four routes are considered technically and economically feasible for construction of the 500-kV transmission system. Route T2 is proposed for the first 500-kV line and route T1 is proposed for the second 500-kV line; routes T3 and T4 are alternatives to the Proposed Action. The total distance traversed would be similar for the two proposed and two alternative corridors: 101 miles (T2), 107 miles (T1), 105 miles (T3), and 126 miles (T4). With the exception of tower sites, the proposed 200-foot ROW could support other compatible land uses, such as grazing. PNM would keep the transmission line ROW closed and would patrol the line by helicopter each month. Lands disturbed by heavy equipment and temporary access roads would be restored to their original condition.

Table 1-1 displays construction work force estimates over time. Construction employment for station facilities would reach peaks of 1515 employees in 1987 and 1530 employees in 1992. Operations employment at station facilities would increase steadily, from 30 employees in 1989 to 900 employees in 1999 when all four units are expected to be on-line.

Table 1-1. NMGS CONSTRUCTION AND OPERATION EMPLOYMENT

			NMGS											
			Construction					Operation						
Year	Intake Pipeline and Reservoir	500-kV Trans-mission Line	Unit 1	Unit 2	Unit 3	Unit 4	Total	Unit 1	Unit 2	Unit 3	Unit 4	Total	Total Employment	Annual Change
1985	—	—	85	—	—	—	85	—	—	—	—	—	85	+85
1986	—	—	800	—	—	—	800	—	—	—	—	—	800	+715
1987	115	—	1515	—	—	—	1630	—	—	—	—	—	1630	+830
1988	295	104	1180	30	—	—	1505	—	—	—	—	—	1505	-125
1989	—	—	360	450	—	—	914	30	—	—	—	30	944	-560
1990	—	—	100	940	40	—	1080	200	—	—	—	200	1280	+336
1991	—	—	—	750	570	—	1320	250	—	—	—	250	1570	+290
1992	—	—	—	270	1260	—	1530	250	24	—	—	274	1804	+234
1993	—	—	—	105	955	30	1090	250	160	—	—	410	1500	-304
1994	—	78	—	—	325	435	838	250	200	30	—	480	1318	-182
1995	—	—	—	—	90	940	1030	250	200	200	—	650	1680	+362
1996	—	—	—	—	—	775	775	250	200	250	—	700	1475	-205
1997	—	—	—	—	—	255	255	250	200	250	24	724	979	-496
1998	—	—	—	—	—	95	95	250	200	250	160	860	955	-24
1999	—	—	—	—	—	—	0	250	200	250	200	900	900	-55

Source: PNM 1980, unpublished data.

According to PNM (unpublished data, 1980), estimated construction employment skill requirements would be as follows:

Skill	Percent of Total Construction Work Force
Boilermakers	9.4
Pipefitters	14.2
Electricians	14.4
Carpenters	5.6
Ironworkers	10.0
Operators	10.0
Laborers	9.0
Teamsters	4.1
Cement masons	0.8
Millwrights	3.3
Insulators	4.0
Sheetmetal workers	1.1
Painters	1.2
Others	0.5
Supervision	12.4

The above estimates are averaged for construction of all four units.

SAN JUAN BASIN ACTION PLAN OVERVIEW AND RELATIONSHIP OF THE NMGS EIS TO ACTIONS INCLUDED IN THE PLAN

The proposed site for the NMGS is located in the San Juan Basin of northwestern New Mexico. The Bureau of Land Management (BLM) is responsible for the management of much of the land and mineral resources in this area, and currently has six separate but

interrelated proposals under consideration within the basin. In order to respond to these, the BLM has developed a San Juan Basin Action Plan (SJBAP). This plan provides for the organizational arrangements whereby the environmental analyses and decision making can be implemented in a timely and efficient manner. The plan describes the process for preparation of three site-specific EISs (including the NMGS EIS) and three Environmental Assessments (EAs):

- Coal Preference Right Lease Applications (EA)
- San Juan River Regional Coal Leasing (EIS)
- Wilderness Study Areas (WSAs) (EIS)
- New Mexico Generating Station (EIS)
- Ute Mountain Land Exchange (EA)
- Bisti Coal Lease Exchange (EA)

In addition to these documents, the action plan provides for the preparation of a Cumulative Overview (CO). The CO is intended to focus on the cumulative impacts that would result from the proposed actions analyzed in the EISs and EAs listed above and therefore to facilitate public review and decision making. As a result of this organization, the impact analysis in the NMGS EIS and technical background reports concentrates on the impacts expected to result from the specific NMGS components proposed. The cumulative impacts expected to result from the proposed NMGS, in addition to the cumulative impacts of other proposals to be developed in the same time period, are described in the CO.

BASELINE CONDITIONS ASSUMED FOR THE NMGS TECHNICAL REPORT IMPACT ANALYSES

The site-specific impact analysis for this technical report was based on the affected environment and available resources that would

be existing at the time of construction and operation of the NMGS facility. Since construction at the NMGS facility would not begin until 1985, certain assumptions regarding project development in the San Juan Basin were necessary. Two levels of project development were considered, along with criteria for each, in developing a status for the various non-SJBAP actions proposed for the San Juan Basin area.

- Baseline 1 - The projects considered in this level of development are those that have approval and are to be built or under construction in 1985. This level represents the projected existing environment without the proposals included in the SJBAP.

- Baseline 2 - The projects considered in this level are in some phase of the application stage. In this level, Baseline 1 projects are added to any projects in Baseline 2 along with any revision in resource production or uses (e.g., coal).

Where differences in Baselines 1 and 2 affect the results of impact analyses, discussion is provided. If no differences are identified, it should be assumed that consideration of the two different baselines did not alter the impact analyses.

A complete list of projects and comprehensive location maps for Baselines 1 and 2 are provided in Appendix C of the NMGS EIS.

ORGANIZATION OF THE REPORT

Section 2.0 of this technical report describes the assumptions and methodological approach used in the assessment of potential impacts of the Proposed Action on the affected environment. In

addition, Section 2.0 contains a definition of the study area and identification of data sources.

Section 3.0, Affected Environment, contains baseline data on existing conditions in the study area, as well as projections of future conditions without the Proposed Action. Information on historical trends is presented where it is useful in providing a basis for predicting most likely future trends. The description of projected future trends takes into consideration the changes in the environment that are expected to occur as a result of the projects identified in Baseline 1. This provides a reasonable estimate of the future existing environment against which the potential impacts of the Proposed Action and alternatives can be assessed.

Section 4.0 describes the potential effects of implementing the Proposed Action and alternatives. Impacts identified are measured against indicators of significance in order to estimate the importance of the impact to the affected human environment. (Potential impacts associated with alternatives to the Proposed Action are compared in Section 9.0.)

In Section 5.0, mitigation measures are suggested. These measures would help to alleviate the potentially significant adverse impacts or enhance the beneficial impacts identified in the Section 4.0 analysis. Those potentially adverse impacts for which no appropriate mitigation measures have been suggested are discussed in Section 6.0 as "unavoidable adverse impacts."

COMPLIANCE WITH THE THREATENED AND ENDANGERED SPECIES ACT

As lead agency for the NMGS EIS, the BLM is charged with ensuring NEPA compliance, as well as responsibility for compliance with the

Threatened and Endangered Species Act of 1973, as amended. The BLM is required to conduct a biological assessment to identify listed species that are likely to be affected by such action. The biological assessment is conducted for those species included on a list, as amended, provided by the U.S. Fish and Wildlife Service (FWS) (Appendix A). Candidate species are included on the list even though they do not have legal protection under the Act. Their inclusion recognizes that they may be listed at any time and have the potential to cause delays or modifications to the proposed action. This technical report is the biological assessment for those species.

The FWS is responsible for providing consultation concerning the possible effects of the proposed action on threatened or endangered species as required by section 7 of the Endangered Species Act of 1973, as amended. Any required consultation will be conducted in accordance with 50 CFR 402, Interagency Cooperation, Endangered Species Act of 1973.

The approach used in reviewing potentially affected endangered and threatened species was to consider those organisms that have been listed, proposed, or are candidates for listing as threatened or endangered by the FWS. The state of New Mexico does not have a list of plant species that have been afforded legislative protection. However, animal species are protected under the Wildlife Conservation Act. Definitions of terms in the report as they relate to the status of the species are given below.

Endangered

Endangered species means any species that is in danger of extinction throughout all or a significant portion of its range (PL 93-20-5, Endangered Species Act, 1973).

Threatened

Threatened species means any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range (PL 93-025, Endangered Species Act, 1973).

Threatened by Similarity of Appearance

The Secretary of the Interior may, by regulation, and to the extent deemed advisable, treat any species as an endangered species or threatened species even though it is not listed, pursuant to section 4 of the Endangered Species Act, if the secretary finds that: (1) such species so closely resembles in appearance, at the point in question, a species that has been listed pursuant to such section that enforcement personnel would have substantial difficulty in attempting to differentiate between the listed and unlisted species; (2) the effect of this substantial difficulty is an additional threat to an endangered or threatened species; and (3) such treatment of an unlisted species will substantially facilitate the enforcement and further the policy of the Endangered Species Act (PL 93-205, 1973).

Proposed

The Secretary of the Interior, within 90 days of receipt of the petition of an interested person under subsection 553(e) of Title 5, United States Code, can conduct and publish in the Federal Register a review of the status of any listed or unlisted species proposed to be removed from or added to the endangered and threatened species lists, if the secretary publishes a finding that such person has presented substantial evidence that warrants such a review. Further details of the review process are provided in PL 93-205 (Endangered Species Act, 1973).

Notice of Review

The Secretary of the Interior may not add species to, or remove such species from, any list published unless the secretary has first: (1) published notice in the Federal Register and notified the governor of each state within which such species is then known to occur that such action is contemplated; (2) allowed each such state 90 days after notification to submit its comments and recommendations, except to the extent that such period may be shortened by agreement between the secretary and the governor or governors concerned; and (3) published in the Federal Register a summary of all comments and recommendations received by him that relate to such proposed action (PL 93-205, Endangered Species Act, 1973).

Status Review

The status of many species is currently being reviewed by the FWS. If the FWS finds sufficient cause to suspect such a species is actually threatened or endangered, the species will then be proposed for inclusion in the federal list following procedures stated in PL 205. During the status review process, the FWS may solicit data from other sources to aid in the decision.

2.0
FRAMEWORK FOR ANALYSIS

GEOGRAPHIC AREA OF INFLUENCE

Potential impacts to threatened or endangered species were assessed for specific areas where construction-related activities would be expected, as follows:

- 3.75 square miles at the proposed plant site
- 90-foot-wide ROW for water pipelines P1, P2, and P3
- 200-foot ROW for transmission lines T1, T2, T3, T4, and T5
- Miscellaneous ancillary facilities, such as the Rio Puerco Station, intake structures and pumping plant on the San Juan River, pumping stations for the proposed and alternative water pipelines, and the water storage reservoir

In addition to these areas, a larger area would be affected due to factors such as increased human presence, off-road vehicle activities, and general increases in recreational use, including possible collection of threatened or endangered species. This larger geographic area of influence was defined for the threatened and endangered species assessment by: (1) a 5-mile radius from the proposed NMGS site and (2) a 10-mile corridor centered on proposed and alternative ROWs.

A further expansion of the geographic area of influence was identified as the result of the potential for acid precipitation effects resulting from the proposed generating station emissions. This expansion of the area of influence included high-elevation habitats and watersheds with poorly buffered soils in northern New Mexico and southern Colorado.

INDICATORS OF SIGNIFICANCE

Determination of impacts to threatened or endangered species was based on an assessment of project components that could potentially affect proposed listed species. Findings of "may affect" were made if a species or potential habitat has been reported in the geographic area of influence and if there is potential for direct or indirect impacts to individuals, populations, or critical habitat. A finding of "no effect" was made if the species or potential habitat has not been reported in the geographic area of influence or there is little potential for direct or indirect impacts.

Findings of the biological assessment will be reviewed by FWS pursuant to Section 7 of the Endangered Species Act. The significance of any impacts that have been identified would be determined on the basis of an assessment of whether there would be jeopardy to the continued existence of a listed or proposed species.

3.0 AFFECTED ENVIRONMENT AND DETERMINATION OF EFFECT

The proposed NMGS project components or areas potentially affected by acid precipitation are located within the historical or potential range of several species listed by FWS as federally endangered or candidates for review (Table 3-1). In the sections below, background information is presented and a determination is made as to whether the project may affect a species or would have no effect on it.

WILDLIFE AND AQUATIC SPECIES

Black-Footed Ferret

The black-footed ferret (*Mustela nigripes*) is listed as endangered throughout its range by the FWS (*Federal Register*; May 20, 1980; pp. 33768-33781) and as endangered (Group I) by the New Mexico Department of Game and Fish (Hubbard et al. 1979). The original ranges of the black-footed ferret and prairie dogs coincided in presettlement times. The black-footed ferret occupied almost all of the mid- and short-grass prairie region, from Saskatchewan and Alberta in the north to areas of New Mexico and Texas in the south (Gates 1973).

From 1903 to the present, black-footed ferrets have been reported from all but the southernmost portion of New Mexico. Most verified

Table 3-1. FEDERAL THREATENED, ENDANGERED, AND CANDIDATE SPECIES

Common Name	Scientific Name	Determination of Effect
Listed		
Black-footed ferret	Mustela nigripes	No effect
Bald eagle	Haliaeetus leucocephalus	No effect
Peregrine falcon	Falco peregrinus	No effect
Humpback chub	Gila eypha	No effect
Bonytail chub	Gila elegans	No effect
Greenback cutthroat trout	Salmo clarki stimous	May affect
Colorado squawfish	Ptychocheilus lucius	No effect
Mesa Verde cactus	Sclerocactus mesae verdae	May affect
Spineless hedgehog cactus	Echinocereus triglochidiatus var. inermis	No effect
Knowlton cactus	Pediocactus knowltoni	No effect
Proposed		
None		
Candidate Plant Species		
Zuni milkvetch	Astragalus accumbens	No effect.
Fleabane	Erigeron rhizomatus	No effect
Devil's claw cactus	Sclerocactus whipplei var. heilii	No effect
Bladderpod	Lesquerella pruinosa	No effect
Mancos milkvetch	Astragalus humillimus	May affect
Annual saltbush	Atriplex pleiantha	No effect

records in New Mexico are at least several decades old (Hubbard et al. 1979). There are no known records of the black-footed ferret in San Juan County during this century. Three collections and a single observation, however, have been verified from McKinley County; the last record was in 1940. Sightings of black-footed ferrets have been reported by local people on the Navajo Reservation directly to the west of tne project area. Although these sightings are considered reliable by the Navajo Game and Fish Program, they have not been confirmed by a trained biologist. Based on available information, prairie dog towns (i.e., potential black-footed ferret habitat) occur only within the T2 and T3 transmission line corridors.

According to Hansen (1981a), the history of the black-footed ferret in New Mexico includes the following:

- The last specimen was collected in New Mexico in 1954.
- No reliable sightings have been recorded in recent years.
- Surveys by the FWS, other government agencies, and private groups have not revealed the presence of black-footed ferrets in New Mexico in recent years. (The Division of Animal Damage Control annually surveys more than 20,000 acres of private land in the northwestern counties.)
- In recent years, even in areas where the ferret was comparatively common historically (e.g., South Dakota), only a few sightings have been made.

The probability of survival of a species that is drastically reduced in range and numbers, as the ferret is, must also be considered. Hansen (1981b) states that the FWS in Albuquerque is

"also planning to prepare a 'Notice of Review' for publication in the Federal Register, which will state that this region of the FWS is considering declaring the species extinct in the states of Arizona, New Mexico, Oklahoma, and Texas." He also states that FWS will no longer recommend that surveys of prairie dog towns be required for linear-type projects within the historical range of the ferret in New Mexico.

Considering the discussion above and that the potential impact would be from the short-term construction of a linear project, the Proposed Action and alternatives should have no effect on the black-footed ferret.

Bald Eagle

The bald eagle (*Haliaeetus leucocephalus*) is listed as endangered in the Southwest by the FWS (Federal Register; May 20, 1980; pp. 33768-33781) and state-endangered (Group II) by the New Mexico Department of Game and Fish (Hubbard et al. 1979).

The bald eagle is generally associated with riparian habitat, including rivers and lakes, and it usually nests near bodies of water where it feeds. Selection of nesting sites varies according to the species of trees growing in a particular area. The tops of tall trees, either living or dead, are generally preferred. Regardless of this variation in sites, certain general elements seem to be consistent: (1) the proximity of water (usually within a half-mile) and a clear flight path to a close point on the water; (2) the largest living tree in a span; and (3) an open view of the surrounding area. The proximity of good perching trees may also be a factor in site selection. An otherwise suitable site may not be used if there is excessive human activity in the area (FWS 1981).

A few bald eagle nests have been reported in New Mexico. A nest was reported near Navajo Reservoir in the early 1960s (Hubbard et al. 1979). No nests are reported in southern Colorado in areas where potential acid precipitation could occur. In winter and during migration the species is relatively widespread and even locally common in New Mexico, especially along major northern and western streams and reservoirs. The bald eagle also occurs in high mountain areas of northwestern New Mexico and southwestern Colorado as a migrant. The bald eagle is a common winter resident along the San Juan River and is reported from the San Juan River basin both downstream and upstream from Farmington, particularly around Navajo Reservoir (FWS 1981). From 18 to 25 wintering bald eagles were reported between Shiprock and Bluff, Utah, during 1978-1980. No bald eagle roosts have been reported along any of the proposed water pipelines or intakes (Ramakka 1981a).

As a relatively common winter resident in the vicinity of proposed and alternative intake structures, the bald eagle is often associated with San Juan River riparian habitat and depends on fish in the river as part of its prey base. No impacts to this riparian habitat or prey base are expected, because no appreciable decrease in San Juan River minimum or peak flows would occur due to proposed water withdrawal for the NMGS. Detailed discussion of this topic is contained in technical reports for hydrology, vegetation, and wildlife resources.

The potential for acid precipitation affects on bald eagles is limited because the prey base near known nesting or wintering areas would not be affected. The only known concentrations of bald eagles in the area of influence for the proposed project are at lower elevations, where the eagles winter in riparian habitat along major streams or rivers. These streams have a high capacity for buffering

inputs of acid and therefore would not be likely to sustain acid precipitation impacts to the bald eagle prey base (fish).

In areas that are more likely to be affected by potential acid precipitation (high mountain lakes and streams of northern New Mexico and southern Colorado), some losses could occur to the bald eagle prey base (fish). Recent studies (EDF, 1982) have indicated that birds and mammals which depend on acid-sensitive species for food could be expected to decline if feeding lakes and streams become acidified. However, impacts to bald eagles in these high-elevation areas would be limited by two primary factors:

- Bald eagles have alternative food sources; i.e., they will prey upon various water birds and mammals (Hubbard et al., 1979) and will feed on carrion.

- Bald eagles occur in high-elevation habitat within the area of influence as migrants and do not make extensive use of the habitat for any extended period. No nesting sites or wintering areas are reported in these areas.

Based upon the information presented above, it has been determined that bald eagles would not be affected by the proposed project because:

- No nests or roosts exist in the vicinity of project components.

- Riparian vegetation and hunting territory would not be affected.

- The prey base in wintering areas (fish in the San Juan River) would not be impacted.

- In high mountain areas where acid precipitation could occur, the bald eagle is present only as a migrant and impacts would not occur because of the limited use of those areas.

Peregrine Falcon

The peregrine falcon is listed as endangered by the FWS. Although habitat requirements for peregrine falcons in the Rocky Mountain region are variable, adequate nesting habitat and extensive hunting habitat are essential. In New Mexico, peregrine falcons nest on cliffs that are typically high and relatively near water that can be used for bathing. These nesting sites are generally located so that they overlook large expanses where the falcon is able to forage for passerine birds and waterfowl. Recent (post-1960) observations of peregrine falcons have been reported in San Juan and Rio Arriba counties in New Mexico (Hubbard et al. 1979). Nesting and hunting peregrines have been documented in most of the counties in the western two-thirds of Colorado (Torres et al. 1978). There are no known nests that would be affected by any component of the proposed project.

Air quality analyses have determined that there is potential for acid precipitation in lakes and streams of northern New Mexico and southern Colorado due to insufficient natural buffering. Although peregrine falcons occur in areas where acid precipitation may occur (northwestern New Mexico and southwestern Colorado), nesting and foraging habitats and the prey base of the peregrine are not likely to be affected. Peregrine falcons primarily forage on passerine birds and waterfowl (Torres et al. 1978). They do not feed on fish, which would be one of the most likely groups to be affected by acid rain. Peregrine falcons could come in contact with potential acidic waters during hunting or bathing in lakes with a lowered pH. This could result in some loss of protective oils from the feathers, but

generally the short time in the water would not result in any significant effects.

A determination of no effect is made for the peregrine falcon because no nests or important habitat occur in the vicinity of project components, and no impacts resulting from potential acid precipitation are anticipated.

Bonytail Chub

The bonytail chub is listed as endangered by FWS (1980). Historically, the bonytail chub inhabited the large tributaries of the Colorado River system. The bonytail has not been reported in Colorado since the 1960s; however, it still occurs in the Green River in Utah.

The bonytail chub does not occur in the area of any project component, and potential acid rain in southwestern Colorado is not likely to affect habitat where bonytail chubs may exist. The large tributaries of the Colorado River system generally range in pH between 7 and 8 (Joseph et al. 1977). Point sources of acid effluents (e.g, acid mine drainage) often cause large changes in pH but are neutralized rather rapidly. These waters are also characterized by enormous sediment loads, which originate from primarily alkaline soils. The conclusion is that any increase in the acidity of lakes and streams in the Colorado River drainage would have little effect on the chemical parameters of large downstream tributaries; therefore there would be no effect on the bonytail chub.

Humpback Chub

The humpback chub is classified as endangered by FWS. Historically, the humpback chub inhabited the large tributaries of the Colorado River system. Present distribution is disjunct, with humpbacks existing in widely isolated canyons.

None of the proposed project components would directly affect any humpback chub habitat. Since the potential for acid rain impacts is similar to that discussed for the bonytail chub, a "no effect" designation has been determined for the humpback (for the same reasons as discussed for the bonytail chub).

Greenback Cutthroat Trout

The greenback cutthroat trout (*Salmo clarki stomias*) is listed as an endangered subspecies by FWS. This subspecies inhabits clear, cold, well-oxygenated headwater streams into which no other trout have been introduced. Other characteristics include moderate gradient, abundant riparian vegetation, rocky to gravelly substrates, and cover (e.g., undercut banks, overhanging vegetation, and eddies behind in-stream boulders). The decline of pure populations of greenback trout has been attributed to the introduction of nonnative trout and habitat destruction. The introduction of other trouts has resulted in hybridization (rainbow and yellowstone cutthroat trouts) or competitive displacement (brook and brown trouts). Habitat alterations, such as water diversions, logging, road building, and overgrazing, have also rendered many streams unsuitable for greenback trout or other fishes.

Historically, greenback trout inhabited the colder waters of the South Platte and Arkansas River drainages (Torres et al. 1978). They now are reported to be restricted to several headwater streams in Colorado, including Black Hollow Creek, Hourglass Creek, Como Creek, South Fork of the Huerfano Creek, Cascade Creek, and the South Fork of the Cache La Poudre River. Several waters in the Rocky Mountain National Park also support greenback trout. None of these streams are in the vicinity of project components, but they do occur in the area that could be affected by potential acid precipitation.

The potential acidification of high mountain lakes would have no effect on the greenback cutthroat trout, because the trout inhabit stream systems. However, high mountain streams in southern Colorado may be susceptible to increases in acidity. These streams lack the buffering capacity of lower-elevation streams because they usually lie in unreactive bedrock that is incapable of neutralizing the acidity of precipitation (EDF 1982). The surrounding terrain often consists of exposed bedrock or limited soil material. The bedrock of the Rockies consists mostly of sandstones and granite, which have little buffering capacity. The precipitation rate at higher altitudes is greater than at lower altitudes; therefore there are greater rates of total acid deposition at higher altitudes. During spring snowmelt runoff, there may be higher concentrations of acidity in a short period of time.

If the high mountain headwater streams are subjected to acid precipitation and the waters become acidic, fishes in those waters may be affected. Acid may inhibit larval development, affect metal concentrations, or cause fish kills. The probability of these impacts occurring and the potential magnitude of such impacts cannot be quantified.

Based on the assessment presented above, a "may affect" determination is made for this species because of the potential for acid precipitation impacts.

Colorado Squawfish

The Colorado squawfish (*Ptychocheilus lucius*) is the largest native North American cyprinid and is listed as endangered throughout its range by the FWS (*Federal Register*; May 20, 1980; pp. 33758-33781). Lengths of 6 feet and weights of 80 pounds or more are not uncommon in early accounts of the Colorado River basin. The Colorado

squawfish is generally considered a large-river fish and is usually reported in mainstem rivers. Most adult squawfish have been taken from pools, eddies, and backwaters, although they have occasionally been collected in riffle-and-run habitat (FWS 1977). Juveniles also appear to prefer quiet waters, usually in backwaters and pools over a silt, sand, or rubble bottom. Young-of-the-year are most typically collected in small, shallow backwaters with a sand or silt bottom and very warm temperature (Vanicek 1967, Holden and Stalnaker 1975, Kidd 1977).

Data presented by Vanicek (1967) and Holden (1973) suggest that the Colorado squawfish spawns in the main channel of large rivers. Other data (Toney 1974, McAda and Seethaler 1975) indicate that eddy and backwater areas of main channels may provide specific spawning habitat. Spawning appears to be initiated after water temperatures exceed 70°F (Vanicek and Kramer 1969, Holden 1973). Although no definite determinations of spawning substrate are available, field observations and hatchery work have suggested that gravel, silt, and sand substrates may be used (FWS 1977).

Spawning of the Colorado squawfish has never been observed in nature. Several early references suggest that squawfish make upstream migrations, presumably for spawning. However, Vanicek (1967) and Holden (1975) indicate that spawning apparently occurs in the same areas where adult populations live year-round. Although the extent of suspected migration is not known, available data suggest that migrations do not cover very long distances or that they may not be necessary for survival (FWS 1977).

Historically, the native fish fauna of the San Juan Basin, and the Colorado River drainage in general, included the squawfish. In modern times the native fauna of the San Juan Basin has been

significantly reduced, both in numbers and distribution. The FWS (1977) indicates that construction of Navajo Reservoir had the major effect on the native fauna; the effects of the cold-water discharge extend to below Farmington. Construction of Navajo Reservoir, water depletions, and irrigation flow returns have probably resulted in the extirpation of the Colorado squawfish in the vicinity of the proposed intake sites (FWS 1977). In the portion of the Colorado River drainage that could be affected by potential acid precipitation, the squawfish is present, but its number and distribution are limited.

The most recent collection of Colorado squawfish in the San Juan River occurred in April 1978 near Aneth, Utah (Minckley and Carothers 1979). The most recent collection in the New Mexico portion of the San Juan River occurred near Bloomfield in 1965. No collections were reported in the San Juan River proper between 1965 and 1978 (Seethaler 1978). The squawfish taken by Minckley and Carothers near Aneth was 177 mm in length, which suggests recent reproduction in the San Juan River, since it seems unlikely that a fish of that size would move upstream from Lake Powell (Seethaler 1978).

The New Mexico Department of Game and Fish (Hubbard et al. 1979) states that the status of the Colorado squawfish in New Mexico is unconfirmed, in spite of intensive surveys in the San Juan drainage in the middle and late 1970s. This and other data point to a severe decline, if not extirpation, of the species in the state. Because of the lack of any recent sightings (since 1965) in the vicinity of the proposed or alternative intakes, and because acid precipitation impacts are unlikely in the area that could be affected (see discussion above for the bonytail chub), the Colorado squawfish would not be affected by project-related activities.

PLANTS

Mesa Verde Cactus

The Mesa Verde cactus, Sclerocactus mesae verdae (Boiss.) L. Benson (Cactaceae), is listed as threatened by the FWS (1980). Except when flowering, Mesa Verde cactus is a small, gray, very inconspicuous plant. Mesa Verde cactus is limited to a very few locations in southwestern Colorado and San Juan County, New Mexico. This species is considered threatened because of its specific habitat requirements (particularly shale badlands, including parts of the Fruitland and Kirtland formations), the high erosion rate in its habitat and its low recolonization potential, and destruction of local populations by cactus collectors. Potential habitat for the plant has been delineated in recent surveys (New Mexico Heritage Program 1982). No Mesa Verde cactus plants were found during surveys of a portion of potential habitat by PNM in 1981 (PNM 1981).

Sclerocactus mesae verdae appears to occur consistently west of range 13 west in New Mexico. No records in the area immediately adjacent to Farmington or to the southeast are reported. Although S. mesae verdae occurs on Fruitland formation, it does not occupy all or any part of the potentially available areas in which that formation occurs. Factors other than the geologic formation may contribute to the distribution pattern of this cactus. Based upon present knowledge of potential habitat, the proposed NMGS would have no effect on the known populations or potential habitat of Sclerocactus mesae verdae, but "may affect" status is determined for the species in areas within corridors designated for P1, P2, P3, T4, and T5.

Knowlton's Hedgehog Cactus

Knowlton's hedgehog cactus (Pediocactus knowltonii Benson) is listed as endangered by the FWS (1980). The known natural

distribution of Knowlton's hedgehog cactus is limited to a small portion of the Los Pinos River valley between La Boca, Colorado, and the Navajo Lake Dam in New Mexico (Knight 1982). There have also been reports of collections from southern Colorado, but these have not been verified (Knight 1982). The known distribution of Knowlton's hedgehog cactus is therefore outside the area of project component land disturbance but within the area where potential acid rain could occur.

This species occurs on dry gravelly hills and slopes between 6000 and 7000 feet in elevation. Specific soils data are not available for the known collection sites. However, all soils in the described collection area have been derived from sandstone and shale parent materials and are alkaline, with soil pH levels between 7.4 and 8.4 (SCS 1980). The presence of calcium carbonate is variable both between soil types and within the soil profile (SCS 1980). Factors which are currently contributing to the endangerment of this species include very restricted distribution, low population levels, potential habitat modification through construction of vacation homes, removal by cactus collectors, trampling by grazing livestock and potential inundation by increased water levels of Navajo Lake (Knight 1982).

A determination of no effect is made for Knowlton's hedgehog cactus because it does not occur in the areas of project components and no impacts resulting from potential acid precipitation are anticipated. (See the discussion of acid precipitation impacts later in this chapter.)

Spineless Hedgehog Cactus

The spineless hedgehog cactus, *Echinocereus triglochidiatus* var. *inermis* (Schum.) Arp., is listed as endangered by the FWS (1980). Its known natural distribution is restricted to extreme

eastern Utah and Mesa, Montrose, and Ouray counties in western Colorado (FWS 1978). This distribution is outside the area of project components but within the area where potential acid precipitation could occur. Suitable habitat for the spineless hedgehog cactus includes sites in partial shade under pinyon pine trees and infrequently among sagebrush on cool exposures between 5000 and 8000 feet in elevation (FWS 1978).

A determination of no effect is made for the spineless hedgehog cactus because it does not occur in the vicinity of project components and no impacts resulting from potential acid precipitation are anticipated. (See discussion of acid precipitation impacts later in this chapter.)

Zuni Milkvetch

The Zuni milkvetch, *Astragalus accumbens* Sheld. (Leguminosae), is listed by the FWS (1980) as a category 1 status review species. The Zuni milkvetch is a New Mexico endemic, known only from the Zuni Mountains southeast of Gallup. This species is apparently restricted to a red clay found below sandstone cliffs (New Mexico Heritage Program 1982). Because the Zuni milkvetch is found in a very small area distant from project components, and is restricted to a substrate apparently not found in the project area, it is not expected to occur on any project component site or right-of-way and would therefore not be affected.

Fleabane

Erigeron rhizomatus Cronq. (Compositae) (fleabane) is listed as a category 1 status review species by FWS (1980). It is restricted to certain geologic conditions south of Fort Wingate, New Mexico (New Mexico Heritage Program 1982). Since it does not occur in the project area, this species would not be affected.

Devil's Claw Cactus

The cactus Sclerocactus whipplei (Engelm. and Biel.) Britt. and Rose (Cactaceae), is a variable species that has been divided into several varieties. Variety Heilii Castetter, Pierce and Schwerin, is listed as a category 1 status review species by FWS (1980). Variety Heilii is found in extreme northern San Juan County, on north-facing slopes that have black sagebrush (Rangeland Resources International, Inc. 1978), and in higher portions of the pinyon-juniper zone (New Mexico Heritage Program 1981). No plants or potential habitat are reported south of the San Juan River (P. Knight, personal communication, 1982). Since none of the NMGS components are proposed in areas north of the San Juan River, the species would not be affected.

Bladderpod, Unnamed

The bladderpod, Lesquerella pruinosa Greene, is listed as under review by the FWS (1980), and as a species which is probably appropriate for listing as threatened or endangered but for which insufficient biological data are available to support a proposed rule (FWS 1980). The known distribution of L. pruinosa is restricted to the vicinity of Pagosa Spring in Archuleta County, Colorado (FWS 1978, BLM 1982, personal communication). This distribution is outside the area of project components but within the area where acid precipitation could occur. Habitat for this species is reported to include dry hills and adobe soils at 7000 feet elevation. A determination of no effect is made for the bladderpod, Lesquerella pruinosa, because it does not occur in the areas of project components and no impacts resulting from potential acid precipitation are anticipated. (See discussion of acid precipitation impacts later in this chapter.)

Atriplex Pleiantha, Unnamed Annual Saltbush

Atriplex pleiantha Weber is known from southwestern Montezuma County in Colorado and in New Mexico (FWS 1978, 1980). This distribution is outside the area of project components but within the area where acid precipitation could occur. Known habitat for this species consists of barren clay slopes of low hills at 5100 feet elevation (FWS 1978).

A determination of no effect is made for this species because it does not occur in the areas of project components and no impacts resulting from potential acid precipitation are anticipated. (See discussion of acid precipitation impacts later in this chapter.)

Mancos Milkvetch

The Mancos milkvetch (Astragalus humillimus Gray ex. Brand) is known to occur only on broken sandstone slopes (Mesa Verde or Pictured Cliffs) on Hogback Mountain in New Mexico between 5240 and 5320 feet in elevation (Knight 1982). Its known soil preference is limited to deep sandy soils on ledges and flat spots, with a slight preference for 10- to 15-degree north-facing slopes (Knight 1982). Two populations of the Mancos milkvetch, both of several hundred plants, are known to occur on Hogback Mountain. Substantial effort has not yielded more collections of this species, and it is considered very rare. Knight (1982) reports that at present there is no immediate threat of habitat destruction at the Hogback Mountain sites. Should no new populations be found, the taxon could be extinguished by an unexpected event. The distance of known populations from NMGS project activities eliminates disturbance due to construction and operation activities, other than potential acid precipitation.

Soils data are not available for Mancos milkvetch collection sites. The Cliff House Member of the Mesa Verde Sandstone Group is reported to have a $CaCO_3$ content of 1040 ppm, HCO_3^- content of 638 ppm, and pH of 7.4 (Irwin 1966). It is likely that sands derived from this or similar sandstones would have a lower pH than their parent material in surface layers, with an accumulation of carbonate (higher pH) at lower levels.

McFee (1980) suggests that noncalcareous sands may be considered sensitive to acidic precipitation. This evidence suggests that soils on which the Mancos milkvetch occur may not provide substantial buffering capacity. While current knowledge of precipitation acidity at these elevations is limited, the probability of substantial amounts occurring is low (Air Quality Technical Report).

Since no relevant data now exist on the biology of the Mancos milkvetch, and there is no clear evidence that acidic precipitation which may fall would be neutralized by soil carbonates, a "may affect" determination is made.

Potential Acid Precipitation Impacts to Threatened or Endangered Plants

Although there are no current studies on the effects of acid precipitation on the plant species considered in this biological assessment, at least two factors limit potential impacts: (1) the low mean annual rainfall and low frequency of precipitation; and (2) relatively well-buffered alkaline soils in the areas where acid rain could potentially occur. These two factors are typical of habitat conditions for all but one of the plant species considered in this biological assessment.

Frequency and Magnitude of Precipitation Events. All of the plants that occur in areas that could be affected by acid precipitation due to NMGS emissions (northwestern New Mexico and southwestern Colorado) are reported at relatively low elevations (5000-8000 feet). At these elevations, mean annual rainfall and the frequency of precipitation are low. As a result, exposure to acid precipitation, directly (on leaf and stem tissue) or indirectly (via the root system), would also be infrequent.

Buffering Capacity of Regional Soils

All of the plants considered in this assessment, with the exception of Mancos milkvetch, are reported from soils that are slightly basic and probably relatively well buffered. According to recent studies on acid rain effects in the intermountain west (Environmental Defense Fund 1982), ecosystems at low elevations in the western states are relatively well buffered by alkaline soils and aerosols which neutralize atmospheric acidity carried down by precipitation. Additional studies (States 1979, EPA 1981, Wiklander 1979, McFee 1980) have indicated that the presence of carbonates and salts in soils provides a high buffering capacity against shifts in soil pH. Since carbonates are often present and pH values for soils are moderate to high in areas where the species considered in this assessment are located, it is likely that soil buffering effects would reduce potential impacts from acidic precipitation. Several of the species under consideration are generally associated with the saline, calcareous Mancos shale (Table 3-2) (Untermann and Untermann 1954).

The buffering capacity of a given soil is strongly related to its cation exchange capacity (CEC) (McFee 1980). In general, alkaline clay soils have a high CEC and low sensitivity to acidification. Noncalcareous sands with low organic matter content generally have low CEC and high sensitivity. McFee (1980) suggests that soils which lose

Table 3-2. KNOWN SOIL PREFERENCES FOR PLANT SPECIES CONSIDERED IN THE BIOLOGICAL ASSESSMENT

Taxon	Known Soil Preference
Knowlton's hedgehog cactus (*Pediocactus knowltoni* Benson)	Clay
Mesa verde cactus (*Sclerocactus mesae verdae* [Boiss and David] Benson)	Clay
Devil's claw cactus (*Sclerocactus whipplei* [Engelm. and Biel] Britt.)	Sandy loam
Annual saltbush, unnamed (*Atriplex pleiantha* Weber)	Clay, Mancos shale
Spineless hedgehog cactus (*Echinocereus triglochidiatus* var. inermis [Schum.] Arp.)	Outcrops on calcareous sandstone
Bladderpod, unnamed (*Lesquerella pruinosa* Greene)	Clay, Mancos shale
Zuni milkvetch (*Astragalus accumbens* Sheld.)	Clay
Fleabane, unnamed (*Erigeron rhizomatus* Cronq.)	Clay
Mancos milkvetch (*Astragalus humillimus*)	Sandy soils

10 percent and 25 percent of CEC of soil after 25 years of exposure to the measured acid input should be considered slightly sensitive and sensitive respectively. CEC data for each site supporting threatened and endangered species considered in this assessment and experimental acidification data based on potentially affected soils are not available; therefore an assessment of soil sensitivity must be based on general knowledge of soil types. Species of concern and reported soil preference of each plant are listed in Table 3-2. With the exception of Mancos milkvetch, none of the plants listed in Table 3-2 are generally associated with a sensitive soil type.

Findings

Findings of no effect or may affect for the plants considered in this assessment are reported above under the discussion for each plant.

4.0
SUGGESTED MITIGATION

The following mitigation (as required by CEQ Regulations) measures are suggested:

- If populations of Mesa Verde cactus that may be affected are located in the project area, construction should avoid the specific locations. If impacts cannot be avoided, compensation under the Endangered Species Act may be considered.

- If the location of construction zones cannot be altered, known populations of plants should be fenced or otherwise protected from potential construction impacts.

- Collection of threatened or endangered cacti by construction or operation employees should be discouraged by supervisory and management personnel.

- If populations of Mesa Verde cactus are present outside construction zones, off-road vehicle access to known populations should be restricted.

- Potential habitat for Mesa Verde cactus that has not been surveyed would be surveyed prior to BLM issuing a notice to proceed.

5.0
UNAVOIDABLE ADVERSE IMPACTS

Presently unknown populations of plants that the project may affect may be destroyed by project activities. (Note, however, that these impacts are subject to change, depending on the development of stipulations.)

6.0 RELATIONSHIP BETWEEN THE SHORT-TERM USE OF THE AFFECTED ENVIRONMENT AND LONG-TERM PRODUCTIVITY

If presently unknown populations of plants are destroyed during construction or operation of the NMGS, long-term viability and the continued existence of local populations could be placed in jeopardy. This determination cannot be made until further field surveys document the abundance and distribution of the species in the region of project components.

7.0 IRREVERSIBLE OR IRRETRIEVABLE COMMITMENT OF RESOURCES

Destruction of local populations would represent an irretrievable commitment of resources. If potential habitat is returned to its original condition, local populations of plants may recolonize, depending on the viability of surrounding populations.

8.0
COMPARISON OF ALTERNATIVES

Potential habitat for one plant species, Sclerocactus mesae verdae, may be affected by transmission lines T4 and T5. No impacts are anticipated for T1, T2, or T3. Potential habitat for Sclerocactus mesae verdae may be affected by all three water pipelines.

POSSIBLE NEW TOWN

1.0
AFFECTED ENVIRONMENT

The following federally listed or proposed threatened or endangered species have range or potential habitats that overlap with the possible new town site.

- Mesa Verde cactus (Sclerocactus mesae verdae)
- Black-footed ferret (Mustela nigripes)
- Bald eagle (Haliaeetus leucocephalus)

No suitable habitat for the Mesa Verde cactus exists within the possible new town boundaries. However, the species has been reported immediately west of the proposed NMGS site; and the heavy clay and gravelly soils in the De-na-zin Wilderness Study Area immediately north of the new town site are potential habitat.

No prairie dog colonies are present on the possible new town site or within a 5-mile buffer zone (Scott Berger, pers. comm., 1982; Jim Ramakka, BLM, pers. comm., 1982). No suitable nesting habitat for bald eagles exists on the possible new town site or within a 5-mile buffer zone. Occurrence of either species would therefore be as occasional migrants.

Bald eagles may occur in the vicinity of the possible new town site as occasional winter migrants. No nests, roosts, or winter concentration areas are present in the area around the possible new town site.

2.0
ENVIRONMENTAL CONSEQUENCES

If the Mesa Verde cactus is present in areas that may be affected because of increased recreational use or because of off-road vehicle activities, potential impacts could include:

- Direct destruction of populations or individuals
- Accelerated erosion in areas supporting the species
- Removal of local populations by cactus collectors

Appendix A

U.S. FISH AND WILDLIFE SERVICE SPECIES LIST
FOR THE NEW MEXICO GENERATING STATION
PROPOSED ACTION AND ALTERNATIVE COMPONENTS

NM30870 EJS
6840(922)

IN REPLY REFER TO:

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE

POST OFFICE BOX 1306
ALBUQUERQUE, NEW MEXICO 87103

SE

December 1, 1981

MEMORANDUM

TO: State Director, Bureau of Land Management, Santa Fe, New Mexico

FROM: Acting Assistant Regional Director, Region 2

SUBJECT: Species List for New Mexico Generating Station, San Juan Basin

This is in reply to your memorandum of November 19, 1981, which requested information about species which are listed or proposed to be listed as threatened or endangered, as provided by the Endangered Species Act. Your area of interest is the Public Service Company of New Mexico's proposed New Mexico Generating Station and related facilities.

As provided by Section 7(c)(1) of the Endangered Species Act, the Fish and Wildlife Service is required to furnish a list of those species, both proposed and listed, that may be affected by Federal construction activities.

Upon receipt of the Fish and Wildlife Service's species list, the Federal agency authorizing, funding or carrying out the construction action is required to conduct a biological assessment for the purpose of identifying listed and proposed species which are likely to be affected by such action.

The biological assessment shall be completed within 180 days after receipt of the species list, unless it is mutually agreed to extend this period. If the assessment is not initiated within 90 days after receipt of the species list, I suggest its accuracy be verified before conducting the assessment.

Biological assessments should include as a minimum:

1) an onsite inspection of the area affected by the proposed activity or program, which may include a detailed survey of the area to determine if species are present and whether suitable habitat exists for either expanding the existing population or potential reintroductions of populations;

2) interview recognized experts on the species at issue, including the Fish and Wildlife Service, State conservation departments, universities, and others who may have data not yet found in scientific literature;

3) review literature and other scientific data to determine the species distribution, habitat needs, and other biological requirements;

4) review and analyze the effects of the proposal on the species, in terms of individuals and populations, including consideration of both direct and indirect effects of the proposal on the species and its habitat;

5) analyze alternative actions that may provide conservation actions;

6) other relevant information;

7) report documenting the assessment results.

For purposes of providing interim guidance, the Fish and Wildlife Service considers construction projects to be any major Federal action authorized, funded or carried out by a Federal agency which significantly affects the quality of the human environment and which is designed primarily to result in the building or erection of man-made structures such as dams, buildings, roads, pipelines, channels, and the like. Normally these projects will require an environmental impact statement.

If the Federal permitting action is not a construction project, there is no need to prepare a biological assessment. However, it remains incumbent upon the Federal agency to assess whether the Federal action may affect endangered and threatened species.

If the biological assessment or other assessment indicates the proposed project may affect listed species, the formal consultation process shall be initiated by writing to the Regional Director, Region 2, U.S. Fish and Wildlife Service, P.O. Box 1306, Albuquerque, New Mexico 87103. If no effect is evident, there is no need for further consultation. I would, however, appreciate the opportunity to review your biological assessment.

In addition, the Act (Sec. 7(c)(1)) now requires Federal agencies to confer with the Service on any agency action which is likely to jeopardize the continued existence of any species proposed to be listed as endangered or threatened or adversely modify critical habitat proposed to be designated for such species. The purpose of this requirement is to identify and resolve at the early planning stage of an action, all potential conflicts between the action and the respective species and critical habitat. The informal consultation process can accomplish this requirement.

The attached sheet provides information on listed species which may occur in the area of interest. If you have need of further assistance, please call the Office of Endangered Species at (505) 766-3972 or FTS 474-3972.

Attachment

cc: Area Office, Phoenix, AZ (SE)
Ecological Services Field Station, Albuquerque, NM

New Mexico Generating Station,
San Juan Basin

Listed Species

Black-footed ferret (*Mustela nigripes*) - Surveys not required for linear projects but may be necessary for area impacts.

Bald eagle (*Haliaeetus leucocephalus*) - Wintering populations may occur in project area, especially along San Juan River.

Colorado squawfish (*Ptychocheilus lucius*) - Could be affected by water withdrawal from the San Juan River.

Mesa Verde cactus (*Sclerocactus mesae-verde*) - May occur in project area, San Juan County.

Proposed Species

None.

Critical Habitat

None.

Candidate Plant Species

Astragalus accumbens - Valencia County

Erigeron rhizomatus - McKinley County

Sclerocactus whipplei var. *heilii* - San Juan County

Sclerocactus whipplei var. *reevesii* - San Juan County

Appendix B

AMENDMENT TO LISTING OF FEDERAL
THREATENED OR ENDANGERED SPECIES

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE

POST OFFICE BOX 1306
ALBUQUERQUE, NEW MEXICO 87103

September 1, 1982

MEMORANDUM

TO : State Director, Bureau of Land Management, P.O. Box 1449, Santa Fe, New Mexico 87501

FROM : Regional Director, Region 2 (SE)

SUBJECT: Updated Species List for the New Mexico Generating Station (NMGS)

In response to your request of August 10, 1982, I have attached an updated species list for your consideration while preparing the EIS for the NMGS. The necessity of updating the original species list we provided on December 1, 1981, was recognized when your staff discovered new information indicating the proposed project had potential for acid rain impact to high mountain lakes and possibly streams in Colorado and northern New Mexico.

Coordinating with Mr. Bob Benton of our Salt Lake City Office, we are adding six listed species and three candidate species to the list we provided on December 1, 1981. All these species are added because your new information indicates that areas of the State of Colorado have potential for being impacted by the NMGS project. Impacts within the State of Colorado were not considered when preparing the earlier species list.

Additional listed species are the peregrine falcon (Falco peregrinus), humpback chub (Gila cypha), bonytail chub (Gila elegans), greenback cutthroat (Salmo clarki stimoas), spineless hedgehog cactus (Echinocereus triglochidiatus var. inermis), and Knowlton cactus (Pediocactus knowltoni). Candidate species added to the list are plant species Lesquerella pruinosa, Astragalus humillimus, and Atriplex pleiantha.

In addition to adding the above species to the list of December 1, 1981, we are removing one candidate plant species, Sclerocactus whipplei var. reevesii. This cactus is no longer being considered as a candidate for listing.

Your understanding that one FWS office usually serves as the lead office on Section 7 consultations involving more than one FWS region is correct. In this

instance, since your primary action is proposed to take place in Region 2, this office will serve as the lead office for FWS endangered species concerns. It will be this office's responsibility to confer with Region 6 and keep them informed of the status of the consultation.

We appreciate the cooperation you have afforded the U.S. Fish and Wildlife Service during this consultation and offer our assistance to you in your management of listed species. Please call the Office of Endangered Species at (505) 766-3972 or FTS 474-3972, if we can be of further assistance.

Attachment

cc: Area Manager, Phoenix Area Office, Phoenix, AZ
Field Supervisor, Ecological Services, Albuquerque, NM
Regional Director, Region 6 (SE)
Salt Lake City Office, Salt Lake City, UT (SE)
Director, FWS, Washington, D.C. (OES)

New Mexico Generating Station
San Juan Basin

LISTED SPECIES

Black-footed ferret (Mustela nigripes) - a weasel-like animal with black feet, tail, and eye mask. Generally associated with prairie dog towns.

Bald eagle (Haliaeetus leucocephalus) - Wintering populations may occur in project area, especially along San Juan River. Nesting birds known to occur in State of Colorado.

Peregrine falcon (Falco peregrinus) - Nesting birds known to occur in areas that may be effected in the State of Colorado. May occur as migrant or wintering individuals from the San Juan River.

Colorado squawfish (Ptychocheilus lucius) - Could be affected by water withdrawal from the San Juan River.

Humpback chub (Gila cypha) - Occurs in the Colorado River and its tributaries.

Bonytail chub (Gila elegans) - Occurs in the Colorado River and its tributaries.

Greenback cutthroat trout (Salmo clarki stomias) - Found in high mountain streams, tributaries to the Arkansas and Platte Rivers, Colorado.

Knowlton cactus (Pediocactus knowltoni) - Known from San Juan County, New Mexico, and could be in southern Colorado.

Mesa Verde cactus (Sclerocactus mesae verde) - May occur in project area, San Juan County, New Mexico.

Spineless hedgehog cactus (Echinocereus triglochidiatus var. inermis) - Known from Montrose, Mesa, and Delta Counties, Colorado.

PROPOSED SPECIES

None.

CRITICAL HABITAT

None.

CANDIDATE PLANT SPECIES

Astragalus accumbens - Valencia County, New Mexico.
Astragalus humillimus - Montezuma County, Colorado, San Juan County, New Mexico.
Atriplex pleiantha - Montezuma County, Colorado.
Erigeron rhizomatus - McKinley County, New Mexico.
Lesquerella prvinosa - Archuleta County, Colorado.
Sclerocactus whipplei var. heilii - San Juan County, New Mexico.

NM 30840 EIS
6840 (934A)

AUG 1 0 1982

Memorandum

To: Regional Director, USFWS, Region 2, Albuquerque, NM

From: State Director, BLM, Santa Fe, NM

Subject: Threatened or Endangered Species List Update for the New Mexico Generating Station Environmental Impact Statement

On November 19, 1981, BLM initiated a list request with your office pursuant to section 7 of the Endangered Species Act (ESA) of 1973 (as amended) for the New Mexico Generating Station (NMGS) EIS. We received a species list on December 1, 1981 which was amended on December 18, 1981. Since then, the Preliminary Draft Environmental Impact Statement (PDEIS) and supporting technical reports have been prepared which indicate potential environmental impacts apparently not considered in the initial list and amendment. Specifically, the Air Quality Technical Report has identified a potential for acid rain impact to high mountain lakes and possibly streams in northern New Mexico and Colorado.

Informal contacts with your office (Mr. Curtis Carley and Mr. Dave Bowman) and your Salt Lake City Office (Mr. Bob Benton) and my staff resulted in agreement that an update of the list is needed. We have also been advised that when more than one state or region is involved that one office of the USFWS will serve as lead for formal and informal consultation and contacts under section 7 of the ESA.

The draft EIS is scheduled for release by November 30, 1982 and the biological assessment is now being prepared. Therefore, we are requesting that an updated list and identification of the lead USFWS office be provided at the earliest date possible. If you have any questions or information needs concerning this request, please contact Ms. Leslie Cone, Project Manager, NMGS Staff at FTS 476-6187 or Comm. 988-6187.

/s/ Leroy C. Montoya

Acting

cc:
Bill Isaaks, New Mexico Department of Natural Resources
Harold Olson, Director, New Mexico Department of Game & Fish
Bob Benton, USFWS, Salt Lake City, Utah
State Director, BLM, Colorado State Office

GLOSSARY

Category 1 status review species - plant species that are officially recognized by the U.S. Fish and Wildlife Service as high-priority candidates for federal threatened and endangered status but have not yet been formally proposed.

Category 2 status review species - plant species that are lower-priority candidates than category 1 for federal threatened and endangered listing, due to lack of biological information.

Endangered species - any species that is in danger of extinction throughout all or a significant portion of its range (Endangered Species Act, 1973).

Special status species - plants rare in the study area and of management concern but not designated in the U.S. Fish and Wildife Service Section 7 threatened and endangered consultation process.

Threatened species - any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range (Endangered Species Act, 1973).

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- Rio Puerco Resource Area
- New Mexico State Office, Santa Fe

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- Office of Endangered Species
- Environmental Services

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