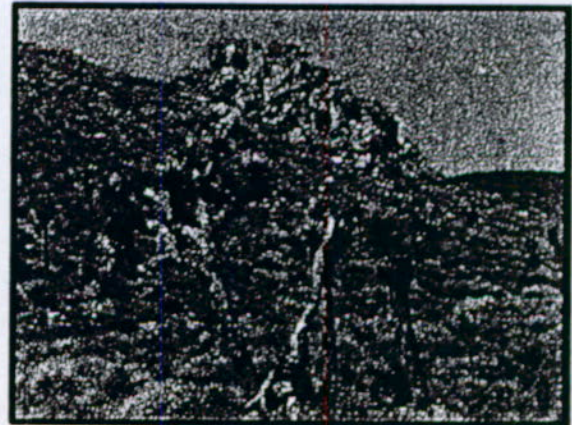
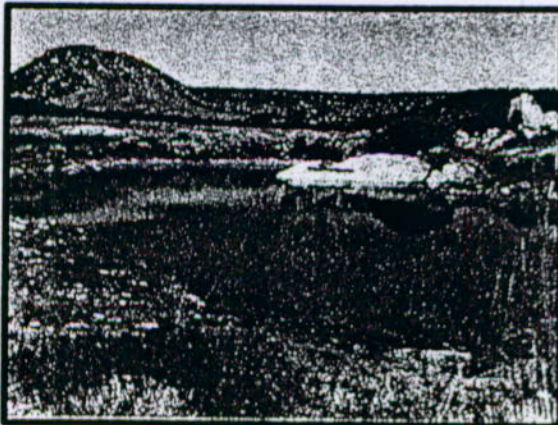


Nevada Test Site Resource Management Plan

December 1998



U.S. Department of Energy
Nevada Operations Office
Las Vegas, Nevada

Reference herein to any specific commercial product, process, or services by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof or its contractors or subcontractors.

Available to the public from –

*U.S. Department of Commerce
National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4650*

Available electronically at <http://www.doe.gov/bridge>. Available to U.S. Department of Energy and its contractors in paper from –

*U.S. Department of Energy
Office of Scientific and Technical Information
P.O. Box 62
Oak Ridge, TN 37831-0062
(423) 576-8401*

Nevada Test Site Resource Management Plan

December 1998

**U.S. Department of Energy
Nevada Operations Office
Las Vegas, Nevada**

This Page Intentionally Left Blank.

1 Table of Contents

1	Table of Contents	1-1
2	Executive Summary.....	2-1
3	Introduction.....	3-1
3.1	Purpose and Scope.....	3-1
3.2	Relationship to Other Planning Documents.....	3-2
3.2.1	Nevada Operations Office 1998 Strategic Plan	3-2
3.2.2	Final Environmental Impact Statement for the Nevada Test Site and Off Site Locations in the State of Nevada	3-2
3.2.3	Department of Interior, Bureau of Land Management Proposed Las Vegas Resource Management Plan and Final Environmental Impact Statement.....	3-2
3.2.4	Legislative Environmental Impact Statement for Nellis Air Force Range Renewal	3-2
3.3	Plan Organization and Use	3-2
3.4	Initial Plan Development	3-3
4	Ecosystem Management Principles	4-1
5	Resource Management at the Nevada Test Site	5-1
5.1	Overall Policy.....	5-1
5.2	Nevada Test Site Land Use Policy.....	5-1
5.3	Overall Resource Management Goal.....	5-2
5.4	Overall Data Management.....	5-2
5.5	Overall Monitoring.....	5-2
5.6	Overall Adaptive Management.....	5-2
5.6.1	Interagency Cooperation	5-4
5.6.2	Interdisciplinary Process.....	5-4
6	Roles and Responsibilities	6-1
6.1	Department of Energy, Nevada Operations Office.....	6-1
6.1.1	Manager.....	6-1
6.1.2	Engineering and Asset Management Division	6-1
6.1.3	Environment, Safety, and Health Division.....	6-1
6.1.4	Human Resources Division.....	6-1
6.1.5	Site Operations Division.....	6-1
6.1.6	Stockpile Stewardship Division	6-1
6.1.7	Technology Development Division.....	6-2
6.1.8	Waste Management Division	6-2
6.1.9	All Other Organizations	6-2
6.2	Contractors and Other Users at the Nevada Test Site	6-2
6.2.1	Bechtel Nevada	6-2

6.2.2	Desert Research Institute.....	6-2
6.2.3	University of Arizona, Tucson.....	6-2
6.2.4	All Other Users of the Nevada Test Site.....	6-2
6.3	Stakeholders and Tribal Governments.....	6-2
6.3.1	Five-Party Agreement.....	6-3
6.3.2	Nevada Test Site Community Advisory Board.....	6-3
6.3.3	Nevada Test Site Development Corporation.....	6-3
6.3.4	American Indian Resources Program.....	6-3

7 Mission Resources 7-1

7.1	Introduction.....	7-1
7.2	Goals.....	7-1
7.3	Inventory and Limitations.....	7-2
7.3.1	Resource Status.....	7-2
7.3.1.1	National Security.....	7-2
7.3.1.2	Environmental Management.....	7-4
7.3.1.3	Technology Diversification.....	7-9
7.3.1.4	Energy Efficiency and Renewable Energy.....	7-9
7.3.1.5	Stewardship of the Nevada Test Site.....	7-9
7.3.2	Legal and Policy Requirements.....	7-9
7.3.2.1	Federal Facility Agreement and Consent Order.....	7-9
7.3.2.2	Resource Conservation and Recovery Act.....	7-10
7.4	Data Management.....	7-10
7.4.1	Geographic Information System-Based Databases.....	7-10
7.4.1.1	Environmental Restoration Management Applications Database.....	7-10
7.4.2	Other Databases.....	7-10
7.4.2.1	Department of Energy, Nevada Operations Office Master Schedule of Activities on the Nevada Test Site.....	7-10
7.4.2.2	Department of Energy, Nevada Operations Office Schedule of Nevada Test Site Programs, Operations, Experiments and Exercises.....	7-11
7.4.2.3	Underground Test Readiness Database.....	7-11
7.4.2.4	Nevada Test Site Waste Acceptance Criteria Database.....	7-11
7.4.2.5	Low-level Waste Inventory System.....	7-11
7.4.2.6	Container Database.....	7-12
7.4.2.7	Hazardous Waste Storage Unit Database.....	7-12
7.4.2.8	HAZTRAK Database.....	7-12
7.4.2.9	Traffic Database.....	7-12
7.4.2.10	Transuranic Database.....	7-13
7.4.2.11	Analytical Chemistry Database.....	7-13
7.4.3	Release of Data.....	7-13
7.5	Monitoring.....	7-13
7.5.1	Purpose.....	7-13
7.5.2	Legal and Policy Basis.....	7-14
7.5.2.1	Department of Energy Order 413.1, Management Control Program.....	7-14

	7.5.2.2	Department of Energy, Nevada Operations Office Procedural Instruction 97-005, Work Authorization Process.....	7-14
	7.5.2.3	Nevada Test Site Standard Operating Procedure 4702, Operations Permits.....	7-14
	7.5.2.4	Resource Conservation and Recovery Act.....	7-14
	7.5.2.5	Mutual Consent Agreement.....	7-15
	7.5.3	Description of Monitoring Program.....	7-15
7.6		Adaptive Management.....	7-16
	7.6.1	Site Use and Development Process.....	7-17
	7.6.2	Accelerating Cleanup: Paths to Closure Plan.....	7-17

8 Site Support Activities and Facilities Resources..... 8-1

8.1		Introduction.....	8-1
8.2		Goal.....	8-1
8.3		Inventory and Limitations.....	8-1
	8.3.1	Resource Status.....	8-1
		8.3.1.1 Buildings.....	8-1
		8.3.1.2 Security.....	8-2
		8.3.1.3 Medical Facilities and Services.....	8-2
		8.3.1.4 Fire Protection.....	8-2
		8.3.1.5 Fuel.....	8-4
		8.3.1.6 Power.....	8-4
		8.3.1.7 Water.....	8-4
		8.3.1.8 Sewage System.....	8-8
		8.3.1.9 Communications.....	8-8
		8.3.1.10 Roads.....	8-8
		8.3.1.11 Railroads.....	8-8
		8.3.1.12 Air Facilities.....	8-8
	8.3.2	Legal and Policy Requirements.....	8-10
8.4		Data Management.....	8-10
	8.4.1	Geographic Information System-Based Databases.....	8-10
		8.4.1.1 Facility Information Management System.....	8-10
	8.4.2	Other Databases.....	8-10
		8.4.2.1 Facility Administrative Maintenance Information System.....	8-10
	8.4.3	Release of Data.....	8-11
8.5		Monitoring.....	8-11
	8.5.1	Purpose.....	8-11
	8.5.2	Legal and Policy Basis.....	8-11
		8.5.2.1 Department of Energy Order 430.1A, Life Cycle Asset Management.....	8-11
	8.5.3	Description of Monitoring Program.....	8-11
8.6		Adaptive Management.....	8-11

9 Health and Safety Resources..... 9-1

9.1		Introduction.....	9-1
9.2		Goal.....	9-1
9.3		Inventory and Limitations.....	9-1

9.3.1	Resource Status	9-1
9.3.1.1	Industrial Safety Program	9-2
9.3.1.2	Industrial Hygiene Program	9-2
9.3.1.3	Radiological Safety Program	9-2
9.3.2	Legal and Policy Requirements	9-3
9.4	Data Management	9-3
9.4.1	Geographic Information System-Based Databases	9-3
9.4.1.1	Nevada Test Site Radiation Survey-1994, Man Made Exposure Rate Maps	9-3
9.4.2	Other Databases	9-3
9.4.2.1	Radioactive Contamination Posting Data Reports	9-3
9.4.2.2	Radiologically Controlled Areas Report	9-5
9.4.3	Release of Data	9-5
9.5	Monitoring	9-5
9.5.1	Purpose	9-5
9.5.2	Legal and Policy Basis	9-5
9.5.2.1	Title 10 Code of Federal Regulations Part 835 - Occupational Radiation Protection, Subpart C - Standards for Internal and External Exposure	9-5
9.5.2.2	Title 10 Code of Federal Regulations Part 835, Subpart E - Monitoring in the Workplace	9-5
9.5.2.3	Title 10 Code of Federal Regulations Part 835, Subpart G - Posting and Labeling	9-5
9.5.2.4	Title 29 Code of Federal Regulations Part 1910, Subpart Z - Toxic and Hazardous Substances	9-5
9.5.2.5	Title 29 Code of Federal Regulations Part 1926, Safety and Health Regulations for Construction	9-6
9.5.2.6	Department of Energy Order 440.1A, Worker Protection Management For Department of Energy Federal And Contractor Employees	9-6
9.5.3	Description of Monitoring Program	9-6
9.5.3.1	Facilities and Buildings	9-7
9.5.3.2	Inactive Facilities and Areas	9-7
9.5.3.3	Vehicles and Equipment	9-7
9.5.3.4	Soil Disturbing Restrictions	9-7
9.6	Adaptive Management	9-8
9.6.1	Industrial Safety Program	9-8
9.6.2	Industrial Hygiene Program	9-8
9.6.3	Radiological Safety Program	9-8
10	Land Resources	10-1
10.1	Introduction	10-1
10.2	Goals	10-1
10.3	Inventory and Limitations	10-1
10.3.1	Resource Status	10-1
10.3.1.1	Topography	10-3
10.3.1.2	Faults	10-4

	10.3.1.3	Floodplains	10-7
	10.3.1.4	Meteorology.....	10-7
	10.3.1.5	Environmental Research Park	10-8
	10.3.2	Legal and Policy Requirements.....	10-8
	10.3.2.1	Public Land Orders	10-8
	10.3.2.2	Interagency Memoranda of Understanding and Agreements	10-9
	10.3.2.3	Executive Order 11988, Floodplain Management.....	10-9
10.4		Data Management	10-9
	10.4.1	Geographic Information System-Based Databases	10-9
	10.4.1.1	Electronic Computer Aided Design File (Nevada Test Site Environmental Impact Statement Land Use Zones)	10-9
	10.4.1.2	Digital Orthophotography.....	10-10
	10.4.1.3	Visible Surface Disturbances Database	10-10
	10.4.1.4	Vision of the Future of the Nevada Test Site Database	10-10
	10.4.2	Other Databases.....	10-10
	10.4.3	Release of Data	10-10
10.5		Monitoring.....	10-10
	10.5.1	Purpose.....	10-10
	10.5.2	Legal and Policy Basis	10-10
	10.5.2.1	Department of Energy Order 430.1A, Life Cycle Asset Management	10-10
	10.5.2.2	Comprehensive Planning letter from the Department of Energy, Nevada Operations Office Manager (May 2, 1997).....	10-10
	10.5.2.3	Department of Energy, Nevada Operations Office Procedural Instruction 97-005, Work Authorization Process... ..	10-11
	10.5.3	Description of Monitoring Program.....	10-11
10.6		Adaptive Management.....	10-11
	10.6.1	Nevada Test Site Record of Decision Land Use Zones	10-11
	10.6.2	Digital Orthophotographs of the Nevada Test Site	10-11
	10.6.3	Digital Hypsography of the Nevada Test Site.....	10-11
	10.6.4	Vision of the Future of the Nevada Test Site.....	10-12

11 Water Resources 11-1

11.1		Introduction	11-1
11.2		Goals	11-1
11.3		Inventory and Limitations.....	11-3
	11.3.1	Resource Status	11-3
	11.3.2	Legal and Policy Requirements.....	11-5
11.4		Data Management	11-6
	11.4.1	Geographic Information System-Based Databases	11-7
	11.4.1.1	Water Supply Well Production Database	11-7
	11.4.1.2	Water Levels Database.....	11-7
	11.4.1.3	Nevada Test Site Detonations Database.....	11-7
	11.4.1.4	Site Boundary Database.....	11-7
	11.4.1.5	Regional Groundwater Data Sets for Groundwater Modeling... ..	11-8
	11.4.1.6	Predicted Plume Extent Maps	11-8

11.4.1.7	Predicted Effects of Contaminant Remediation and Water Production Maps.....	11-8
11.4.2	Other Databases.....	11-8
11.4.2.1	Water Supply Well Locations Database	11-8
11.4.2.2	Low-Level Radioactive Waste Disposal Inventories Database...	11-8
11.4.2.3	Perennial Groundwater Yield Report.....	11-8
11.4.2.4	Special Reports.....	11-9
11.4.2.5	Spring Discharge at Ash Meadows Database.....	11-9
11.4.2.6	Water Supply Well Safe Drinking Water Act Monitoring Database	11-9
11.4.2.7	Vadose (Unsaturated) Zone Monitoring Database.....	11-9
11.4.2.8	Regional Groundwater Flow Model	11-9
11.4.3	Release of Data	11-10
11.5	Monitoring.....	11-10
11.5.1	Purpose.....	11-10
11.5.2	Legal and Policy Basis	11-10
11.5.2.1	Nevada Administrative Code, Chapter 534, Underground Water and Wells	11-10
11.5.2.2	Clean Water Act and Safe Drinking Water Act.....	11-10
11.5.2.3	Department of Energy, Nevada Operations Office Procedural Instruction 97-001, Siting Criteria for Protection of Groundwater at the Nevada Test Site	11-11
11.5.2.4	Federal Facility Agreement and Consent Order	11-11
11.5.2.5	Department of Energy Order 5400.1, General Environmental Protection Program	11-11
11.5.2.6	Department of Energy Order 5400.5, Radiation Protection of the Public and the Environment	11-11
11.5.3	Description of Monitoring Program.....	11-11
11.6	Adaptive Management.....	11-12
11.6.1	National Environmental Policy Act Process	11-13
11.6.2	Groundwater Protection Management Program Plan	11-13
11.6.3	Test Readiness Program.....	11-13
11.6.4	Underground Test Area Project	11-14

12 Cultural Resources 12-1

12.1	Introduction	12-1
12.2	Goal	12-1
12.3	Inventory and Limitations.....	12-1
12.3.1	Resource Status	12-1
12.3.2	Legal and Policy Requirements.....	12-4
12.3.2.1	National Historic Preservation Act.....	12-4
12.3.2.2	Department of Energy National Environmental Policy Act Implementing Procedures	12-4
12.3.2.3	Department of Energy, Nevada Operations Office Procedural Instruction 96-005, Protection of Endangered Species and Cultural Resources.....	12-4
12.4	Data Management	12-4

12.4.1	Geographic Information System-Based Databases	12-4
12.4.2	Other Databases.....	12-5
12.4.2.1	Archeological Site Database.....	12-5
12.4.2.2	Cultural Resources Surveys Database.....	12-5
12.4.2.3	Curation Database	12-5
12.4.2.4	Technical Reports	12-5
12.4.3	Release of Data	12-5
12.5	Monitoring.....	12-5
12.5.1	Purpose.....	12-5
12.5.2	Legal and Policy Basis	12-6
12.5.2.1	National Historic Preservation Act.....	12-6
12.5.2.2	National Environmental Policy Act.....	12-6
12.5.3	Description of Monitoring Program.....	12-6
12.5.3.1	Identification of Historic Properties.....	12-6
12.5.3.2	Project Monitoring	12-7
12.5.3.3	Post-Project Monitoring	12-7
12.5.3.4	Site Integrity Monitoring	12-7
12.6	Adaptive Management	12-7

13 American Indian Resources 13-1

13.1	Introduction	13-1
13.2	Goal.....	13-3
13.3	Inventory and Limitations.....	13-3
13.3.1	Resource Status	13-4
13.3.2	Legal and Policy Requirements.....	13-4
13.3.2.1	National Historic Preservation Act.....	13-4
13.3.2.2	American Indian Religious Freedom Act.....	13-4
13.3.2.3	Executive Order 13007, Indian Sacred Sites	13-4
13.3.2.4	Department of Energy American Indian Policy	13-4
13.4	Data Management	13-4
13.4.1	Geographic Information System-Based Databases	13-7
13.4.1.1	American Indian Low-Level Radioactive Waste Transportation Study.....	13-7
13.4.2	Other Databases.....	13-8
13.4.2.1	Appendix G of Nevada Test Site Environmental Impact Statement Database.....	13-8
13.4.2.2	Native American Cultural Resources at the Nevada Test Site Database.....	13-8
13.4.2.3	Native American Graves Protection and Repatriation Act Database	13-9
13.4.2.4	American Indian Rapid Cultural Assessment Database.....	13-9
13.4.2.5	Rock Art Interpretive Study.....	13-9
13.4.3	Release of Data	13-9
13.5	Monitoring.....	13-9
13.5.1	Purpose.....	13-9
13.5.2	Legal and Policy Basis	13-9
13.5.2.1	Executive Order 13007, Indian Sacred Sites	13-9

	13.5.2.2	Native American Graves Protection and Repatriation Act.....	13-10
	13.5.2.3	National Historic Preservation Act.....	13-10
	13.5.2.4	National Environmental Policy Act.....	13-10
	13.5.2.5	Executive Order 11514, Protection and Enhancement of Environmental Quality	13-10
	13.5.2.6	Department of Energy American Indian Policy	13-10
	13.5.3	Description of Monitoring Program.....	13-10
	13.5.3.1	Participation of American Indian Monitors in Archeological Excavations.....	13-10
	13.5.3.2	Rapid Cultural Assessments	13-10
	13.5.3.3	Additional Monitoring	13-11
13.6		Adaptive Management.....	13-12
	13.6.1	Define Consultation	13-12
	13.6.2	Establish Cultural Affiliation.....	13-13
	13.6.3	Tribal Contact.....	13-13
	13.6.4	Tribal Meeting.....	13-13
	13.6.5	Forming Consultation Committees.....	13-13
	13.6.6	Site Visits.....	13-13
	13.6.7	Develop Management Recommendations	13-13
	13.6.8	Closing Consultation	13-14
14		Biological Resources.....	14-1
14.1		Introduction	14-1
14.2		Goals	14-1
14.3		Inventory and Limitations.....	14-1
	14.3.1	Resource Status	14-1
	14.3.1.1	Vegetative Types.....	14-1
	14.3.1.2	Animals.....	14-3
	14.3.1.3	Threatened and Endangered Species.....	14-3
	14.3.1.4	Candidate Species	14-3
	14.3.1.5	Species of Concern	14-6
	14.3.1.6	State Regulated Species.....	14-6
	14.3.1.7	Wetlands and Aquatic Habitats	14-9
	14.3.1.8	Other Important Habitats	14-9
	14.3.1.9	National Environmental Research Park.....	14-9
	14.3.2	Legal and Policy Requirements.....	14-9
	14.3.2.1	Endangered Species Act	14-9
	14.3.2.2	Migratory Bird Treaty Act	14-12
	14.3.2.3	Executive Order 11990, Protection of Wetlands.....	14-12
	14.3.2.4	Title 10 Code of Federal Regulations Part 1021, Department of Energy National Environmental Policy Act Implementing Procedures	14-12
	14.3.2.5	Nevada Administrative Codes 503.030, 503.050, and 503.080	14-12
14.4		Data Management	14-12
	14.4.1	Geographic Information System-Based Databases	14-12
	14.4.1.1	Plants and Animals Database.....	14-12

14.4.1.2	Baseline Study Plots Database.....	14-13
14.4.1.3	Vegetation Map Database.....	14-13
14.4.1.4	Wetlands Database.....	14-13
14.4.2	Other Databases.....	14-13
14.4.2.1	Basic Environmental Compliance and Monitoring Reports Database.....	14-13
14.4.2.2	Nevada Test Site Ecological Monitoring and Compliance Program Summaries Database.....	14-13
14.4.2.3	Biological Surveys Database.....	14-13
14.4.2.4	Special Reports Database.....	14-13
14.4.3	Release of Data.....	14-13
14.5	Monitoring.....	14-13
14.5.1	Purpose.....	14-13
14.5.2	Legal and Policy Basis.....	14-13
14.5.2.1	Executive Order 11514, Protection and Enhancement of Environmental Quality.....	14-13
14.5.2.2	Endangered Species Act.....	14-14
14.5.2.3	Migratory Bird Treaty Act.....	14-14
14.5.2.4	Executive Orders 11644 and 11989, Off-Road Vehicles on Public Lands.....	14-14
14.5.2.5	Executive Order 11988, Floodplain Management.....	14-14
14.5.2.6	Executive Order 11990, Protection of Wetlands.....	14-14
14.5.2.7	Department of Energy Order 5400.1, General Environmental Protection Program.....	14-14
14.5.2.8	Department of Energy Order 5400.5, Radiation Protection of the Public and the Environment.....	14-14
14.5.3	Description of Monitoring Program.....	14-14
14.5.3.1	Compliance with the Biological Opinion for Desert Tortoise Protection.....	14-15
14.5.3.2	Biological Surveys.....	14-15
14.5.3.3	Candidate Species and Species of Concern Surveys.....	14-15
14.5.3.4	Raptor Surveys.....	14-15
14.5.3.5	Special Interest and Game Species Surveys.....	14-15
14.5.3.6	Wildlife Water Sources Visits.....	14-15
14.5.3.7	Hazardous Materials Spill Center Monitoring Program.....	14-15
14.5.3.8	Routine Radiological Monitoring of Biota.....	14-16
14.6	Adaptive Management.....	14-16
15	Air Resources.....	15-1
15.1	Introduction.....	15-1
15.2	Goal.....	15-1
15.3	Inventory and Limitations.....	15-1
15.3.1	Resource Status.....	15-1
15.3.2	Legal and Policy Requirements.....	15-9
15.3.2.1	Clean Air Act - Federal.....	15-9
15.3.2.2	Clean Air Act - State.....	15-9
15.3.2.3	Title V Operating Permits.....	15-9

	15.3.2.4	Open Burning Variances	15-10
	15.3.2.5	Opacity Restrictions	15-10
	15.3.2.6	Prevention of Significant Deterioration Regulation	15-10
	15.3.2.7	Restricted Area	15-10
15.4		Data Management	15-10
	15.4.1	Geographic Information System-Based Databases	15-12
	15.4.1.1	Sampling Locations Database	15-12
	15.4.2	Other Databases	15-12
	15.4.2.1	Annual Site Environmental Reports Database	15-12
	15.4.2.2	National Emission Standards for Hazardous Air Pollutants Annual Report Database	15-12
	15.4.2.3	Off-site Environmental Monitoring Report Database	15-12
	15.4.2.4	Operating Permits Database	15-12
	15.4.2.5	Emissions Inventory Database	15-13
	15.4.3	Release of Data	15-13
15.5		Monitoring	15-13
	15.5.1	Purpose	15-13
	15.5.2	Legal and Policy Basis	15-13
	15.5.2.1	Clean Air Act	15-13
	15.5.2.2	Department of Energy Order 5400.1, General Environmental Protection Program	15-13
	15.5.2.3	Department of Energy Order 5400.5, Radiation Protection of the Public and the Environment	15-14
	15.5.2.4	Title 40 Code of Federal Regulations Part 61, National Emission Standards for Emissions of Radionuclides Other Than Radon From Department of Energy Facilities - Subpart H	15-14
	15.5.3	Description of Monitoring Program	15-14
	15.5.3.1	Radiological Air Monitoring	15-14
	15.5.3.2	Ambient Air Quality	15-14
15.6		Adaptive Management	15-15
	15.6.1	Pollution Control Program	15-15
	15.6.2	Permitting Program	15-15

16 Geological and Mineral Resources 16-1

16.1		Introduction	16-1
16.2		Goal	16-1
16.3		Inventory and Limitations	16-1
	16.3.1	Resource Status	16-1
	16.3.1.1	Rock Types	16-1
	16.3.1.2	Base Metal and Precious Metal Mining Districts	16-2
	16.3.1.3	Timber Mountain Caldera	16-2
	16.3.1.4	Syncline Ridge Area	16-2
	16.3.1.5	Industrial and Commercial Rocks and Minerals	16-5
	16.3.1.6	Geothermal and Hydrocarbons	16-5
	16.3.2	Legal and Policy Requirements	16-5
	16.3.2.1	Public Land Orders	16-5

	16.3.2.2	United States Air Force Memorandum of Understanding	16-5
	16.3.2.3	Department of Energy, Nevada Operations Office Policy 450.X.....	16-5
16.4		Data Management	16-6
	16.4.1	Geographic Information System-Based Databases	16-6
	16.4.1.1	Nevada Test Site Database	16-6
	16.4.2	Other Databases.....	16-6
	16.4.2.1	Archiving Database	16-6
	16.4.2.2	Petrographic/Geochemical Database and Stratigraphic Framework for the Southwest Nevada Volcanic Field	16-7
	16.4.2.3	Gravity/Aeromagnetic Database	16-7
	16.4.3	Release of Data	16-7
16.5		Monitoring.....	16-7
	16.5.1	Purpose.....	16-7
	16.5.2	Legal and Policy Basis	16-8
	16.5.3	Description of Monitoring Program.....	16-8
16.6		Adaptive Management.....	16-8
17		Airspace Resources	17-1
17.1		Introduction	17-1
17.2		Goal.....	17-1
17.3		Inventory and Limitations.....	17-1
	17.3.1	Resource Status	17-1
	17.3.2	Legal and Policy Requirements.....	17-3
17.4		Data Management	17-3
	17.4.1	Geographic Information System-Based Databases	17-3
	17.4.2	Other Databases.....	17-3
	17.4.2.1	Annual Utilization Report for Special Use Airspace	17-3
	17.4.3	Release of Data	17-3
17.5		Monitoring.....	17-3
	17.5.1	Purpose.....	17-3
	17.5.2	Legal and Policy Basis	17-3
	17.5.3	Description of Monitoring Program.....	17-3
17.6		Adaptive Management.....	17-4
18		Socioeconomic Resources	18-1
18.1		Introduction	18-1
18.2		Goal.....	18-1
18.3		Inventory and Limitations.....	18-1
	18.3.1	Resource Status	18-1
	18.3.2	Legal and Policy Requirements.....	18-3
18.4		Data Management	18-3
	18.4.1	Geographic Information System-Based Databases	18-3
	18.4.2	Other Databases.....	18-3
	18.4.2.1	Labor Force and Employment by Place of Residence Database.....	18-3
	18.4.2.2	Income Data and Employment by Place of Work Database.....	18-3

15

18.4.2.3	Historical and Current Populations Database (Clark County)....	18-3
18.4.2.4	Projections of Employment, Personal Income and Gross State Product	18-3
18.4.2.5	1990 Census of Population and Housing Report	18-3
18.4.2.6	Growth Projections Database (Clark County)	18-3
18.4.3	Release of Data	18-4
18.5	Monitoring.....	18-4
18.5.1	Purpose.....	18-4
18.5.2	Legal and Policy Basis	18-4
18.5.3	Description of Monitoring Program.....	18-4
18.6	Adaptive Management.....	18-4
18.6.1	Employment Data Management	18-4
18.6.2	Education Outreach Activities.....	18-4
18.6.3	Nevada Risk Assessment/Management Program.....	18-5
18.6.4	Department of Energy, Nevada Operations Office and County Agreements	18-5
18.6.5	Community Reuse Organization	18-5
19	List of Preparers	19-1
20	References	20-1
21	Glossary	21-1
22	Acronyms	22-1

List of Tables

Table 8-1	Facility Types and Cumulative Space	8-2
Table 8-2	138 Kilovolt Line Segments.....	8-6
Table 8-3	Nevada Test Site Power Line Lengths	8-6
Table 8-4	Active Water Supply Wells on the Nevada Test Site	8-6
Table 8-5	Heliports	8-10
Table 11-1	Perennial Yield of Major Hydrographic Basins of the Nevada Test Site.....	11-3
Table 11-2	Maximum Historical Discharge from Nevada Test Site Wells, by Hydrographic Basin	11-6
Table 13-1	American Indian Traditional-Use Plants Present in the Nevada Test Site Area.....	13-5
Table 13-2	American Indian Traditional-Use Animals Present at the Nevada Test Site.....	13-8
Table 14-1	Endangered, Threatened, Candidate Species, Species of Concern, and State Regulated Species that may Occur on the Nevada Test Site	14-5
Table 15-1	Standards of Quality for Ambient Air.....	15-2
Table 15-2	Current Configuration of the Off-site Environmental Surveillance Program	15-14

List of Figures

Figure 5-1	Nevada Test Site and Major Ecoregions.....	5-3
Figure 5-2	General Overview of Site Use and Development Process.....	5-5

Figure 5-3	Site Use and Development Process Zones.....	5-6
Figure 7-1	Primary National Security Program Locations.....	7-3
Figure 7-2	Underground Testing Area Corrective Action Units	7-5
Figure 7-3	Soils Sites Corrective Action Units.....	7-6
Figure 7-4	Industrial Corrective Action Sites.....	7-7
Figure 7-5	Location of Radioactive Waste Management Sites and Hazardous Waste Storage Unit.....	7-8
Figure 8-1	Medical and Fire Response Times.....	8-3
Figure 8-2	Power Distribution System.....	8-5
Figure 8-3	Water Service Areas and Supply Wells.....	8-7
Figure 8-4	Transportation System.....	8-9
Figure 9-1	Nuclear Tests and Surface Contamination.....	9-4
Figure 10-1	Record of Decision Land Use Zones.....	10-2
Figure 10-2	Shaded Relief Map of the Nevada Test Site Area	10-5
Figure 10-3	Fault Map.....	10-6
Figure 11-1	Hydrographic Basins.....	11-4
Figure 12-1	Relative Concentrations of Prehistoric Cultural Resources	12-2
Figure 12-2	Relative Concentrations of Historic Cultural Resources.....	12-3
Figure 13-1	American Indian Region of Influence.....	13-2
Figure 14-1	Vegetative Communities of the Nevada Test Site.....	14-2
Figure 14-2	Range of the Wild Horse and Selected Animal Species of Concern on the Nevada Test Site.....	14-4
Figure 14-3	Range and Abundance of the Desert Tortoise on the Nevada Test Site.....	14-7
Figure 14-4	Locations of Candidate Plants and Plant Species of Concern on the Nevada Test Site.....	14-8
Figure 14-5	Natural and Manmade Water Sources on the Nevada Test Site	14-10
Figure 14-6	Other Important Habitats on the Nevada Test Site.....	14-11
Figure 15-1	Thermoluminescent Dosimeter Stations	15-4
Figure 15-2	Location of Thermoluminescent Dosimeter Fixed Stations and Personnel Monitoring Participants.....	15-5
Figure 15-3	Air Sampling Stations.....	15-6
Figure 15-4	Air Surveillance Network and Pressurized Ion Chamber Station Locations	15-7
Figure 15-5	Location of Safety and Storage-Transportation Tests on the Nevada Test Site and Nellis Air Force Range.....	15-8
Figure 15-6	Hazardous Materials Spill Center Controlled Area	15-11
Figure 16-1	Generalized Geologic Map	16-3
Figure 16-2	Location of Mining Districts on the Nevada Test Site, Tonopah Test Range, and Nellis Air Force Range.....	16-4
Figure 17-1	Nevada Test Site and Vicinity Airspace	17-2

This Page Intentionally Left Blank.

18

2 Executive Summary

The Nevada Test Site (NTS) Resource Management Plan (RMP) describes the NTS Stewardship Mission and how its accomplishment will preserve the resources of the ecoregion while accomplishing the objectives of the mission. The plan was developed using the principles of ecosystem management and identifies goals for managing the resources, organizational roles and responsibilities, and resource limitations. The plan also identifies the data management tools, monitoring plans, and adaptive management processes that will be used to facilitate informed decision making related to the use of the natural and manmade resources at the NTS.

The NTS Stewardship Mission is to manage the land and facilities at the NTS as a unique and valuable national resource. The *United States Department of Energy, Nevada Operations Office (DOE/NV) Strategic Plan (DOE/NV, 1998)* defined a land use policy that supports national security missions as the primary NTS mission. The land use policy recognizes that the transition from an active underground nuclear weapons testing program to a program of stewardship of the enduring nuclear stockpile and test readiness provides opportunities to make portions of the NTS available for alternate uses.

The RMP has defined goals for twelve resource areas based on the principles of ecosystem management. These goals were established using an interdisciplinary team of DOE/NV resource specialists with input from surrounding land managers, private parties, and representatives of Native American governments. The overall goal of the RMP is to facilitate improved NTS land use management decisions within the Great Basin and Mojave Desert ecoregions.

DOE/NV managers and NTS users will consider the following resource management

goals when making decisions that effect NTS resources:

Mission Goals

- ✓ Preserve the capability to resume underground nuclear testing on the NTS and accomplish stockpile stewardship and national security missions.
- ✓ Administer activities on the NTS so that resources are used effectively.
- ✓ Use the NTS for compatible activities that contribute to the economic diversification of southern Nevada.
- ✓ Identify, characterize, and remediate the lands and facilities contaminated by past activities to a standard compatible with the land uses and missions of the NTS.

Site Support Activities and Facilities Goal

- ✓ Manage facilities and services to support missions on the NTS effectively.

Health and Safety Goal

- ✓ Minimize health and safety risks to individuals on and around the NTS.

Land Goals

- ✓ Accommodate activities and projects on the NTS while minimizing impacts to undisturbed lands.
- ✓ Minimize impacts to sensitive areas of the NTS.

Water Goals

- ✓ Maintain an adequate water supply for existing and new uses on the NTS while ensuring a long-term sustainable supply of water for the NTS and the surrounding ecosystem.
- ✓ Maintain the quality of waters that are presently clean.
- ✓ Minimize the impact to groundwater quality should resumption of underground nuclear testing be required.
- ✓ Manage groundwater resources to maximize the availability of water while minimizing the impacts to human health and the environment from contamination remaining from underground nuclear testing.

Cultural Goal

- ✓ Identify, evaluate, and protect cultural and historical landscapes and resources.

American Indian Goal

- ✓ Consult with culturally affiliated tribes to identify values and resources and develop management recommendations.

Biological Goals

- ✓ Protect and conserve significant biological resources.
- ✓ Minimize the cumulative impacts to biological resources.

Air Goal

- ✓ Maximize air quality on the NTS.

Geological and Mineral Goal

- ✓ Consider the impacts of NTS operations on unique geological features and mineral resource areas.

Airspace Goal

- ✓ Manage the NTS airspace to enhance national security, public safety, and operational safety in the conduct of missions on the NTS.

Socioeconomic Goal

- ✓ Manage the resources and missions in a manner that considers the local and regional social and economic values and stimulates the local and regional economy.

The RMP describes the existing condition and limitations of each resource. Overall, the resources at the NTS are healthy and able to accommodate increased activity.

The five mission areas of National Security, Environmental Management (EM), Technology Diversification, Energy Efficiency and Renewable Energy, and NTS Stewardship are well managed and complimentary to the regional ecosystems. The national security mission requirement for restricted access to the NTS and sensitivity to encroachment by the public for over fifty years have created a relatively pristine environment at the NTS. Approximately 90% of the NTS lands are undisturbed. (DOE/NV, 1997) NTS cultural resources have not been subjected to the illegal collecting and/or damage from indiscriminate uses that occur on public lands. Most archeological sites are in good condition. Due to the absence of grazing, mining, off-road vehicle travel, or other public uses, the vegetative communities over most of the NTS are in a healthy, natural condition. Animal populations are stable and in a relatively natural balance with existing habitats.

Water and air quality and water uses are well within defined limits. Water use (900 acre-feet per year (ac-ft/yr)) is less than 2% of the perennial yield of the major NTS hydrographic basins. Contamination associated with underground nuclear testing is often localized

near the test cavity, leaving the water above, below and lateral to the test uncontaminated. The NTS is well within Environmental Protection Agency (EPA) standards for air quality.

The infrastructure at the NTS is utilized and maintained in accordance with its strategic importance. As a result, the infrastructure of the NTS varies in physical status. At the NTS, the majority of the infrastructure was constructed over 25 years ago. Bechtel Nevada (BN), the management and operating contractor of the NTS, continues to provide services such as: medical, fire protection, fuel, power, water, sewer, and communications.

The geology of the NTS provides a variety of rock types for study of unique volcanic features and fossil assemblages and for exploration of mineral deposits. It is DOE/NV policy that mining of locatable or leasable minerals and resources is not allowed at the NTS.

Air space resources at the NTS are designated by the Federal Aviation Administration (FAA) as restricted areas 4808 North and 4808 South. The air space is restricted from public use, with exceptions granted periodically for flights supporting projects at the NTS.

Improving land use management decisions requires that the best available information be used in the decision-making process. This plan identifies databases needed to make resource management decisions based on the RMP goals. The DOE/NV functional organization with the appropriate technical expertise is responsible for maintaining the quality of individual databases. The NTS geographic information system (GIS) uses the databases described in the plan to develop data layers useful to resource management at the NTS. The NTS GIS data layers allow decision-makers to locate projects and activities in areas of the NTS that are appropriate for the proposed use. Most of the databases identified in the RMP are available to the public.

Progress toward the RMP goals will be monitored at the individual resource level. Most monitoring is done in areas where projects and activities are planned to occur or are already occurring. The level of monitoring depends on the sensitivity of the resources in the area. The level of monitoring ranges from minimal for air quality to a complex program for monitoring groundwater. Monitoring includes project oversight and tracking for mission activities, project and activity reviews for location suitability, site surveys, and air, water and soil sampling. Most of the monitoring programs identified in the RMP are existing programs. The only new monitoring requirement is to perform mineral surveys for projects and activities proposed for locations within designated areas of geological and mineral resources.

Improved land use decisions at the NTS will require interagency cooperation, stakeholder and tribal government involvement, and an interdisciplinary approach to land use planning decisions. The DOE/NV has entered into a Five-Party Agreement with the Nellis Air Force Range (NAFR), the Bureau of Land Management (BLM), the United States Fish and Wildlife Service (USFWS), and the state of Nevada. (Five-Party Agreement, 1997) The purpose of the Five-Party Agreement is to enhance management of the natural resources within the Great Basin and Mojave Desert ecoregions located on the NTS, the NAFR, and the Desert National Wildlife Range. The parties have agreed to meet at least annually to share information and discuss issues of mutual concern.

The DOE/NV has developed an interdisciplinary process to ensure that before execution, project and activity impacts to NTS resources are considered and resource management conflicts have been resolved. All projects and activities at the NTS are subject to approval by the DOE/NV Manager. The Site Use and Development (SUD) Board is made up of senior managers representing various

organizations associated with DOE/NV. The primary purpose of the board is to provide recommendations to the Manager on the use of the NTS and its resources. In addition to the SUD Board, a working group was established to support the planning process. The SUD Working Group consists of federal and contractor staff personnel who are knowledgeable about NTS operations, resource management, and land use planning at the NTS. Additionally, the SUD Working Group has access to a wide variety of subject matter experts.

DOE/NV will perform and publish an annual summary review of DOE/NV's stewardship of the NTS. The annual summary will include a description of progress made towards meeting the goals of the RMP, pertinent monitoring data, actions that were taken to adapt to changing conditions, and any other changes to the RMP. DOE/NV will solicit stakeholder and tribal government input on resource management on a continuing basis and the annual review will be distributed to interested stakeholders and tribal governments.

3 Introduction

3.1 Purpose and Scope

DOE/NV made a commitment to prepare a RMP in the *Framework for the RMP* (Volume 2, *Final Environmental Impact Statement (EIS) for the NTS and Off-Site Locations in the State of Nevada*. (DOE/NV, 1996a) This commitment is documented in the EIS Record of Decision (December 9, 1996) (DOE/NV, 1996b), and is consistent with the Secretary of Energy's policy on facility and land use (Department of Energy (DOE) Policy 430.1). The RMP also supports the Stewardship mission of the *DOE/NV 1998 Strategic Plan*. (DOE/NV, 1998)

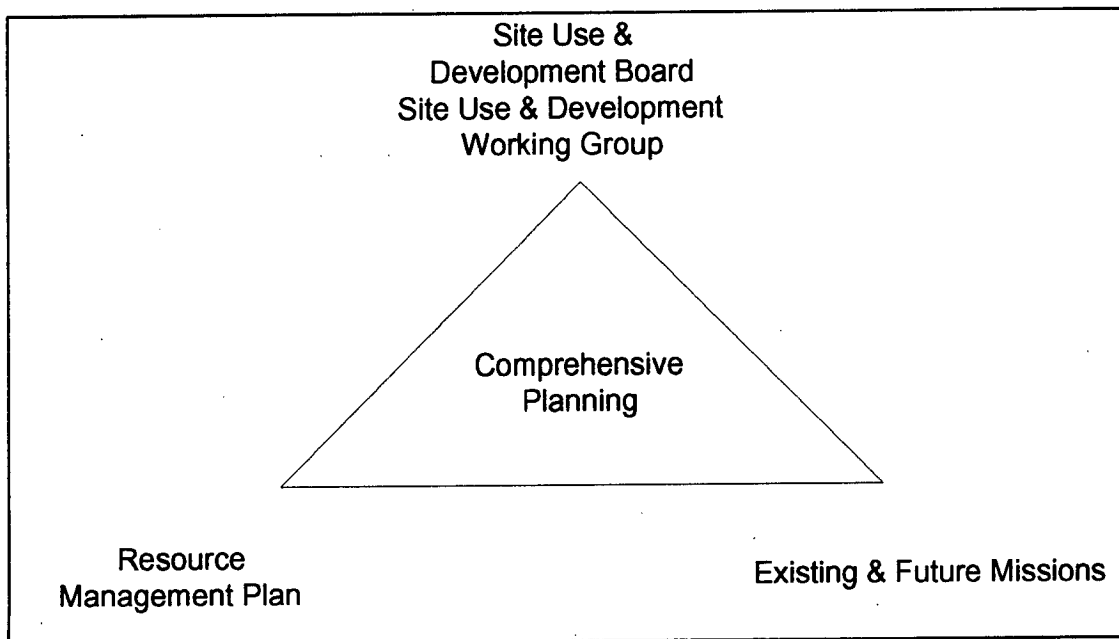
The RMP is an important component of the comprehensive planning effort for the NTS. The overall goal of comprehensive planning is to ensure that the NTS can provide needed resources for existing and future missions using the principles of ecosystem management. Comprehensive planning can be viewed as a combination of three components.

The first corner of the triangle is the existing and future missions. This encompasses the

activities that use the resources of the NTS and that must be integrated.

The next corner of the triangle is the SUD Board and Working Group. The primary purposes of the board are to: (1) provide recommendations to the DOE/NV Manager on the suitability of proposed projects and programs on the NTS and (2) resolve policy issues on the management of resources. The primary purpose of the Working Group is to provide information and recommendations to the SUD Board in support of comprehensive planning.

The last corner of the triangle is the RMP. The purpose of this plan is to provide the tools needed to support comprehensive planning. These tools range from identifying the resources that need to be managed to setting goals or limitations on the use of these resources to assessing the impacts from the use of these resources. Stakeholder and tribal government input was solicited as the plan was developed.



The combination of the three elements of comprehensive planning provides the tools and the mechanism to make informed decisions regarding the use of resources at the NTS.

3.2 Relationship to Other Planning Documents

3.2.1 Nevada Operations Office 1998 Strategic Plan

This plan defines the Stewardship of the NTS as one of five DOE/NV missions. This plan identifies a strategic initiative to develop long-term strategies for stewardship of the NTS. Two important objectives in developing this strategy are to complete the NTS RMP by December of 1998 and institutionalize the process for land use planning on the NTS. (DOE/NV, 1998)

3.2.2 Final Environmental Impact Statement for the Nevada Test Site and Off Site Locations in the State of Nevada

This document provides the baseline analysis for resource management at the NTS. The Record of Decision for this document committed DOE/NV to develop a RMP based on the principles of ecosystem management. Volume II of this document provides the framework for the RMP. (DOE/NV, 1996a)

3.2.3 Department of Interior, Bureau of Land Management Proposed Las Vegas Resource Management Plan and Final Environmental Impact Statement

This plan outlines the various decisions for management of renewable and non-renewable resources in the approximately 3.3 million acres of public land in Clark County and southern Nye County of Nevada. (United States

Department of Interior (DOI), 1998) The NTS is located in southern Nye County. DOE/NV has reviewed this plan for consistency with DOE/NV's resource management goals and to ensure that BLM plans will not have a negative impact on the NTS missions.

3.2.4 Legislative Environmental Impact Statement for Nellis Air Force Range Renewal

This document provides analysis of the alternatives being considered for the NAFR renewal legislative EIS. (United States Department of Defense (DoD), 1996) DOE/NV has participated in public meetings and commented on the legislative EIS process to ensure consistency with the DOE/NV RMP and to ensure that NAFR plans will not have a negative impact on the NTS missions.

3.3 Plan Organization and Use

The resources of the NTS have been divided into 12 resource areas. The *Framework for the RMP* determined the content of the 12 areas. The resources include a mix of manmade and natural resources.

Each resource area section begins with an introduction followed by one or more goals for managing the resource. Each resource goal was developed considering the balance between the primary mission of the NTS, economic development, and the limits of the ecological sustainability. Additionally, these goals reflect the principle of sustaining native ecosystems. Each goal is followed by two to three paragraphs of explanation. The explanation includes discussions on the purpose of the goal and any associated issues.

The inventory and limitations section describes the existing condition of the resource based on the best information available and any limitations on the use of the resource. A combination of maps and tables are used for

most resources to describe how much of the resource is available for use and where the resource is located. The section on legal and policy requirements discusses any restrictions on use of or impact to the resource.

The data management section describes the data required to manage the resource, how the data will be maintained or created, and how data can be transferred to on-site and off-site users. The databases containing the data required to manage the resources are divided into GIS-based databases and non GIS-based databases. The use of GIS databases reflects a commitment by DOE/NV to continue to develop and use the best information management tools available. For each database listed, information is included on what type of data it contains, the organization that maintains the data, how often the data is updated and the quality of the data. The quality of the data is a subjective rating that reflects the level of confidence that the DOE/NV subject matter expert has in the completeness and quality of the data. Information on which data is available to the public and how to obtain the data is also included.

The monitoring and adaptive management sections were developed recognizing that data gathering and management actions should contribute to accomplishment of the RMP goals. The monitoring activities and resource management processes were designed to monitor and assess performance and adapt resource management actions as necessary.

The monitoring section describes the methods used to determine the status and condition of the resource. A description of each legal or policy document that pertains to monitoring the resource is included. The monitoring programs for each resource are described and include the items monitored, methods used to monitor, frequency of monitoring, and responsible organization.

The adaptive management section describes how the resource will be managed to try to achieve the goals listed for each resource. The processes, programs, and plans used to manage the resource are described and include a brief summary, a description of how this contributes to achieving a goal, and opportunities for stakeholder and tribal government involvement.

The references cited in this plan are available for public review at the DOE/NV Public Reading Facility located at 2621 Losee Road, Building B-3, in North Las Vegas, Nevada.

Representatives of the Consolidated Group of Tribes and Organizations (CGTO) were invited to provide input on the document so that their concerns and viewpoints regarding American Indian resources would be presented. In some instances, viewpoints of the American Indians differ widely from the DOE's. To facilitate identification, the viewpoints of the CGTO are included in the document as italicized text.

3.4 Initial Plan Development

The principles of ecosystem management described in Section 4 were used to develop this plan. The overall plan was developed using an interdisciplinary team. Input was received from surrounding land managers, private parties, and Native American government representatives. The adaptive management sections address continued stakeholder and tribal government involvement.

DOE/NV subject matter experts initially developed the goals for this document. An initial set of goals was presented to stakeholders in a series of five workshops held September 15-23, 1997. Eighty-two people representing 13 stakeholder groups attended the workshops. The comments received at these workshops were used to refine the initial goals. A revised set of goals was developed and distributed to 107 people representing 25 stakeholder groups for review and comment on October 31, 1997. Two additional

workshops were held on December 2 and 4, 1997, and were attended by 24 people representing seven stakeholder groups. The comments received through the document review and workshops were used to revise and finalize the goals. The final goals were distributed to 163 people representing 25 stakeholder groups, 16 local Native American tribes, and 3 official Indian organizations on February 12, 1998. The goals presented in this document were used to guide the development of the remaining sections of the NTS RMP.

The introduction, inventory and limitations, and data management sections were added to the document and distributed to 169 people representing 26 stakeholder groups, 16 local Native American tribes, and 3 official Indian organizations for review on March 26, 1998. Comments were received from nine stakeholder groups and the CGTO. During this review, a large number of stakeholders indicated that they would like to be dropped from future reviews of the draft document.

The monitoring sections were added to the document and distributed to 102 people representing 19 stakeholder groups, 16 local Native American tribes, and 3 official Indian organizations for review on May 21, 1998. Comments were received from five stakeholder groups.

The remaining sections were added to the document and distributed to 105 people representing 15 stakeholder groups, 16 local Native American tribes, and 3 official Indian organizations for review on October 13, 1998. Comments were received from five stakeholder groups and the CGTO.

4

Ecosystem Management Principles

Representatives of the CGTO provided input on this section so that their concerns and viewpoints regarding American Indian resources could be presented. In some instances, viewpoints of the American Indians differ widely from the DOE's. To facilitate identification, the viewpoints of the CGTO are included as italicized text.

American Indians conceive their native ecosystem as a balanced chain of being where all living creatures are connected with each other as well as with landforms and celestial bodies. Each landscape feature and contour elevation of the land is tended by an animal keeper. Each keeper in turn is connected to a celestial body or constellation. This interdependency implies that any action taken on one ecosystem component or resource will affect all other components and resources. American Indians have the spiritual and cultural obligation to interact with the native ecosystem so that all its components and resources may thrive. This obligation is fulfilled both ceremonially and through non-disturbing, sustainable resource use. When resources are not used, plants not pruned, animals not culled, fruits and nuts not collected, water tanks not cleaned of sand, and rocks not prayed upon, the earth begins to decay and may even die. Humans are here to act as stewards of the land; American Indians carry this responsibility with great care and respect.

It is DOE policy to manage all of its land and facilities as valuable national resources, with stewardship based on principles of ecosystem management and sustainable development. An ecosystem is an interconnected community of living things, including humans and the physical environment with which they interact. The ecosystem approach is a method of maintaining the integrity of natural systems and processes that integrates ecological, economic, and social values. The goal of NTS ecosystem management is to accomplish the DOE/NV missions of national security, EM, technology diversification, energy efficiency and renewable energy, and NTS stewardship while at the same

time, sustaining the health, and biological diversity of NTS ecosystems. The NTS RMP is being developed using the following ecosystem management principles:

- ✓ Accommodate Economic Development, within the Limits of Ecological Sustainability

Ecosystems are limited in their ability to sustain economic development, and land use decisions must take into account the immediate and long-term impacts upon NTS ecosystems and the natural processes that support them. The DOE *Land and Facility Use Planning Policy* emphasizes the integration of mission, economic, ecological, social, and cultural values into the ecosystem approach. (DOE Policy 430.1) The ecosystem approach recognizes the interrelationship between a sustainable economy and a sustainable environment and fosters both. The approach should reduce conflict, increase understanding, and help accommodate many goals simultaneously through cooperation.

- ✓ Sustain the Productivity and Diversity of Native Ecosystems

Maintaining biodiversity is one of the primary reasons for implementing ecosystem management. Managing for ecological productivity and diversity promotes viable populations of native plants and animals and the ecological processes that support them. This principle will be incorporated by selecting and striving to achieve goals for biological resources that reflect this principle.

American Indians who have traditional cultural ties to the NTS view themselves as an integral part of the native ecosystem. Successful preservation and management of productivity and diversity in the native ecosystem involves a balanced interaction not only among humans and other living systems, but among all

resources--plants, animals, minerals, land forms, water, soils, air, and celestial bodies.

✓ Adopt an Interdisciplinary/Interagency Approach to Land Management

Using ecological boundaries requires cooperation between federal, state, local management agencies, and American Indian tribes as well as private parties. By working together, managers will be able to integrate conflicting legal mandates and management goals.

✓ Gather and Use the Best Scientific Information Available to Support Land Use Decisions

Successful ecosystem management requires the best scientific information (biological, physical, economic, and social), research, new technologies, and monitoring results available to determine appropriate land use decisions. Management of existing and new data and data sharing among agencies is an important aspect. Improving integration of available scientific data into project planning and improving methods for collecting, sharing, and using scientific information is another important aspect.

✓ Practice Adaptive Management

Adaptive management assumes that scientific knowledge is limited. Adaptive management focuses on management as a learning process that allows managers to remain flexible and adapt to uncertainty. Adaptive management encourages agency officials to be prudent and responsive by allowing policies, programs, and performance to be monitored and assessed.

5 Resource Management at the Nevada Test Site

5.1 Overall Policy

DOE Policy 430.1, *Land and Facility Use Planning*, was issued on July 9, 1996. This policy states:

"It is DOE policy to manage all of its land and facilities as valuable national resources. Our stewardship will be based on the principles of ecosystem management and sustainable development. We will integrate mission, economic, ecological, social, and cultural factors in a comprehensive plan for each site that will guide land and facility use decisions. Each comprehensive plan will consider the site's larger regional context and be developed with stakeholder participation. This policy will result in land and facility uses which support the Department's critical missions, stimulate the economy, and protect the environment." (DOE Policy 430.1)

This policy is the basis for the content of the NTS RMP.

5.2 Nevada Test Site Land Use Policy

A NTS land use policy was adopted in the strategic plan issued by DOE/NV on June 23, 1998. This policy states:

"The NTS is a Defense Programs site established to support national security missions. The existing assets of the NTS represent a unique and indispensable extension of the National Laboratories' experimental capabilities and are essential to the timely execution of operations and experiments in support of the Stockpile Stewardship Program.

The NTS is also an operational site for other important activities. EM programs include environmental restoration, low-level radioactive waste management, and ground water

characterization activities. A variety of non-defense research and development activities is conducted in cooperation with universities, industry, and other federal agencies. Work for other activities are conducted by other federal agencies, especially the DoD. The NTS is one of several DOE designated National Environmental Research Parks.

In August 1997, Secretary of Energy, Federico Peña expanded the historical role of the NTS by signing an Economic Development Use Permit, which allows private entities to use portions of the NTS over the next 10 years. While the goal of this initiative is to attract new work to the NTS and lessen the effects of downsizing, DOE/NV's policy is to provide for the broadest range of utilization consistent with the NTS national security mission.

The transition of the NTS from an active underground nuclear weapons testing program to a program of stewardship of the enduring nuclear stockpile and test readiness has provided the opportunity to make portions of the NTS available for alternate uses. To ensure that proposed alternate uses of the NTS are in the interest of national security, compatible with the primary Defense Programs mission, and contribute to the overall vitality of the NTS, land use policies were established for different parts of the NTS. These policies are designed to preserve the usefulness of the portions of the NTS that are essential to the Defense Programs mission and to locate other activities in more appropriate areas of the NTS. In addition, these policies are consistent with the DOE's policy to manage all land and facilities as valuable national resources with stewardship based on the principles of ecosystem management and sustainable development." (DOE/NV, 1998)

This policy is the basis for the content of the NTS RMP. The land use policies established

for the different parts of the NTS have been broken down into three major use zones. These zones are discussed in Section 5.6.2.

5.3 Overall Resource Management Goal

- ✓ Improve land use management decisions within the Great Basin and Mojave Desert ecoregions.

The intent of this goal is to adopt an interagency approach to applying ecosystem management principles to land use within the Great Basin and Mojave Desert ecoregions. The NTS spans the transition zone between the Mojave and Great Basin Deserts as shown in Figure 5-1. Agencies within the ecoregions can make better-informed decisions and prevent resource management conflicts between land uses by coordinating RMPs, activities, and data.

Coordination and cooperation with surrounding land managers are the keys to accomplishing this goal. The surrounding land managers include the BLM, the United States Air Force (USAF) NAFR, the USFWS (Desert National Wildlife Range), National Park Service, Nye County, Clark County, the state of Nevada, and the Yucca Mountain Site Characterization Office.

5.4 Overall Data Management

Improving land use management decisions requires that the best available information be used in the decision making process. Quality data must be useful and accurate. This plan identifies those databases needed to make resource management decisions based on the RMP goals. Other databases not identified in the RMP are maintained by DOE/NV for a variety of reasons and may be useful to planners on individual projects. The DOE/NV functional organization with the appropriate technical expertise is responsible for

maintaining the quality of the individual databases. The data identified by this plan will be used in the planning process to help determine the best location for a proposed project, aid in determining progress toward resource management goals, and support National Environmental Policy Act (NEPA) reviews.

The NTS GIS uses the databases described throughout the document to develop data layers useful to resource management at the NTS. The NTS GIS contains data layers that allow the project managers and the SUD Working Group to determine if an area of the NTS being considered for use is appropriate for that use. NTS GIS contains data layers showing areas sensitive to mission conflicts, safety hazards, biological impacts, cultural impacts, or geological impacts. Impacts to sensitive areas must be considered and conflicts resolved before locating a project in an area. Many of these data layers exist and are shown throughout this document. As more information becomes available existing data layers will be updated and new data layers created.

5.5 Overall Monitoring

Progress toward the goals of the RMP will be monitored at the individual resource level. The information obtained through individual resource monitoring will be used to develop an annual summary review of DOE/NV's stewardship of the NTS.

5.6 Overall Adaptive Management

Improved land use decisions at the NTS will require interagency cooperation and stakeholder and tribal government involvement, an interdisciplinary approach to land use planning decisions, monitoring of progress toward established resource management goals, and improved data management tools.



Figure 5-1 Nevada Test Site and Major Ecoregions

5.6.1 Interagency Cooperation

The DOE/NV has entered into a Five-Party Agreement with the NAFR, the BLM, the USFWS, and the state of Nevada. (Five-Party Agreement, 1997) The agreement represents an important element in the implementation of interagency cooperation and stakeholder and tribal government involvement. The purpose of the Five-Party Agreement is to enhance management of the natural resources within the Great Basin and Mojave Desert ecoregions located on the NTS, the NAFR, and the Desert National Wildlife Range. The parties have agreed to meet at least annually to share information and discuss issues of mutual concern. Additionally, the agreement provides for an open public meeting to be held annually.

5.6.2 Interdisciplinary Process

DOE/NV has developed an interdisciplinary process to ensure that before execution, project and activity impacts to NTS resources are considered and resource management conflicts have been resolved. A general overview of the process is shown in Figure 5-2. All projects and activities at the NTS are subject to approval by the DOE/NV Manager.

Projects are coordinated through the SUD Board for screening and location before approval by the DOE/NV Manager. The SUD Board is made up of senior managers representing various organizations associated with DOE/NV. Organizations represented on the board include DOE Programs, Management and Operating Contractors, the National Laboratories, Nellis Air Force Base, the NTS Development Corporation, and the Defense Threat Reduction Agency. The primary purpose of the board is to provide recommendations to the DOE/NV Manager on the use of the NTS and its resources. In addition to the SUD Board, a working group has been established to support the planning process. The primary purposes of the SUD

Working Group are to: (1) work with project managers to identify and resolve project issues related to use of the NTS and (2) support of the planning process by providing information and recommendations to the SUD Board. The SUD Working Group consists of federal and contractor staff personnel who are knowledgeable about NTS operations, resource management, and land use planning at the NTS. Additionally, the Working Group has access to a variety of subject matter experts.

The SUD process has two subcomponents called Screening Approval and Location Approval. The purpose of Screening Approval is to decide if a proposed project is compatible with the existing missions of the NTS and is an appropriate use of NTS resources. A project must meet one or more of the following general criteria to be considered an appropriate use of the NTS:

- ✓ Supports DOE programs
- ✓ Supports a national interest
- ✓ Promotes preservation of Nuclear Test Readiness core competencies
- ✓ Supports or enhances the NTS infrastructure
- ✓ Promotes diversification of the NTS or regional economy
- ✓ Promotes employment of current or former NTS employees

More detailed criteria has been developed that establishes three major use zones. These zones are shown in Figure 5-3. The National Security Use Zone has the most stringent criteria, followed by the Restricted Use Zone and finally the General Use Zone.

National Security Use Zone projects must meet all of the following criteria:

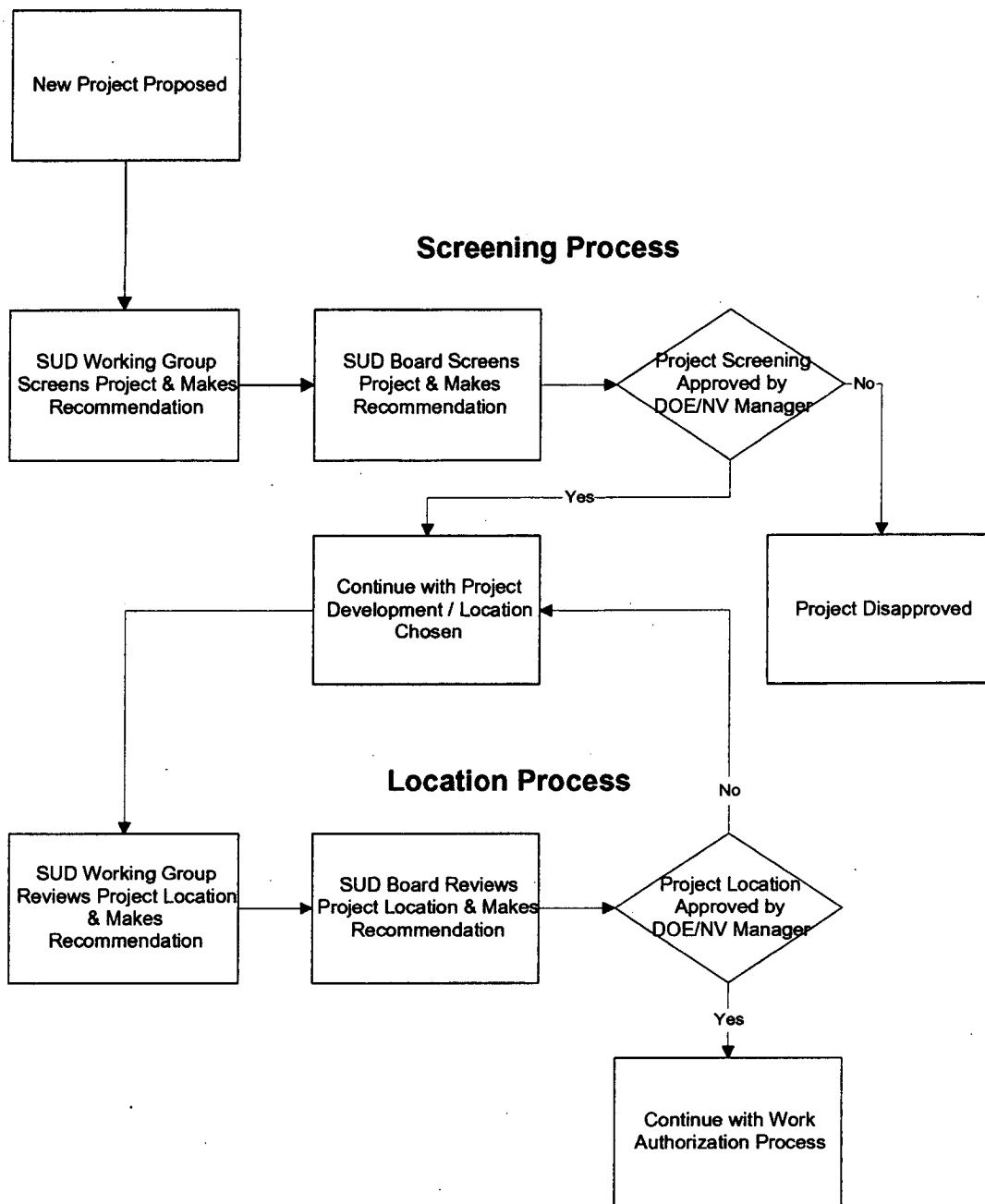
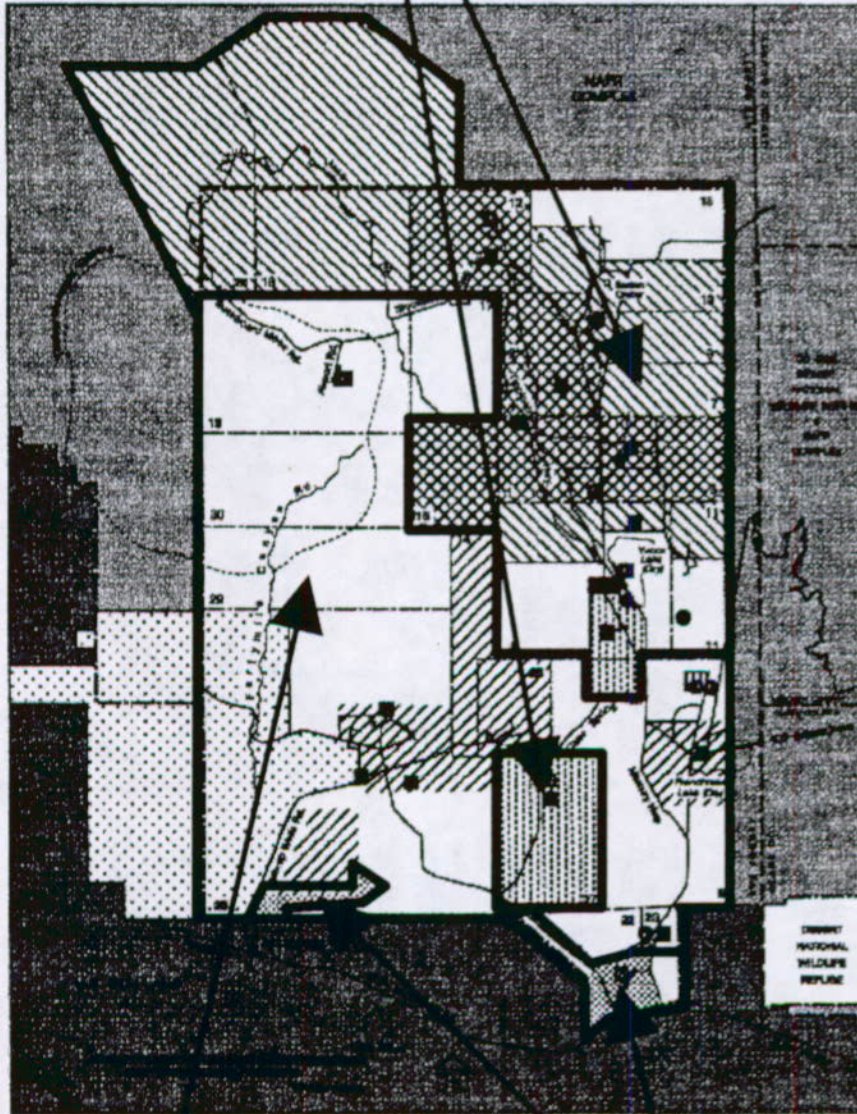


Figure 5-2 General Overview of Site Use and Development Process

National Security Zone



Restricted Use Zone

General Use Zone

Figure 5-3 Site Use and Development Process Zones

34

- ✓ Complementary to or compatible with stockpile stewardship and test readiness programs.
- ✓ Complementary to or compatible with existing missions in the area.
- ✓ Compatible with NTS natural and man-made resources.
- ✓ Compelling need (such as security, restricted access, remote location, physical characteristics) that drives the project to be located in this zone.

Restricted Use Zone projects must meet all of the following criteria:

- ✓ Will not prohibit or significantly degrade the execution of the national security mission.
- ✓ Will not prohibit or significantly degrade the execution of existing missions.
- ✓ Compatible with NTS natural and man-made resources.
- ✓ Compelling need (such as security, restricted access, remote location, physical characteristics) that drives the project to be located within the security boundary of the NTS.

General Use Zone projects must meet all of the following criteria:

- ✓ Will not prohibit or significantly degrade the execution of the national security mission.
- ✓ Will not prohibit or significantly degrade the execution of existing missions.
- ✓ Compatible with NTS natural and man-made resources.
- ✓ Justification of need to be within the boundaries of the NTS (remote location, physical characteristics, availability of land, proximity of services, etc.).

The purpose of Location Approval is to determine an appropriate location(s) for a project on the NTS. During the Location Approval process, consideration is given to:

- ✓ Impacts on existing missions
- ✓ Consistent land and facility use
- ✓ Conflicts with sensitive areas
- ✓ Appropriate use of NTS resources

DOE/NV will use the SUD process in future programmatic and site-specific NEPA reviews to identify alternative locations of new projects on the NTS. The DOE/NV NEPA Compliance Officer reviews all proposed projects and activities at the NTS to determine the level of NEPA review required.

This Page Intentionally Left Blank.

36

6 Roles and Responsibilities

6.1 Department of Energy, Nevada Operations Office

The responsibilities of the primary DOE/NV organizations involved in the RMP are described in the following sections.

6.1.1 Manager

Responsible for approving the RMP and ensuring that the actions specified in the plan are implemented by the appropriate DOE/NV and contractor organizations.

6.1.2 Engineering and Asset Management Division

Responsible for the Site Support Activities and Facilities resources section of the RMP. Provides input for the annual summary to the Technology Development Division on the progress made towards meeting the goal for this resource and any actions that were taken to adapt to changing conditions.

Responsible for ensuring activities at the NTS are conducted in compliance with the RMP.

Responsible for oversight of the maintenance and support of the NTS GIS system.

6.1.3 Environment, Safety, and Health Division

Responsible for the Health and Safety, Water, Cultural, American Indian, Biological, and Air resources sections of the RMP. Provides input for the annual summary to the Technology Development Division on the progress made towards meeting the goals for these resources and any actions that were taken to adapt to changing conditions.

Responsible for ensuring activities at the NTS are conducted in compliance with the RMP.

6.1.4 Human Resources Division

Responsible for the Socioeconomic resources section of the RMP. Provides input for the annual summary to the Technology Development Division on the progress made towards meeting the goal for this resource and any actions that were taken to adapt to changing conditions.

Responsible for ensuring activities at the NTS are conducted in compliance with the RMP.

6.1.5 Site Operations Division

Responsible for the national security portion of the Mission resources section and the Airspace resources section of the RMP. Provides input for the annual summary to the Technology Development Division on the progress made towards meeting the goals for these resources and any actions that were taken to adapt to changing conditions.

Responsible for ensuring activities at the NTS are conducted in compliance with the RMP.

6.1.6 Stockpile Stewardship Division

Responsible for the Geological and Mineral resources section of the RMP. Provides input for the annual summary to the Technology Development Division on the progress made towards meeting the goal for this resource and any actions that were taken to adapt to changing conditions.

Responsible for ensuring activities at the NTS are conducted in compliance with the RMP.

6.1.7 Technology Development Division

Responsible for the technology diversification, energy efficiency, and renewable energy portions of the Mission resources section and the Land resources section of the RMP. Provides input for the annual summary on the progress made towards meeting the goals for these resource and any actions that were taken to adapt to changing conditions.

Responsible for ensuring activities at the NTS are conducted in compliance with the RMP.

Responsible for operating the interdisciplinary process discussed in Section 5.6.2.

Responsible for the compilation and publication of an annual summary on the RMP. The annual summary will include a description of the progress made towards meeting the goals of the RMP, pertinent monitoring data, actions that were taken to adapt to changing conditions with the resources, and any other changes to the RMP.

Responsible for conducting a biennial review of the RMP to determine if a sufficient number of changes have occurred to merit revising the plan. If a revision to the RMP is determined to be necessary, the revised plan will be sent for review to key stakeholders and tribal governments before publication.

6.1.8 Waste Management Division

Responsible for the EM portion of the Mission resources section of the RMP. Provides input for the annual summary to the Technology Development Division on the progress made towards meeting the goals for this resource and any actions that were taken to adapt to changing conditions.

Responsible for ensuring activities at the NTS are conducted in compliance with the RMP.

6.1.9 All Other Organizations

Responsible for ensuring activities at the NTS are conducted in compliance with the RMP.

6.2 Contractors and Other Users at the Nevada Test Site

6.2.1 Bechtel Nevada

Responsible for implementing the actions specified in the RMP as directed by DOE/NV and ensuring that activities at the NTS are conducted in compliance with the RMP.

Responsible for maintenance and support of the NTS GIS system.

6.2.2 Desert Research Institute

Responsible for implementing the actions specified in the RMP as directed by DOE/NV and ensuring that activities at the NTS are conducted in compliance with the RMP.

6.2.3 University of Arizona, Tucson

Responsible for implementing the actions specified in the RMP as directed by DOE/NV and ensuring that activities at the NTS are conducted in compliance with the RMP.

6.2.4 All Other Users of the Nevada Test Site

Responsible for ensuring activities at the NTS are conducted in compliance with the RMP.

6.3 Stakeholders and Tribal Governments

DOE/NV will solicit stakeholder and tribal government input on resource management practices on a continuing basis. Stakeholder and tribal government contacts established during the development of the RMP will be continued through informal communications

and through methods that are more formal. Projects that require EISs or Environmental Assessments will follow the established NEPA process for public involvement. The annual review discussed in Sections 5.5 and 6.1.7 will be distributed to interested stakeholders and culturally affiliated tribes. Other formal stakeholder and tribal government forums are discussed below.

6.3.1 Five-Party Agreement

The Five-Party Agreement discussed in Section 5.6.1 provides a forum for coordination with the surrounding land managers and the state of Nevada. This agreement also provides for an annual public meeting. (Five-Party Agreement, 1997)

6.3.2 Nevada Test Site Community Advisory Board

The Community Advisory Board provides a monthly forum for public involvement in the EM Program at the NTS.

6.3.3 Nevada Test Site Development Corporation

The NTS Development Corporation has been established to act as a single community voice on issues concerning economic development at the NTS. The NTS Development Corporation participates on the SUD Board mentioned in Section 5.6.2.

6.3.4 American Indian Resources Program

As discussed in Section 13.6.1, DOE/NV has a government-to-government consultation relationship with culturally affiliated tribes and organizations. Through the CGTO, DOE/NV maintains a formal forum and solicits input on resource preservation and management on a regular basis.

This Page Intentionally Left Blank.

7 Mission Resources

7.1 Introduction

The NTS plays a vital part in the National Security interests of the United States (U.S.) of America. A cornerstone of this role was the U.S. nuclear weapons testing program. Since the moratorium on nuclear testing began on October 2, 1992, the primary mission of the NTS changed to supporting the DQE Stockpile Stewardship and Management Program for the nation's enduring nuclear weapon stockpile. The mission of the NTS is composed of five mission elements (DOE/NV, 1998):

- ✓ National Security – support the DOE Stockpile Stewardship Program through subcritical and other weapons physics experiments, emergency management, test readiness, work for other defense organizations and other experimental programs.
- ✓ EM – support environmental restoration, groundwater characterization activities, hazardous waste management, and radioactive waste management.
- ✓ Technology Diversification – support non-traditional departmental programs and commercial activities that are compatible with the Stockpile Stewardship Program.
- ✓ Energy Efficiency and Renewable Energy – support the development of solar energy, alternative fuel and energy efficiency technologies.
- ✓ Stewardship of the NTS – manage the land and facilities at the NTS as a unique valuable national resource.



U1a Complex

7.2 Goals

- ✓ Preserve the capability to resume underground nuclear testing on the NTS and accomplish the stockpile stewardship and national security missions.

The NTS was originally selected for nuclear weapons testing because the climate, terrain, and isolation minimized the risk to security and public safety. The intent of this goal is to ensure that activities on or near the NTS do not affect the ability to resume underground nuclear testing operations safely and securely should the nation's security require such testing.

- ✓ Administer activities on the NTS so that resources are used effectively.

It is the intent of this goal to manage the NTS as a valuable national resource and establish accountability for stewardship of NTS resources. This stewardship will be based on the principles of ecosystem management and sustainable development.

- ✓ Use the NTS for compatible activities that contribute to the economic diversification of southern Nevada.

The intent of this goal is to ensure that future activities consider the current missions of the NTS and the prioritization of those missions, and are developed with stakeholder and tribal government participation. This will result in compatible activities that support DOE's critical missions, stimulate the economy, and protect the environment.

- ✓ Identify, characterize, and remediate the lands and facilities contaminated by past activities to a standard compatible with the land uses and missions of the NTS.

The Environmental Restoration program is designed to identify, characterize, and remediate soils, facilities, and groundwater. Some soils, facilities, and groundwater on the NTS were contaminated by past operations. The RMP will provide valuable information for establishing remediation standards DOE/NV will use to meet its cleanup obligations under various environmental laws. The waste management activities will continue to safely and properly treat, store, and dispose of waste on the NTS.

The RMP will be the basis, in part, for land use scenarios that lead to agreement on remediation standards with the regulator, stakeholders, and tribal governments. This agreement depends on their acceptance of the plan as a policy and management document that achieves ecosystem management principles. The land use scenarios will also help to define the future status for waste disposal sites.

7.3 Inventory and Limitations

7.3.1 Resource Status

The five mission elements described in Section 7.1 are discussed in detail in the following sections.

7.3.1.1 National Security

Stockpile stewardship and management activities include science-based weapons experimentation and maintenance functions to ensure the safety, reliability, and performance of the nation's nuclear weapon stockpile. These activities are conducted throughout the NTS, with the majority of the activities being conducted at five primary locations as shown in Figure 7-1.

- ✓ Subcritical Experiments – These are dynamic experiments involving high explosives and special nuclear material and are conducted at the U1a Complex in Area 6.
- ✓ Device Assembly Facility – This facility, located in Area 6, is a multi-structure facility where nuclear devices and high explosives can be assembled, modified or disassembled, staged, and component tested.
- ✓ Area 27 Assembly/Storage Facilities – These facilities have been the primary location for the assembly of nuclear device tests assemblies for the nuclear test program. These facilities are used to support the Big Explosives Experimental Facility and other programmatic activities.
- ✓ Big Explosives Experimental Facility – This facility, located in Area 4, is used as a hydrodynamic test facility for detonations of very large conventional high-explosive charges and devices.
- ✓ Hazardous Materials (HAZMAT) Spill Center – This is a research and demonstration facility, located in Area 5. It is available to private and public sector test and training sponsors who are concerned with the safety aspects of hazardous chemicals.

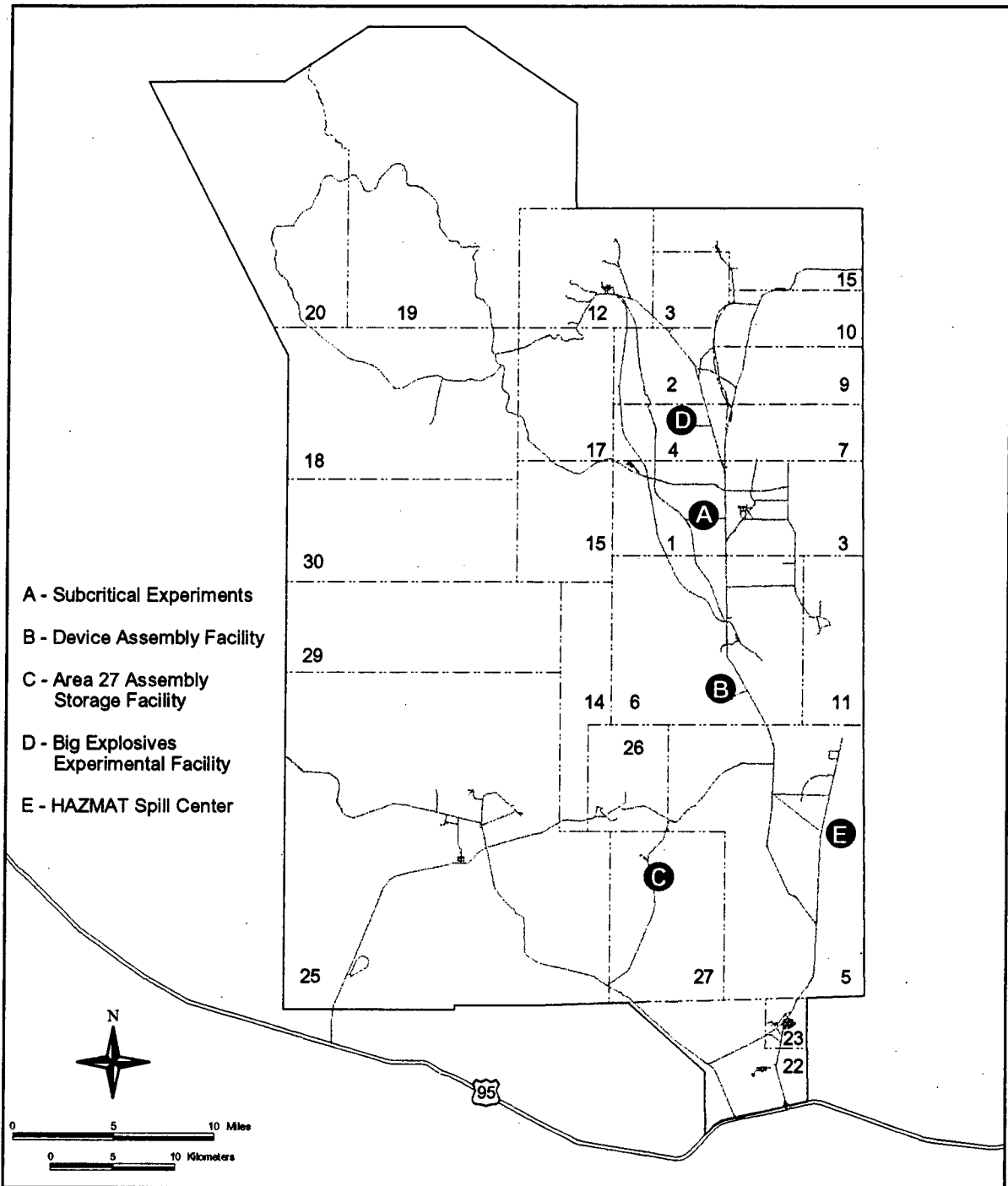


Figure 7-1 Primary National Security Program Locations

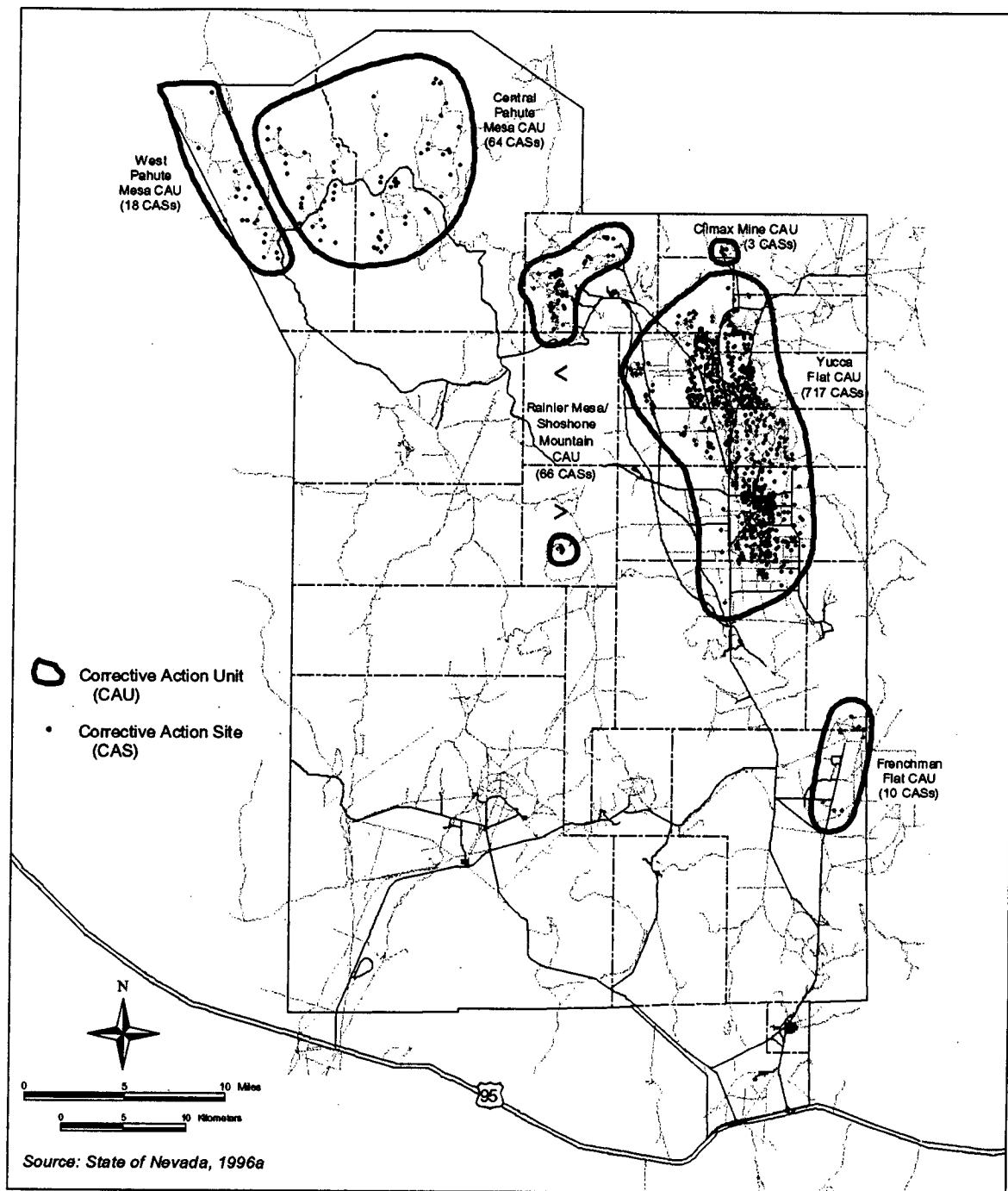


Figure 7-2 Underground Testing Area Corrective Action Units

44

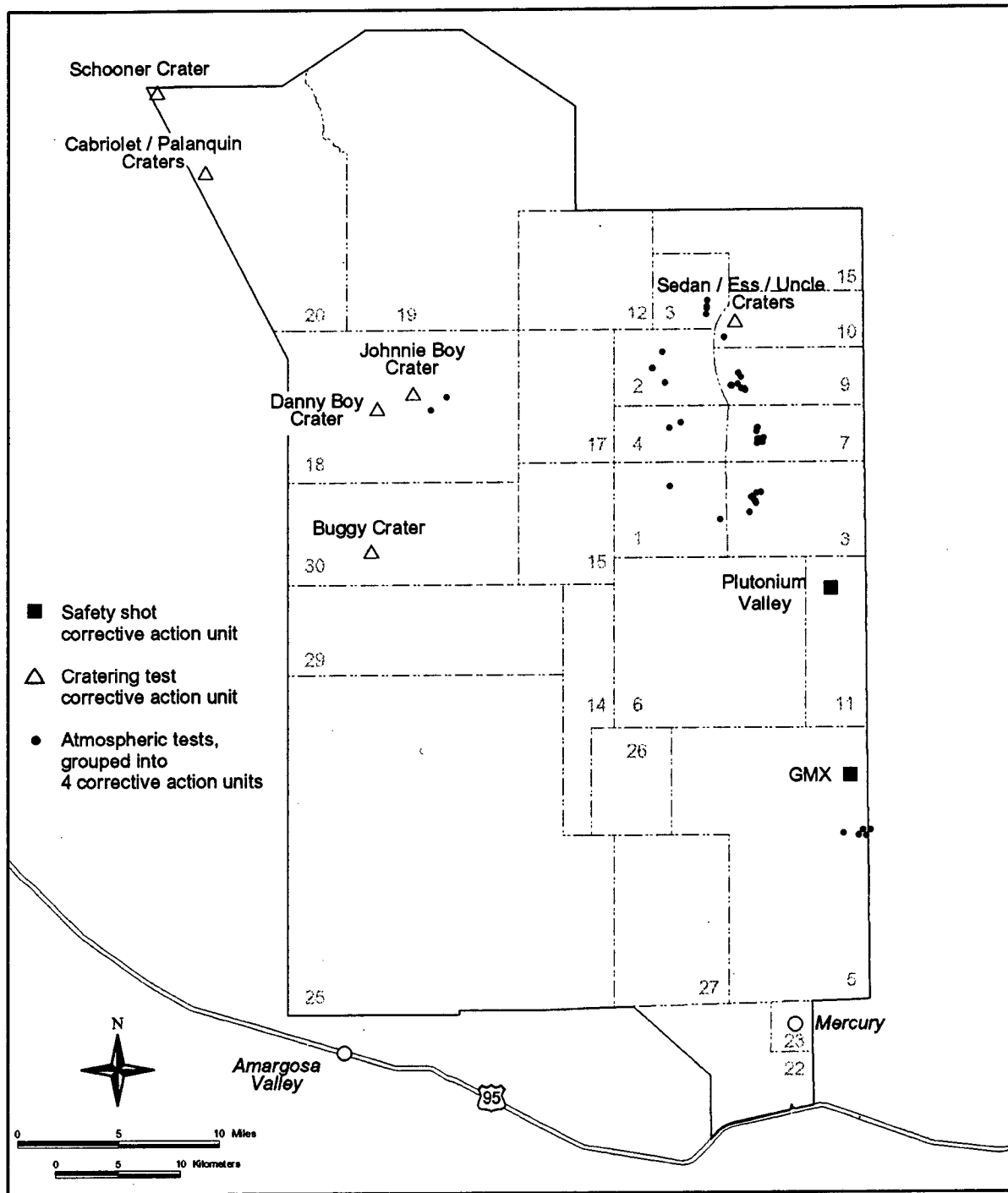


Figure 7-3 Soils Sites Corrective Action Units

45

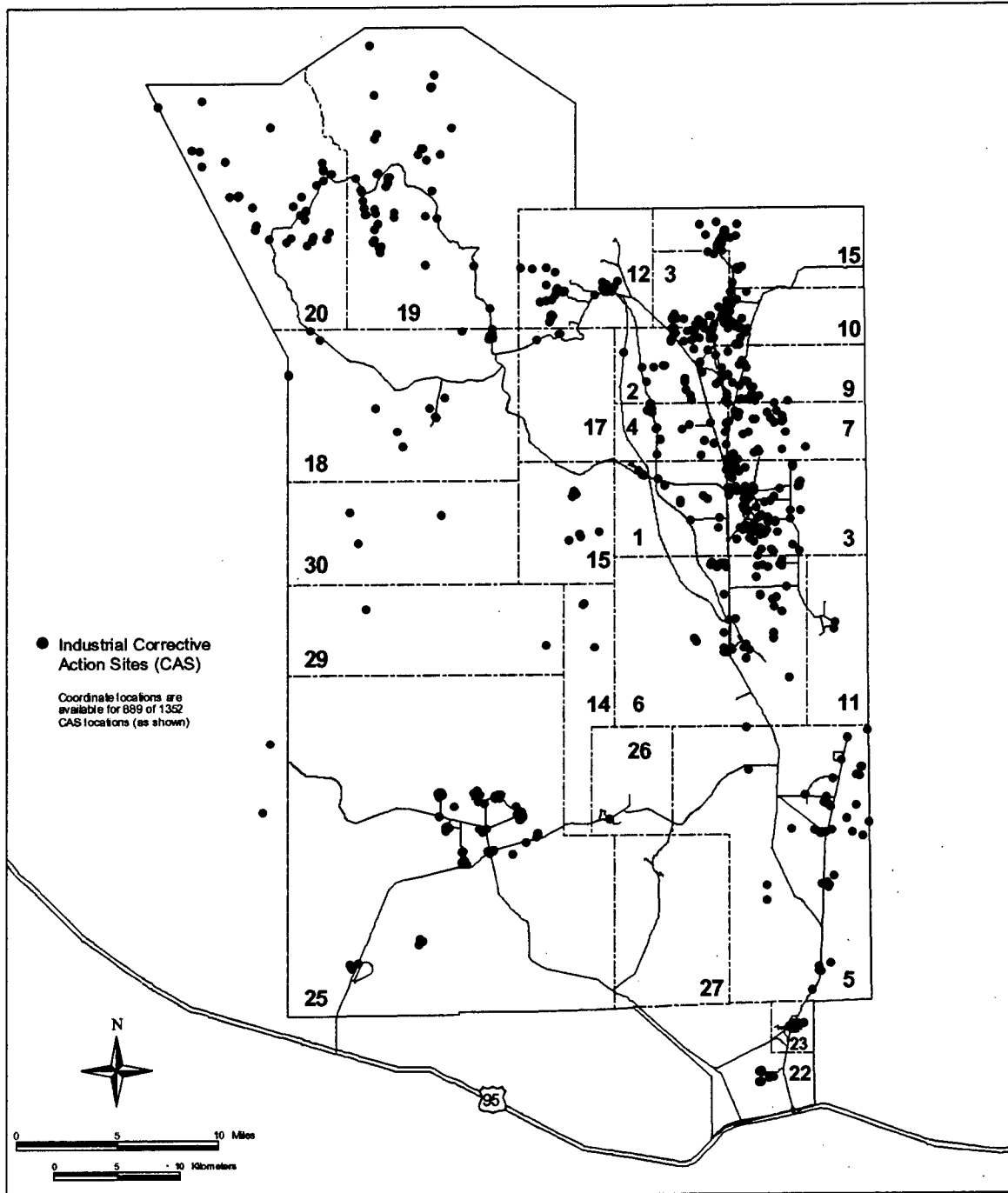


Figure 7-4 Industrial Corrective Action Sites

46

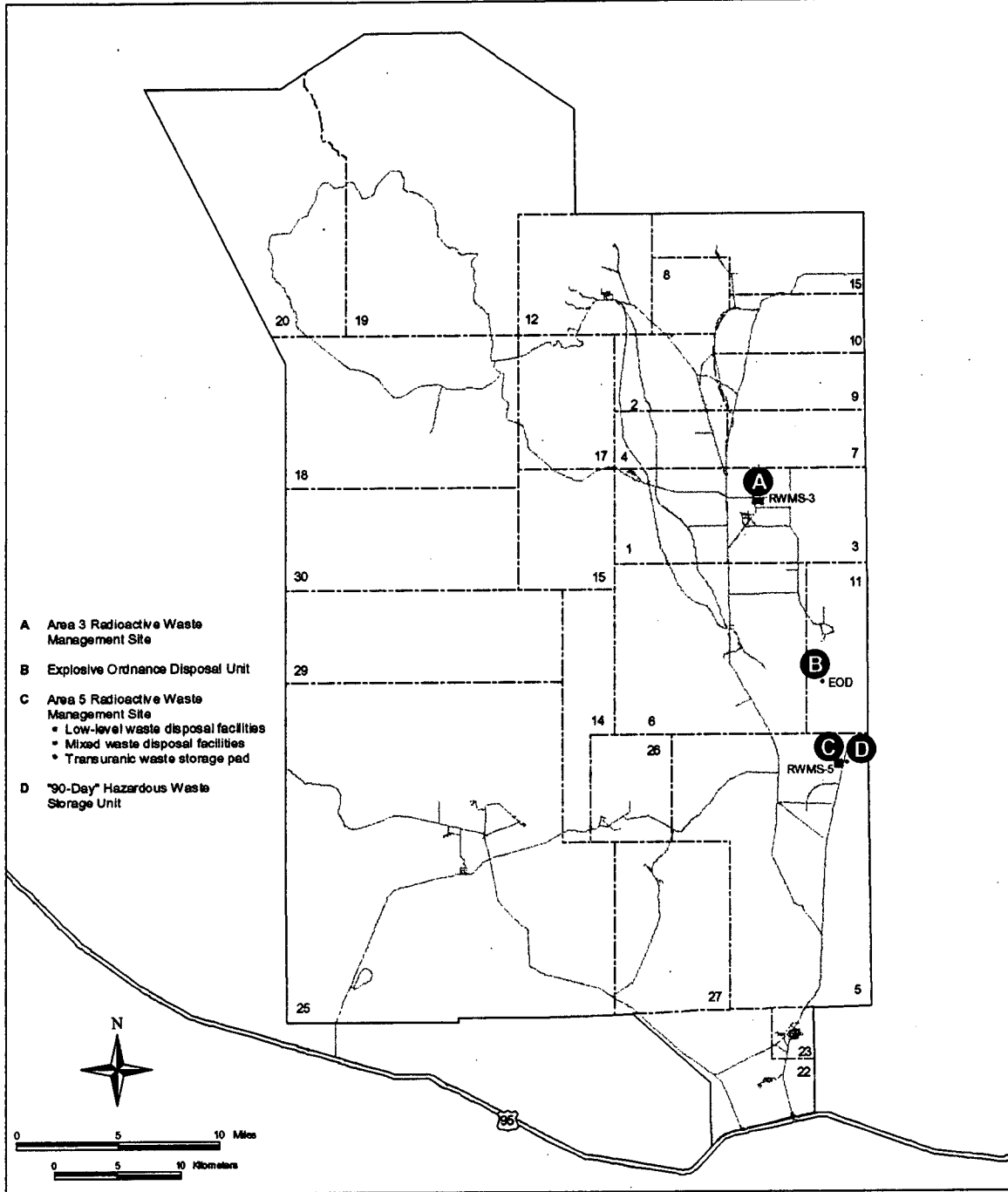


Figure 7-5 Location of Radioactive Waste Management Sites and Hazardous Waste Storage Unit

47

currently being used for waste management activities. This includes the administrative and support facilities and the Waste Examination Facility.

- ✓ Area 5 Hazardous Waste Storage Unit – This unit is located directly across from the Area 5 RWMS. This site is a Resource Conservation and Recovery Act (RCRA) permitted unit used to store non-radioactive hazardous waste.
- ✓ Area 11 Explosive Ordnance Disposal (EOD) Unit – This unit is a RCRA permitted facility used for thermal treatment of waste explosives.

7.3.1.3 Technology Diversification

Several different organizations are participating in the effort to diversify the programmatic mix of activities at the NTS.

The NTS Development Corporation works with the DOE to facilitate the reuse of federal assets that contribute to the creation of high value jobs and to promote the growth of science and technology in Nevada. The NTS Development Corporation has identified three target markets – aerospace, energy efficiency, and chemicals. Two examples of the types of projects underway by the NTS Development Corporation are:

- ✓ Kistler Aerospace Corporation – This company is interested in constructing a commercial rocket launch facility at the NTS in Area 18. The facility would be used to launch reusable aerospace vehicles that deploy satellite payloads into a low-earth-orbit.
- ✓ Fluid Tech, Inc. – This company has set up an operation in the Engine Maintenance Assembly/Disassembly Building in Area 25 to decontaminate commercial equipment and return the

cleaned equipment and waste to the commercial customer.

The Nevada Testing Institute is providing training for novice miners in the basic aspects of mine safety and has constructed a ground motion generator to study earthquake phenomenon. The company is also interested in constructing a center to conduct experiments on components of civilian structures that may be exposed to terrorist attacks.

7.3.1.4 Energy Efficiency and Renewable Energy

A number of initiatives are being pursued in the areas of energy efficiency and renewable energy. A Solar Enterprise Zone was established as part of DOE's effort to help enhance the nation's energy supply and to neutralize the impacts of downsizing at the NTS. The 125-acre (0.51 km²) site is located in Areas 22 and 23.

7.3.1.5 Stewardship of the Nevada Test Site

Stewardship is managing the lands and facilities at the NTS as a unique valuable national resource. The stewardship of the NTS may be best characterized as the landlord function of DOE/NV. The NTS is a large complex consisting of land, facilities, infrastructure, and natural resources that are described throughout this document. The land and facilities that comprise the NTS are discussed in Sections 8 and 10.

7.3.2 Legal and Policy Requirements

7.3.2.1 Federal Facility Agreement and Consent Order

This order is an agreement between DOE/NV, the DoD, and the state of Nevada and outlines a schedule of cleanup and

monitoring commitments for sites potentially contaminated by the DOE and DoD. Environmental restoration activities are conducted according to the requirements of this order. (State of Nevada, 1996a)

7.3.2.2 Resource Conservation and Recovery Act

All hazardous waste must be managed in accordance with RCRA. (42 United States Code (USC) 6901) Under its terms, the EPA granted the state of Nevada oversight authority for RCRA activities within the state. Subsequently, the Nevada Division of Environmental Protection (NDEP) issued a RCRA Permit to the DOE/NV to operate a hazardous waste storage unit and EOD unit and to perform corrective actions at the NTS. Most of the environmental restoration activities at the NTS are regulated under the *Federal Facility Agreement and Consent Order* (FFACO), which is tied to the RCRA Permit.

The RWMS in Area 5 has an Interim Status RCRA Mixed Waste Disposal Unit and must comply with Federal and state RCRA laws, regulations, and permit conditions. In addition, only authorized and trained personnel are allowed to enter and use this facility unescorted.

Hazardous waste management is regulated under RCRA Subtitle C and the Nevada Administrative Code (NAC). These regulations provide specific criteria for the accumulation, temporary storage, waste characterization, treatment, transportation, and disposal of hazardous waste. In addition to the regulatory criteria, DOE/NV operates the Hazardous Waste Storage Unit and the EOD Unit in compliance with the additional requirements specified in the *NTS RCRA Hazardous Waste Operating Permit*. (NEV-HW-009)

7.4 Data Management

7.4.1 Geographic Information System-Based Databases

7.4.1.1 Environmental Restoration Management Applications Database

This database is used to archive data relating to environmental restoration projects. It contains the following types of data:

- ✓ Wells
- ✓ Geological information
- ✓ Hydrological information
- ✓ Geophysical information
- ✓ Geochemical information

The data quality is high. IT Corporation updates the database monthly or as data is generated.

7.4.2 Other Databases

7.4.2.1 Department of Energy, Nevada Operations Office Master Schedule of Activities on the Nevada Test Site

This schedule is used to ensure that project-related activities of the various programs and projects on the NTS do not conflict. It contains the following types of data:

- ✓ DOE/NV Division
- ✓ Activity
- ✓ NTS area where the activity is taking place
- ✓ NTS grid coordinates where the activity is taking place
- ✓ Start and finish dates

- ✓ Name of Project Manager

The data quality is good. The DOE/NV Site Operations Division updates the database monthly.

7.4.2.2 Department of Energy, Nevada Operations Office Schedule of Nevada Test Site Programs, Operations, Experiments and Exercises

This schedule is used to track, monitor, and report on specific test readiness and operational related activities. It contains the following types of data:

- ✓ Dates
- ✓ Name/Activity
- ✓ Purpose/Description of the Activity
- ✓ NTS area where activity is taking place
- ✓ Sponsor and/or DOE/NV Point of Contact
- ✓ Organizations involved

The data quality is good. The DOE/NV Stockpile Stewardship Division updates the database monthly or as needed.

7.4.2.3 Underground Test Readiness Database

This database contains information on personnel, physical assets, infrastructure support services, processes, and procedures required to resume underground nuclear testing. It contains the following types of data:

- ✓ Names of qualified individuals
- ✓ Inventories of available physical assets
- ✓ Inventories of available infrastructure

- ✓ Listings of compliance requirements and procedures

The data quality is good. The BN Readiness Program updates the database annually.

7.4.2.4 Nevada Test Site Waste Acceptance Criteria Database

This database is used to manage the disposal activities at the RWMSs in Areas 3 and 5 from 1997 to the present. It contains the following package-based data:

- ✓ Waste type
- ✓ Waste location coordinates
- ✓ Waste quantities
- ✓ Waste generator
- ✓ Package weight
- ✓ Container codes related to waste volumes
- ✓ Curies (Ci) per waste package

The data quality is high. The BN Waste Management Program updates the database as needed.

7.4.2.5 Low-level Waste Inventory System

This database contains waste location information on low-level and mixed low-level wastes disposed at the RWMSs in Areas 3 and 5 from 1992 to 1997. It contains the following package-based data:

- ✓ Waste type
- ✓ Waste location coordinates
- ✓ Waste quantities
- ✓ Waste generator

- ✓ Package weight
- ✓ Container codes related to waste volumes
- ✓ Ci per waste package

The data quality is high. The database is a historical reference and is not updated by the BN Waste Management Program.

7.4.2.6 Container Database

This database contains waste location information on low-level and mixed low-level wastes disposed at the RWMSs in Areas 3 and 5 from 1972 to 1992. It contains the following shipment data:

- ✓ Waste type
- ✓ Waste location coordinates
- ✓ Waste quantities
- ✓ Waste generator
- ✓ Package weight
- ✓ Container codes related to waste volumes
- ✓ Ci per waste shipment

The data quality is low to fair. The database is a historical reference and is not updated by the BN Waste Management Program.

7.4.2.7 Hazardous Waste Storage Unit Database

This database is used to manage the non-radioactive hazardous waste storage activities at Hazardous Waste Storage Unit in Area 5 from the date the RCRA Part B Permit was issued until closure of the unit. It contains the following data:

- ✓ Quantity of waste stored
- ✓ Type of waste stored

- ✓ Waste code identification
- ✓ Time waste stored on the facility
- ✓ Generator information

The data quality is high. The BN Waste Management Program updates the database as needed.

7.4.2.8 HAZTRAK Database

This database is used to track the movement of hazardous materials shipments to, from, and on the NTS. It is used by the Fire Department when responding to emergencies. It contains the following types of information:

- ✓ Shipment origin
- ✓ Shipment destination
- ✓ Shipment date
- ✓ Shipment arrival date

The data quality is high. The BN Traffic Division updates the database as needed.

7.4.2.9 Traffic Database

This database is used to track the movement of low-level radioactive waste shipments to the RWMSs in Areas 3 and 5. It contains the following types of data:

- ✓ Vehicle(s) carrying low-level waste to the NTS
- ✓ Number and type of packages
- ✓ Point(s) of origin
- ✓ Destination
- ✓ Estimated and actual time of arrival

The data quality is high. The BN Waste Management Program or the Waste Generator update the database as needed.

7.4.2.10 Transuranic Database

This database is used to manage the storage of TRU and mixed TRU wastes at the Area 5 RWMS. It contains the following types of data:

- ✓ TRU and mixed wastes stored at the TRU Pad
- ✓ Quantity of waste stored at the TRU Pad
- ✓ Generator of the waste

The data quality is high. The BN Waste Management Program updates the database as needed.

7.4.2.11 Analytical Chemistry Database

This database is used to maintain laboratory data results in a controlled environment for report generation and other analytical use. It contains information regarding sample planning, quality assurance, and sample management using the following data:

- ✓ Hazardous constituents
- ✓ Radioactive constituents
- ✓ Sample location
- ✓ Sample date
- ✓ Sample size

The data quality is high. IT Corporation updates the database monthly or as data is generated.

7.4.3 Release of Data

The DOE/NV Master Schedule of Activities on the NTS, the DOE/NV Schedule of NTS Programs, Operations, Experiments, and Exercises, and the Underground Test Readiness Database contain information on internal practices and are marked for "Official Use Only". The information may be exempt from public release under the Freedom of Information Act.

Both Environmental Restoration and Waste Management records have limitations regarding release of information. Some data is classified and unavailable to those without security clearances. Raw and draft data is typically unavailable, however, DOE/NV will evaluate all inquires for data. Requests for database information must be made to either the DOE/NV Environmental Restoration Division Director for information regarding environmental restoration data or the DOE/NV Waste Management Division Director for information regarding waste management data.

7.5 Monitoring

7.5.1 Purpose

DOE/NV monitors its Defense Program missions to ensure management practices are in place in order that resources are effectively and efficiently used. Monitoring of NTS missions plays an important role to assure the ability to resume underground nuclear testing and to support stockpile stewardship and national security missions. This monitoring also assures that DOE/NV uses the NTS for compatible activities to help in the economic diversification of southern Nevada.

The DOE/NV EM program is committed to managing and monitoring its RWMSs, RCRA permitted facilities, and Corrective Action activities. These sites and activities are managed and monitored in order to meet

DOE/NV's goals regarding environmental restoration and waste management, effective administration of activities on the NTS, and the use of the NTS for compatible activities.

7.5.2 Legal and Policy Basis

7.5.2.1 Department of Energy Order 413.1, Management Control Program

DOE managers are accountable for the performance, productivity, operations, and integrity of their programs by using management controls. This accountability is accomplished by evaluations using existing information and day-to-day knowledge. It is also accomplished through providing reasonable assurance that the DOE programs are protected from waste, fraud, and mismanagement and by promoting the open recognition of problems before identification by outside organizations. Attention is focused on correcting the most serious problems facing DOE and the component organizations, reporting the major problems, preparing strategic plans to address these problems, and reporting through the DOE chain of command to the President and Congress. (DOE Order 413.1)

7.5.2.2 Department of Energy, Nevada Operations Office Procedural Instruction 97-005, Work Authorization Process

The purpose of this document is to identify the process and expectations for authorizing new work and changes to existing work under the purview of DOE/NV. This process applies to DOE/NV and its customers. (DOE/NV Procedural Instruction (PI) 97-005)

7.5.2.3 Nevada Test Site Standard Operating Procedure 4702, Operations Permits

The purpose of this procedure is to ensure accomplishment of a formal safety review, ensure environmental clearances and approvals are obtained, and provide a basis to conduct oversight and surveillance. Operations permits also provide for noninterference with other NTS projects and programs. (DOE/NV NTS Standard Operating Procedure (SOP) 4702)

7.5.2.4 Resource Conservation and Recovery Act

The EPA and the NDEP require environmental monitoring and project progress tracking of RCRA permitted facilities through the *RCRA Permit Application*, *RCRA Part B Permit* (NEV-HW-009), and Title 40 Code of Federal Regulations (CFR) Parts 260-282.

The *Permit Application* is the document that describes the units DOE/NV desires to permit or the units DOE has already permitted. RCRA units operating before 1987 and where DOE/NV wants to continue operations by seeking a RCRA permit are operated under RCRA interim status. DOE/NV operates the Pit 3 Mixed Waste Disposal Unit under this status. Currently, the NDEP allows only DOE/NV mixed waste, generated within Nevada and meeting the Federal Land Disposal Restrictions, to be disposed in this RCRA unit.

The *RCRA Part B Permit* is the document, issued by the state of Nevada, that allows DOE/NV to operate its RCRA units as well as describing the conditions under which DOE/NV will operate the Hazardous Waste Storage Unit and EOD Unit.

The *FFACO* is a direct result of DOE/NV's RCRA Permit Application. The Order was

signed in May 1996 by DOE/NV, the NDEP, and the DoD and requires DOE/NV to remediate its historical solid waste management units. The Order outlines a schedule of cleanup and monitoring commitments for sites contaminated by DOE and the DoD. The Order ensures these government entities will work together to authorize cost-effective corrective action activities on the NTS and minimizes the likelihood of litigation among the parties. It establishes a framework for identifying, prioritizing, investigating, remediating, and monitoring contaminated sites covered by the Order. The Order requires that a comprehensive inventory of all identified corrective action sites be maintained, along with the tracking and reporting of pertinent site information. The DOE/NV Environmental Restoration Division maintains this information in its Common Data Repository. (State of Nevada, 1996a)

The Federal Facility Compliance Act waived the federal government's previous sovereign immunity to RCRA fines and penalties. It allowed the government a three-year delay before being subject to fines and penalties for storing land disposal restricted mixed waste in violation of RCRA storage prohibition. It also provided an indefinitely extended delay for such storage on condition that a site operated in compliance with a mixed waste plan and order. (42 USC 6961) Consequently, DOE/NV negotiated the *Site Treatment Plan* with the state of Nevada. (DOE/NV, 1996c) This agreement requires DOE/NV to develop treatment and disposal plans, and track the progress of meeting those plans, for its mixed waste streams identified on the NTS before March 16, 1996.

7.5.2.5 Mutual Consent Agreement

A *Mutual Consent Agreement* has been established by DOE/NV and the NDEP that allows available storage capacity on the TRU pad to be used for the storage of on-site

generated low-level mixed waste that does not meet RCRA Land Disposal Restrictions provisions. The Agreement incorporates the handling of low-level mixed waste generated by DOE/NV activities within the state of Nevada that are not currently identified in the *Site Treatment Plan*. The Agreement provides DOE/NV with a nine-month period to prepare and submit a plan for the treatment and disposal of such wastes. (State of Nevada, 1995)

7.5.3 Description of Monitoring Program

A number of methods are used to monitor the activities at the NTS. DOE/NV has established a SUD Board responsible for screening new work to ensure compatibility with current missions and determining whether the proposed location is suitable. This process applies to all new activities, regardless of funding source or programmatic affiliation.

DOE/NV maintains the *DOE/NV Master Schedule of Activities on the NTS* and the *DOE/NV Schedule of NTS Programs, Operations, Experiments, and Exercises*. These schedules are maintained to ensure that project related activities between the various programs and projects on the NTS do not conflict. These schedules are also used to monitor and report on specific test readiness and operations related activities.

Operations permits are issued and maintained by the Operations Coordination Team of the DOE/NV Site Operations Division. These permits are used to provide assurances to DOE/NV management that all pertinent reviews and clearances have been obtained and that the activity does not conflict with other activities on the NTS.

DOE/NV EM uses additional methods to oversee and monitor its resources. These methods are:

54

- ✓ Site Visits - Each project manager visits the sites under their responsibility and reviews the project's progress. The project managers also monitor environmental, health, and safety issues.
- ✓ Assessments - Project managers and Division Directors conduct quarterly, midyear, and year-end assessment reviews of their projects. These reviews are to raise and resolve issues that might affect project progress.
- ✓ Project Tracking - DOE/NV EM maintains its own Project Management System called the Project Management Information System. Progress towards accomplishment of goals is reported to DOE Headquarters using the Progress Tracking System. The Project Management Information System and Progress Tracking System are used to track and communicate progress of project milestones to stakeholders, tribal governments, and regulators.
- ✓ Enforceable Agreements - RCRA, the FFACO, the *Mutual Consent Agreement*, the *RCRA Part B Permit and Permit Application*, and the *Federal Facility Compliance Act Consent Order* (State of Nevada, 1996b) require DOE/NV to perform environmental monitoring. In addition, project progress monitoring of hazardous waste, mixed waste, and environmental remediation activities are required.

The DOE EM and the NDEP consider waste management and environmental restoration priorities on an annual basis and establish enforceable milestones for the next two fiscal years (FYs). The *FFACO* and *Federal Facility Compliance Act Consent Order* require that the status of the sites and the milestones be reviewed on a quarterly basis with the NDEP. Progress towards completion of the milestones is continually tracked at both the DOE local and headquarters level.

The Area 3 and 5 RWMSs have an integrated monitoring program that monitors air, groundwater, unsaturated zone, and the ecosystem for radionuclides, RCRA constituents, and indicators of waste migration (i.e. water content) as necessary. Monitoring of the facilities is required to assure that site activities do not affect the environment or public. Information on the integrated monitoring program is reported as part of the Annual Site Environmental Reports described in Section 15.4.2.1. When the Waste Management Division completes its work at the Area 3 and Area 5 RWMSs, the land will not be available for other NTS uses.

7.6 Adaptive Management

Since the NTS plays a vital part in the National Security interests of the country, one of the goals is to maintain the capability to resume underground testing, accomplish stockpile stewardship and national security missions. To measure success DOE will coordinate with the surrounding land managers to ensure that encroachment is minimized, buffer zones are established on the NTS and incompatible missions are thoroughly analyzed before any work begins that could effect the NTS missions. Another goal is to administer activities so that NTS resources are used effectively. Factors that will be considered and integrated into NTS activities to meet and this goal will be mission, economic, social, cultural and life cycle. In order to use the NTS for compatible activities that contribute to the economic diversification of southern Nevada, proposed projects will be screened to ensure that they support the national interest and current DOE programs.

The goals will also be accomplished by the continued implementation of an EM program that includes site specific performance assessments; disposal cell closure cap development and construction; personnel training; safety and hazard assessments;

upgrading of handling and characterization equipment and technologies; maintenance of disposal capacities and capabilities; and various monitoring disciplines. Success will be measured by tracking compliance to federal and state laws and regulations and by assessing the ability to meet performance and compliance milestones. Environmental Restoration and Waste Management Programs currently have baseline documents that will be used as the basis for evaluating the programs as changes to processes are developed and implemented. These baselines contain narrative descriptions, scopes of work, schedules, and funding estimates of existing and planned programs and projects. These baselines also serve as the foundation for out-year plan development.

7.6.1 Site Use and Development Process

DOE/NV has set up a SUD Board, made up of senior DOE/NV officials and National Laboratory representatives. Their purpose is to review proposed activities that will occur on the NTS and to rule out activities not appropriate for DOE/NV facilities or that cannot meet customer needs. The SUD Board then recommends to the DOE/NV Manager approval or disapproval of proposed projects on the NTS. The SUD Board will have the benefit of the finalized NTS RMP to help ensure that:

- ✓ Buffer zones within the NTS are considered to prevent incompatible missions from encroaching on one another.
- ✓ NTS activities integrate mission, economic, ecological, social, cultural and life cycle factors to guide resource use decisions.
- ✓ Proposed activities are screened and prioritized using criteria that includes, support of the national interest, current

DOE programs, diversification of the southern Nevada economy and employment of current or former NTS employees.

Success will be measured by tracking projects and programs that are presented before the SUD Board. This will ensure that mission goals are being managed with no adverse impacts.

7.6.2 Accelerating Cleanup: Paths to Closure Plan

EM initiated a new management foundation that will restructure and streamline formerly independent pieces of the DOE EM program into a single, cohesive system. The focus is to bring more resources to bear on the remediation of as much of the DOE Complex as possible by FY 2006 as described in the *Accelerating Cleanup: Paths to Closure* report for DOE/NV. The final document was completed in June 1998. This document provides an outlook of future Environmental Restoration and Waste Management Program activities. Because *Accelerating Cleanup: Paths to Closure* serves as the central description document for both of these programs, it will promote program integration for the interrelated activities that occur between Waste Management and Environmental Restoration.

The plan includes site specific descriptions as well as an integrated illustration of the EM mission. Information from the site-specific documents is used to support various decisions necessary to complete work for the DOE Complex. A cohesive plan that includes critical information on program activities is vital because it provides information to other programs that may be impacted by those activities. For example, the DOE/NV *Accelerating Cleanup: Paths to Closure* document includes estimated waste volumes that will be generated by Environmental Restoration projects. This is beneficial

56

information that the Waste Management Program requires in order to plan for waste handling resource acquisition and disposal capacity development. The plan also provides valuable insight on how activities at other sites may impact the EM mission resources at the NTS. (DOE, 1998)

The *DOE/NV Accelerating Cleanup: Paths to Closure* is designed to indicate DOE/NV plans and to be a forum to:

- ✓ Manage mission resources through a project-based system. Streamline formerly independent pieces of the program into projects. Bring more resources to bear on remediating as many sites as possible by FY 2006.
- ✓ Characterize and remediate contamination at the NTS and associated off-site locations. Restore contaminated surface sites outside the NTS boundaries for unrestricted use. Retain institutional control of the off-site subsurface, and monitor the groundwater to ensure there is no risk to the public.
- ✓ Continue to enhance strategies to safely accept and dispose of low-level waste. Continue to perform facility evaluations of the generators intending to dispose of radioactive waste at the NTS. Monitor the disposal site to ensure that performance objectives are met.
- ✓ Remove existing TRU waste and mixed waste for disposition. Characterize and dispose of mixed low-level waste at the Area 5 RWMS to the extent possible. Send mixed low-level waste that cannot be disposed at the Area 5 RWMS to approved off-site commercial treatment and disposal facilities.
- ✓ Close on-site disposal areas in compliance with regulatory requirements. Maintain full compliance with all applicable

environmental laws, remediation agreements, settlement decisions, and Defense Nuclear Facilities Safety Board recommendations.

- ✓ Conduct negotiations between DOE/NV, regulators, Tribal Nations, and stakeholders. Provide opportunities for open discussion with Tribal Nations and stakeholders prior to incorporating new risk reduction plans in future versions of *Accelerating Cleanup: Paths to Closure*.
- ✓ Set priorities, sequence work, and measure performance.
- ✓ Place priority on projects that eliminate urgent risks, especially those that may affect workers, the public, or the environment. This will be accomplished through proactive program management and integration.
- ✓ Identify opportunities to reduce risk.
- ✓ Serve as a planning, budget formulation, and life cycle cost-tracking document.
- ✓ Maintain a presence at the NTS to ensure reduced risks to human health and the environment including both passive and active institutional controls.

To the extent possible, comments from meetings with regulators, Tribal Nations, and stakeholders are incorporated in the plan. This effort creates a comprehensive document by including input from a diverse set of viewpoints.

8 Site Support Activities and Facilities Resources

8.1 Introduction

The NTS has an infrastructure consisting of power distribution systems, roads and grounds, laboratory facilities, medical facilities, storage facilities, bunkers, warehouses, office space, water distribution systems, sewage systems, and other structures. The NTS also provides other services such as feeding, housing, janitorial, busing, vehicles, equipment, and limited recreation facilities.



U.S. 95 Entrance to the Nevada Test Site

8.2 Goal

- ✓ Manage facilities and services to support missions on the NTS effectively.

The maintenance of the infrastructure on the NTS is critical to the success of ongoing missions and for sustaining the value of the NTS as a premier outdoor laboratory. The intent of this goal is to provide facilities and services required to support the NTS missions through cost-effective management of the NTS infrastructure.

8.3 Inventory and Limitations

8.3.1 Resource Status

8.3.1.1 Buildings

All major facilities at the NTS are configured, utilized, and maintained in accordance with their strategic importance, which depends upon current mission requirements. Consequently, the usage and physical status of any specific building unit may vary during its design life span. At the NTS, the majority of the buildings were constructed over 25 years ago as temporary structures. Less than 10% have been constructed in the last 15 years.

Currently, there are 900 buildings (2,790,572 square feet (ft²) (259,244 square meters (m²)). Each facility has been assigned a usage code to delineate the types of space available. The seven usage codes listed below provide a method for describing the large number of facilities.

- ✓ Administrative – All traditional office environments where personnel are primarily engaged in desk or workstation oriented tasks.
- ✓ Institutional – Buildings that are constructed for institutional purposes such as hospitals, medical clinics, schools, specialized training, auditorium/theater, libraries, cafeteria, and visitors centers.
- ✓ Housing – Buildings to house temporary overnight lodging of visitors.
- ✓ Storage – Buildings used for general storage of materials. These facilities can include incidental office space for administrative or control of materials.
- ✓ Industrial – Buildings used for producing or manufacturing items or materials.

- ✓ Service – This category differs from the institutional category by the kind of service performed. Both types provide support to personnel for the basic installation missions, but service facilities supply goods and services while institutional facilities provide process types of non-material services.
- ✓ Research and Development – Laboratories are divided functionally by research discipline housed in the building.

Table 8-1 provides a breakdown of these types of facilities and their cumulative space.

8.3.1.2 Security

The NTS is surrounded by government-controlled buffer zones and protected by Security Police officers, mobile patrols, and highly trained emergency-response teams. Sensitive areas within the NTS use chain-link fencing, protective alarms, closed-circuit television, and secure communications systems. The Nye County Sheriff's Department provides civil law enforcement.

The NTS is a controlled-access area with road access beginning at the Security Station on Mercury Highway, 5 miles (mi) from the U.S. Highway 95 Mercury turnoff. Although a security clearance is not required for entry, access is not allowed without proper identification and an identification badge. Personnel are issued dosimetry badges if

entering areas where they might be exposed to radiation levels above background. Security areas within the NTS have stringent personnel controls, requiring the appropriate security clearance and an operational need before access is allowed.

The entire perimeter of the NTS is not fenced, but it is posted as a restricted area; access is prohibited except at designated entrances. Beyond the perimeter, the BLM and NAFR provide buffer zones. Barricades and/or Security Stations control the few roads that access NTS boundaries. Perimeter barricades are checked by security force patrols.

8.3.1.3 Medical Facilities and Services

An eight-bed dispensary in Mercury serves as a clinic or small hospital. First-aid stations are located near field activities so that personnel may be treated quickly. Ambulances are used to cover the NTS from the Area 6 and the Area 23 fire stations and first aid station. These ambulances also respond to emergencies at nearby communities and highways. Response times from the two fire stations to various parts of the NTS are shown in Figure 8-1.

8.3.1.4 Fire Protection

A fire department staffed by support-contractor personnel provides 24-hour fire fighting services for facilities on the NTS. Crash/rescue services are also provided on a "as-requested"

Table 8-1 Facility Types and Cumulative Space

Usage code	Number	ft ²	m ²
Administrative	162	558,490	51,884
Institutional	13	118,389	10,998
Housing	88	292,843	27,205
Storage	215	453,936	42,171
Industrial	9	219,191	20,363
Service	374	858,321	79,738
Research and Development	39	289,402	26,885
Total	900	2,790,572	259,244

(Source: Facility Information Management System)

Nevada Test Site
Fire Station Response Times

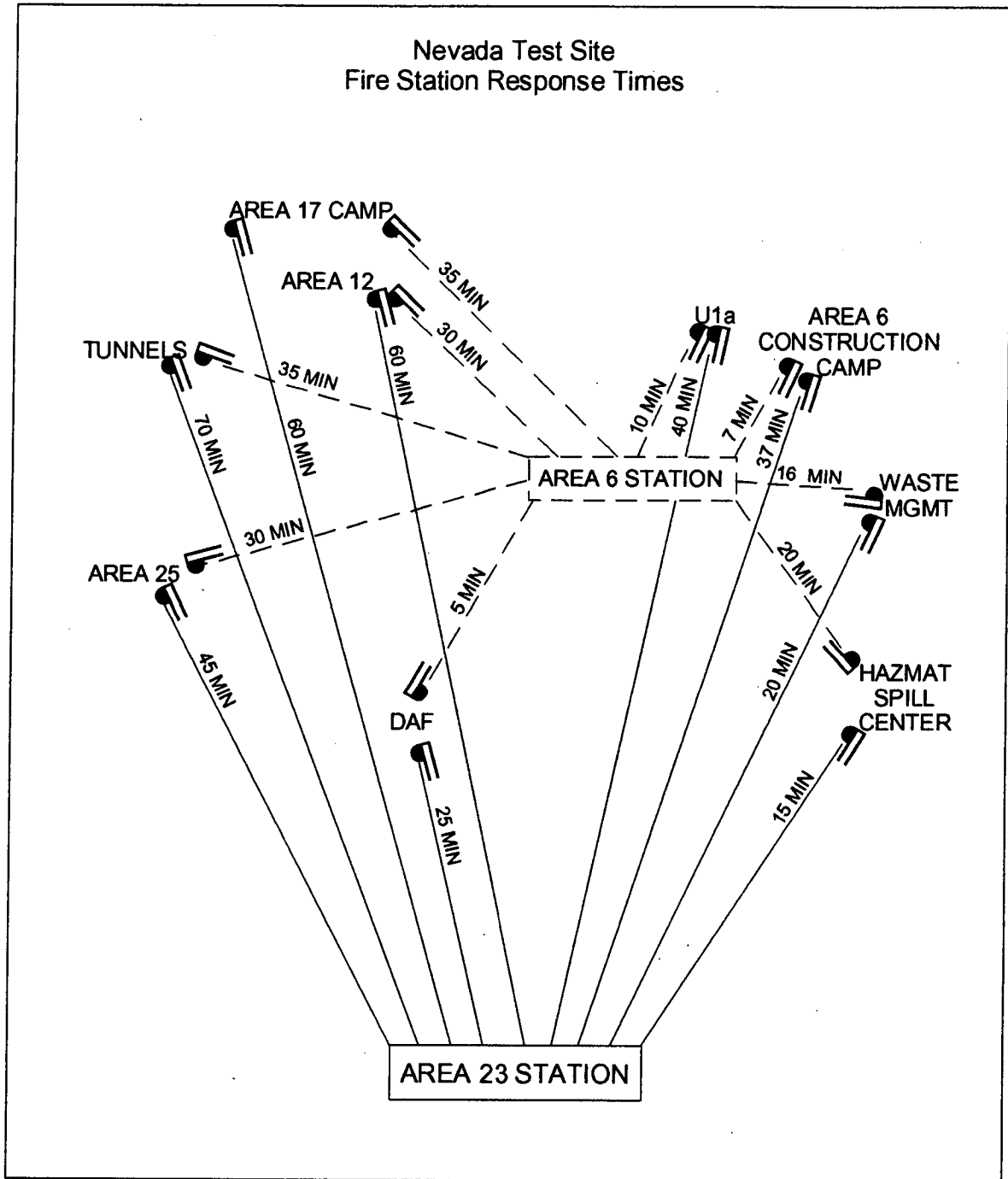


Figure 8-1 Medical and Fire Response Times

60

basis. Within the boundaries of the NTS, the fire department also provides support during the transportation, transfer, and storage of toxic and flammable gases.

Fire fighting personnel are trained in fire suppression techniques and response methods for hostile environments. In addition, fire prevention procedures have been developed and are kept current for all major buildings that are in service and for all operations.

The fire department maintains one fire station in Mercury that provides services 24 hours a day, seven days a week. Both the firefighters and the paramedics are housed in the same facility. Additionally, a combination fire and first aid station is open in Area 6 during regular work hours (Monday through Thursday from 7 a.m. until 5:30 p.m.). A fire station and a first aid station are located in Area 12, but they are currently closed. These facilities could be reopened if required.

8.3.1.5 Fuel

Unleaded and diesel fuel are available at the NTS. The fuel capacity in Mercury is 12,000 gallons (gal) (45,424 liters (L)) of unleaded fuel and 10,000 gal (37,853 L) of diesel fuel. The bulk fuel storage capacity in Mercury is 420,000 gal (1,589,826 L) of unleaded fuel and 420,000 gal (1,589,826 L) of diesel fuel. The fuel capacity in Area 6 is 20,000 gal (75,706 L) of unleaded fuel and 20,000 gal (75,706 L) of diesel fuel. The bulk fuel storage capacity in Area 6 is 42,000 gal (158,983 L) of unleaded fuel and 105,000 gal (397,457 L) of diesel fuel. The fuel capacity in Area 12 is 20,000 gal (75,706 L) of unleaded fuel.

8.3.1.6 Power

The power for the NTS is transmitted through a 138 kilovolt (kV) loop that supplies nine major substations and two 138kV radials as shown in Figure 8-2. The power sub-transmission involves an extensive 34.5kV system and short

69kV and 12kV systems. These voltages are transformed to a 4.16kV distribution voltage and then to a 480-208/120 working voltage. The NTS is served by approximately 600 mi (966 kilometers (km)) of transmission and sub-transmission lines. The capacity of the 138kV loop is 80 megawatts and most of the 138kV substations are 10-15 megawatts. Currently 20-25% of the total capacity is being used.

The NTS currently has two 138kV feeds that supply the system. Nevada Power Company connects to the NTS 138kV loop at the Mercury Switching Center. The 138kV line that runs from the Mercury Switching Center to Jackass Flats Substation is also the property of Nevada Power. The other feed comes from Valley Electric Association and attaches to the loop at Jackass Flats Substation.

The 138kV system has nine substations, one switching center, and one tap station that are connected by approximately 133 mi (214 km) of transmission line. Table 8-2 provides a key to the line length and date of construction for each segment. Table 8-3 provides approximate aggregate lengths of power lines by voltage throughout the NTS.

8.3.1.7 Water

The NTS is served by four public water systems comprised of 10 operating wells that supply a system of storage tanks, sumps, and distribution lines. The active NTS water wells are listed in Table 8-4, along with data pertinent to resource management. Five separate systems are serviced through approximately 160 mi (257 km) of buried pipeline and booster pumps. Figure 8-3 depicts the NTS water service areas and both the active and inactive water wells. A number of wells, tanks, and sumps are not presently in use. However, they could be reactivated if needed. In the past, the groundwater system and the installed production system have delivered up to 4,200 ac-ft/yr (5.18 million cubic meters per

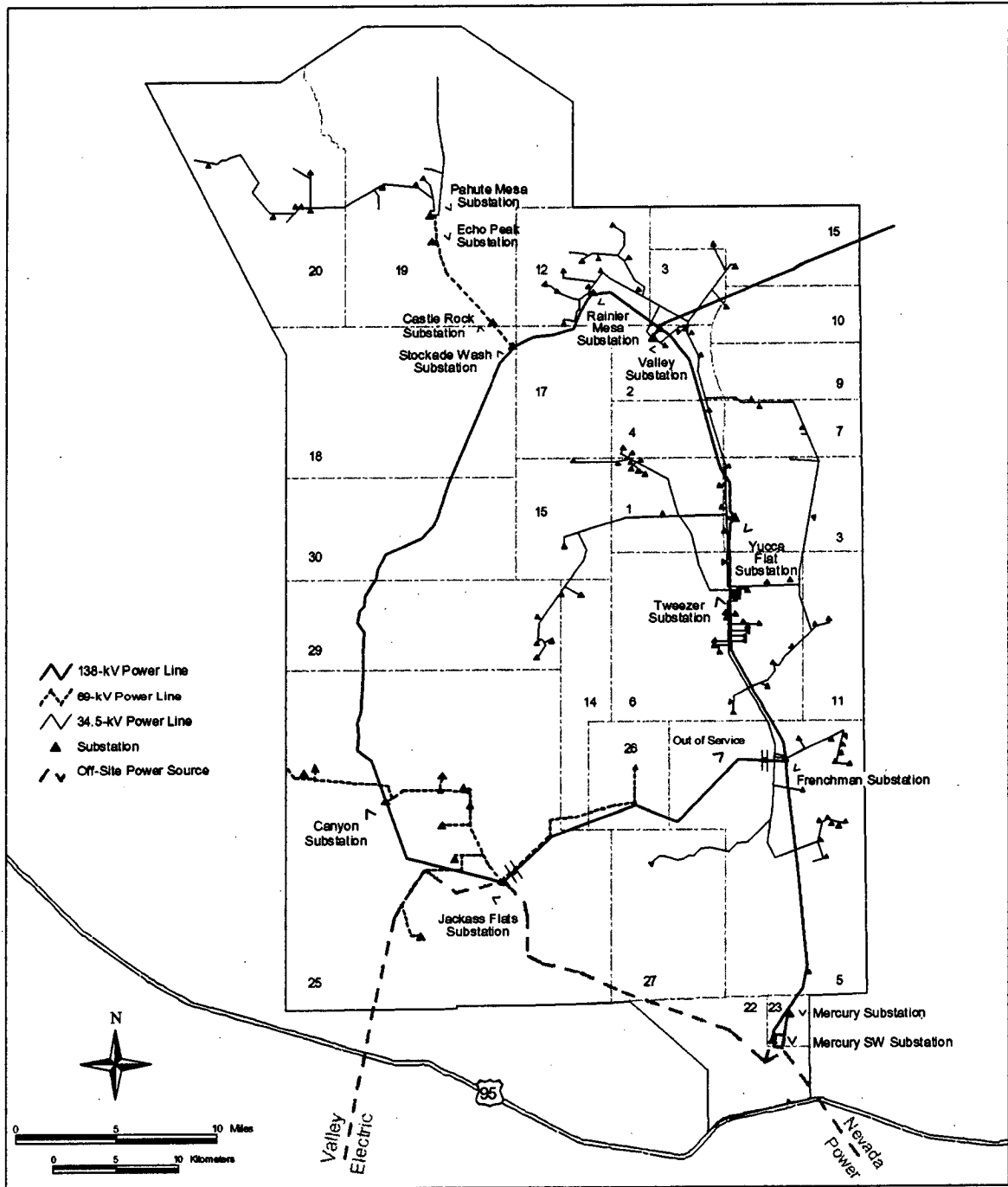


Figure 8-2 Power Distribution System

62

Table 8-2 138 Kilovolt Line Segments

Line Description	Length (mi)	Length (km)	Year Built
Mercury Switch Center to Frenchman Flat	14.50	23.33	1963
Frenchman Flat to Tweezer	9.00	14.48	1963
Tweezer to Valley	14.00	22.53	1963
Valley to Rainier Mesa	4.25	6.84	1963
Rainier Mesa to Stockade Wash	5.50	8.85	1964
Stockade Wash to Canyon	26.47	42.60	1966
Canyon to Jackass Flats	8.03	12.92	1966
Jackass Flats to Mercury Switching Center (NPC Line)	17.00	27.36	1957
Jackass Flats to Frenchman Flat (not in service)	16.25	26.15	1966
Valley to Systems	17.40	28.00	1966

Table 8-3 Nevada Test Site Power Line Lengths

Voltage Level	Type of Line	Configuration	Length (mi)	Length (km)
138 kV	Transmission	Overhead	133	214
69 kV	Transmission	Overhead	18	29
34.5 kV	Transmission	Overhead	200	322
12.5 kV	Distribution	Overhead	50	80
4.16 kV	Distribution	Overhead	132	212
4.16 kV	Distribution	Underground	60	97
Total Mi of Power Lines			593	954

Table 8-4 Active Water Supply Wells on the Nevada Test Site

Well	Area Served	Sumps and Reservoirs Storage Capacity		Flow Rate	
		Gal	L	Gal/minute	L/minute
8	2, 12	553,000	2,100,000	540	2,045
UE-16d	1	None	None	194	735
C	6, 3	1,290,000	4,880,000	290	1,100
C-1	6, 3	See Well C	See Well C	290	1,100
4 and 4a	6	See Well C	See Well C	700	2,651
5b	5, 22, 23	710,000	2,700,000	230	871
5c	5, 22, 23	50,000	190,000	230	871
J-12	25	3,555,000	13,510,000	760	2,878
J-13	25	50,000	190,000	680	2,574
Army Well 1	22,23	None	None	98	371

63

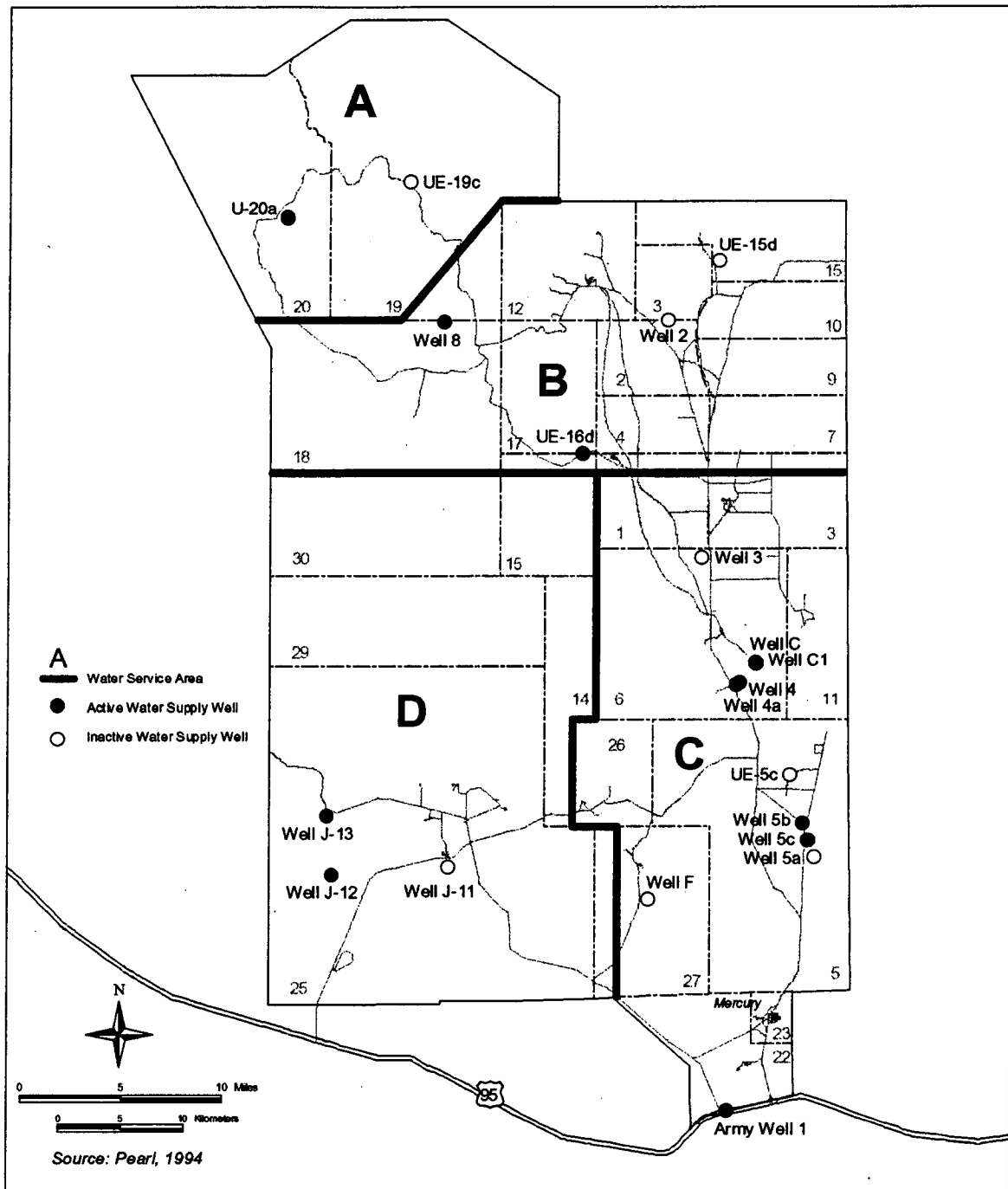


Figure 8-3 Water Service Area and Supply Wells

64

year (Mm^3/yr) to support site activities. Additional information on water is located in Section 11.

8.3.1.8 Sewage System

There are two basic types of sewage treatment facilities at the NTS. The larger systems that support camps have sewage lagoon treatment systems. The smaller outlying systems consist of septic tank/leach field systems. There are nine NTS sewage lagoons located in Areas 5, 12, 22, 23, two in Area 25, and three in Area 6.

8.3.1.9 Communications

The NTS uses digital telephone switching, fiber optic transmission, microwave two-way radio, voice privacy and data transmission systems, general and special purpose data communications, and teleconferencing services (secure as necessary). There are approximately 700 mi (1,127 km) of communication lines on the NTS.

8.3.1.10 Roads

The main access road to the NTS (Mercury Highway) originates at U.S. Highway 95, approximately 65 mi (105 km) northwest of Las Vegas. The NTS has restricted access from Amargosa Valley on U.S. 95. Other existing roadways, although unpaved, could provide access or exit routes in case of emergency.

The on-site road network consists of 400 mi (644 km) of paved roads and over 300 mi (483 km) of unpaved roads as shown in Figure 8-4. Additionally, the NTS contains numerous test-related unpaved roads, which are no longer used. The unpaved portion of the roadway network is composed of graded gravel roads and jeep trails.

Transportation facilities related to the roadway network include bus parking and commuter vehicle parking areas. Commuter buses provide

daily and express passenger service to the NTS from Las Vegas and Pahrump by way of U.S. Highway 95. The number of buses entering the NTS can vary daily, depending upon the on-site activities in progress.

The bulk of the traffic accesses the NTS from Security Station 100 near Mercury. Bus service is also provided between Mercury and the forward areas. Paved areas are provided for the commuter buses at the support facilities within Areas 6, 23 (Mercury), and 25. Limited bus parking is also available at other support facilities on the NTS. Parking for government and private commuter vehicles is available at most buildings on the NTS. Several large parking lots provide space for government and private commuter vehicles.

8.3.1.11 Railroads

The closest mainline railroad to the NTS is the Union Pacific, which is 65 mi (105 km) away in Las Vegas. This line connects southern California with points east, but does not connect with the NTS.

There is a 9-mi (14-km), standard gauge railroad within Area 25. A shorter, similar line was located at the Area 26 Disassembly and Test Bunker sites. This line is abandoned, and much of the track and equipment has been removed.

8.3.1.12 Air Facilities

The only functional airport at the NTS is Desert Rock Airstrip. Existing features at Desert Rock Airstrip include a paved runway of 7,515 feet (ft) (2,291 meters (m)), an administration and control building, a fireman standby trailer, an aircraft unloading pad, aircraft parking tie-down spurs, two windsocks, and radio activated runway lights. Desert Rock Airstrip is a "prior permission requested" facility and is not currently in use except for emergency landings. The largest plane that can be accommodated at the Desert Rock Airstrip is a C-130.

65

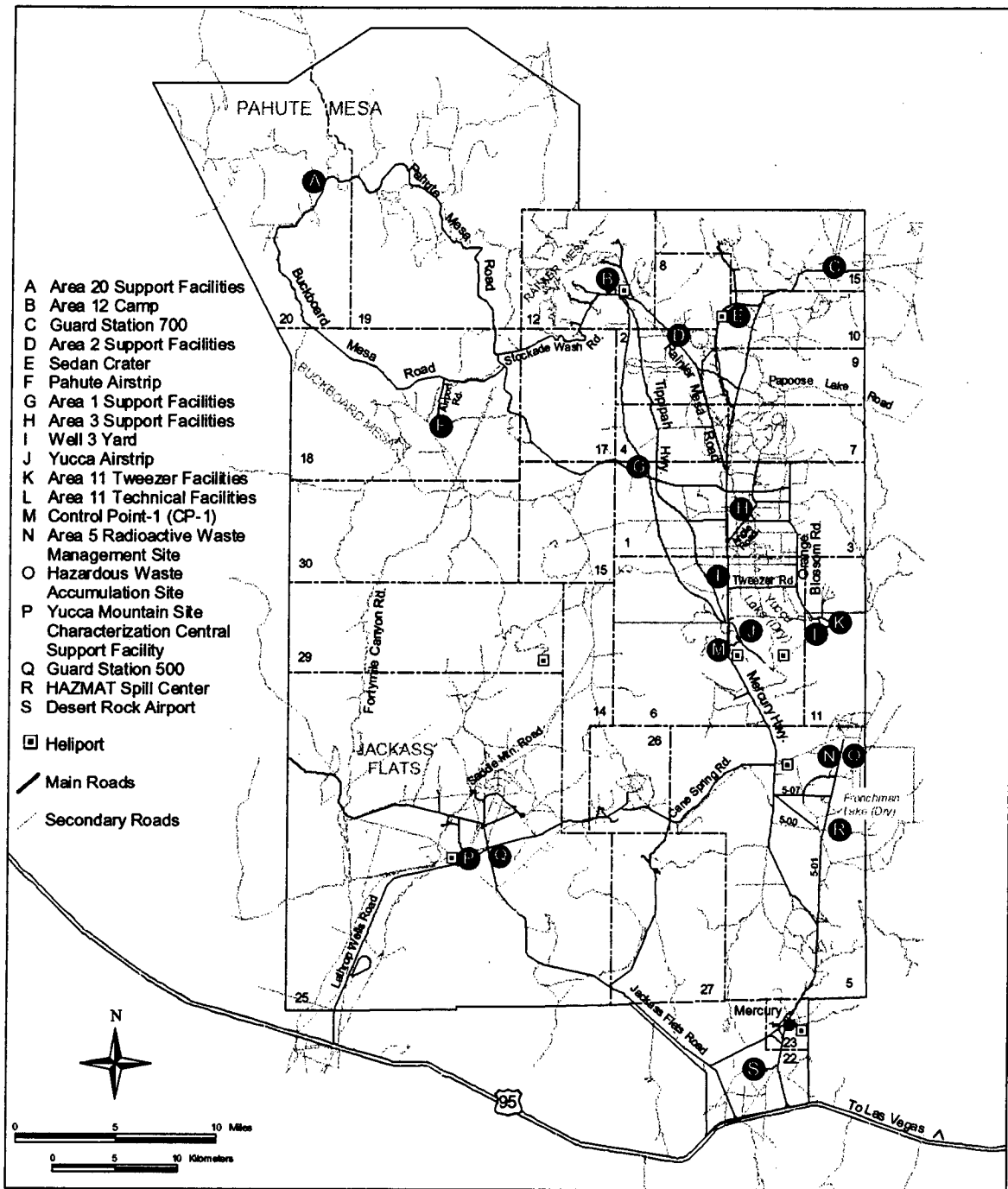


Figure 8-4 Transportation System

66

An airstrip in Area 18, the Pahute Mesa airstrip, was maintained when underground testing activities were being conducted in Areas 19 and 20. This airstrip is abandoned and would require major reconstruction before it could be used again.

Helipads equipped with windsocks, fire extinguishers, and painted markings are located in those places identified in Figure 8-4 and Table 8-5.

8.3.2 Legal and Policy Requirements

The temporary use of underutilized facilities at the NTS by others must comply with the *DOE Organization Act*, 91 Statute 565 (42 USC 7101), Section 161g of the *Atomic Energy Act* (42 USC 2201g) and the *Energy Reorganization Act* (42 USC 5821b). Disposals of facilities and real property are in accordance with the *Federal Property and Administrative Services Act*. (40 USC 471)

8.4 Data Management

8.4.1 Geographic Information System-Based Databases

8.4.1.1 Facility Information Management System

The database is used to determine the utilization of space, total acquisition cost, utilization rates, amount of real property owned by DOE, and

for calculating replacement plant value. It contains the following types of data:

- ✓ Building Information (square footage, building number, building construction cost, condition, occupants, and building type)
- ✓ Land Information (acres, acquisition type, acquisition date, acquisition cost, and legal description)
- ✓ Other Structures Information (roads and grounds, fences, power lines, substations, towers, sewage lagoons, wells, well houses, and water distribution systems)
- ✓ Trailer and Module Information (date acquired, square footage, and condition)

The data quality is good. The BN Site Services Division, Facilities Department updates the database daily.

8.4.2 Other Databases

8.4.2.1 Facility Administrative Maintenance Information System

The database is used to manage maintenance information and contains the following types of data:

- ✓ Type of Maintenance
- ✓ Schedule

Table 8-5 Heliports

Area	Location
6	East of Mercury Highway, across from the Control Point
12	South of the Construction Camp
18	At Abandoned Pahute Mesa Airstrip
22	At Desert Rock Airstrip
23	Adjacent to Mercury Medical Facility
25	West of Administration Building in the Central Support Area

67

✓ Completion Date

✓ Close Out Date

The data quality is good. The BN Site Services Division, Facilities Department updates the database daily.

8.4.3 Release of Data

Facility Information Management System and Facility Administrative Maintenance Information System database reports are available to the public through the Freedom of Information Act. Requests for Freedom of Information Act data must be made to the Freedom of Information Act Officer of the DOE/NV Office of Public Affairs and Information.

8.5 Monitoring

8.5.1 Purpose

Site support activities and facilities resources are monitored to ensure that the maintenance and operation of the facilities and infrastructure at the NTS are conducted in accordance with all applicable federal, state, and local laws and regulations. These resources are also monitored to ensure the safety and health of the employees is maintained.

8.5.2 Legal and Policy Basis

8.5.2.1 Department of Energy Order 430.1A, Life Cycle Asset Management

This order directs that an integrated systematic approach for capital assets be in place to establish an objective basis for allocating budgetary resources. This approach will manage, maintain, and ultimately replace assets based on their need to meet mission requirements effectively and efficiently. The assets must be monitored to ensure they are managed properly. (DOE Order 430.1A)

8.5.3 Description of Monitoring Program

This monitoring is conducted with reviews of the maintenance cost data in conjunction with maintenance work orders to determine that the facilities and infrastructure are adequately maintained to protect the assets. This is conducted daily with selected items for each review. The databases for these assets are the Facility Information Management System and the Facility Administrative Maintenance Information System.

In reviewing infrastructure projects, DOE/NV employs an objective risk-based approach to decide their relative importance based on mission projections. Each project is rated and ranked for a five year planning period. These five-year plans are updated annually. The prioritization process is driven by four major categories: health and safety, environmental, safeguards and security, and programmatic. Monitoring is done by reviewing the plans to see if there has been any change to the requirements.

8.6 Adaptive Management

There are provisions in the contract between BN and DOE/NV that describes the site services work to be performed by the contractor. Success in meeting the goal will be measured by tracking projects and program requirements to ensure compliance with federal, state and local laws and regulations relating to operation and maintenance of the site services.

An asset management plan is being developed and will provide guidance for the NTS site services program. Facility management, maintenance management, and site services procedures also provide guidance to ensure facilities are managed in a safe and effective manner. The asset management plan is designed to:

68

- ✓ Ensure all assets are properly operated and maintained.
- ✓ Ensure qualified personnel manage the site infrastructure and all assets.
- ✓ Incorporate stakeholder and tribal government input to ensure their requirements are met.
- ✓ Monitor all assets.
- ✓ Develop a process to ensure that asset acquisition, operation, maintenance, and disposition meet all program requirements.

The asset management plan will be administered by BN. Implementation of the asset management plan will ensure that the site support activities and facilities goal is met.

9 Health and Safety Resources

9.1 Introduction

A variety of safety and health protection programs exist to protect workers, the environment, and the public from potential safety and health hazards from work at the NTS. BN in conjunction with the national laboratories, and all site users, manages the various safety and health programs. Industrial safety, industrial hygiene, and radiological safety are the major safety and health program elements operated and managed in accordance with state, federal, and DOE requirements.

9.2 Goal

- ✓ Minimize health and safety risks to individuals on and around the NTS.

DOE/NV's ongoing goal is to conduct its operations in a manner that ensures the health and safety of employees, contractors, users, and the public. The DOE and contractors systematically incorporate Integrated Safety Management into work practices at all levels so that missions are accomplished while protecting the public, the worker, and the environment.

9.3 Inventory and Limitations

9.3.1 Resource Status

The health and safety protection programs rely on the concepts of the Integrated Safety Management program. The program is composed of seven guiding principles:

- ✓ Line Management – Line management shall be directly responsible for the protection of the public, the workers, and the environment.



Controlled Area Roadside Sign

- ✓ Roles and Responsibilities – Clear lines of authority and responsibility for ensuring safety shall be established and maintained at all organizational levels.
- ✓ Competence – Personnel shall possess the experience, knowledge, skills, and abilities necessary to carry out responsibilities.
- ✓ Balanced Priorities – Resources shall be effectively allocated to address programmatic, operational, and safety considerations.
- ✓ Safety Standards – Before work is performed, the associated hazards shall be evaluated.
- ✓ Hazard Controls – Hazard controls shall be tailored to the work being performed.
- ✓ Operation Authorization – Requirements for operations shall be clearly established before work begins.

Integrated Safety Management relies on five core functions:

- ✓ Define Scope of Work – Missions are translated into work, expectations are set, tasks are identified, and resources are allocated.
- ✓ Analyze the Hazards – Hazards associated with the work are identified, analyzed, and categorized.
- ✓ Develop and Implement Hazard Controls – Controls to prevent or mitigate hazards are identified, the safety envelope is established and controls are implemented.
- ✓ Perform Work within Controls – Readiness is confirmed and work is performed safely
- ✓ Provide Feedback and Continuous Improvement – Identify and act upon opportunities to improve the planning of work, oversight, regulatory enforcement, etc.

9.3.1.1 Industrial Safety Program

The Industrial Safety Program ensures that safe working conditions are maintained at construction sites, underground, and in industrial work places. This is done by observing safe job practices, wearing personal protective equipment, and following the principles of the Integrated Safety Management Program.

There are two outdoor locations where unique safety controls and restricted access apply. The Big Explosives Experimental Facility, located in Area 4, provides a facility for conducting tests with large charges of high explosives. This facility meets DOE requirements for explosives facilities, and users must ensure compliance with laboratory and safety plans and procedures for various tests. During tests, the area surrounding the Big Explosives Experimental Facility is under restricted access and control. The HAZMAT Spill Center, located in the northwest

quadrant of Area 5, performs various chemical release tests when the wind is blowing from the direction of 225 degrees (with minor variation). The prime testing season during a year is May through August, although testing occurs almost continuously throughout the year. When tests are in operation, the area of restricted access is east of 5-01 Road and north of the Red Stake Road in Area 5. The specific safety procedures and controls vary depending on the purpose of the test and the types and volumes of chemicals planned for release.

9.3.1.2 Industrial Hygiene Program

The Industrial Hygiene Program ensures that worker exposure to potential health hazards (whether biological, physical, or chemical) is minimized by effective identification, evaluation and control of these hazards. This is done by using applicable engineering controls, work practices, and personal protective equipment. Surveys of chemical and physical agents generated by work at the NTS are monitored to ensure worker protection requirements are being met and that engineering controls (i.e. mechanical exhaust ventilation, etc.) are performing as designed and required.

9.3.1.3 Radiological Safety Program

The Radiological Safety Program ensures that workers are protected from radiological hazards by monitoring, personal protective equipment, shielding, and working distance controls. It is DOE's policy that worker exposure to radiological sources and contamination be maintained below federal standard exposure limits, and to strive for any exposure to be As Low As Reasonably Achievable. In addition, access by workers to radiological contaminated and exposure areas of the NTS requires specific training, personal protective equipment, and monitoring equipment. Control of these areas may involve signs, barriers, fences, and other

appropriate controls. Radiation surveys have been conducted at the NTS with the areas of major radioactive deposition and plume areas noted in Figure 9-1. There are a number of radiologically contaminated facilities and land areas at the NTS. These locations are posted for radiological control and only persons with the appropriate training can enter these areas without trained escorts. Entry into radiological areas requires Radiation Worker training as specified in the *DOE/NV and Yucca Mountain Project Radiological Control Manual*. # (DOE/NV, 1994) Entry into controlled[‡] and radioactive materials areas requires General Employee Radiological Training.

Special access authorization must be requested from BN for entry into inactive facilities containing contamination areas or to perform ground-disturbing activities in controlled areas.

There is an ongoing program by BN to assure that all radiological areas requiring access and work controls are properly posted and boundary controls are in place. Areas without radiological posting/controls in place should be available for unrestricted work, however, any radioactivity detected in these uncontrolled areas should be reported to BN immediately.

9.3.2 Legal and Policy Requirements

Federal laws apply to the management and protection of workers and the public. *Occupational Radiation Protection* (10 CFR Part 835) establishes radiation protection standards, limits, and programs for protecting individuals from ionizing radiation at DOE facilities. *Occupational Safety and Health Standards* (29 CFR Part 1910) and *Safety and Health Regulations for Construction* (29 CFR Part 1926), provide the program requirements for industrial safety and industrial hygiene.

9.4 Data Management

The following data sets are available to determine man-made radiation exposure rates, terrestrial radiation exposure rates, radiation contaminated site locations, and radiation controlled area locations on the NTS.

9.4.1 Geographic Information System-Based Databases

9.4.1.1 Nevada Test Site Radiation Survey-1994, Man Made Exposure Rate Maps

These maps, produced on January 26, 1995, show residual radioactivity at the NTS resulting from past testing programs. The man made components of terrestrial radiation exposure levels are shown at levels greater than 3 micro roentgens per hour (7.7×10^{-10} coulomb-per kilogram per hour) above background. Maps of total terrestrial gamma levels are being prepared. The maps are the result of a helicopter survey that covered 100% of the NTS. The data quality is high, as this was a high resolution, low altitude (200 ft (61 m) above ground level) survey. The map is documentation of work performed by the BN Remote Sensing Laboratory and is not updated.

9.4.2 Other Databases

9.4.2.1 Radioactive Contamination Posting Data Reports

The reports contain data on surface surveys, instrument surveys, historical information on posted sites on the NTS, and maps of the posted areas. The data quality is moderate. The BN Health Physics Department updates the database as needed.

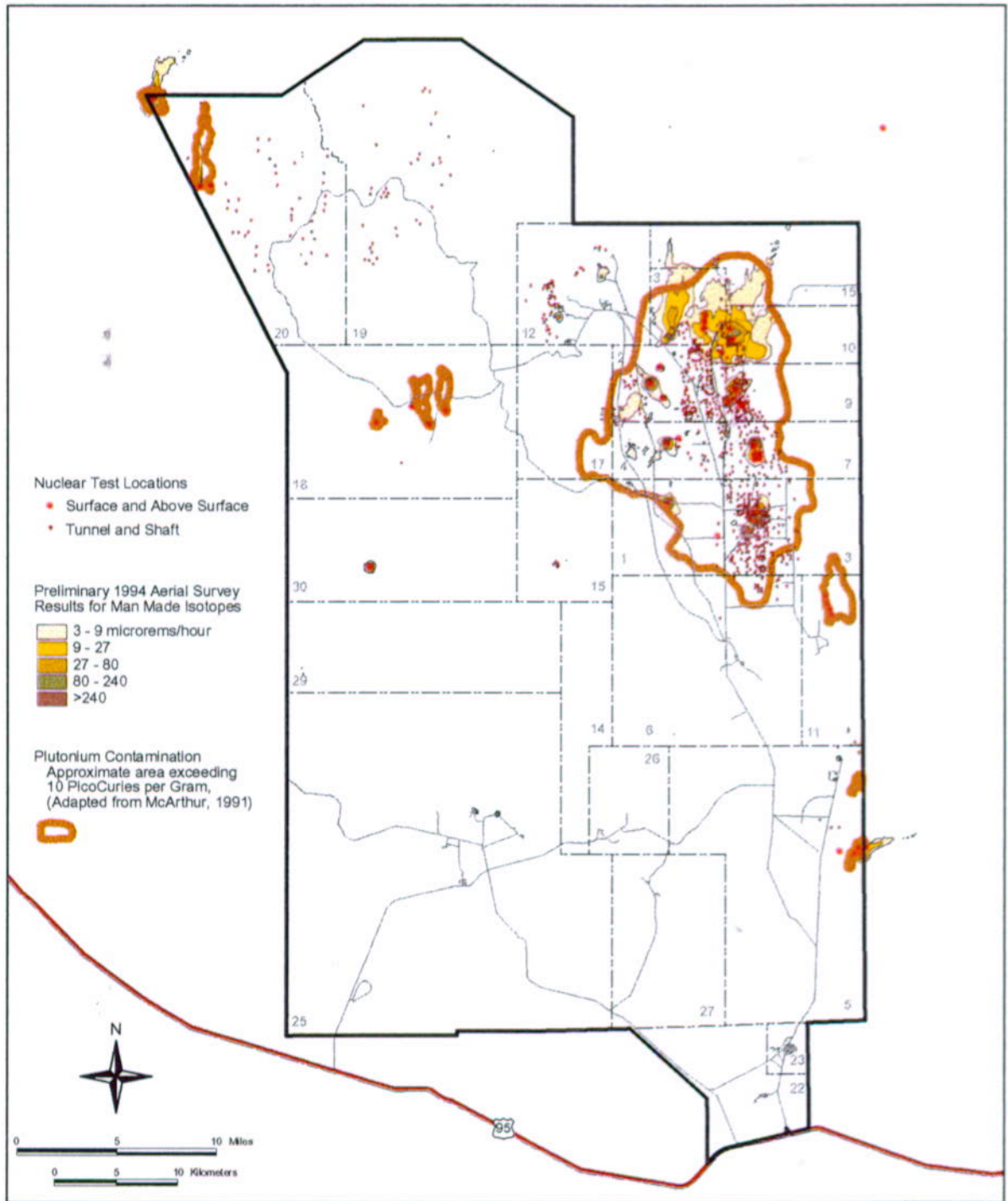


Figure 9-1 Nuclear Tests and Surface Contamination

73

9.4.2.2 Radiologically Controlled Areas Report

This report lists all the radiologically controlled and posted areas on the NTS along with maps. The maps are nonspecific as to boundaries of contaminated areas. The data quality is moderate. The BN Health Physics Department is updating the database.

9.4.3 Release of Data

The above data are available to the public. Requests for database information in this section must be made to the Director of the DOE/NV Environment, Safety, and Health Division.

9.5 Monitoring

9.5.1 Purpose

Monitoring identifies radiological, industrial hygiene, and safety hazards in the workplace.

9.5.2 Legal and Policy Basis

9.5.2.1 Title 10 Code of Federal Regulations Part 835 - Occupational Radiation Protection, Subpart C - Standards for Internal and External Exposure

Section 835.208, Limits for Members of the Public Entering a Controlled Area, requires that any member of the public exposed to radiation and/or radioactive material during direct on-site access at a DOE site or facility not exceed 0.1 rem (0.001 sievert) total effective dose equivalent in a year. (10 CFR Part 835)

9.5.2.2 Title 10 Code of Federal Regulations Part 835, Subpart E - Monitoring in the Workplace

Section 835.402, Individual Monitoring, lists requirements for monitoring individual exposure to external radiation with personnel dosimetry, and internal radiation exposure with bioassays. Section 835.403, Area Monitoring, lists requirements for measuring radioactivity concentrations in the ambient air of the workplace. Section 835.404, Radioactive Contamination Control and Monitoring, requires that instruments and techniques used for radioactive contamination monitoring and control be adequate to ensure compliance with the specified requirements. (10 CFR Part 835)

9.5.2.3 Title 10 Code of Federal Regulations Part 835, Subpart G - Posting and Labeling

Section 835.602, Controlled Areas, requires that each access point to a controlled area be posted, identifying it as a controlled area, whenever radioactive material and/or radiation fields that require posting may be present in the area. Section 835.603, Radiological Areas, requires each access point to a radiological area (as defined in Section 835.2) be posted with conspicuous signs. (10 CFR Part 835)

9.5.2.4 Title 29 Code of Federal Regulations Part 1910, Subpart Z - Toxic and Hazardous Substances

Subpart Z lists the maximum allowable exposure limits for air contaminants (chemicals, metals, and mineral dusts). Workplace air contaminant levels are determined through industrial hygiene monitoring of air with sampling/monitoring equipment. For those chemical and metal contaminants that have specific sections such as

1910.1001 Asbestos, specific monitoring requirements are further detailed. This document also requires inspection and monitoring of various workplace industrial operations. (29 CFR Part 1910)

9.5.2.5 Title 29 Code of Federal Regulations Part 1926, Safety and Health Regulations for Construction

This section requires inspection and monitoring of construction sites for health and safety hazards. (29 CFR Part 1926)

9.5.2.6 Department of Energy Order 440.1A, Worker Protection Management For Department of Energy Federal And Contractor Employees

The order's stated objective is to establish the framework for an effective worker protection program that will reduce or prevent injuries, illnesses, and accidental losses by providing Federal and contractor workers with a safe and healthful workplace. DOE Order 440.1A requires assessment of exposure to chemical, physical, biological, or ergonomic hazards through appropriate workplace monitoring (including personal, area, wipe, and area sampling); biological monitoring; and observation. Monitoring results are to be recorded. Construction sites are required to be monitored by daily inspections of workplace activities/hazards. (DOE Order 440.1A)

DOE 440.1A requires an additional industrial hygiene reference which is used in conjunction with the above cited Title 29 CFR Part 1910, Subpart Z. It is the *American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices* (ACGIH, 1998). When these Threshold Limit Values are lower than the Occupational Safety and Health

Administration Title 29 CFR Part 1910.1000 list for any contaminant, then the ACGIH Threshold Limit Values limit is used as the maximum allowable exposure for a worker.

9.5.3 Description of Monitoring Program

Radiation workplace monitoring is accomplished by conducting radiation and contamination surveys, use of constant air monitoring systems, air sampling, soil sampling, water sampling, and area dosimetry. Personnel monitoring is accomplished by performing radiation surveys, use of personnel dosimetry, and implementation of the internal dosimetry program. Posting, demarcation, and labeling of radiological hazards are also included in this activity. Radiological areas and radioactive materials are posted and labeled to alert personnel to the presence of external radiation or contamination. Radiation protection instrumentation is also an element of the monitoring activity. This activity involves choosing the right instruments for the expected radiation, maintenance and calibration of the instruments, and field checks.

Industrial hygiene monitoring of worker exposure to chemical contaminants and physical agents involves air monitoring and sampling using various monitoring and measurement equipment and sampling media. Title 29 CFR Part 1910 provides detailed monitoring requirements for specific regulated chemical and metal contaminants.

Industrial workplace operations and construction sites are required to be periodically monitored, by inspection and walkthrough of work areas, to evaluate industrial safety hazards and controls. Depending on various operations, this would include personal protective equipment, machine guarding, fall protection, electrical safety, among others.

75

9.5.3.1 Facilities and Buildings

Surveys of operationally active facilities that have the possibility of becoming contaminated, such as buildings, shops, warehouses, laboratories, etc., are performed as needed by BN. Surveys are conducted using appropriate portable radiation detection instruments and swipe sampling techniques even if the other monitoring devices are in use, such as air monitors. A copy of any survey that finds contamination is sent to the organization responsible for that facility, building, or area.

9.5.3.2 Inactive Facilities and Areas

DOE/NV has several inactive facilities and numerous test areas that are contaminated and require access control. Inactive facilities or areas having undergone past decontamination activities are exempt from periodic resurvey. BN controls and conducts all reentry into inactive facilities for the purpose of facility walk-through and inspection. If an inactive facility becomes operational, the requirements for routine contamination surveys will again apply.

9.5.3.3 Vehicles and Equipment

Vehicles that enter Areas 3 and 5 RWMSs for any reason are surveyed using either the handheld radiation detection instruments or swipe surveys before being allowed to leave the area.

Vehicles designated for government surplus or unrestricted release to the public are thoroughly surveyed before being released. All vehicle surveys and findings are recorded, documented, and maintained by BN.

All equipment that is removed from the forward areas of the NTS must be checked for contamination. Radioactive materials must be packaged for transportation in accordance with DOE regulations.

9.5.3.4 Soil Disturbing Restrictions

Areas scheduled for drilling sites, construction sites, or any extreme soil disturbing activity must be cleared through BN radiological field operations section to ensure radiological safety. Construction or soil disturbing activities do not begin before receipt of approval. Due to the nature of past nuclear weapons testing, there are widespread areas of radioactive soil contamination on the NTS. The following protocols are addressed in the *DOE/NV and Yucca Mountain Project Radiological Control Manual*.

Soils containing beta-gamma emitting radionuclides are posted when exposure rate levels exceed 0.5 millirem (mrem) per hour (5×10^{-6} sievert per hour) on average, as measured by appropriate field monitoring instruments at 12 inches (30 centimeters) from the ground surface. Soils containing beta or gamma-emitting radionuclides shall be fenced and posted when exposure rate levels meet or exceed 5 mrem per hour (5×10^{-5} sievert per hour) at 12 inches (30 centimeters) from the ground surface. (DOE/NV, 1994)

Soils containing alpha-emitting radionuclides in concentrations that could result in airborne radioactivity levels greater than 1/50 of a derived air concentration or calculated air concentration, and averaged over 1,100 ft² (100 m²), are posted. Soils containing alpha emitting radionuclides in concentrations which could result in measured airborne radioactivity levels greater than 1/10 of a derived air concentration or a calculated air concentration, and averaged over 1,100 ft² (100 m²), are fenced and posted. (DOE/NV, 1994)

Field soil monitoring information is used to update, as needed, both the Radioactive Contamination Posting Data Reports and the Radiologically Controlled Areas Report.

9.6 Adaptive Management

Compliance with industrial safety, industrial hygiene, and radiological safety federal, state and DOE requirements are mandatory and DOE, contractors, and users plan, perform, and accomplish work within those requirements. As federal, state, and DOE requirements change, DOE/NV will use adaptive management to ensure compliance.

9.6.1 Industrial Safety Program

DOE/NV will continue to minimize safety hazards to the workers and public. This is accomplished by ongoing compliance with the Occupational Safety and Health Administration and DOE safety program requirements. Routine inspections and surveillance of work places ensure program compliance. DOE, the maintenance and operations contractor, and users perform safety inspections and programmatic reviews. Implementation of Integrated Safety Management involves specific instances of work definition and planning, hazards identification and analysis, definition and implementation of hazard controls, performance of work, developing and implementing operating procedures, and monitoring and assessing performance for improvement. Implementation of Integrated Safety Management is ongoing with the contractors, users, and DOE/NV.

9.6.2 Industrial Hygiene Program

DOE/NV is continuing to control and minimize health hazards to the workers and public. This is accomplished by compliance with the Occupational Safety and Health Administration and DOE health program requirements. Contractors, users, and DOE perform work place inspections to ensure and minimize exposure to health hazards. DOE, the contractors, and users accomplish further program enhancement, by following the

Integrated Safety Management guiding principles and core functions.

9.6.3 Radiological Safety Program

DOE/NV is continuing to ensure that radiation exposure to workers and the public and releases of radioactivity to the environment are maintained below regulatory limits. DOE/NV will continue to reduce exposures and releases further with a process that seeks to make any exposures or releases As Low As Reasonably Achievable. DOE/NV will continue ongoing work place inspections and monitoring which DOE, contractors, and users perform. Inactive facilities and areas that are known to be contaminated and require access control are fenced and posted with warning signs. In remote areas where personnel rarely perform work activities, appropriate posting at the perimeter boundary as well as access roads to the contaminated area may be substituted instead of fencing. Further program enhancement is accomplished by following the Integrated Safety Management guiding principles and core functions.

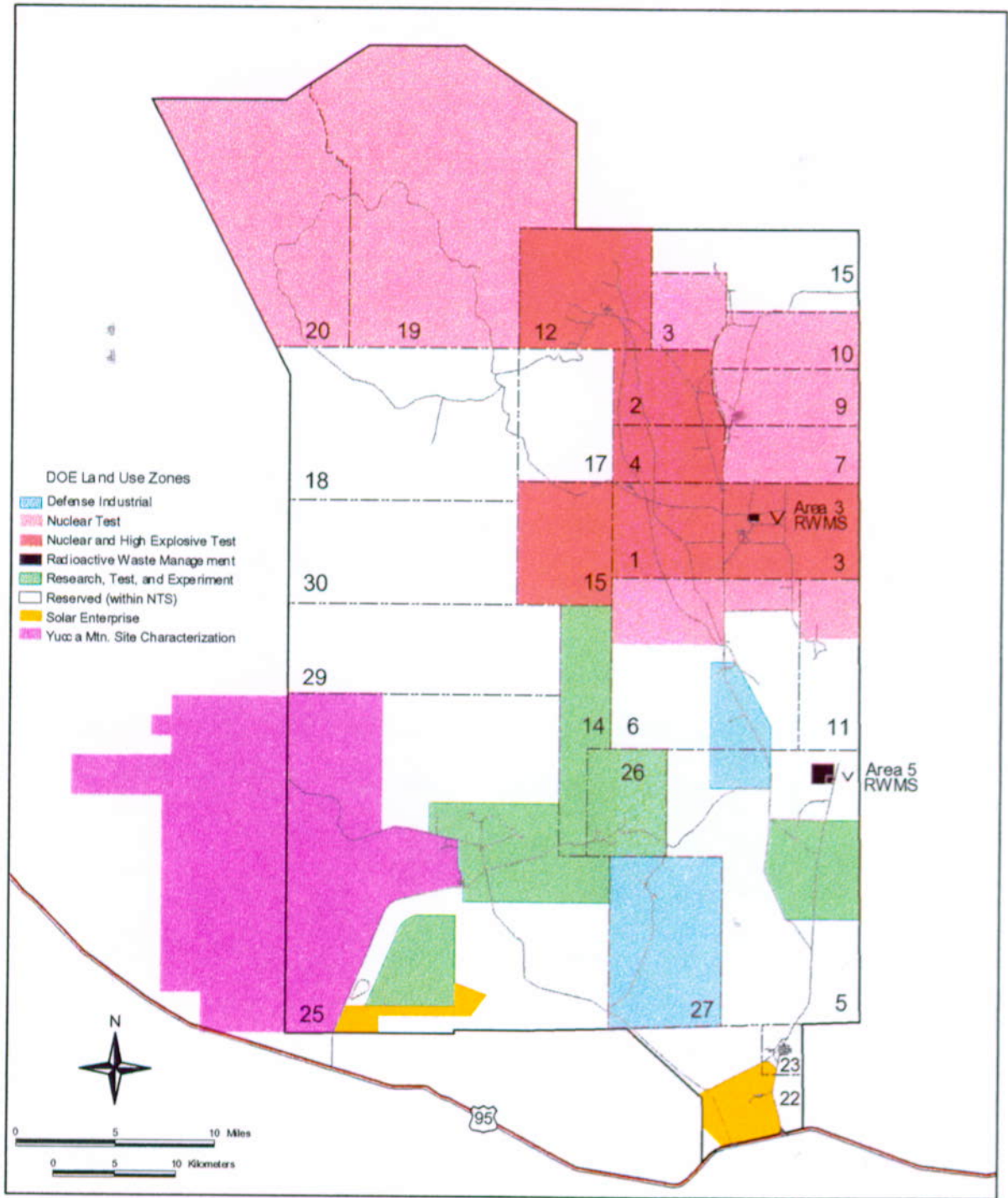


Figure 10-1 Record of Decision Land Use Zones

78

programs or projects. Approximately 7-10% (94-135 mi² (243-350 km²)) of the land at the NTS has been disturbed. (DOE/NV, 1997) Facility expansion is possible within all of the developed areas at the NTS. Facility expansion in the undeveloped areas is dependent upon several factors including terrain, available infrastructure, and resource impacts.

In most cases, an area is assigned to a use category based on the environmental characteristics it exhibits. Environmental characteristics, especially geography and geology, generally determine how suitable an area is for a particular use. Technical and experimental areas cluster in those sectors of the NTS where geography and geology are most favorable to testing.

The following information describes the land use zone categories depicted on the Record of Decision Land Use map shown in Figure 10-1.

- ✓ Nuclear Test Zone – This area is reserved for dynamic experiments, hydrodynamic tests, and underground nuclear weapons and weapons effects tests. This zone includes compatible defense and nondefense research, development, and testing activities.
- ✓ Nuclear and High Explosives Test Zone – This area is designated within the Nuclear Test Zone for additional underground nuclear weapons tests and outdoor high explosive tests. This zone includes compatible defense and nondefense research, development, and testing activities.
- ✓ Research Test and Experiment Zone – This area is designated for small-scale research and development projects and demonstrations; pilot projects; outdoor tests; and experiments for the development, quality assurance, or reliability of material and equipment under controlled conditions. This zone includes compatible defense and

nondefense research, development and testing projects and activities.

- ✓ Radioactive Waste Management Zone – This area is designated for the management of radioactive wastes.
- ✓ Solar Enterprise Zone – The area is designated for the development of a solar power generation facility, and light industrial equipment and commercial manufacturing capability.
- ✓ Defense Industrial Zone – This area is designated for stockpile management of weapons, including production, assembly, disassembly or modification, staging, repair, retrofit, and surveillance. Also included in this zone are permanent facilities for stockpile stewardship operations involving equipment and activities such as radiography, lasers, material processing, and pulsed power.
- ✓ Reserved Zone – This area includes land and facilities that provide widespread flexible support for diverse short-term testing and experimentation. The reserved zone is also used for short duration exercises and training such as nuclear emergency response and Federal Radiological Monitoring and Assessment Center training and DoD land-navigation exercises and training.

10.3.1.1 Topography

The topography of the NTS is typical of the Great Basin section of the Basin and Range province in Nevada, Arizona, and Utah. Broad valleys separate numerous north to south rugged mountain ranges. On the NTS, the highest elevations are on Pahute Mesa (approximately 7,200 ft (2,195 m) above sea level) and on Rainier Mesa (approximately 7,700 ft (2,347 m) above sea level). The lowest elevations are in Frenchman Flat and Jackass Flat (approximately 3,000 ft (914 m) above sea

level) on the dry-lake beds or playas. Elevations on the NTS range from 3,000-4,500 ft (914-1,372 m) above sea level in the southern and eastern valleys to 5,500-6,900 ft (1,676-2,103 m) in the high country near the northern and western boundaries. The slopes of the upland surfaces are steep and dissected; however, the slopes of the lower, alluvial-fan surfaces are gentle. Figure 10-2 is a shaded relief map of the NTS and the surrounding area.

There are three principal alluvial valleys within the NTS:

- ✓ Yucca Flat (a north-south, elongated, closed basin with a playa at its southern end) occupies much of the eastern NTS.
- ✓ Frenchman Flat (an oval-shaped, closed basin with a playa at its center) is in the southeastern portion of the NTS.
- ✓ Jackass Flats, which drains away from the site into the Amargosa Desert, lies in the southwest corner of the NTS.

Pahute Mesa, the Belted Range (which includes Rainier Mesa), Timber Mountain, and Shoshone Mountain are prominent highland areas that dominate the NTS landscape. Timber Mountain is a caldera to the south of Pahute Mesa. The colorful Calico Hills form the northern edge of Jackass Flats.

Nuclear testing has changed the NTS topography in the last 45 years. Many craters were produced by tests conducted on or near the surface during the days of atmospheric testing. Some tests, deliberately buried at shallow depths, produced throw-out craters. Underground nuclear tests, designed to be contained, usually produced collapse sinks when the overburden above the nuclear cavity collapsed. Collapse sinks are particularly common at Yucca Flat, where most of the underground testing occurred.

The topography and soils around Mercury camp are typical of the NTS alluvial basins. The alluvial plain at Mercury slopes gently to the southwest. The soil is dense, silty sand that contains gravel and scattered boulders. Mercury is located within a major drainage basin. A steeply sloping local sub-basin drains from the northeast directly into Mercury. The sub-basin is drained by an arroyo system and is subject to high peak runoff.

10.3.1.2 Faults

Western North America lies within a broad tectonic belt of right-lateral movement caused by differential motion between the North American and the Pacific crustal plates. This type of motion may have occurred earlier in southern Nevada and eastern California along the Walker Lane and Las Vegas Valley shear zones and the Death Valley and Furnace Creek fault zones. Relatively high seismic activity continues today along the Death Valley and Owens Valley fault zones northwest and southwest of the NTS as shown in Figure 10-3.

Most displacement along the Las Vegas Valley Shear Zone southeast of the NTS appears to have occurred during the last 17 million years; however, it has been suggested that motion along this zone ceased about 10 million years ago. The Las Vegas Valley Shear Zone seems to have been inactive for millions of years.

Seismic activity and surface fault displacements occurred during this century within the Walker Lane Shear Zone prior to the 6.5 tremor recorded on June 29, 1992. Although no distinct faults can be traced between the two zones, the structural, volcanic, and topographic features throughout this region suggest a connection.

In the southern NTS, two major fault zones (the Cane Spring and the Rock Valley fault zones) trend northeast to southwest. Some small-magnitude earthquakes are associated with these faults. In August 1971, an earthquake of

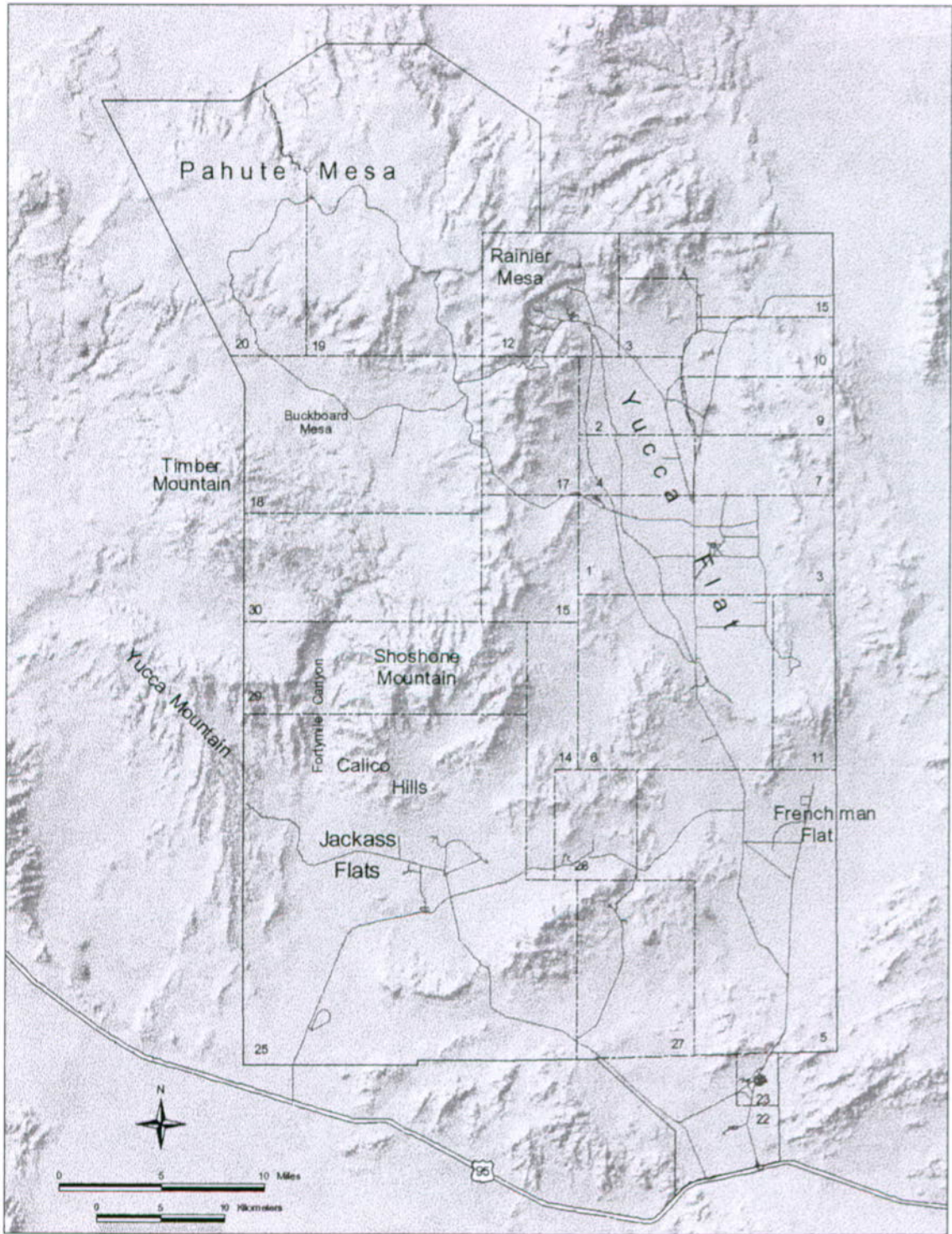


Figure 10-2 Shaded Relief Map of the Nevada Test Site Area

81

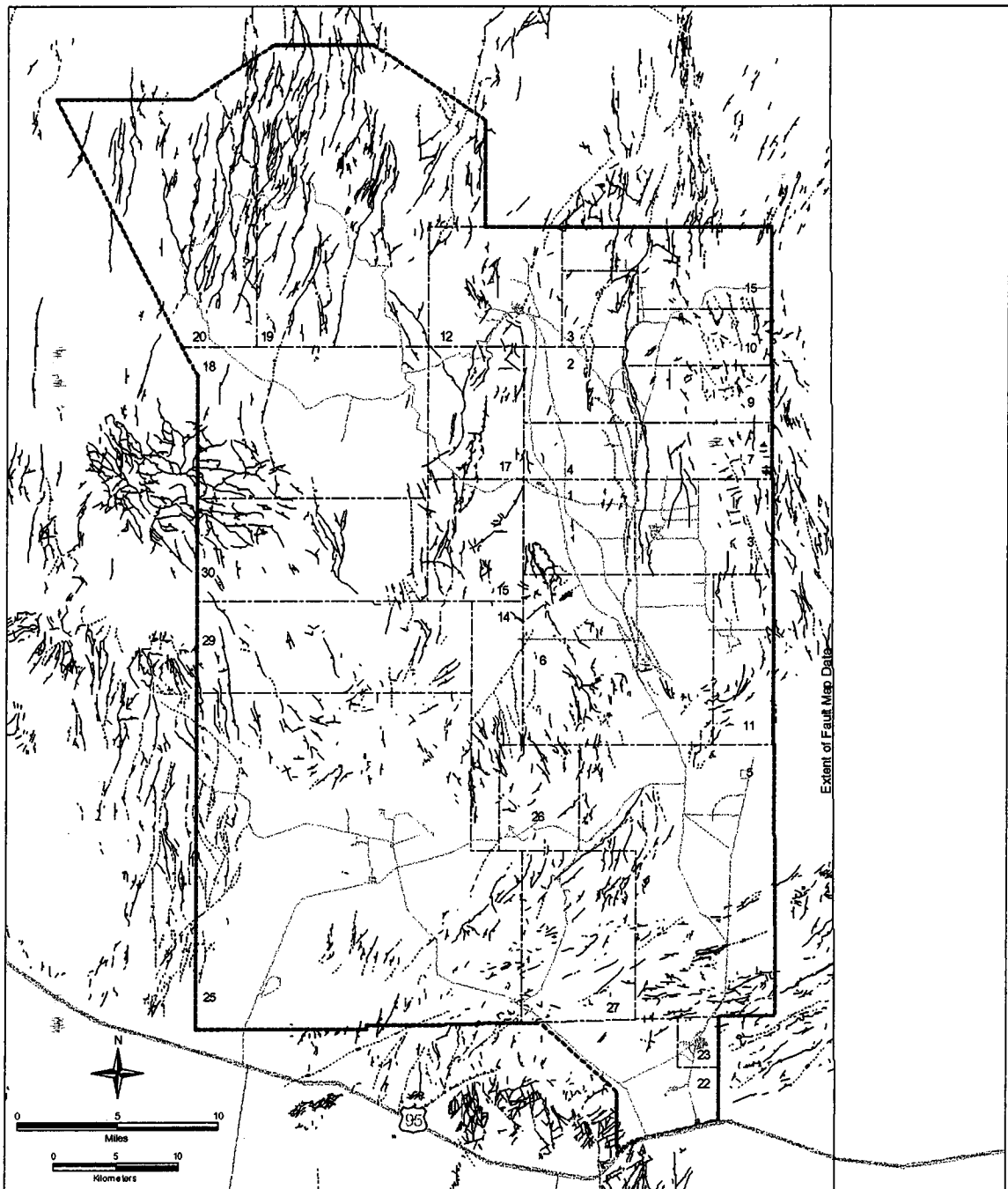


Figure 10-3 Fault Map

82

magnitude 4.3 occurred along the Cane Springs fault zone. In February 1973, an earthquake of magnitude 4.5 occurred along the Rock Valley fault system. No surface displacement was associated with these two earthquakes. Little Skull Mountain, located in the southern portion of Area 25 of the NTS was the epicenter of an earthquake that registered 5.7 on the Richter scale on June 28, 1992. On September 13, 1992, the epicenter of another earthquake, registering 4.1 on the Richter Scale, was determined to be 7 mi (11 km) below the Little Skull Mountain area. No buildings or equipment suffered damage. This earthquake was determined to be related to the 4.9 earthquake that occurred earlier that morning in Yucca Valley, California.

Movement along Yucca Fault, at the northern end of Yucca Flat, has occurred during the past few thousand years. A series of faults between Yucca Fault and the Carpetbag Fault Zone exhibits major displacement.

Geophysical data suggest that fault movement is ongoing in alluvial basins throughout Nevada. However, because surface processes easily rework the alluvium, evidence of fault movement is often obscured. Localized faults, fractures, and associated minor structures throughout the NTS result from natural crustal forces as well as induced activities such as underground testing, mining, drilling, and hydraulic fracturing.

Processes that have formed the NTS geologic and geographic features continue to operate. These processes are often associated with natural hazards that can affect the use of the resources of the site. Of special interest are past and present regional tectonic activity and localized faulting and folding. These processes are studied to evaluate the potential for ongoing natural seismic activity.

10.3.1.3 Floodplains

Rainfall events that cause flooding on the NTS are usually summer convectional storms (short-duration, high-intensity storms over a localized area). Rapid runoff during these storms can cause flooding in normally dry washes when runoff exceeds the capacity of the channel. During these storms, alluvial fan surfaces can also experience high-velocity flows that follow unpredictable flow paths. Broad, unconfined sheet flow can also occur, as well as the flooding of dry lakebeds or playas.

Flood-control measures employed previously at the NTS included siting facilities on relatively high ground and with respect to natural drainage patterns. Recognized flood-control measures are being incorporated into all new facility design, as required for regulatory compliance. The existing facilities that require permits for waste treatment, storage, and/or disposal are also addressing these requirements. Problems still exist during and after intense storms because many existing roads cross minor drainage washes at dip-crossings, making them susceptible to occasional flooding, erosion, and sedimentation.

10.3.1.4 Meteorology

The NTS is located in a climatic transition zone between the Mojave Desert ecosystem to the southwest and the Great Basin Desert ecosystem that characterizes much of Nevada. Climate varies significantly within the NTS according to the elevation and topography. Weather patterns also vary significantly from one year to the next. Climate extremes are found on the mesas and on the playas, the two major testing environments.

Annual precipitation averages about 12 inches (30 centimeters) on top of Pahute Mesa (approximate elevation 7,000 ft (2,134 m)) and about 5 inches (13 centimeters) at the Desert Rock weather station (approximate elevation 3,000 ft (914 m)). Most precipitation occurs in

the winter when snow falls at the high elevations. The snow cover does not last. During the summer, a secondary wet season brings thunderstorms that create localized flash flooding.

Temperature extremes of -30 degrees Fahrenheit (°F) to 115 °F (-34 degrees Celsius (°C) to 46 °C) have been recorded at the NTS. On the playas, the daily temperature range can exceed 35 °F (20 °C); however, the range on the mesas is usually between 10-15 °F (6-9 °C).

Seasonal changes in the movement of regional, high-pressure, and low-pressure air systems affect wind-direction frequencies. At the NTS, southerly winds predominate in summer and northerly winds predominate in winter. Wind speeds at the NTS average between 8-17 mi per hour (13-27 km per hour). Throughout the year, average wind speed variation reflects wind-reversal patterns; the average daily wind speed is highest during mid-afternoon and lowest a few hours after sunset. The highest average wind speeds occur during the spring months and are associated with the large storms prevalent then.

10.3.1.5 Environmental Research Park

The NTS is part of the National Environmental Research Park Network. This designation is opening new avenues of research within the vast land area of the NTS. Research into biological diversity, plant and community development in disturbed and undisturbed landscapes, regional climate trends, soil formation differences, and other factors that control environmental conditions will now be added to the ecological studies currently conducted on-site.

The compatibility of the environment with energy technology options can be studied. At the NTS, researchers will be able to expand environmental information about the vast deserts, mountain ridges, closed basins, and ecological conditions that exist in this region.

Certain areas of the NTS will be excluded from the designation of the Environmental Research Park because of operations or other activities related to the primary mission of the NTS.

10.3.2 Legal and Policy Requirements

10.3.2.1 Public Land Orders

The NTS was created through the issuance of four PLOs. PLO 805, dated February 12, 1952, reserved lands for the use of the United States Atomic Energy Commission (AEC) as a weapons testing site. Subsequent withdrawals in 1958, 1961, and 1965 reserved the withdrawn lands for use by the AEC at the NTS. (PLO 1662, PLO 2568, PLO 3759) The 1961 withdrawal was more specific in that it reserved the lands for use of the AEC in connection with the NTS for test facilities, roads, utilities, and safety distances. (PLO 2568)

The *Federal Land Policy and Management Act of 1976* (43 USC 1701-1784), its implementing regulations (43 CFR Part 2300), and the PLOs themselves are silent on the use of withdrawn lands for related purposes. There are no specific prohibitions against additional use, if the purpose for which the withdrawal was authorized remains valid.

DOI is vested with oversight responsibility to review existing land withdrawals under the *Federal Land Policy and Management Act*. The DOI has suggested in its comments on the EIS that substantial changes in land use at the NTS may require a new land withdrawal. The DOE believes that land use at the NTS is compatible with the primary purpose of each land withdrawal. DOE has recently initiated consultation with the DOI, including its BLM office in Nevada, regarding the status of the existing NTS land withdrawals, with respect to current and proposed activities at the NTS. The initial meeting identified several issues relevant to the potential impact of proposed NTS activities on the status of the withdrawals. After

each agency has completed its evaluation of these issues, discussions will continue.

10.3.2.2 Interagency Memoranda of Understanding and Agreements

There are two agreements that affect land use at the NTS. The first of these agreements is a MOU between the USAF and the DOE that grants the DOE use of Pahute Mesa on the NAFR. This MOU is authorized under Section 3(f) of the *Withdrawal of Public Lands for Military Purposes Act* (16 USC 460ff) which allows other activities to occur on lands reserved for military purposes.

The second agreement is an intra-agency Memorandum of Agreement (MOA) between the DOE/NV and the DOE Yucca Mountain Site Characterization Office. This MOA allows temporary use of the NTS lands withdrawn under *PLO 2568*, and use of some of the existing facilities in Area 25 for various site characterization activities required under the *Nuclear Waste Policy Act of 1982* (42 USC 10101). The MOA allows the use of other areas of the NTS for field studies associated with the site characterization activities, conditional on those activities' noninterference with NTS programs.

10.3.2.3 Executive Order 11988, Floodplain Management

Executive Order (EO) 11988 requires that DOE take actions that reduce the risk of flood loss, to minimize the impact of floods on human safety, health, and welfare, and to restore and preserve natural and beneficial values served by floodplains. The EO also requires that DOE evaluate the potential effects of any actions it may take in a floodplain to ensure that planning and budget requests reflect consideration of flood hazards and floodplain management. (EO 11988)

10.4 Data Management

Land use data will be used primarily to assist in siting activities and projects. Land use data includes land use zones, contour maps, undisturbed land and environmental, cultural, and mission sensitive areas, and planning maps. The land use zones are used as a basis for siting compatible activities together. Land use zone maps provide land use descriptions and project location-screening criteria. Land use maps aid in minimizing land use conflicts and impacts of new activities on existing NTS missions.

Aerial photography and topographical maps contribute to the siting process by providing information on terrain. Slope and drainage are important factors in identifying areas for development of mission and support complexes and utility corridors. These maps also provide terrain information to identify natural barriers for activities that require safety or security buffers. A database of undisturbed land and sensitive areas is required to identify these areas. Once identified, criteria can be developed to minimize impacts to these areas. Planning maps provide a higher level of detail on projected land use within the land use zones. Planning maps target specific areas for development of mission activities, common support areas, and utility corridors.

10.4.1 Geographic Information System-Based Databases

10.4.1.1 Electronic Computer Aided Design File (Nevada Test Site Environmental Impact Statement Land Use Zones)

Contains the following information:

- ✓ Graphic representation of the land use zones at the NTS
- ✓ Narrative description of the land use zones

85

- ✓ Graphic representation of the project screening zones

The data quality is good. The BN Geo Tech Services Department updates the file as needed.

10.4.1.2 Digital Orthophotography

Contains the following information:

- ✓ Digital Orthophotography of the NTS (digital aerial photography corrected for the curvature of the Earth)
- ✓ Hypsography (digital topography)
- ✓ Surface infrastructure such as roads, facilities, surface disturbances, and power lines

The BN Geo Tech Services Department in cooperation with the United States Geological Survey (USGS) is developing this data. This data is expected to be complete by March 1999. When complete this data will comply with USGS specifications.

10.4.1.3 Visible Surface Disturbances Database

This database contains the visible surface disturbances on the NTS. This data quality is good. The BN Geo Tech Services Department will update the database as part of the Digital Orthophotography project.

10.4.1.4 Vision of the Future of the Nevada Test Site Database

Contains the following information:

- ✓ Proposed areas for development
- ✓ Utility corridors
- ✓ Infrastructure improvements

The data quality is good. The BN Strategic Development Department and the NTS

Development Corporation update the database as needed.

10.4.2 Other Databases

None.

10.4.3 Release of Data

The Digital Orthophotography will be available through the USGS Library when complete. Requests for other database information in this section must be made to the DOE/NV Engineering and Asset Management Division Director.

10.5 Monitoring

10.5.1 Purpose

Proposed land uses at the NTS must be monitored to insure that land uses minimize impacts to undisturbed lands and sensitive areas of the NTS. Proposed NTS land uses must also be monitored to track land use trends and assure consistency with the PLOs and the Record of Decision Land Use Zones. Tracking and monitoring of proposed land uses will also prevent land use conflicts.

10.5.2 Legal and Policy Basis

10.5.2.1 Department of Energy Order 430.1A, Life Cycle Asset Management

This order requires each DOE site to have a documented land use planning process. (DOE Order 430.1A)

10.5.2.2 Comprehensive Planning letter from the Department of Energy, Nevada Operations Office Manager (May 2, 1997)

This letter established the SUD Board. The primary purposes of the board are to (1) provide recommendations to the Manager on

86

the suitability of proposed projects and programs on the NTS, and (2) resolve policy issues on the management of resources and assets. This letter also established a SUD Working Group. The purpose of the Working Group is to provide information and recommendations to the SUD Board in support of comprehensive planning. The Working Group is also a resource that can be used by project managers to help with the site selection process. (Vaeth, 1997)

10.5.2.3 Department of Energy, Nevada Operations Office Procedural Instruction 97-005, Work Authorization Process

This instruction specifies the system for authorizing new work and changes to existing work at the DOE/NV. This instruction includes a review by the SUD Board. (DOE/NV PI 97-005)

10.5.3 Description of Monitoring Program

The SUD Board has developed a process that provides for review of proposed projects by the Board and the SUD Working Group. The review will determine whether the proposed project is consistent with the RMP.

It is the responsibility of the individual DOE project manager to ensure that all the requirements of the Work Authorization Process have been met before proceeding with new work or changes to existing work. The DOE/NV Site Operations Division has overall responsibility for assuring that use of an area is consistent with land use approvals. The Site Operations Division maintains a master schedule of proposed and ongoing projects and activities at the NTS.

10.6 Adaptive Management

The goals for land resources will be accomplished through the SUD process

described in Section 5.6.2. New land disturbance will be minimized when feasible by:

- ✓ Locating projects in previously disturbed areas
- ✓ Use of existing facilities and infrastructure
- ✓ Locating projects with compatible requirements together

Success will be measured by tracking the impacts to undisturbed and sensitive areas of the NTS. The SUD process will be modified as needed to adapt to changing priorities on the resources.

The SUD Working Group and Project managers will work together using the NTS GIS to locate projects at the NTS. The following GIS data layers will be available to assist in achieving the objective listed above.

10.6.1 Nevada Test Site Record of Decision Land Use Zones

This data layer will guide projects to areas with compatible mission requirements. In general, projects consistent with the Record of Decision Land Use Zones will require less NEPA review than other projects.

10.6.2 Digital Orthophotographs of the Nevada Test Site

This data layer provides aerial photographs of the NTS that allow a project manager to find previously disturbed areas and to locate surface facilities and infrastructure in the area.

10.6.3 Digital Hypsography of the Nevada Test Site

This data layer provides topographical information to project managers interested in slope and contour of an area.

87

10.6.4 Vision of the Future of the Nevada Test Site

This is a series of data layers depicting areas of potential development and planned facility and infrastructure improvements. This series of data layers will be useful in performing risk assessments for use in determining the future disposition of land and facilities.

88

11 Water Resources

11.1 Introduction

Water resources of the NTS include surface water and groundwater. Natural surface water consists of 20 springs and seeps derived from local groundwater recharge and shallow lakes, catchments, and ephemeral streams containing water only after significant precipitation. The springs are associated with sensitive habitats containing flora and fauna of extremely limited distribution. Artificial impoundments include sewage lagoons and tunnel effluent containment ponds. Groundwater is present in large quantities in carbonate, alluvial, and volcanic aquifers beneath the NTS. The quality of a small portion of the NTS groundwater is degraded by radionuclides from underground nuclear testing, but the majority of NTS groundwater is of good quality.

11.2 Goals

- ✓ Maintain an adequate water supply for existing and new uses on the NTS while ensuring a long-term sustainable supply of water for the NTS and the surrounding ecosystem.

Water is an essential resource required for the missions on the NTS. Attainment of this goal will ensure that water will not become a limiting factor in mission accomplishment. Water in the Death Valley Groundwater Flow System (extending from recharge areas to the north and east of the NTS to discharge areas to the south and west) defines a unique ecosystem of human and natural life. The evolution of significant numbers of threatened and endangered species was linked to the limited distribution of water and the species' survival depends upon its continued flow. Man's activities in large part are dictated by the economic availability of water and access to land. Attainment of this goal requires the application of the principles of ecosystem management on a regional scale.



Gold Meadows Spring in Area 12 of the NTS

Management of groundwater is needed to maintain the viability of native plant and animal species, to sustain the productivity and diversity of native ecosystems, and to accommodate human uses. Multiple federal and state agencies, counties in two states, farmers, developers, and residents all have critical stakes in the attainment of the goal. In addition, the U.S. District Court for Nevada retains jurisdiction (pursuant to a 1974 decision of the Ninth Circuit Court of Appeals, affirmed in 1976 by the U.S. Supreme Court) over the relationship between water use and water level in Devil's Hole, so that it may act promptly if a change in water level is required to preserve and protect the endangered pupfish. (U.S. v. Cappaert et al., 375 F. Supp. 456 (D. Nevada 1974); 508 F.2d 313 (9th Cir. 1974); aff'd 426 U.S. 128; 96 S. Ct. 2062 (1976)). Without an interdisciplinary and multiparty approach, data acquisition and analysis will be costly, fragmented, and contentious.

Long-term availability of water is the most significant water use issue on the NTS. While the national security missions on the NTS have precedence over other NTS missions, accomplishment of expanded use of the NTS envisioned in the Strategic Plan and the NTS EIS requires careful and prudent exploitation of

groundwater resources. Within the broader region, the ecosystem management principles are required to prevent non-NTS use from affecting NTS missions. DOE has the right to protest off-site uses that negatively impact DOE's prior rights. The principles are also required to prevent NTS uses from affecting the long-term sustainability of the resource. DOE also asserts that the defense missions of the NTS are clearly entitled to an implied federal reserved water right. In contrast, new commercial ventures on the NTS are not entitled to this right and are subject to state requirements for appropriating groundwater as administered by the State Engineer.

- ✓ Maintain the quality of waters that are presently clean.

To support the use of water for existing and new missions, the quality of the water at the NTS must be protected. DOE will strive to maintain compliance with federal and state water quality standards.

Disposal of low-level radioactive waste at the NTS has been analyzed in formal performance assessments. These analyses show that there is no pathway for contaminants to reach the groundwater under normal conditions. Waste operations can be considered consistent with the goal of non-degradation. It is only an unlikely combination of events that would cause non-attainment of the goal.

- ✓ Minimize the impact to groundwater quality should resumption of underground nuclear testing be required.

Resumption of underground nuclear testing is possible if DOE is directed to do so by Congress or the President. It is DOE's goal to accommodate testing activities with minimal impact to the human and natural components of the surrounding ecosystem.

The goal of minimizing impacts of underground testing on the groundwater is complicated by

compliance with international agreements to prevent releases of radiation to the air such as the *Limited Test Ban Treaty*. Containment generally requires deep burial of underground tests, thereby placing the test closer to, or in, the water table. Thus, attainment of the water quality goal must be viewed in the context of the treaty constraints.

- ✓ Manage groundwater resources to maximize the availability of water while minimizing the impacts to human health and the environment from contamination remaining from underground nuclear testing.

There is a link between the water quantity and water quality goals listed above. It is inevitable that existing contamination from previous underground nuclear testing at the NTS will spread. The purpose of this goal is to guide the management of groundwater resources affected by underground nuclear testing.

Additional costs may result from moving points of diversion from locations that would otherwise be chosen to minimize potential adverse effects of water use in the presence of existing contamination. The benefit of any proposed change in point of diversion would have to be weighed against the cost. Significant amounts of water may need to be withdrawn to change contaminant migration, such as the local reversal of flow directions in or near a testing area. These amounts may exceed the amounts otherwise determined as acceptable from a water quantity point of view. A balance will need to be achieved between the potential gain in water quality and the potential loss in water availability elsewhere in the ecosystem. The extent to which the spread of contamination can be affected by groundwater withdrawal is subject to analysis. This analysis is based on the *FFACO* between DOE, the Defense Threat Reduction Agency, and the state of Nevada. Any decision to modify water withdrawal amounts or locations to affect water quality must be incorporated into the formal process described in the agreement. Withdrawals

outside the NTS are out of the control of DOE. DOE can participate with surrounding holders of water rights and land management agencies to take an ecosystem approach to water management, but has no authority to impose any pattern of water use.

11.3 Inventory and Limitations

11.3.1 Resource Status

The status of NTS water resources is detailed in the NTS EIS. (DOE, 1996a) Brief summaries are presented in the following paragraphs with emphasis on the aspects pertinent to the four water resource management goals. Where information that is more recent has been developed, the information in the EIS is updated here.

The NTS lies within the Death Valley groundwater system extending from north of the NTS to Death Valley. The flow system originates as precipitation in the higher elevations, primarily to the north and east, and flows to discharge areas such as Death Valley and the Amargosa Valley to the south and southwest. The state of Nevada Department of Conservation and Natural Resources (Scott et al, 1971) estimates that the perennial groundwater yield of the system for eight hydrographic basins partly or wholly within the

NTS, shown in Figure 11-1 and Table 11-1, exceeds 46,000 ac-ft/yr (56.7 Mm³/yr). This amount is based upon the assumption that about half of the approximately 82,000 ac-ft/yr (101 Mm³/yr) of groundwater flowing into the basins is available for withdrawal on a perennial basis and that recharge from precipitation in these basins is estimated to be over 11,000 ac-ft/yr (13.6 Mm³/yr). Work that is more recent reports similar groundwater budgets. (Harrill et al, 1988 and Sadler et al, 1992) However, there is some uncertainty in these numbers. The regional groundwater models discussed in Section 11.4 have not been used to estimate basin perennial yields.

The aquifers are capable of producing large amounts of water from individual wells. In addition, there is perhaps four times as much water in storage than is estimated as perennial yield for the Death Valley flow system. (Harrill et al, 1988)

Groundwater underlying the NTS generally meets standards for drinking water and other uses. It is classified according to EPA guidelines as Class II, groundwater currently or potentially a source of drinking water (Chapman, 1994). Most areas of the NTS have been undisturbed by underground nuclear testing and have no contamination. Testing has resulted in the deposition of about

Table 11-1 Perennial Yield of Major Hydrographic Basins of the Nevada Test Site

Basin	Perennial Yield (ac-ft/yr)	Perennial Yield (Mm ³ /yr)
Mercury	8,000	9.90
Rock Valley	8,000	9.90
Yucca Flat	350	0.43
Frenchman Flat	16,000	20.00
Buckboard Mesa	3,600	4.40
Jackass Flats	4,000	4.90
Oasis Valley	2,000	2.60
Gold Flat	1,900	2.30
Kawich Valley	2,200	2.70
TOTAL	46,050	57.13

Source: Scott et al, 1971

300,000,000 Ci (1.1×10^9 Becquerel (Bq)) of contamination in or near the groundwater in the testing areas. (DOE, 1996a) However, the contamination associated with nuclear tests is often localized near the test cavity, leaving the water above, below and lateral to the test uncontaminated.

Presently, groundwater withdrawals on the NTS are less than 900 ac-ft/yr ($1.1 \text{ Mm}^3/\text{yr}$), with most of that withdrawn far from the testing areas. Because of the distances between existing water supply wells and the underground tests, DOE believes that water use on the NTS has little or no effect on the migration or spread of contamination from underground nuclear testing. Off-site water use is far removed from the testing areas. The closest significant withdrawals are in Oasis Valley, about 30 km away from the nearest underground test, and are not thought to affect contaminant migration.

11.3.2 Legal and Policy Requirements

Water use in Nevada is based on the appropriative doctrine and is regulated by the State Department of Conservation and Natural Resources through an appropriations process. The federal government asserts sovereign immunity from the state's management of water resources where water is used from land withdrawn from the public and the use is for the purposes for which the land was withdrawn.

Currently, the only existing permits to appropriate water on the NTS are held by the DOE Yucca Mountain Site Characterization Project for use at Yucca Mountain, and DOE/NV for economic development activities. Water rights holders down-gradient of the NTS have asserted that water under-flowing the NTS replenishes and supplies the water utilized by them, and is therefore subject to prior appropriation by them. Protests of DOE water rights applications at Yucca Mountain by down-gradient water rights holders are pending before the State Engineer. The resolution of these

protests will provide more guidance on the availability and limitations on water use for non-defense purposes.

As a matter of policy, DOE has committed to follow the principles of ecosystem management in the utilization of water resources. In this regard, water use potentially could be limited by the impact of NTS water use on down-gradient water rights holders at Death Valley National Park (Devil's Hole detached unit) and Ash Meadows National Wildlife Refuge. However, there is no evidence that NTS water use has resulted in any impacts at Devil's Hole. (Avon and Durbin, 1994) Further, water level declines on the NTS related to groundwater withdrawal have been minor. (La Camera et al, 1996) Water discharge records at Ash Meadows have been interpreted by the USFWS to reflect a short-term downward trend (Mayer, 1997), but the cause has not been determined. Therefore, an exact maximum discharge rate, or water use limitation, for NTS water development cannot be established.

In view of the difficulties in defining an optimum water use, DOE has established interim amounts based upon historical use as shown in Table 11-2. These interim amounts are not limits, but are intended to be used as general guides for planning resource use. These water use rates are thought to be sustainable because they have been attained in the past without measurable impact on the regional groundwater system. Water use above these amounts may also be sustainable, and will have to be determined on a case-by-case basis in the event larger amounts of water are required for a specific use. In order to define more clearly the sustained yield of NTS hydrographic basins in the future, studies are underway, which will result in a stronger technical basis for the definition of limitations.

Discharge of pollutants to water at the NTS is regulated by the *Clean Water Act* (42 USC 1251) for surface discharges and the *Safe Drinking*

Table 11-2 Maximum Historical Discharge from Nevada Test Site Wells, by Hydrographic Basin

Basin	Maximum Discharge (ac-ft/yr)	Maximum Discharge (Mm ³ /yr)
Mercury	428	0.528
Yucca Flat	856	1.060
Frenchman Flat	1,664	2.050
Buckboard Mesa	524	0.646
Jackass Flats	277	0.342
Gold Flat	426	0.525
TOTAL	4,175	5.151

Source: USGS

Water Act (42 USC 300f) for injection wells, both of which are administered by the state of Nevada. DOE acknowledges the limitations imposed by these acts. In general, discharges must meet requirements imposed by the state as specified in permits.

Resumption of underground nuclear testing can result in degradation of the groundwater that far exceeds the limitations imposed by the *Safe Drinking Water Act*. In this special case, DOE proceeds with the test in the interest of national security. DOE has established limitations designed to take advantage of site conditions and test execution to minimize impacts. (DOE/NV PI 97-001) These limitations are as follows:

- ✓ The experiment shall use previously used areas of underground nuclear testing.
- ✓ Minimize experiments with working points at or below the water table.
- ✓ Working points shall be placed no closer than two cavity radii from the regional carbonate aquifer.
- ✓ An experiment location shall not be sited closer than 4,921 ft (1,500 m) from the NTS boundary where groundwater is leaving the NTS.

- ✓ An experiment location with a total drilled depth extending two cavity radii, or 98 ft (30 m), whichever is greater, beneath the working point shall be plugged to a minimum of one cavity radius.

In order to optimize the use of water while considering the contamination remaining from underground testing, DOE has initiated the Underground Test Area Project. The objectives of the project are to characterize the nature and extent of contamination, select remedial alternatives in agreement with the state of Nevada, and implement the selected alternatives. Accomplishment of this project is part of the process described above and detailed in the *FFACO* between DOE, the state of Nevada, and the Defense Threat Reduction Agency. (State of Nevada, 1996a) Limitations on water use or locations of groundwater diversion, if any, will be documented formally among the parties to the agreement.

11.4 Data Management

The types of data used to manage water resources depend upon the specific goal to be attained. The first goal relates to maintaining an adequate water supply and is supported by perennial water yield calculations from empirical and theoretical studies. A number of studies and reports pertain to the sustainability of water resources in hydrographic basins on and around the NTS. These include regional reconnaissance studies, regional flow models, discrete state compartment models, and water

rights proceedings. Each of these data sources is evaluated and summarized into an estimate of groundwater available.

The goal of maintaining clean water requires knowledge of potential contaminants either already on the site or planned for the site. Primary among these sources is low-level radioactive waste disposed of at the Area 3 and Area 5 RWMSs. The management tool is the Performance Assessments for both sites. In addition, protection of groundwater reserves utilized by water supply wells requires knowledge of the well locations. Finally, knowledge of other contaminants brought on-site can help in resource protection by assuring that hazardous constituents are properly tracked and disposed.

Attainment of the goal to minimize groundwater quality impacts in the unlikely instance of resumed underground nuclear testing requires groundwater flow and test program data. Five criteria are used to evaluate proposed test locations considering the location of former tests on the NTS, groundwater depth and flow directions, proximity to carbonate rock, and emplacement configuration for the proposed test.

Data related to the nature and extent of contamination, and its fate and transport under various transient groundwater conditions, is required to meet the goal of minimizing the impacts from contaminated water. Extensive characterization data, mechanisms of transport, predicted plume locations, behavior of the groundwater under conditions of natural and artificial discharge, and the effect of proposed remedial alternatives need to be acquired to attain this goal.

11.4.1 Geographic Information System-Based Databases

The following databases reflect extensive data collection during the past five decades. Data quality is variable and is described in the

individual sections. Data coverage is sometimes variable and no evaluation of the adequacy of the data sets for achievement of specific goals has been attempted.

11.4.1.1 Water Supply Well Production Database

This database contains the weekly production of water from all NTS water supply wells. The data quality is excellent. The USGS updates the database continually.

11.4.1.2 Water Levels Database

This database contains the elevation of the piezometric surface for wells on and around the NTS and is part of the National Water Information System database. The data undergoes extensive review resulting in generally excellent quality. The USGS updates the database continually.

11.4.1.3 Nevada Test Site Detonations Database

This database contains information on all underground nuclear tests/detonations, including spatial location, working point elevation, surface elevation, depth to water, test/detonation name, and hole name. The data is from the weapons testing databases of Los Alamos National Laboratory, Lawrence Livermore National Laboratory, the Defense Threat Reduction Agency, and BN. Known and estimated water levels are from the USGS. The data quality is excellent. This is a historical database maintained by IT Corporation.

11.4.1.4 Site Boundary Database

This database contains the boundary of the NTS. The data quality is excellent. Updates are performed by BN to reflect boundary changes that occur.

95

11.4.1.5 Regional Groundwater Data Sets for Groundwater Modeling

Extensive data sets related to geologic framework, recharge and discharge, aquifer characteristics, potentiometric surface, and chemistry are maintained to support the development of a regional flow model. The first-generation model is complete. The second-generation database is under construction and is not scheduled for completion until 2002. Data quality is good. The USGS updates the database continually. Completion of the second-generation databases and model is contingent upon continuing to receive adequate funding.

11.4.1.6 Predicted Plume Extent Maps

These maps will predict contaminant migration including uncertainty and will indicate the distance various radiocontaminants can be expected to migrate from the underground nuclear testing areas because of groundwater flow. IT Corporation has started data collection and the modeling is beginning. Final results will be produced for each of six groups of underground tests under a schedule specified in the *FFACO*. Final products are scheduled for completion from early 1999 through late 2007.

11.4.1.7 Predicted Effects of Contaminant Remediation and Water Production Maps

This set of piezometric surface drawdown maps and contaminant plume migration maps could result from the development of a transient-state groundwater flow model and subsequent application of a transport model. The USGS is scheduled to initiate a transient-state flow model in about 2001 for completion about two years later. Application of a transport model is not yet planned.

11.4.2 Other Databases

11.4.2.1 Water Supply Well Locations Database

This database contains the spatial coordinates of water supply wells and construction details. The data quality is good. The BN Nevada Operations Division updates the database when modifications to wells are performed.

11.4.2.2 Low-Level Radioactive Waste Disposal Inventories Database

This database contains the inventory of radioactive constituents in each container of waste accepted for disposal at the Area 3 and Area 5 RWMSs. Data generation is subject to extensive controls and is audited periodically, resulting in excellent data quality. BN updates the database continuously as waste is accepted.

11.4.2.3 Perennial Groundwater Yield Report

This report contains the estimated perennial yield of each hydrographic basin wholly or partly on the NTS. This information is presented in Table 4-23 of the *Final EIS for the NTS and Off-Site Locations in the State of Nevada*. (DOE/NV, 1996a) The data is based upon reconnaissance-scale hydrologic mapping completed in the late 1960s. Data quality is preliminary with large estimated uncertainty. The report is final and is not being updated by DOE/NV. Estimates by other authors include:

- ✓ Analysis of Harrill, Gates, and Thomas (Harrill et al, 1988)
- ✓ Discrete state compartment models completed by the Desert Research Institute (DRI) (Byer, 1991; Feeney et al, 1987; Sadler et al, 1992; and Spencer, 1990)
- ✓ Zone water budgets in the IT Corporation regional model (IT Corporation, 1997a)

96

- ✓ Conceptual model of PAL Consultants, Inc. (PAL, 1995)
- ✓ Zone water budgets in the regional flow model of the USGS (D'Agnese et al, 1997)

Analysis of the above reports and performing predictive modeling using one or both of the regional flow models can result in a significantly improved estimate of perennial yield.

The USGS is presently working on a second-generation regional model to be used, in part, to estimate perennial yields. Estimated completion of the model is in 2003.

The State Engineer of the Nevada Division of Water Resources is considering water rights applications in one hydrographic basin of the NTS. The results of the formal water rights hearings, expected to be complete by late 1999, will serve as a recent, formal, state interpretation of the perennial yield of approximately the western third of the NTS.

11.4.2.4 Special Reports

These detailed topical reports contain information related to hydrologic aspects of the NTS and surrounding areas. A bibliography of relevant reports is contained in a report by Seaber. (Seaber et al, 1997) The data is high quality and updated on an as needed basis by the USGS, DRI, Lawrence Livermore National Laboratory, Los Alamos National Laboratory, BN, and other contractors.

11.4.2.5 Spring Discharge at Ash Meadows Database

This database contains the volume of water discharged from numerous springs in the Ash Meadows area. The data quality is good. The USFWS updates the database continually.

11.4.2.6 Water Supply Well Safe Drinking Water Act Monitoring Database

This database contains the analytical results of sampling of water supply wells required by the federal and state Safe Drinking Water Act. The data is updated by BN as new results are received and published annually in the Annual Site Environmental Report along with trending and analysis of important results. Plans are in place to include this data set in the digital environmental monitoring database. Estimated time to completion is during 1999. In addition, the Nevada Bureau of Health Protection Services maintains Ground Water Vulnerability Assessments for the NTS water supply wells. The data are in digital and hard copy form and are not routinely updated.

11.4.2.7 Vadose (Unsaturated) Zone Monitoring Database

This database contains results of neutron logging of boreholes in and near closed RCRA regulated facilities. The data is updated by BN as new results are received and published annually in the Annual Site Environmental Report along with trending and analysis of important results. Plans are in place to include this data set in the digital environmental monitoring database. Estimated time to completion is during 1999.

11.4.2.8 Regional Groundwater Flow Model

The *Regional Groundwater Flow and Tritium Transport Modeling and Risk Assessment of the Underground Test Area, NTS, Nevada* and the companion document *Underground Test Area Subproject Phase 1 Data Analysis Task Data Documentation Package* (IT Corporation, 1997b) comprise the documentation of regional flow modeling performed for the Underground Test Area Project. The database contains maps and tables of data related to the location of the regional carbonate aquifer and hydrologic flow

97

directions. The reports are available on CD-ROM and on the DOE/NV Home Page at <http://www.nv.doe.gov>. The data quality is good. This is a historical record of work performed by IT Corporation and is not being updated.

11.4.3 Release of Data

There are few restrictions on the release of NTS hydrological data to the public, stakeholders, tribal governments, or other interested parties. The Water Supply Well Production and Water Levels databases are published annually by the USGS and are expected to be available via Internet by 1999. The documents associated with the Regional Groundwater Flow Model are available on CD-ROM and on the DOE/NV Home Page at <http://www.nv.doe.gov>.

Data that remain restricted include radionuclide inventories associated with underground nuclear testing and certain underground-test-related phenomena, which are classified for national security reasons. Databases that have not been reviewed and approved for release by DOE or the originating organization are also not available. All requests for hydrological information must be made to the DOE/NV Environment, Safety, and Health Division Director.

11.5 Monitoring

11.5.1 Purpose

Water resources are monitored to assure that adequate supplies are available for use and to determine if potential contaminant sources pose a risk to water quality. Should underground nuclear testing resume, monitoring of the fielding of tests will assure minimization of test-related effects on the groundwater. In the future, completion of the Underground Test Area Project will result in the design of a monitoring program that allows the balancing of water use needs with control of underground contamination.

11.5.2 Legal and Policy Basis

There is no legal limit to the amount of water available for use in support of the NTS defense missions owing to an implied federal reserved water right (*Shamberger v. U.S.*, 165 F. Supp. 600 (D. Nev. 1958); *aff'd* 279 F.2 699 (9th Cir. 1960)). However, vested or other federal reserved water rights with earlier priority dates may not be harmed.

11.5.2.1 Nevada Administrative Code, Chapter 534, Underground Water and Wells

Commercial use of water on the NTS is limited to the amount permitted by the State Engineer under the authority of these statutes. As a matter of policy, however, DOE is committed to applying the principles of ecosystem management in order to assure the sustained availability of water. To determine if these legal or policy limits are met, the amount of water produced is monitored. At present, no water is produced for commercial use on the NTS. (NAC 534)

11.5.2.2 Clean Water Act and Safe Drinking Water Act

The *Clean Water Act* requires the control of discharges to waters of the U.S. (42 USC 1251) The *Safe Drinking Water Act* controls water supply wells and injection wells, and includes voluntary wellhead and groundwater protection programs. (42 USC 300f) Monitoring of public water supply quality is mandatory. The state of Nevada has enacted the *Nevada Water Pollution Control Law*, which implements certain provisions of the federal *Clean Water Act* and the federal *Safe Drinking Water Act*. Through the *Nevada Water Pollution Control Law*, the state controls point source and diffuse source pollution discharges into surface waters, discharges into groundwater through injection wells, distribution of drinking water supplies, and development of individual septic tank systems. (Nevada Revised Statutes

(NRS) 445A.300-445A.730) As a matter of policy, DOE is committed to preventing new contamination of groundwater. The acts require monitoring of water to demonstrate compliance.

11.5.2.3 Department of Energy, Nevada Operations Office Procedural Instruction 97-001, Siting Criteria for Protection of Groundwater at the Nevada Test Site

This instruction states the DOE policy regarding the protection of groundwater during the unlikely resumption of underground nuclear testing. Evaluation of compliance with the instruction by monitoring test-siting plans is required. (DOE/NV PI 97-001)

11.5.2.4 Federal Facility Agreement and Consent Order

The order requires that remedial alternatives be evaluated for the contamination remaining from underground nuclear testing. Monitoring of groundwater quality is likely to be a significant component of closure for the underground testing areas. (State of Nevada, 1996a)

11.5.2.5 Department of Energy Order 5400.1, General Environmental Protection Program

This order establishes environmental protection requirements to ensure that DOE operations comply with federal, state, and local environmental protection laws and regulations, EOs, and DOE internal policies. The order requires monitoring of the effect of DOE operations on the environment, including water. (DOE Order 5400.1)

11.5.2.6 Department of Energy Order 5400.5, Radiation Protection of the Public and the Environment

DOE operates its facilities and conduct its activities so that radiation exposures to members of the public are maintained within the limits established, and protects the environment from radioactive contamination the extent practicable. Monitoring of water is required to establish compliance with the order. (DOE Order 5400.5)

11.5.3 Description of Monitoring Program

Water availability is monitored through the measurement of groundwater levels in wells and the quantity of water produced. The USGS conducts the monitoring, maintains the databases, and reports the results annually in a statewide water resources summary. In addition, the Annual Site Environmental Report summarizes data and any changes in water level trends. Over the long term, existing and new regional groundwater modeling and topical studies will improve the understanding of water availability and planning.

Surface water is monitored by BN at discharge locations according to permits issued by the state of Nevada. Analytes and sampling frequency are specified by the permits according to the specific discharge water characteristics. Groundwater quality is monitored through an integrated system of monitoring wells. BN is primarily responsible for the on-site wells while the EPA handles off-site wells. Drinking water is monitored for primary and secondary standards according to the schedule set in the federal and state laws, and in monitoring waivers and variances issued by the state of Nevada Division of Health. Radiological constituents are monitored under the Environmental Monitoring Plan. Monitoring wells near permitted waste disposal or water discharge facilities are monitored for specified constituents and frequencies in accordance with

the state permit. All other on-site and off-site monitoring is specified in the draft *Routine Radiological Environmental Monitoring Plan* and focuses on gross gamma and tritium.

Active disposal sites and closed disposal sites that have remaining contamination are monitored in accordance with state approved monitoring plans and the state permit for the Hazardous Waste Storage Unit.

Monitoring of compliance with the siting guidelines for conduct of underground nuclear tests is performed by DOE/NV in accordance with the procedures in DOE/NV PI 97-001, *Siting Criteria for Protection of Groundwater at the NTS*.

Monitoring of the availability of water considering the legacy of contamination remaining from underground testing is being considered as part of activities required by the FFACO. Groundwater modeling is intended to allow evaluation of the affect of water use on potential radionuclide migration and assist selection of optimum water production wells and monitoring wells. As studies are completed, monitoring plans are negotiated and approved for each of the underground test area corrective action units.

11.6 Adaptive Management

The four goals related to water are interrelated and their attainment is linked through adaptive management.

The first goal, to maintain adequate water supplies on a sustainable basis within the context of the larger ecosystem, is presently being met. Water use on the NTS is far below recent historical maximum consumption rates and negative ecosystem effects were never demonstrated at the higher historical rates. Therefore, to evaluate DOE's continued success in meeting this goal, it is sufficient to examine annual water use on the NTS. However, to account for the possibility of

changing conditions regionally, it is important to keep abreast of changes throughout the ecosystem. DOE intends to do this through participation in the annual Devil's Hole workshop dedicated to regional water and ecosystem issues. At the workshop, information about water use, ecosystem health, and management options is exchanged. Further, DOE is negotiating with other federal agencies to develop a MOU regarding water use. Through these approaches, DOE will be able to assess if current water use management is continuing to result in attainment of this goal. Non-attainment will result in modification, or adaptation, of management approaches to attain the goal.

The second goal, to maintain the quality of waters that are presently clean, is presently being met. Contamination from underground tests is a special case, covered in the third and fourth goals. Attainment of the goal is evaluated in two ways. First, operations that have the potential to contaminate the groundwater are subjected to a permitting process that results in stipulated controls of discharge. Second, a monitoring network is installed to evaluate the effectiveness of controls and detect any loss of control before groundwater degradation occurs.

The third goal, to minimize impacts to the groundwater should testing resume, is not presently being evaluated due to the nuclear testing moratorium. Procedures are in place to minimize impacts, but evaluation of success in attaining the goal is a moot issue unless nuclear testing resumes.

The fourth goal, to maximize water availability while minimizing impacts of contamination remaining from underground nuclear testing, has yet to be evaluated. In order to manage successfully the interaction of water availability and groundwater remediation, complex characterization and remedial alternative studies need to be completed. Then, negotiations between regulators and DOE, with input from

100

stakeholders and tribal governments, will result in a final approach, which balances competing interests. While it may not be possible to please all interested parties, the participatory approach will result in an equitable and balanced solution.

The above discussion describes DOE's philosophy and approach to attaining the four water resources goals at the NTS. In order to accomplish these objectives, specific projects or processes must have the responsibility and authority to implement the approach outlined above. Following are four specific DOE processes, programs, and projects that will be used to accomplish the water resources goals through adaptive management.

11.6.1 National Environmental Policy Act Process

The mechanism for the analysis of groundwater quantity and quality is the NEPA process required for any significant DOE action. The DOE/NV Environment, Safety, and Health Division manages this process. This process includes stakeholder and tribal government input from all interested parties. The extent of analysis will be determined depending upon the magnitude of proposed use and the interest and recommendations of stakeholders and tribal governments. Because of the nature of the NEPA process, DOE cannot successfully complete the process without adequately addressing all relevant water concerns at the appropriate level of detail. Thus, proposed actions involving small amounts of water will require little analysis, while proposed actions with large water needs will require significant analysis, both in accordance with the procedures of the NEPA analysis.

In order to be prepared to perform analyses necessary to evaluate proposed uses, DOE is participating in the production of an improved groundwater flow model. This effort may eventually include participation by other federal agencies, the state of Nevada, counties, municipal water providers, and private water

users. The use of models can help decision-makers select projects, which allow sustained availability of water on the NTS.

11.6.2 Groundwater Protection Management Program Plan

Maintenance of the quality of waters that are presently clean is managed through the implementation of the *Groundwater Protection Management Program Plan*, required by DOE Order 5400.1. The DOE/NV Environment, Safety, and Health Division manages this plan. With the exception of nuclear testing impacts discussed in goal three, DOE/NV policy is zero degradation. BN is responsible for writing a new plan every three years, with annual updates. DOE/NV will work with BN to assure coordination among NTS users.

Sewage lagoons, RWMSs, remediation activities, and similar operations have the potential to contaminate groundwater if managed improperly. DOE's policy of environmental protection and no degradation of groundwater assures that such operations are managed to prevent introduction of contaminants into the groundwater.

The site-wide groundwater-monitoring network will be used to track attainment of this goal.

11.6.3 Test Readiness Program

Underground nuclear testing is not expected to resume. Nonetheless, DOE procedures are in place to balance groundwater protection with accomplishment of the testing mission. Undoubtedly, significant public and regulatory scrutiny would accompany a resumption of testing. The focus and resolution of public, state, and federal concerns with respect to contamination of groundwater is impossible to predict at this time. Thus, DOE intends to adapt to whatever situation arises and implement appropriate procedures. The DOE/NV Stockpile Stewardship Division is responsible for this program.

11.6.4 Underground Test Area Project

The Underground Test Area Project, managed by the DOE/NV Environmental Restoration Division, operates under the regulatory guidance of the *FFACO* among DOE, the state of Nevada, and the Defense Threat Reduction Agency. The project is responsible for determining the nature and extent of any contamination associated with underground nuclear tests and for evaluating and implementing remedial actions. There is the potential that active remediation will be considered, including the managed withdrawal or injection of water to alter contaminant movement.

At present, all such alternatives are conceptual and no negotiations or discussions relating to them have been held. Should such alternatives be considered achievement of the fourth goal would be an integral part of negotiations. The interests of the state of Nevada in minimizing the continuing impact of contamination on long-term water supplies will be considered. Stakeholder and tribal government interests will be considered according to the framework laid out in the *EM Public Involvement Plan* (Appendix V of the *FFACO*). One important element of the plan is the involvement of the Community Advisory Board.

The concept of adaptive management is important here as well, as DOE's understanding of the nature and extent of contamination will change through time. Extensive discussions probably will be required to attain the goal of balancing sustained water use with contaminant control.

12 Cultural Resources

The Cultural and American Indian Resources sections have been separated into two sections in this document. Although the programs are similar, the principles and goals under which they are administered are different. To ensure that tribal concerns are addressed, tribal participation is incorporated into the cultural resource management program.

12.1 Introduction

Historical and prehistoric cultural resources are abundant at the NTS. Prehistoric sites include rock shelters, brush houses, fire pits, and most commonly, artifact scatters on the ground. Historical sites include mining districts, isolated homesteads, stage way stations, fences, and corrals. Sites associated with nuclear testing and nuclear rocket development are mostly remnants of test effect structures, rocket engine test stands, underground bunkers, and rocket engine maintenance facilities.

12.2 Goal

- ✓ Identify, evaluate, and protect cultural and historical landscapes and resources.

Cultural landscapes and resources may be considered as nonrenewable components of an ecosystem. Their identification, evaluation, and protection also contribute to ecosystem integrity. The preservation of our cultural heritage is in the public interest so that the legacy of cultural, educational, esthetic, economic, and energy benefits will be maintained and enriched for future generations.

The principal issues that may arise would be the added administrative, time, and financial burdens that compliance with cultural resource regulatory requirements may place on projects and programs.



Test Effect Structure

12.3 Inventory and Limitations

12.3.1 Resource Status

NTS cultural resources range from sites associated with the earliest prehistoric people in the New World to structures associated with atmospheric nuclear testing. To date, 1,615 prehistoric and 65 historic sites have been identified on the NTS. Of these, 891 have been determined eligible for the National Register of Historic Places (NRHP). Approximately 5% of the NTS (40,500 acres) (164 km²) has been surveyed for cultural resources. Based on current knowledge, all areas of the NTS have the potential to contain cultural resource materials.

Most of the known prehistoric cultural resources on the NTS are concentrated in the northern third on Pahute and Rainier Mesas and in the western portion in the Forty-Mile Canyon and Cat Canyon areas as shown in Figure 12-1. Historic and prehistoric cultural resources are also common around Tub Spring, Reitmann Seep, Topopah Spring, Tipipah Spring, Cane Spring, Whiterock Spring, and Captain Jack Spring. Frenchman and Yucca Flats are rich in significant structures of the atmospheric testing and Cold War eras as shown in Figure 12-2.

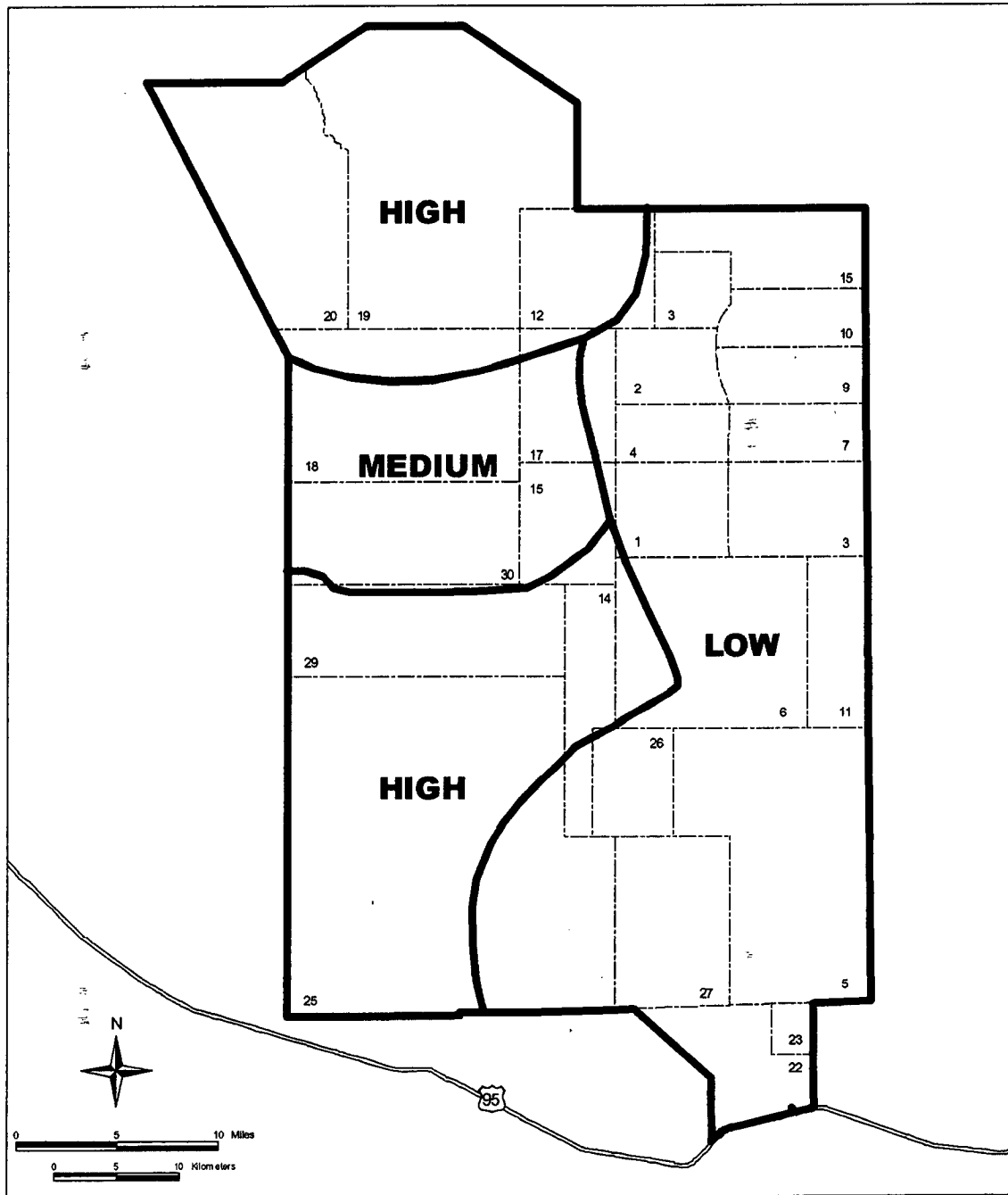


Figure 12-1 Relative Concentrations of Prehistoric Cultural Resources

104

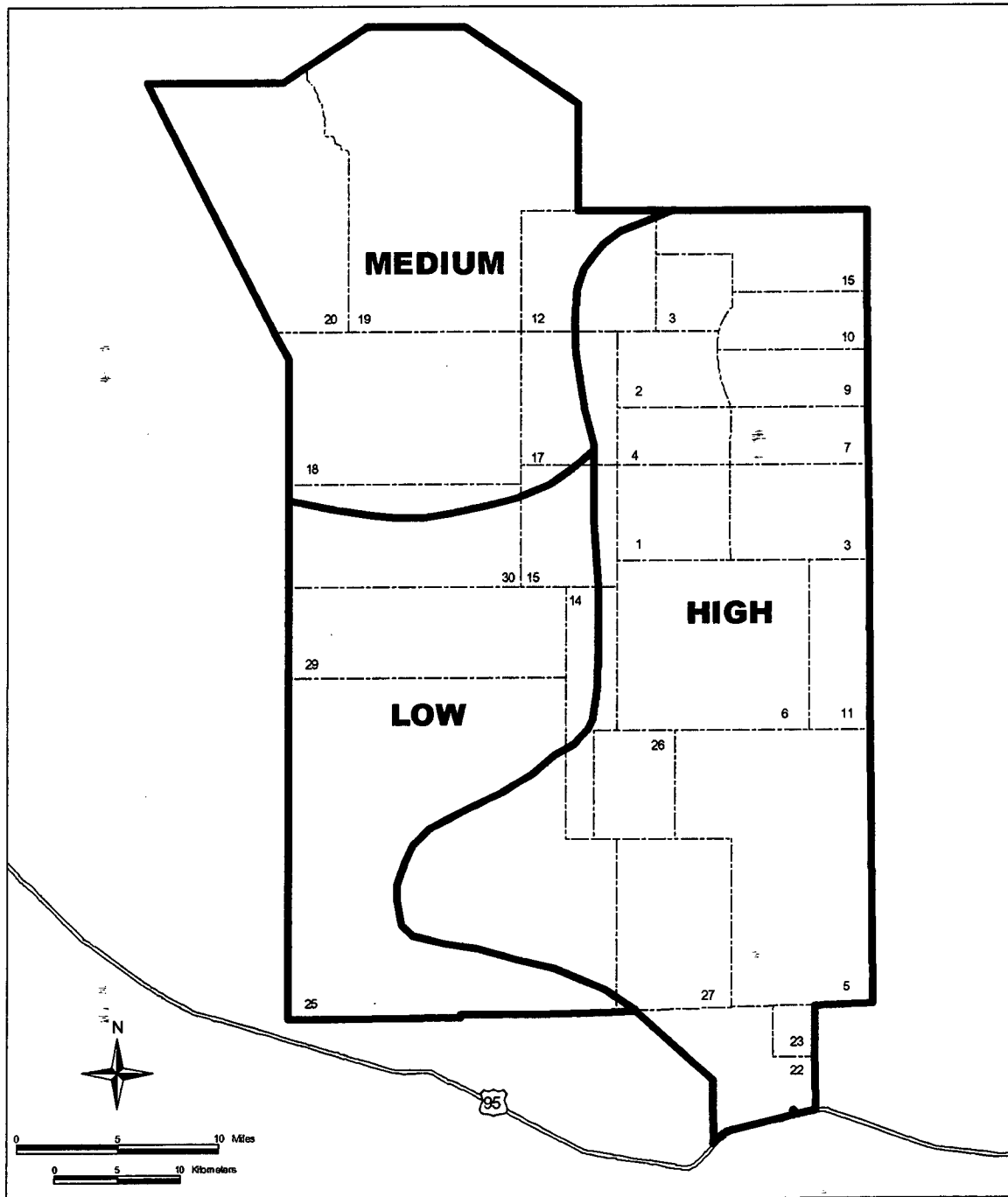


Figure 12-2 Relative Concentrations of Historic Cultural Resources

Significant facilities and structures relating to the nuclear rocket development period are found in Areas 25 and 26.

Due to the restricted status of the NTS for over 50 years, NTS cultural resources have not been subjected to the illegal collecting and/or damage from indiscriminate land uses that occur on public lands. Most archeological sites are in good condition. Many test effect structures and other structures associated with the Cold War and nuclear rocket development eras are deteriorating and in need of maintenance or restoration.

12.3.2 Legal and Policy Requirements

12.3.2.1 National Historic Preservation Act

This act requires federal agencies to take into account the effect of their undertakings on historic properties and consult with State Historic Preservation Offices and the Advisory Council on Historic Preservation concerning those effects. (16 USC 470) The procedures that govern this process are found in Title 36 CFR Part 800. This means conducting surveys or other archeological research, preparing reports, consulting with the Nevada State Historic Preservation Office (NSHPO), and implementing measures to mitigate any adverse effects. (36 CFR Part 800)

12.3.2.2 Department of Energy National Environmental Policy Act Implementing Procedures

These procedures require the preparation of an Environmental Assessment for actions that adversely affect environmentally sensitive resources. Properties (sites, buildings, structures, objects) of historic, archeological, or architectural significance designated by federal, state, or local governments or properties eligible for listing on the NRHP are considered

environmentally sensitive areas. (10 CFR Part 1021)

12.3.2.3 Department of Energy, Nevada Operations Office Procedural Instruction 96-005, Protection of Endangered Species and Cultural Resources

This instruction provides guidelines and instructions to ensure that projects and programs are conducted in a manner to provide optimum protection for cultural resources. (DOE/NV PI 96-005)

12.4 Data Management

DOE/NV conducts cultural resource surveys and historical evaluations to identify cultural resources, including traditional cultural properties important to American Indians. The surveys and evaluations also gather information to determine if the resource is eligible for the NRHP, assess project effects, and develop mitigation measures. Survey results are documented in archeological and historical evaluation reports. These reports provide the required data for consultation with the NSHPO. They also provide a valuable record of the archeological and historical resources at the NTS.

When ground-disturbing activities adversely affect an archeological site, DOE/NV is required by the *National Historic Preservation Act* (NHPA) to collect and preserve the cultural materials that would be impacted. (36 CFR Part 79) These data are needed to mitigate the adverse effect and preserve and document the contribution of the site to the Nevada archeological record.

12.4.1 Geographic Information System-Based Databases

None.

106

12.4.2 Other Databases

12.4.2.1 Archeological Site Database

The database contains the following types of data:

- ✓ Inventory and description of all recorded prehistoric and historic sites on the NTS from 1978 to present.
- ✓ USGS topographic maps showing site locations.

The data is high quality. DRI updates the database annually.

12.4.2.2 Cultural Resources Surveys Database

The database contains written reports describing the results of each site-specific cultural resource survey conducted on NTS since 1978. The data is high quality. DRI updates the database annually.

12.4.2.3 Curation Database

The database contains a listing of all cultural materials collected on the NTS through approved data recovery plans. It contains the following types of data:

- ✓ Artifact description
- ✓ Location
- ✓ Date collected
- ✓ Site number

The data is high quality. DRI updates the database annually.

12.4.2.4 Technical Reports

The database contains comprehensive reports of the results of all archeological data recovery programs and other archeological investigations

conducted on the NTS since 1978. It contains the following types of data:

- ✓ Research questions addressed
- ✓ Methods
- ✓ Results
- ✓ Artifact analyses

The data is high quality. DRI updates the database as needed.

12.4.3 Release of Data

Information about the location and character of an archeological site may be withheld from public disclosure per Section 304 of the *NHPA* if DOE/NV determines that the disclosure may:

- ✓ Cause a significant invasion of privacy;
- ✓ Risk harm to the historic resource; or
- ✓ Impede the use of a traditional religious site by practitioners.

Since access to the NTS is strictly controlled, most archeological documents that contain site location information can be made available to the public, tribal governments, and interested stakeholders without the risk of vandalism occurring. All requests for archeological or historic information must be made to the DOE/NV Environment, Safety, and Health Division Director. The CGTO has requested that the locations of religious sites and traditional cultural properties not be publicly disclosed without their approval.

12.5 Monitoring

12.5.1 Purpose

Cultural resources monitoring at the NTS enables DOE/NV to identify historic properties and to document, through time, the

107

condition of those historic properties. Through monitoring, DOE/NV gathers information to meet its stewardship responsibilities. These responsibilities include identifying and maintaining the integrity of historic properties, ensuring NTS activities do not adversely affect historic properties, and recording the effects of natural forces on archeological sites and historic structures. Monitoring also provides DOE/NV with documentation to verify that avoidance or other mitigation recommendations, which were agreed to through consultation with the NSHPO, have been followed.

12.5.2 Legal and Policy Basis

12.5.2.1 National Historic Preservation Act

This act requires federal agencies to establish a preservation program for the identification, evaluation, and nomination of historic properties that they own or control to the NRHP. The act also requires federal agencies to manage such properties to maintain their historic, archeological, architectural, and cultural values. (16 USC 470)

12.5.2.2 National Environmental Policy Act

This act places the responsibility on federal agencies to use all practicable means, including monitoring, to improve and coordinate federal plans, functions, programs, and resources to preserve important historic, cultural, and natural aspects of our heritage. (42 USC 4321)

12.5.3 Description of Monitoring Program

The monitoring program includes archeological sites, traditional cultural properties, and historic buildings, structures and objects. Monitoring is conducted:

- ✓ Before land disturbing activities or building modifications to identify historic properties.

- ✓ During project activities to ensure that adjacent site(s) are not damaged.
- ✓ Following construction to document that activities stayed within the project boundaries and did not damage a nearby site.
- ✓ Periodically at significant sites to ensure that vandalism is not occurring and to determine if the site is deteriorating from natural forces.

All monitoring is conducted by DRI archeologists in accordance with the procedures outlined in the *Monitoring Plan for the Cultural Resources Program* (DRI, 1997).

12.5.3.1 Identification of Historic Properties

In order to identify and evaluate cultural resources and assess project effects, surveys of the project area and area of potential effect must be conducted. The "area of potential effect" is the geographical area or areas within which an activity may cause changes in the character or use of historic properties. The following three survey levels are used.

Class I surveys are intended to be professional studies of existing information. Their goal is to compile, analyze, and interpret all relevant data pertaining to a particular project area. They define significant research questions, data needs and gaps, management priorities, and develop documentary models for the project area.

Class II and Class III surveys involve the physical, in the field inspection of a project area. Class II surveys examine only a part of the area while Class III surveys cover the entire project area. For NTS projects, a Class III survey consisting of pedestrian transects spaced 30 ft (9.1 m) apart over the entire project area is typically conducted.

108

12.5.3.2 Project Monitoring

When a historic property is in danger of being damaged by construction or other project activities, archeologists are on-site to ensure that all project activities stay within the project boundaries.

12.5.3.3 Post-Project Monitoring

Due to unplanned changes in project scope, it is often necessary to conduct an on-site inspection of the project site following project completion. The inspection documents that project activities stayed within the project boundaries and verify that avoidance or other protection recommendations, which were agreed to through consultation with the NSHPO, have been followed.

12.5.3.4 Site Integrity Monitoring

Selected archeological sites and historic structures and sites important to American Indians are monitored annually by an on-site inspection. The condition of these structures and sites are assessed and photographs are taken. This information serves as a baseline for future monitoring.

12.6 Adaptive Management

The goal of the NTS cultural resource management program will be accomplished by the implementation of a cultural resource management program that includes cultural resource surveys, historical evaluations, avoidance, archeological data recovery, consultation with the NSHPO, and monitoring. Incorporating cultural resource review early in project planning is crucial to achieving this goal. Success will be measured by tracking project compliance with the various EOs, statutes, and implementing regulations governing the management of cultural resources and project monitoring to verify compliance.

The NTS Cultural RMP will provide guidance for the NTS cultural resource management program. The final Cultural RMP will be completed by June 30, 1999. The NTS cultural resource management program is conducted by the Quaternary Sciences Center of the DRI, University System of Nevada, Las Vegas, Nevada. The Environment, Safety, and Health Division of DOE/NV provides program guidance, scopes of work, and quality control. Implementation of the NTS Cultural RMP will ensure that the cultural resource management goal will be met.

The NTS Cultural RMP is designed to:

- ✓ Employ professional archeologists that meet the Secretary of the Interior Standards for Historic Preservation to conduct archeological surveys/historical evaluations, archeological data recovery, identify cultural resources, determine NRHP eligibility, assess project effects, and prepare reports.
- ✓ Incorporate stakeholder, public, NSHPO, Advisory Council on Historic Preservation, Indian tribes, representatives of other federal, state, and local governments, and interested individuals and organizations into the review process in accordance with Title 36 CFR Part 800.
- ✓ Provide the CGTO with a reasonable opportunity to identify its concerns about historic properties and advise on identification of historic properties, including those of traditional religious and cultural importance. They will also have the opportunity to articulate its views on project effects on such properties, and participate in the resolution of adverse effects.
- ✓ Monitor and protect known cultural resource sites and areas that contain potential unreported sites.
- ✓ Develop a systematic program to inventory archeological sites and buildings, structures,

and objects that may have significant historical importance.

- ✓ Use the NRHP criteria to evaluate the significance of identified cultural resources. (36 CFR Part 60.4)
- ✓ Include sufficient lead time in the project planning process to meet cultural resource compliance requirements for field surveys, archeological excavations, historical evaluations, report preparation, and consultation with the NSHPO.
- ✓ Curate cultural resource materials and associated records in accordance with the provisions of Title 36 CFR Part 79.
- ✓ Disseminate information about the NTS cultural resource management program through an educational outreach program using a variety of print and news media including scientific journals, local newspapers, press releases, videos and museums.
- ✓ Provide opportunities for stakeholders, the public, and American Indians to visit NTS cultural resource sites for scientific, religious, or educational purposes.

13 American Indian Resources

Representatives of the CGTO provided input on this section so that their concerns and viewpoints regarding American Indian resources could be presented. In some instances, viewpoints of the American Indians differ widely from the DOE's. To facilitate identification, the viewpoints of the CGTO are included as italicized text.

13.1 Introduction

The CGTO has a long-standing relationship with DOE/NV and is actively involved in the DOE/NV American Indian Religious Freedom Act Compliance Program, *Native American Graves Protection and Repatriation Act* activities, *Low-Level Radioactive Waste Transportation Study*, Rapid Cultural Assessment activities and American Indian Monitoring Program. The group includes 16 tribes and 3 official Indian organizations, representing the Southern Paiutes, Western Shoshones, and Owens Valley Paiutes as shown in Figure 13-1. Each ethnic group has cultural and/or historical ties to the NTS and the surrounding areas. The primary focus of the CGTO has been the protection of traditional cultural resources and they have identified several sites at the NTS that are important to Indian people. These include storied rocks, rock shelters, wooden lodges, rock rings, springs, and certain archeological sites.

The people of the culturally affiliated tribes and organizations would like to share a few thoughts on how the RMP for the NTS should be developed and implemented. These thoughts provide a cultural and philosophical viewpoint for further understanding the concerns and recommendations contained in this document.

What Happened to Our Land - Perhaps the most fundamental thought is that Indian people are surprised at the ways in which others have used their traditional lands and resources. This surprise is best expressed in



American Indian Storied Rocks

the following native language statements which generally translate as "what have you done to our land?"

"Usah dum-me sogobia, ah zai manavouth?" [Shoshone]

"Illahee sho odlis?" [Cowitz]

"Punekai havonaquts tunipar nune tuvip?" [Paiute]

Making Paths Come Together - Indian people believe that we must work together for our mutual benefit in the management of these lands and resources. We share this goal, but must recognize that we now walk different paths:

We are on different paths, but trying to come together. Perhaps water is the place to start. In those mountains, I see ancient people. I see their spirits. The animals see their spirit. Some people cannot see, but some of us can. The natural world often is invisible but it is where all of our paths meet--that is, where we are in harmony with our Mother Earth.

Water and Our Mother - If you have polluted water and cannot clean it what you need to do is to look at the earth. This is an example of a cumulative effect:

This is the mother. And the water is the blood that runs in her veins like you and I have--water is her life support. In turn, water supports us. So when you do nuclear testing underground you are impregnating her

///

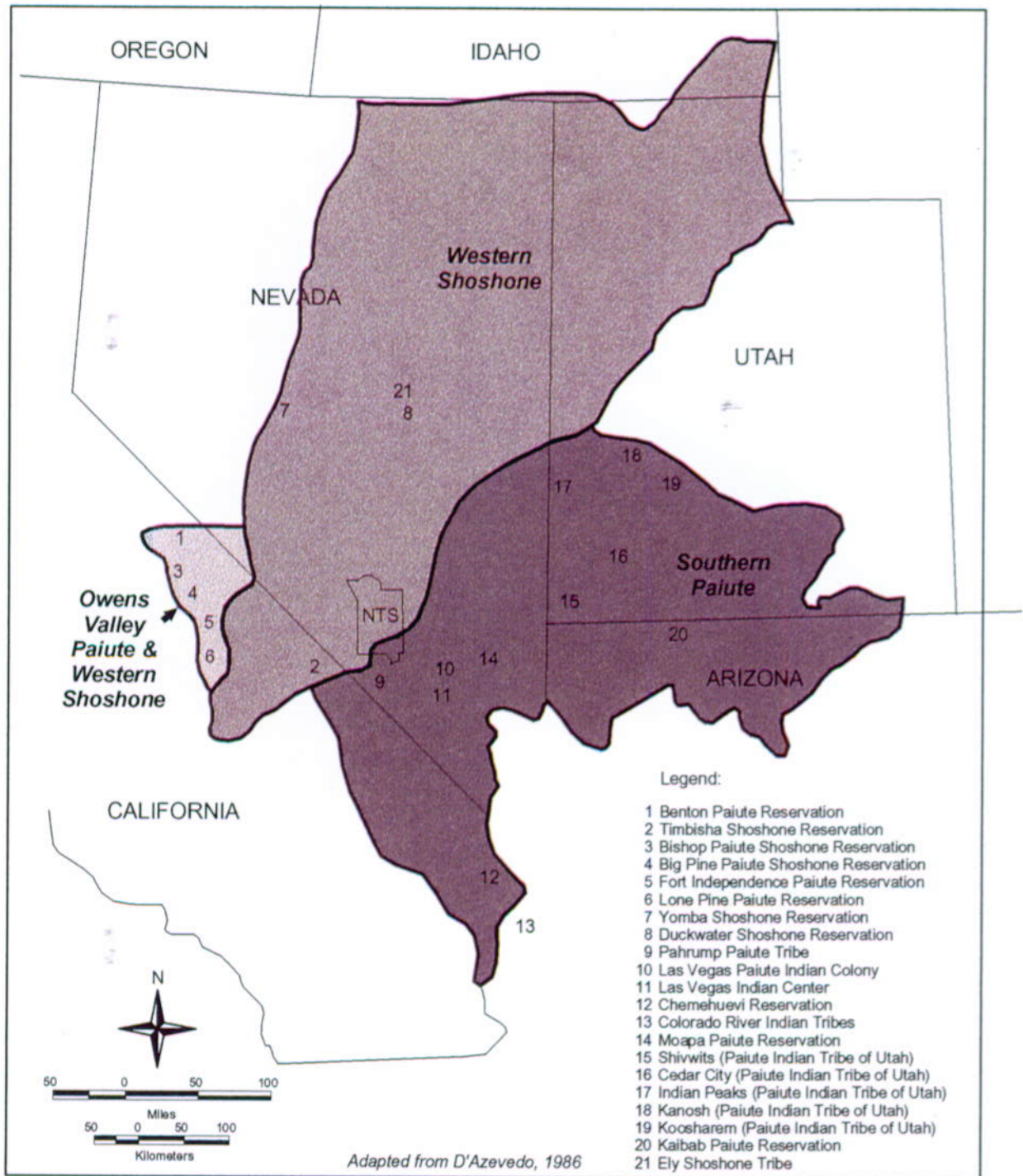


Figure 13-1 American Indian Region of Influence

112

with contamination. So what is going to happen? It may not be in our lifetime but then again it could be--is that this contaminated water is going to come out somewhere --we do not know where. You talk about "upstream" and "downstream" but water goes where it wants to. So when you talk about doing underground testing and you say you are going to minimize the impacts of contamination on water, it cannot be done. That is the thing to think about: you are contaminating the life source not only for our people but also for yours. So, think about it when you start blowing up Mother Earth again--she is the life source of all people, plants, and animals.

Fixing the Radiation Problem - Our people already knew about radiation and we talked about fixing it whenever it became a problem. This knowledge is symbolically discussed in the following winter story, which has been shortened so it can be read and told all year round.

Radiation: A Native American Legend - Long time ago, when the animals were the keepers of the earth and humans were not where they are today...the animals were the caretakers of the land... The sun was an angry sun, he burned everything up and in reality, and nothing was growing on the earth. The animals all gathered together to see who was to fix or rearrange the sun. Each animal gave his reason why he should be the one--it was finally decided that the cottontail and his younger brother the brush rabbit were the two.

So the two set out...to the east...where the sun comes up. When the sun came up, they hid in their holes because of the intense heat caused by his radiation. They walked for three days and each morning the cottontail would shoot his arrow toward the sun but it would burn up--but each day they got closer to the sun. Then on the third day, they got ready...Cottontail told his brother to dig a tunnel, so they got ready and the cottontail shot down the sun. They dove into their holes...and the sun fell to the earth. With his powers, the cottontail set the sun in the place where it is today.

The casualty was there, because the brush rabbit was burned by the sun--so today his fur is black--burned by the sun.

13.2 Goal

- ✓ Consult with culturally affiliated tribes to identify values and resources and develop management recommendations.

American Indian Tribal Governments have a special legal and political relationship with the U.S. Government. History, treaties, laws, court decisions, and the U.S. Constitution define this relationship. Treaties and agreements establish the basis for a government-to-government relationship. Traditional cultural properties, power places, sacred sites, and many natural resources are considered by Indian people to be inextricably linked parts of an ecosystem. Proper ecosystem management must include consideration of these traditional values.

Some tribal governments may take issue with the method of consultation in that it does not always meet their expectations.

13.3 Inventory and Limitations

Monitoring of cultural resources at the NTS is a formalized program by which DOE/NV documents, through time, the conditions of such resources. Similarly, DOE/NV has invested a great deal of time and resources in the inventory and monitoring of flora and fauna, particularly threatened or endangered species. The inventory and monitoring of American Indian resources conducted under the supervision of the DOE/NV Environment, Health and Safety Division, has targeted mostly archeological sites. Ethnoarcheology, ethnobotany, and ethnozoology inventories have been conducted on a limited number of localities on the NTS and adjacent DOE/NV facilities (e.g., studies at Yucca Mountain, and Rapid Resource Assessments at other locations specified in Section 13.4.2.4). Many other resources and areas remain unstudied.

The goal of the culturally affiliated tribes and organizations is to develop a strategy by which resource inventories are integrated and, thus, best reflect cultural landscapes that are a part of the ecosystem. It is the view of our people that natural and cultural resources are

inextricably linked to one another and therefore they must be described, inventoried, and monitored as a whole.

13.3.1 Resource Status

A number of sites have been identified by tribal representatives within the NTS boundaries that are important to Indian people. Resources at these sites range from important plants to archeological materials and storied rocks. In addition, 107 plant and more than 20 animal species present on the NTS have been identified by Indian elders as part of their traditional resources. These plant and animal species are presented in Tables 13-1 and 13-2.

Due to the restricted access status of the NTS for over 50 years, most of the site (more than 90%) has not been impacted by grazing, mining, off-road vehicle travel, or other public uses. This has contributed significantly to the preservation of many cultural and biological resources important to American Indians. Principle impacts to the landscape from DOE/NV activities include atmospheric nuclear testing in Yucca Flats, drill pad construction for underground nuclear testing and subsidence craters in Yucca Flats and Pahute and Rainier Mesas, and facility construction in various areas.

13.3.2 Legal and Policy Requirements

13.3.2.1 National Historic Preservation Act

This act directs federal agencies to involve Indian tribes in its historic preservation planning programs to ensure that tribal values are considered. (16 USC 470) Specific details on the procedures to accomplish this and the federal agency's responsibility are given in Title 36 CFR Part 800.

13.3.2.2 American Indian Religious Freedom Act

This act states that it is the policy of the U.S. to protect and preserve for Native Americans their inherent right to believe, express, and exercise their traditional ceremonies and rites. (42 USC 1996)

13.3.2.3 Executive Order 13007, Indian Sacred Sites

This order directs federal agencies to accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners and to avoid adversely affecting the physical integrity of such sacred sites.

13.3.2.4 Department of Energy American Indian Policy

This policy outlines several principles that are to be followed by DOE in its interactions with American Indian tribes. The policy provides general guidance for management actions affecting American Indians, and emphasizes implementation of such activities in a knowledgeable and sensitive manner. This policy requires DOE/NV to consult with tribes to assure that tribal concerns are considered before DOE/NV taking actions, making decisions, or implementing programs that may affect resources important to tribes. (DOE Order 1230.2)

13.4 Data Management

The *American Indian Religious Freedom Act*, EO 13007, and the *NHPA* require DOE/NV to identify and protect, to the extent practicable, religious sites, traditional cultural properties, and other resources important to American Indians with cultural or historic ties to the NTS. To identify such sites, DOE/NV, in consultation with the CGTO, conducts ethnographic studies, cultural resource surveys, and rapid cultural assessments. The results are

114

Table 13-1 American Indian Traditional-Use Plants Present in the Nevada Test Site Area

Scientific Name	Common Name	Yucca Mountain	Pahute and Rainier Mesas
<i>Achnatherum hymenoides</i>	Indian ricegrass	X	X
<i>Achnatherum speciosa</i>	bunchgrass	X	
<i>Amelanchier utabensis</i>	serviceberry	X	
<i>Amsinckia tessellata</i>	fiddleneck	X	
<i>Anemopsis californica</i>	Yerba mansa	X	
<i>Arabis pulchra</i>	wild mustard	X	
<i>Artemisia ludoviciana</i>	sagebrush, wormwood	X	
<i>Artemisia nova</i>	black sagebrush		X
<i>Artemisia tridentata</i>	big sagebrush	X	X
<i>Atriplex confertifolia</i>	shadscale	X	
<i>Calochortus bruneaunis</i>	sego lily		X
<i>Calochortus flexuosus</i>	mariposa lily	X	
<i>Castilleja applegatei</i>	Indian paintbrush	X	
<i>Castilleja applegatei</i> var. <i>martinii</i>	narrowleaf paintbrush		X
<i>Chenopodium fremontii</i>	Fremont goosefoot		X
<i>Cirsium neomexicanum</i>	desert thistle	X	
<i>Coleogyne ramosissima</i>	black brush	X	
<i>Coryphantha vivipara</i> var. <i>desertii</i>	fishhook cactus	X	
<i>Coryphantha vivipara</i> var. <i>rosea</i>	foxtail cactus		X
<i>Datura wrightii</i>	jimsonweed	X	
<i>Descurainia pinnata</i>	tansy mustard	X	
<i>Dichelostemma pulchellum</i>	desert hyacinth	X	
<i>Distichlis spicata</i>	salt grass	X	
<i>Echinocactus polycephalus</i>	cotton-top cactus	X	
<i>Echinocereus englemannii</i>	hedge hog cactus	X	
<i>Eleocharis palustris</i>	spikerush		X
<i>Elymus elymoides</i>	squirrel tail		X
<i>Encelia virginensis</i> var. <i>actonii</i>	brittlebush	X	
<i>Ephedra nevadensis</i>	Indian tea	X	X
<i>Ephedra viridis</i>	Indian tea	X	X
<i>Eriastrum eremicum</i>	desert eriastrum		X
<i>Ericameria nauseosa</i>	rabbitbrush	X	X
<i>Eriogonum inflatum</i>	desert trumpet	X	
<i>Erodium cicutarium</i>	herringbill		X
<i>Euphorbia albomarginata</i>	rattlesnake weed	X	X
<i>Gaistrum</i> spp.	earthstar	X	
<i>Gilia inconspicua</i>	gilia		X
<i>Grayia spinosa</i>	spiny hop sage		X
<i>Gutierrezia microcephala</i>	matchweed	X	
<i>Juncus hallicus</i>	wire grass	X	
<i>Juniperus osteosperma</i>	juniper, cedar	X	X

115

Table 13-1 American Indian Traditional-Use Plants Present in the Nevada Test Site Area
(continued)

Scientific Name	Common Name	Yucca Mountain	Pahute and Rainier Mesas
<i>Krameria erecta</i>	range ratany	X	
<i>Krascheninnikovia lanata</i>	winterfat		X
<i>Larrea tridentata</i>	creosote bush, greasewood	X	
<i>Lewisia rediviva</i>	bitter root		X
<i>Lycium andersonii</i>	wolfberry	X	
<i>Lichen</i>	lichen	X	X
<i>Lycium pallidum</i>	wolfberry	X	
<i>Menodora spinescens</i>	spiny menodora	X	
<i>Mentzelia albicaulis</i>	desert corsage	X	X
<i>Mirabilis multiflora</i>	four o'clock		X
<i>Nicotiana attenuata</i>	coyote tobacco	X	X
<i>Nicotiana trigonophylla</i>	Indian tobacco	X	
<i>Opuntia basilaris</i>	beavertail cactus	X	
<i>Opuntia echinocarpa</i>	golden cholla cactus	X	
<i>Opuntia erinacea</i>	Mojave prickly pear	X	
<i>Opuntia polyacantha</i>	grizzly bear cactus		X
<i>Orobanche corymbosa</i>	broomrape, wild asparagus		X
<i>Penstemon floridus</i>	Panamint beard tongue		X
<i>Penstemon pabutensis</i>	Pahute beard tongue		X
<i>Peraphyllum ramosissimum</i>	squawapple	X	
<i>Phragmites australis</i>	cane, reed	X	
<i>Pinus monophylla</i>	pinyon pine	X	X
<i>Psoralea argemone</i>	dotted dalea	X	
<i>Purshia glandulosa</i>	buckbrush	X	
<i>Purshia stansburiana</i>	cliffrose		X
<i>Purshia tridentata</i>	buckbrush		X
<i>Quercus gambelii</i>	scrub oak	X	X
<i>Rhus trilobata</i> var. <i>anisophylla</i>	squawbush	X	
<i>Rhus trilobata</i> var. <i>simplicifolia</i>	squaw bush	X	
<i>Ribes cereum</i>	white squaw currant		X
<i>Ribes velutinum</i>	desert gooseberry		X
<i>Rosa woodsii</i>	woods rose		X
<i>Rumex crispus</i>	curly dock, wild rhubarb	X	
<i>Salix exigua</i>	willow	X	
<i>Salix gooddingii</i>	black willow	X	
<i>Salsola kali</i>	Russian thistle		X
<i>Salvia columbariae</i>	chia sage	X	
<i>Salvia dorrii</i>	purple sage, Indian tobacco	X	
<i>Sisymbrium altissimum</i>	tumbling mustard		X
<i>Sphaeralcea ambigua</i>	globe mallow	X	X
<i>Stanleya pinnata</i>	Prince's Plume	X	X

116

Table 13-1 American Indian Traditional-Use Plants Present in the Nevada Test Site Area
(continued)

Scientific Name	Common Name	Yucca Mountain	Pahute and Rainier Mesas
<i>Stephanomeria paniciflora</i>	spiny wire lettuce, gum bush	X	X
<i>Streptanthella longirostris</i>	wild mustard	X	
<i>Streptanthus cordatus</i>	wild mustard	X	
<i>Suaeda moquinii</i>	Seepweed	X	
<i>Symphoricarpos longiflorus</i>	snowberry	X	
<i>Thamnosma montana</i>	turpentine bush	X	
<i>Thelypodium axiflorum</i>	wild cabbage	X	
<i>Typha domingensis</i>	cattail	X	
<i>Typha latifolia</i>	cattail	X	
<i>Veronica anagallis-aquatica</i>	speedwell	X	
<i>Vitis arizonica</i>	wild grape	X	
<i>Xylorhiza tortifolia</i>	desert aster	X	
<i>Yucca baccata</i>	banana yucca	X	X
<i>Yucca brevifolia</i>	Joshua tree	X	
<i>Yucca schidigera</i>	Mojave yucca, Spanish bayonet	X	

documented in cultural survey reports and other special reports, which are used to develop management and mitigation recommendations.

From an American Indian perspective, the world is an understood, integrated whole with physical and supernatural dimensions. For this reason, American Indian data management should be designed to include the largest geographic area and highest possible number of resources. Data management of American Indian resources should be geared toward (1) maintaining and expanding databases that result from consultation and (2) protecting them from unlawful disclosure.

13.4.1 Geographic Information System-Based Databases

There is a perceived need to identify culturally significant American Indian sites and areas located on, and adjacent to, the NTS. The first level of site evaluation can be achieved through the addition of a Native American data layer to the NTS GIS. This data layer should be developed and maintained by a subcommittee of the CGTO, under the supervision of the CGTO and subject to approval by the member tribal governments. This subcommittee will indicate, through a meta-data

analysis, where significant sites have been identified, where significant sites likely exist, and where there is insufficient information to evaluate resources.

13.4.1.1 American Indian Low-Level Radioactive Waste Transportation Study

Contains the following types of data:

- ✓ Maps of transportation routes
- ✓ Traditional use areas
- ✓ Locations of involved tribes
- ✓ Reports
- ✓ Other information regarding the social and cultural impacts to American Indians of transporting low-level nuclear waste over three transportation routes

The data is high quality. The Bureau of Applied Research in Anthropology, University of Arizona updates the study as needed.

117

Table 13-2 American Indian Traditional-Use Animals Present at the Nevada Test Site

Scientific Name	Common Name
<i>Alectoris chukar</i>	Chukar
<i>Ammospermophilus leucurus</i>	White-tailed antelope squirrel
<i>Amphispiza bilienata</i>	Black-throated sparrow
<i>Aquila chrysaetos</i>	Golden eagle
<i>Buteo jamaicensis</i>	Red-tailed hawk
<i>Callipepla gambelii</i>	Gambel's quail
<i>Canis latrans</i>	Coyote
<i>Cicadidae spp.</i>	Cicada
<i>Cnemidophorus tigris</i>	Western whiptail lizard
<i>Colaptes auratus</i>	Northern flicker
<i>Crotalus spp.</i>	Rattlesnake
<i>Eutamias dorsalis</i>	Cliff chipmunk
<i>Felis concolor</i>	Mountain lion
<i>Felis rufus</i>	Bobcat
<i>Formicidae formicinae</i>	Mound-building ant (red and black ant)
<i>Gopherus agassizii</i>	Desert tortoise
<i>Odocoileus hemionus</i>	Mule deer
<i>Ovis canadensis</i>	Bighorn sheep
<i>Sauromalus obesus</i>	Chuckwalla
<i>Spizella breweri</i>	Brewer's sparrow
<i>Stagmomantis spp.</i>	Praying mantis
<i>Sylvilagus spp.</i>	Cottontail
<i>Vulpes velox</i>	Kit fox
<i>Zenaida macroura</i>	Mourning dove

13.4.2 Other Databases

Several American Indian databases include information on ethnoarcheology, botany, and zoology. Databases built through consultation also include information gathered from published sources approved by the tribes. Judicious use of published sources helps contextualize historically the ethnographic data collected in current studies.

13.4.2.1 Appendix G of Nevada Test Site Environmental Impact Statement Database

The database contains a summary of opinions expressed by the CGTO regarding the effects of DOE/NV proposed programs on resources important to American Indians. The data is

high quality. The NTS EIS is a final document and is not updated by the DOE/NV Environment, Safety, and Health Division.

13.4.2.2 Native American Cultural Resources at the Nevada Test Site Database

The database contains the results of on-site visits by tribal elders to 11 ethnoarcheology sites, 8 ethnobotany sites, and 13 ethnozoology sites on Pahute and Rainier Mesas. The data is high quality. The Bureau of Applied Research in Anthropology, University of Arizona updates the database as needed.

118

13.4.2.3 Native American Graves Protection and Repatriation Act Database

The database contains the results of *Native American Graves Protection and Repatriation Act* consultation with the CGTO. (25 USC 3001) The database includes criteria for sacred object determination, list of sacred objects, and final disposition of those objects. The data is of high quality. The Bureau of Applied Research in Anthropology, University of Arizona updates the database as needed.

13.4.2.4 American Indian Rapid Cultural Assessment Database

The database contains the results of an American Indian Rapid Cultural Assessment at Double Tracks, Clean Slates, Central Nevada Test Area, and the Kistler Aerospace project areas. The data is of moderate quality. The Bureau of Applied Research in Anthropology, University of Arizona updates the database as needed.

13.4.2.5 Rock Art Interpretive Study

The study contains the locations of various storied rocks on the NTS and interpretations by CGTO representatives. Describes study participants, methods, photographs, and recommendations for protection. The data is of high quality. The Bureau of Applied Research in Anthropology, University of Arizona updates the study as needed.

13.4.3 Release of Data

Information about the location and character of an American Indian religious site, traditional cultural property, or site important to American Indians may be withheld from public disclosure per Section 304 of the *NHPA* if DOE/NV determines that the disclosure may:

- ✓ Cause a significant invasion of privacy;

- ✓ Risk harm to the resource; or
- ✓ Impede the use of a traditional religious site by practitioners.

However, CGTO representatives have reviewed all reports that are available for public dissemination and all culturally sensitive information has been removed. All requests for American Indian information must be made to the DOE/NV Environment, Safety, and Health Division Director.

13.5 Monitoring

13.5.1 Purpose

It is the objective of culturally affiliated tribes and organizations to ensure the preservation of traditional, cultural, and natural resources at the NTS valued by American Indians for future generations of American Indians. Within this framework, tribal governments are responsible for reviewing NTS programs and activities that may affect these resources, providing recommendations for protection, mitigation, and monitoring. The purpose of the NTS American Indian monitoring program is to ensure that the status of these resources are monitored through a program that includes meaningful tribal participation.

13.5.2 Legal and Policy Basis

13.5.2.1 Executive Order 13007, Indian Sacred Sites

This order directs federal agencies to:

- ✓ Accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners.
- ✓ Avoid adversely affecting the physical integrity of such sites.
- ✓ Consult with tribal representatives to identify and monitor such sites.

119

- ✓ Provide tribes notice of proposed actions or programs that may affect sacred sites. (EO 13007)

13.5.2.2 Native American Graves Protection and Repatriation Act

This act encourages federal agencies to include tribal participation in field studies and excavations. This participation is to ensure that American Indian human remains, associated funerary objects, unassociated funerary objects, and sacred objects are identified and monitored to ensure that they are adequately protected. (25 USC 3001)

13.5.2.3 National Historic Preservation Act

This act requires federal agencies to consult with American Indian tribes that attach religious and cultural significance to historic properties that may be affected by agency activities. Consultation would include the development of protection measures and/or monitoring plans. (16 USC 470)

13.5.2.4 National Environmental Policy Act

It is the responsibility of federal agencies to use all practicable means, including monitoring, to improve and coordinate federal plans, functions, programs, and resources to preserve important historic, cultural, and natural aspects of our heritage. (42 USC 4321)

13.5.2.5 Executive Order 11514, Protection and Enhancement of Environmental Quality

This order directs federal agencies to monitor, evaluate, and control on a continuing basis their activities to protect and enhance the quality of the environment. (EO 11514)

13.5.2.6 Department of Energy American Indian Policy

This policy requires field offices with areas of cultural or religious concern to American Indians to consult with them about the potential impacts of proposed DOE actions on those resources. This includes the identification of such resources, development of protection and/or mitigation measures, and monitoring plans. (DOE Order 1230.2)

13.5.3 Description of Monitoring Program

13.5.3.1 Participation of American Indian Monitors in Archeological Excavations

Under this program, American Indian monitors from the Western Shoshones, Southern Paiutes, and Owens Valley Paiutes participate in archeological excavations at the NTS. DRI provides general archeological excavation training before the fieldwork begins and general supervision during the fieldwork.

The monitors' responsibilities are to observe and participate in excavation activities to ensure that they are conducted in a culturally sensitive manner and to identify potential burial sites, associated funerary objects, unassociated funerary objects, and sacred objects. DRI archeologists and University of Arizona ethnographers provide assistance with field journals and report preparation.

13.5.3.2 Rapid Cultural Assessments

When NTS activities may affect traditional, cultural, or other resources important to American Indians, a Rapid Cultural Assessment of the proposed project area is conducted. The purpose of the assessment is to identify and evaluate the condition of such resources, develop protection and/or mitigation measures, and develop a monitoring plan to ensure that any agreed to protection or mitigation measures

120

are implemented. The Rapid Cultural Assessment team consists of American Indians representing Western Shoshones, Southern Paiutes, and Owens Valley Paiutes. Team members are selected by their respective tribal governments based on their knowledge of traditional lifeways and the significance of cultural and natural resources in those lifeways.

13.5.3.3 Additional Monitoring

There are sites on the NTS that are of value to American Indians that are accessible by NTS personnel and subject to vandalism and deterioration from natural forces. They are periodically monitored to document these potential effects. Monitoring methods include on-site inspections, drawings and sketches, photographs, and physical descriptions of resource condition. The level of monitoring depends on the importance of the resource and its susceptibility to disturbance from DOE/NV activities and natural forces. The monitoring plan is developed in consultation with culturally affiliated tribes and approved by all tribal governments before implementation.

The CGTO will support the development of a long-term monitoring program for American Indian sites and resources at the NTS. This program would be designed and implemented by a properly trained monitoring task group or subgroup, with representatives from all ethnic groups and organizations.

At a minimum, a long-term comprehensive monitoring plan for American Indian resources should include:

- ✓ *Identification and ranking of sites that need to be monitored according to the characteristics, degree of diversity, and cultural significance of its resources, including one or more of the following:*
 - *Spiritual or power places*
 - *Burials*
 - *Traditional use plants*
 - *Animals and their habitats*
 - *Minerals*

- *Landforms*
- *Springs and water tanks*
- *Rock art*
- *Archeological features*
- *Artifacts*
- ✓ *Consultation and research aimed at identifying culturally significant sites/resources not yet included in existing databases.*
- ✓ *Systematic recording of culturally sensitive areas and specific locations, and development of a GIS database and map.*
- ✓ *Selection of high-priority ranked sites to be periodically and systematically monitored by trained Indian monitors, including Gold Meadow, Upper Fortymile Canyon, Prow Pass, Ammonia Tanks, Calico Hills, and other sites to be determined in the future.*
- ✓ *Design and implementation of a monitoring methodology that emphasizes resource condition and integrity, protection priorities, length of time and intensity of monitoring, and periodic updating of site ranking. Monitoring activities should prioritize inspection before site/resource-disturbing activities occur, during such activities, and after activities have been completed. Additionally, sites/resources already in the DOE/NV databases (see Section 13.4) should be periodically monitored to ensure that they have not been disturbed in any way.*
- ✓ *Development and maintenance of a long-term monitoring database, including Microsoft Access, electronic inventories, monitoring data forms, photographic archives, and multimedia data summaries. Maintenance of the databases will require the selection of a permanent database repository, funds to maintain the databases, related equipment, and responsible technical personal, and training of American Indian monitors. Material outputs of monitoring activities should be accessible to tribal governments and aid in the education of tribal youth. These outputs may be presented in conventional report and compact disk formats.*

121

Ideally, the monitoring database should maintain DOE/NV aware of potential adverse effects to sensitive American Indian resources, thus enabling agency and site managers to explicitly address such issues at the earliest project planning stage. Comprehensive monitoring strategies have the potential for diminishing the need for mitigation and restoration actions. However, the monitoring database cannot replace consultation with tribal governments and the CGTO at the earliest project planning stage.

Within available budget allocations, DOE/NV supports the development of a long-term monitoring program for American Indian resources at the NTS and will consult with the CGTO to complete this plan. The outline presented in this section will be used as a framework for the development of the plan.

13.6 Adaptive Management

The goal of the DOE/NV American Indian Program is to consult with culturally affiliated tribes to identify values and NTS resources important to American Indians and develop recommendations for the protection or management of those resources. This goal will be accomplished by the implementation of a consultation program in accordance with *American Indian Religious Freedom Act*, *DOE American Indian Policy*, *NHPA*, *EO 13007*, and the *Native American Graves Protection and Repatriation Act*. In addition, the principles of the American Indian Consultation Model, which was adopted by the American Indian Writers Subgroup and presented in Appendix G of the NTS EIS, will be used as guidance. Consultation recognizes the government-to-government relationship between DOE/NV and culturally affiliated tribes. Success will be measured by how much resource decision making power is shared with the tribes and the ability and willingness of DOE/NV to implement recommendations. Monitoring will be used to verify DOE/NV compliance with accepted tribal recommendations.

American Indians agree with the ecosystem management understanding that Western scientific knowledge is limited, and believe that over the ten thousand years Indian people have lived on the NTS they have acquired environmental knowledge that can be useful for the sustainable and productive management of the land. In native tradition, the bear teaches Indians about medicine plants. The mountain sheep is a source of medicine knowledge. Rabbits eat medicine, and we benefit from that medicine by eating rabbits. Indian science emphasizes this chain-like acquisition of knowledge about the environment and teaches Indian people to benefit from resources without disturbing or destroying them. Controlled burning, plant pruning, moving camps from one place to another, and cleaning water tanks, are examples of how Indians care for the resources given to them. Indian people also hold knowledge of geology and mineralogy, weather, and time-telling techniques. All this knowledge has allowed us to survive and maintain our identity through cycles of drought, famine, disease, war, and adversity.

Therefore, it is imperative for the DOE/NV to remain in consultation with Native Americans. An adaptive management plan of American Indian resources should be developed in consultation with the CGTO. This plan would provide specific recommendations involving a wide range of issues, from philosophy of land management to evaluation of individual sites, and from the protection of renewable and nonrenewable resources to discussion of the disposition of specific artifacts or materials deriving from the natural environment.

The following steps comprise the DOE/NV American Indian Consultation Program. The program is conducted by the Bureau of Applied Research in Anthropology, University of Arizona, Tucson, with the assistance of DRI. The DOE/NV Environment, Safety, and Health Division provides program guidance, scopes of work, and quality control.

13.6.1 Define Consultation

Specific statutes, regulations, and policies drive Federal consultation. It is a process by which American Indians with cultural or historic ties to the NTS are brought into discussions about

122

the effects of DOE/NV activities on resources and traditional values at the NTS important to Indian people. It can include exchange of information, repatriation, access to sacred or ceremonial sites, meetings, conducting special studies or cultural assessments, or participation in DOE/NV programs. It will be conducted in a knowledgeable, sensitive manner respectful of tribal needs and concerns, and commence early in the planning process. DOE/NV will strive to remove statutory, regulatory, and/or procedural impediments that may limit its ability to work effectively with tribes.

13.6.2 Establish Cultural Affiliation

Sixteen tribes and three official Indian organizations representing three ethnic groups (Western Shoshone, Southern Paiute, and Owens Valley Paiute) from Arizona, California, Nevada, and Utah have cultural or historic ties to the NTS. Collectively this group is called the CGTO and is the principal group with which consultation will be conducted. Other tribes may be included depending on the scope of NTS activities.

13.6.3 Tribal Contact

The government-to-government relationship is the basis for tribal contacts and Tribal Chairpersons are the principle points-of-contact for all NTS related programs and activities. The tribes designate Official Tribal Contact Representatives to represent their tribal governments during consultation and will be included as tribal contacts. In addition, tribal individuals that can provide valuable cultural insight are added as "interested parties". Maps, letters, reports, photographs, and other correspondence relevant to the issues to be discussed accompany the initial communication.

13.6.4 Tribal Meeting

Face-to-face meetings between DOE/NV and tribal representatives provide a good forum for obtaining advice and opinions, discussing

upcoming work, resolving controversial issues, approving reports, appointing consultation committees, and developing management recommendations. By meeting together and acting in unison, Indian people of different tribes and ethnic groups are able to draw on common information and speak with a single voice.

13.6.5 Forming Consultation Committees

Indian tribal governments are inundated with projects, requests, and paper work, all needing attention. Most tribal government officials do not have the time or energy to be involved in every aspect of tribal business. Hence, consultation committees form to work on specific projects and report to Tribal Councils. The committees are composed of Indian people selected by tribal governments based on their knowledge of the issue being discussed.

13.6.6 Site Visits

As many NTS activities involve land disturbance, it is essential that site visits by traditional cultural experts or consultation committee members be conducted. The site visits are used to identify sacred sites, cultural resources having ceremonial or religious significance, or other resources important to American Indians.

13.6.7 Develop Management Recommendations

Tribal cultural experts or the consultation committee develops recommendations for the mitigation, protection, or management of traditional, cultural, or natural resources important to American Indians. They are then presented to Tribal Councils for approval. Upon tribal approval, recommendations are then officially given to DOE/NV. The feasibility of tribal recommendations depends on whether they remain within the federal statutes and regulations that govern land

123

management decisions at the NTS, and on the ability and willingness of DOE/NV to implement them.

The CGTO will support the appointment of a management task group or subgroup to draft an adaptive management plan. This plan will address:

- ✓ *The Indian vision for the future of the NTS.*
- ✓ *The role of research to identify resources and management priorities.*
- ✓ *The role of environmental education for Indian youth and transfer of knowledge to the next generations.*
- ✓ *The restoration of balance in the native ecosystem.*

Adaptive ecosystem management, as understood and practiced by Indian people, would be best approached if culturally appropriate ecological and geographic units are defined, interpreted, and protected. Through consultation, the CGTO and its Management task group can provide specific guidance regarding:

- ✓ *Identification of cultural-geographic units to be managed, including: resources, sites, local use areas, landmarks, ecoscapes, storyscapes, and regional landscapes,*
- ✓ *Determination of boundaries, characteristics, and significance of protected cultural-geographic units,*
- ✓ *Definition of proper American Indian uses of protected cultural-geographic units, including access for ceremonial and youth education purposes, and*
- ✓ *Delineation of culturally appropriate modes of disposition of artifacts unnaturally removed from the NTS, including debitage, ceremonial tools, and culturally significant objects from the natural environment as, for example, eagle feathers, tortoise shells, and mountain sheep horns.*

Within available budget allocations, DOE/NV supports the development of an American Indian adaptive management plan for the NTS and will consult with the CGTO to complete

this plan. The outline presented in this section will be used as a framework for the development of the plan.

13.6.8 Closing Consultation

Due to the variety of NTS programs and activities, several individual consultations may occur. The logical close to consultation is the DOE/NV official response to the tribes regarding the acceptance or rejection of tribal recommendations. Because this is a long-term program, it is important that a positive relationship between DOE/NV and the tribes is maintained and that future consultations build upon, and incorporate lessons learned, from previous consultations.

One goal of the culturally affiliated American Indian tribes and Indian organizations is to contribute actively to DOE/NV's knowledge base for implementing adaptive management strategies. This goal may be achieved through the creation of a systematic database containing information on traditional American Indian resource management strategies. To this end, a field-based consultation to collect tribal elder and cultural expert's knowledge on specific resource stewardship practices should be designed and implemented in the near future. This is the first step in the identification of management and monitoring priorities.

Ultimately, the adaptive management of American Indian Resources should envision long-term involvement of tribes and organizations, at a minimum 10 years, or the length of this RMP and ideally 25 years, or the length of the EIS. In other words, it should outlast current agency and tribal administrations. This vision for the future must encompass the timely recording and preservation of traditional ecosystem stewardship knowledge held by tribal elders and the education of the Indian youth who will become tribal managers and elders one day.

14 Biological Resources

14.1 Introduction

The NTS is located along the transition zone between the Mojave and Great Basin deserts and has a diverse and complex mosaic of plant and animal communities. The communities are representative of both deserts, as well as some communities common only in the transition zone. This transition zone extends to the east and west beyond the boundaries of the NTS. Desert tortoises, a federally threatened species, are found in southern third of the site. Mule deer, mountain lions, and antelope can be found in the mountains and valleys of Pahute and Rainier Mesas. A small herd of wild horses occurs in the northern half of the site near Rainier Mesa. Doves, hawks, ravens, and owls are common throughout the area. Rare plants include Clokey's eggvetch, Blue Diamond cholla, and Beatley's milk vetch. Several springs and seeps are found throughout the area.

14.2 Goals

- ✓ Protect and conserve significant biological resources.

While all of the biological resources on the NTS are considered important, some will require greater management attention than others. These significant resources would include federally listed species, state sensitive species, candidate species, species of concern, and aquatic habitats. The status of these species would be monitored through a standardized monitoring program and project-specific biological surveys.

All projects in tortoise habitat must be conducted according to the terms and conditions of the DOE/NV Programmatic Biological Opinion for desert tortoise protection on the NTS. This can increase project costs.



Wild Horses

- ✓ Minimize the cumulative impacts to biological resources.

Managing for ecological productivity and diversity protects the native conditions and the ecological patterns and processes that maintain those conditions. This type of management can also adapt to short-term stress and long-term change.

14.3 Inventory and Limitations

14.3.1 Resource Status

14.3.1.1 Vegetative Types

Mojave Desert plant communities are found at elevations below approximately 4,000 ft (1,219 m) in Jackass Flats, Rock and Mercury Valleys, and Frenchman Flat as shown in Figure 14-1. Creosote bush is the dominant shrub.

Two plant communities are common to the transitional area between the Mojave and Great Basin deserts. The first occurs at elevations of 4,000-5,000 ft (1,219-1,524 m) in the middle third of the NTS and the dominant shrub in this community is blackbrush. The second community occurs in the closed basins of

125

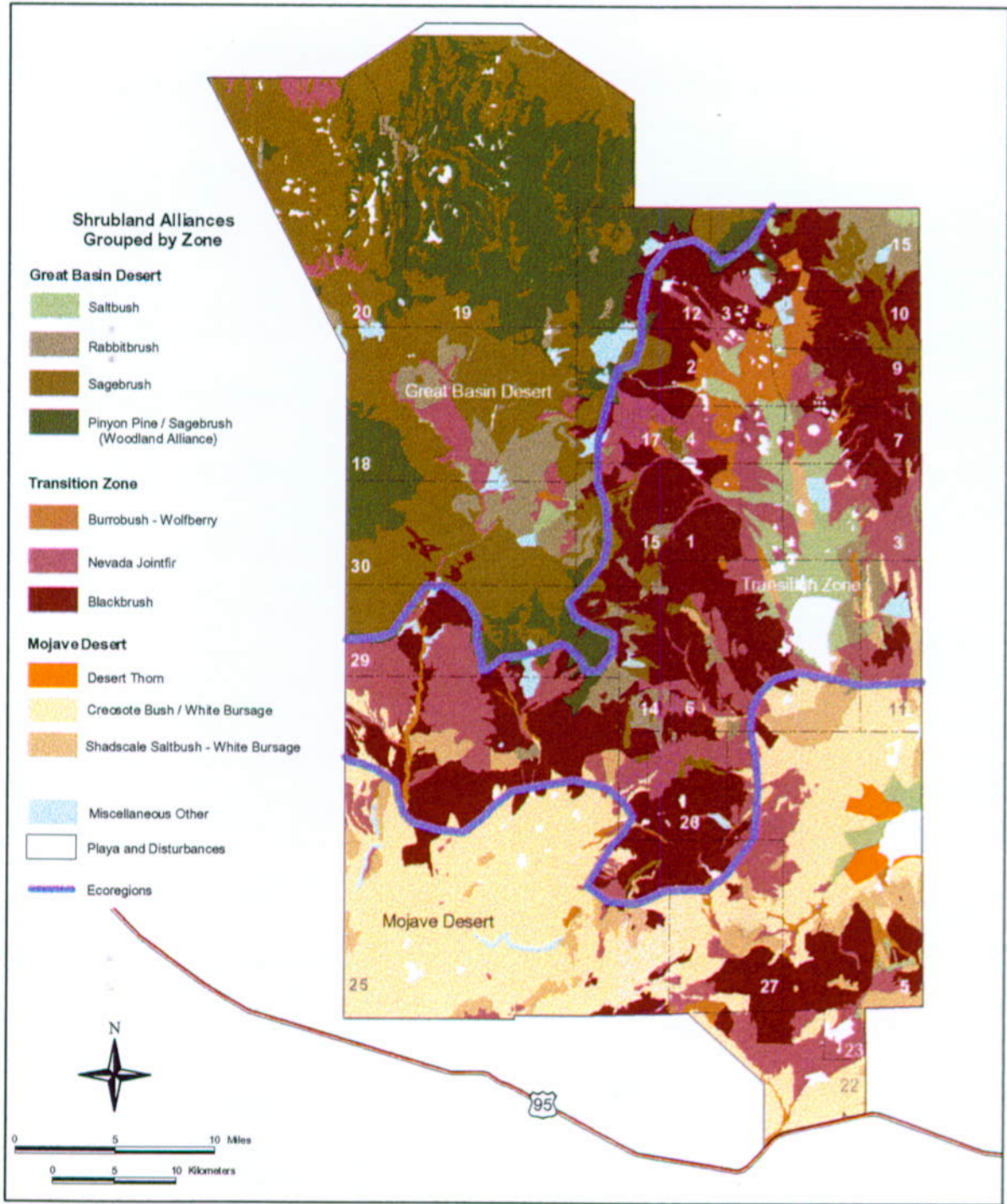


Figure 14-1 Vegetative Communities of the Nevada Test Site

Frenchman and Yucca Flats and the most abundant shrubs in these areas are hopsage and wolfberry. Little or no vegetation grows on the playas in these basins.

Plant communities of the Great Basin Desert occur at elevations generally above 5,000 ft (1,524 m) in the northern third of the NTS. Shadscale, winterfat, big sagebrush, and black sagebrush are common shrubs. Pinyon pine and Utah juniper are found above 6,000 ft (1,829 m) and form an open shrub-woodland.

Due to the restricted access status of the NTS for over 50 years, the vegetative communities over most of the NTS are in a healthy, natural condition and not impacted by grazing, mining, off-road vehicle travel, or other public uses. Principle impacts from DOE/NV activities include atmospheric nuclear testing in Yucca Flats, drill pad construction for underground nuclear testing and subsidence craters in Yucca Flats and Pahute and Rainier Mesas, and facility construction in various areas. The only natural factor affecting NTS vegetative types is fire. All disturbed areas combined total less than 10% of the NTS area.

14.3.1.2 Animals

Approximately 279 species have been recorded on the NTS, including 54 species of mammals, 190 species of birds, 33 species of reptiles, and two species of introduced fishes.

Typical Mojave Desert species include kit fox, Merriam's kangaroo rat, desert tortoise, chuckwalla, western shovelnose snake, and sidewinder snake. Great Basin species include cliff chipmunk, Great Basin pocket mouse, mule deer, northern flicker, scrub jay, Brewer's sparrow, western fence lizard, and striped whipsnake. About 50 wild horses live in the northern part of the NTS. The range of the wild horse and selected animal species of concern on the NTS is shown in Figure 14-2. Migratory shorebirds and waterfowl have been

observed on the playas when water from rainfall runoff is present.

State-designated game animals on the NTS include mule deer, mountain lions, cottontail rabbits, chukar partridge, Gambel's quail, mourning dove, bighorn sheep, and pronghorn antelope. Bobcats and kit foxes are the only state-designated fur-bearing animals on the NTS. Hunting and trapping are prohibited on the NTS.

Animal populations on the NTS are stable and in a relatively natural balance with existing habitats. This is largely due to the absence of disturbances such as grazing, mining, hunting, off-road vehicle travel, and indiscriminate collecting. No known long-term adverse effects on animal populations from DOE/NV activities have been recorded.

14.3.1.3 Threatened and Endangered Species

The peregrine falcon is the only federally endangered species that has been reported on the NTS as shown in Table 14-1. It is a rare migrant and has been sighted only once.

The only federally threatened species found on the NTS is the Mojave Desert population of the desert tortoise. Desert tortoises are found throughout the southern half of the NTS as shown in Figure 14-3. The abundance of tortoises on the NTS is low to very low relative to other areas within the range of this species. The NTS contains less than 1% of the total desert tortoise habitat of the Mojave Desert population.

14.3.1.4 Candidate Species

Candidate species are those for which the USFWS has sufficient information to support a federal listing as threatened or endangered. The mountain plover is the only candidate animal species for listing under the *Endangered Species*

127



Figure 14-2 Range of the Wild Horse and Selected Animal Species of Concern on the Nevada Test Site

128

Table 14-1 Endangered, Threatened, Candidate Species, Species of Concern, and State Regulated Species that may Occur on the Nevada Test Site

Common Name	Scientific Name	Status
Plants		
Amargosa penstemon	<i>Penstemon fruticiformis</i> var. <i>amargosae</i>	SOC
Beatley milk vetch	<i>Astragalus beatleyae</i>	SOC, NV-E
Beatley phacelia	<i>Phacelia beatleyae</i>	SOC
Black woolypod	<i>Astragalus funereus</i>	SOC
Cane Spring evening primrose	<i>Camissonia megalanatha</i>	SOC
Clokey's egg-vetch	<i>Astragalus oopherus</i> var. <i>clokeyanus</i>	ESA-C
Kingston bedstraw	<i>Galium hilendiae</i> ssp. <i>kingstonense</i>	SOC
Pahute Mesa beardtongue	<i>Penstemon pahutensis</i>	SOC
Pahute Mesa green gentian	<i>Frasera pahutensis</i>	SOC
Parish's phacelia	<i>Phacelia parishii</i>	SOC
Sanicle biscuitroot	<i>Cymopterus ripleyi</i> var. <i>saniculoides</i> ?	SOC
White bearpoppy	<i>Arctomecon merriami</i>	SOC
White-margined beardtongue	<i>Penstemon albomarginatus</i>	SOC
Reptiles		
Chuckwalla	<i>Sauromalus obesus</i>	SOC
Desert tortoise	<i>Gopherus agassizii</i>	ESA-T, NV-P
Birds		
American peregrine falcon	<i>Falco peregrinus anatum</i>	ESA-E
Chukar	<i>Alectoris chukar</i>	NV-G
Ferruginous hawk	<i>Buteo regalis</i>	SOC
Gambel's quail	<i>Callipepla gambelii</i>	NV-G
Golden eagle	<i>Aquila chrysaetos</i>	EA, NV-P
Loggerhead shrike	<i>Lanius ludovicianus</i>	SOC
Mountain plover	<i>Charadrius montanus</i>	ESA-C
Mourning dove	<i>Zenaida macroura</i>	NV-G
Western burrowing owl	<i>Speotyto cunicularia</i>	SOC, NV-P
White-faced ibis	<i>Plegadis chibi</i>	SOC, NV-P
Mammals		
Bobcat	<i>Lynx rufus</i>	NV-F
Desert bighorn sheep	<i>Ovis canadensis nelsoni</i>	NV-G
Desert cottontail	<i>Sylvilagus audubonii</i>	NV-G
Fringed-myotis	<i>Myotis thysanodes</i>	SOC
Kit fox	<i>Vulpes velox macrotis</i>	NV-F
Long-eared myotis	<i>Myotis evotis</i>	SOC
Long-legged myotis	<i>Myotis volans</i>	SOC
Mountain lion	<i>Felis concolor</i>	NV-G
Mule deer	<i>Odocoileus hemionus</i>	NV-G
Nuttall's cottontail	<i>Sylvilagus nuttalli</i>	NV-G
Pale Townsend's big-eared bat	<i>Plecotus townsendii pallescens</i>	SOC
Pronghorn antelope	<i>Antilocapra americana</i>	NV-G

129

Table 14-1 Endangered, Threatened, Candidate Species, Species of Concern, and State Regulated Species that may Occur on the Nevada Test Site (continued)

Spotted bat	<i>Euderma maculatum</i>	SOC, NV-P
Wild Horse	<i>Equus caballus</i>	WHBA
<p>Note: The status codes used in the table are as follows:</p> <ul style="list-style-type: none"> • ESA – Endangered Species Act; E-Endangered, T-Threatened, C-Candidate • NV-E – Endangered under Nevada Division of Forestry • NV-P – Protected by state of Nevada • NV-G – Regulated as game by state of Nevada • NV-F – Regulated as furbearer by state of Nevada • WHBA – Protected under Wild Horse and Burro Act • EA – Protected under Bald and Golden Eagle Act • SOC – Species of Concern. Formerly listed as Category 2 species by the USFWS. The USFWS remains concerned about these species, but further biological research and field studies are needed to resolve the conservation status of these taxa. Many species of concern will be found not to warrant listing, either because they are not threatened or endangered or because they do not qualify as species under the definition in the ESA. Such species are the pool from which future candidates for listing will be drawn. <p>This table does not include all bird species protected by the Migratory Bird Treat Act.</p>		

Act that is known to occur on the NTS and it is an uncommon migrant through the area.

Clokey's egg-vetch, a candidate plant, has been found at five major locations on NTS on the eastern portions of Pahute Mesa, southern portions of the Belted Range, and northern portions of the Eleana Range as shown in Figure 14-4. It is found in Pinyon-juniper communities generally associated with washes.

14.3.1.5 Species of Concern

Species of concern are thought to be rare due to their restricted distribution or presence of habitat disturbance. Populations of twelve plant species of concern are distributed throughout the NTS. Ten animal species of concern occur on the NTS and the range of six of these species on the NTS, which have been determined through field surveys, are shown in Figure 14-2. Further biological research and field studies are needed to resolve the conservation status of these species. It is,

therefore, important to protect known existing populations for further study and to prevent them from being upgraded by the USFWS to candidate species status. Species locations are shown in Figure 14-4 and listed in Table 14-1.

14.3.1.6 State Regulated Species

One plant and five animals protected by the state of Nevada occur on the NTS. In addition, several state-designated game and fur-bearing animals occur on the NTS. Mule deer, cottontail rabbits, mourning dove, chukar, Gambel's quail, and bobcats have been observed throughout most of the regions of the NTS. Bighorn sheep and pronghorn antelope inhabit surrounding areas and may on occasion stray onto the NTS. Mountain lions are more frequently observed in the northern half of the site. Kit foxes have been most frequently observed in Frenchman and Yucca Flats.

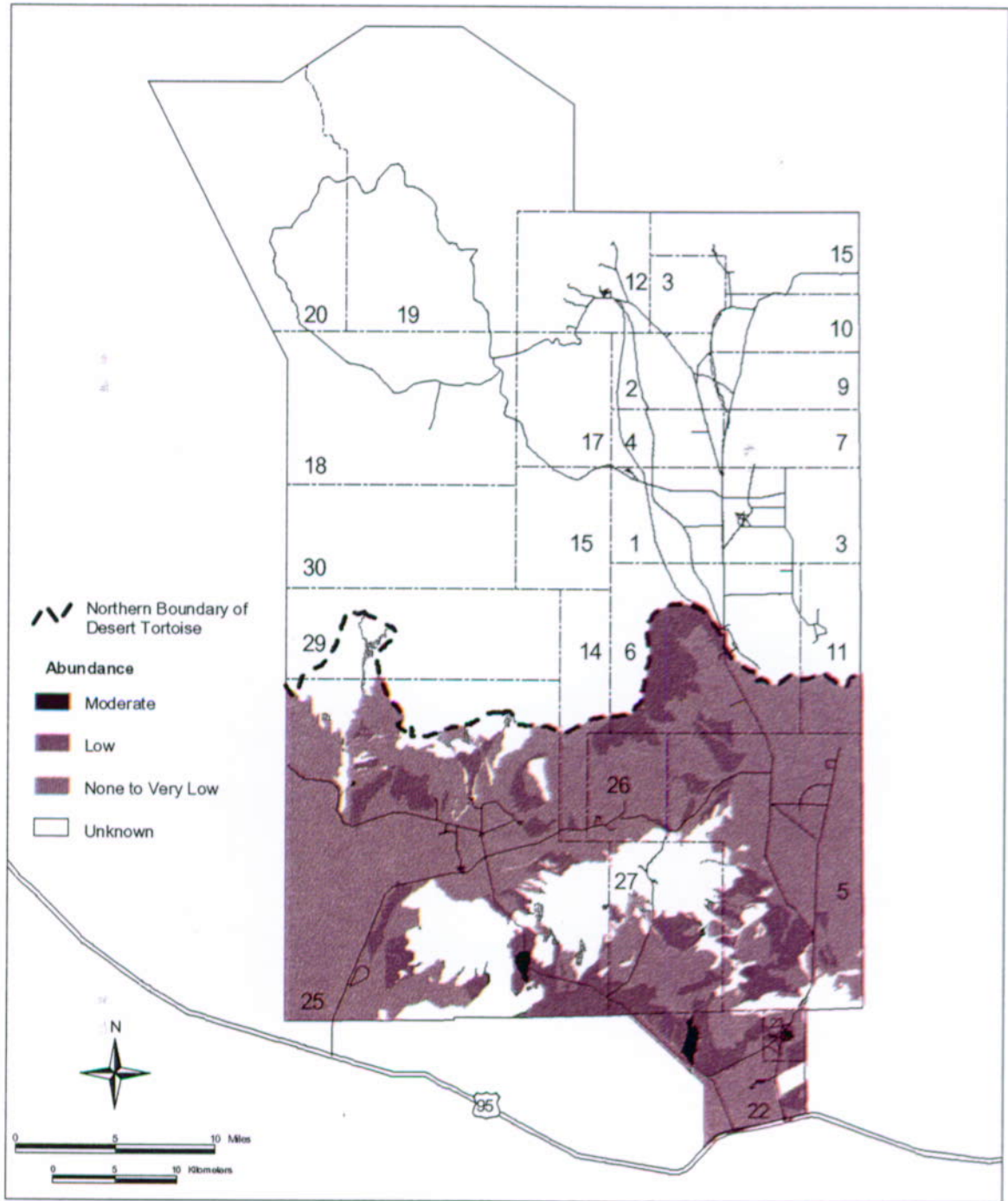


Figure 14-3 Range and Abundance of the Desert Tortoise on the Nevada Test Site

131

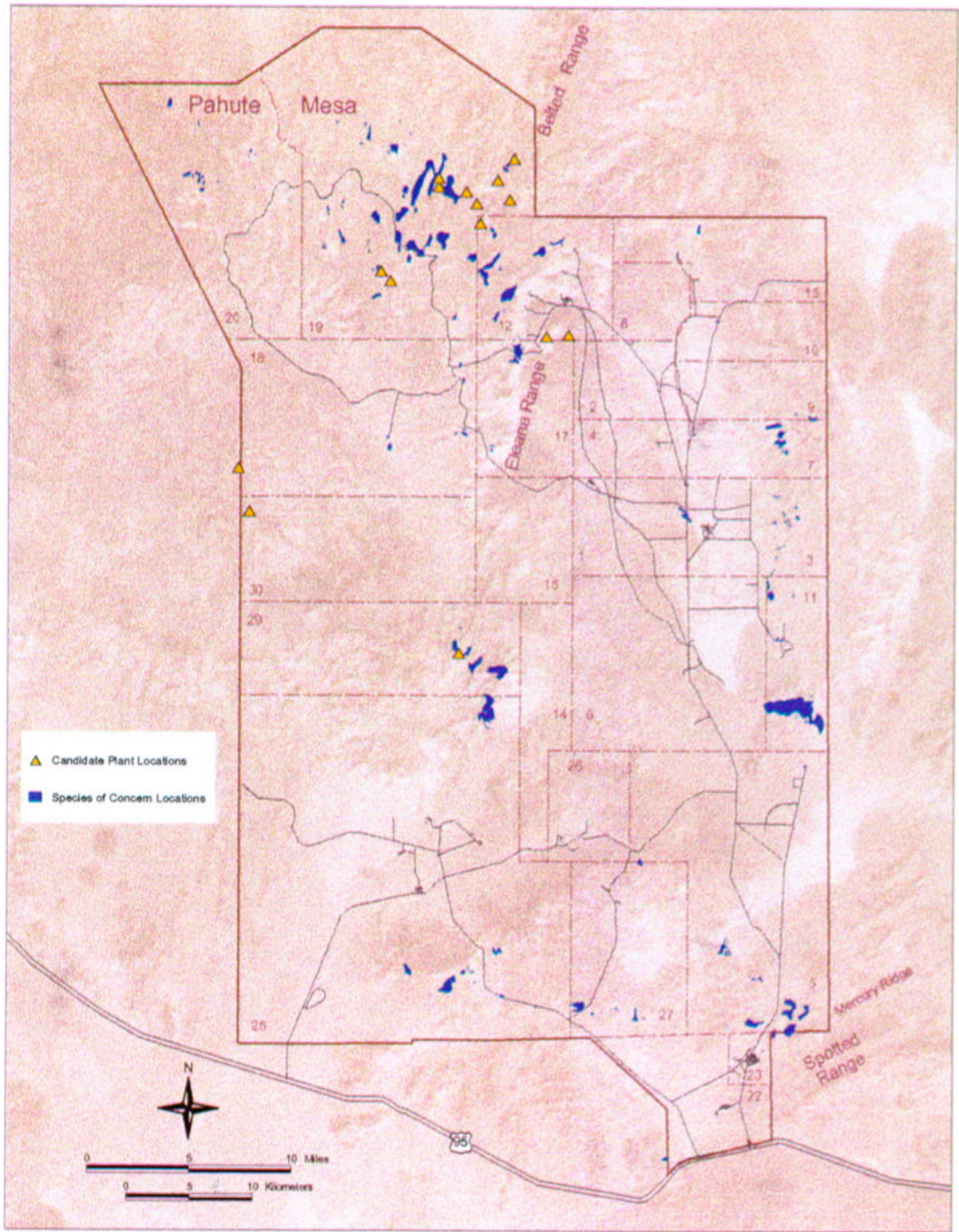


Figure 14-4 Locations of Candidate Plants and Plant Species of Concern on the Nevada Test Site

132

14.3.1.7 Wetlands and Aquatic Habitats

There are 25 known natural water sources on the NTS consisting of 20 springs and seeps, four tanks (natural rock depressions that catch and hold surface runoff), and one intermittent playa pond as shown in Figure 14-5.

Eighty-one species of plants have been recorded in or near these aquatic habitats. Most species are forbs, followed by grasses, rushes and sedges, and trees and shrubs. A total of 138 animal species have been documented at these sites with birds comprising the majority (100 species). Many freshwater invertebrates such as roundworms, fairy shrimp, tadpoles, and snails have also been recorded.

There are also several manmade water sources on the NTS, which provide important habitat for aquatic plants and animals and attract a variety of wildlife. For instance, migratory waterfowl use water impoundments such as sewage lagoons, and wild horses use two manmade ponds.

14.3.1.8 Other Important Habitats

Important habitats include areas that have high species diversity, that are unique, that are undisturbed, and that do not recover easily from disturbances. Public access to the NTS has been restricted for more than 50 years, resulting in a large percentage of the land that has not been impacted by DOE/NV or other user activities. The original intent of obtaining this expanse of land was to provide a large safety and security buffer that was needed for atmospheric and underground testing of nuclear weapons. However, the undeveloped nature of this land and the restricted access has led to the preservation of habitat for plants and animals. These areas are shown in Figure 14-6.

14.3.1.9 National Environmental Research Park

The NTS was designated as a National Environmental Research Park in 1992. This designation broadened the scope of the NTS mission to that of an outdoor laboratory where scientists and students can conduct research on a variety of environmental and ecological issues. DOE has established seven such parks, within the DOE National Environmental Research Park Network.

14.3.2 Legal and Policy Requirements

Federal laws as well as other relevant and appropriate regulations (Nevada Department of Wildlife and Nevada Division of Forestry) apply to the management and protection of NTS biological resources. Requirements that restrict the use of NTS biological resources are listed in the following paragraphs.

14.3.2.1 Endangered Species Act

This act provides for the designation and protection of plants and animals in danger of extinction because of natural or man-made factors. It emphasizes the conservation of ecosystems upon which species depend. It also requires federal agencies, in consultation with the USFWS, to ensure that their programs are not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of critical habitat. The act also requires federal agencies to monitor the status of candidate species and species of concern. (16 USC 1531-1543)

The desert tortoise is the only threatened or endangered species that inhabits the NTS. DOE/NV completed consultation with the USFWS concerning the effects of the programs of the NTS EIS on the desert tortoise. A Final Programmatic Biological Opinion for tortoise protection at the NTS was received from the USFWS in August 1996. The Opinion is valid

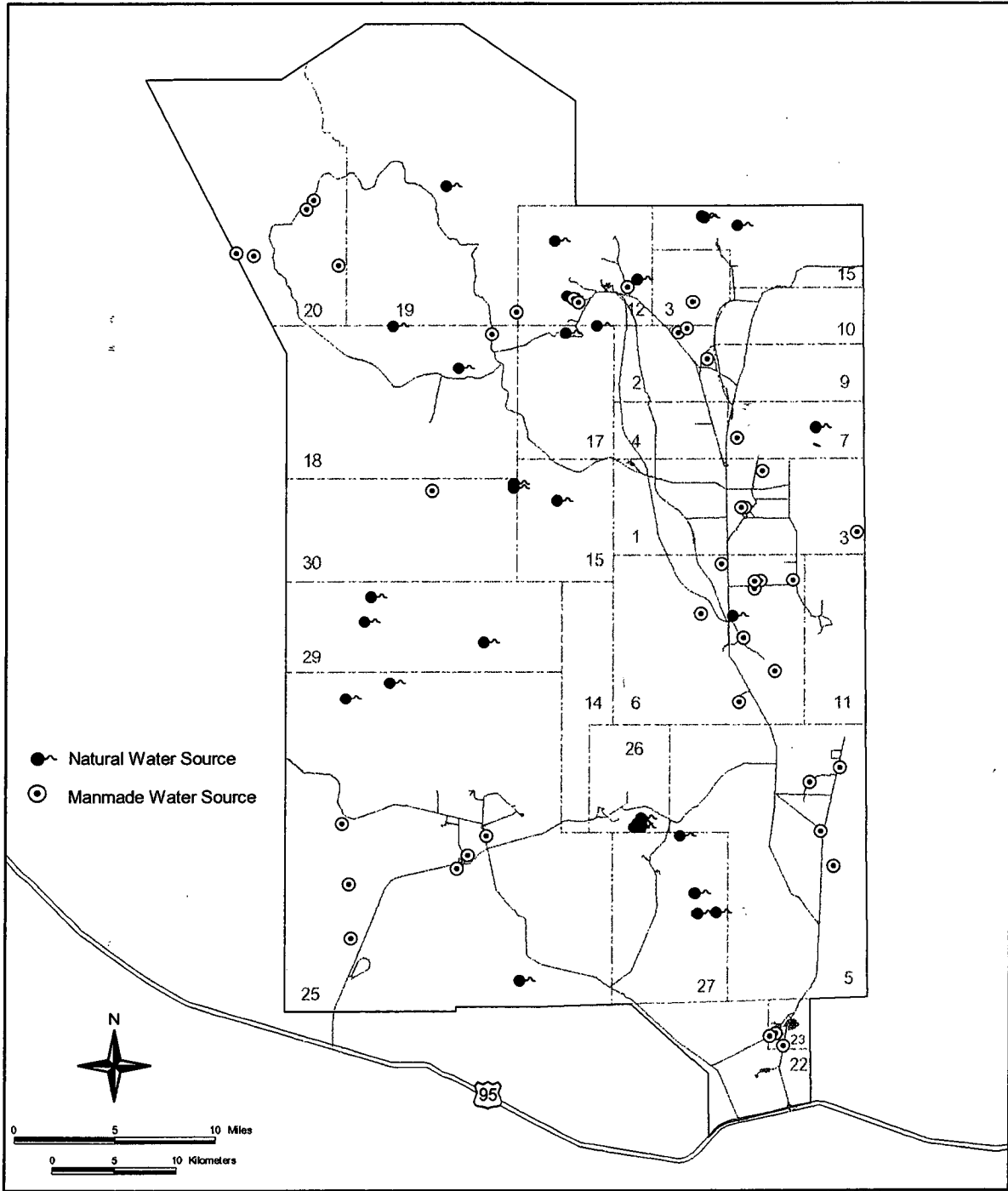


Figure 14-5 Natural and Manmade Water Sources on the Nevada Test Site

134

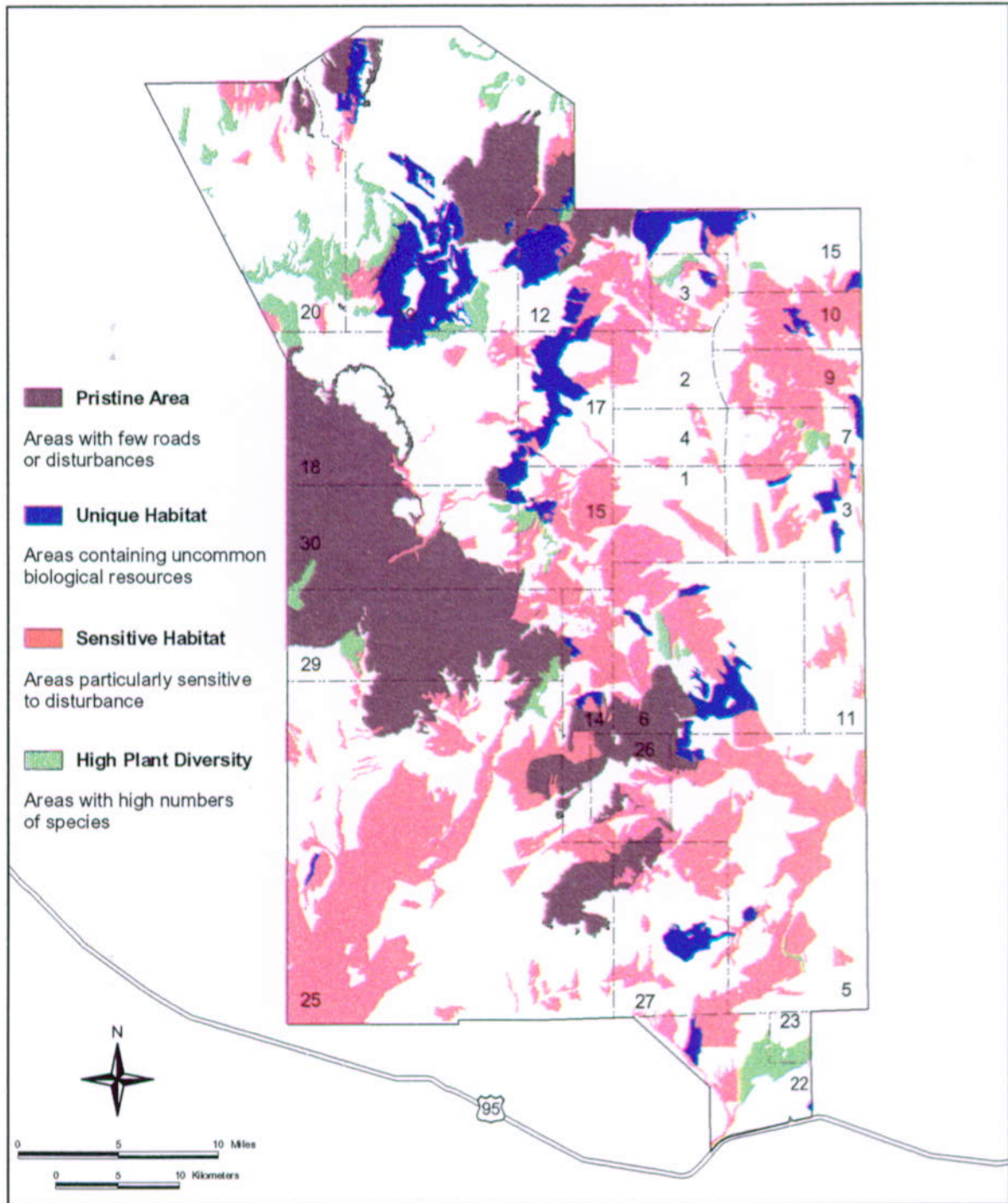


Figure 14-6 Other Important Habitats on the Nevada Test Site

135

for 10 years and allows for the disturbance of 3,015 acres (12 km²) of tortoise habitat. Activities within the range of the desert tortoise at the NTS must be conducted in accordance with the terms and conditions of the Opinion. This may require pre-activity surveys, tortoise clearance surveys, zone-of-influence surveys, tortoise relocations, on-site biologists, and monetary mitigation for destruction of habitat.

Two candidate species and 16 species of concern occur on the NTS. Destruction of candidate species and species of concern habitats could lead to listing, which would impose additional restrictions on land-use activities.

14.3.2.2 Migratory Bird Treaty Act

This act prohibits hunting, taking, killing, capturing, or possessing migratory birds except as authorized by regulation or in accordance with a permit from the USFWS. (16 USC 703) Species protected under the act are listed by the USFWS under Title 50 CFR Part 10.13.

14.3.2.3 Executive Order 11990, Protection of Wetlands

This order requires federal agencies to act to minimize the destruction of wetlands and to preserve and enhance the natural and beneficial values of wetlands. Sixteen of the 25 aquatic habitats on the NTS meet the jurisdictional wetlands criteria established by the Army Corp of Engineers and the EPA, and, therefore, should be protected from degradation. Although the remaining nine aquatic habitats do not qualify as wetlands, they are rare, localized habitats that are important to regional wildlife. (EO 11990)

14.3.2.4 Title 10 Code of Federal Regulations Part 1021, Department of Energy National Environmental Policy Act Implementing Procedures

These procedures require the preparation of an Environmental Assessment for actions that adversely affect environmentally sensitive resources. Federally listed threatened and endangered species, candidate species, and species of concern and their habitats are considered environmentally sensitive species. State listed threatened or endangered species and their habitats are also considered environmentally sensitive species. (10 CFR Part 1021)

14.3.2.5 Nevada Administrative Codes 503.030, 503.050, and 503.080

These codes contain listings of animal species protected by the Nevada Department of Wildlife. (NAC 503.030, NAC 503.050, NAC 503.080) A list of plants fully protected by the Nevada Division of Forestry is given in NAC 527.010.

14.4 Data Management

Biological surveys and other ecological investigations are conducted to identify important biological resources within proposed land-use or project areas in order to assess project impacts and develop recommendations to minimize adverse effects.

14.4.1 Geographic Information System-Based Databases

14.4.1.1 Plants and Animals Database

The database contains distribution, numbers, and locations of threatened and candidate species, species of concern, and state sensitive species. The data quality is good. BN Ecological Services updates the database annually.

136

14.4.1.2 Baseline Study Plots Database

The database contains the locations of historical biological study areas on the NTS at which studies by DOE contractors and outside universities were conducted. The data quality is good. BN Ecological Services updates the database annually.

14.4.1.3 Vegetation Map Database

The database contains a map with site descriptions for ecological landform units on NTS. The data quality is good. BN Ecological Services updates the database annually.

14.4.1.4 Wetlands Database

The database contains the locations and characterizations of NTS springs and wetlands. The data quality is good. BN Ecological Services updates the database annually.

14.4.2 Other Databases

14.4.2.1 Basic Environmental Compliance and Monitoring Reports Database

The database contains the 1988-1994 annual reports describing the status of the flora and fauna on the NTS. The data quality is good. Reports are final and not updated by BN Ecological Services.

14.4.2.2 Nevada Test Site Ecological Monitoring and Compliance Program Summaries Database

The database contains the 1995 to present annual reports describing results of Ecological Monitoring and Compliance Program. The data quality is good. BN Ecological Services prepares a new report annually.

14.4.2.3 Biological Surveys Database

The database contains over 450 written reports of the results of site-specific biological surveys

conducted at the NTS. The data quality is good. BN Ecological Services prepares a new report annually.

14.4.2.4 Special Reports Database

The database contains detailed reports describing status of sensitive plant and animal species, including the desert tortoise, wetlands, and selected species of concern on the NTS. The data quality is good. BN Ecological Services updates the database as needed.

14.4.3 Release of Data

There are no restrictions on the release of NTS biological data to the public, stakeholders, tribal governments, or other interested parties. All requests for biological information must be made to the DOE/NV Environment, Safety, and Health Division Director.

14.5 Monitoring

14.5.1 Purpose

Biological monitoring is conducted to determine the status and trend of existing resources, evaluate project impacts, and to determine whether management or restoration measures are working as planned. Monitoring detects changes in biological resources from natural phenomena or economic uses, provides a basis for biological resource decisions, and ensures prompt analysis and application of data in the adaptive management process.

14.5.2 Legal and Policy Basis

14.5.2.1 Executive Order 11514, Protection and Enhancement of Environmental Quality

This order directs federal agencies to monitor, evaluate, and control on a continuing basis their activities to protect and enhance the quality of the environment. (EO 11514)

137

14.5.2.2 Endangered Species Act

This act requires federal agencies to protect listed species and ecosystems upon which they depend and to monitor the status of such species. The act also encourages federal agencies to monitor the status of candidate species and species of concern. (16 USC 1531-1543)

14.5.2.3 Migratory Bird Treaty Act

This act prohibits the unauthorized taking, killing, capturing, or possessing migratory birds. Project activities that may result in the take of migratory birds must be monitored to confirm that no migratory birds were incidentally taken. (16 USC 703)

14.5.2.4 Executive Orders 11644 and 11989, Off-Road Vehicles on Public Lands

These orders direct federal agencies to monitor the effects of off-road vehicles on lands subject to their jurisdiction. (EO 11644, EO 11989)

14.5.2.5 Executive Order 11988, Floodplain Management

This order seeks to avoid adverse impacts from occupying or modifying floodplains and to avoid floodplain development where there is a practicable alternative. It is DOE policy to exercise leadership, take action and to avoid to the extent possible the long-term and short-term impacts associated with the occupancy and modification of floodplains. For those actions undertaken in a floodplain, DOE must verify that implementation of the selected alternative is proceeding as planned. (EO 11988)

14.5.2.6 Executive Order 11990, Protection of Wetlands

This order seeks to avoid adverse impacts from destroying or modifying wetlands and to avoid new construction in wetlands where there is a

practicable alternative. It is DOE policy to exercise leadership, take action and to avoid to the extent possible the long-term and short-term impacts associated with the destruction, occupancy, and modification of wetlands. For those actions undertaken in a wetland, DOE must verify that implementation of the selected alternative is proceeding as planned. (EO 11990)

14.5.2.7 Department of Energy Order 5400.1, General Environmental Protection Program

This order requires DOE/NV to characterize and define trends in NTS biological resources and to document and evaluate the effects of DOE/NV activities on biological resources through a formalized monitoring program. (DOE Order 5400.1)

14.5.2.8 Department of Energy Order 5400.5, Radiation Protection of the Public and the Environment

DOE operates its facilities and conducts its activities so that radiation exposures to members of the public are maintained within the limits established, and protects the environment from radioactive contamination to the extent practicable. Some level of monitoring of environmental components, including biota, is required to establish compliance with the order. (DOE Order 5400.5)

14.5.3 Description of Monitoring Program

The NTS Ecological Monitoring and Compliance program is composed of the following components. Biologists and scientists of BN Ecological Services conduct all monitoring.

14.5.3.1 Compliance with the Biological Opinion for Desert Tortoise Protection

Activities within the range of the desert tortoise at the NTS must be conducted in accordance with the terms and conditions of the Final Programmatic Biological Opinion from the USFWS. This may require pre-activity surveys, tortoise clearance surveys, zone-of-influence surveys, tortoise relocations, on-site biologists, and mitigation for habitat destruction. Monitoring activities include conducting pre-activity, zone-of-influence, clearance, and post-activity surveys on a project-by-project basis using the methods prescribed in the Opinion.

14.5.3.2 Biological Surveys

Biological surveys are conducted to identify species of concern and their habitats and other important biological resources within proposed land use or project areas in order to develop recommendations to minimize adverse effects. Survey reports provide evidence of the DOE/NV commitment to proper biological resource management at the NTS.

14.5.3.3 Candidate Species and Species of Concern Surveys

Field surveys are conducted as needed in areas of specific soil types, terrain, and vegetative associations that are likely to be habitats for the candidate plant and animal species or species of concern. Surveys identify population locations or favored habitat that may be impacted by NTS activities and thus impact these sensitive species. Fieldwork focuses on monitoring long-term trends in species distribution and relative abundance patterns.

14.5.3.4 Raptor Surveys

Pedestrian and vehicle field surveys are conducted annually to identify important habitat features that can be protected or modified to maintain the existing NTS raptor population.

Surveys are conducted in the spring to locate raptor nest sites, including the golden eagle and prairie falcon.

14.5.3.5 Special Interest and Game Species Surveys

Wild horses occur on the NTS and are of special interest to stakeholders and tribal governments. The NTS wild horse population has declined 25% over the past three years and the cause is unknown. Vehicle and pedestrian field surveys are conducted to monitor population status, habitat use, and potential causes of both adult and foal deaths. The date and location of each horse observation are documented and the composition of distinct bands is recorded.

Chukar populations on the NTS provide the Nevada Department of Wildlife with a source of chukars for transplanting to other areas in Nevada. Five springs are surveyed from June to August to determine if chukar populations are high enough to support transplanting.

14.5.3.6 Wildlife Water Sources Visits

Natural and man-made water sources on the NTS provide unique habitats for a variety of aquatic plant and animal species. There are 16 natural water sources on the NTS that qualify as wetlands. Man-made excavations and sumps that contain water also attract wildlife. Quarterly visits to these natural and man-made water sources are conducted to document water quality, changes in vegetation, aquatic organisms present, wildlife usage, and animal deaths.

14.5.3.7 Hazardous Materials Spill Center Monitoring Program

A special monitoring program has been developed for the HAZMAT Spill Center in Area 5. Monitoring activities focus on documenting impacts on biota on the NTS and along the western boundary of the Desert National Wildlife Range. Biologists and

scientists of BN Ecological Services conduct all monitoring.

The level of monitoring is determined by the exposure risk of each proposed test. The three levels of risk categories are as follows:

- ✓ Minimal Risk Monitoring - No biotic monitoring is required unless air quality monitoring sensors detect that release concentrations exceed planned levels, guidelines, or established boundaries.
- ✓ Moderate Risk Monitoring - Monitoring consists of sampling transects before and after a test is conducted at two locations, about 1 km and 3 km downwind of the release point.
- ✓ High Risk Monitoring - Monitoring consists of transects before and after a test is conducted at three locations, about 1 km, 3 km, and 5 km downwind of the release point.

14.5.3.8 Routine Radiological Monitoring of Biota

In some areas of the NTS, plants, surface water, and soils were contaminated with long-lived man-made radionuclides by a variety of nuclear tests and experiments. A minimal-effort, routine monitoring program for NTS biota will be implemented to document that radionuclide concentrations in biota are below levels known to be harmful to plants and animals. Monitoring efforts will focus in areas having the highest known residual concentrations of radionuclides in surface soils and water. Radionuclides to be monitored are tritium, cesium-137, strontium-90, plutonium-239, and plutonium-240.

Plant samples at contaminated and control sites will be collected from two or more species. The species selected will represent the most dominant plant life forms. Plant parts will be collected that represent new growth over the

past year and will include aerial stems, leaves, and flowers or seeds. Rabbits and doves at each contaminated and control site will be collected and edible tissues analyzed for the presence of the aforementioned radionuclides. Rabbits were selected, as they are abundant throughout the NTS and would have high radionuclide body burdens representative of exposure to contaminated soil, air, water, or plants. Doves were selected as they have a high probability of entering the human food chain. Plants and animals will be sampled annually at selected sites.

14.6 Adaptive Management

The goals of the biological resource management will be accomplished through the Ecological Monitoring and Compliance Program and species or habitat conservation or protection measures. The program is designed to ensure compliance with applicable laws and regulations, document the status and trend of existing biological resources, and provide information that can be used to predict and evaluate potential impacts of proposed projects on these resources. Information gathered through this program will provide the basis for biological resource management at the NTS and the development and implementation of conservation or protection measures. Success will be measured by the degree of minimization of adverse impacts to important biological resources.

The Ecological Monitoring and Compliance Program provides the basis for biological resource management at the NTS. The BN Environmental Sciences Division conducts the program. The Environment, Safety, and Health Division of DOE/NV provides program guidance, scopes of work, and quality control.

The program is designed to:

- ✓ Inventory the presence, locations, and types of important biological resources.

140

- ✓ Monitor the status and trend of these resources and project impacts on them.
- ✓ Protect and conserve these resources as required by applicable statutes, regulations, and orders.
- ✓ Minimize adverse impacts to these resources.
- ✓ Facilitate project planning by incorporating information on biological resource management into project planning.

To address these requirements, the following monitoring components will be implemented:

- ✓ Implementation of the Biological Opinion for desert tortoise protection. Monitoring activities include pre-project, clearance, zone-of-influence, post-project surveys, and on-site biologists.
- ✓ Project-specific biological surveys to identify important biological resources and provide information to minimize adverse impacts.
- ✓ Candidate species and species of concern inventories to monitor long-term trends in species distribution and relative abundance.
- ✓ Raptor surveys to identify important nesting and roosting sites.
- ✓ Special interest and game species surveys to monitor wild horse and chukar population trends.
- ✓ Monitoring of natural and man-made water sources to document water quality, wildlife usage, habitat status, and animal deaths.
- ✓ Routine radiological monitoring of biota to document that radionuclide concentrations are below levels known to be harmful to plants and animals.

This Page Intentionally Left Blank.

142

15 Air Resources

15.1 Introduction

This section discusses maintenance of air quality on the NTS. Off-site ambient air quality is not included. The NTS is located in Nevada Intrastate Air Quality Control Region 147. Region 147 has been designated as an attainment area with respect to the *National Ambient Air Quality Standards* (40 CFR Part 81.329). Criteria air pollutants emitted at the NTS include particulates from construction activities, aggregate production, surface disturbance, and fugitive dust from vehicles traveling on paved and unpaved roads. Other pollutants are from various fuel-burning equipment, high explosive tests, incineration, open burning, chemical releases from the HAZMAT Spill Center, and volatile organics from fuel storage facilities. The 1996 *National Emission Standards for Hazardous Air Pollutants (NESHAPS) Report* summarizes the net total emission of all sources of radiation into the air, primarily tritiated liquid effluent from E Tunnel and resuspension of surface contaminants from historic aboveground tests. Radiation sampling stations, on and off-site, have confirmed this effect to be negligible.



EPA Monitor Collecting an Air Sample

15.2 Goal

- ✓ Maximize air quality on the NTS.

The goal is intended to maintain the best air quality on the NTS that is reasonably achievable while accommodating human use and occupancy. This goal is broad due to the complex aspects of the different sections of the *Clean Air Act (CAA)* (42 USC 7401) and parts of the CFR.

15.3 Inventory and Limitations

15.3.1 Resource Status

Air quality in a given location is described in terms of the concentrations of various pollutants in the atmosphere. The EPA designates an area as being in attainment for a pollutant if ambient concentrations of that pollutant are below the *National Ambient Air Quality Standards* as shown in Table 15-1. The area is in non-attainment if violations of the National standards occur. The NTS is located in an attainment area. (40 CFR Part 81.329) Therefore, ambient air quality over the NTS is not currently monitored for criteria pollutants or other hazardous air pollutants, except for radionuclides.

Radiological effluents in the form of air emissions and liquid discharges are normally released into the environment as a part of NTS operations. Figure 15-1 illustrates the location of NTS thermoluminescent dosimeter stations used to measure radiological effluents. Radioactivity in liquid discharges released to on-site waste treatment or disposal systems (containment ponds) is monitored to assess the efficacy of treatment and control and to provide a quantitative and qualitative annual summary of released radioactivity. Air emissions are

143

Table 15-1 Standards of Quality for Ambient Air

Nevada Standards			National Standards			
Pollutant	Averaging Time	Concentration	Method	Primary	Secondary	Method
Ozone	1 Hour	235 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) (0.12 parts per million (ppm))	Chemiluminescent	235 $\mu\text{g}/\text{m}^3$ (0.12 ppm)	Same as Primary	Chemiluminescent
Ozone – Lake Tahoe Basin, #90	1 Hour	195 $\mu\text{g}/\text{m}^3$ (0.10 ppm)				
Carbon Monoxide less than 5,000 ft above Mean Sea Level	8 Hours	10,000 $\mu\text{g}/\text{m}^3$ (9.0 ppm)	Nondispersive Infrared	10 milligrams per cubic meter (mg/m^3)	Same as Primary	Nondispersive Infrared
At or greater than 5,000 ft above Mean Sea Level		6,670 $\mu\text{g}/\text{m}^3$ (6.0 ppm)		(9.0 ppm)		
Carbon Monoxide at any Elevation		1 Hour		40,000 $\mu\text{g}/\text{m}^3$ (35 ppm)		
Nitrogen Dioxide	Annual Arithmetic Mean	100 $\mu\text{g}/\text{m}^3$ (0.05 ppm)	Chemiluminescent	100 $\mu\text{g}/\text{m}^3$ (0.05 ppm)	Same as Primary	Chemiluminescent
Sulfur Dioxide	Annual Arithmetic Mean	80 $\mu\text{g}/\text{m}^3$ (0.03 ppm)	Ultraviolet Fluorescence	80 $\mu\text{g}/\text{m}^3$ (0.03 ppm)	Same as Primary	Pararosaniline Method
	24 Hours	365 $\mu\text{g}/\text{m}^3$ (0.14 ppm)		365 $\mu\text{g}/\text{m}^3$ (0.14 ppm)		
	3 Hours	1,300 $\mu\text{g}/\text{m}^3$ (0.5 ppm)		None	1,300 $\mu\text{g}/\text{m}^3$ (0.5 ppm)	
Particulate Matter as PM_{10}	Annual Arithmetic Mean	50 $\mu\text{g}/\text{m}^3$	High Volume PM_{10} Sampling	50 $\mu\text{g}/\text{m}^3$	Same as Primary	High Volume PM_{10} Sampling
	24 Hours	150 $\mu\text{g}/\text{m}^3$		150 $\mu\text{g}/\text{m}^3$		

144

Table 15-1 Standards of Quality for Ambient Air (continued)

Lead (Pb)	Quarterly Arithmetic Mean	1.5 $\mu\text{g}/\text{m}^3$	High Volume Sampling, Acid Extraction and Atomic Absorption Spectrometry	1.5 $\mu\text{g}/\text{m}^3$	Same as Primary	High Volume Sampling, Acid Extraction and Atomic Absorption Spectrometry
Visibility	Observation	Insufficient amount to reduce the prevailing visibility to less than 30 mi when humidity is less than 70%	Observer or camera	-	-	-
Hydrogen Sulfide	1 Hour	112 $\mu\text{g}/\text{m}^3$ (0.08 ppm)	Cadmium Hydroxide Stractan Method	-	-	-

monitored for source characterization and operational safety as well as for environmental surveillance purposes.

Current radiological air emissions consist primarily of small amounts of tritium, radioactive noble gases, and plutonium released to the atmosphere that are attributed to:

- ✓ Diffusion of tritiated water vapor in atmospheric moisture from evaporation of tritiated water from tunnel and characterization well containment ponds.
- ✓ Diffuse emissions calculated from the results of environmental surveillance activities. In addition to the on-site thermoluminescent dosimeter stations shown in Figure 15-1, Figure 15-2 illustrates the locations of fixed thermoluminescent dosimeter stations and personnel

monitoring participants both on and off the NTS used to measure radiological effluents.

- ✓ Resuspension of plutonium as measured with air sampling equipment or calculated by use of resuspension equations. The locations of NTS air sampling stations are shown in Figure 15-3. Figure 15-4 illustrates the air quality surveillance network and pressurized ion chamber station locations.
- ✓ Release of krypton-85 from tests under Pahute Mesa when atmospheric pressure changes occur. Such releases have been statistically undetectable since 1996. The location of safety and storage-transportation tests on the NTS and NAFR are shown in Figure 15-5.

145

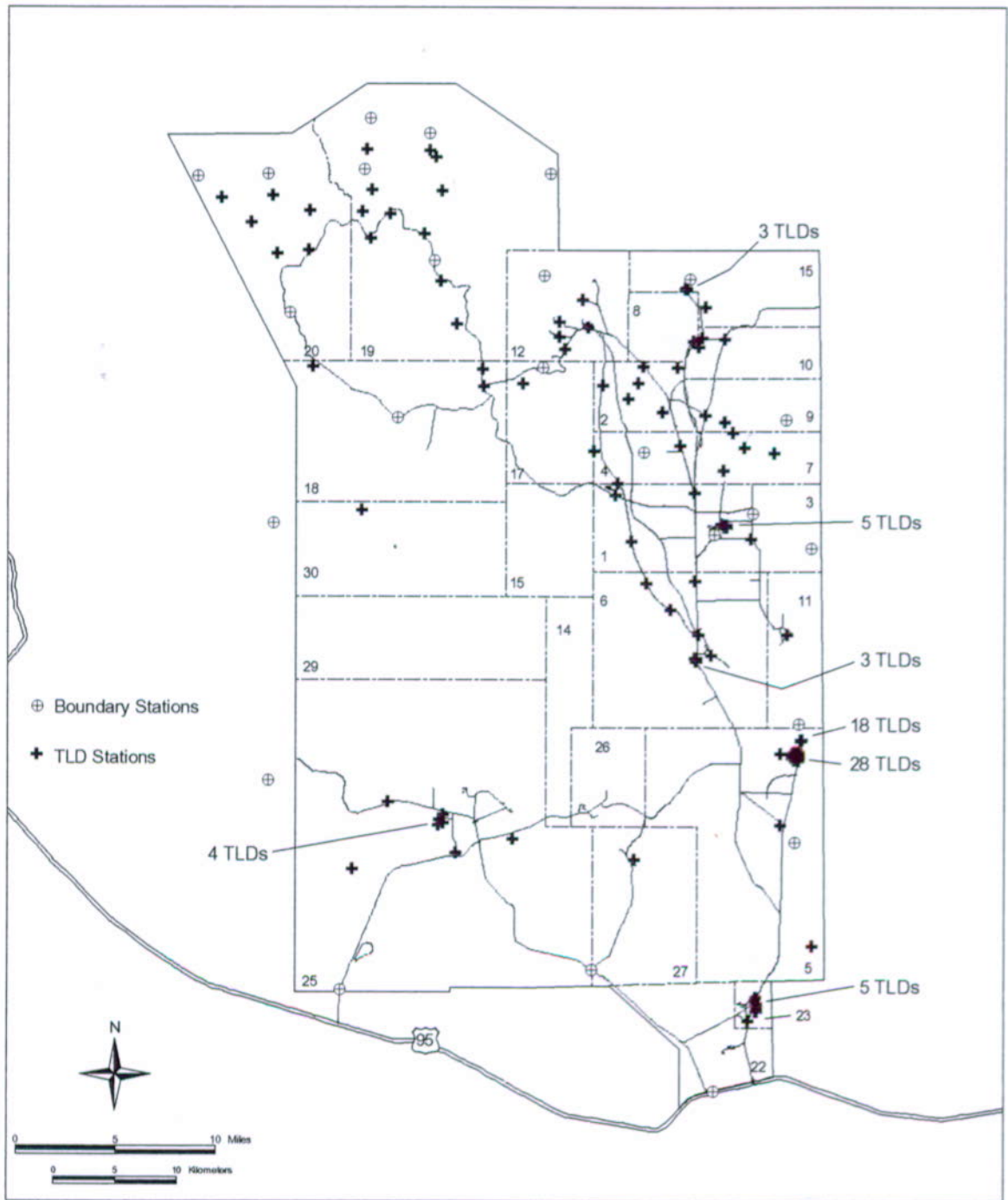


Figure 15-1 Thermoluminescent Dosimeter Stations

146

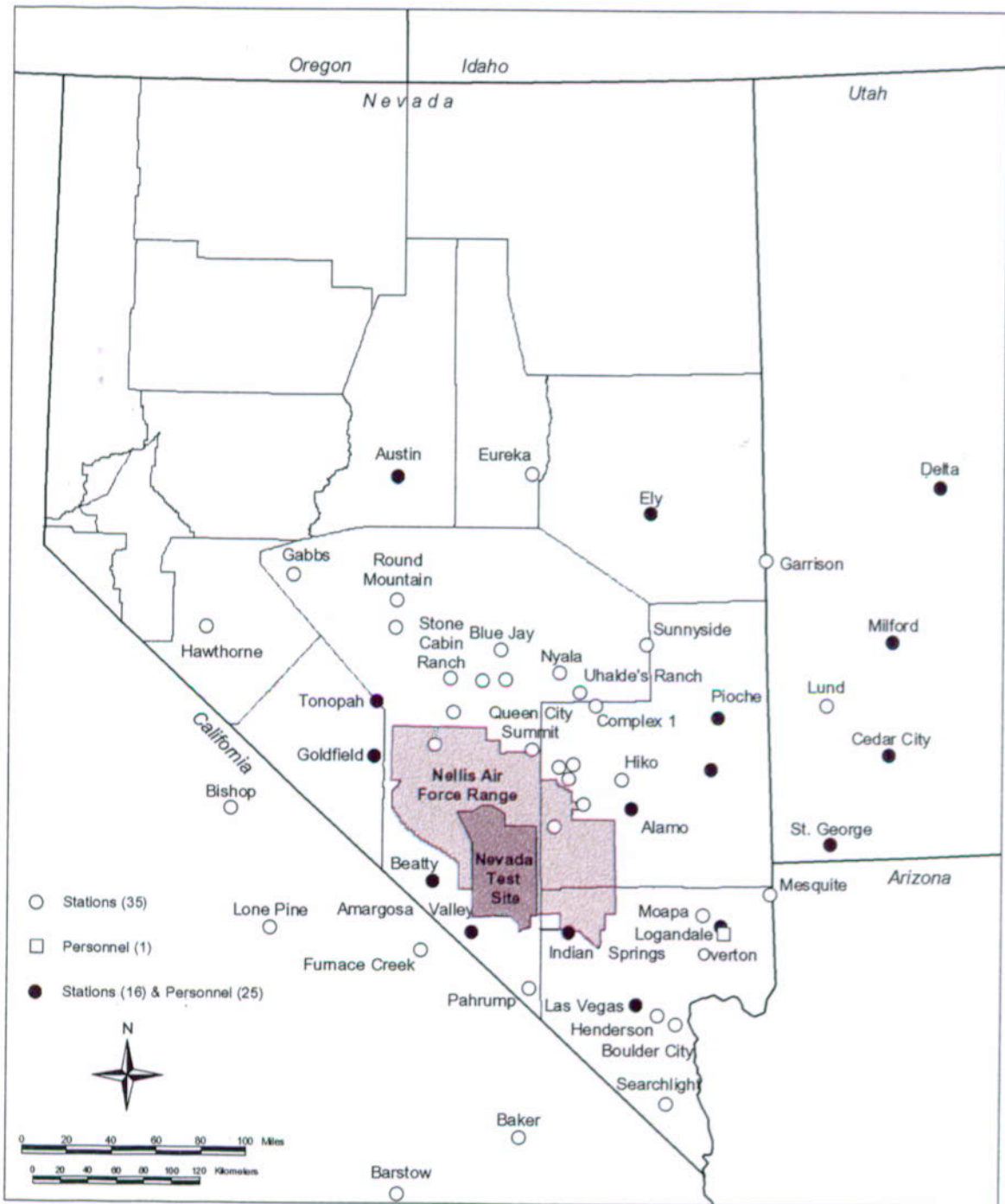


Figure 15-2 Location of Thermoluminescent Dosimeter Fixed Stations and Personnel Monitoring Participants

147

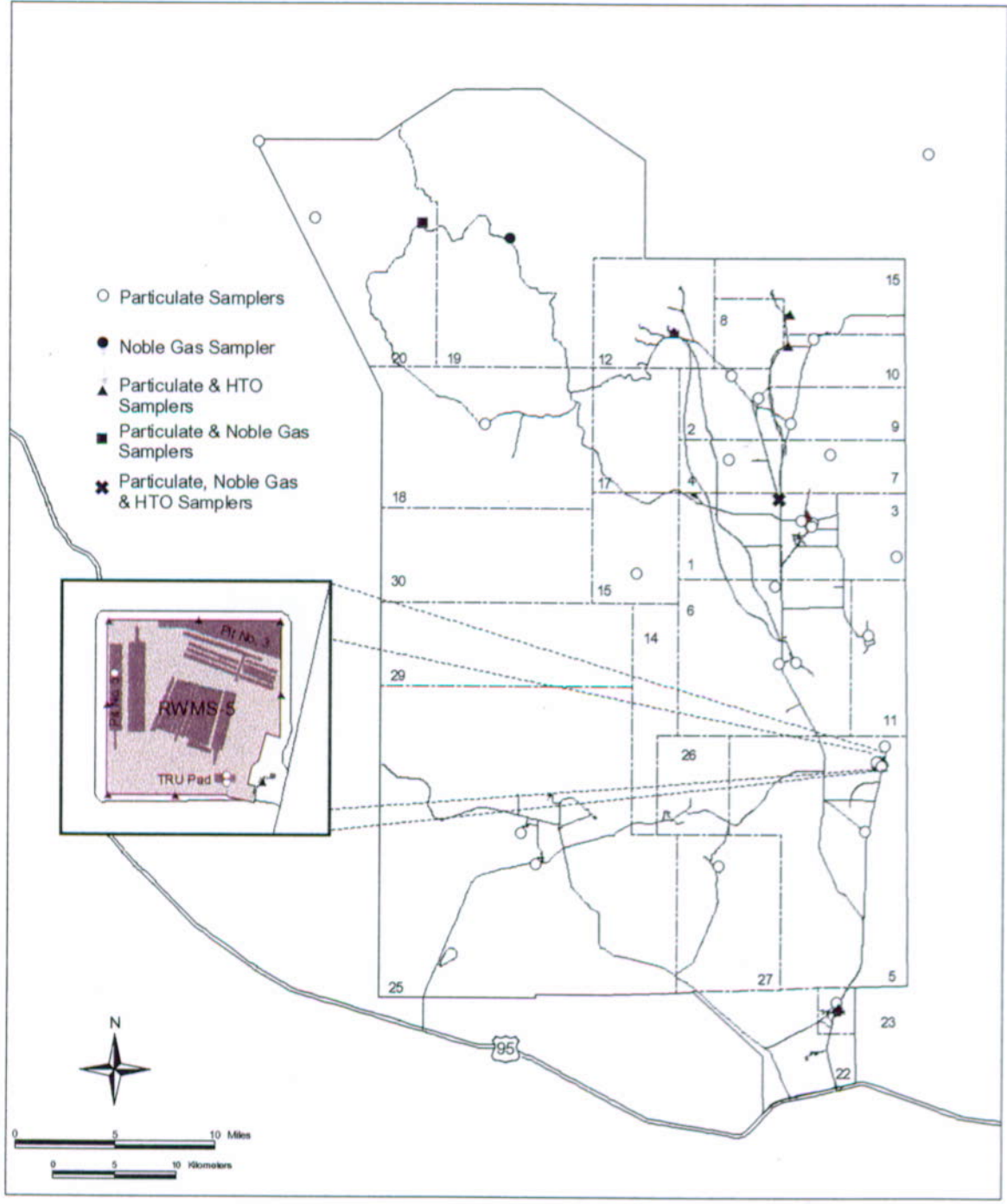


Figure 15-3 Air Sampling Stations

148

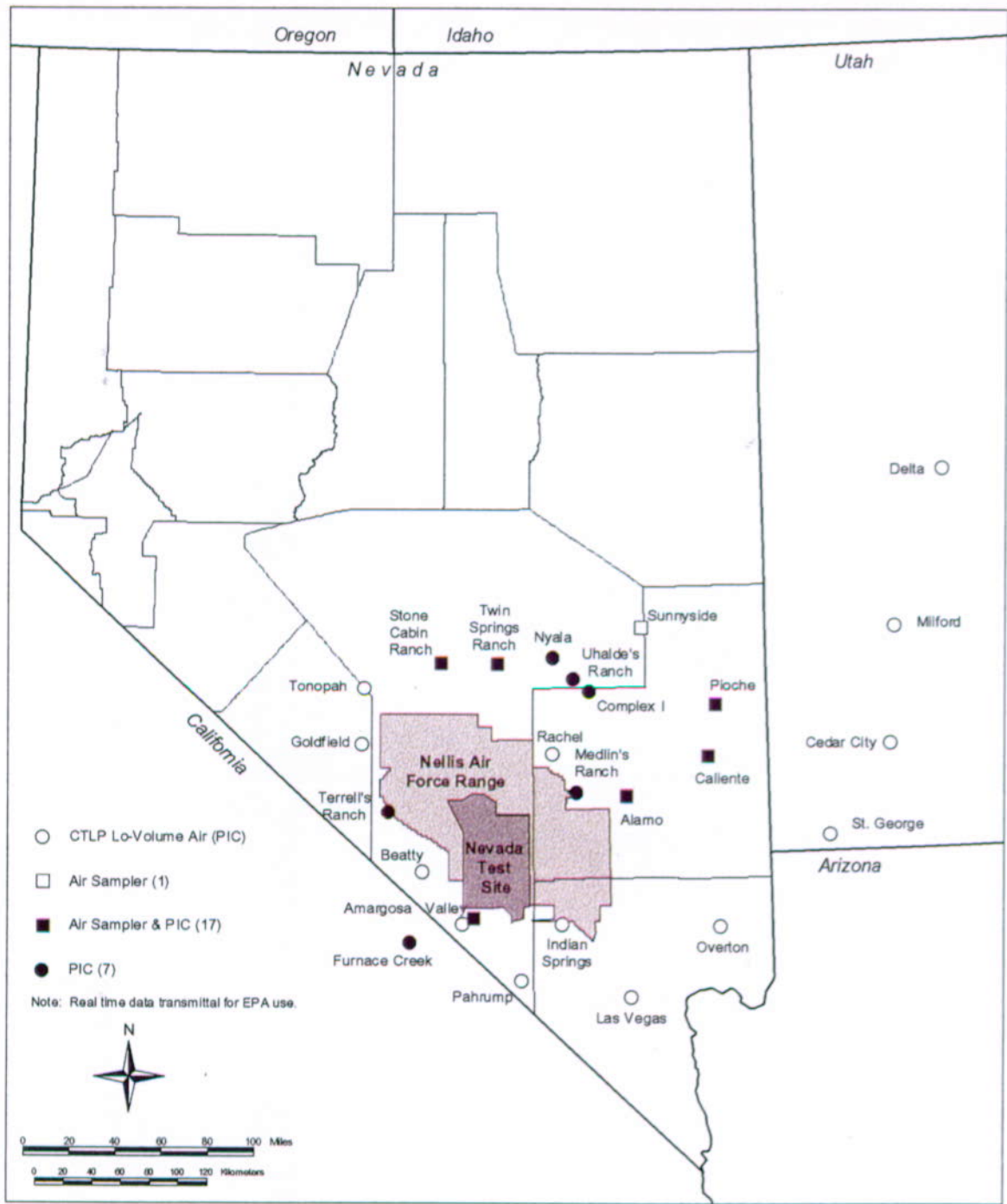


Figure 15-4 Air Surveillance Network and Pressurized Ion Chamber Station Locations

149

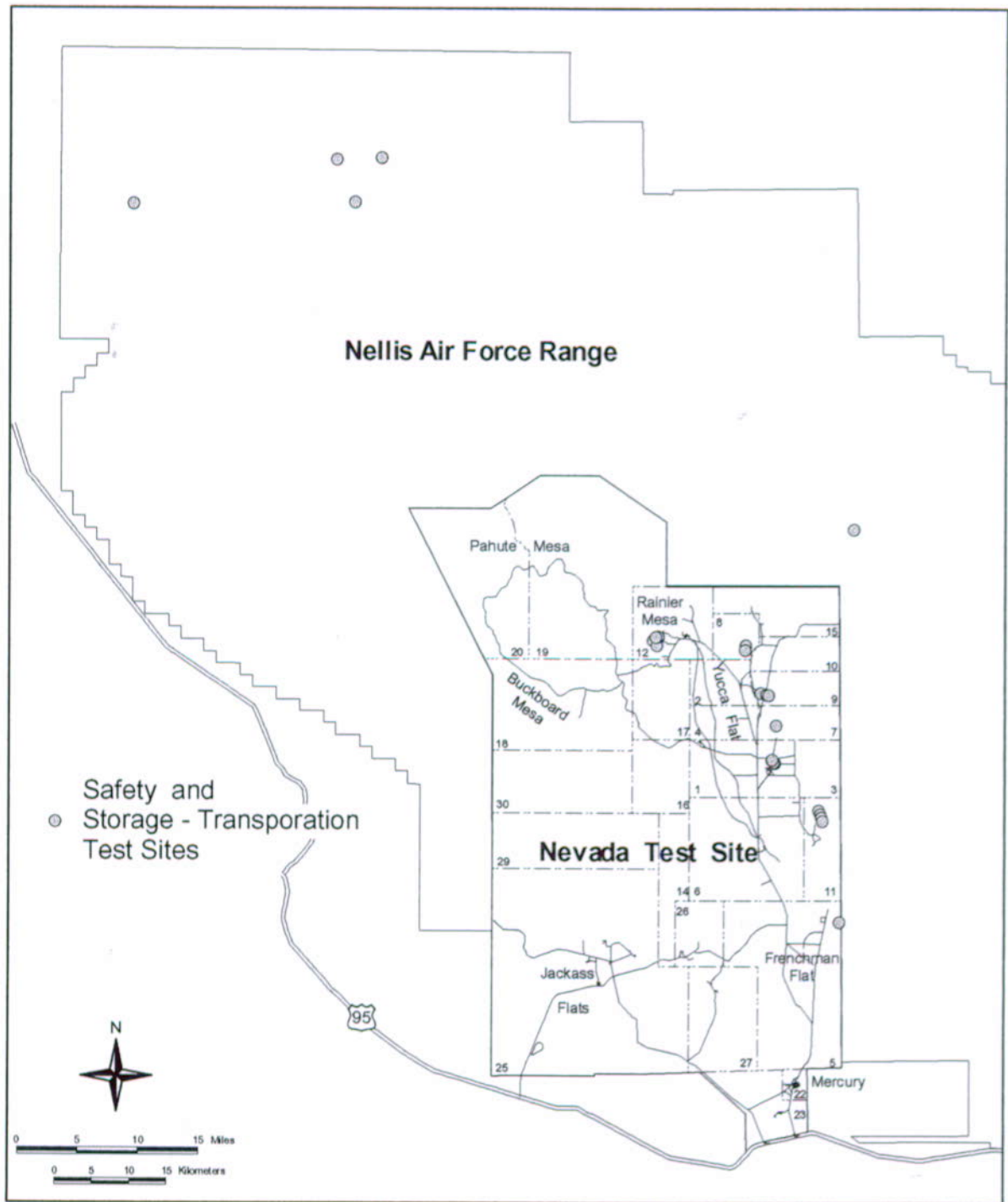


Figure 15-5 Location of Safety and Storage-Transportation Tests on the Nevada Test Site and Nellis Air Force Range

150

Diffuse emissions included tritiated water, only slightly above detection limits, from the RWMS in Area 5 and resuspended plutonium-239 and plutonium-240 from areas on the NTS where it was deposited by atmospheric nuclear tests or device safety tests in earlier years as shown in Figures 9-1 and 15-5. None of these radioactive materials were detected in the off-site area above ambient level (i.e., within expected normal ranges for background radiation levels for this geographical region). Evaporation of effluent from characterization wells drilled in Area 20 could have contributed tritiated water to the atmosphere, but the amounts were too small to be detected by tritium monitors on-site. No liquid effluents were discharged to any off-site area, therefore, no gaseous emissions could have accrued off-site by evaporation.

15.3.2 Legal and Policy Requirements

15.3.2.1 Clean Air Act - Federal

This act is the major federal law regulating air emissions of DOE operations, processes, and facilities. The objectives of the act are to protect and enhance the quality of the nation's air resources and to protect public health and welfare by placing limitations and restrictions on air pollution emissions. Under the act, the EPA authorizes the state of Nevada to administer *CAA* regulations and to ensure that proper steps are taken to control air contamination from industrial processes and land disturbing activities. (42 USC 7401)

The *CAA* compliance activities under *NESHAPS* are limited to asbestos renovation or abatement projects and radionuclide monitoring and reporting. There are no criteria pollutant or prevention of significant deterioration monitoring requirements for NTS operations.

NTS operations are conducted in compliance with the *NESHAPS* radioactive air emission standards of Subpart H, of Title 40 CFR

Part 61. In compliance with those requirements, reports on airborne radioactive effluents are provided to DOE Headquarters for submission to the EPA.

There are two locations on the NTS where airborne radioactive effluents may be emitted from what technically meet the definition of A-stacks, the tunnels in Rainier Mesa and the analytical laboratory hoods in the Mercury area. Based on the amount of radioactivity handled, the exhaust from the laboratories is considered negligible compared to other sources on-site and the tunnels have been sealed. One tunnel still leaks and is expected to do so for the near future.

15.3.2.2 Clean Air Act - State

NAC 445B.100 through 445B.845 address air quality. The NAC are the implementing program for state regulations. The NAC provide for an air quality permitting program named Title V. The Title V permitting program allows the state to issue air quality operating permits for each source of ambient air pollution. Each stationary source of air pollution that does not meet the exemption criteria found in NAC 445B.293 must be permitted by the state of Nevada. Each permitted source will have operating restrictions and reporting requirements under NAC 445B.100 to NAC 445B.395. In addition, design or modifications to existing facilities or new facilities that affect emission rates of hazardous materials to the atmosphere must be approved by the NDEP Administrator before start of construction or modifications.

15.3.2.3 Title V Operating Permits

Title V permits are addressed in NAC 445B.287 through 445B.335. Restrictions are outlined in the permit. These limitations usually include:

- ✓ Establishing a specific number of operating hours.

- ✓ Limiting the amount of throughput (tons/per year).
- ✓ Specifying the number and type of emission control devices.
- ✓ Dust control for construction projects and dirt roads.
- ✓ Restrictions on handling, transporting, or storage of materials.
- ✓ Control of surface disturbance activities.
- ✓ Control of fuel used for boilers and internal combustion engines (i.e. type of fuel and establishing a maximum allowable combustion rate).
- ✓ Limiting the opacity of emissions to 20%.
- ✓ Restricting the modification, alteration, or changes in operation until an approved permit modification is obtained.

Operating permits must be reviewed and renewed 5 years after date of issue. (NAC 445B.323) Emissions exceeding the regulatory limit for ambient air of 100 tons (90,718 kilograms) per year of any one criteria pollutant, or 10 tons (9,072 kilograms) of any one hazardous pollutant, or 25 tons (22,680 kilograms) of any combination of hazardous pollutants would elevate the NTS permit status from a Class II general source to a Class I major source.

15.3.2.4 Open Burning Variances

In addition to operating permits, the state also issues a Burn Variance to allow open burns (NAC 445B.381). Presently, there are two burn variances in use on the NTS, one for training and Class A fires and one for burns in Area 27.

15.3.2.5 Opacity Restrictions

Opacity is the amount of light obscured by particulate pollution in the air. All emissions are

restricted to 20% opacity, or less, for no more than 3 minutes in any 1-hour. (NAC 445B.354)

15.3.2.6 Prevention of Significant Deterioration Regulation

Prevention of Significant Deterioration is a regulation incorporated in the *CAA* that limits increases of pollutants in attainment areas to certain increments even though ambient air quality standards are being met (40 CFR Part 52.21). In addition, recently passed legislation on Visibility Protection Provisions (Sections 169 a and b) of the *CAA* will regulate particulate matter down to 2.5 microns. The nearest Prevention of Significant Deterioration Class I areas to the NTS are the Grand Canyon National Park, 130 mi (208 km) to the southeast, and the Sequoia National Park, 105 mi (169 km) to the southwest. If a large project were proposed on the NTS, an EIS would be required which would evaluate cumulative impacts under these parts of *CAA* legislation.

15.3.2.7 Restricted Area

There is only one area on the NTS that affects ambient air resources to the extent that development of new facilities in the area would be restricted. That area is depicted in Figure 15-6 as the HAZMAT Spill Center controlled area, located in Area 5. The nature of activities at the HAZMAT Spill Center involves air emissions that would not be compatible with most other potential uses of the surrounding area. Since the HAZMAT Spill Center is operated almost continuously during the year, the spilling and dispersion of extremely hazardous materials in this area would negate use by other activities throughout the year.

15.4 Data Management

Data is collected in the form of air samplers and other environmental-type samples (soil, water, etc) in order to confirm the net radiological condition of the air. This data, along with off-

152

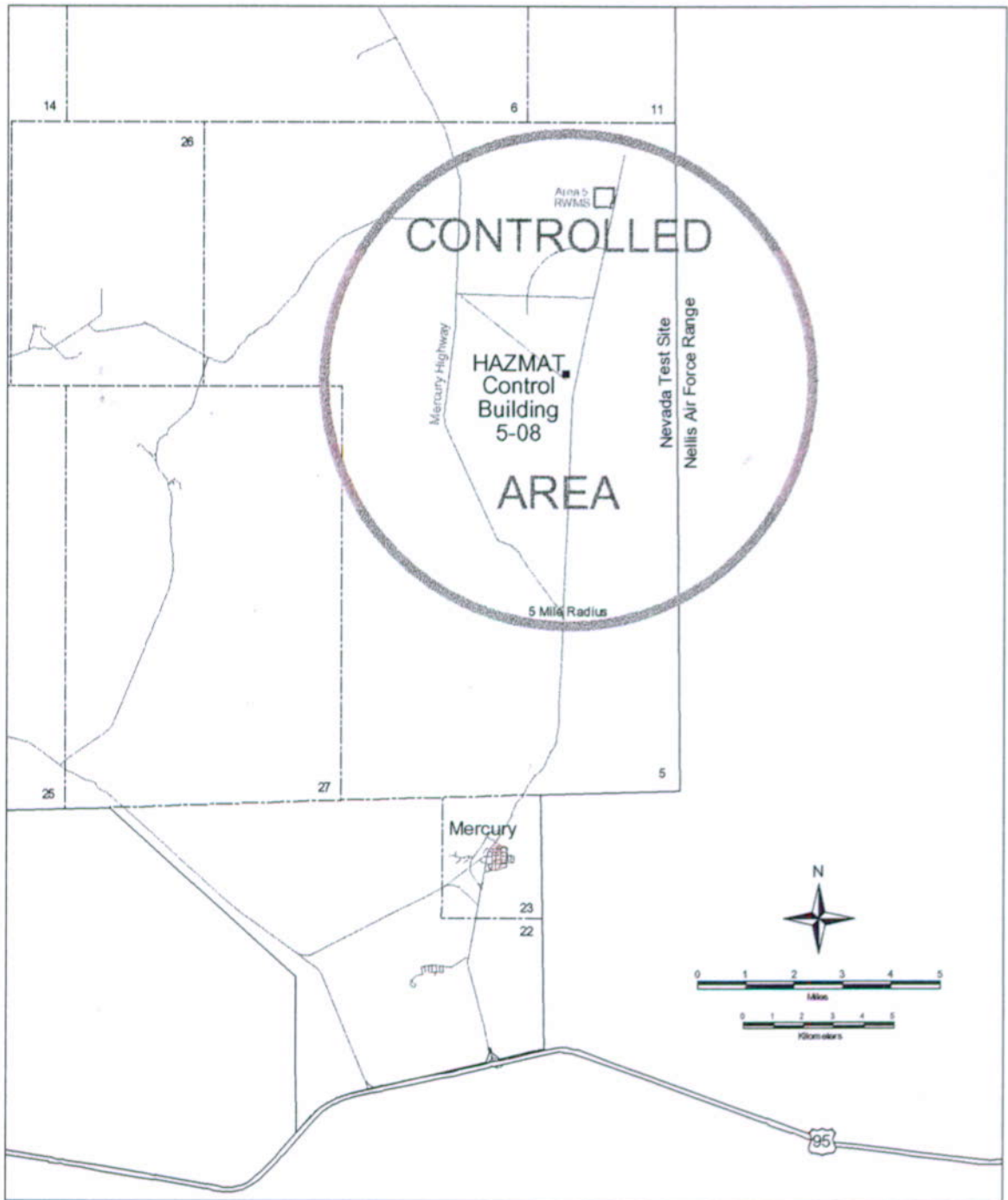


Figure 15-6 Hazardous Materials Spill Center Controlled Area

153

site sample collection and analysis, confirms that NTS meets the requirements of the *CAA* and *NESHAPS*.

Ambient air quality monitoring is not required for the NTS. However, for 5 years, operating permit records are maintained regarding annual emission rates. These records cover air pollution control equipment utilized, emission limits, and operating parameters (i.e. throughput and hours of operation). Inspection records and visible opacity test records are also maintained.

15.4.1 Geographic Information System-Based Databases

15.4.1.1 Sampling Locations Database

BN maintains the NTS GIS-based system for all sampling locations on-site. All off-site locations, which are currently maintained by the EPA, are currently being included in the BN GIS database. Data included in this database is limited to location (longitude and latitude) of the sampling sites and assigns each a unique identification number for records purposes. The data quality is high. The BN Environmental Monitoring Program updates the database annually.

15.4.2 Other Databases

15.4.2.1 Annual Site Environmental Reports Database

This database contains the 1964 to present annual reports describing the status of environmental monitoring of the NTS and off-site locations. This report compiles all environmental monitoring issues into a single document. All sampling data is presented for all types of media collected. All discharges and releases (if applicable) are discussed. The NTS performance in all environmental type regulations is discussed and summarized. The report also summarizes biological, waste, and other applicable programs that may be affected

by NTS and its operations. The data quality is high. The BN Environmental Monitoring Program generates a new report each year.

15.4.2.2 National Emission Standards for Hazardous Air Pollutants Annual Report Database

This database contains the 1990 to present annual reports describing the radiological condition of the air on the NTS and the effect of the NTS on neighboring communities. This report addresses air quality issues only. The data quality is high. The BN Environmental Monitoring Program generates a new report each year.

15.4.2.3 Off-site Environmental Monitoring Report Database

This database contains the 1989 to present time annual reports describing the status of off-site environmental monitoring performed for the NTS. Sample results and trending data are presented in this report for off-site samples collected for the identified year. The data quality is high. The EPA generates a new report each year.

15.4.2.4 Operating Permits Database

Three air quality operating permits exist for the NTS. The three air quality operating permits are:

- ✓ AP9711-0549 – this is a Class II operating permit which covers the NTS. BN is the operator and maintains compliance under this permit. This permit also covers an incinerator operated by Wackenhut Services, Inc.
- ✓ AP9711-0556 – this is a Class II operating permit which covers the HAZMAT Spill Center activities. BN also operates and maintains compliance for this facility.

154

- ✓ 97-27- this is an open burn permit used by Lawrence Livermore National Laboratory.

Records related to these permits contain the following types of data that must be retained for the life of the permit, i.e. 5 years:

- ✓ Air pollution control equipment utilized
- ✓ Emission limits
- ✓ Operating parameters (i.e. throughput and hours of operation)
- ✓ Inspection records
- ✓ Visible opacity test records

The data quality is high. The BN Environmental Compliance Group updates the database annually.

15.4.2.5 Emissions Inventory Database

An emissions inventory was submitted to the state of Nevada to demonstrate that the NTS is a Class II minor source. The database contains the following data:

- ✓ Source description
- ✓ Process rate
- ✓ Operating hours
- ✓ Emission factor
- ✓ Control technology
- ✓ Calculated emissions

The data quality is high. The BN Environmental Compliance Group updates the database annually.

15.4.3 Release of Data

There are no restrictions on the release of NTS environmental monitoring data to the public,

stakeholders, tribal governments, or other interested parties. All requests for this information must be made to the DOE/NV Environment, Safety, and Health Division Director.

15.5 Monitoring

15.5.1 Purpose

The objective of the on-site air monitoring program is to provide measurements at all potential sources of radiological effluents to confirm that emissions will not cause an estimated dose equivalent greater than 1% of the 10 mrem per year (1×10^{-6} sievert per year) standard. The objectives of the off-site air monitoring program are to assure nearby residents of the safety of the air and water, provide a long-term environmental baseline, and detect the migration of contamination from past and current activities.

15.5.2 Legal and Policy Basis

15.5.2.1 Clean Air Act

This act, specifically *NESHAPS* of Title 40 CFR Part 61, was enacted in 1963 for the prevention and control of air discharges to protect public health and welfare. The Act requires air monitoring. (42 USC 7401)

15.5.2.2 Department of Energy Order 5400.1, General Environmental Protection Program

This order establishes environmental protection requirements to ensure that DOE operations comply with federal, state, and local environmental protection laws and regulations, EOs, and DOE internal policies. The order requires monitoring of the effect of DOE operations on the environment, including air. (DOE Order 5400.1)

155

15.5.2.3 Department of Energy Order 5400.5, Radiation Protection of the Public and the Environment

DOE operates its facilities and conduct its activities so that radiation exposures to members of the public are maintained within the limits established, and protects the environment from radioactive contamination to the extent practicable. Monitoring is required to establish compliance with the order. (DOE Order 5400.5)

15.5.2.4 Title 40 Code of Federal Regulations Part 61, National Emission Standards for Emissions of Radionuclides Other Than Radon From Department of Energy Facilities - Subpart H

The *NESHAPS* Report mandated by the EPA states that no DOE facility will emit radionuclides in such quantity that any off-site person would receive an effective dose equivalent of 10 mrem (1×10^{-6} sievert). This requires the measurement of radionuclide concentration in air, surface waters, and emissions so that no such source contributes a measurable portion of the 10 mrem (1×10^{-6} sievert) dose. (40 CFR Part 61)

15.5.3 Description of Monitoring Program

15.5.3.1 Radiological Air Monitoring

The on-site program consists of an aerosol (particulate in air) network, a tritiated water

vapor network, and a surface water network. Samples are collected by BN personnel on-site and analyzed for radionuclides in the Mercury Analytical Services Laboratory.

The off-site program consists of an aerosol (particulate in air) network. Samples are collected by EPA personnel from the off-site locations and analyzed for radionuclides in the Office of Radiation and Indoor Air National Laboratory in Las Vegas, Nevada. Table 15-2 lists the frequency of collection, analyses performed, and type.

Actual locations of sample collection, frequency of those collections, and analyses performed are reviewed annually. Changes to on-site and off-site monitoring are documented in the *Routine Radiological Environmental Monitoring Plan*.

15.5.3.2 Ambient Air Quality Monitoring

Since activities relating to ambient air quality at the NTS remain below national and state ambient air quality standards, no monitoring program is required. Table 15-1 lists the national and state ambient air quality standards. However, some information is maintained regarding air emissions. This information is referenced in Sections 15.4 and 15.4.2.4. The NTS Class II Air Quality Operating Permit (AP9711-0549) requires monthly opacity readings for all permitted sources, with the exception of the four bulk fuel storage tanks. Personnel that are certified as Method 9 Visible Emissions Evaluators must document these readings.

Table 15-2 Current Configuration of the Off-site Environmental Surveillance Program

Sample Type	Description	Collection	#Locations	Analysis
Aerosol (Particulate)	Low Volume	Weekly	17	Alpha/Beta Gamma Plutonium isotopes
	High Volume	Weekly	6	(Same)

156

15.6 Adaptive Management

Numerous federal and state regulations, state of Nevada air quality operating permit restrictions, and self-imposed goals work together to protect ambient air quality on the NTS.

15.6.1 Pollution Control Program

Pollution prevention planning is incorporated into relevant operations conducted by the DOE on the NTS. The BN Environmental Compliance Department conducts the program. Regarding air quality concerns, pollution is controlled by:

- ✓ Mechanical devices such as baghouses (with shrouds as necessary); covers on transport trucks (as needed); covers on containers; and shrouds and covers on conveyor belts.
- ✓ Use of high-efficiency particulate air filters or other relevant filters, where appropriate.
- ✓ Water used for wetting of materials storage areas, materials as they are processed, soil in construction areas, soil in surface disturbance areas, and roads in soil processing areas.
- ✓ Use of chemical dust suppressants in specific areas.
- ✓ Revegetation of disturbed areas.
- ✓ Best operational practices such as refraining from operating emissions producing equipment during very windy conditions and by slowing the production process to minimize emissions.
- ✓ Visible Emission Evaluators conduct monthly opacity readings on relevant processes and equipment. In addition, inspections are conducted on a quarterly basis where random opacity readings may be taken. State of Nevada personnel conduct random inspections on the NTS.

- ✓ Areas with radioactive soils are fenced to prevent unauthorized entry and disturbance. Operations within these areas require dust control measures and operational air monitoring.
- ✓ Use of alternative fueled (natural gas) vehicles. 75% of all NTS new light duty vehicle acquisitions will be alternative fuel vehicles.

If air quality were to become a concern, the pollution prevention measures would be reassessed.

15.6.2 Permitting Program

Under Title V, the state of Nevada regulates facilities on the NTS for air quality emissions. In addition, DOE/NV uses many best management practices that add protection for air quality over the NTS. The BN Environmental Compliance Department conducts the program. The following processes all work together to protect air quality.

- ✓ Historically, DOE/NV has evaluated project or program plans for reducing air emissions and will continue to evaluate all new projects and programs to determine the best means of minimizing air emissions.
- ✓ Each new project is evaluated, to determine its potential emissions, in relation to the Class II permit and *NESHAPS* compliance status early in the decision making process. This is one of the factors that should be considered in determining whether a project can come to the NTS.
- ✓ Through an active inspection program, air emissions are evaluated on a continuing basis. Permit restrictions are continually reviewed and assessed. Modifications are made as necessary.
- ✓ Records are kept for all required monitoring data and supporting information, inspection

157

activities, and opacity readings for 5 years. Several reports are made to the state regarding annual air emissions, test plans for each test series at the HAZMAT Spill Center and a summary final report of actual emissions for each test series. Each January, an estimate of asbestos renovation and abatement projects for that calendar year is sent to the EPA. In addition, for each asbestos renovation or abatement project conducted during the year, a report on actual amounts of asbestos removed or altered is also sent to EPA. Copies of these asbestos reports are also sent to the state of Nevada Bureau of Health Protection Services. An annual report is submitted to the EPA that provides monitoring data and calculations confirming compliance with the *NESHAPS* requirements.

158

16 Geological and Mineral Resources

16.1 Introduction

Only broad parameters of the extent of geologic resources on the NTS are known. Common geologic resources include industrial minerals, such as silica, bentonite clay, and zeolites, as well as building stone and aggregate. Hydrocarbon and geothermal resources in the deeper subsurface are more difficult to evaluate. Base and precious metal resources are well known to the mining and mineral industries and several mining districts have been sampled. Economic minerals of interest include gold, silver, mercury, lead, copper, antimony, zinc, arsenic, tungsten, and molybdenum. Most of these deposits are found in proximity to igneous intrusions. The Timber Mountain Caldera complex is also a potential source of mineralization. Rock sections that contain unique fossil assemblages are also considered geologic resources. Mining districts identified in nuclear testing areas are not considered part of the geologic and mineral resources if they are radioactively contaminated or unsafe for surface geologic investigations.

16.2 Goal

- ✓ Consider the impacts of NTS operations on unique geologic features and mineral resource areas.

The purpose of this goal is to assure that new construction sites do not impact known resource areas of the more valuable base and precious metals. Mineral surveys will be conducted for new sites so that they do not disturb these areas. Common industrial mineral resources are more expendable and some site locations may have priority over their preservation. Geologic features have been identified and are not considered likely new sites for construction.



Rock Arch of Miocene Volcanic Tuff

This goal accommodates human use and occupancy with limitations. Periodic study of unique geologic features will not significantly affect the ecosystem. It is likely that there will be extensions of known mining districts and that new geologic features will be identified. Decisions on which areas need to be limited to access will have to be made.

16.3 Inventory and Limitations

16.3.1 Resource Status

The geology of the NTS provides a variety of rock types for study of unique volcanic features and fossil assemblages and for exploration of mineral deposits. The NTS is located in the Southwest Nevada Volcanic Field in the northern subprovince of the Basin and Range Physiographic Province.

16.3.1.1 Rock Types

The geology of the NTS consists of a thick section of Paleozoic and older sedimentary rocks, locally intrusive Cretaceous granitic rocks, a variable assemblage of Miocene volcanic rocks, and locally thick deposits of

159

post-volcanic sands and gravel that fill the present valleys.

The Southwest Nevada Volcanic Field is dominated by several large overlapping calderas (volcanic dome features) which includes the higher topography of Pahute Mesa, Shoshone Mountain, and Timber Mountain in the western half of the NTS. These rocks are hosts for precious metal mineralization. Paleozoic carbonate rocks which are exposed primarily on the south and west flanks of Yucca Flat are host for base metal mineralization. Cretaceous intrusive rocks are exposed at the surface at the northern end of Yucca Flat, associated with base metal mineralization, and in the Gold Meadows area (White Rock Springs). Intrusive rocks are mostly buried in the Calico Hills, where they are both a source and host rock for base metal and precious metal mineralization. A generalized geologic map of the NTS is presented in Figure 16-1.

16.3.1.2 Base Metal and Precious Metal Mining Districts

There are a number of mines that were developed into districts in the early 1900s and most recently in the late 1970s. Shafts, drifts, and adits were driven into surface mineralization, extensively sampled, and in some cases, small amounts of ore were extracted and milled. These districts were investigated and further sampled by the Nevada Bureau of Mines and Geology (NBMG). (NBMG, 1984)

The Calico Hills and Mine Mountain Districts exhibit copper, silver, lead, zinc, and mercury sulfides in fractured Paleozoic carbonates and clastic rocks. An intrusive at depths exceeding 2,500 ft (762 m) is the presumed source for the mineralization.

The Oaks Springs District located in the southern end of the Belted Range includes the Climax stock (portion of larger intrusive) which was the site of a radioactive waste repository

pilot project in 1956. Small amounts of tungsten were produced in 1940 from a skarn and tactite deposit (mineralized zone surrounding the intrusive) in Paleozoic sediments. Silver, copper, lead, zinc, molybdenum sulfides are also present. The workings in the District extend 7 mi (11 km) to the southeast into the Half Pint Range.

The Wahmonie District is located east of Jackass Flats and north of Skull Mountain. Mineralization can be traced for 8 mi (13 km) along a trend, but alteration of the host rock extends over an area of 20 mi² (52 km²). The workings at the Wingfield Shaft, Horn Silver Mine are radioactively contaminated. Free gold with silver sulfides is found at the surface. An intrusive locally exposed at the surface, is the presumed source for the mineralization. Figure 16-2 indicates the location of mining districts on the NTS, Tonopah Test Range, and NAFR.

16.3.1.3 Timber Mountain Caldera

The Timber Mountain Caldera, shown in Figure 16-1, which encompasses approximately 150 mi² (389 km²) along the western edge of the NTS, was designated a National Natural Landmark by the National Park Service. The topographic high of Timber Mountain is the core of the Caldera, which is circumscribed by a conspicuous valley, characteristically called the ring fracture zone (a collapse feature with associated large vertical fault displacement). This area is preserved for research studies in caldera development by scientists and students.

16.3.1.4 Syncline Ridge Area

There are two exposures of Mississippian and Pennsylvanian sediments on the western flanks of a large syncline (structural trough) forming a prominent ridge west of Yucca flat. These exposures represent the most complete fossil assemblage in the world that documents the time boundary between the Mississippian and Pennsylvanian geologic periods. Complete sections of these rocks are uniquely exposed in

160

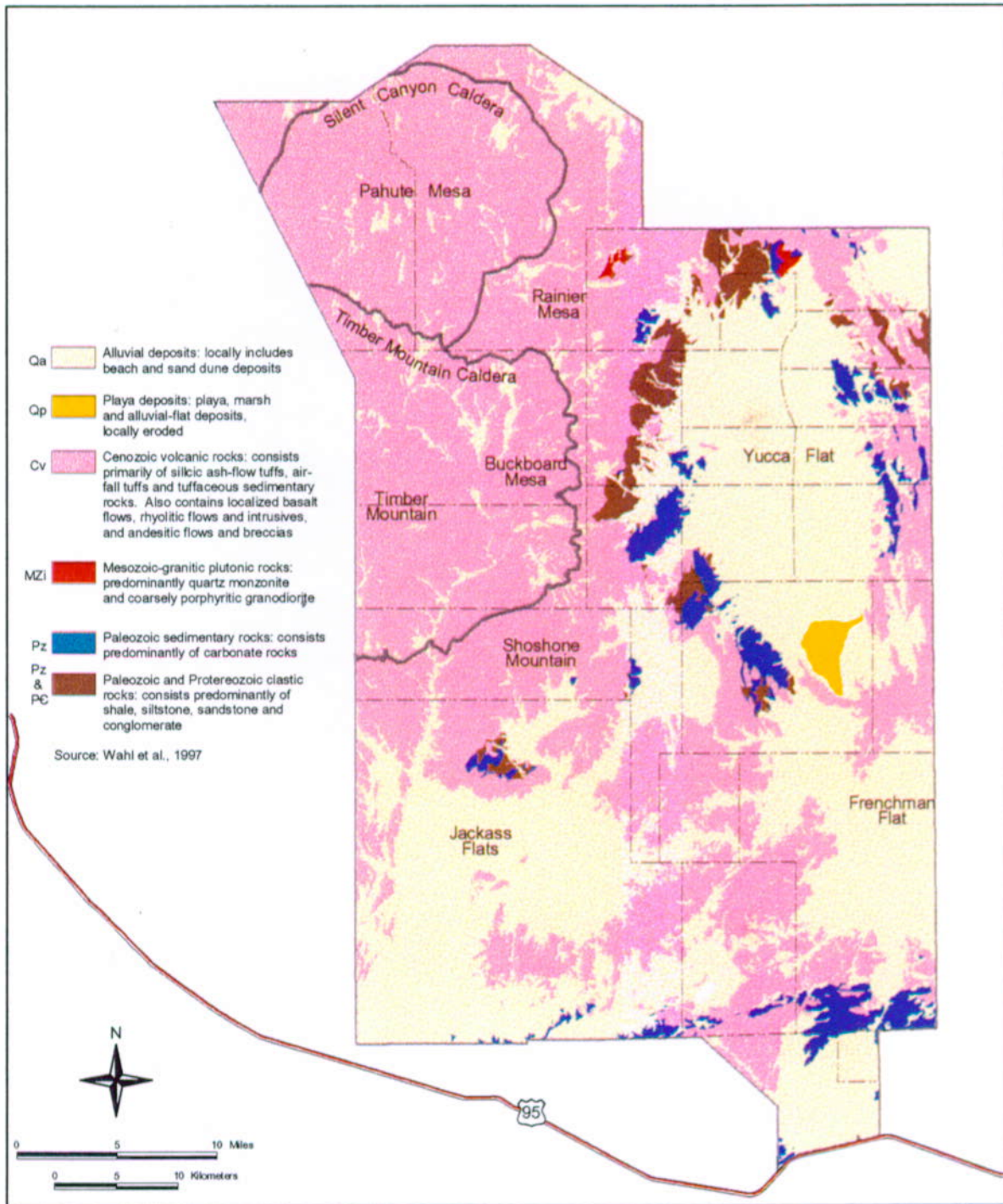


Figure 16-1 Generalized Geologic Map

161

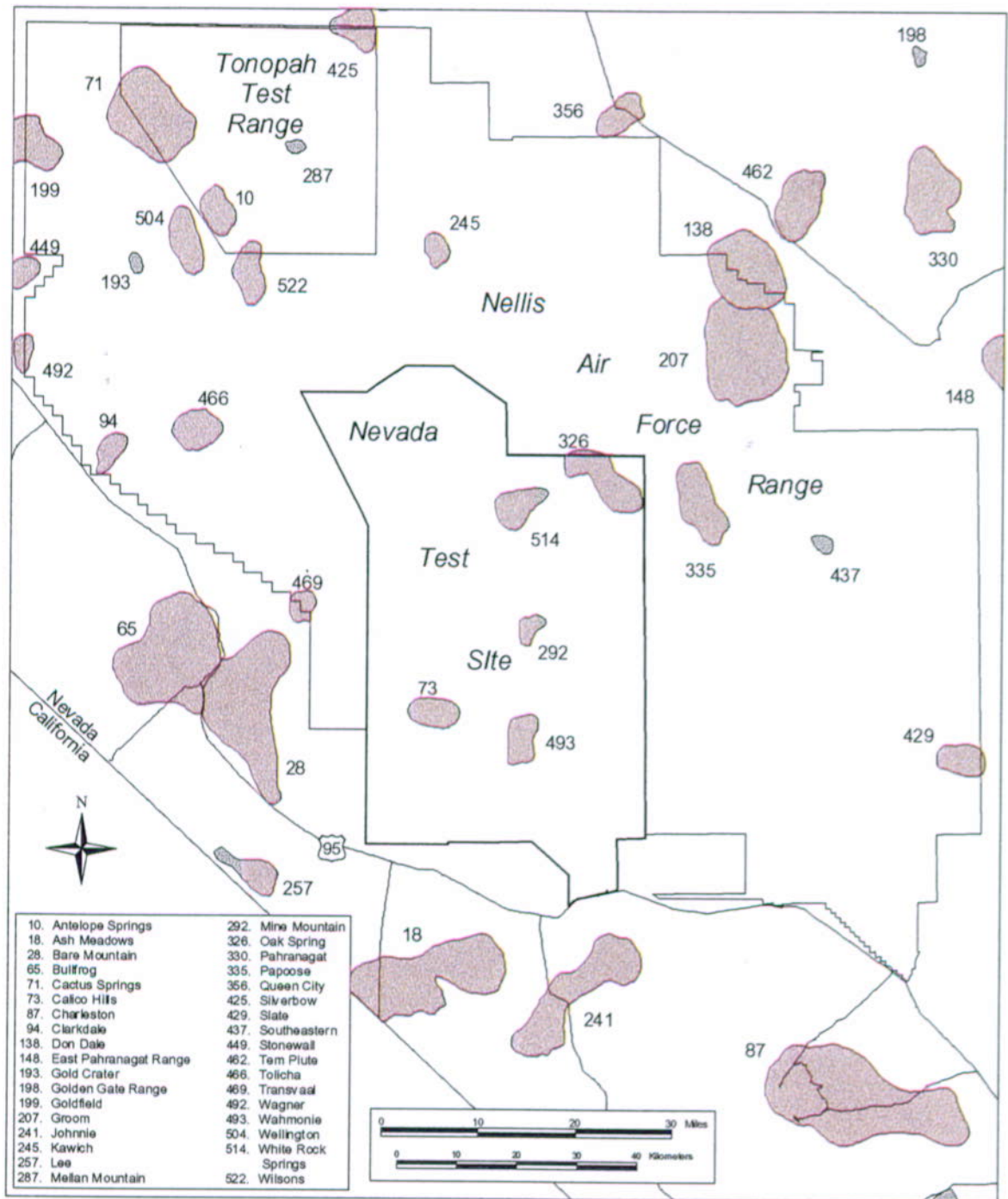


Figure 16-2 Location of Mining Districts on the Nevada Test Site, Tonopah Test Range, and Nellis Air Force Range

162

southwest Nevada and should be preserved for worldwide research studies by scientists and students.

16.3.1.5 Industrial and Commercial Rocks and Minerals

This resource includes aggregate, cinders, lava rocks, and other rock and mineral commodities having commercial value for landscaping. Although cinders and lava rock are being extracted in close proximity to the NTS, they do represent a sizable resource which is easily accessible to main transportation routes and are relatively inexpensive to extract. Aggregate production in Las Vegas Valley proper is on the decline because of poor quality, and the NTS is considered by the state of Nevada as a viable source for new aggregate. DOE/NV will have specific needs for aggregate on-site in the future. Traditional aggregate sources are limited and new sources will have to be surveyed and may have to be extracted to fulfill these needs.

16.3.1.6 Geothermal and Hydrocarbons

No occurrences of these resources have been reported in the region. Previous investigators of the NTS have concluded there is low potential for hydrocarbon resources (Harris et al, 1980) and potential for moderate temperature geothermal resource (Harry Reid Center, 1994).

16.3.2 Legal and Policy Requirements

16.3.2.1 Public Land Orders

The NTS was withdrawn for nuclear testing by the AEC in 1952, 1958, 1961, and 1965. (PLO 805, PLO 1662, PLO 2568, PLO 3759) Two of the PLOs potentially limit extraction of mineral resources from the NTS.

PLO 805 in 1952 withdrew most of the eastern half of the NTS, specifically the closed drainages of Frenchman Flat (Area 5) and Yucca Flat, the main nuclear testing areas

before 1960. The withdrawal includes all of Areas 1-4, 6-11, 14, 15, 23 (Mercury town site), 26, and 27, the eastern three-fourths of Areas 12, 16, and 17, the eastern one-fourth of Area 25, and eastern one-sixth of Area 29. PLO 1662 in 1958 withdrew Area 13 in the extreme northeastern portion of the NTS primarily for access to the testing areas from the northeast. PLO 2568 in 1961 withdrew the western half of the NTS, specifically, all of Areas 18 and 30, the southern one-third of Areas of 19 and 20, and the remainder of Areas 25 and 29. PLO 3759 in 1965 withdrew Area 22, which is the area south and west of Mercury.

These PLOs segregated the lands from all forms of appropriation (selling of land) under the public land laws, including general mining laws. PLOs 805 and 1662 were further segregated from leasing under the mineral leasing laws, whereas PLOs 2568 and 3759 were not specifically segregated.

16.3.2.2 United States Air Force Memorandum of Understanding

A MOU agreement between DOE and the USAF withdrew the remainder of Areas 19 and 20 for testing.

16.3.2.3 Department of Energy, Nevada Operations Office Policy 450.X

It is DOE/NV policy to not allow the mining of locatable (e.g. gold, silver) or leasable (e.g. oil, gas, geothermal) minerals at the NTS. The DOE/NV will continue to allow the extraction and use of saleable minerals (aggregate) for missions and support activities on the NTS. Additionally, project and program managers at the NTS will consider the impacts of their activities on mineral resources in the area. When necessary they will perform appropriate mineral surveys, and act to protect valuable mineral resources in the impacted area. (DOE/NV Policy 450.X)

163

As areas on the NTS are selected for projects they will be compared to known mining districts, mineralized areas, and unique geologic features. If there is an overlap, a separate mineral resource survey of the area will be conducted to determine the feasibility of facility construction based on the planned extent of surface disturbance. Existing state mineral surveys and the *Petrographic/Geochemical Database and Stratigraphic Framework for the Southwest Nevada Volcanic Field* will be used to implement ground surveys of planned construction sites.

16.4 Data Management

Databases can assist in meeting the goal of defining geologic and mineral resource areas in two ways. First, to assist in locating areas that are regionally similar in rock type and structure to known resource areas. Second, to assist in characterizing the geology and hydrology of a mineral resource area or unique geologic feature.

16.4.1 Geographic Information System-Based Databases

16.4.1.1 Nevada Test Site Database

This database is useful as an introduction to the NTS for road access, infrastructure location, location of restricted areas, and vegetation and rock outcrop patterns (satellite imagery). It contains the following types of data:

- ✓ Nevada state and county roads
- ✓ Topography
- ✓ USGS topographic quadrangle boundaries
- ✓ NAFR boundaries
- ✓ NTS area boundaries
- ✓ Land ownership
- ✓ Land use zones

- ✓ USGS Gravimetric Anomaly Map
- ✓ Elevation 3-D models
- ✓ Satellite image maps
- ✓ Radiological survey data
- ✓ Man-made radiation contours
- ✓ Underground nuclear test locations

The data quality is high. National Map Accuracy Standards are followed. Standard references are stated in a meta-data file. The BN Geotechnical Services Division updates the database as data is received.

The Facilities Database, also maintained by BN, will be integrated into this database. This database gives the locations and identification numbers for all buildings on the NTS. Funding for integration of this database is not required, and will be completed by BN, as resources become available.

16.4.2 Other Databases

16.4.2.1 Archiving Database

This database is needed to perform regional literature searches and subsurface studies of the NTS, and characterize the geology and hydrology of an identified mineral resource area. It contains the following types of data:

- ✓ NTS publications
- ✓ Geophysical logs
- ✓ Well information - water levels, log depths
- ✓ Drill core availability

The data quality is high. The USGS Water Resources Division updates the database annually. The lithology and physical properties of the geologic units published by the USGS will be digitized and added to this database.

164

Funding for this activity is scheduled to be available through FY 1999 from Defense Programs through the NTS Archiving Program.

16.4.2.2 Petrographic/Geochemical Database and Stratigraphic Framework for the Southwest Nevada Volcanic Field

This database can be used in characterizing the physical properties, geochemistry, and petrography of rock units that may be considered as hosts or sources of mineralization. It contains the following types of data:

- ✓ Petrography
- ✓ Geochemistry
- ✓ Mineralogy – bulk and x-ray diffraction analyses
- ✓ Microprobe analyses – analytical petrography
- ✓ Field Study sample information - locality, type, lithology, stratigraphy

The data quality is high. Published sources are listed in meta-data files. No single standard is followed. Each data point is judged according to completeness of information. The Los Alamos National Laboratory Environmental and Earth Sciences Division updates the database annually.

A supplemental database (GEODES) which contains the Los Alamos National Laboratory geophysical logs will be integrated into this database as funding is provided through the NTS Archiving Program.

16.4.2.3 Gravity/Aeromagnetic Database

This database is useful for outlining major subsurface structures that can control mineralization. It contains the following types of data:

- ✓ Digital gravity data
- ✓ Aeromagnetic and gravity maps

The data quality is high. National map standards are followed for digitizing maps. Quality control of gravity data is conducted as data is entered by the USGS and National Geophysical Data Center. The data is updated only when new surveys are conducted by the USGS. The database was last updated in 1983.

16.4.3 Release of Data

A pilot study is underway to release the NTS GIS Database on an Intranet, designed solely for other federal agencies and Nevada subcontractors. The data to be released are facilities, infrared imagery, road networks, and nuclear test locations. CD-ROMS for this database will be made available for user distribution on an annual basis. There are no plans to publish this data for off-site use. Hard copies are not available. The USGS Archiving database is found on an Internet Web site at <http://nevada.usgs.gov/mercury>. Hard copies are not available. The Petrographic/Geochemical database will be placed on an Internet Web site this year, and is accessible through the National Geophysical Data Center in Boulder, Colorado. Hard copies are not available. The Gravity Data is available through the Internet from the National Geophysical Data Center at <http://www.ngdc.noaa.gov>. The Gravity/Aeromagnetic database is available in a map form as a USGS publication.

16.5 Monitoring

16.5.1 Purpose

The known geologic and mineral resources of the NTS are not in jeopardy of misuse, extraction, or depredation, and therefore, do not require physical monitoring. Monitoring of the inventory of the resource areas would be helpful in determining total tonnages and grades of mineralization. Arbitrary boundaries of the

165

known mining districts are defined in the NTS GIS database. As selected areas for proposed mission and support projects are assessed for geologic and mineral resources, these boundaries may be better defined, and new ones may be added. Samples gathered during the assessments will be used to calculate rough dimensions of the deposits, tonnages, and grades that should be the basis for the inventory.

16.5.2 Legal and Policy Basis

The DOE/NV Policy on mining at the NTS does not allow mining of locatable or leasable minerals and resources, such as gold, silver, oil, gas, and geothermal. The policy does allow extraction of saleable minerals, especially aggregate, which could be used for mission and support activities. Though there is no requirement to monitor the more valuable locatable minerals as a resource, an effort should be made ensure that these resources are protected from depredation from construction projects. (DOE/NV Policy 450.X)

16.5.3 Description of Monitoring Program

Although the DOE/NV mining policy for the NTS does not require a monitoring program to manage the geologic and mineral resources, mineral surveys will be an integral part of the site approval process. Project managers will include a mineral survey in their checklist required by DOE/NV PI 97-005, *Work Authorization Process*. The mineral survey will be conducted along with the other surveys that may be required for the project. The mineral survey will include a review of proposed project sites for compatibility with known mineral deposits and a ground survey of any known mineralization. Approval or disapproval of the site for construction is based on the results of the survey and extent of planned construction activities. Any surveys will be coordinated in advance with defense-related project activities and included in time frameworks to gain

construction approval. Areas of known mineralization should not be impacted unless absolutely necessary and alternate sites will be defined by the priority of the mission or support need. The survey results will be made available on the DOE/NV Internet. The sample data will be retained on the USGS Core Library database for use by geoscientists in evaluation of mineral inventories.

16.6 Adaptive Management

The goal of geologic and mineral resource management is to consider the impacts of NTS operations on unique geologic features and mineral resource areas. Implicit in this goal is the responsibility to avoid any impacts on the more valuable base and precious metal resources. Mineral surveys may be needed to characterize the locations chosen for new projects and should be made early in the project so that alternate locations maybe selected if needed. Success will be measured by avoidance of known mineralized areas and geologic features where feasible.

Project managers should survey for non-impact locations outside designated areas of geologic and mineral resources. If a location is needed within these resource areas, a mineral survey will be requested. The project manager and the mineral assessment company will develop the scope of the mineral survey. The results of the survey, as well as any existing mineral survey data, can be used by the project manager to determine the suitability of the proposed location. If mineral surveys indicate similar geology, host rocks, and rock alteration to known mineralized areas or geologic features, alternate locations should be reviewed. Approval of locations which impact common geologic resources, such as building stone, silica, and bentonite clay, may be allowed because of their natural abundance on the NTS. Mineral surveys for aggregate (gravel) may be requested if this resource is required for construction of approved projects.

166

The recently developed DOE/NV mineral use policy stated in Section 16.3.2.3, which does not permit extraction of base and precious mineral resources, will remain in effect indefinitely. There are no plans to revise the current NTS PLO withdrawals to exclude mineral resources.

Stakeholders place a high value on the base and precious metal resources of the NTS. Though the DOE/NV prohibits mineral extraction for commercial profit, the mineral surveys can be an instrument to ensure that these resources are preserved for field studies. Access to geologic features and mineral resources at the NTS will always be available upon request for study by interested stakeholders and geoscientists. Requests may be made through the Office of Public Affairs and Information of DOE/NV.

Long-term success of the mineral survey program can be measured by a consistent history of location choices that minimize impacts on unique geologic features and mineral resource areas. If a more liberal DOE/NV mineral use policy were adopted, the resources would be available.

This Page Intentionally Left Blank.

168

17 Airspace Resources

17.1 Introduction

Airspace resources at the NTS are composed of two areas of special use airspace, designated by the FAA as restricted areas 4808 North (R4808N) and 4808 South (R4808S). Although they are "owned" by the FAA, they are used and controlled exclusively by the DOE/NV, 24 hours per day from surface to infinity. Both are restricted from public use, with exceptions being granted periodically for flights supporting projects at the NTS. The restricted airspace surrounding the NTS to the north, east, and west is under the control of NAFR.

17.2 Goal

- ✓ Manage NTS airspace to enhance national security, public safety, and operational safety in the conduct of missions on the NTS.

The purpose of managing the NTS airspace (R4808N and R4808S) is to ensure mission accomplishment while considering possible limited accommodation of airspace use by others.

Issues that arise with allowing NTS airspace to be used by others fall into three main categories. National security considerations remain paramount for much of the activity conducted at the NTS. It was the prime reason for the original land withdrawal for weapons testing in 1952. It continues today as part of the mandate to maintain our underground nuclear test readiness capability. These considerations also allow other national security activities to conduct programs at a level of confidence not available elsewhere. Public safety considerations figure prominently in missions conducted at the NTS and requests for access to the NTS by ground and by air. Due to land areas that still pose a risk to health, a process of close control over air traffic is required.



Desert Rock Airstrip

Requests must be made in advance for each flight or project so DOE/NV can evaluate and grant approvals or require changes to the requests before approval can be given. Non-governmental aircraft must be in support of an NTS project or a project that is proposed for the NTS. Operational safety considerations are needed when granting approvals to projects being conducted simultaneously near each other, either on the ground or in the air. Overflight of ground projects requires analysis of safety concerns for both entities before approval can be given. Usually, one or more restrictions must be placed on the project(s) to ensure an adequate level of safety is maintained.

17.3 Inventory and Limitations

17.3.1 Resource Status

The airspace resources, R4808N and R4808S, overlay the NTS and are located approximately 60 mi northwest of Las Vegas, Nevada. They are described in *DoD Flight Information Publication AP 1/A* and *FAA Order 7400.8* and are shown on the map in Figure 17-1. They are depicted in all flight maps and publications, both Visual Flight Rules and Instrument Flight Rules,

169

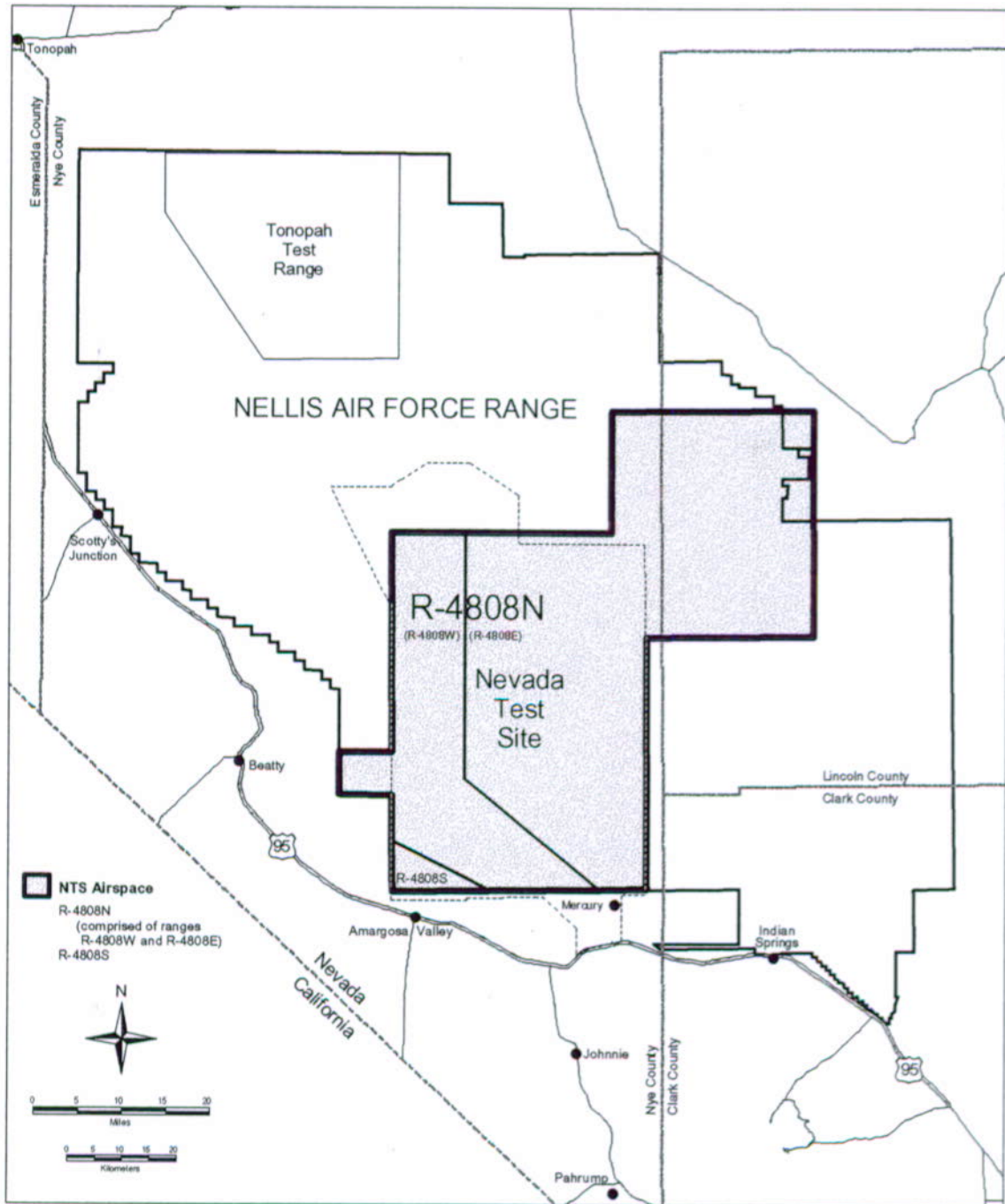


Figure 17-1 Nevada Test Site and Vicinity Airspace

170

dealing with the southwestern U.S. region of FAA airspace.

17.3.2 Legal and Policy Requirements

The airspace was withdrawn by PLO and designated as two parcels of special use airspace by the FAA, under *Federal Air Regulation Part 73* (14 CFR Part 73). The using agency for each is DOE/NV, which has established that the parcels of airspace are in use by DOE 24 hours per day, 365 days per year, and are not accessible by the public, except under certain conditions. These conditions include flying in direct support of a project at or proposed for, the NTS, meeting minimum-security requirements, being scheduled in the airspace by DOE, as well as other project-dependent conditions.

17.4 Data Management

Data is needed to determine if the airspace is being utilized effectively. This data is compiled annually from traffic count statistics obtained from DOE and USAF sources and is sent to the Regional FAA Offices in Palmdale, California.

17.4.1 Geographic Information System-Based Databases

None.

17.4.2 Other Databases

17.4.2.1 Annual Utilization Report for Special Use Airspace

Contains the following types of data:

- ✓ Restricted area identification
- ✓ Period of report
- ✓ Number of aircraft flights per year
- ✓ Average number of flights per day

- ✓ Altitudes affected

- ✓ Hours of air traffic control facility operation, per day, per week and annually

The data quality is adequate for the function. DOE/NV updates the database annually.

17.4.3 Release of Data

The database listed above contains information on internal practices and is marked for "Official Use Only". The information may be exempt from public release under the Freedom of Information Act.

17.5 Monitoring

17.5.1 Purpose

The airspace is monitored by air traffic control agencies, both military and civilian, to ensure integrity from unwarranted intrusions by aircraft. Additionally, any military requests for use must be made through proper channels at Nellis Air Force Base and are reviewed by DOE/NV for approval.

17.5.2 Legal and Policy Basis

Current MOUs with the USAF and FAA require them to monitor the airspace and do not place any limits on this function.

17.5.3 Description of Monitoring Program

R4808N and R4808S are monitored by FAA and military air traffic control agencies, 24 hours per day, from the surface to the upper limits of the capability of radar. This ensures mission accomplishment by allowing only selected and controlled flights of aircraft through the airspace at such times, or on such routes, as to preclude any interference with other missions.

Aircraft intruding into the airspace are detected and tracked to their destinations, or until such

171

time as their identity can be determined. This information is passed on to the FAA who takes steps to investigate the intruder and if necessary, prosecute them for violation of Federal Air Regulations. Suspected breaches of security are mitigated by the responsible organization(s) interacting independently with the individual(s) involved.

17.6 Adaptive Management

The goal for the airspace resources will be accomplished by continuation of current efforts by the FAA, USAF, and DOE to monitor, identify, and, if needed, prosecute aircraft operators who infringe upon the restricted airspace.

Current agreements will continue to be periodically reviewed by DOE/NV for needed changes as technologies, airspace delegations, and regulations evolve. Any proposed changes, which affect the general aviation public, will be disseminated for comment using existing FAA and USAF procedures regarding Federal Regulation changes. Traffic monitoring information will continue to be passed along annually to the FAA Regional Office. One measure of the success of the program will be the continuation of, and potential increases in, the requests by potential users to avail themselves of the NTS and the security it provides them for their projects.

18 Socioeconomic Resources

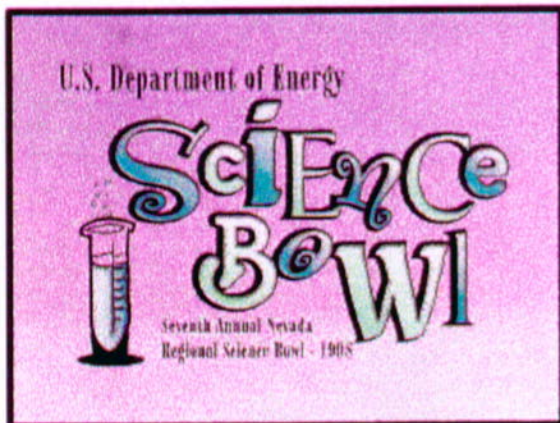
18.1 Introduction

Socioeconomic analysis is an assessment of the environmental consequences of demographic and economic changes resulting from the implementation of a proposed activity as well as an assessment of the impacts upon local government facility, service, and fiscal conditions. Resources are varied for socioeconomic impact studies involving the community groups around the NTS. These groups include, among others, the NTS Development Corporation, Clark County, Nye County, Esmeralda County, Lincoln County and the local Native American tribes. Data to be evaluated in these studies may include employment, earning, population, and demographic statistics as well as county budgets, capital improvement programs, master plans, functional plans, and community perception analysis.

18.2 Goal

- ✓ Manage resources and missions in a manner that considers the local and regional social and economic values and stimulates the local and regional economy.

This goal will allow DOE/NV to enhance its



Science Bowl Logo

position as a responsible member of the community. Socioeconomic information can be used as a tool in making business decisions for the NTS. This information will also allow DOE/NV to provide additional educational and awareness information and could lead to increased understanding and cooperation from the local communities.

18.3 Inventory and Limitations

18.3.1 Resource Status

Socioeconomic analysis involves two major steps: (1) the characterization and projection of existing social and economic conditions surrounding the site; and (2) the evaluation of potential changes in socioeconomic conditions that could result from construction and operations associated with the site.

As of September 30, 1997, NTS employment equaled approximately 0.69% of the total labor force in the surrounding counties of Clark, Nye, Lincoln, and Esmeralda. This is down from 1.99% of the total labor force in 1990. Funding for the NTS has decreased from \$856.2 million in 1990 to approximately \$390 million in 1997. Of the NTS employment, approximately 90% live in Clark County and 7% live in Nye County. Within Clark County, the majority of workers live in Las Vegas. In addition to the affected counties, there are also several Indian reservations, tribal emergency response units, and tribal police departments that are potentially impacted by NTS activities.

DOE/NV works with the NTS Development Corporation, its designated Community Reuse Organization, to support projects that stimulate the local and regional economy in the creation of high value job opportunities that promote the growth of science and technology. The organization is one of the voices of the

community in proposing projects of mutual benefit for development at the NTS and surrounding communities.

DOE/NV has established formal partnerships with several educational institutions consisting of the Clark, Nye, Lincoln, and Esmeralda County School Districts and the Board of Regents of the University and Community College System of Nevada including the University of Nevada-Las Vegas, University of Nevada-Reno, and DRI. The partnerships are formalized by a MOU. DOE is authorized by this MOU to assist the school or university in a variety of ways: faculty/teacher assistance, faculty/teacher research opportunities, loans to universities and gift agreements to the K-12 students of instructional and related equipment, student counseling, National Laboratory and school system linkages, and teacher, faculty, student internships.

Presently, several members of the DOE labor force play a major roll in local community ventures. The JASON project is an international science experience, with approximately 20,000 students and teachers from southern Nevada schools participating. This project includes some equipment from the Remote Sensing Laboratory, 2 satellite technicians, and about 300-400 volunteers.

DOE/NV actively participates in and supports the annual Regional High School Science Bowl competition, with participants from Nevada and several bordering states. Between 150-200 volunteers make this event a success.

The Science Now program is 25 years old, with more than 33 high schools from Nevada and Utah actively involved. Students participate in hands-on workshops with DOE and DOE contractor scientists in the following fields: chemistry, archeology, meteorology, biology, physics, computer-aided design, and endangered species tracking. In-kind support of scientists and other employees (about 12-15) for about 2-3 hours is used during the workshops.

Professionals and Youth Building a Commitment is a Clark County School District Program designed to motivate youth to stay in school by having Las Vegas business community members share their career-success story with students during a short (10-12 minute) presentation. This year, 45 DOE/NV employees will make over 200 presentations to students.

An additional partnership is the grant support from DOE/NV to the Harry Reid Center for Environmental Studies at the University of Nevada-Las Vegas. The Harry Reid Center is committed under the grant to performing a stakeholder driven risk assessment of the NTS. This program includes an education and outreach program designed to increase public understanding of risks associated with ongoing and potential new missions for DOE/NV. The Harry Reid Center provides independent technical and information specialist personnel who evaluate and disseminate risk assessment information related to the science, technology, projects, and missions under consideration for implementation at the NTS.

DOE/NV has entered into a MOU with the Nye County Board of Commissioners, the Lincoln County Board of Commissioners and the Officials of the Township of Caliente to describe interface responsibilities of mutual assistance associated with DOE and/or DOE/NV activities. These agreements are made with respect to existing and future activities that may have an impact on the environment and the health and safety of the people of Nye County, Lincoln County and town of Caliente. These activities consist of programs that include emergency off-site assistance (fire, law enforcement, and medical), transportation of DOE-owned hazardous materials, storage of hazardous materials, and research and development at DOE and DOE/NV operations.

174

18.3.2 Legal and Policy Requirements

There are no specific legal and policy requirements associated with socioeconomic resources. However, when addressing the socioeconomic impact, consideration must be given to all DOE Orders, statutes, regulations, and policies as they apply.

18.4 Data Management

18.4.1 Geographic Information System-Based Databases

None.

18.4.2 Other Databases

18.4.2.1 Labor Force and Employment by Place of Residence Database

The database contains information on the state, county, and city populations for Nevada, per capita income and labor force employment statistics. The data quality is good. The database is updated quarterly by the Nevada Research and Analysis Bureau.

18.4.2.2 Income Data and Employment by Place of Work Database

The database contains historical personal income and per capita income values converted to constant 1994 dollars using the current U.S. Department of Commerce national income deflator index. Constant dollars are used as a gauge in adjusting the dollars of other years to ascertain actual purchasing power. The data quality is good. The database is updated annually by the U.S. Department of Commerce, Bureau of Economic Analysis.

18.4.2.3 Historical and Current Populations Database (Clark County)

The database contains information on population totals for Clark County and Nevada and the percentage of total Nevada population in Clark County. The data quality is good. The Center of Business and Economic Research, University of Nevada-Las Vegas updates the database annually.

18.4.2.4 Projections of Employment, Personal Income and Gross State Product

This database contains information on projections of Nevada employment, population, personal income, and gross state product through the year 2045. The data quality is good. The U.S. Department of Commerce, Bureau of Economic Analysis updates the database annually.

18.4.2.5 1990 Census of Population and Housing Report

This report contains baseline housing needs based on housing unit and population data. The data quality is fair. The U.S. Census Bureau generates a new report every 10 years.

18.4.2.6 Growth Projections Database (Clark County)

This database contains growth projections for Clark County population, labor force, employment, and income. The data quality is good. The Center of Business and Economic Research, University of Nevada-Las Vegas updates the database annually.

Future socioeconomic information, associated with specific NTS missions, will be tracked through the establishment of a database.

175

18.4.3 Release of Data

There are no known restrictions to the release of socioeconomic data to the public, stakeholders, tribal governments, or other interested parties. Requests for database information should be made directly to the organizations referenced in this section.

18.5 Monitoring

18.5.1 Purpose

Socioeconomic information can be used as a tool in making business decisions for the NTS. Consequently, by monitoring the socioeconomic impacts on the community, DOE/NV evaluates and enhances its position as a responsible member of the community.

18.5.2 Legal and Policy Basis

No laws or documents affect the monitoring of this resource.

18.5.3 Description of Monitoring Program

Monitoring the socioeconomic impacts upon the surrounding communities involves the two step process mentioned in Section 18.3.1. First, DOE/NV will establish a baseline characterization of the existing social and economic conditions surrounding the NTS. Second, DOE/NV will evaluate the potential changes in socioeconomic conditions that could result from proposed DOE/NV activities.

Monitoring of this resource is accomplished through periodic comparisons of the varied available databases. In addition, monitoring also includes continual open communication in order to maintain and update understanding and cooperation from the local communities on proposed DOE/NV activities.

18.6 Adaptive Management

The *DOE/NV Strategic Plan* includes the following vision statement. "We [DOE/NV] act as a responsible member of the community by encouraging opportunities for economic growth and respecting community programs through contributions of time, personal involvement, and financial support." (DOE/NV, 1998)

The goal of managing the socioeconomic impact is to manage resources and missions in a manner that considers the local and regional social and economic values and to stimulate the local and regional economy. This goal will be achieved through the continued implementation of the DOE/NV programs listed below.

18.6.1 Employment Data Management

DOE/NV reviews employment data to evaluate the impact of increased or decreased employment upon the city, county, and state population. The DOE/NV Human Resources Division is responsible for gathering employment data for the DOE/NV federal work force and the DOE/NV contractors. For any proposed mission or activity, analysis of DOE/NV employment as compared to city, county, and state employment will be available through the Human Resources Division.

18.6.2 Education Outreach Activities

Education and community outreach programs enable DOE/NV to enhance community interest and awareness in DOE/NV and the fields of science and technology. The DOE/NV Office of Public Affairs and Information is responsible for education outreach programs. They coordinate and manage the formal partnerships with the varied educational institutions. They are also responsible for involving DOE/NV in local community activities such as Science Now, the Regional Science Bowl, and the JASON Project.

Success is evaluated through responses from the community. If improvements are necessary in the outreach programs, DOE/NV will reassess the initiatives at that time.

18.6.3 Nevada Risk Assessment/Management Program

The Nevada Risk Assessment/Management Program is part of a national effort by DOE to develop new sources of information and an approach to risk assessment, risk management, risk communication, and public outreach as these objectives relate to the ecological and human health effects of radioactive and hazardous waste management and site remediation activities. Toward this public goal, the Nevada Risk Assessment/Management Program has developed a risk assessment team, a public working group, and a scientific peer review group to carry out the program.

The DOE/NV Technology Development Division provides program guidance through annual budget and work scope reviews. In addition, they receive monthly status reports and hold bimonthly progress meetings.

18.6.4 Department of Energy, Nevada Operations Office and County Agreements

The MOUs established with Lincoln County, Nye County and the City of Caliente represent the initiative of DOE/NV to support and protect the social and economic values of the surrounding community. Additional MOUs are in the process or will be established with additional counties and communities. Staff from the DOE/NV Assistant Manager for EM organization are responsible for management of the MOUs with the counties concerning impacts upon the environment and the health and safety of the people in the areas surrounding the NTS. DOE/NV will assure that a representative is available to the county governments through a single point of contact

for the MOUs, as well as other needs as directed by the Manager of DOE/NV. In addition, there will be a DOE/NV point of contact within the Assistant Manager for EM organization for the Emergency Operating Center during emergencies. The Emergency Operating Center will contact the emergency response person in the various governments for response actions.

18.6.5 Community Reuse Organization

DOE/NV supports the Community Reuse Organization in mitigating the effect from federal facility downsizing to the surrounding communities through the reuse of federal assets for business development purposes and the attraction of science and technology related industry to the region. The Community Reuse Organization also works with the local communities as a voice to the DOE/NV regarding local economic development activities and their influence on projects and programs pursued by the DOE.

This Page Intentionally Left Blank.

178

19 List of Preparers

The following individuals were primarily responsible for preparing this document.

ARNOLD, Richard, Chairman, Pahrump Paiute Tribe, Nevada, CGTO
- American Indian Resources

BICKMORE, Toby C., Contractor Industrial Relations Specialist, Human Resources Division, DOE/NV
- Socioeconomic Resources

BOYCE, Donald C., Industrial Hygienist, Environment, Safety and Health Division, DOE/NV
- Health and Safety Resources

CARILLI, Jhon T., Environmental Scientist, Waste Management Division, DOE/NV
- Mission Resources

CHARLES, Jerry, Cultural Resource Program Representative, Ely Shoshone Tribe, Nevada, CGTO
- American Indian Resources

CHILDERS, Michael J., General Engineer, Site Operations Division, DOE/NV
- Mission Resources

CLOQUET, Don, Board Member, Las Vegas Indian Center, Nevada, CGTO
- American Indian Resources

COLARUSSO, Angela P., Physical Scientist, Waste Management Division, DOE/NV
- Mission Resources

CORNELIUS, Betty, Museum Director, Colorado River Indian Tribes, Arizona, CGTO
- American Indian Resources

DUNCAN, Douglas W., Hydrology Program Manager, Environment, Safety and Health Division, DOE/NV
- Water Resources

ELLE, Donald R., Physical Scientist, Office of the Manager, DOE/NV
- RMP Project Manager

FRANK, Maurice, Cultural Resource Program Representative, Yomba Shoshone Tribe, Nevada, CGTO
- American Indian Resources

FURLOW, Robert C., Environmental Scientist, Environment, Safety and Health Division, DOE/NV
- American Indian Resources
- Biological Resources
- Cultural Resources
- Ecosystem Management Principles

GIBLIN, Michael O., EM Advisor, Waste Management Division, DOE/NV
- Mission Resources

LACHMAN, Teri A., General Engineer, Technology Development Division, DOE/NV
- Introduction
- Mission Resources
- Roles and Responsibilities

LEEDOM, Stephen H., Physical Scientist, Stockpile Stewardship Division, DOE/NV
- Geological and Mineral Resources

MCNEILL, N. George, Health Physicist, Environment, Safety and Health Division, DOE/NV
- Air Resources

179

MONTANA, Charles W., Realty Officer,
Engineering and Asset Management Division,
DOE/NV

- Site Support Activities and Facilities Resources

MOOSE, Gaylene, Cultural Resource Program
Representative, Big Pine Paiute Tribe,
California, CGTO

- American Indian Resources

NAYLOR, Neddeen, Tribal Elder, Lone Pine
Paiute Tribe, California, CGTO

- American Indian Resources

SAYLOR, Charles W., Environmental
Scientist, Environment, Safety and Health
Division, DOE/NV

- Air Resources

STOFFLE, Richard, Associate Research
Anthropologist, Bureau of Applied Research in
Anthropology, University of Arizona, Tucson

- American Indian Resources

THORNTON, Kevin D., General Engineer,
Technology Development Division, DOE/NV

- Ecosystem Management Principles
- Executive Summary
- Introduction
- Land Resources
- Resource Management at the NTS
- Roles and Responsibilities
- Site Support Activities and Facilities Resources

TINNEY, Larry R., Senior Science Specialist,
BN

- RMP GIS Figures

WOOD, Jeryl L., Test Operations
Management Specialist, Site Operations
Division, DOE/NV

- Airspace Resources

ZEDEÑO, M. Nieves, Research Associate,
Bureau of Applied Research in Anthropology,
University of Arizona, Tucson

- American Indian Resources

180

20 References

- 10 CFR Part 835 DOE, "Occupational Radiation Protection", *CFR*, Office of the Federal Register, National Archives and Records Administration (NARA), United States Government Printing Office (GPO), Washington, DC, 1998.
- 10 CFR Part 1021 DOE, "NEPA Implementing Procedures", *CFR*, Office of the Federal Register, NARA, GPO, Washington, DC, 1998.
- 14 CFR Part 73 FAA, "Special Use Airspace", *CFR*, Office of the Federal Register, NARA, GPO, Washington, DC, 1998.
- 16 USC 460ff "Withdrawal of Public Land for Military Purposes", *USC*, Public Law 99-606, Washington, DC, 1986.
- 16 USC 470 "NHPA", *USC*, Public Law 04-422 as amended, Washington, DC, 1966.
- 16 USC 703 "Migratory Bird Treaty Act", *USC*, Public Law 40 Statute 755, Washington, DC, 1918.
- 16 USC 1531-1543 "Endangered Species Act", *USC*, Public Law 93-205 as amended, Washington, DC, 1973.
- 25 USC 3001 "Native American Graves Protection and Repatriation Act", *USC*, Public Law 101-601, Washington, DC, 1990.
- 29 CFR Part 1910 U.S. Department of Labor, "Occupational Safety and Health Standards", *CFR*, Office of the Federal Register, NARA, GPO, Washington, DC, 1998.
- 29 CFR Part 1926 U.S. Department of Labor, "Safety and Health Regulations for Construction", *CFR*, Office of the Federal Register, NARA, GPO, Washington, DC, 1998.
- 36 CFR Part 60.4 DOI, National Park Service, "NRHP, Criteria for Evaluation", *CFR*, Office of the Federal Register, NARA, GPO, Washington, DC, 1998.
- 36 CFR Part 79 DOI, National Park Service, "Curation of Federally-Owned and Administered Archeological Collections", *CFR*, Office of the Federal Register, NARA, GPO, Washington, DC, 1998.
- 36 CFR Part 800 Advisory Council on Historic Preservation, "Protection of Historic and Cultural Properties", *CFR*, Office of the Federal Register, NARA, GPO, Washington, DC, 1998.

40 CFR Part 52.21	EPA, "Prevention of Significant Deterioration of Air Quality", <i>CFR</i> , Office of the Federal Register, NARA, GPO, Washington, DC, 1998.
40 CFR Part 61	EPA, "NESHAPS", <i>CFR</i> , Office of the Federal Register, NARA, GPO, Washington, DC, 1998.
40 CFR Part 81.329	EPA, "Attainment Status Designations – Nevada", <i>CFR</i> , Office of the Federal Register, NARA, GPO, Washington, DC, 1997.
40 CFR Parts 260-282	EPA, "Hazardous Waste Management System", <i>CFR</i> , Office of the Federal Register, NARA, GPO, Washington, DC, 1998.
40 USC 471	"Federal Property and Administrative Services Act", <i>USC</i> , Public Law 103-355 as amended, Washington, DC, 1949.
42 USC 300f	"Safe Drinking Water Act", <i>USC</i> , Public Law 93-523 as amended, Washington, DC, 1974.
42 USC 1251	"Clean Water Act", <i>USC</i> , Public Law 95-217 [amendments to the Federal Water Pollution Control Act of 1972], Washington, DC, 1977.
42 USC 1996	"American Indian Religious Freedom Act", <i>USC</i> , Public Law 95-341, Washington, DC, 1996.
42 USC 2201g	"Atomic Energy Act", <i>USC</i> , Public Law 83-703, Washington, DC, 1954.
42 USC 4321	"NEPA", <i>USC</i> , Public Law 91-190 as amended, Washington, DC, 1969.
42 USC 5821b	"Energy Reorganization Act", <i>USC</i> , Public Law 93-348, Washington, DC, 1974.
42 USC 6901	"RCRA", <i>USC</i> , Public Law 94-580 as amended, Washington, DC, 1976.
42 USC 6961	"Federal Facility Compliance Act", <i>USC</i> , Public Law 102-386, Washington, DC, 1992.
42 USC 7101	"DOE Organization Act", <i>USC</i> , Public Law 95-91, Washington, DC, 1977.
42 USC 7401	"CAA", <i>USC</i> , Public Law 90-148 as amended, Washington, DC, 1955.
42 USC 10101	"Nuclear Waste Policy Act", <i>USC</i> , Public Law 97-425 as amended, Washington, DC, 1982.

182

- 43 CFR Part 2300 DOI, "Land Withdrawals", *CFR*, Office of the Federal Register, NARA, GPO, Washington, DC, 1997.
- 43 USC 1701-1784 "Federal Land Policy and Management Act", *USC*, Public Law 94-579, Washington, DC, 1976.
- 50 CFR Part 10.13 USFWS, "List of Migratory Birds", *CFR*, Office of the Federal Register, NARA, GPO, Washington, DC, 1997.
- 97-27 State of Nevada, *Air Quality Operating Permit*, Carson City, Nevada, 1997.
- ACGIH, 1998 ACGIH, Inc., Documentation of the Threshold Limit Values and Biological Exposure Indices, Sixth edition, Cincinnati, OH, 1998.
- AP9711-0549 State of Nevada, *Air Quality Operating Permit*, Carson City, Nevada, 1997.
- AP9711-0556 State of Nevada, *Air Quality Operating Permit*, Carson City, Nevada, 1997.
- Avon and Durbin, 1994 Avon, L., and T.J. Durbin, *Hydrologic Evaluation of Recent Water-Level Decline at Devil's Hole*, Report No. 2, Las Vegas Valley Water District, Las Vegas, Nevada, 1994.
- Byer, 1991 Byer, R.M., Jr., A Carbon-14 Calibrated Discrete-State Compartment Model of the Groundwater Flow System, Yucca Mountain and Vicinity, Nevada-California, M.S. Thesis, University of Nevada, Reno, Reno, Nevada, p. 246, 1991.
- Chapman, 1994 Chapman, J.B., *Classification of Groundwater at the NTS*, Publication # 45069, DRI, Las Vegas, Nevada, 1994.
- D'Agnese et al, 1997 D'Agnese, F.A., C.C. Faunt, A.K. Turner, and M.C. Hill, *Hydrogeologic Evaluation and Numerical Simulation of the Death Valley Regional Groundwater Flow System, Nevada and California*, WRIR 96-4300, USGS, Denver, Colorado, p. 124, 1997.
- D'Azevedo, 1986 D'Azevedo, W.L., (eds), *Great Basin*, Volume II, Smithsonian Institution, Washington, DC, 1986.
- DoD, 1996 DoD, "Notice of Intent to Prepare a Legislative EIS for NAFR Renewal", Volume 61, Number 105, *Federal Register*, Office of the Federal Register, NARA, GPO, Washington, DC, 1996.
- DoD AP 1/A Defense Mapping Agency, DoD, *Area Planning and Special Use Airspace*, St. Louis, Missouri, June 18, 1998.

DOE, 1998	DOE, <i>Accelerating Cleanup: Paths to Closure</i> , DOE/EM-0362, Washington, DC, June 1998.
DOE Order 413.1	DOE, "Management Control Program", Washington, DC, 1995.
DOE Order 430.1A	DOE, "Life Cycle Asset Management", Washington, DC, 1998.
DOE Order 440.1A	DOE, "Worker Protection Management for DOE Federal and Contractor Employees", Washington, DC, 1998.
DOE Order 1230.2	DOE, "American Indian Tribal Government Policy", Washington, DC, 1992.
DOE Order 5400.1	DOE, "General Environmental Protection Program", Washington, DC, 1990.
DOE Order 5400.5	DOE, "Radiation Protection of the Public and the Environment", Washington, DC, 1993.
DOE Policy 430.1	DOE, "Land and Facility Use Planning", Washington, DC, 1996.
DOE/NV, 1994	DOE/NV, DOE/NV and Yucca Mountain Project Radiological Control Manual, Revision-1, DOE/NV/10630—59, Las Vegas, Nevada, 1994.
DOE/NV, 1996a	DOE, Final EIS for the NTS and Off-Site Locations in the State of Nevada, DOE/EIS 0243, Las Vegas, Nevada, 1996.
DOE/NV, 1996b	DOE/NV, "Record of Decision: EIS for the NTS and Off-Site Locations in the State of Nevada", Volume 61, Number 241, <i>Federal Register</i> , Office of the Federal Register, NARA, GPO, Washington, DC, 1996.
DOE/NV, 1996c	DOE/NV, <i>NTS Site Treatment Plan</i> , DOE/NV—397 Rev. 2, Las Vegas, Nevada, March 1996.
DOE/NV, 1997	DOE/NV, Environmental Assessment for the Area 5 RWMS Access Improvement at the NTS, Nevada, DOE/EA-1170, Las Vegas, Nevada, November 1997.
DOE/NV, 1998	DOE/NV, <i>DOE/NV Strategic Plan</i> , Las Vegas, Nevada, 1998.
DOE/NV NTS SOP 4702	DOE/NV, "Operations Permits", Las Vegas, Nevada, 1994.
DOE/NV PI 96-005	DOE/NV, "Protection of Endangered Species and Cultural Resources", Las Vegas, Nevada, 1996.
DOE/NV PI 97-001	DOE/NV, "Siting Criteria for Protection of Groundwater at the NTS", Las Vegas, Nevada, 1997.

184

DOE/NV PI 97-005	DOE/NV, "Work Authorization Process", Las Vegas, Nevada, 1997.
DOE/NV Policy 450.X	DOE/NV, "DOE/NV Policy on Mining at the NTS", Las Vegas, Nevada, 1998.
DOI, 1998	DOI, BLM, Las Vegas Field Office, <i>Proposed Las Vegas RMP and Final EIS</i> , Publication Number TD 194.66 .N3 C6 1998, Las Vegas, Nevada, 1998.
DRI, 1997	Quaternary Sciences Center, DRI, <i>Monitoring Plan, Cultural Resources Program, DOE/NV, Las Vegas, Nevada</i> , Las Vegas, Nevada, 1997.
EO 11514 ⁴	EO, <i>Protection and Enhancement of Environmental Quality</i> , Office of the President, Washington, DC, 1970.
EO 11644	EO, <i>Use of Off-Road Vehicles on the Public Lands</i> , Office of the President, Washington, DC, 1972.
EO 11988	EO, <i>Floodplain Management</i> , Office of the President, Washington, DC, 1977.
EO 11989	EO, <i>Off-Road Vehicles on Public Lands</i> , Office of the President, Washington, DC, 1977.
EO 11990	EO, <i>Protection of Wetlands</i> , Office of the President, Washington, DC, 1977.
EO 13007	EO, <i>Indian Sacred Sites</i> , Office of the President, Washington, DC, 1996.
FAA Order 7400.8	FAA, "Special Use Airspace", GPO, Washington, DC, November 1997.
Feeney et al, 1987	Feeney, T.A., M.E. Campana, and R.L. Jacobson, <i>A Deuterium-Calibrated Groundwater Flow Model of Western NTS and Vicinity</i> , Publication No. 45057, DRI, Las Vegas, Nevada, p.46, 1987.
Five-Party Agreement, 1997	Five-Party Cooperative Agreement between NAFR, BLM, USFWS, DOE/NV, State of Nevada, December 1, 1997.
Harrill et al, 1988	Harrill, J.R., J.S. Gates, and J.M. Thomas, <i>Major Ground-Water Flow Systems in the Great Basin Region of Nevada, Utah, and Adjacent States</i> , Hydrologic Investigations Atlas HA-694-C Scale 1:1,000,000, USGS, Denver, Colorado, 1988.
Harris et al, 1980	Harris, A.G., B.R. Wardlaw, C.C. Rust, and G.K. Merrill, <i>Maps for Assessing Thermal Maturity Conodont Color Alteration Index Maps, in Ordovician through Triassic Rocks in Nevada, Utah and Adjacent part of Idaho</i>

185

- and California*, Miscellaneous Investigations Series Map I-1249, USGS, Denver, CO, 1980.
- Harry Reid Center, 1994 Harry Reid Center for Environmental Studies and Professional Analysis, Inc., *Preliminary Assessment of Geothermal Potential, NTS, Nye County, Nevada*, Prepared for DOE, Las Vegas, Nevada, December 1994.
- IT Corporation, 1997a IT Corporation, *Regional Groundwater Flow and Tritium Transport Modeling and Risk Assessment of the Underground Test Area, NTS, Nevada*, DOE/NV-477, DOE, Las Vegas, Nevada (CD-ROM), 1997.
- IT Corporation, 1997b IT Corporation, *Underground Test Area Subproject Phase 1 Data Analysis Task Data Documentation Package*, ITLV/10972-181, IT Corporation, Las Vegas, Nevada (CD-ROM), 1997.
- La Camera et al, 1996 La Camera, R.J., C.L. Westenburg, and G.L. Locke, *Selected Ground-Water Data for Yucca Mountain Region, Southern Nevada and Eastern California, Through December 1995*, Open-File Report 96-553, USGS, Carson City, Nevada, p. 75, 1996.
- Mayer, 1997 Mayer, Tim, *Spring Discharge and Water Level Monitoring at Ash Meadows NWR*, Presentation at the 7th Annual Devil's Hole Workshop, Longstreet, Nevada, March 26, 1997.
- McArthur, 1991 McArthur, R.D., *Radionuclides in Surface Soil at the NTS*, Publication No. 45077, DRI, Las Vegas, Nevada, 1991.
- NAC 445B.100-445B.845 "Air Controls", NAC, Carson City, Nevada, 1998.
- NAC 503.030 "Protected and Threatened Animals", NAC, Carson City, Nevada, 1992.
- NAC 503.050 "Protected Birds", NAC, Carson City, Nevada, 1976.
- NAC 503.080 "Reptiles", NAC, Carson City, Nevada, 1992.
- NAC 527.010 "List of Fully Protected Species", NAC, Carson City, Nevada, 1979.
- NAC 534 "Underground Water and Wells", NAC, Carson City, Nevada, 1998.
- NBMG, 1984 *A Mineral Inventory of the NTS, and Portions of Nellis Bombing and Gunnery Range, Southern Nye Co., Nevada*, Open File Report 84-2, NBMG, 1984.
- NEV-HW-009 State of Nevada, *Notification of Hazardous Waste Activities*, Carson City, Nevada, 1995.

186

- NRB 30 DOI, National Park Service, *Guidelines for Evaluating and Documenting Rural Historic Landscapes*, Washington, DC, 1991.
- NRB 38 DOI, National Park Service, *Guidelines for Evaluating and Documenting Traditional Cultural Properties*, Washington, DC, 1992.
- NRS 445A.300-445A.730 "Water Pollution Control Law", NRS, Carson City, Nevada, 1973.
- PAL, 1995 PAL Consultants, *A Conceptual Model of the Death Valley Ground-Water Flow System, Nevada-California*, Report Prepared for the DOI, Death Valley National Park, CA, 1995.
- Pearl, 1994 Pearl, R., Personal communication dated October 21, 1994, from R. Pearl, DOE, Las Vegas, Nevada to Beth Moore, GeoTrans, Inc., Las Vegas, Nevada, regarding summary water well information and water chemistry data for 1993, for NTS wells, 1994.
- PLO 805 DOI, BLM, "Withdrawing Public Lands for Use of the AEC; Partial Revocation of EOs 8578 and 9019", 17 FR 1522 and 17 FR 1942, *Federal Register*, Office of the Federal Register, NARA, GPO, Washington, DC, 1952.
- PLO 1662 DOI, BLM, "Withdrawing Public Lands for Use of the AEC in connection with the NTS, Additional to those withdrawn by PLO 805 of February 12, 1952", 23 FR 4700, *Federal Register*, Office of the Federal Register, NARA, GPO, Washington, DC, 1958.
- PLO 2568 DOI, BLM, "Transferring Lands from Department of the USAF to AEC", 26 FR 12292, *Federal Register*, Office of the Federal Register, NARA, GPO, Washington, DC, 1961.
- PLO 3759 DOI, BLM, "Withdrawal for AEC", 30 FR 9881, *Federal Register*, Office of the Federal Register, NARA, GPO, Washington, DC, 1965.
- Sadler et al, 1992 Sadler, W.R., M.E. Campana, R.L. Jacobson, and N.L. Ingraham, *A Deuterium-Calibrated, Discrete-State Compartment Model of Regional Groundwater Flow, NTS and Vicinity*, Publication No. 45088, DRI, Las Vegas, Nevada, p. 77, 1992.
- Scott et al, 1971 Scott, B.R., T.H. Smales, F.E. Rush, and A.S. Van Den Burgh, *Water for Nevada*, Planning Report No. 3, Nevada Department of Conservation and Natural Resources, Division of Water Resources, Carson City, Nevada, 1971.
- Seaber et al, 1997 Seaber, P.R., E.D. Stowers, and R.H. Pearl, *Bibliography of Reports and Studies of the Geology, Hydrogeology, and Hydrology at the NTS, Nye County, Nevada, From 1951 to 1996*, Publication No. 45156, DRI, Las Vegas, Nevada, p. 212, 1997.

187

- Spencer, 1990 Spencer, E.B., *A Radiocarbon Study of Groundwater in the Western NTS and Vicinity*, M.S. Thesis, University of Nevada, Reno, Reno, Nevada, p. 92, 1990.
- State of Nevada, 1995 State of Nevada, Department of Conservation and Natural Resources, NDEP, *Mutual Consent Agreement Between the State of Nevada and the DOE for the Storage of the Low-Level Land Disposal Restricted Mixed Waste*, Transmittal from P. Liebendorfer (NDEP) to D. Elle (DOE/NV), Las Vegas, Nevada, 1995.
- State of Nevada, 1996a State of Nevada, Department of Conservation and Natural Resources, NDEP, *FFACO*, Carson City, Nevada, 1996.
- State of Nevada, 1996b State of Nevada, Department of Conservation and Natural Resources, NDEP, *Federal Facility Compliance Act Consent Order*, Carson City, Nevada, March 6, 1996.
- Vaeth, 1997 Vaeth, T.A., Memorandum to from T.A. Vaeth to DOE/NV Principal Staff, *Comprehensive Planning*, May 2, 1997.
- Wahl et al, 1997 Wahl, R.R., D.A. Sawyer, S.A. Minor, M.D. Carr, J.C. Cole, W.C. Swadley, R.J. Laczniak, R.G. Warren, K.S. Green, and C.M. Engle, *Digital Geologic Map Database of the NTS Area, Nevada*, Open-File Report 97-140, USGS, Denver, Colorado, 1997.

21 Glossary

Ambient. Surrounding or background conditions without an identifiable source.

Ambient air. That portion of the atmosphere, outside of buildings, to which the public has access.

Associated Funerary Objects. Objects that, as part of a death rite or ceremony, are believed to be placed with the individual human remains either at the time of death or later. Both the human remains and the objects are in possession of the Federal agency or museum.

Baseline. The initial environmental conditions against which the environmental consequences of various alternatives are evaluated.

Candidate species. Plant and animal species for which the USFWS has sufficient information on their biological status and threats to propose them as endangered or threatened.

Corridor. A strip of land of various widths on both sides of a particular linear facility, such as a highway, rail line, or utility line.

Cultural Landscape. A spatial unit that contains the tangible evidence of the activities and habits of the people who occupied, developed, used, and shaped the land to serve human needs; they may reflect the beliefs, attitudes, traditions, and values of these people. (National Register Bulletin (NRB) 30)

Ecosystem. An interconnected community of living things, including humans and the physical environment with which they interact.

Endangered species. A species that is in danger of extinction throughout all or a significant portion of its range.

Forbs. A broad-leaved herbaceous plant.

Geologic. Pertaining to earth materials (such as rocks and minerals) and processes that act to change earth materials (such as faulting and erosion).

Groundwater. Subsurface water that lies within the zone of saturation.

Infrastructure. Utilities and other physical support systems needed to operate a laboratory or test facility. Included are items such as electric distribution systems, water supply systems, sewage disposal systems, and roads.

Life cycle. Consists of the five stages of a project. The stages are planning, acquisition or construction, operation, maintenance, and disposition.

Low-level radioactive waste. Radioactive waste not classified as high-level waste, TRU waste, or spent nuclear fuel, or the tailings or wastes produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material content.

Protect. An administrative action that uses the identification of actions or measures that will ensure continuation of the availability of a resource. It does not necessarily mean the imposition of physical barriers or hardened facilities to prevent access to the resource.

Radiation. Emissions, either electromagnetic or particulate, that result from the transformation of an unstable atom or nucleus.

Remediate. The process, or a phase in the process, of rendering radioactive, hazardous, or mixed waste environmentally safe, whether through processing, entombment, or other methods.

Repatriation. The return of human remains, associated funerary objects, unassociated funerary objects, and objects of cultural patrimony and sacred objects, to the American Indian tribe or organization who is culturally affiliated with those remains and objects, or to lineal descendants of the individual whose remains are being returned. (25 USC 3001)

Sacred Object. Specific ceremonial objects which are needed by traditional Native American religious leaders for the practice of traditional Native American religions by their present day adherents.

Sacred Site. Any specific, discrete, narrowly delineated location on Federal land that is identified by an Indian tribe, or Indian individual determined to be appropriately authoritative representative of an Indian religion, as sacred by virtue of its established religious significance to, or ceremonial use by, an Indian religion. (EO 13007)

Species of concern. Species of possible management concern are due to their restricted distribution or the presence of habitat disturbance. Further biological research and field study is needed to resolve the conservation status of these species.

Threatened species. A species that is likely to become endangered within the near future throughout all or a significant portion of its range.

Traditional cultural property. Any place or area that is eligible for inclusion in the NRHP because of its association with cultural practices or beliefs of a living community that are rooted in that community's history, and are important in maintaining the continuing cultural identity of the community. (NRB 38)

Treaty. A formal agreement, league, or contract, between two or more nations or sovereigns, formally signed and solemnly ratified by the supreme power of each state.

Unassociated Funerary Objects. Objects that, as part of a death rite or ceremony, are believed to be placed with the individual human remains either at the time of death or later. The remains are not in possession of the Federal agency or museum.

Viable. A population that is self-sustaining or capable of maintaining a continued existence.

Wetlands. An area that is regularly saturated by surface water or groundwater and subsequently supports vegetation that is adapted for life in saturated soil conditions.

22 Acronyms

ac-ft/yr	acre-feet per year	gal	gallon
ACGIH	American Conference of Governmental Industrial Hygienists	GIS	geographic information system
AEC	United States Atomic Energy Commission	GPO	United States Government Printing Office
BLM	Bureau of Land Management	HAZMAT	Hazardous Materials
BN	Bechtel Nevada	km	kilometer
Bq	Becquerel	km ²	square kilometers
°C	degrees Celsius	kV	kilovolt
CAA	Clean Air Act	L	liter
CFR	Code of Federal Regulations	m	meter
CGTO	Consolidated Group of Tribes and Organizations	m ²	square meters
Ci	curie	µg/m ³	micrograms per cubic meter
DoD	United States Department of Defense	mg/m ³	milligrams per cubic meter
DOE	United States Department of Energy	mi	mile
DOE/NV	United States Department of Energy, Nevada Operations Office	mi ²	square miles
DOI	United States Department of Interior	Mm ³ /yr	million cubic meters per year
DRI	Desert Research Institute	MOA	Memorandum of Agreement
EIS	Environmental Impact Statement	MOU	Memorandum of Understanding
EM	Environmental Management	mrem	millirem
EO	Executive Order	NAC	Nevada Administrative Code
EOD	explosive ordnance disposal	NAFR	Nellis Air Force Range
EPA	Environmental Protection Agency	NARA	National Archives and Records Administration
°F	degrees Fahrenheit	NBMG	Nevada Bureau of Mines and Geology
FAA	Federal Aviation Administration	NDEP	Nevada Division of Environmental Protection
FFACO	Federal Facility Agreement and Consent Order	NEPA	National Environmental Policy Act
ft	feet	NESHAPS	National Emission Standards for Hazardous Air Pollutants
ft ²	square feet	NHPA	National Historic Preservation Act
FY	fiscal year	NRB	National Register Bulletin
		NRHP	National Register of Historic Places
		NRS	Nevada Revised Statutes
		NSHPO	Nevada State Historic Preservation Office
		NTS	Nevada Test Site

PI	Procedural Instruction
PLO	Public Land Order
ppm	parts per million
RCRA	Resource Conservation and Recovery Act
RMP	Resource Management Plan
RWMS	Radioactive Waste Management Site
SOP	Standard Operating Procedure
SUD	Site Use and Development
TRU	transuranic
U.S.	United States
USAF	United States Air Force
USC	United States Code
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey