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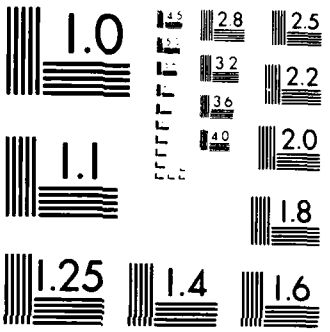

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MITIGATIONS

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DEPARTMENT OF THE AIR FORCE

M-X ETR-38

M-X ENVIRONMENTAL TECHNICAL REPORT:

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Prepared for

United States Air Force
Ballistic Missile Office
Norton Air Force Base, California

By

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Santa Barbara, California

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DEPARTMENT OF THE AIR FORCE
WASHINGTON 20330

OFFICE OF THE ASSISTANT SECRETARY

Federal, State and Local Agencies

On October 2, 1981, the President announced his decision to complete production of the M-X missile, but cancelled the M-X Multiple Protective Shelter (MPS) basing system. The Air Force was, at the time of these decisions, working to prepare a Final Environmental Impact Statement (FEIS) for the MPS site selection process. These efforts have been terminated and the Air Force no longer intends to file a FEIS for the MPS system. However, the attached preliminary FEIS captures the environmental data and analysis in the document that was nearing completion when the President decided to deploy the system in a different manner.

The preliminary FEIS and associated technical reports represent an intensive effort at resource planning and development that may be of significant value to state and local agencies involved in future planning efforts in the study area. Therefore, in response to requests for environmental technical data from the Congress, federal agencies and the states involved, we have published limited copies of the document for their use. Other interested parties may obtain copies by contacting:

National Technical Information Service
United States Department of Commerce
5285 Port Royal Road
Springfield, Virginia 22161
Telephone: (703) 487-4650

Sincerely,

JAMES F. BOATRIGHT
Deputy Assistant Secretary
of the Air Force (Installations)

1 Attachment
Preliminary FEIS

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1.0 INTRODUCTION

1.1 PURPOSE

Construction, operation and, ultimately, decommissioning of the M-X system will cause significant impacts on both human and natural resources within the regions in which it is to be deployed. It is the policy of the Air Force to make every effort practicable to avoid adverse impacts on environmental resources through the design, siting, and construction of the M-X system and in activating the system for operation.

This technical report provides a comprehensive discussion of overall Air Force mitigation plans. It also summarizes specific mitigations identified for the resources evaluated within the FEIS.

Numerous public comments suggesting additional mitigations or requesting information on proposed mitigation measures were received since publication of the Draft EIS. The Air Force has given due consideration to all comments and this technical report recognizes those programs and procedures which are appropriate and feasible in mitigating adverse environmental impacts.

1.2 APPROACH

Mitigation measures are the means by which adverse environmental impacts can be lessened or eliminated. These may include any of the following: (1) avoiding the impact altogether by not taking an action or part of an action; (2) minimizing impacts by limiting the degree or magnitude of the action and its implementation; (3) rectifying the impact by repairing, rehabilitating, or restoring the affected environment; (4) reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; (5) compensating for the impact by replacing or providing substitute resources or environments.

In this FEIS the term Air Force includes other participating Department of Defense (DOD) agencies such as the U.S. Army Corps of Engineers (COE) and the Office of Economic Adjustment (OEA).

It is important throughout this FEIS to distinguish among mitigation measures according to the authorities required to implement the various measures. Like any other federal agency, the Air Force can accomplish only those measures for which it receives authority and for which funds are appropriated. This category of mitigations is identified in the FEIS as those which the Air Force (including participating DOD agencies) "will do." Examples of such mitigations are the environmental protection provisions which are normally included in federal construction contracts. A second category of mitigations is described in the FEIS as those which the Air Force "will advocate." For these, the Air Force will initiate some affirmative action in an appropriate channel, but it does not have authority or funding to implement the measure. An example of such an action would be the provision of federal funds to assist communities in their development planning. The Air Force will pursue such action in accordance with public law. Finally, the FEIS describes a third category of mitigations -- those in which the Air Force "will cooperate." These mitigations amount to suggestions by the Air Force of areas in

which other agencies might cooperate to protect and enhance the environment. Such conditions are more appropriately developed and implemented through institutions other than the Air Force. An example of this sort of mitigation would be the adoption of a comprehensive land use plan and zoning ordinances by a local government agency.

This report discusses both the comprehensive Air Force mitigations programs and specific mitigations for environmental resources. Section 2 discusses Air Force programs and commitments to mitigations. These programs are functionally organized into three categories: community planning, environmental protection planning, and natural resource planning.

Section 3 discusses mitigations on a resource-by-resource basis. This format is provided to enable a reader to review specific resource mitigations. Each resource area includes a discussion of Air Force programs which will be used to mitigate adverse environmental impacts. Additionally, other mitigations under consideration are provided to present a range of possible mitigations. The mitigations included under the heading "Other Mitigations under Consideration" have not been committed to by the Air Force. These potential mitigations will be reviewed on a case-by-case basis during subsequent planning.

1.3 AIR FORCE ENVIRONMENTAL PLANNING

The Air Force has established environmental planning functions at all levels of command which are responsible for Air Force activities related to community, land use, natural resources, environmental protection and pollution abatement and control planning. Participating DOD agencies have similar environmental programs. These environmental planning functions are designed to implement Department of Defense and Air Force policies and programs to (1) protect and improve the natural resources of air, water, and land, (2) prevent, abate and control deterioration or pollution of the environment and (3) conserve and effectively utilize soil, water, vegetation, fish, wildlife, and various man-made resources.

The Air Force's environmental planning programs are more fully understood when viewed in relation to the Air Force's major role and the way each Air Force installation interacts with local and regional communities. Each of the approximately one-hundred existing major installations is:

- a community itself, providing housing and community services for its inhabitants and employees;
- an industry, creating employment for the surrounding community;
- a landmanager/owner with the rights and obligations to protect its property and activities; and
- an airfield and/or aerospace operator, responsible for providing National Defense consistent with the health, safety and welfare of the people living nearby.

The Air Force began its involvement in environmental planning with a set of goals which outline its planning process. The goals include:

- providing for systematic and effective participation and coordination with all levels of government in matters of environmental planning so that Air Force needs and concerns are known and protected.

- providing for current and long range operational/support capability to perform assigned, proposed or potential missions.

- ensuring wise protection, provision, use and management of human, financial, natural, and man-made resources.

- determining the desires, concerns, priorities and projected needs of the Air Force community.

- promoting land use/airspace compatibility with offbase areas which affect or may be affected by base development and operations.

- promoting the public health, safety, welfare and overall quality of life.

Air Force environmental planning is organized to ensure that the Air Force, operating with established constraints, can meet the requirements and responsibilities of each of its roles, and achieve stated Air Force goals. For normal base functions at the installation level, overall program management rests with the Base Civil Engineer. Base environmental planning offices are organized in the three basic areas noted above: community planning, environmental protection planning, and natural resource planning.

Air Force community planning is a process that will ensure that each installation is able to support current and future missions, with emphasis on the timely provision of physical development, the minimization of adverse environmental effects resulting from base activities, and the proper use/management of natural resources. Significant activities within community planning are development and maintenance of the Base Comprehensive Plan (BCP), management of the Air Installation Compatible Use Zone (AICUZ) Program, and management of the Interagency Intergovernmental Coordination for Environmental Planning (IICEP) Program.

Air Force environmental protection planning is a process for correlating all environmental quality standards, policies, and requirements affecting existing and proposed installation activities and facilities, and for ensuring that all Air Force actions are reviewed for environmental impact. Significant activities within environmental protection planning are management of the environmental impact analysis process, preparation and maintenance of pollution control plans, and organization and management of the base environmental protection committee.

Air Force natural resources planning is a process for the identification, conservation, and management of resources (fish, wildlife, open space, timber products and outdoor recreation). Significant activities of natural resources planning are preparation of base natural resources plans and management of natural resources conservation programs.

From a corporate viewpoint, Environmental Planning Offices are assisted by environmental protection committees at all levels of the Air Force. The Environ-

mental Protection Committees (EPC) consist of representatives from various career/functional areas, and serve as steering bodies to monitor the overall conduct of the Air Force environmental planning program. Specifically, the committees review and coordinate policies and procedures in support of stated Air Force goals, coordinate and solve environmental protection problems, and ensure compliance with the Environmental Impact Analysis Process as required by NEPA and the President's Council on Environmental Quality Regulations. Current Air Force policy outlines EPC's as commander's committees, with the Major Command/installation commander designated as the EPC chairperson.

1.4 M-X PLANNING PHASES

For the M-X project there are three planning phases, each of which has an appropriate and different environmental action. These are:

1. Pre-Operational Planning

   The first phase includes project feasibility, planning, design, construction, and assembly and checkout. This phase includes close coordination with responsible state and Federal agencies on the appraisal of the environmental resources, impact identification, impact analysis, mitigation alternatives, mitigation plan, and the Environmental Impact Statement. In many instances, there will be memorandums of agreement with agencies describing procedures to be followed. In the design stage, the major step of mitigation by avoidance is implemented to the extent practicable. During design and construction stages, the environmental effort includes verification by mobile field teams of resources and impacts identified in the EIS. The deployment stage requires monitoring of environmental and mitigation requirements and implementation of mitigations relevant to deployment activities.

2. Operation Planning

   The second planning phase incorporates those planning and environmental activities normal to an Air Force operating base, including Community, Environmental Protection and Natural Resource Planning. These programs would each be applied to a variety of resources and in aggregate would encompass all mitigations. Additional details of this planning phase are contained in Section 1.3 of this report.

3. Decommissioning

   Another element of Air Force planning which must be considered, but which is not proposed as an action at this time, is the decommissioning of the M-X missile system. Air Force project decommissioning planning also would take environmental consequences into consideration. M-X decommissioning would be a major federal action requiring several years to establish realistic alternatives, plan for their implementation, conduct the required environmental reviews, and carry out the selected action. The Department of Defense, Air Force, state and local agencies, the public and Congress would participate in the process. The first two planning categories are addressed in the FEIS and serve as instruments

for mitigating identified impacts. The plan for decommissioning would be prepared at the time such action is deemed to be proper and is called for by the Congress.

1.5 M-X MITIGATION MANAGEMENT

The Air Force has developed an M-X Mitigation Management Plan which is a general procedural framework for identifying, proposing, and approving mitigation measures and for formalizing them into a mitigation plan. The development and implementation of the mitigation plan will involve the participation of many organizations (federal, state, and local governments) and cover a diversity of subject areas. However, the overall responsibility for the mitigation management plan and the eventual mitigation plan rests with the Air Force.

The mitigation plan will be a dynamic, working document for incorporating specific mitigation measures and providing implementation plans for each mitigation. Included in the mitigation plan is a record of expected impacts, proposed mitigations, approved mitigations, and implementation strategies. The mitigation plan will describe each mitigation measure, assign Offices of Primary Responsibility (OPR) for implementation, and ensure incorporation of mitigations into specific functional implementation plans and actions. Finally, the plan will provide a framework for actions necessary to ensure compliance with Air Force commitments and monitoring requirements. Field activities for monitoring/compliance of mitigations will be the responsibility of the environmental planning function of the appropriate OPR.

The National Environmental Policy Act and the Council on Environmental Quality regulations require the identification of mitigation measures in both the Final Environmental Impact Statement and Decision Paper.

Following the publishing of the FEIS, the Air Force will issue an M-X Decision Paper. It will provide a concise public record of the M-X decision. The Decision Paper will state mitigation measures the Air Force will implement and describe a monitoring program.

1.6 NON-FEDERAL PARTICIPATION IN MITIGATIONS

State and local governments have an active mitigation role through the Department of Defense's Community Impact Assistance Program. A basic premise of this program, administered by the Defense Department's Office of Economic Adjustment and the Air Force, is that state and local governments are responsible for identifying their impact assistance requirements and planning their mitigation programs. The Air Force actively participates in the state and local planning processes and will assist by providing information on the M-X missile system construction, activation and operation. The Community Impact Assistance Program is described in more detail in Section 2 of this report. There is an intergovernmental procedure that gives state and local governments latitude for initiating and developing their own mitigation plans to reflect local values, needs and concerns in regard to impacts, and to act in concert with overall community development.

In addition, voluntary organizations, churches, businesses, colleges, universities, and others could develop and initiate mitigation plans, and seek private

investment. While this report deals with formal procedures for the mitigation of impacts identified in the FEIS, each facet of the mitigation program will afford opportunities for private organizations, groups and individuals to mitigate impacts through the private sector. The Air Force encourages these private sector activities.

2.0 AIR FORCE MITIGATIONS

Air Force mitigations are those mitigations committed to by the Air Force and participating DOD agencies. These mitigations are organized into the Air Force Environmental Planning Program which has three major components: community planning, environmental protection planning, and natural resources planning.

2.1 COMMUNITY PLANNING

COMMUNITY IMPACT ASSISTANCE (2.1.1)

A community impact assistance program for M-X was initiated in early 1980. This program, which focuses on state and local planning, is ongoing and evolving in both substance and scope pursuant to congressional direction. As of 1 September, 1981 there are a number of unresolved issues regarding future procedures, requirements identification, budgeting mechanisms and delivery of funds. Resolution of these questions is beyond the control of the Air Force, however special impact assistance legislation is pending in the Congress. This proposed legislation is based on the findings of the congressionally directed study of this subject submitted by the President to the Congress on 28 August, 1981. There is, however, existing authorizing legislation for an assistance program which is acceptable to state and local authorities. Funds were also appropriated for impact planning in FY 80 and 81 and the Air Force has requested $10 million in FY 82. The following is a discussion of past, present and potential M-X community impact assistance.

There is a long history of federal impact assistance since World War II which indicates that communities and states seriously affected by extraordinary defense growth have not been required to bear the full burden of public facility and service costs associated with the establishment of major, new defense bases. Supplemental federal assistance has been available as the prevailing norm to assist defense growth (i.e., impacted areas). This federal commitment was reaffirmed by President Carter on 27 March 1978 and the Congress in Section 802 of the "Military Construction Authorization Act of 1981" (P.L. 96-418).

During World War II, the Congress passed two Lanham Acts which authorized the Federal Works Agency - an independent office reporting directly to the President - to provide a broad range of community facilities. Schools, hospitals, recreational facilities, waterworks and sewage projects were constructed and other activities conducted at a cost of $456 million during the period 1941-45.

Congress enacted two bills during the Korean War relating to the construction of schools and the operation of school districts related to federally - connected children. Both of these programs continue today. A total of $1,546.8 million has been expended for construction and $4,748.6 million has been spent for operation of school districts.

As part of the U.S. Army Corps of Engineers Manhattan District Project, the federal government established and financed three self-contained communities. These communities at Los Alamos, New Mexico; Oak Ridge, Tennessee; and Richland, Washington have since been transferred to local authorities, however,

since their transfer, federal assistance payments have been given to the communities. Each community has advanced to, or become very near to, self-sufficiency.

The Congress established a special program for supplemental Department of the Army community impact assistance for the Safeguard Anti-Ballistic Missile program. The Secretary of Defense was authorized to assist affected communities in meeting costs of increased municipal services and facilities resulting from the ABM Program. The Safeguard Community Impact Assistance Program (including the community share of costs) was implemented through existing domestic federal agency programs. Prior to cessation of the ABM program, $12.9 million was expended under this program.

Shortly after announcement of the Trident project in Kitsap County, Washington, local officials requested assistance of the Economic Adjustment Committee. The Congress reenacted the Safeguard legislation and permitted the Secretary of Defense to supplement the resources available to the domestic agencies on the same basis of avoiding an "unfair and excessive financial burden" to the Trident impacted communities. A subsequent amendment to the HEW authorization bill permitted the construction of school facilities in anticipation of increased student enrollments. Through December 1980, a total of $28.1 million in assistance has been provided by federal domestic agencies. The DOD contributions have amounted to $86.1 million. Local and state capital contributions have been $92.7 million and $52.2 million, respectively.

Federal community impact assistance has been provided to the Ft. Steward, Georgia area due to significant mission expansion. Additionally, the Department of Defense Access Roads Program has been used for new road construction or improvements to existing roads associated with Defense installation construction or expansion. Special housing assistance is also possible under Section 238(c) of the National Housing Act for areas impacted by new military base expansions.

The existing Federal impact assistance policy applying to M-X calls for impact assistance activities to be conducted through the Economic Adjustment Program (EAP). This program was established by Executive Order 12049 and transmitted to members of the Economic Adjustment Committee by Presidential Memorandum. A specific M-X EAP was initiated jointly by the Air Force and the DOD Office of Economic Adjustment (OEA).

In response to requests of Governor List of Nevada and Governor Matheson of Utah, the Secretary of Defense mobilized the President's EAC to provide Nevada and Utah with assistance in defining the potential growth impacts that the M-X deployment might cause. A preliminary framework for an M-X economic adjustment strategy was developed by the Air Force and the OEA and was transmitted to those states in early 1980. The framework was proposed as a starting point for the development of a more detailed local-state-federal economic adjustment activity.

The objectives of the M-X economic adjustment program are: (1) to minimize the adverse socio-economic effects of large scale rapid growth and (2) to maximize the economic benefits for the affected areas. A major goal of the economic adjustment process is to coordinate and expedite the delivery of federal assistance to meet communities' needs. Four basic components of the M-X economic

adjustment program, as outlined in the preliminary framework, are (a) organization, (b) planning, (c) mobilization of private sector resources and, (d) financing.

At the Federal level the Air Force and the OEA are jointly managing the assistance program. The primary forum for Federal coordination is the President's Economic Adjustment Committee. The EAC, chaired by the Secretary of Defense and composed of 18 executive agencies, is charged with helping communities and individuals that may be affected by changes in DOD programs using a combination of federal, state and local resources. The OEA is the permanent staff of the EAC.

The most critical organizational components in the impact assistance program are the M-X Intergovernmental Working Groups established by the Governors of Nevada and Utah to bring together monthly the main participants of the planning process. Representatives on these working groups are local (municipalities and counties), state (M-X coordinator's offices and other state agencies), and federal (OEA, Air Force and the Corps of Engineers). These groups also review and forward funding requests to the Air Force and approve comprehensive work programs for the use of impact assistance funds.

At the local level there are two multi-agency planning groups (Nevada-M-X Local Oversight Committee and Utah-M-X Impact Policy Board). These groups have full time professional staffs and are composed of elected officials from potentially affected local jurisdictions. They coordinate local impact planning activities, general funding requests, disburse impact planning funds and conduct impact planning studies.

M-X impact assistance planning must be a cooperative intergovernmental activity, with program participants sharing responsibilities in a well-defined planning work program. In FY 80 the Congress appropriated $1 million for impact planning in the states of Utah and Nevada. These funds were used by the four groups discussed above for the purposes of assessing and strengthening state and local institutional capacity; developing baseline data sources; creating and updating comprehensive community development plans; devising growth management policies; identifying and initiating needed state and federal legislative changes; and developing an appropriate economic model for assessing anticipated fiscal impacts.

In the FY81 Military Construction Authorization Act (P.L. 96-418), the Congress authorized a $5 million appropriation (Section 801) to be used for the development of comprehensive plans for the benefit of the states and local communities directly affected by the deployment of the M-X system, to prepare them for the potential impacts and to plan for mitigating those impacts to the maximum extent possible. The plans are to be developed in coordination with the Secretary of Defense and the Department of the Air Force and shall, pursuant to Congressional direction, serve as the basis for the extended community impact program identified in Section 802 of P.L. 96-418.

Section 802 of P.L. 96-418 authorizes the Secretary of Defense to assist communities located near M-X system sites, and the states in which such communities are located, in meeting the costs of providing increased municipal services and facilities, if the Secretary determines that there is an immediate and substantial increase in the need for such services and facilities as a direct result of the work being carried out in connection with the construction, installation, testing

and operation of the M-X system and that an unfair and excessive financial burden will be incurred as a result of the increased need for such services and facilities.

The Secretary is directed by the Congress to carry out this assistance program through existing Federal programs. The Secretary is authorized to supplement funds of existing programs, to provide financial assistance to help communities pay their share of the costs under such existing federal programs and to guarantee state or municipal indebtedness for improved public facilities.

The planning program authorized to be funded in Section 801 of P.L. 96-418 is underway in accordance with the approved comprehensive work programs. The outputs of this program will serve as the basis for future impact assistance funding requests. The Air Force has requested $10 million to continue this effort in FY 82.

In Section 803 of P.L. 96-418 the Congress directed the President to conduct a thorough study to: (1) identify Defense actions that warrant impact assistance, (2) examine the options and recommend organizational mechanisms to administer impact assistance, (3) examine options and recommend procedures for budgeting, (4) recommend changes in existing programs, and (5) consult with state and local authorities. The final report was submitted by the President to the Congress on 28 August 1981.

During the conduct of the 803 study, a special impact assistance legislative proposal was prepared by a joint federal, state, and local task force. The approach would authorize a special impact assistance program for M-X. This program would give states and localities the primary responsibility for impact planning and the identification of impact assistance requirements. These requests would be submitted to the Department of Defense and, following validation, would be submitted to the Congress for appropriation considerations. Following appropriation, funds would be transferred from the Department of Defense to a state fiscal agent to be administered in accordance with the approved Community Impact Services and Facilities Plan.

In summary, a community impact assistance program which focuses on state and local planning is underway. Six million dollars have been appropriated to date and $10 million has been requested in the FY82 budget request. The direction that impact assistance will take is dependent on Congressional action (continue with Section 802 or adopt a Section 803 alternative). In either case, community impact assistance (amount, scope, and substance) depends on state and local planning and the requests generated from that process.

OTHER COMMUNITY PLANNING MITIGATIONS (2.1.2)

In addition to the overall Community Impact Assistance Program, other specific mitigations will be implemented by the Air Force. These mitigations will be directed toward the following resources; quality of life, population, housing, public finance, education, health services, public safety, land-use planning, transportation, construction resources, and Native Americans.

Quality of Life (2.1.2.1)

Mitigation programs for impacts on the various elements comprising the human and natural environment indirectly represent mitigations for some Quality of

Life impacts. Thus, mitigation programs for resource categories such as education, housing, and wildlife also affect Quality of Life.

Mitigations should be directed toward maintaining the continuity of local traditions, institutions, attitudes, and lifestyles by minimizing the effects of change on social structure and providing for the integration of newcomers into the community.

In order to assist in the community integration process, the Air Force will institute social programs for M-X personnel. In addition, the Air Force will advocate making public land available for community development projects and providing federal assistance for social service programs.

Population (2.1.2.2)

The impacts on existing community populations are related to the size of the M-X labor force and the induced secondary effects as well as the location of life support camps and operating bases. Mitigations should be directed toward minimizing the labor force requirements and minimizing the demand for public facilities and services due to an increased temporary population.

The Air Force will minimize the labor force requirements to the maximum extent possible through utilization of labor saving technologies and procedures, and by careful planning and scheduling of construction activities. Temporary facilities for construction workers will be provided at life support camps to minimize the impact of temporary population increases and demand for public facilities and services in communities. For a discussion on mitigation measures for housing, community infrastructure, public finance and urban land use, see other sections of the FEIS.

Housing (2.1.2.3)

Mitigation measures should be directed toward providing temporary housing during the construction period and permanent housing near the operating bases.

The Air Force will provide temporary housing for construction workers in life support camps and initiate a cooperative community planning program to avoid placing an undue burden on neighboring communities. Moreover, the Air Force will advocate that community impact assistance be provided to local governments to help in mitigating impacts on housing. In addition, if, during the cooperative community planning process, it is determined that dependents should be included in life support communities, this measure could substantially reduce the demand for housing in neighboring communities. All excess housing units constructed for M-X workers will be disposed of after completion of the project in accordance with appropriate laws and regulations.

Other potential mitigations that could be effective are outside the authority of the Air Force to implement. However, the Air Force will cooperate with appropriate authorities in the establishment of "off-base" land use controls.

Public Finance (2.1.2.4)

Increased demand for public facilites necessitates the acquisition of large amounts of capital by the community to finance the construction of additional public facilities such as roads, schools and health facilities and services. The Air Force has instituted a cooperative community planning and community assistance program. A comprehensive discussion of this program is contained in Section 2.1. Specific programs and descriptions of mitigations are discussed under the sections on Education, Health Services, Public Safety, Land-use Planning, Quality of Life, Housing and Transportation.

The Air Force will advocate that land-use controls be utilized to guide growth, that training programs for local laborers be established to provide them with the necessary skills to obtain M-X jobs, and that state and local development programs be initiated.

Education (2.1.2.5)

Mitigation measures for educational services should be directed toward meeting increased demand for facilities and teachers during the construction and operational phases of the project.

The Air Force would advocate community impact assistance for local communites to develop both temporary and permanent educational facilities. If, during the cooperative community planning process, it is determined that dependents should be included in life support communities, then providing temporary educational facilities and services in the camps could reduce the demand for those services in neighboring communities.

Health Services (2.1.2.6)

The influx of new residents will cause a rapid increase in the demand for health services. Mitigations should be directed toward satisfying the need for temporary health services and facilities during construction, and for permanent services and facilities near the operating base.

The Air Force will provide health care services in life support camps in coordination with the community planning program and will cooperate with federal, state, and local agencies for emergency health care. In addition, the Air Force will advocate community impact assistance to assist local governments to develop temporary and permanent health care services and facilities. Existing federal programs which could provide assistance include:

Health Services Administration, Public Health Service, Community Health Centers (Public Health Service Action, Section 330)

Health Services Administration, Public Health Service, Medical Facilities Construction - Loans and Loan Guarantees,

Health Services Administration, Public Health Service, Health Planning - Health Systems Agencies (Health Systems Agencies (HSAs))

Other mitigations which are state and local prerogatives include hiring of additional physicians, assistants, and the operation of mobile health care units.

Public Safety (2.1.2.7)

Under the cooperative community impact assistance program, the Air Force will cooperate with federal, state, and local agencies in fire protection and law enforcement. The Air Force will contract with local fire and police authorities for public safety in life support camps where practical. The Air Force will advocate that federal grants be established for public safety services in order to fund the necessary additional public safety programs.

Land Use Planning (2.1.2.8)

Significant pressures for growth and land conversion are expected to be generated during the M-X project. Mitigations for land use planning should be directed toward reducing the impact expected to occur in land use patterns of surrounding communities. The Air Force will provide temporary housing for M-X workers in life support camps which will reduce housing development pressures in nearby communities.

When consistent with M-X project needs, the Air Force will plan roads and utilities for temporary facilities which could be used by the resident community after project completion.

Moreover, the Air Force will advocate that public land be made available for community development, and that zoning and subdivision controls be implemented. The Air Force will cooperate with planning agencies on comprehensive land use.

Transportation (2.1.2.9)

Mitigation measures should be directed toward minimizing the volume of M-X related traffic on existing roads and assisting state and local governments in maintaining and improving existing roads that may be damaged by M-X related traffic.

The Air Force will implement a variety of measures designed to minimize M-X related traffic on existing roads. Buses will be provided to transport workers between life support camps and work areas, and from communities to work areas. Carpools will be encouraged to reduce the number of private automobiles. Construction traffic will use project roads rather than public roads where possible. Work shifts will be staggered when practical to reduce peak period traffic. Truck traffic routes will be designated where practical.

The Air Force will construct defense access roads where they are required as determined by further studies and construct project roads and temporary construction roads. The Air Force will advocate community impact assistance for state and local governments to assist in maintaining and improving existing public roads that may be damaged by M-X related traffic. The Air Force will coordinate transportation planning with federal, state and local transportation agencies.

Other mitigations which the Air Force will implement include paving roads as early in the project as possible and providing traffic control for construction traffic to insure safe and efficient operation.

Construction Resources (2.1.2.10)

The M-X project will require large quantities of several construction resources, particularly cement. Mitigation measures should be directed toward diversifying sources and utilizing construction techniques and procedures to reduce the requirements of scarce resources.

In order to minimize impacts on other construction projects and materials requirements in private sector industries, the Air Force and the COE will diversify cement purchase points and sources to the extent possible. The Air Force will also utilize construction methods and procedures to minimize impacts on scarce resources. The Air Force will consider both the use of off-site construction techniques, and the design of permanent facilities such that they also satisfy temporary needs.

The Air Force will provide centralized procurement of materials and equipment to minimize adverse economic impacts to other industries where feasible.

Native Americans (2.1.2.11)

A Programmatic Memorandum of Agreement (PMOA) for the preservation of historical properties and resources has been negotiated among the Air Force, the Bureau of Land Management, and the Advisory Council on Historic Preservation. This agreement establishes procedures for compliance with existing federal laws to protect cultural resources, including Native American ancestral and sacred sites. The Air Force will coordinate and consult with Native Americans on M-X planning activities, and will avoid cultural sites in accordance with the PMOA. In addition, the Air Force will involve Native Americans in Cultural/Historical Resource Programs and will coordinate and consult with Native Americans on M-X siting activities. Further, the Air Force will establish a mechanism for a community impact assistance program for Native Americans in conjunction with a non-Native American assistance program.

2.2 ENVIRONMENTAL PROTECTION PLANNING

Air Force environmental protection planning is a process for correlating all environmental quality standards, policies and requirements affecting existing and proposed installation activities and facilities, and insuring that all Air Force actions are reviewed for environmental impact. Significant activities within environmental protection planning are: management of the environmental impact analysis process, preparation and maintenance of pollution control plans, and organization and management of the base environmental protection committee. Specific resources that fall under this program are air quality, water, waste, noise, and energy.

AIR QUALITY MANAGEMENT (2.2.1)

Air quality will be managed primarily through implementation of a dust control program and an emissions control program. The dust control program will

include procedures to monitor air quality throughout the construction of the system. This will ensure compliance with the overall program and identify areas where excessive dust is generated.

Most fugitive dust will be caused by vehicles and equipment, or by exposed surfaces. The program will establish design policy and construction procedures that will minimize surface disturbance and control erosion. Construction traffic will stay on road surfaces, and off-road construction travel will be subject to restriction. Dust palliatives will be applied to roads to minimize dust generated by moving vehicles. Vehicle travel will be kept at a minimum. A bus system to transport workers to work areas will be established. Speed limits will be established and enforced. The DTN will be paved as early in the project life as practicable in order to reduce fugitive dust. Dust control equipment will be provided on vehicles and stationary sources. Aggregate storage areas and areas experiencing construction activity will be designed to minimize dust. Respiratory protection devices will be provided for workers when required.

In order to prevent temporarily disturbed areas from becoming long-term sources of dust, a revegetation program will be established. The revegetation program is discussed in Section 2.3.

The emissions control program will ensure that emission levels comply with federal, state, and local air quality standards through the establishment of an air quality monitoring program.

Emissions will be minimized by designing the operating base for both reduced vehicle travel and nonmotor vehicle transportation. Nonpolluting energy sources will be utilized where feasible. Bus systems will be established for construction personnel. Additionally, buses will be available for operating base personnel to travel within the base itself.

Emission control equipment will be provided and an inspection and maintenance program will be established for Air Force vehicles.

WATER MANAGEMENT (2.2.2)

A water management program will ensure compliance with state water appropriation laws and federal and state water quality laws. This will include a program to monitor the quality and quantity of surface water and the amount of water table drawdown. To provide water for the project, the Air Force will investigate and develop new water points. Existing water rights will be purchased or leased as required. At locations where it would reduce impacts, water may be imported from adjacent valleys during construction where practicable.

The Air Force will implement a water conservation program for construction and operation. The Air Force will advocate reclaiming water for multi-purpose use. Temporary facilities for water storage and retention ponds will be constructed as required. A well-field management plan will be developed for groundwater withdrawal to mitigate potential impacts on surface water.

Project design and construction procedures will be developed for erosion control, including the installation of drainage structures, surface contouring and

landscaping. A revegetation program will also be established. This is discussed in more detail in Section 2.3.1.

WASTE MANAGEMENT (2.2.3)

The Air Force will implement the following mitigations to minimize impacts to solid waste, wastewater, and hazardous waste disposal.

Solid Waste (2.2.3.1)

The Air Force will dispose of waste in accordance with federal, state and local regulations. Construction and operation practices will minimize the volume of solid waste and a materials recovery program will be developed. Surface and groundwater quality will be monitored to ensure that solid waste disposal practices do not impact water quality. The Air Force will also seek authority to develop joint-use facilities where cooperative community planning determines it would be beneficial.

Wastewater (2.2.3.2)

A wastewater program will be developed to insure water conservation, compliance with federal, state and local regulations and monitor wastewater effluent. Facilities will be designed with current techniques to minimize the volume of wastewater. Joint-use facilities will be developed where cooperative community planning determines it would be beneficial. The Air Force will advocate reclaiming wastewater.

Hazardous Waste (2.2.3.3)

The Air Force will implement a hazardous waste program to ensure compliance with federal, state and local hazardous waste regulations. A countermeasures and contigency plan will be developed and implemented for potential spills. Procedures will be developed to minimize the volume of hazardous waste. Surface and groundwater quality will be monitored.

NOISE MANAGEMENT (2.2.4)

The noise management program will consider noise impacts in planning construction activities and highway siting. Facilities will be designed to utilize noise absorption and insulation measures, and maximize the distance between noise sources and receiver where appropriate. Airfields will be located in accordance with Air Installation Compatible Use Zone (AICUZ) policy.

ENERGY MANAGEMENT (2.2.5)

The Air Force will design facilities to utilize alternative and unrenewable energy sources where feasible and facilities will be sited to minimize energy use. Planning of energy facilities will be coordinated with local utilities. An energy conservation program will be established and an energy monitoring and control system will be developed for the operating bases.

2.3 NATURAL RESOURCES PLANNING

Air Force natural resource planning will include preparation of base natural resources management plans and the management of land, mining and minerals, grazing and range, agriculture, forestry, wildlife, recreation, and cultural and paleontological resources. Effects upon resources not on Air Force lands, such as visual resources and wilderness, will be managed in cooperation with applicable federal and state agencies.

LAND MANAGEMENT (2.3.1)

Construction of the M-X transportation network, missile shelters, and operating facilities will require that native vegetation be removed. This will impact livestock forage, wildlife habitat, and soils erosion. To minimize the impact of soil problems, the Air Force will establish a soil erosion control program. Construction will be planned to minimize the disturbence of areas and sites will be selected which have favorable drainage, topography, and soils. Planning will encompass directing runoff to suitable outlets and sediment basins where required. Revegetation with suitable native plants will be utilized as an erosion control measure.

Construction activities will minimize soil mixing wherever possible by avoiding highly productive soils and stockpiling and replacing surface soils. Adverse soil compaction will be minimized by restricting construction off-road travel.

The Air Force will establish a revegetation program in cooperation with appropriate federal and state agencies. This program would include measures to field investigate existing vegetation communities, minimize disturbed areas, confine vehicles to designated corridors, utilize effective soil handling procedures, reapply high-quality surface soils, amend low-quality surface soils, develop a seeding and transplanting program, irrigate as applicable, restrict livestock grazing in revegetation areas, restrict off-road travel, monitor revegetation areas, and include vegetation valuable to specific wildlife.

The Air Force will establish a visual resource management program. This program would include preparation of visual simulations to assess impacts, facilities design and placement to lessen visual impacts insofar as feasible, and monitoring to protect visual resources.

The Air Force will withdraw from public use the minimum land required for M-X. It will also relocate or otherwise compensate for impacts to rights of way. M-X roads will be open to public use after the completion of construction. The Air Force will utilize point security to allow normal agricultural, grazing, ranching, mining, and recreation activities up to M-X shelter fences.

In addition, the Air Force will develop a fire prevention and protection program in cooperation with the Bureau of Land Management and state and local fire agencies.

MINING AND MINERALS (2.3.2)

During the siting of M-X facilities, areas of known high value mineral deposits will be identified and avoided. The Air Force will coordinate and cooperate with local mine operators to minimize disruption of mining operations. Where it is not

practical to totally avoid a claim, impacted claim holders will be compensated in accordance with law. These mining conflicts will be settled on a case-by-case basis.

After the construction of shelters is completed, if a high value mineral resource is discovered and recovery is economically justified, the Air Force will advocate that Congress consider the abandonment or dismantling of affected shelter sites if it is necessary for mineral recovery.

GRAZING (2.3.3)

Measures to reduce the impact of M-X on grazing and ranching operations should be directed toward minimizing the loss of annual forage through removal of vegetation, loss of access to rangelands, the loss of watering sites and other disturbances which could increase ranch operating costs.

The Air Force will implement programs to minimize disruption of ranch operations through system design and control of off-road construction traffic. This will be accomplished by reducing soil disturbance and providing gates, cattleguards, fencing and improved access. The Air Force will also provide replacement water sources for livestock as required.

In order to further reduce impacts on ranching operations, the Air Force will accomplish a revegetation program and an erosion control program in cooperation with appropriate federal and state agencies. In those cases where grazing resources and facilities cannot be avoided or ranching operations are affected, the Air Force will provide monetary compensation to owners in accordance with law. The Air Force will institute education programs for construction and operating base personnel.

AGRICULTURE (2.3.4)

The Air Force will site project facilities to avoid irrigated lands where feasible. Where private land is required for the project, owners will be compensated in accordance with law. As discussed under the water management program, the Air Force will minimize water use to avoid impacting water sources for irrigation where possible.

FORESTRY MANAGEMENT (2.3.5)

The Air Force will cooperate with federal, state, local and tribal agencies when working in forest management areas.

FISH AND WILDLIFE MANAGEMENT (2.3.6)

The Air Force will implement management programs with the objective of protecting wildlife, aquatic and plant species in accordance with the federal Endangered Species Act and other applicable federal and state laws.

The Air Force will institute cooperative programs with appropriate federal and state agencies for wildlife management. The Air Force would assist in identifying, monitoring, and managing species to counteract project impacts. These programs would include all or part of the following, as appropriate: avoid important habitats,

if possible; schedule activities to avoid critical periods; fence selected construction areas; provide supplemental or replacement water and/or food sources; restrict worker pets in life support communities; suppress adverse noise impacts; assist enforcement and management agencies; transplant wildlife; and provide additional habitat or alter other habitats to offset impacts.

To protect rare, threatened, and endangered species, the Air Force will institute cooperative programs with federal and state management agencies, identify the critical habitat of rare, threatened, or endangered species and monitor populations. Sensitive habitats will be avoided and construction activities will be scheduled to minimize disturbance insofar as possible. Additional measures to minimize impacts will include restricting construction off-road travel and restricting firearms in life support camps and at job sites. When the avoidance of habitats is not possible, the Air Force will determine suitable replacement habitats and will relocate species as required.

In order to prevent the spread of noxious vegetation and the inadvertent introduction of new species, the Air Force will survey noxious vegetation and introduced species and monitor infestation levels. Eradication of unwanted vegetation caused by M-X activities will be accomplished in conjunction with the revegetation program.

The Air Force will cooperate with federal and state agencies' management of wild horses and burros in accordance with the Wild Horse and Burro Act of 1971.

RECREATION (2.3.7)

The Air Force will provide recreational programs in temporary life support camps in cooperation with local communities. In addition, the Air Force will advocate both the improvement of community recreation facilities and additional recreational activities.

The Air Force will provide educational programs for M-X personnel and their dependents and assist federal, state, and local agencies in providing recreational management. Moreover, the Air Force will assist the public in search and rescue efforts during emergencies. The Air Force will advocate cooperating with federal and state agencies in controlling off-road vehicle areas.

CULTURAL RESOURCES (2.3.8)

The Air Force will establish a cultural resources program in conformance with the Programatic Memorandum of Agreement (PMOA) and consistent with large government programs. The PMOA was established among the Air Force, the Bureau of Land Management (BLM) and the Advisory Council on Historic Preservation in order to protect/recover historical/cultural resources (including paleontological), through approved procedures. The full text of the PMOA is contained in Chapter 5 of the FEIS.

In accordance with the PMOA, the M-X Cultural Resource Management Program will be developed by the Air Force and COE specifically for the project in consultation with SHPO's, Advisory Council on Historic Preservation, BLM, and Native Americans, where appropriate.

PALEONTOLOGICAL RESOURCES (2.3.9)

Under the Air Force's Cultural Resources Program, the Air Force will provide for the evaluation of paleontological resources encountered during construction and for data recovery, as appropriate.

WILDERNESS (2.3.10)

The Air Force will cooperate with federal, state, and local agencies in managing visitations to wilderness resource areas and provide an education program for M-X workers and dependents. Wilderness areas will be avoided in siting and impacts such as noise and lowered air quality will be minimized during construction and operation. Visual impacts will be minimized by means of visual resources management during siting, design, and construction.

3.0 RESOURCE MITIGATIONS

This section discusses mitigations on a resource-by-resource basis. This format is provided to enable a reader to review specific resource mitigations. Each resource area includes a discussion of Air Force programs which will be used to mitigate adverse environmental impacts. Additionally, other mitigations under consideration are provided to present a range of possible mitigations. The mitigations included under the heading "Other Mitigations Under Consideration" have not been committed to by the Air Force. These potential mitigations will be reviewed on a case-by-case basis during subsequent planning.

3.1 QUALITY OF LIFE

"Quality of life" is a term that describes personal satisfactions and concerns with one's total setting, which is made up of human and natural resources. A comprehensive discussion of "quality of life" is given in ETR-35. Mitigations for many aspects of the quality of life are discussed in subsequent sections that focus on specific sectors of social life such as education, health services and public safety, and specific natural resources such as wildlife. In this EIS, certain social aspects such as community integration, the structure of social groupings in an area, and interaction patterns are treated in the "Quality of Life" section. The mitigations in this section address impacts on these aspects of social life.

Social aspects such as community integration are particularly vulnerable to change through large, rapid increases in population which, in turn, change the distributions of social status and political power in an area, alter the structure of social groupings, and add new values and ways of life. Newcomers need to become familiar with a new setting and integrate themselves into it. Present residents need to adapt to newcomers, and to the changes that would be induced both by the construction and operation of as large a project as the M-X system and by mitigation measures for a variety of specific social and natural impacts. Some quality of life mitigation measures can ease adaption to changing conditions, but are unlikely to prevent the occurrence of change in ways of life, community integration, values and interaction patterns.

Satisfaction with the quality of one's life is partly dependent on the goals and aspirations that residents of an area have for themselves and their community. The intergovernmental community impact assistance process (described in Section 2.1) would enable impacted communities to consider the goals and aspirations they wish to set for themselves, given both new opportunities and constraints that would be presented by construction and operation of the M-X system. From an analytic standpoint, residents can ask themselves what aspects of M-X conflict with local goals and aspirations, what aspects of M-X enhance local goals and aspirations, and what new goals and aspirations would be practical with the presence of M-X. A community's answers to these questions could alter their conception of the quality of their lives during the mitigation planning process itself.

AIR FORCE PROGRAMS (3.1.1)

To facilitate integration processes for Air Force personnel and dependents, the Air Force will establish a variety of social programs at operating bases. To help

communities with their quality of life concerns, the Air Force will advocate provision of Federal assistance for social service programs and making public land available for community development projects. The Department of Defense and the Department of Agriculture's; Farmers Home Administration have programs which could provide assistance in these areas. Mitigations for impacts on housing, health and community services, transportation, recreation, education, and employment are addressed in other sections of this ETR.

OTHER MITIGATIONS UNDER CONSIDERATION (3.1.2)

The intergovernmental community impact assistance process would be the key program for mitigating quality of life impacts. The way in which local governments participate in the planning process, and the types of mitigation plans they develop for themselves, would shape their future quality of life. In addition, there are other mitigation steps that local groups, both governmental and non-governmental, could undertake to mitigate impacts on such social aspects of the quality of life as community integration.

In general, the integration of newcomers into communities, especially those that are relatively small and socially homogeneous, is problematic for several reasons. First, established residents tend to have a full round of social life based on family, friends and community activities which leaves little time or energy for making friends with newcomers. Second, in some localities, established residents do not readily accept newcomers until the latter show their commitment to the area through active participation in local affairs over several years. Sometimes this can be as long as five to ten years. Where this is the case, workers who are likely to be in an area for only a few years, would probably not gain acceptance even though some may participate in community affairs. Third, in some areas, even though newcomers may be active in local affairs and attain elective office, they are never fully accepted by the long-established families who make up the "old guard" or the inner circle. Although full integration of old timers and newcomers occurs rarely, in locations where newcomers arrive in insufficient numbers, they can change some aspects of the quality of life through their participation in local affairs by introducing new ideas. Theoretically, established residents would stand a better chance of avoiding some quality of life changes if they were willing to accept newcomers, especially those who show a willingness to conform to local norms and accept local values.

A number of mitigation steps could be undertaken by local groups to further communtiy integration. Community relations committees could be formed to develop innovative approaches to assimilate newcomers. Information services could be developed to inform newcomers about all aspects of local life, including where certain services can be obtained, local history and traditions, leisure and recreation opportunities, churches and voluntary organizations. Special cultural and social activities could be planned in which like-minded newcomers and residents could meet each other. Voluntary organizations could organize membership drives to encourage newcomers to join (HUD, 1976:625; Gilmore and Duff, 1975). Hospitality programs, such as welcome wagons, can also help ease the entry of new households into an area (HUD, 1976:25; Greene and Curry, 1977:7). Such steps would help maintain community identity and pride, without ignoring or denying the real problems that arise when rapid growth occurs, including the finding of scapegoats for problems that are no one's fault in particular (Cortese, 1980a:24-25).

State university or local colleges could provide community development technical or research assistance to localities through appropriate departments, particularly in dentifying social values and social problems (Greene and Curry, 1977:7; Uhlmann, 1979:407). Local branches of state agencies could be established to facilitate state services and technical assistance to communities (Greene and Curry, 1977:70). State universities could establish human services to assist impacted areas, such as the Wyoming Human Services Program provided by the University of Wyoming (Uhlmann, 1979:407).

3.2 WATER RESOURCES

AIR FORCE PROGRAMS (3.2.1)

The primary source of water for the M-X program is from the groundwater supply. The Air Force will comply with state water law, and may purchase or lease existing water rights. The fundamental approach is to plan water resources development to avoid or minimize impacts.

The Air Force will establish a comprehensive hydrologic monitoring program in cooperation with state water engineers. This program would help ensure that impacts resulting from withdrawals at M-X wells would be detected. The purpose of such a program would be to monitor hydraulic responses and water quality trends caused by M-X pumping. The details of this program will be tailored to the unique conditions encountered at each site ultimately selected and approved for M-X water diversions. The program elements will include regularly scheduled monitoring of water levels in existing wells and M-X wells, water quality sampling, and, where appropriate, measurement of spring flows. Such a program would help provide for detection of deleterious effects of M-X withdrawals so that pumping schedules can be adjusted or, if necessary, certain well use can be controlled, restricted or terminated.

OTHER MITIGATIONS UNDER CONSIDERATION (3.2.2)

A most commonly applied and effective mitigation measure is to ensure that well placement and well design are based on sound hydrological and geological studies of the groundwater system. In states like Nevada, Utah, and New Mexico, where groundwater resources are managed and administered under an appropriation doctrine, such studies are routinely performed to defend water rights applications. The results of the studies are presented to the state engineers to demonstrate that a proposed groundwater development scheme will not result in impairment of senior water rights. Mathematical models are commonly applied in these studies to project the hydraulic responses of aquifers to withdrawals, and to further demonstrate that approval of an appropriation application will not impinge on existing rights.

Development of groundwater to satisfy M-X needs will be done in accordance with state law. In defending its applications to appropriate groundwater, the Air Force will have to meet a standard of performance as stringent as that required of any other party requesting large appropriations. Undesirable impacts can be predicted and effectively reduced when state-of-the-art methods are used to collect and analyze hydrologic data, and when the results of such work form the basis for planning and developing final designs for water development. The data collection activities of the M-X water resources program are discussed in detail in Section 3.1.2 of Chapter 3.

During the drilling and construction of M-X wells, an experienced hydrologist and/or geologist should be at the site to collect geologic and hydrologic data and to insure that the wells are installed properly. At the completion of well construction, pump testing should be conducted to evaluate aquifer response characteristics and well yield, so that the permanent pump can be sized properly and in accordance with state law. This testing would also be valuable in projecting possible adverse impacts of M-X pumping and would provide data useful in designing an optimum pumping schedule and an effective operational monitoring program.

In some cases, the early construction of M-X wells and enclosed storage reservoirs could offer a method of reducing both the number of wells required and the annual groundwater withdrawal rate.

Water Supply Alternatives (3.2.2.1)

Because of hydrologic, legal, environmental, and/or economic constraints on groundwater development, the M-X system may be unable to rely on a single water source. In some areas, it is possible that combined surface and groundwater development, the lease or purchase of existing water rights, or special innovative water systems will be used to satisfy M-X water requirements so that unacceptable impacts are avoided. However, such options should be examined carefully before implementation, since other impacts are commonly associated with these alternatives. For example, the lease or purchase of existing water rights would not result in an increase in the quantity of water diverted for beneficial use, but such transfers could change the points of diversion which would have to be addressed before the state water engineer, as would the change in water use.

Additionally, water rights transfers may result in socioeconomic impacts where an existing economy is heavily based on water development for a certain industry or group of industries like irrigated agriculture, and/or mining and ore processing.

A number of innovative methods of obtaining water for M-X construction or operation are at least theoretically and technically possible. If, after further study, they are found to be practicable in some areas, they could serve to mitigate impacts associated with more conventional water development methods. For example, any technique which salvages water, which would otherwise be lost to evapotranspiration, can reduce the amount of water diverted from aquifer storage or withdrawn from a surface reservoir. In some settings, it may be feasible and cost-effective to construct retention dams in the canyons of the bordering mountains to capture all or a portion of the water that would normally reach and temporarily flood the playa. This water could then either be used directly or be released slowly for recharge into the heads of the alluvial fans. This practice has been applied successfully in California, and possibly can greatly increase groundwater withdrawals from the bajada areas (Lohman, 1972).

It should be emphasized that while such practices for salvaging lost water can be effective in certain settings, they are not techniques which are broadly applicable or effective in producing dependable supplies of water throughout the Great Basin Region. Such methods can be quite costly, and the dams and diversion works require careful maintenance, including removal of debris and accumulated sediment. The dam structures and spillways must be carefully designed to

accommodate peak flows that have a reasonable probability of occurring during the life of the project. Adequate hydrologic data needs to be collected or be available to provide a basis for these design elements. Such water salvaging methods can, however, be effective in augmenting water supplies, given the right hydrologic conditions and economic circumstances. At OB sites, for example, the high initial cost of such measures can be amortized over a period of 20 to 30 or more years and adequate personnel should be available to ensure proper maintenance of the physical structures.

If appropriations are not approved in sufficient quantities to meet the projected M-X OB demands, leasing or purchasing local water rights could be a viable alternative for most Nevada/Utah sites. Water importation could be another alternative.

Extensive development of groundwater resources in large portions of the Texas/New Mexico siting area has occurred and provides the basis for a strong agricultural economy. The competition for groundwater in many of these areas is intense and has generated concern among the farmers and ranchers that M-X water requirements could threaten the local economy. However, in some areas of both west Texas and eastern New Mexico, it is possible that groundwater could be withdrawn and diverted to M-X use without significantly disrupting the agriculturally based economy of the region. For example, some lands, in both states, have recently been withdrawn from irrigated agricultural use for economic reasons. Groundwater supplies are still available in these areas; however, the combination of increasing pumping lifts and higher energy costs has made it increasingly difficult for irrigators to realize reasonable profits. Much of this land remains in production, as dry-land farming is now being practiced. In some of these areas, it may be feasible and desirable to satisfy M-X demands using existing wells to recover groundwater which is effectively unavailable to agricultural users for economic reasons. In other portions of the Texas/New Mexico siting area where groundwater supplies are insufficient, it may be possible to transport water from adjacent or distant areas with available supplies. For example, surface water may be available at Ute Reservoir. Diverting some of this water for M-X could be an effective mitigating measure to avoid unnecessary aquifer depletion in portions of the deployment area.

Saline water encroachment caused by extensive pumping of groundwater for irrigation has been a problem in some areas of the southwestern United States. This has been a problem in the Roswell, New Mexico area for many years, for example (New Mexico Water Quality Control Commission, 1975). Solutions to problems of saline water intrusion are rarely simple, and effective measures must be based on careful examination of the characteristics of each situation. Should such problems arise as a result of M-X pumping, solutions will likely require consideration of both water quality and specific legal water rights issues. Mitigation techniques which may be employed individually or in combination with each other include:

1. Pumping the saline aquifer in its source area to reduce the head and retard or stop migration toward the area of encroachment.

2. Reduce the pumping of fresh water in the area of encroachment.

3. Augment supplies from other sources.

4. Rearrange the well distribution pattern in the area of encroachment.

5. Inject freshwater along the zone of encroachment to increase the head in the freshwater aquifer.

Evaporation (3.2.2.2)

Evaporation from reservoirs, lakes and rivers accounts for hundreds of thousands of acre-ft annually. There are two alternatives for salvaging some of this lost surface water due to evaporation. The first involves use of evaporation suppressants. It has been demonstrated that a monomolecular film formed by such substances as hexadecanol on the water surface can significantly reduce evaporation losses. However, major problems involving economic application and detection of the film would require more research before a practical, operational evaporation reduction program will be available.

Another method to reduce evaporation would be to utilize underground storage where adequate aquifers exist. Underground storage possibilities are limited by available aquifer space and the extensive systems required to introduce and withdraw the water. Underground storage does not provide the opportunity for recreation, fishing, and wildlife activities presented by surface ponds and lakes.

Desalination (3.2.2.3)

There are scattered supplies of saline water located throughout the study area which are not currently being used. Desalination is the converstion of freshwater from saline water, which usually involves distillation, membrane and crystallization processes. It seems likely that some users such as power, self-supplied manufacturing, rural domestic and urban would utilize this supply source.

Wastewater Reclamation (3.2.2.4)

The reclamation of wastewater for uses in irrigation, power, mining, and manufacturing is already an accepted practice. Wastewater generated from domestic use within the M-X Operating Bases could be treated and re-used for local watering and irrigation. Wastewater reclamation is being examined for application for the M-X project.

3.3 EROSION

The importance of minimizing impacts to the soil resource can be understood by examining some soil properties and uses. Most of the soils of the Nevada/Utah study region support rangeland and many are potentially arable. Of the soils in the Texas/New Mexico study region, most are fertile and presently support irrigated crops, dryland farming of a few drought tolerant grain crops, and rangeland. In both regions, the soil supports associated communities of native vegetation and wildlife. Finally, as a porous mantle over the earth's surface, soil acts as a reservoir for the collection and storage of water from rain and melting snow that might otherwise be lost as unrestricted runoff.

Disturbance of the soil system will be unavoidable during vegetation clearing, grading, earthwork, and other M-X-related contruction activities. The primary

impact to the soil resource resulting from these activities is loss of the finer soil particles due to an increased susceptibility to wind and water erosion, leaving the soil surface most coarsely textured, less fertile, and less capable of holding water. Other associated impacts to soils are degradation of surface soil quality as surface soils are mixed during excavation activities with subsoils of distinctly lower quality, and destruction of the soil structures as the soils are compacted by heavy construction equipment and other vehicles. Each of these primary impacts has important associated secondary impacts; e.g., wind eroded silts and clays degrade air quality and water erosion causes increased sediment loads to surface waters.

Soils will become susceptible to erosion as the natural vegetation cover and, in certain areas, desert pavement, which normally provide protection against the erosive forces of wind and water, are removed or deteriorated over large areas. Water erosion will be further accelerated as earthwork activities change natural drainage patterns. Gully formation could be a significant problem on the downslope side of roads as runoff is concentrated through culverts. Wind erosion of the fine soil particles will result as vehicles drive across the dry soils and earthwork projects move them about.

In addition to causing the loss of the soil resource, such acceleration of the erosion processes will cause many adverse secondary impacts. Sediment carried in runoff water from construction sites can pollute streams, block drainage and irrigation ditches, damage crops and reduce the productivity of adjacent natural areas. Wind erosion will result in the degradation of the ambient air quality until the soil surface is adequately restabilized. Furthermore, wind carried soil particles will damage downwind land, crops, native vegetation, buildings, and fences, cause traffic hazards, present potential health hazards and make a general nuisance.

Construction of protective structures may involve excavations 20 ft deep or more at each protective structure site and the deposition of the soil material at the surface. Earthwork activities during road construction will also disturb the vertical soil profile although the disruption will generally be shallower. Lower soil horizons contain leached substances (salts, alkali, and other deleterious substances) in concentrations that would restrict normal plant growth. Mixing of these deep soils with the productive upper layers will result in a lower level of plant productivity and enhance wind and water erosion, affecting the necessary revegetation efforts as well as future agricultural activities.

Heavy construction equipment operating on wet soil surfaces as well as repeated passes of smaller vehicles over soil surfaces would cause the soil to compact and lose its structure. Compacted soils are difficult to revegetate without adequate treatment. In addition, compacted soils have lower infiltration rates which result in increased runoff rates and accelerated erosion.

AIR FORCE PROGRAMS (3.3.1)

The Air Force will establish an erosion control program including: selection of appropriate sites where drainage, topography, and soils are favorable for planned use, minimization of disturbed areas, control of runoff by constructing temporary sediment basins, revegetation of disturbed areas, minimization of soil mixing, paving of roads as early in project life as practicable, application of dust palliatives on roads, and control of off road travel.

OTHER MITIGATIONS UNDER CONSIDERATION (3.3.2)

Water Erosion (3.3.2.1)

Many of the adverse water erosion impacts associated with soil disturbance during construction activities can be avoided or reduced in duration and magnitude through the mitigation measures discussed in the following (from "Guides for Erosion and Sediment Control in Nevada," USDA, SCS, Reno, Nevada. August 1976).

Erosion and sediment can be controlled on construction sites if certain principles are followed in the use of treatment of land. These principles are: (1) using soils suited for the development, (2) leaving soil bare for the shortest possible time, (3) reducing the velocity and controlling the flow of runoff, and (4) releasing runoff safely into downstream areas.

Combinations of the following practices have proven effective in applying the above principles:

1. Select land where drainage patterns, topography, and soils are favorable for the planned use. Throughout the site selection process, it should be noted that the potential for water erosion increases with slope steepness and length. The potential for soil erosion in any one of the valleys in the Nevada/Utah study region could be reduced by moving the project to areas within the valley where the slope is less steep and shorter.

2. Fit the development to the site and provide for erosion control in the development plant. Erosion control design measures that can be incorporated into site development plans are discussed in detail in various sources (Clyde et al., June 1978; USDA Soil Conservation Service, August 1976; U.S. Department of the Navy, October 1979; and Technical Guides available at each of the field offices of the Soil Conservation services).

3. Subdivide large tracts into smaller units on which construction can be completed rapidly to minimize the area exposed to erosion.

4. Remove vegetation only from areas where it is necessary and reducing grading to the minimum required.

5. Control runoff and diverting it to suitable outlets.

6. Protect critical areas during construction with mulch, temporary seedings, or mechanical measures.

7. Construct sediment basins to detain runoff and trap sediment during construction.

8. Provide safe off-site disposal of runoff.

9. Establish permanent vegetation and installing erosion control structures as soon as possible. For additional discussion of this mitigation, refer to Appendix B of ETR-14 "Vegetation."

If successful erosion control treatment is applied to the land in the watershed, sediment production can be reduced to levels which would cause negligible damage to the lands and facilities below the site and the need to install protective measures for sediment control would be minimized. When sediment yield is high enough to be a hazard to lands and facilities below, sediment control measures need to be applied. These are discussed under surface water mitigations.

Revegetation of disturbed lands is one of the most important components of an erosion control strategy. The cost of revegetating disturbed lands is directly related to the area required to be revegetated, the amount of leveling and shaping that would be required and the effectiveness of precipitation received during the establishment period. In most areas of the Nevada/Utah study region and many areas of the Texas/New Mexico study region, revegetation may not be successful without irrigation. This demand for the use of supplemental water will incur great economic costs and will produce conflicts in the allocation of the existing water resources. These issues apply in the same manner to revegetation as a mitigation for wind erosion, as discussed in the following.

Wind Erosion (3.3.2.2)

In order to minimize wind erosion of the soil during M-X construction activities, the following mitigation measures, as recommended by the New Mexico Eastern Plains Council of Governments, could be implemented where feasible:

1. Avoid coarse textured soils and dune sand areas.

2. Salvage and stockpile all soil suitable for use in revegetation practices.

3. Disturb the least possible area to effectuate the job.

4. Maintain vegetative cover on construction areas to the latest possible time.

5. Perform emergency tillage on all possible areas as soon as wind erosion starts.

6. Stabilize the areas to native vegetation on rangeland or condition compatibe with land use.

7. Protect area until cover is well established, or it is returned to desired use.

8. Lay out roads considering wind direction and treat surfaces to minimize wind erosion.

9. Plan works to have the least conflict with lands that have conservation practices, including installing windbreaks.

The best procedure to rapidly stablize an area that has been subjected to wind erosion is to: 1) fence the area and eliminate grazing and other disturbance; 2) smooth the area, break up hard pans and prepare a seedbed; 3) lay out and develop a supplemental irrigation system; 4) mulch the area; 5) plant a mixture of native

grasses with suitable drill, in June or July; 6) add appropriate amounts of fertilizer; 7) allow the vegetative stand to become well established; 8) reseed areas that do not catch on the first attempt, and defer the area for three to five years or until establishment is successful; 9) develop a very light grazing system that allows the grass to retain its vigor and stand density; and 10) prohibit vehicular traffic in the area.

Areas where highly productive surface soils are underlain by subsoils of distinctly poorer quality could be identified and mapped. The extent of earthwork in such areas could be minimized in order to preserve the quality of the soil resource. If avoidance is not possible, surface soil determined to be of distinctly higher quality than the underlying horizons could be selectively stockpiled during excavation and later replaced. These soil-revegetation related mitigations are discussed in further detail in "Soil Handling Procedures to Maximize Revegetation Potential in the Nevada/Utah Candidate Siting Region for the M-X Missile System" (Master, 1980).

Soil compaction is best minimized by controlling off-road vehicle travel, especially on wet soils. In areas where compaction is inevitable, thereby making revegetation more difficult and increasing water erosion problems, tillage practices can be employed after construction. Tillage loosens the compacted surface while preparing a suitable seed bed for revegetation. In addition, tillage, along with contour terracing, contour furrowing, contour trenching, mulching, deep chiseling and other activities, facilitates runoff intake and retention to achieve moisture conservation for revegetation and to help control runoff and erosion.

3.4 AIR QUALITY

Air quality impacts resulting from the M-X system will occur both during the construction and the operating phases. The primary pollutant emission during construction is particulate matter. The major sources for this pollutant are fugitive dust emissions from construction activities, vehicle travel over unpaved roads, and wind erosion from disturbed surfaces. An additional significant source of particulate matter occurs at the asphaltic concrete plants. Gaseous emissions of NO_x, CO, TSP, and SO_x will be released from construction vehicles as well as the vehicles of construction workers commuting to and from the work sites. A large source of NO_x will be the generator associated with concrete batching plants in the deployment valleys.

During system operation, the major air quality impact will result from wind erosion emission from disturbed surfaces. Additional particulate matter and gaseous pollutants will occur due to vehicle travel over DTN and cluster roads during operation. At the operating bases, air quality impacts will result primarily from emissions from vehicle traffic, and various residential emissions at the base community.

AIR FORCE PROGRAMS (3.4.1)

The Air Force has committed to a program of air quality monitoring in the deployment areas during construction and operation. The monitoring program will include measurements of both particulate and gaseous pollutants. The purpose of this program is to identify potential air quality problems, monitor the effectiveness of mitigation measures, and idenfity where the need exists for additional mitigation of emissions.

Air quality will be managed primarily through implementation of a dust control program and an emissions control program. The dust control program will include procedures to monitor air quality throughout the construction of the system. This will ensure compliance with the overall program and identify areas where excessive dust is generated.

Most fugitive dust will be caused by vehicles and equipment, or by exposed surfaces. The program will establish design policy and construction procedures that will minimize surface disturbance and control erosion. Construction traffic will stay on road surfaces, and off-road construction travel will be subject to restrictions. Dust palliatives will be applied to roads to minimize dust generated by moving vehicles. Vehicle travel will be kept at a minimum. A bus system to transport workers to work areas will be established. Speed limits will be established and enforced. The DTN will be paved as early in the project life as practicable in order to reduce fugitive dust. Dust control equipment will be provided on vehicles and stationary sources. Aggregate storage areas and areas experiencing construction activity will be designed to minimize dust. Respiratory protection devices will be provided for workers.

In order to prevent temporarily disturbed areas from becoming long-term sources of dust, a revegetation program will be established. The revegetation program is discussed in Section 2.3.

The emissions control program will ensure that emission levels comply with federal, state, and local air quality standards through the establishment of an air quality monitoring program.

Emissions will be minimized by designing the operating base for both reduced vehicle travel and non-motor vehicle transportation. Nonpolluting energy sources will be utilized where feasible. Bus systems will be established for construction personnel. Also, buses will be provided for operating base personnel to travel within the base itself.

Emission control equipment will be provided and an inspection and maintenance program established for Air Force vehicles.

OTHER MITIGATIONS UNDER CONSIDERATION (3.4.2)

For dust control, wet suppression with water alone is unlikely due to limited water resources in the basing region. The use of water mixed with a wetting agent (surfactant) is an effective suppressant of dust and would decrease the amount of water needed. Application of oil to road surfaces is an effective measure, but one that has side effects. Trucks traveling on an oily road would have a greater likelihood of sliding off. Furthermore, it is estimated that 70 to 75 percent of the oil applied is lost due to runoff (Cooper, et al., 1979). This could be damaging to the local biota. Dust can also be effectively controlled through the use of chemical stabilizers which serve to isolate road surfaces from wind and vehicle entrainment of dust by promoting the formation of a protective crust with the road dirt. The effectiveness of the above-mentioned mitigations is variable and depends on the implementation of the measures as well as numerous other factors. However, the reduction efficiency of emissions by these measures is generally around 50 percent.

An innovative approach in the control of dust generation from unpaved roads is the use of road carpets to stabilize the dust surface. Road carpets consist of a fabric laid over the soil to contain the overburden aggregate, while allowing newly-deposited fine particles to pass through the fabric (Blackwood, 1979). Thus, these particles are not reentrained into the air. Field tests of road carpets indicate a control efficiency ranging from 30 to 70 percent.

In addition to road dust, emissions of particulate matter due to construction activity and wind erosion from aggregate piles can be mitigated. The use of innovative technologies such as the wind fence and charged particle fogger for controlling aggregate pile emissions could result in substantial savings of water.

The establishment and enforcement of speed limits can effectively control dust as it has been shown that in the 30 mph to 50 mph range, emissions are directly proportional to vehicle speed (U.S. EPA, 1977). Vehicle miles traveled will be minimized during construction through the restriction of off-road travel as well as the use of mass transportation for commuting workers. The reduction of vehicle miles traveled will also reduce gaseous emissions of NO_x, HC, CO, and SO_x coming from the vehicles themselves.

A primary measure to control wind erosion is the revegetation of disturbed surfaces. The effectiveness and the extent of the revegetation will depend to a large extent on the amount of water available for revegetation. Under a comprehensive revegetation program using water whenever and wherever needed, recovery in the Nevada/Utah area could take 5 to 10 years. Recovery in Texas/New Mexico under the same program could take about 3 years. Obviously, a revegetation program will become more effective towards reducing emissions in the succeeding years after the program is initiated. There will be a certain period in which the wind erosion emissions will be unmitigated.

Impacts during operation of the M-X will occur at the operating bases. If a power plant is required it will meet all applicable federal, state, and local emission standards.

3.5 MINING

The major impacts to mining activity, toward which mitigations should be directed, would result from preemption of mining land use, interference with existing mining operations and competition for labor and resources.

AIR FORCE PROGRAMS (3.5.1)

During the siting of M-X facilities, areas of known high value mineral deposits will be identified and avoided. The Air Force will coordinate and cooperate with local mine operators to minimize disruption of mining operations. Where it is not practical to totally avoid a claim, impacted claim holders will be compensated in accordance with law. These mining conflicts will be settled on a case-by-case basis.

After the construction of shelters is completed, if a high value mineral resource is discovered and recovery is economically justified, the Air Force will advocate that Congress consider the abandonment or dismantling of affected shelter sites if it is necessary for mineral recovery.

OTHER MITIGATIONS UNDER CONSIDERATION (3.5.2)

Prior to construction of project facilities, a geologic survey of the entire deployment area could be undertaken to identify areas of potentially valuable mineral deposits. These would be a more detailed study than the literature survey already completed and would include field surveys. Where geologic evidence warrants it and geologic conditions make it practical, a limited drilling program could be instituted for confirmation of mineral values.

Project roads could be located in order to provide better access to existing or proposed mines. This could be beneficial to some mining operators who may otherwise have to construct new roads at considerable expense.

Mitigations for impacts and mining due to the increased demand for labor and resources are discussed in Section 3.15, Employment and Labor Force.

3.6 NATIVE VEGETATION

The major impacts to vegetation would occur as a result of scarification and habitat degradation from construction and operations activities. These impacts would occur primarily as a result of soil erosion due to vegetation loss; loss of primary ecosystem producers from habitat and soil degradation; spread of noxious vegetation; decreased forage value and amounts due to decreased photosynthesis; amd decreased ecosystem diversity and productivity. Mitigation measures will be directed toward minimizing these impacts.

AIR FORCE PROGRAMS (3.6.1)

The Air Force will implement all practical revegetation procedures in cooperation with appropriate federal and state agencies. Procedures which would be incorporated in the revegetation program, as appropriate, include characterization of existing vegetation communities, minimizing disturbed areas, characterization of the distribution and nature of soils, development of effective soils-handling procedures, development of a seeding and transplanting program, irrigation of disturbed areas where applicable, protection of planted areas and monitoring of revegetated areas. In addition, the Air Force would provide programs to minimize the spread of noxious vegetation and for the control of erosion and dust. The Air Force would also implement education programs for workers and their dependents.

OTHER MITIGATIONS UNDER CONSIDERATION (3.6.2)

Project Elements (3.6.2.1)

Existing vegetation communities could be characterized by defining the structure, composition and areal extent of major plant communities. This information could be used as a guide in selecting suitable revegetation species and as a baseline for site-specific habitat quality and impact analyses, and for monitoring programs.

Vegetation disturbance could be minimized by confining vehicles to designated corridors and by restricting scraping, grading and excavation to only those areas necessary for facility construction and operation. For example, soil storage areas

need only be scraped, rather than graded. These procedures would minimize root system disruption and burial of seeds and vegetative propagules contained in surface soils which contribute to site revegetation.

The distribution and nature of soils could be characterized by soils mapping at Order 1 detail (1:10,000 scale) to identify high and low quality soils. Soil profile can be characterized, and disturbed soil horizons and overburden could be characterized to aid in rating cover-soil quality. This would include electrical conductance of soil extract (EC), pH of soil parts, texture, sodium absorption ratio (SAR), organic carbon content and exchangeable sodium percentage (ESP). Additional details are contained in Appendix B of ETR-14.

Effective soil handling procedures on disturbed sites would maximize revegetation potential. These would include, where appropriate: salvage of high quality soil from locations of permanent facilities and construction staging areas and haul roads; segregation of topsoil and subsurface soils; direct reapplication of high-quality surface soils; grading and scarification of sub-surface materials prior to reapplication; disruption of hardpans in excavated areas to enhance root penetration and water percolation; amendment of low-quality soils; and production of an optimal surface configuration which would provide for stable slopes, minimize run-off and erosion and increase water retention. Additional details are contained in Appendix B of ETR-14.

Seeding and transplanting requires the availability and proper selection of revegetation species. Seed and plant stock suppliers must be notified sufficiently in advance of construction to provide necessary materials. Also necessary are: selection of suitable revegetation ecotypes or cultivars that provide wildlife food and habitat; livestock forage and erosion control (some unpalatable species should be included); and performance of suitable seeding and transplanting operations utilizing the technical expertise of interested federal and state agencies. Additional details are contained in Appendix D of ETR-14.

Irrigation of disturbed areas may be applicable in some areas. A combination of drip and sprinkler irrigation systems could be used to establish plants in areas with less than 8 inches of rainfall per year. Water "harvested" from impermeable surfaces (such as roads) or obtained from water treatment facilities could be used to supplement well water for irrigation. Shelter approach roads may be used to collect water during rainstorms. Moore and Rudd (1981) have suggested that this water be pumped to an underground storage tank, and be used to feed wildlife water guzzlers and irrigation systems. Remote roadside and construction camp areas could be sprinkler or drip irrigated by water hauled in by pumper truck. Due to the limited water availability within the project area, irrigation priority should be given to large cleared patches (i.e., shelter locations), to steep cut or filled slopes, to highly erodible soils, and to disturbed areas near population centers. Fifty thousand acre-feet or more of water would be required for sprinkler irrigation of all disturbed areas. By irrigating selected areas, and by using drip and sprinkler systems in a water conserving drip and sprinkler fashion, the water requirements could be reduced by one-half or more. Planting efforts usually fail in areas that receive less than 8 in. of precipitation annually (which includes roughly 80 percent of the projected disturbed area), unless irrrigation is used. Very limited success of seeding efforts can be expected in areas that receive less than 6 in of precipitation annually and are not irrigated. Additional details are contained in Appendix C of ETR-14.

Planted areas should be protected from livestock grazing and off-road vehicle (ORV) travel. Rabbits and hares (lagomorphs) will be drawn to the succulent irrigated vegetation. Some rodents can nearly destroy revegetation efforts. Rodent control methods, including fine mesh fencing (partially buried) or the use of rodenticides could be used. A pre-planting census of rodent populations would be useful in determining if significant rodent damage is likely to occur. The planting of large areas at a time would reduce the extent to which rodents might converge and destroy the newly planted vegetation. The planting of some unpalatable species may reduce vegetation damage caused by rodents. Fencing with two or three strands of electric wire would restrict livestock and ORV's. Removing livestock from the area and preventing ORV use would reduce the need for fencing. Protection from grazing can be partially accomplished by coordinating herding practices of ranching operations. For more information on fencing and ranching operations, see ETR-40.

A revegetation and erosion control monitoring program would entail periodic inspections of rehabilitated areas to monitor the success of the procedures used. Early discovery of failures and the need for reapplications and other amenities are essential for successful revegetation. The program could also include revegetation study plots. Data from such plots would be of great value in determining the viability of procedures and necessary retreatments and in assessing the success of early revegetation practices. This would improve revegetation success in later construction areas.

The erosion control and revegetation programs could include a detailed, site-specific reclamation program as part of construction and operation plans. Because the project area includes many types of terrain, soils, vegetation, land uses, and climatic conditions, the program would include techniques and procedures tailored to specific conditions. Local expertise and locally effective reclamation methods could be followed when the site-specific procedures are developed.

Detailed information regarding applicable techniques concerning erosion control measures and reclamation procedures can be obtained from the Soil Conservation Service. Technical assistance and approval of written plans for federal lands can be obtained from the Bureau of Land Management, and implementation would be coordinated with appropriate managing agencies.

The success of revegetation efforts would be dependent upon an erosion control program that includes: characterization of candidate sites according to drainage topography, textures and other physical characteristics of the soil; selection of appropriate facility sites; minimizing soil disturbances; control of runoff and direction of the runoff to suitable locations; construction of sediment basins; revegetation of cleared areas to the extent possible; and the application and securing of mulch (straw, gravel) for erosion control, water retention, and soil temperature moderation.

The education program for workers and their dependents could include wilderness education, importance of rare and protected species, desert ecology and the need to protect sensitive and rehabilitated areas.

Vegetative Growth Conditions

Surface soils should be excavated, stored, and re-applied after construction ceases in affected areas. Surface soils generally have physical, chemical, and

biological properties which are substantially more conducive to vegetation re-establishment than underlying subsoils. Also, surface soils contain seed and vegetative propagules which contribute to vegetation re-establishment. In Nevada and Utah, surface soils are often less saline than underlying soils. Segregation of excavated surface and subsoils is recommended to prevent contami- nation and mixing.

Low-quality surface soils could be amended. When surface soils are of poor quality, more favorable revegetation conditions may be accomplished by blending the surface soil with higher quality subsoil or overburden. Removed vegetation can be segregated, shredded, and mixed with removed soil to promote tilth and nutrient status. Also, mulches and netting to reduce erosion could be applied. Surface mulches of straw or ground vegetable fiber can greatly reduce erosion, when the material is crimpted into the ground to prevent detachment. Additional information can be found in Appendix B and D of ETR-14.

Another potential mitigation could be to improve subsurface soil conditions. In many areas in the Nevada/Utah candidate siting region, the soil profile contains a hardpan which restricts both root penetration and vertical water migration. The reconnaissance soil survey for Railroad Valley, Nevada (Nevada State Engineer's Office, 971), identifies numerous duripans (a silica-cemented hardpan) beginning 10 to 20 in. beneath the soil surface. Landscape categories which contain duripans include "saline soils of the lakeplain" (Naduragids), "finer textured soils of the smooth alluvial plains" (Naduragids), and "shallow soils of the dissected fans and foothills" (Durargids, Durothids and Durixeralls). On hardpan containing soils, revegetation could be enhanced by disruption of the hardpan during excavation or by subsoil cultivation procedures.

Suitable areas that are currently barren or poorly vegetated due to overgrazing could be vegetated. Forage quality and quantity can be upgraded in many areas by broadcast seeding. If the seeded areas intercept sufficient rainfall, germination will occur. If the seeded areas are irrigated where rainfall is less than 8 in/year, moderate success can be expected. Additional information on this subject is contained in Appendix C, ETR-14.

Spread of Noxious Vegetation (3.6.2.2)

The introduction of domestic livestock on the western range during the last half of the 19th century resulted in overgrazing and denuding of large areas. At the turn of the century, various alien annual plant species were imported by chance or design from southwestern and central Asia. When these annuals arrived, they entered into a biological vacuuum. Few native annuals existed as competitors, and with the great decline of the perennial shrubs, alien annuals spread very rapidly. Most of the aliens (e.g., Halogeton glomeratus) do not compete well with healthy perennial shrubs; so areas that have retained a good shrub cover have few areas dominated by alien annuals. Preservation of the vegetative propagules (e.g. roots) of many shrub plants will greatly increase the probability of native vegetation recovery.

The following procedures could be mitigations to reduce the impact of the spread of noxious vegetation. One would be to minimize repeated disturbance of soil. Repeated soil and vegetation disturbance during operations can destroy soil structure and vegetative propagules that may have survived the initial disturbance.

Also, repeated disturbance allows the alien annuals to reinvade the site and prolong their dominance.

Studies indicate that Russian-thistle (Salsola sp.) is palatable to livestock, although forage quality is less than the preferred native shrubs and grasses. Russian thistle will gradually be succeeded by other aliens, and then gradually by native species. These characteristics of Salsola sp. render it somewhat desirable for revegetation, wherein Salsola sp. will claim the site, exclude halogeton, and provide a source of livestock forage.

Another possible mitigation would be the revegetation of soil storage piles. Large mounds of excavated soil provide optimum conditions for invasion of some alien annuals (e.g., halogeton). If these storage mounds are not immediately revegetated with more desirable species (e.g. alfalfa) alien annuals already existing in the area will quickly invade, assume dominance, and exclude perennials. Even if the aliens are later removed from the mound, the soil will have a large resident seed source to produce a new population very quickly after soil is reapplied.

Still another mitigation could be to seed plant species that outcompete noxious alien annuals. A discussion is presented in Appendix A (ETR-14) of a desirable alien (Kochia prostrata) that appears to successfully outcompete Halogeton glomeratus.

Species Selection and Application (3.6.2.3)

Wildland shrubs serve as wildlife habitat, game and livestock food, soil stabilizers, fuel and landscaping vegetation. Plant species fulfilling one or more of these uses can be matched to specific site requirements. Species should be selected that grow naturally in the disturbed or similar environments. Plants adapted for the environment should be selected for browsing tolerance, palatability, nutritional quality, ease of reproduction, growth rate, and competitive ability.

Species application could be accomplished by broadcast seeding, drill seeding, or by containerized planting. Broadcast seeding is the cheapest application method, but it requires the greatest amount of water for irrigation in areas with less than 8 in of precipitation annually. Broadcast seeding also requires greater amounts of seed (about 20 lbs per acre, compared to about 6 lbs per acre for drill methods). Containerized planting will be more successful in wet areas than either seeding method, because seeds are more subject to rot than are seedlings.

Detailed discussions of species suitability seeding methods, and seed sources are presented in Appendix D of ETR-14.

Decreased Ecosystem Diversity and Productivity (3.6.2.4)

Removal of vegetation will generate ecosystem wide effects that will cause many impacts, such as decreased food and habitat for wildlife, flooding, and soil erosion. These impacts--reduced food supply, for example--can intensify vegetation removal due to overutilization of the residual resource. The most promising source of insight into the complexity of interactions and associated project impacts is the formulation and application of ecosystem models. Much more model development and refinement of data are necessary, however, before meaningful inferences can be made.

3.7 RARE PLANTS

The major impacts to rare plants would occur as a result of habit degradation resulting from project activity. These impacts would occur primarily as a result of: clearing, grubbing or deposition; destruction of rare plant habitat as a consequence of a change in water runoff patterns and increased erosion; possible changes in reproductive capabilities from increases in fugitive dust, including that from cement and aggregate dust; potential loss of species and species specific habitats due to disturbance of groundwater supplies; physical damage to rare plants from increased use of off-road areas by off-road vehicles; physical damage to rare plants resulting in loss, decrease in vigor or narrowing of distribution from increased use of off-road areas by hikers, hunters and campers; and illegal collection of rare species, primarily cacti.

Mitigation measures will be directed toward minimizing these impacts.

AIR FORCE PROGRAMS (3.7.1)

The Air Force will implement rare, threatened, and endangered species programs in accordance with Section 7 of the Endangered Species Act. These programs will include identifying areas which contain rare, threatened, and endangered species; avoiding identified areas; fencing and otherwise preserving identified areas; transplanting directly impacted species as necessary; limiting construction off-road travel; controlling dust; monitoring populations; providing conservation education programs, and offsetting unavoidable impacts with additional refuges where required.

In order to prevent the spread of noxious vegetation and the inadvertent introduction of new species caused by M-X activities, the Air Force will survey noxious vegetation and introduced species and monitor infestation levels.

OTHER MITIGATIONS UNDER CONSIDERATION (3.7.2)

There are currently no federally listed rare plant species projected to be affected by the M-X project, therefore the Endangered Species Act does not directly apply. However, there are presently a number of candidate rare plant species which occupy unique habitats, and which USFWS believes should be considered in environmental planning (45 FR 82480). Because they are recognized by scientists as being intrinsically rare, these species are considered here in much the same way that federally listed plants would be. The discussion which follows pertains to rare plants in general, individual species are mentioned where pertinent.

Loss of Plants Due to Clearing, Grubbing or Deposition (3.7.2.1)

There are several potential mitigations which would reduce the impacts of possible permanent loss of individual rare plants, of entire rare plant populations or possible reduction in rare plant population size due to clearing, grubbing or deposition. Avoidance, and thus preservation of rare plant habitat, is generally regarded as the primary means of limiting impacts on rare plants. However, the complexity of the project, coupled with the difficulties involved in locating rare plants, makes avoidance of every known location of a candidate rare plant species impractical. A more practical method is to concentrate on regions of unique or

sensitive habitats where rare plant species tend to congregate, or where aggregations of rare plants are known to occur. For the Nevada/Utah project area, at least 5 regions have been identified as being unique or sensitive habitats for rare plants. These regions should receive highest priority for avoidance. The suggestion has been made to designate them as portions of a "Great Basin Botanical Preserve." These special habitat types and the species known to occur on them are:

1. White "gypsum mounds" in White River Valley (Frasera gypsicola, Lepidium nanum, Phacelia parishii).

2. Soils derived from the Sevy dolomite geological formation in Northern Pine and Wah Wah valleys (Cryptantha compacta, Penstemon concinnus).

3. Grampian Hill, in Western Wah Wah Valley (Lepidium ostleri, Trifolium andersonii var. friscanum, Eriogonum sorodium, ined.).

4. Sandy soils in the west-central portion of Railroad Valley (near Locke's Ranch) (Astragalus uncialis, Sphaeralcea caespitosa).

5. White alkaline beaches or playa remnants, primarily those in the Sevier Lake area (Eriogonum natum).

One of the problems with this regional, or eco-unit, approach is establishing a boundary for any of these habitat areas, since they are not yet clearly defined. Furthermore, the correct size necessary for maintenance of species diversity for any particular eco-unit is difficult to determine and subject to much discussion (Ramsay, 1976; Smith; 1976; White, 1979).

Many suggestions have been made regarding the means by which avoided areas can be managed most efficiently. In California, conservation easements are relatively inexpensive and an effective means of protecting rare plant habitats. By using this method in Utah, small portions of privately owned habitat for endangered species could be transferred to, for instance, the Utah Native Plant Society for protection of the species and its habitat. The easement is usually created by the giving of a deed. The conservation organization given the easement is then given the right to prohibit certain activities on the site (Owens and Nelson, 1981). The method is enforceable, accomplished in California through injunctive relief, because a court can stop any harmful activity. It also offers a tax advantage to the property owner. In California, only nonprofit, tax-exempt organizations with a purpose to protect land may acquire and hold such easements (California Civil Code Section 815.3). Such a law does not currently exist in Nevada, but an attempt could be made to enact one. The State of Utah does have a law providing for gross conservation easements (Hoose, 1980).

The possibility of land acquisition by private, nonprofit organizations such as the Nature Conservancy could be explored as a further means of managing avoided areas. Much of the land in the M-X project area, however, is currently federally-owned and thus cannot be acquired.

Another mitigation is to confine disturbance to an absolute minimum through detailed contractor specifications. The buried trench demonstration project, or MAV, can be cited as an Air Force M-X precedent for controlled construction.

Proper training of project personnel could assist in preserving natural habitat area. Strict limitation of vehicular and foot traffic could assist in protecting areas of special biological sensitivity. New seedlings are small and easily destroyed. If they are destroyed, the seed source present in the soil can become exhausted, and new seeds must migrate into the area, slowing the process of regrowth. Depending upon the potential for disturbance of vehicular and foot traffic in a given area, posted signs, fences, or a combination of these may be required to limit disturbance.

Salvage transplanting is another potential mitigation. Recently, Dr. Stanley Welsh (Brigham Young University) indicated that salvage transplanting would work for some rare species, including Penstemon and cacti. He indicated that there is apparently suitable but unoccupied habitat for the Penstemon species that he had examined. Other plants (e.g. Cryptantha, Cymopterus, Arctomecon) are evidently not transplantable. He suggested coordinating with the Native Plant Societies since many of their members have rock gardens and welcome the opportunity to salvage plant species (e.g. cacti) for which no other suitable transplant habitat exists.

For many desert species no method of transplanting or seed germination has been found. For those species which can be transplanted, there is considerable uncertainty regarding the long-term survival of the transplants and their capacity to reproduce (e.g. a specific pollinator may be lacking at the transplant site, thereby precluding sexual reproduction). Transplanting could be considered as an alternative for those sites that cannot be avoided.

Narrowing Species Distribution (3.7.2.2)

Potential mitigations that could be included to reduce the impact of narrowing of a species' current distribution due to clearing, grubbing or deposition would be to devise "recovery plans" which would explore the feasibility of establishing effected plants in suitable potential habitats. For any management plan to be successful, it is necessary to identify growth requirements for the species. Following that, experiments can be run to determine whether the species can be germinated successfully in suitable habitat in the wild. Frasera pahutensis, a candidate species under review by USFWS, is thought to have potential for seeding in pinyon-juniper (Goodrich and Atwood, 1979) because of its abundance in two large but widely separated populations. It could be studied for determining its feasibility for use as a range vegetation species.

Loss of Species and Species-Specific Habitat (3.7.2.3)

Spring areas such as Monte Neva Hot Springs in Steptoe Valley, where the Monte Neva Indian paintbrush (Castilleja salsuginosa) appears to be dependent upon the substrate is an example of this type of potential impact.

There are two potential mitigations that could be included to reduce the impact of potential loss of species and species-specific habitats due to disturbance of groundwater supplies. One measure could be to prevent habitat water depletion. Monitoring could be conducted yearly or at shorter intervals for the first 5 years or so, then perhaps at 5-year intervals thereafter for the life of the project.

Another measure could be to determine growth requirements (substrate type, pollinators) of species potentially affected, so that as a last resort if desiccation

cannot be prevented, the species can be transplanted and maintained under greenhouse conditions.

Damage From Off-Road Vehicles (3.7.2.4)

All impacts from off-road vehicles result in either a loss of individual rare plants or populations of rare plants. There are two potential mitigations that could reduce the impact of physical damage to rare plants from increased use of off-road areas by vehicles. One mitigation could be the reduction of travel. Another would be to establish sacrifice areas (zoned for ORV use) which do not contain rare plant species, and zone the remainder of the land for on-road travel only.

Another mitigation could be the fencing of rare populations. This has been proposed as a means of limiting access to the populations and therefore protecting them. However, fencing is not always a good means of affording protection to a population of rare plants. At one location in Nevada, a fence was erected around a Camissonia megalantha population in a heavily trampled area near a water hole. Saltbrush plants within the fenced area were then released from grazing pressure and overgrew the site, leaving the rare plant colonies inside the fence worse off than those outside the fence (Yoder-Williams, 1981).

Illegal Collection of Rare Species (3.7.2.5)

Increased use of off-road areas by greater numbers of hikers, hunters and campers may result in increased incidence of illegal collection of rare species, primarily cacti. This would contribute to the decreased abundance of these plants. This impact could be mitigated by establishment of cooperative programs for enforcement of collection regulations. Assistance could be provided to states for enforcement of state conservation laws, especially those pertaining to illegal collection. Additionally, the education program would be designed to include education of personnel in the natural history of the area and conservation of local ecosystems. Studies have shown that disturbance can be reduced if recreationists understand the impacts of their activity (Ream, 1978).

3.8 PRONGHORN ANTELOPE

The major impacts to pronghorn would occur as a result of habitat degradation and increased animal disturbance related to project activities. These impacts would occur primarily in the following ways: pronghorn behavioral avoidance of construction areas possibly resulting in abandonment of large portions of range and key habitat; pronghorn habitat loss due to vegetation removal; sedimentation of important water sources from erosion due to vegetation removal; increased traffic to job sites due to increased personnel during construction and operation; disturbance of pronghorn by recreationists; increased illegal hunting; introduction of exotic and domestic species (e.g., dogs and cats) due to increased personnel in area during construction and operation; loss of important pronghorn movement patterns and exclusion from habitat and water sources due to construction of fences in the project area.

Mitigation measures will be directed toward minimizing these impacts.

AIR FORCE PROGRAMS (3.8.1)

The Air Force will institute cooperative programs with appropriate federal and state agencies for wildlife management. The Air Force would assist in identifying, monitoring, and managing species to counteract project impacts. These programs would include all or part of the following, as appropriate: avoid important habitats if possible; schedule activities to avoid critical periods; fence selected construction areas, provide supplemental or replacement water and/or food sources; restrict worker pets in life support communities; suppress adverse noise impacts; assist enforcement and management agencies; transplant wildlife; and provide additional habitat or alter other habitats to offset impacts.

In addition, the Air Force will restrict weapons in life support camps and at job sites, restrict off-road travel, accomplish a revegetation program in cooperation with appropriate federal and state agencies, and provide conservation education programs for workers and their dependents. A program to manage groundwater withdrawal as it effects surface water and an erosion control program will be instituted by the Air Force. The Air Force will advocate funding additional state fish and wildlife personnel.

In order to prevent the spread of noxious vegetation and the inadvertent introduction of new species, the Air Force will survey noxious vegetation and introduced species and monitor infestation levels. Eradication of unwanted vegetation caused by M-X activities will be accomplished in conjunction with the revegetation program.

OTHER MITIGATIONS UNDER CONSIDERATION (3.8.2)

Pronghorn Abandonment of Range and Key Habitats (3.8.2.1)

Potential mitigations that could be included to reduce the impact of pronghorn behavioral avoidance of construction areas, possibly resulting in abandonment of large portions of range and key habitat, follow.

One measure could be to avoid critical areas such as key water sources, kidding areas, preferred concentration areas and areas with high quality food concentrations. Preservation of highly critical areas by siting project elements in less critical areas would greatly reduce impacts. The timing of construction activities within each valley where key habitat is present to avoid critical summer months and the kidding period would also reduce impacts.

In addition, new water sources could be developed in areas outside of project influence that lack water but are otherwise suitable habitat. Water is critical for pronghorn, therefore, water availability limits pronghorn distribution in much of the Great Basin. It is probable that much presently uninhabited area would support pronghorn if water is made available during the dry season. Building storage "ponds" at intermittent springs, catchment basins, or self-filling watering devices may allow pronghorn to expand their range into areas presently too dry to support them.

Another possible measure could be to implement range improvement practices in areas outside of project development. "Range fertilization" to improve habitat quality in areas outside of project development would increase the number of

pronghorn the treated area could support (as long as adequate water exists on summer ranges). This improved range would then be able to support some pronghorn displaced from project areas. Also, reducing livestock grazing allotments (especially sheep) would preserve more food, and thus allow the range to support more pronghorn in areas where livestock and pronghorn compete for a limited food base. This measure would impact ranching operations, however.

Another measure could be to transplant pronghorn from "reserves" into areas abandoned due to construction activities. The establishment of key habitat areas where a population could be maintained and from which stock could be transplanted into affected valleys could augment recovery after construction ceases.

Pronghorn Habitat Loss Due to Vegetation Removal (3.8.2.2)

Three potential mitigations that could be included to reduce the impact of pronghorn habitat loss due to vegetation removal are: improve range in areas outside disturbed area, reduce livestock grazing allotment, and avoid critical areas such as key water sources.

Increased Traffic to Job Sites (3.8.2.3)

Several potential mitigations exist to reduce the impact of increased personnel in the area during construction and operation. One could be to schedule construction activities within key habitat so that these areas are not disturbed during the critical summer months and kidding period. Minimizing traffic could reduce pronghorn road mortalities by decreasing traffic levels in heavy use areas. Also, roads used for construction purposes which are not required for operations could be closed.

Another measure could be to limit the number of roads built through preferred concentration areas, kidding areas, and areas with water sources and/or high quality food concentrations. This would help alleviate disturbance, help prevent traffic mortalities, and decrease recreational use, thus reducing further stresses on these animals. Also warning and caution signs could be posted in areas of heavy pronghorn use. Another possible measure could be to schedule work shifts to begin/end at times when pronghorn are least susceptible to traffic. Pronghorn are active throughout the day, but are most active around sunrise and sunset. This measure may prove very effective in decreasing disturbance and road mortality. It is also possible that pronghorn would adjust their behavior to avoid heavy traffic periods which would render this measure of minor importance. Also, vehicle speeds could be restricted on roads regularly crossed by pronghorn.

Disturbance of Pronghorn by Recreationists (3.8.2.4)

Potential mitigations to reduce the impact of disturbance of pronghorn by recreationists due to increased personnel in area during construction and operations include establishing ORV use areas outside key pronghorn habitats, limiting road construction through pronghorn key habitat, and limiting ORV use in key pronghorn habitats or closing areas to ORV use. ORV use has the potential to severely affect pronghorn. Restricting ORV use in key habitats would be an effective mitigation, especially during kidding and breeding. Also, local law enforcement agencies and federal land management agencies could be funded to provide enforcement of vehicle restrictions.

Increased Poaching Due to Increased Personnel (3.8.2.5)

There are several potential mitigations that could be implemented to reduce the impact of increased poaching due to increased personnel in the area during construction and operation. One measure could be to fund state management and local law enforcement agencies to provide increased enforcement of hunting regulations. These agencies are generally understaffed and have small budgets for enforcement activities. Agencies would receive supplemental funding proportional to the population increase in their areas of jurisdiction. Poaching is difficult to police. Even with extra personnel and funds, most poaching would go undetected.

Introduction of Exotic and Domestic Species (3.8.2.6)

A potential mitigation to reduce the impact of the introduction of exotic and domestic species (e.g., dogs and cats) due to increased personnel in area during construction and operation could be to restrict pets (especially dogs) from life support camps.

Loss of Water Sources (3.8.2.7)

The following are potential mitigations that could be included to reduce the impact of loss of important pronghorn water sources due to water table drawdown. New water sources in areas outside of project influence could be developed. Supplemental water for artifical watering devices could be provided. The Utah Division of Wildlife Resources has developed a self-filling watering device supplied by large capacity storage tanks. These tanks require periodic refilling. Also, project water could be utilized for pronghorn use. Water from wells developed for project use could be piped to covered catchments available for pronghorn use.

Another mitigation could be to construct water catchments near project facilities to catch run-off. Shelter entrances would collect precipitation run-off that could be channeled to a catchment constructed to provide pronghorn access. If activity around shelters is such that pronghorn avoid these catchments, the water could be periodically pumped a short distance to a trough available for pronghorn use. This has the potential to be an effective mitigation.

Exclusion From Habitat and Water Sources (3.8.2.8)

A potential mitigation to reduce the impact of exclusion of pronghorn from habitat and water sources due to construction of fences in project areas could be to construct fences to allow pronghorn access but still restrict livestock. Barbed-wire fences can be constructed according to recommendations by the Interstate Antelope Conference (1962).

Restriction of Movement (3.8.2.9)

A potential mitigation to reduce the impact of restriction of pronghorn movement patterns due to construction of fences in project areas could be to construct fences according to recommendations by the Interstate Antelope Conference (1962).

3.9 SAGE GROUSE/LESSER PRAIRIE CHICKEN

The major impacts to sage grouse and lesser prairie chicken would occur as a result of habitat degradation during construction and operation and disturbances due to increased population. These impacts would occur primarily as a result of habitat loss due to construction activities, sage grouse and prairie chicken behavioral avoidance of construction activity and noise, increased illegal hunting due to increased human populations, increased predation by introduced exotic and domestic species (e.g., dogs and cats) accompanying increased human populations, and increased pressures on sage grouse and prairie chickens due to increased recreation activity.

Mitigation measures will be directed toward minimizing these impacts.

AIR FORCE PROGRAMS (3.9.1)

The Air Force will institute cooperative programs with appropriate federal and state agencies for wildlife management. The Air Force would assist in identifying, monitoring, and managing species to counteract project impacts. These programs would include all or part of the following, as appropriate: avoid important habitats if possible; schedule activities to avoid critical periods; fence selected construction areas; provide supplemental or replacement water and/or food sources; restrict worker pets in life support communities; suppress adverse noise impacts; assist enforcement and management agencies; transplant wildlife; and provide additional habitat or alter other habitats to offset impacts.

In addition, the Air Force will restrict weapons in life support camps and at job sites, restrict off-road travel, accomplish a revegetation program in cooperation with appropriate federal and state agencies, and provide conservation education programs for workers and their dependents. A program to manage groundwater withdrawal as it effects surface water and an erosion control program will be instituted by the Air Force. The Air Force will advocate funding additional state fish and wildlife personnel.

OTHER MITIGATIONS UNDER CONSIDERATION (3.9.2)

Habitat Loss Due to Construction (3.9.2.1)

There are several potential mitigations that could be included to reduce the impact of habitat loss from construction activities. Among these would be to site the base so as to avoid known sage grouse and habitat, and avoid building any structure within two miles of all leks, brood-use areas and wintering grounds. This would involve identifying key habitats within sage grouse or prairie chicken range. Also, by creating mesic areas in non-affect areas using water from construction wells, areas of sagebrush that presently do not support sage grouse could be enhanced to support them. This could make up for some of the area lost. Water could be allowed to flow into an area that had been cleared of brush and seeded with forbs and some grasses. This flow could be constant and spread over the entire cleared area to keep it moist during appropriate seasons. Artifical leks near destroyed natural leks could also be created. This would consist of clearing an area in the brush to facilitate courtship dances by male sage grouse. Each artificial lek should be near the destroyed lek but far enough away so as not to be disturbed by continued construction or operations.

Another potential measure could be to clear sagebrush in strips. In areas of continuous sagebrush, clearing in strips approximately 30 meters wide and then seeding with forbs and some grasses will increase productivity of areas for sage grouse. This could be done in sage grouse habitat not affected by construction.

An attempt could be made to avoid construction of above ground utility lines in sage grouse habitats. Some raptors use utility poles and lines to perch on while hunting. Utility lines running through sage grouse and prairie chicken habitat will increase the likelihood of loss of sage grouse and prairie chicken to predation. Another mitigation would be to avoid the building of above ground utility lines in sage grouse and prairie chicken habitat and keep all above ground lines approximately one mile from the edge of their range. Another possible mitigation could be to modify utility poles within sage grouse and prairie chicken habitat to prevent raptors from perching on them. Cones placed on the top of the poles and steeply slanted arms would prohibit raptors from perching on them. This might take some experimental design efforts, but would help decrease raptor use of these perches. This would only need to be done in sage grouse or prairie chicken habitat. Standard design poles that do not electrocute raptors could be used elsewhere.

Another potential mitigative measure could be to conduct surveys of sage grouse and prairie chicken range to identify currently unknown leks, brood-use areas, and wintering grounds.

Habitat Loss Due to Behavioral Avoidance (3.9.2.2)

A potential mitigation that could be included to reduce the impact of habitat loss due to sage grouse or prairie chicken behavioral avoidance of construction activity and noise would be to schedule construction activities to take place at times other than breeding and nesting seasons, avoid construction activities near sage grouse key habitat during the spring and early summer (March - June), and plan construction activities during these months in non-sage grouse or prairie chicken areas.

Increased Poaching Due to Increased Human Population (3.9.2.3)

Two potential mitigative measures that could be included to reduce the impact of increased poaching due to increased human populations are to post signs and increase funding to state wildlife agencies. Signs could be posted that would indicate penalties for poaching. These signs could be posted at side roads from main roads in sage grouse or prairie chicken habitat. This could have the reverse effect of pointing out sensitive areas to persons who otherwise might be unaware of them. Increased funding would allow for the hiring of more law enforcement personnel to discourage poaching.

Increased Predation Loss Due to Exotic Species (3.9.2.4)

A potential mitigation for increased predation loss due to introduced exotic species (e.g., dogs and cats) accompanying increased human populations could be to prohibit personnel at life support camps and operating bases from keeping dogs and/or cats, or enforce strict controls on such animals (e.g, leash laws). Restrictions concerning pets could be written into the construction contracts between the federal government and private construction firms. If this mitigation

were implemented, the threat of predation loss due to domestic or feral predators would be substantially lessened.

Increased Pressures Due to Increased Recreation (3.9.2.5)

There are several potential mitigations that could be included to reduce the impact of increased pressures on sage grouse and prairie chickens due to increased recreational activity of additional human population. Camping in and around wet meadow and riparian areas could be prohibited, especially during spring and summer months. Wet meadows and riparian areas are used extensively by sage grouse as a source of succulent vegetation, especially during the dryer summer months. These areas are also often essential for supplying adequate food for young sage grouse broods. This mitigation would only apply to meadow areas on federally controlled lands.

Another measure could be to post signs restricting camping near key habitats (i.e., leks, brood-use areas, and wintering grounds) indicating that these areas are off-limits to camping and picnicking during seasons of sage grouse and prairie chicken use. These animals are sensitive to human disturbances and may abandon key habitat areas if disturbance is prolonged, with a concomitant reduction in reproductive success.

Also, ORV activity could be prohibited in sage grouse and prairie chicken habitat. ORV activity can destroy or degrade habitat through loss of vegetation and disruption of the soil, and noise may scare sage grouse or prairie chickens away from key habitats, which could eventually cause permanent abandonment of the areas. Methods for prohibiting ORV activity in sage grouse and prairie chicken habitat would include fencing, which could be prohibitively costly due to the large area requiring fencing, posting of signs, and education of local ORV recreationists.

Finally, specific ORV-use areas near operating bases could be established. Establishment of specific ORV-use areas near OBs sufficiently removed from sage grouse habitat will reduce impacts. By establishing several ORV-use areas, this activity would be concentrated and more easily managed, while the serious impacts of widely dispersed habitat damage common from ORV use could be significantly reduced.

3.10 BIGHORN SHEEP

The major impacts to bighorn sheep would result from disturbance by recreationists, increased road kills, increased poaching, and behavioral avoidance of migration routes.

Mitigation measures will be directed toward minimizing these impacts.

AIR FORCE PROGRAMS (3.10.1)

The Air Force will institute cooperative programs with appropriate federal and state agencies for wildlife management. The Air Force would assist in identifying, monitoring, and managing species to counteract project impacts. These programs would include all or part of the following, as appropriate: avoid important habitats if possible; schedule activities to avoid critical periods; fence selected construction

areas; provide supplemental or replacement water and/or food sources; restrict worker pets in life support communities; suppress adverse noise impacts; assist enforcement and management agencies; transplant wildlife; and provide additional habitat or alter other habitats to offset impacts.

In addition, the Air Force will restrict weapons in life support camps and at job sites, restrict off-road travel, accomplish a revegetation program in cooperation with appropriate federal and state agencies, and provide conservation education programs for workers and their dependents. A program to manage groundwater withdrawal as it effects surface water and an erosion control program will be instituted by the Air Force. The Air Force will advocate funding additional fish and wildlife personnel.

In order to prevent the spread of noxious vegetation and the inadvertent introduction of new species, the Air Force will survey noxious vegetation and introduced species and monitor infestation levels. Eradication of unwanted vegetation caused by M-X activities will be accomplished in conjunction with the revegetation program.

OTHER MITIGATIONS UNDER CONSIDERATION (3.10.2)

Disturbance of Bighorn by Recreationists (3.10.2.1)

There are two potential mitigation measures that could be included to reduce the impact of disturbance of bighorn by recreationists. One could be to limit road construction through bighorn migration areas. Desert bighorn generally inhabit mountain areas unsuitable for project components, but occasionally cross potential deployment areas to utilize water sources in adjacent mountain ranges. Recreational use in bighorn migration areas may stress bighorn during migration and prevent sheep from exploiting adjacent habitats. Limiting road construction in critical migration areas whenever possible will help alleviate undue stresses and prevent traffic mortalities.

Another measure could be to post caution signs in bighorn migration areas. In conjunction with other mitigation measures, this inexpensive measure may alleviate some disturbance. Unfortunately, it may lead to increased disturbance by persons unaware of or unconcerned with the possible impacts of hindering bighorn movements. Also, road construction could be limited through bighorn migration areas.

Another potential mitigation could be to develop water sources on bighorn summer ranges in areas not accessible for recreation. This would reduce the impact by providing alternate water sources where disturbance would be less likely. Construction of artificial water catchments and large capacity storage "ponds" at seasonal springs and weak seeps (Yoakum and Dasmann, 1969) may be effective in reducing the impacts.

The control of domestic sheep movements and wild horses and burros to reduce range overlap with bighorn sheep could also be a possible mitigation. Competition for forage and water with domestic sheep, wild horses and burros can have severe detrimental effects on desert bighorn populations (McQuivey, 1978, Jones, 1980 and numerous others). This potential mitigation would reduce M-X related impacts by

reducing the stress on bighorn populations caused by livestock, wild horses and burros. This may be a difficult mitigation to implement, but it would be effective and is consistent with state wildlife agencies' recommendations for bighorn sheep management.

Another mitigation could be to fund the monitoring of bighorn populations in the Coyote Spring area one year prior to construction and throughout the construction period. This measure was instituted in the Denver Water Board's Foothill Water Project (the Denver Water Board agreed to pay the U.S. Government $10,000 if any bighorn sheep were willfully killed - Branvold, 1981, personal communication). This may be difficult to successfully implement.

Finally, to restrict recreational use at bighorn watering sites during summer months in areas under governmental jurisdiction could be another measure taken to reduce the impact of recreationists. Water is extremely critical to bighorn in the summer, and any activity (bird watching, hiking, photography, etc.) that keeps bighorn sheep away from important water sources should be avoided. Closure of campgrounds, roads, and hiking trails at or leading to bighorn water sources would be effective and relatively inexpensive.

Increased Road Kills (3.10.2.2)

Three potential mitigation measures that could be included to reduce the impact of increased road kills are to limit road construction through bighorn sheep migration areas, post caution signs in bighorn migration areas, and close roads used for construction purposes that will not be needed for project operations after construction.

Increased Poaching (3.10.2.3)

One potential mitigation measure that could be included to reduce the impact of increased poaching is to provide additional personnel for enforcement of hunting regulations.

Avoidance During Migration (3.10.2.4)

There are four potential mitigation measures that could be included to reduce the impact of behaviorial avoidance of construction areas during migration. Three are to install noise suppressing mufflers on machinery and equipment, restrict off-road construction travel and time construction in critical areas to avoid migration periods. The latter measure would ease bighorn sheep access through construction areas. The fourth potential measure could be to develop water sources on bighorn sheep ranges where construction activity may block access to summer water holes. This would ameliorate the impact of preventing bighorn sheep movement across construction areas to water in adjacent mountain ranges if enough alternate water sources can be developed in areas lacking water, and if bighorn sheep can adapt to using these new sources.

3.11 DESERT TORTOISE

The major impacts to desert tortoise would be loss and habitat degradation and mortality from increased human populations associated with project activities.

These impacts would primarily result from construction activity, increase in desert tortoise road kills, increase in vandalism and collection of desert tortoises as pets, increased recreational pressures, and introduction of exotic and domestic animals.

Mitigation measures will be directed toward minimizing these impacts.

AIR FORCE PROGRAMS (3.11.1)

To protect rare, threatened, and endangered species, the Air Force will institute cooperative programs with federal and state management agencies. The Air Force will identify the critical habitat of rare, threatened, or endangered species and will monitor populations. Sensitive habitats will be avoided and construction activities will be scheduled to minimize disturbance insofar as possible. Additional measures to minimize impacts will include restricting construction off-road travel and restricting firearms in life support camps and at job sites. When the avoidance of habitats is not possible, the Air Force will determine suitable replacement habitats and will relocate species as required.

In addition, the Air Force will accomplish a revegetation program in cooperation with appropriate federal and state agencies, and provide conservation education programs for workers and their dependents. A program to manage groundwater withdrawal as it effects surface water and an erosion control program will be instituted by the Air Force. The Air Force will advocate funding additional fish and wildlife personnel.

OTHER MITIGATIONS UNDER CONSIDERATION (3.11.2)

Loss of Habitat due to Construction (3.11.2.1)

Potential mitigations that could be implemented to reduce the loss of habitat due to scarification of vegetation from construction activities include avoidance of areas with tortoise populations. The only area in either basing region containing desert tortoise is the area in the vicinity of the Coyote Spring OB. Therefore avoidance of impacts to this species would require selection of an alternative without a Coyote Spring OB.

An alternative measure would be to remove all desert tortoise from areas to be directly impacted and relocate to areas that have low desert tortoise populations, but could support higher populations with management of lifestock grazing, ORV activity, and mining exploration in these areas. This would involve careful, labor intensive searches of the affected areas to find all desert tortoises in the area. Searches could continue during construction to find desert tortoises which weren't found previously. This would involve coordination with the BLM and knowledgeable groups such as the Desert Tortoise Council to choose a large enough site that meets the needed requirements for transplantion as well as coordination with BLM to manage other conflicting activities on this land. This process would be difficult to implement and if any of the steps are left out the mitigation might prove ineffective. Particular attention needs to be paid to finding a suitable area and eliminating all present competing uses. All desert tortoises taken from the affected areas which could not be placed in suitable habitat should be donated to scientific organizations for research purposes.

The extensive planting of nonnative vegetation in desert tortoise habitat could be prohibited, and planting of lawns and exotic shrubbery could be minimized. The Air Force could encourage use of native plants for landscaping, particularly palatable annuals that desert tortoises eat, and maintain existing desert vegetation in open areas. In addition to reducing water needs, and providing potential for survival of some native biota including tortoises, this will reduce the number of possible exotic predators coming into these areas.

Another mitigation could be minimizing new and temporary roads in desert tortoise habitat.

The Air Force could implement a mass transit system for commuting, such as a bus system that would connect the OB with Las Vegas and support communities, and would reduce traffic and fuel consumption and may eliminate the need to enlarge roads between these points. It may also reduce the need for construction of housing on base by making living in the Las Vegas area more feasible and attractive.

Increase in Desert Tortoise Deaths due to Increased Vehicular Traffic (3.11.2.2)

Several potential mitigations could be effective in reducing the increased deaths of desert tortoises due to increased vehicular traffic. One is to provide convenient mass transit between OB and support communities. This would minimize passenger car use, reduce traffic, fuel consumption, and cost to personnel. Another measure would be to construct desert tortoise-proof fencing and underpasses for tortoises along roads, when appropriate in desert tortoise habitat.

In addition, speed limits can be reduced along roads in desert tortoise habitat to minimize road kills. Warning signs and lights could also be used to reduce road kills.

Increased Vandalism and Collection (3.11.2.3)

To reduce the impact of an increase in vandalism and collection of desert tortoises as pets as a result of increased population in the area, several potential mitigations could be implemented. One would be to fund state agencies for increased surveillance of desert tortoise areas to enforce laws against collecting. Particular attention should be given to increased funding of the Nevada Department of Wildlife so they can increase law enforcement officers patrolling these areas. This could be a very effective mitigation. An additional measure would be to publicize laws.

Increase in Impacts from Increased Recreational Pressures (3.11.2.4)

Potential measures to reduce the impacts from increased recreational pressure as a result of increased population in the area include measures to prohibit ORV activity in desert tortoise habitat. Signs prohibiting ORV activity in desert tortoise habitat could be posted, and assistance could be provided to state agencies to patrol these areas. Fencing particularly vulnerable areas to prevent vehicular access would be effective, combined with directing ORV enthusiasts to established BLM ORV areas near Las Vegas. This is a mitigation that would help conserve desert tortoises and their habitat. ORV activity could be limited to existing roads by posting signs on major roads and existing dirt roads warning ORV enthusiasts to stay

on existing roads. One area could be set up to receive all ORV activity within Coyote Spring Wash. It would be best to choose an area with the lowest desert tortoise density and prohibit ORV activity in all other areas of Coyote Spring Wash. Another mitigation would be to prohibit camping in desert tortoise habitat. Signs prohibiting camping and directing campers to campsites outside of desert tortoise habitat could be posted.

Introduction of Exotic and Domestic Species (3.11.2.5)

Introduction of exotic and domestic species (e.g., dog and cats) due to increased personnel in the area during construction and operation could be mitigated by adopting a program to restrict or strictly regulate pets (especially dogs) in life support camps. These animals disturb and/or kill native wildlife species.

3.12 UTAH PRAIRIE DOG

The major impacts to Utah prairie dogs would occur as a result of habitat degradation and disturbance from the increased human populations due to the project. These impacts would occur from loss of habitat due to construction activity, increase in shooting and vandalism of Utah prairie dogs and their colonies, increase in Utah Prairie Dog road kills due to increased vehicular traffic on roads in the area, increase in impacts from increased recreational pressures, and introduction of exotic and domestic animals (e.g., dogs and cats) due to increased personnel in the area during construction and operation.

Mitigation measures will be directed toward minimizing these impacts.

AIR FORCE PROGRAMS (3.12.1)

To protect rare, threatened, and endangered species, the Air Force will institute cooperative programs with federal and state management agencies. The Air Force will identify the critical habitat of rare, threatened, or endangered species and will monitor populations. Sensitive habitats will be avoided and construction activities will be scheduled to minimize disturbance insofar as possible. Additional measures to minimize impacts will include controlling construction off-road travel and restricting firearms in life support camps and at job sites. When the avoidance of habitats is not possible, the Air Force will determine suitable replacement habitats and will relocate species as required.

In addition, the Air Force will accomplish a revegetation program in cooperation with appropriate federal and state agencies, and provide conservation education programs for workers and their dependents. A program to manage groundwater withdrawal as it effects surface water and an erosion control program will be instituted by the Air Force. The Air Force will advocate funding additional state fish and wildlife personnel.

OTHER MITIGATIONS UNDER CONSIDERATION (3.12.2)

Loss of Habitat due to Construction (3.12.2.1)

The Air Force could route the DTN in southern Pine Valley to avoid the only active Prairie dog colonies in the siting region and could maintain a one-half to one mi buffer zone between the DTN and the colonies, wherever possible.

There are several mitigations that could be effective to reduce the impacts of the loss of habitat due to scarification of vegetation from construction activity. One measure could be to reroute the DTN from OB site through Wah Wah valley, thus avoiding direct conflicts with Utah prairie dogs. Another could be to reduce or eliminate livestock grazing in the vicinity of prairie dog towns during spring and summer months. This would decrease competition with livestock for key forage species and also reduce trampling of prairie dog burrow complexes. This could be accomplished in conjunction with designation of Utah prairie dog habitat as Areas of Critical Environmental Concern (ACEC).

Another potential measure could be to provide additional funds to state agencies and the BLM to allow for increased transplanting of Utah prairie dogs from private lands to new sites on public lands with suitable habitat. Funds would also be used for management of prairie dog habitat degraded or otherwise impacted by construction activities.

Increase in Vandalism as a Result of Increased Human Population (3.12.2.2)

Increased shooting and vandalism of Utah prairie dogs and their colonies as a result of increased human population in the areas could be mitigated by fencing and prohibiting access to Utah prairie dog colonies on federal lands, and by providing the maximum possible buffer zone between colonies and the DTN.

Increase in Road Kills due to Increased Vehicular Traffic (3.12.2.3)

To reduce the increase in road kills due to increased vehicular traffic on roads in the area there are several mitigations that could be effective. One is to maintain the maximum possible buffer zone between DTN and colonies. Because prairie dogs seldom venture far from the edges of their towns, maintaining a suitable buffer zone between roadways and colonies should eliminate most of this impact.

Increase in Impacts from Increased Recreational Pressures (3.12.2.4)

Several mitigations could be effective in reducing recreational pressure. One is to relocate the proposed construction camp from Pine Valley to an area more remote from the prairie dog colonies in Pine Valley. This mitigation would minimize indirect impacts from the DDA.

Another measure would be to prohibit off-road vehicle (ORV) activity by construction or OB personnel in or near prairie dog colonies in Pine Valley. This mitigation may be difficult to enforce, but could be effective if combined with an education program informing personnel of this species. Designation by BLM of the colonies as ACECs would allow enforcement of such prohibition. This may be more effective and acceptable to ORV users if it is implemented in combination with a program to set aside designated ORV use areas near OB sites, but away from current or potential Utah prairie dog habitat; thus concentrating the impacts to a few areas and avoiding widely dispersed ORV impacts which could be highly detrimental to prairie dogs. Such areas with diverse terrain and comparatively free from natural resource conflicts could be attractive for ORV use. ORV activity, if unchecked, could result in destruction of habitat, loss of forage plants, destruction of burrow complexes, and increased access to prairie dog colonies, thus increasing the likelihood of shooting and vandalism.

Another measure is to prohibit camping in or near Utah prairie dog habitats. Signs could be posted in restricted areas. A ban on camping may be difficult to enforce. However, this particular recreational impact may not be significant because Utah prairie dog habitat is often in valley bottoms and on bajadas in grassy or sparsely vegetated habitats, areas not usually considered attractive for camping.

It may also be effective to fence off areas surrounding Utah prairie dog colonies to prevent access by recreationists (eg. ORV users, campers, and potential poachers). Most colonies are small and the cost would not be prohibitive. Large areas surrounding each colony could be included within the exclosures to allow for expansion of the populations. Fencing of colonies would also restrict livestock grazing and trampling around colonies. Finally, recreational use could be discouraged, thereby lessening impacts in Southern Pine Valley by reducing access to the valley.

Introduction of Exotic and Domestic Species (3.12.2.5)

One potential mitigation measure that could reduce the impacts caused by introducing exotic and domestic animals (e.g., cats and dogs) into the area, would be to restrict or closely regulate (e.g., by leash laws) pets (especially dogs) from life support camps. Dogs are known to harass and/or kill native wildlife species.

3.13 AQUATIC SPECIES/PROTECTED AQUATIC SPECIES

The major impacts to protected aquatic species would be the loss or degradation of habitats as a result of the M-X project. A variety of causes would lead to impacts, such as habitat loss from groundwater withdrawal, habitat loss and/or degradation caused by increased sedimentation and/or turbidity, increased stress to sensitive habitats and species due to increased recreation, introduction of exotic species, habitat alteration due to eutrophication from wastewater discharge, pollution of sensitive habitats by exotic chemicals, and habitat loss from surface water withdrawal.

Mitigation measures will be directed toward minimizing these impacts.

AIR FORCE PROGRAMS (3.13.1)

The Air Force will institute cooperative programs with appropriate federal and state agencies for wildlife management. The Air Force would assist in identifying, monitoring, and managing species to counteract project impacts. These programs would include all or part of the following, as appropriate: avoid important habitats if possible; schedule activities to avoid critical periods; assist enforcement and management agencies; transplant wildlife; and provide additional habitat or alter other habitats to offset impacts.

To protect rare, threatened, and endangered species, the Air Force will institute cooperative programs with federal and state management agencies. The Air Force will identify the critical habitat of rare, threatened, or endangered species and will monitor populations. Sensitive habitats will be avoided and construction activities will be scheduled to minimize disturbance insofar as possible. Additional measures to minimize impacts will include restricting construction off-road travel. When the avoidance of habitats is not possible, the Air Force will determine suitable replacement habitats and will relocate species as required.

OTHER MITIGATIONS UNDER CONSIDERATION (3.13.2)

Habitat Loss from Groundwater Withdrawal (3.13.2.1)

Water use for construction and operation of various phases and facilities of the M-X project will utilize groundwater aquifers that may provide discharge for springs and streams either nearby or distant from the point(s) of withdrawal. The degree to which groundwater withdrawal affects a sensitive aquatic habitat will depend upon the amount and rate of withdrawal, and location from which the water was withdrawn. The direction of groundwater flow, the supply or perennial yield of the aquifer, and the existing transmissivity and fault structure of the aquifer strata determine the magnitude and the time lag of effect. Water supply for each spring or stream is unique, with a wide variety of water quality types occurring in the Great Basin. From a thermal aspect alone, springs are known to exist virtually side-by-side, one of which is hot and the other cold (e.g., Ash Springs in Pahranagat Valley). In other valleys, such as Railroad, a series of cold springs occur on the eastern side of the valley, apparently following an ancient fault line, while, on the western side of the valley, two clusters of hot springs occur less than 30 mi apart.

Habitat loss would result in reduced carrying capacity of the habitat for sensitive aquatic species. For fish, this could result in crowding, loss of spawning habitat, and loss of substrate from which food organisms such as algae and invertebrates grow. At Devils Hole in Ash Meadows, Nevada, it was shown that reduction of water exposed a previously submerged ledge which provided both feeding and spawning habitat for the Devils Hole pupfish. It was shown that this loss of habitat caused a gradual decrease in the population levels of the formerly stable community of pupfish. When the water level at Devils Hole was reestablished at preexisting conditions, the population of pupfish returned to former levels of abundance.

There are several mitigations that could be included to reduce the potential for habitat loss from groundwater withdrawal. One measure could be to avoid upslope well locations near sensitive aquatic habitats. Several likely mitigations may be employed to ameliorate impacts of groundwater pumping upon nearby and distant aquatic habitats. Monitoring of habitat conditions during pumping may indicate that pumping rates can be adjusted to maintain adequate levels of spring flow and still provide for construction and operation water needs. For instance, pumping rates could be increased during spring snowmelt runoff conditions; conversely, since springtime is critical for spawning of sensitive fish species, it may be this time of year when reductions of water levels would be most critical. During mid-summer when aquifer production is lowest, pumping near sensitive aquatic habitats could also be reduced in order to prevent complete desiccation of the habitats.

Another possible measure could be the interim augmentation of spring flow. In aquatic habitats located at a greater distance from pumping fields, it may be observed that water-level reductions occur much later after initiation of pumping. Since recovery of spring-flow rates may also take a relatively long time, it may be necessary for interim augmentation of spring flow which is not immediately mitigatable by changing of pumping rates or locations. In such a situation, it may be recommended that water of a similar quality be piped in from a nearby non-connected source, or even from the same aquifer source. For instance, a well

drilled adjacent to a spring and tapping the same aquifer as the spring could be utilized as a source to supplement spring flow until normal spring flow is reestablished. This is a difficult strategy requiring careful planning and control so that the spring habitat does not become dependent on supplementation from the piped-in water.

Another potential mitigation to well-water withdrawal from an aquifer would be to recharge that aquifer with treated domestic wastewater from life support camps and operating bases. This mitigation would be limited by the difficulty in recharging an aquifer over several hundred feet deep and the natural tendency of evaporative loss of the wastewater before it is injected into the groundwater as a result of the arid desert climate.

A final mitigation, when all other mitigations prove ineffective, would be to transplant affected sensitive species to compatible habitats not affected by groundwater withdrawal. This is exceedingly difficult and requires trial-and-error experiments, since habitat requirements for many desert aquatic species are unique and essentially unknown. Successful implementation of this mitigation would require early contingency planning including: early identification of habitats and species that may be jeopardized; characterization of critical environmental parameter (including water quality, flow, food and spawning requirements); surveys to identify suitable sites for transplantation; possible modifications of transplant sites to accomodate requirements of the transplanted species; and early transplantation to establish the new population before the source habitat becomes unable to support the species. Since a large proportion of spring habitats in the Great Basin already contain endemic biota, selection of receiving habitats for transplantation requires consideration of impacts to the endemic biota that may be caused by the transplantation.

Habitat Loss Caused by Increased Sedimentation (3.13.2.2)

Structures such as DTN, cluster roads, and shelters may be constructed near aquatic habitats. Depending upon the slope and proximity of the construction, erosion followed by increased turbidity and sediment load in aquatic habitats is possible. Since no project structure will be constructed directly over perennial aquatic habitats for geotechnical reasons, it is not expected that direct physical disturbance such as major channelization or clearing of aquatic vegetation will occur.

Increased sedimentation and/or turbidity can cause habitat loss and/or degradation. Habitat loss will result in impacts discussed previously. Habitat degradation such as increased turbidity could also stress affected sensitive aquatic biological populations. Some fish require clear water for feeding and increased turbidity could cause starvation. Increased turbidity could also suffocate food organisms such as filter-feeding and gill-breathing benthic macroinvertebrates. Suffocation of fish due to clogged gills could result from increased water turbidity.

There are two potential mitigation measures that could reduce the impact of habitat loss and/or degradation caused by increased sedimentation and/or turbidity. The primary mitigation would be to avoid siting upslope from sensitive aquatic habitats, or, if this is not possible, utilize erosion prevention measures. Dams, weirs, erosion netting, and revegetation can aid in the prevention of erosion.

Reinforcement of bridge and culvert structures which are non-obstructive to water flow patterns could also be helpful in eliminating enhanced surface erosion and subsequent down-slope sedimentation and turbidity in aquatic habitats.

Another potential measure could be to schedule construction that is near and upslope from sensitive aquatic habitats after the major expected rainfall season. If sedimentation of sensitive aquatic habitats cannot be avoided, affected aquatic habitats could be restored, rehabilitated, or enhanced as soon as possible before adverse reductions or resident species occur.

Increased Stress to Habitats due to Increased Recreation (3.13.2.3)

An expected accompaniment to any large project in relatively pristine environments is the incursion of recreational pursuits, some of which will be new to the region. The Great Basin and much of the Texas/New Mexico High Plains is relatively sparsely populated. New construction and operation personnel, their families, and support personnel can be expected to pursue a variety of recreational activities. Attractive aquatic habitats provide diversion in the form of swimming, fishing, camping and even gold panning. Many habitats can be reached only by foot, horseback, or offroad vehicle (ORV).

Populations of sensitive aquatic species occurring in aquatic habitats subject to recreation would experience stress from disturbances to which they are unaccustomed. It can be expected that many of the aquatic species will adapt to multiple use of their habitat for recreation. However, if this recreation damages part of their habitat or disturbs them during a particularly critical sensitive part of their life cycle, they may be unable to cope, and subsequently decline in abundance. Swimming can disturb spawning activities as well as feeding, and fishing can remove a major portion of a resource, such as trout. Camping, in itself, should not disturb sensitive aquatic species unless waste materials are disposed of into the aquatic habitat which degrades its quality. Gold panning in a trout stream could reduce water quality by increasing turbidity. Some endemic trout are particularly sensitive to increased turbidity and may be seriously affected by this pastime. ORV use can irreversibly disturb the sediments and gravel substrates of a small stream or spring. This increases turbidity and reduces production of benthic macroinvertebrates which are important food for many sensitive aquatic species.

There are two potential mitigation measures that could reduce the impact of increased stress to sensitive habitats and species due to increased recreation. Since recreation is a highly dispersed activity, it would be difficult to protect every sensitive aquatic habitat from recreational incursion. A practical mitigation could be to educate construction workers and those associated with operation of the facility with the sensitivity and uniqueness of the aquatic biota inhabiting many of the more prominent and attractive aquatic habitats in the project area. Those habitats considered most sensitive to recreational habitat disturbance may require fencing and protection by an onsite resource manager.

Introduction of Exotic Species (3.13.2.4)

Exotic species are those which do not normally occur in an area. These include: introduced aquarium species such as goldfish, mollies and swordtails; a pest-control species such as mosquitofish; and game species such as hybrid trout, bass, sunfish, and even carp.

Exotic species bring with them an aggressiveness to populate a habitat with their own kind and, possibly, a whole new host of diseases that may infect endemic species. It has been shown that some exotic species have been highly successful in eliminating endemics (e.g., mosquitofish, carp, and trout). Goldfish are now common in numerous springs throughout the Great Basin and compete for food with the endemic species.

There are two potential mitigations that could reduce the impact of introduction of exotic species. One of the primary mitigations to the introduction of exotic species is the education of the public to the harm or damage to endemic species that they may cause. Where public education is ineffective, fencing of the aquatic habitat and stationing of an onsite manager could be required.

Another measure could be to renovate aquatic habitats. Once an aquatic habitat has been contaminated by exotic species, it may be necessary to renovate or remove those exotic species. This is usually difficult and requires careful collection of endemics from the present mixed population, after which the entire habitat is poisoned with a short-lived toxin, and endemics are reintroduced. Invariably, some of the exotic species are not killed, and return in abundance at some later date. Renovating the habitat could also require placement of weirs downstream to prevent the upstream movement of undesirable exotics. This has been undertaken at Hot Creek in White River Valley, where bass have been removed from head springs to prevent extirpation of the Moorman White River springfish.

Habitat Alteration from Wastewater Discharge (3.13.2.5)

Near centers of population growth, wastewater disposal may create a problem in nearby surface waters. Treated domestic wastewater can enrich receiving waters and change the species composition of the resident biota. This is especially evident where the receiving water is of relatively small volume and does not sufficiently dilute the wastewater which is discharged into it.

Eutrophication, nutrient enrichment and oxygen reduction of receiving water as a result of wastewater discharge, can alter species composition, especially at the lower trophic levels. Certain sensitive aquatic species such as fish may find that a primary food source is eliminated as a result of wastewater discharges. If the species is unable to adapt to a new food source, it may suffer starvation. Even treated wastewater discharges can also deplete the oxygen in the surface water, especially at night time and in heated waters, so that the endemic species are unable to survive. Many existing aquatic habitats in the Great Basin are characterized by relatively low oxygen levels. Resident species have adapted to low oxygen levels, but are approaching their limits of tolerance. Any further reduction in dissolved oxygen levels, even very small reductions, could eliminate certain sensitive aquatic species.

One potential mitigation that could be included to reduce the impact of habitat alteration due to eutrophication from wastewater discharge could be advanced waste treatment, or lagooning. Domestic wastewater which is discharged into a small volume of receiving water would require advanced treatment to reduce the oxygen demand and nutrient levels of materials discharged. Since this is probably prohibitively expensive, it may be prudent to avoid discharge of domestic waste- waters into sensitive aquatic habitats by injecting them deep into distant

aquifers or by simply allowing the wastewater to evaporate from lagoons and removing the sludge to land fills. Wastewater may also be used as a dust palliative or recylced for domestic use.

Pollution of Habitats by Exotic Chemicals (3.13.2.6)

Near construction sites where activity of trucks, tractors, and machinery is high, there is the probability that oil or gasoline spills will occur as a result of machinery breakdowns, etc. These chemicals could enter surface waters as a result of heavy rainfall. Construction materials such as cement and iron oxides could also enter surface waters during rainfall.

Introduction of exotic chemicals into pristine, sensitive, aquatic habitats could seriously threaten populations occurring therein. The toxicity of petrochemicals is usually high to unacclimated species. Information on susceptibility specific to species occurring in the project areas is presently unavailable. Less toxic construction materials, such as cement or iron oxides, could reduce habitat quality by increasing turbidity.

There are two potential mitigations that could reduce the impact of pollution of sensitive habitats by exotic chemicals. Introduction of construction materials into surface water habitats could be mitigated or avoided by regular and effective quality control procedures for construction and machinery operation. The potential for pollution of aquatic habitats could be reduced or prevented through effective containment and cleanup procedures.

Surface Water Withdrawal (3.13.2.7)

Although the primary water source for the project will be groundwater, there may be certain instances when withdrawal of surface water for construction, dust control, or revegetation may be contemplated. Since surface waters of the desert regions of the southwest United States are scarce, the use of this water is invariably already subject to heavy prior use by livestock, agriculture, wildlife, and resident aquatic species.

Withdrawal of water directly from surface waters could be the most damaging of all potential impacts to sensitive aquatic habitats. Where this has occurred previously as a result of agriculture or road construction, extinction of fish species has resulted (e.g., Ash Meadows and Pahranagat valleys). Surface water use not only disturbs the habitat, but also reduces it. Any free-swimming or floating aquatic biota are likely to be pumped out of the habitat, depending upon the amount and rate of water withdrawn.

The primary mitigation for this possible impact would be the strict prohibition of water withdrawal from small surface water habitats, especially those that are known to contain sensitive aquatic species. Even a seemingly barren aquatic habitat may contain as yet undescribed species of cryptic fish or invertebrates. This is not to mention the potential critical nature of the habitat to desert wildlife which may depend on its water supply for survival. The next nearest aquatic habitat may be located at a distance greater than can be tolerated by resident wildlife. Water requirement impacts to wildlife are discussed in another section of this report.

3.14 WILDERNESS

The major impacts to wilderness resources would occur as a result of biological, physical and aesthetic degradation due to increased visitor use and direct project activity. These specific impacts are: 1) impairment of scenic landscapes due to valley floor scarification as a result of cluster and road networks, 2) impairment of the solitude and primitive quality of wilderness due to construction noise, 3) impairment of scenic landscapes visible from montane vista points due to changes in air quality from construction activities, 4) and impairment of the natural and solitary aspects of wilderness areas because of increased use and enhanced access to formerly remote areas.

Mitigation measures will be directed toward minimizing these impacts.

AIR FORCE PROGRAMS (3.14.1)

The Air Force will cooperate with federal, state, and local agencies in managing visitations to wilderness resource areas and provide an education program for M-X workers and dependents. Wilderness areas will be avoided in siting, and impacts such as noise and lowered air quality will be minimized during construction and operation. Visual impacts will be minimized by means of visual resources management during siting and design.

OTHER MITIGATIONS UNDER CONSIDERATION (3.14.2)

Impairment of Landscapes Due to Scarification (3.14.2.1)

One potential mitigation that could reduce the impairment of scenic landscapes due to the presence of cluster and road networks could be to provide for natural screening of valley floor scarification. This particular impact would be extremely difficult to mitigate. A revegetation program using native species, especially the taller species, may alleviate the visual impact to some extent.

Impairment of Wilderness Due to Noise (3.14.2.2)

There are several potential mitigations that could be included to reduce the impact of impairment of the solitude and primitive quality of wilderness areas due to construction noise. One measure could be to reduce construction noise, which will have a temporary impact. During that time the impacts of noise can be reduced by using equipment that meets EPA noise emission guidelines (U.S. Dept. of Energy, 1979). Temporary noise barriers could be used in construction zones near sensitive receptors, although their construction would in itself create noise (Minnesota Pollution Control Agency, 1980). Temporary plantings of fields of high vegetation are effective barriers (Southern Minnesota Municipal Power Agency, 1981). Water requirements may preclude this type of mitigation, however.

Two other possible measures could be the rerouting of air craft to avoid low flights over the vicinity of wilderness areas, and scheduling construction in small units at a given time to lessen noise impacts.

Impairment of Landscapes Due to Air Quality (3.14.2.3)

There are three potential mitigations that could be included to reduce the impairment of scenic landscapes visible from montaine vista points due to changes in air quality from construction activities. They could include minimizing construction activities on windy days, scheduling construction in small units to lessen dust impacts, and scheduling construction activities for a time of year when soil moisture content is high. Soil moisture content would have to be monitored on a site-specific basis.

Impairment of Wilderness Quality from Increased Recreation (3.14.2.4)

Effects of M-X deployment on wilderness would probably be the responsibility of the managing agencies which would, in turn, provide the most effective mitigating measures. By legislative mandate (Federal Land Policy and Management Act, 1976) managing agencies must administer Wilderness Resources (including areas under review) in a manner consistent with the objectives of the Wilderness Act of 1964 (Crawford, 1979). Section 2(c) states that wilderness areas "shall be administered for the use and enjoyment of the American people in such manner as will leave them unimpaired for future use and enjoyment of wilderness and so as to provide for the protection of these areas, the preservation of their wilderness character, and for the gathering and dissemination of information regarding their use and enjoyment as wilderness" (Federal Register, 1981).

"Naturalness" and "solitude" are the distinguishing qualities of areas classified as wilderness, and they also serve as principal criteria in the formation of management policy (Hendee et al., 1978). While public use and enjoyment are provided for in the Wilderness Act, recreational uses of these areas are appropriate only so long as natural processes can operate as freely as possible (Hendee et al., 1978). Impairment of the qualities of naturalness and solitude in both designated wilderness areas and areas under review must be prevented through appropriate policies developed by the managing agencies, with the cooperation of the Air Force.

One potential mitigation that could reduce the impairment of the naturalness and solitude of wildernesses from increased recreational pressure could be Air Force assistance in wilderness management. The Air Force could coordinate with managing agencies to provide wilderness zoning strategies, as well as assistance in regulating visitor use and enforcing wilderness controls. The basic problem is to define the limits of acceptable change consistent with managment objectives for the affected area. Most change on a recreational site results from initial light use, and continued or increased use results in little additional change (Hendee et al., 1978). Site impact can be more effectively minimized by concentrating use on particularly resistant sites, rather than by encouraging dispersed use. Research indicates that vegetational changes can be minimized by routing trails and camps in meadows and open forests where understories are dominated by graminoids and heliophytic plants. Densely forested areas should be avoided, particularly where understories are dominated by woody shrubs and erect forbs (Cole, 1979). However, such action may increase soil erosion, wildlife disturbance, and visual distance. A determination of the changes in environmental characteristics that would accompany the routing of trails and camps could be made by the managing agency for each wilderness resource.

Another measure could be Air Force coordination of well-structured intensive recreation programs. Such programs could include trips to other recreation areas, trap and skeet ranges, commercial packers and organized trail rides. Localized and controlled wilderness use and/or dispersed recreation outside the effected areas could reduce impacts throughout the DDA.

3.15 EMPLOYMENT AND LABOR FORCE

The M-X project will have both direct and indirect effects on employment and labor force characteristics in affected counties and communities. The rapid influx of construction and associated workers and later military personnel will change the occupational profile of many areas from predominantly agricultural, government, and/or mining to service and trade oriented industries.

In the construction phase, the demand for labor may well outstrip the supply, causing local wage inflation and labor movement out of the lower paying occupations. Occupations at a disadvantage include agriculture, government and community public services, and service-oriented activities.

In addition, dramatic increases in population and the attendant market for goods and services will likely cause increased competition for available commercial building sites and existing structures, causing an escalation in land and property value. Accompanying this trend will be an increase in the scale of operation of businesses. Local existing businesses will face increased competition from nonlocal business chains. After the peak year of construction, a reversal of price trends would likely occur as people leave the region of influence. Pricing impacts would likely be deflationary as housing demand declines and the aggregate level of personnel consumption expenditures decline.

Mitigation strategies should be concentrated on economic development planning and implementation, including provisions for planning assistance funds.

AIR FORCE PROGRAMS (3.15.1)

The Air Force will advocate the use of the community impact assistance mechanism to assist local governments to mitigate impacts on employment and labor force. In addition, the Air Force will cooperate with local planning agencies. The Air Force will minimize the labor force requirements to the extent possible through utilization of labor saving technologies and procedures, and by careful planning and scheduling of construction activities.

OTHER MITIGATIONS UNDER CONSIDERATION (3.15.2)

Local planning for the M-X impacts is currently in preliminary stages and should continue as additional information and details concerning the project plans and requirements become available. To meet initial demands, extensive importation of labor, and other resources and final goods, will be necessary. Planning the construction of industrial developments consistent with long-term area needs, such as small scale business parks, or restaurants and motels, could lessen the unemployment effect that is expected after the peak M-X construction years. This would, however, spur additional employment growth. It is also less appropriate in those rural areas where only technical facilities are planned. There, short-run

adjustments, such as importing goods and services, may be a more appropriate way to cope with project needs. In these rural areas, expansion of the local industrial base is expected to lead to "bust-type" recession problems during post construction years, although without such an industrial base project demands could not be fulfilled.

Local residents and businesses are integral parts of community, growth, and management planning. Job training programs, information dissemination, worker relocation assistance, and contract negotiation classes coordinated by federal, state, and local manpower and economic specialists, would be required.

Geographic dispersal of personnel would tend to redirect the workers, their families, and their expenditures away from OB communities, reducing stress on local labor markets. However, this would generate additional growth in other communities. This could be mitigated in part by basing some permanent personnel at the Area Support Center rather than at the operating bases.

3.16 EARNINGS

The M-X project could cause labor and material shortages within the deployment region and correspondingly put pressure on local wages and prices. Mitigations should be directed toward minimizing competition for local labor and materials except within local areas where the increased labor and materials requirements could be considered a benefit to the local economy.

AIR FORCE PROGRAMS (3.16.1)

The Air Force will provide centralized procurement of materials and equipment to minimize adverse economic impacts, where feasible. This measure could avoid placing excessive demand on local suppliers that could cause shortages and higher prices. The Air Force will minimize the labor force requirements to the extent possible through utilization of labor saving technologies and procedures and by careful planning and scheduling of construction activites.

OTHER MITIGATIONS UNDER CONSIDERATION (3.16.2)

A training program could be established that would assist local laborers in acquiring higher paying employment and reduce the number of in-migrants necessary to satisfy the demand for skilled workers. Although this measure would help local laborers obtain higher paying M-X-related employment, it would also tend to deplete the local labor force.

Placing a higher number of permanent personnel in the ASCs could distribute the in-migrants over a much broader area and reduce the stress on markets serving the operating base areas.

Scheduling construction activities to avoid concurrent construction peaks with other major projects in the same area (such as the White Pine Power Project and the Intermountain Power Project) could reduce the stress on those areas and help provide longer and steadier employment for workers in those areas.

3.17 POPULATION

The magnitude of the population impact is directly related to the size of the labor force employed on the project and the secondary employment induced by the project. The in-migrating population, in turn, will determine the increase in levels of economic activity to be expected in the region, as well as the increased demand placed on public services. Thus, the size of the population increase, the timing of that increase, and the constituent nature of the in-migrant population are crucial factors toward which mitigations should be directed. Efforts to accommodate the inevitable population influx will be complicated in some communities because of the boom-bust nature of the fluctuations, particularly in areas where only DDA facilities are to be constructed.

Large population increases will dramatically change the daily lives of the people residing within the deployment region. Such change will have both positive and negtive aspects. On the positive side, a greater range of both economic and cultural opportunities may be provided to small communities, even though growth pushes populations over size thresholds. As positive economies of scale are achieved, improvements in economic efficiency in both government and the private sector can be expected. On the other hand, large population increases will stress and overburden many public services such as education, housing, public safety and community services. Local governments will be placed in a fiscal dilemma: increased population immediately demands services (expanded existing ones and new ones) but revenues (much in the form of property tax revenues) lag behind the need for capital expenditures. Mitigations of these problems should include a cooperative community planning process so that benefits associated with the M-X project can be realized, while adverse impacts are minimized.

AIR FORCE PROGRAMS (3.17.1)

The impacts on existing community populations are directly related to the size of the M-X labor force and the induced secondary effects, as well as the location of life support camps and operating bases. Mitigations should be directed toward minimizing labor force requirements and the demand for public facilities and service due to an increased temporary population.

The Air Force will minimize labor force requirements to the maximum extent possible through utilization of labor saving technologies and procedures, and by careful planning and scheduling of construction activities. Temporary facilities for M-X workers will be provided at life support camps to minimize the impact of temporary population increases and the demand for public facilities and services in neighboring communities. For a discussion on mitigation measures for housing, community infrastructure, public finance and urban land use, see other sections of the FEIS.

OTHER MITIGATIONS UNDER CONSIDERATION (3.17.2)

Other measures which could mitigate impacts include the provision of accurate and timely estimates of labor requirements and the locations of those requirements to local and state planning officials as soon as possible so as to best prepare courses of action. The Air Force could coordinate the M-X project construction work schedule to avoid conflict with other large-scale projects in the area and, thus, keep to a minimum the regionwide cumulative impacts.

Demand for public facilities and services in local communities could be reduced if the Air Force provided as many public services at the life support camp sites as possible. These would include temporary housing, fire protection, law enforcement, entertainment, recreation and medical and dental services. Similarly, the Air Force could provide as much on-base housing as possible during the operation phase of the project.

3.18 HOUSING

The provision of housing in adequate quantity and quality has been identified as one of the most critical problems in small communities undergoing rapid growth. Central to this problem is the breakdown of supply and demand equilibrium conditions and the inability of the local housing market to reestablish a balance.

Problems associated with the supply of both permanent and temporary housing include: (1) a critical shortage of capital from local financial institutions; (2) the inflated cost of housing; and (3) the uncertainty surrounding forecasts of both the quantity and timing of the demand for housing. The lack of adequate housing can, in itself, produce a series of secondary impacts within the community. They include: (1) increased worker turnover rate; (2) decreased individual productivity and a concomitant reduction in general productivity levels; and (3) increased difficulty in recruitment of needed professional and public sector employees.

AIR FORCE PROGRAMS (3.18.1)

In order to avoid placing an undue burden on neighboring communities, the Air Force will provide temporary housing for M-X workers in life support camps and initiate a cooperative community planning program. Moreover, the Air Force will advocate that community impact assistance be provided to local governments to assist in mitigating impacts on housing. In addition, if, during the cooperative community planning process, it is determined that it would be appropriate to include dependents in life support communities, this measure could substantially reduce the demand for housing in neighboring communities. All excess housing units constructed for M-X workers will be disposed of after completion of the project in accordance with appropriate laws and regulations.

Other potential mitigations that could be very effective are outside the authority of the Air Force to implement. However, the Air Force will cooperate with appropriate authorities in the establishment of land-use controls.

Existing federal programs that could provide housing impact assistance are listed below.

Farmers Home Administration (U.S.D.A.)

Rural Housing Site Loans (Section 523 and 524 Site Loans)

Assistance in the form of direct loans and guaranteed/insured loans is available to assist public or private nonprofit organizations to acquire and develop land in rural areas for subdivision into building sites and sale on a nonprofit basis to families eligible for low- and moderate-income loans, cooperatives, and nonprofit organizations. Funds may be used for purchase

and development of sites, equipment, water and sewer facilities, engineering and legal fees, landscaping, walks, parking areas and driveways. Eligible applicants are private or public nonprofit organizations.

Rural Rental Housing Loans

Assistance in the form of guaranteed/insured loans is available to provide rental and cooperative housing and related facilities for rural residents. Loans may be used to construct, purchase, improve or repair rental or cooperative housing, for related recreational and service facilities and for land acquisition and improvement. Eligible applicants include state or local public agencies, individuals, nonprofit organizations, corporations, trusts and cooperatives.

Water and Waste Disposal Systems for Rural Communities

Assistance in the form of project grants and guaranteed/insured loans is available to promote orderly growth of rural areas by meeting the need for new and improved rural water and waste disposal facilities. Funds may be used for installation, repair, improvement or expansion of rural water and waste disposal facilities, including distribution lines, well-pumping facilities, and collection and treatment of sanitary, storm and solid wastes. Eligible applicants include municipalities, counties and other political subdivisions of a state such as; districts and authorities; associations, cooperatives and nonprofit corporations; and Native American tribes.

Business and Industrial Loans

Assistance in the form of guaranteed/insured loans is available to assist public, private or cooperative organizations, Indian tribes or individuals in rural areas to obtain quality loans for business and industry. Loans may be used for improving, developing or financing business, industry and employment, pollution abatement and control, and the conservation, development and utilization of water for aquaculture purposes. Eligible applicants include municipalities, counties or other political subdivisions of a state, Native American tribes, cooperatives, corporations and individuals.

Community Facilities Loans

Assistance in the form of guaranteed/insured loans is available for construction, enlargement and improvement of community facilities providing essential services to rural residents. Funds may be used for fire and rescue services, transportation, traffic control, community, social, cultural, health and recreational benefits, industrial park sites, access ways, utility extensions and other facilities for public use. Eligible applicants include state agencies, political and quasi-political subdivisions of states and associations, including corporations and Native American tribes.

Industrial Development Grants

Assistance in the form of project grants is available to facilitate the development of business, industry and related employment for improving the economy in rural communities. Funds may be used to finance industrial sites,

including land acquisition and development, construction, conversion, enlargement, repair or modernization of buildings, plants, machinery, equipment, access streets and roads, parking areas, transportation serving the site, utility extensions, necessary water supply and waste disposal facilities, pollution control and abatement incidental to site development, fees and refinancing, and other projects designed to facilitate development of private business enterprises. Eligible applicants include public territories such as states, counties, cities, townships and incorporated towns and villages, boroughs, authorities, districts and Native American tribes.

Area Development Assistance Planning Grants

Assistance in the form of project grants is available for the development of comprehensive planning for rural development. Funds may be used for development of comprehensive processes to enable areas with existing plans to make revisions or fill in critical gaps to ensure an integrated, usable package which can be implemented. Eligible applicants include states, units of general local government, regional and local planning commissions and Native American tribes.

Energy Impacted Area Development Assistance Program

This program is included for its potential as a possible prototype for an M-X impacted community assistance program. Assistance in the form of project grants is available for the development of growth management and housing plans and in developing and acquiring sites for housing and public facilities and services. Funds may be used for preparation of growth management and/or housing plans, site acquisition and development for single- and multifamily housing and public facilities and services such as firehouses, sewer plants, water plants, community centers, libraries, city or town halls, and schools. Local governments, councils of local governments and state governments are eligible applicants under this program.

Department of Housing and Urban Development

Mortgage Insurance--Construction or Substantial Rehabilitation of Condominium Projects (234(d))

Assistance in the form of guaranteed/insured loans is available to enable sponsors to develop condominium projects. Loans may be used to finance the construction or rehabilitation of multifamily housing structures by a sponsor intending to sell individual units as condominiums also eligible for mortgage insurance under this program. Eligible sponsors include investors, builders, developers and public bodies meeting FHA requirements for mortgage.

Mortgage Insurance--Land Development and New Communities (Title X)

Assistance in the form of guaranteed/insured loans is available to assist the development of large subdivisions or new communities. Loans may be used to assist in financing land acquisition and development of building sites, including water and sewer systems, streets and lighting and other installations needed for residential communities. Eligible applicants are prospective developers, subject to HUD approval. Public bodies are not eligible.

Mortgage Insurance--Management Type Cooperative Projects (213 Management Type)

Assistance in the form of guaranteed/insured loans is available to enable nonprofit cooperative ownership housing corporations or trusts to acquire housing projects to be operated as management-type cooperatives. Insured mortgages may be used to finance construction, acquisition or rehabilitation of housing of five or more units. Eligible mortgagors are nonprofit cooperatives, ownership housing corporations or trusts.

Mortage Insurance--Rental Housing (207)

Assistance in the form of guaranteed/insured loans is available to provide rental housing. Insured mortgages may be used to finance the construction or rehabilitation of rental housing of five or more units. Eligible mortgagors include investors, builders, and developers meeting FHA requirements.

Mortgage Insurance--Rental Housing for Moderate Income Families (221(d) (4))

Assistance in the form of guaranteed/insured loans is available to provide quality rental housing within the price range of low and moderate income families. Insured mortgages may be used to finance construction or rehabilitation of rental housing of five or more units. Eligible applicants include profit-motivated sponsors and limited distribution and nonprofit sponsors.

Mortgage Insurance--Rental and Cooperative Housing for Low and Moderate Income Families, Market Interest Rate (221(d)(3) Market Rate)

Assistance in the form of guaranteed/insured loans is available to provide quality rental or cooperative housing within the price range of low- and moderate-income families. Insured mortgages may be used to finance construction or rehabilitation of rental or cooperative housing or to finance the acquisition of properties rehabilitated by a local public agency. Eligible sponsors include public, nonprofit, cooperative, builder-seller, and investor.

Low Income Housing--Assistance Program (Public Housing)

Assistance in the form of direct payments for specified use and direct loans is available to provide housing and related facilities for low income families through an authorized Public Housing Agency. Funds may be used for acquisition and construction and annual contributions are made to public housing agencies for debt service payments and to maintain adequate operating and maintenance service and reserve funds. Eligible applicants are public housing authorities established by a local government in accordance with state law, authorized public agencies and Native American tribal organizations.

Low Income Housing--Homeownership for Low-Income Families (Turnkey III, Mutual Help for Native-Americans)

Assistance in the form of direct payments for specified use and direct loans is available to provide, through local public housing agencies, low-income

families with the opportunity of owning their own homes. Eligible applicants are PHAs, including Native American Housing Authorities, and the proposed program must be approved by the local governing body.

Mortgage Insurance--Homes--Military Impact Areas (238(c))

Assistance in the form of guaranteed/insured loans is available to help families undertake home ownership in military impacted areas. Loans may be used to finance the purchase of proposed, under construction or existing one- to four-family housing. All families are eligible to apply.

Surplus Land for Low and Moderate Income Housing (Section 414 Surplus Land Program)

Assistance in the form of sale, exchange, or donation of property and goods and advisory services and counseling is available to provide surplus property and land at fair value for use for low or moderate income housing and related commercial and industrial use. Eligible applicants include cities, counties and state governments and private applicants.

Community Development Block Grants/Small Cities Program (Small Cities)

Assistance in the form of project grants is available to help communities provide decent housing and expanded economic opportunities principally for persons of low and moderate income. Funds may be used for acquisition, rehabilitation or construction of public works facilities, economic development, code enforcement and like projects. All states, counties, and units of general local government, except metropolitan cities and urban counties, may apply for Small Cities Grants.

Native American Community Development Block Grant Program (Indian Setaside)

Assistance in the form of project grants is available to aid Native American tribes in the development of viable communities. Funds may be used to support a wide range of activities, including acquisition, disposition and rehabilitation of real property, public facilities, solid waste facilities, fire protection, parking and public utilities. Eligible applicants include any tribe, band, group or nation.

Mobile Home Loan Insurance--Financing Purchase of Mobile Homes as Principal Residences of Borrowers

This program makes possible reasonable financing of mobile home purchases with guaranteed/insured loans. HUD insures lenders against losses on loans. Insured loans may be used to purchase mobile home units by buyers intending to use them as their principal place of residence. The maximum amount of the loan is $16,000 ($24,000 if two or more modules are to be financed). The borrower must give assurance that the unit will be placed on a site which complies with FHA standards and with local zoning requirements.

Lower-Income Housing Assistance Program (Section 8--Housing Assistance Payments Program for Lower Income Families)

This program aids lower-income families in obtaining decent, safe and sanitary housing in private accommodations and promotes economically mixed existing, newly constructed, and substantially rehabilitated housing. It provides housing assistance payments to participating private owners and public housing agencies for decent, safe and sanitary housing for lower and very low-income families at rents they can afford. Housing assistance payments are used to make up the difference between the maximum approved rent due to the owner for the dwelling unit which is reasonable in relation to comparable market units and the occupant family's required contribution towards rent. Assisted families are required to contribute not less than 15, nor more than 25 percent of their adjusted family income toward rent.

Department of the Interior--Bureau of Native American Affairs

Native American Housing Assistance

Assistance in the form of project grants (contracts), training, advisory services and counseling and dissemination of technical information is available through the Native American Housing Improvement Program and in coordination with DHHS and HUD. Eligible applicants are for HIP, needy Native Americans, and for HUD, Native Americans who meet income criteria and other rules.

OTHER MITIGATIONS UNDER CONSIDERATION (3.18.2)

Housing, both permanent and temporary, will be in short supply. Existing housing will be available at inflated prices (both purchase price and rents). Household living conditions may deteriorate as crowding increases and as substandard housing is pressed into use. Mitigations could include a procedure to provide and administer a number of programs such as: (a) direct loans to developers; (b) seed money loans; (c) mortgage purchase; and (d) loans to lenders and to develop a local Housing Authority and/or Housing Development Corporations to receive and administer federal funds for housing and to issue notes and bonds. Innovative housing technology could be encouraged. States can encourage the use of factory-built houses by adapting building and zoning codes that specify industrial performance standards in their building codes rather than minimum property standards. In addition, local agencies could access appropriate sections of applicable federal programs.

Construction financing and mortgage funds could be in short supply and that which is available may be at unfavorable terms. In order to lessen the impact, efforts could be directed to increase the effectiveness of local lending institutions to meet increased demand for mortgage financing. This could be accomplished by increasing secondary mortgage market activity, with governmental approval to lending institutions.

Small communities will have difficulty attracting housing developers who are familiar with the local environment where conditions determining long-run demand for housing are uncertain. Uncertainty deters both developers and lenders from providing housing. This could be mitigated if project impacts are forecast as

accurately as possible in terms of magnitude, location, and timing, and communicated rapidly to the necessary local and state planning bodies. Other resources could transfer risk away from the developer and lender by providing loans to lenders and the guarantee of loans to developers. State bond banks could provide a means through which a number of small, not generally known and therefore weaker, credits of individual communities can be combined into a single bond issue to secure a lower net interest cost.

Long-term residents on fixed or low incomes would be most severely affected by housing cost inflation. This can be mitigated through the use of existing federal programs.

Development of socially and aesthetically undesirable land use patterns associated with temporary residence construction could be mitigated by regional, county, and community planning agencies formulating comprehensive land use plans, and passing enabling zone and code legislation to allow areas to assimilate growth impacts with minimum negative effects.

Some of the mitigation measures outlined above can utilize strategies already existing in federal and state legislative programs. Others will require the creation of new programs and/or the modification of existing programs. All measures will necessitate the creation of an appropriate administrative structure for their efficient and effective operation.

3.19 PUBLIC FINANCE

As population expands rapidly in communities, the demand for public facilities and services increases dramatically. Such demand necessitates the acquisition of large amounts of capital by the community to finance the construction of additional public facilities such as roads, schools, and health facilities and services. However, the traditional financing mechanisms employed by communities become insufficient to meet the needs placed upon them and may be augmented by alternative methods.

Communities may be unable to use normal financing methods because of a number of reasons, including the following: (a) demand for services precedes the available revenues to provide those services, especially an increased tax base; and (b) community members may be unwilling to indebt themselves for the provisions of services and facilities to temporary residents.

It will be necessary to accumulate funds for the construction of new and/or expanded capital resources, as well as for operating costs of new and/or expanded services. It will also be necessary to finance an economic development program such that long-term benefits from the project can be captured and contribute to economic prosperity for the community after the completion of the immediate project.

AIR FORCE PROGRAMS (3.19.1)

Increased demand for public facilities necessitate the acquisition of large amounts of capital by the community to finance the construction of additional public facilities such as roads, schools, and health facilities and services. The Air Force has instituted a cooperative community planning and community assistance

program. A comprehensive discussion of this program is contained in Section 2.1. Specific programs and descriptions of mitigations are discussed under sections of Education, Health Services, Public Safety, Land-Use Planning, Quality of Life, Housing, and Transportation.

The Air Force will advocate that land-use controls be utilized to guide growth, that training programs for local labor be established to provide them with the necessary skills to obtain M-X jobs, and that state and local development programs be initiated.

OTHER MITIGATIONS UNDER CONSIDERATION (3.19.2)

There are additional mitigations which could be adopted by state and local governments. Some or all of these could be evaluated and possibly financed through the community impact assistance program. Tax increment financing could be employed to acquire "up-front" capital and is presently allowable under Utah and Nevada law. Direct or indirect tax exempt authorities could be created. These agencies, patterned on airport and port authorities, would have the power to levy taxes, issue bonds, and undertake and contract for certain types of construction activities.

3.20 EDUCATION

The influx of large numbers of new residents into existing communities would increase the requirements for school facilities and teachers. The additional requirements could overburden teaching and support staff as well as cause overcrowding of facilities. Mitigation planning should be directed toward satisfying the increased demand for teachers and facilities during construction and operation of the system.

AIR FORCE PROGRAMS (3.20.1)

The Air Force will advocate the use of the community impact assistance mechanism for requirements identified through the planning process. A detailed discussion of M-X cooperative community planning and community impact assistance programs is included in Section 2 of this ETR. Current programs for educational services include the following:

Department of Education

School Assistance in Federally Affected Areas - Construction (Impact Aid/Disaster Aid)

Assistance in the form of project grants is available for the construction of urgently needed school facilities in school districts which have had substantial increases in school membership as a result of new or increased federal activities. Funds may be used to construct and equip school facilities. Eligible applicants include local educational agencies which provide free public elementary or secondary education in federally impacted areas.

School Assistance in Federally Affected Areas - Maintenance and Operation (Impact Aid/Diaster Aid)

Assistance in the form of formula grants is available to provide financial support to local educational agencies when enrollments or availability of revenue are adversely affected by federal activities, including a sudden and substantial increase in school attendance. Funds may be used for maintenance and operation expenditures. Eligible applicants are local educational agencies which provide free public elementary or secondary education.

If it is determined that it would be appropriate to include M-X worker dependents in life support camps, providing temporary educational facilities and services in the camps could reduce the demand for those services in nearby communities. The Air Force will provide permanent primary educational facilities for military dependents living on the operating bases.

OTHER MITIGATIONS UNDER CONSIDERATION (3.20.2)

The major planning problem for local areas is the need to provide temporary services during peak construction years without incurring debts that cannot be met by the decreased population of the operational period. This problem is especially significant in the counties without operating bases, where the effects are short term. To mitigate this problem there are measures which could be implemented by state and local agencies. These include: institute double sessions to maximize usage of existing school facilities, adapt general community facilities for use as classrooms on a temporary basis, and provide a pool of mobile classrooms which could be moved about the region, meeting high levels of demand as needed. A pool of teachers could serve the same function. A community development authority with bonding service for school construction able to tap the national bond market could be established. At some schools, it may also be beneficial to increase the number of counselors and teaching faculty support staff to alleviate problems associated with short-term student integration and worker turnover that could cause disruption of the student learning process.

3.21 HEALTH SERVICES

The influx of new residents into the region will cause a rapid increase in the demand for health services. Mitigation measures should be directed toward satisfying the need for temporary health services during construction and permanent health services near the operating bases. This could include construction of new facilities or expansion of existing ones as well as providing a good environment to attract health care professionals to the region.

AIR FORCE PROGRAMS (3.21.1)

The Air Force will advocate community impact assistance be provided to local communities to develop health care services and will cooperate with federal, state and local agencies for emergency health care.

The Air Force will provide health care services in temporary life support camps. Additionally, if it is determined that it would be appropriate to include dependents in life support camps communities, health services for dependents could be included.

Existing federal programs which could provide community impact assistance include the following programs:

Department of Health and Human Services

Community Health Centers (Public Health Service Act, Section 330)

Assistance in the form of project grants is available to support the development and operation of community health centers which provide primary, supplemental and environmental health services to medically underserved population. Funds may be used for acquiring and modernizing existing buildings, including amortizing principal and paying interest, and for special purpose equipment. Eligible applicants include state and local governments and any public or nonprofit private organization or agency.

Native American Health Services--Health Management Development Program (Indian Health)

Assistance in the form of project grants is available for developing, improving and expanding health programs. Funds may be used for public health nursing, maternal and child health care, dental and nutrition services, psychiatric care and health education. Eligible applicants are federally recognized tribes and tribal organizations.

Native American Health Services--Sanitation Management Development Program (Public Law 86-121 Program)

Assistance in the form of project grants is available to alleviate unsanitary conditions. Funds may be used for construction of sanitation facilities for individual homes and communities and other environmental health activities. Eligible applicants are federally recognized tribes and tribal organizations.

Maternal and Child Health Services (MCH)

Assistance in the form of formula grants and project grants is available to extend and improve services, especially in rural areas, for reducing infant mortality and improvement of the health of mothers and children. Funds may be used for well-child clinics, pediatric clinics, maternity clinics, dental care, family planning and other health services. Eligible applicants are state health agencies for formula grants and state health agencies and institutions of higher learning for project grants.

Drug Abuse Community Service Programs (Drug Abuse Services (H80))

Assistance in the form of project grants is available to reach, treat and rehabilitate narcotic addicts, drug abusers and drug-dependent persons. Funds may be used for partial support of the operational costs of community-based treatment programs, detoxification, institutional and/or community-bsed aftercare services. Eligible applicants are public or private nonprofit organizations.

Alcoholism Treatment and Rehabilitation/Occupational Alcoholism Services Programs

Assistance in the form of project grants is available to provide treatment services, coordinate them with community-based resources and expand the involvement of public agencies in arranging for and/or providing alcoholism treatment services. Funds may be used for costs directly related to these programs, including salaries and fringe benefits, consultant fees, necessary travel, supplies and equipment and other necessary expenses. Eligible applicants include state and local governments and public or private nonprofit organizations.

Medical Facilities Construction--Loans and Loan Guarantees

Assistance in the form of direct loans and guaranteed/insured loans is available for planning and provision of medical facility modernization, additional outpatient facilities and additional inpatient facilities in areas of recent rapid population growth. Funds may be used for new construction, expansion or remodeling and equipment necessary for a construction project or for provision of a new service in a community. Eligible applicants for direct loans are state and local governments and all entities having bonding authority. Private nonprofit organizations are eligible for mortgage loan guarantees.

Health Maintenance Organizations (HMOs)

Assistance in the form of project grants, direct loans and loan guarantees is available to promote development of prepaid, comprehensive health maintenance organizations. Funds may be used for feasibility surveys, planning, initial development projects and initial operation costs and construction of ambulatory health care facilities. Eligible applicants for grants and loans are public and private nonprofit organizations. Private organizations are eligible for loan guarantees. Federally qualified HMOs are eligible for loans and loan guarantees for initial operating costs.

Emergency Medical Services (EMS)

Assistance in the form of project grants is available for the development of comprehensive regional emergency medical services systems. Funds may be used for feasibility studies and planning, establishing and initial operation, expansion and improvement. Eligible applicants are states, units of general local government, public entities administering a compact or other regional arrangement or consortium, or any other public entity and any nonprofit private entity.

Health Planning--Health Systems Agencies (Health Systems Agencies (HSAs))

Assistance in the form of project grants is available to provide for effective health resources planning at the area level. Funds must be used by the health systems agency for compensation of agency personnel, collection of data, planning, and performance of statutory functions. Eligible applicants are private nonprofit corporations, single units of general local government, or regional planning bodies.

Community Mental Health Centers--Comprehensive Services Support

Assistance in the form of project grants is available for comprehensive mental health services through community mental health centers. Grants are provided for staffing, planning, initial operations, consultation and education services, conversion and financial distress. Eligible applicants include public and nonprofit private entities and community mental health centers.

OTHER MITIGATIONS UNDER CONSIDERATION (3.21.1)

Other mitigations which could attract and retain necessary health services personnel include establishment of an incentive recruitment program, development of satellite medical centers, employment of physician assistants, development of public health nursing agencies, establishment of alcohol and drug abuse centers, provision of ambulance service to regional hospitals, and development of health maintenance organizations.

It may also be possible to use physicians in federal public health service to staff rural clinics in the vicinity of M-X facilities. In addition, state health departments may provide technical and financial assistance, although this could deplete services in other areas unless additional financial assistance is provided to the states. The states may also establish an interstate ambulance network that would permit rapid transport of accident victims to regional hospitals.

3.22 PUBLIC SAFETY SERVICES

The rapid influx of a transient population into the communities and life support camps could lead to increases in the crime rate and increases in the danger of fires. The requirements for personnel and facilities for both fire protection and law enforcement would increase in a short time. Additionally the judicial and correctional systems would need to be expanded.

Mitigations should be directed toward satisfying the need for temporary services and facilities during construction, and the need for permanent services and facilities for the operating phase.

AIR FORCE PROGRAMS (3.22.1)

The Air Force will provide security and fire protection personnel for the operating bases, ASCs, and the shelters. Under a cooperative community impact assistance program, the Air Force will cooperate with federal, state and local agencies in fire protection and law enforcement. The Air Force will contract for public safety in life support communities where practical. The Air Force will advocate establishment of federal grants for public safety services in order to fund the necessary additional public safety programs.

OTHER MITIGATIONS UNDER CONSIDERATION (3.22.2)

Other potential mitigation strategies include prepaid property taxes for use in financing additional service and establishment of a state community development authority to finance public services.

3.23 URBAN LAND USE

Mitigations for urban land use should be directed toward satisfying the temporary demand for urban land during construction and managing temporary and permanent growth.

AIR FORCE PROGRAMS (3.23.1)

Mitigation for Urban Land Use would be implemented through the community impact assistance program described in Section 2.1. The Air Force will provide temporary housing for M-X workers in life support camps which will reduce housing development pressures in nearby communities.

When consistent with M-X project needs, the Air Force will plan roads and utilities for temporary facilities which could be used by the resident community after project completion.

Moreover, the Air Force will advocate that public land be made available for community development, and that zoning and subdivision controls be implemented. The Air Force will cooperate with planning agencies on comprehensive land use.

OTHER MITIGATIONS UNDER CONSIDERATION (3.23.2)

Preparation or updating and adoption of zoning ordinances, subdivision regulations, mobile home ordinances, and comprehensive plans could be undertaken by local governments to guide growth induced by M-X construction activities. Plans need to account for the boom/bust cycle of the M-X construction program. (For status and adoption dates of master plans, zoning ordinances, and subdivision regulations in Nevada/Utah, see ETR-36). Land banking could be utilized by municipalities, counties, or states to direct temporary urban facilities to suitable locations during the peak construction period. Cities and counties could identify areas suitable for temporary urban facilities. Urban service areas could be established to ensure that urban development will take place only within designated zones. Adoption of ordinances at municipal and county levels requiring environmental impact analyses of land development projects would help identify and mitigate impacts.

Cities and counties could recruit personnel to enforce zoning ordinance and subdivision regulations. Funding for such positions during M-X construction phases could be made through M-X community impact assistance program.

County or state actions could encourage the establishment of new towns or development zones to handle a portion of the peak and/or long-term urban land needs. Clark County Department of Comprehensive Planning, in "M-X: Growth Management Policy Plan" (April 1981), analyzed three options for handling the M-X-induced growth: a new town built around an OB at Coyote Spring, an option involving some new town concepts through development split between Moapa Valley and Las Vegas Valley, and a third option centered on the Las Vegas Valley.

Designation of planned unit development (PUD) zones where a mixture of land uses specially suited to construction workers and their families may be developed on a temporary basis, e.g., housing, recreation, neighborhood commercial, day-care

facilities. Such PUDs could encourage the selection of housing by worl suitable locations rather than in carrying rural and/or agricultural areas. Tem facilities could be constructed to provide benefits over the long term, e.g., fa for mobile homes that can be used as campgrounds and RV overnight areas fo the end of the construction period. Community services/facilities trust fund be created wherein private land developers contribute to a pool of funds from future needs are totally or partially financed. These future needs could inclu items as extending water and sewer lines, upgrading streets to handle higher volumes and perhaps even dismantling temporary developments. The trus contribution could be determined by the scale and nature of the developmer participation could be a condition for development to occur.

Regional planning commissions could be established. Funding o commissions during M-X construction years could be accommodated throug Community Impact Assistance Funds. Financial and technical assistance cc provided to aid communities in filing requests for release of BLM la community expansion purposes. State-and university-sponsored training pr could be established in land use and growth management for officia administrators from impacted local governments. A department of local could be created at state levels to provide technical assistance for la planning.

3.24 LAND OWNERSHIP

Mitigations for the impacts on land ownership should be direct towa avoidance of using private land and state trust land. Further mitigation me should be taken to assure that only a minimal amount of project related distur would cause impacts on adjoining land ownerships.

AIR FORCE PROGRAMS (3.24.1)

The Air Force will avoid private land to the extent possible. Where land is required, owners will be compensated according to the appropriate law

A revegetation program will be established in cooperation with feder state agencies. This will help protect adjoining properties from the spr noxious plants and dust from disturbed surfaces. The revegetation prog discussed in more detail in Section 3.6 (Native Vegetation). An educational pr will also be established for M-X personnel.

OTHER MITIGATIONS UNDER CONSIDERATION (3.24.2)

Because the purchase of private land by the federal government would c local jurisdictions of land assessment revenue, the trading of private land for land in the same county could mitigate the impact of the loss from local ta Further, if public land located at the fringe of urban communities were conve private land by such value-for-value exchanges, this land would become avail relieve the pressure for land for private community development induced by M

Mitigations to protect adjoining private property could include mini disruption of farming, grazing and recreational activities through system modifications, including cattle guards, fences, and gates, protection from

and dust, and replacement water for cattle and crops. When new roads are cut into otherwise limited access areas, problems of vandalism and theft can result. Gates for exclusive use of property owners and the Air Force would help mitigate such problems.

Protection of private lands from erosion can be accomplished by construction techniques that assure that storm waters from Air Force used land would not flood, silt-up, or otherwise damage downstream private properties.

Mitigation of damage to crops from blowing dust is discussed in ETR-13 (Atmospheric Resources).

Because the project could use water that is presently available to private users for agriculture, it is important to attempt to find replacement water. This could be accomplished in two ways. First, deep wells could be drilled by the Air Force for its own use and the use of private property owners--wells that could not otherwise be afforded by those people. Second, water could be brought into any given area from another water basin where there is a surplus. The problems and mitigations to the use of deep wells and interbasin water transfers are discussed in ETR-12 (Water Resources).

3.25 LAND USE (IRRIGATED CROPLANDS)

Mitigations should be directed toward avoidance of irrigated croplands, and preservation of water supplies and farming operations where avoidance is not practical.

AIR FORCE PROGRAMS (3.25.1)

The Air Force will avoid irrigated croplands where feasible and will compensate owners in accordance with law when croplands are required for the project. The Air Force will minimize water use on the project to reduce the possibility of adversely affecting water sources. When possible, the Air Force will advocate that additional irrigation sources be identified and provided. Project roads will be open to the public after construction which may improve access for some farms.

OTHER MITIGATIONS UNDER CONSIDERATION (3.25.2)

One important mitigation would be to assure that irrigation systems be kept open and operative. This could be accomplished by running roadways parallel to row crop furrows, thus avoiding blockage of the gravity flow of irrigation water. Where it is necessary to run roads across irrigation rows, the placement of irrigation culverts under the roadways, or the provision of other water sources could assure irrigation.

It is also important that natural drainage areas and man-made drainage ditches remain open for the free flow of storm water. Croplands can be damaged by flooding that could occur if drainage areas are blocked during heavy storms. Such drainage systems could be kept open during both construction and operation phases by careful supervision of construction processes and maintenance as necessary during the operations period. Further, new drainage systems could be constructed

by the Air Force to assure that erosion from roads and construction areas does not "silt-up" cropland areas. Cooperation with farm operators in the construction of such facilities is important.

It will also be important to cooperate with farmers in the timing of the construction of M-X facilities to assure that they do not interfere with the rather short time periods when farmers plant and harvest their crops.

The additional use of water for M-X from a given basin, especially during construction, could be a problem for irrigated farming operations, if water shortages occur. Use of water conservation methods, especially during construction, could help resolve such problems. Further, steps could be taken to import water from other basins where there are surplus water resources available. Care must be taken in this regard not to interfere with natural ecological systems.

Of particular concern is the compaction of soil in areas that would be used temporarily during construction periods. Such uses would include vehicle and equipment storage areas and construction roads. If these areas are to be reused for cropland, the Air Force could rehabilitate the soil using acceptable farming methods. Such rehabilitation methods could be agreed upon by the owner and the Air Force prior to the Air Force's acquisition of use rights.

In the Texas/New Mexico region there are a large number of pivot irrigation systems, but because of the high cost of relocating them, care should be taken to assure that M-X facilities are sited where they would not interfere with the pivot systems. Protective shelters, for example, could be placed in the center of sections of land with four pivot systems. This way, the irrigation systems could continue operation without interference and only a small portion of the irrigated area would be disturbed by the shelter access road. Although the access road would be "irrigated" by the pivot system, this is not considered to be a problem to its use as a roadway.

3.26 RANCH AND FARM HOUSES

Mitigation measures should be directed toward avoiding ranches and farm houses to the greatest extent possible and compensating owners for property taken.

AIR FORCE PROGRAMS (3.26.1)

The Air Force will site the system to avoid ranches and farm houses by 2,965 feet where possible. Where they cannot be avoided by that minimum distance property intests will be purchased according to appropriate laws.

OTHER MITIGATIONS UNDER CONSIDERATION (3.26.2)

The mitigations discussed for private land in Section 3.24, Land Ownership, would also apply to Ranches and Farm Houses.

3.27 GRAZING

The major impacts to grazing would occur as a consequence of loss of forage or its use, loss of livestock, and increased operating costs to ranchers. These

impacts would be both direct and indirect and would occur primarily due to: loss of forage through direct destruction of vegetation by construction of project facilities; loss of vegetation through indirect destruction of vegetation resulting from erosion, sedimentation and vehicular traffic associated with the construction and operation of M-X; loss of forage use through loss of accessability to range lands by construction, operation or indirect interference associated with M-X; loss of forage use through loss of watering sites needed to utilize rangelands; increased loss of livestock from increased road kills; increased loss of livestock from increased theft and vandalism; increased operating expenses from dispersion of cattle through breaks in fences and increased movement resulting from disturbance; increased livestock losses and reductions in weight gain from an increased frequency and biomass of toxic plants such as halogeton in areas disturbed by M-X; increased costs of operation and reduced returns resulting from increased wage scales and reduced labor availability associated with M-X presence; increased costs of ranching resulting from increased costs and reduced availability of materials and equipment caused by M-X presence; reduced viability of livestock operations resulting from the combined direct, indirect and economic impacts of M-X; damage to adjacent rangeland and reduced livestock capacity from feral wildhorses and burros, and wildlife displaced by M-X disturbances; increased operating expenses resulting from increased damage to livestock operations, facilities and range improvements brought about by M-X presence; and loss of grazing capacity from revegetation destruction by increased occurrence of wildfires.

Mitigation measures would be directed toward minimizing these impacts.

AIR FORCE PROGRAMS (3.27.1)

Measures to reduce the impact of M-X grazing and ranching operations should be directed toward minimizing the loss of annual forage through removal of vegetation, loss of access to rangelands, the loss of watering sites, and other disturbances which could increase ranch operating costs.

The Air Force will implement programs to minimize the disruption of ranch operations through system design and control of offroad construction traffic. This will be accomplished by reducing soil disturbance and providing gates, cattelguards, fencing and improved access. The Air Force will also provide replacement water sources for livestock as required.

In order to further reduce impacts on ranching operations, the Air Force will accomplish a revegetation program and an erosion control program in cooperation with appropriate federal and state agencies. In those cases where grazing resources and facilities cannot be avoided or ranching operations are affected, the Air Force will provide monetary compensation to owners in accordance with law. The Air Force will institute education programs for construction and operation base personnel.

OTHER MITIGATIONS UNDER CONSIDERATION (3.27.2)

Mitigating losses to the Nevada/Utah livestock industry that will occur as a result of M-X presence is both legally and functionally a complex problem. Two sources of the losses must be distinguished, those directly the result of M-X and those indirectly the result of M-X. While the impacts that are directly the result of

M-X can be mitigated in some form, most of the impacts not directly the result of project actions are considered to be opportunity costs and can not be legally mitigated under existing legislation (U.S. Army Corps of Engineers, 1981). For example, if a cow is struck by a construction vehicle driven by an on-the-job employee, it is directly the result of M-X and compensation would be provided. If the same individual is in a private vehicle at some other time and kills a cow, it is an indirect impact and not the responsibility of the Government. Compensation to the owner in this case is a civil matter between the owner of the cow and the individual who actually killed the cow.

This area of nonmitigatible indirect impacts apparently also includes items such as inflated operating costs, labor shortages, nuisance factors, theft, vandalism and other types of losses and costs that can be associated with M-X presence. Overall the major sources of impact to the Nevada/Utah livestock industry fall into the legally nonmitigatible category unless there is some special dispensation on the part of the Government.

Many of the details of mitigations undertaken will have to be negotiated on an individual basis between affected operators and the BLM, Corps of Engineers, contractors and the Air Force once a finalized project configuration is known.

Loss of Forage Through Direct Destruction by Construction (3.27.2.1)

Three potential measures that could mitigate the impact of loss of forage through direct destruction of vegetation by construction of project facilities follow: One could be to avoid highly productive grazing areas of native vegetation such as winterfat and improved rangelands such as crested wheatgrass seedings. Highly productive grazing areas (e.g. native vegetation such as winterfat dominated winter ranges and improved rangelands such as crested wheatgrass seedings) can be avoided in some instances to help reduce impacts. Cropland and pastures primarily used to raise feed for livestock and rangelands that are critical to the continued viability of livestock operations regardless of productive capacity should also be avoided. Also, construction activities should be scheduled to occur as much as possible during periods when affected rangelands are not used used by livestock.

Another mitigation could be monetary compensation for lost resources and facilites where authorized by law. Subsidies to assist in acquiring supplemental forage when local sources are impacted, or otherwise nonaccessable during the M-X construction period, are possible. The major problem with this mitigation is that livestock adapted to range forage can have considerable difficulty switching to feed because of time required for adaptation of the rumen micro-flora (Stoddart et al., 1975).

Loss of Forage Through Loss of Accessibility to Rangeland (3.27.2.2)

There are potential mitigation measures that could reduce the impact of the loss of forage through loss of accessability to rangelands by construction, operation or indirect interference associated with M-X. One mitigation measure could be the payment of monetary compensation for lost resources, livestock and facilities where authorized by law. Another could be to schedule construction activities to occur as much as possible during periods when affected rangelands are not used by livestock. Finally, construction activities could be regulated to minimize disturbance and access restrictions to livestock.

Loss of Forage Through Loss of Watering (3.27.2.3)

One potential mitigative measure that could be included to reduce the impact of loss of forage through loss of watering sites needed to utilize rangelands could be payment of monetary compensation for lost resources, livestock, and facilities where authorized by law.

Loss of Livestock From Theft and Vandalism (3.27.2.4)

A possible mitigation could be more enforcement personnel to control illegal impacts to the livestock industry. Provisions for subsidies to local law enforcement agencies to allow for larger numbers of law enforcement personnel to increase surveillance of livestock ranges would reduce losses due to theft and vandalism.

Increased Operating Expenses From Dispersion of Cattle (3.27.2.5)

Potential mitigations that could reduce the impacts on ranchers' increased operating expenses from dispersion of cattle through breaks in fences and increased movement resulting from project construction disturbances are: monetary compensation for lost resources, livestock, and facilities where authorized by law; scheduling of construction activities to occur as much as possible during periods when affected rangelands are not used by livestock; and subsidizing livestock operators to cover increased costs of labor and materials resulting from project presence.

Loss of Livestock Through Loss of Rangeland (3.27.2.6)

There are several potential mitigations that could be included to reduce the impact of loss of livestock capacity through carryover effects of the loss of critical rangelands and/or forage supplies during critical seasons of the year. One potential measure could be monetary compensation for lost resources, livestock, and facilities where authorized by law. Subsidies could be provided to assist in importing supplemental forage when local sources are impacted by M-X. Avoidance of those rangelands that are critical to the continued viability of livestock operations could be a possible mitigation measure.

Loss of conomic Viability of Livestock (3.27.2.7)

One potential mitigation that could be included to reduce the impact of loss of economic viability of livestock operations resulting from the combined direct, indirect and economic impacts of M-X could be payment of monetary compensation where authorized by law.

Increased Operating Expenses (3.27.2.8)

One potential mitigation measure that could reduce the impact of increased operating expenses resulting from increased damage to livestock operations, facilities and range improvements directly brought about by M-X presence could be more enforcement personnel to control illegal impacts to the livestock industry.

Loss of Grazing Due to Wildfire (3.27.2.9)

A potential mitigation to loss of grazing capacity from vegetation destruction due to increased occurrence of indirect M-X project wildfires would be to increase

fire detection and control capabilities. Subsidizing local fire protection agencies would be one measure to help mitigate this problem.

3.28 RECREATION

The major impacts to recreational activities would occur as a result of increased recreational use and possible loss of existing recreational sites due to project activity. These impacts would occur primarily as a result of increased demand for existing recreational facilities. An increase in population in an area reduces recreational experiences and leads to prohibitions on access to once remote sites. The result of increased recreational use, and thus potentially greater conflicts of user activities, leads to a direct loss of certain dispersed recreational sites. Project construction will reduce access to currently available recreation areas.

Mitigation measures should be directed toward minimizing these impacts.

AIR FORCE PROGRAMS (3.28.1)

The Air Force will provide recreational programs in temporary life support camps in cooperation with local communities. In addition, the Air Force will advocate the improvement of community recreation facilities and additional recreation activities.

The Air Force will provide educational programs for M-X personnel and their dependents and assist federal, state, and local agencies in providing recreational management. Moreover, the Air Force will assist the public in search and rescue efforts during emergencies. The Air Force will advocate cooperation with federal and state agencies in controlling off-road vehicles areas.

OTHER MITIGATIONS UNDER CONSIDERATION (3.28.2)

Increased Demand for Recreational Facilities (3.28.2.1)

The impacts of increased demand for existing recreational facilities could result in reduced recreational experiences. These impacts could be mitigated by funds for additional recreational site development, and planning and staffing of the various land management agencies in the study region. The proposed development of the Ward Charcoal Ovens State Park, including the Willow Creek Reservoir, could alleviate some of the demand upon other recreational resources in the region. Swimming demands may be mitigated by adding to the funding proposed for the development of Cave Lake State Park and the building of community swimming pools for the new in-migrants. Developed camping sites could be needed in some areas of the study region as well. Additional funding could be used to establish and maintain new campgrounds. Development of the proposed Arrow Canyon State Park just south of the Coyote Spring OB site could help reduce the recreational pressure in this region.

Another measure could be that whenever necessary, both financial and planning assistance could be provided in trailhead marking and development, and parking lot and sanitation facilities development, etc.--in sum, any reasonable efforts to ensure access to both developed and undeveloped recreational sites.

Increased Access to Remote Sites (3.28.2.2)

A potential mitigation that could be included to reduce the impact of increased access to once remote sites could be restrictions on user activities. Areas that were once good hunting areas may now become overrun with campers, hikers, and other recreational users. Restricted access could be applied to some of these areas, thus limiting conflicts of user activities.

Direct Loss of Dispersed Recreational Sites (3.28.2.3)

A potential mitigation measure is the avoidance of known rockhounding or gem collecting areas, and avoidance of "Areas of Critical Environmental Concerns" (ACEC) as defined by the BLM. Funding or planning assistance could be provided in determining which dispersed recreational sites and ACECs could be avoided to assure minimal impacts.

Reduction of Access to Recreation Areas (3.28.2.4)

A potential mitigation that could be included to reduce the impact of the reduction of access to currently available recreation areas by placement of project activities could be the avoidance or preservation of access to these facilities. The placement of the operating base in Ely may reduce access to Comins Lake and/or the Ward Charcoal Ovens State Park. If the base is located at Ely, it could be done in such a manner that access to these facilities will not be restricted.

3.29 TRANSPORTATION

Potential mitigations for impacts on transportation should focus on four types of measures: reduce the opportunity for potential conflicts with existing traffic, provide for growth with advanced planning, reduce the volume of traffic (especially heavy truck traffic), and assist local governments in maintaining and/or improving existing roads.

AIR FORCE PROGRAMS (3.29.1)

The Air Force will implement a variety of measures to minimize the volume of M-X-related commuter traffic on existing roads. Buses will be provided to transport workers between the construction camps and communities. Carpools will be encouraged for workers who do not ride the buses. Work shifts will be staggered where possible to reduce peak period traffic volumes. In order to minimize the volume of M-X related truck traffic on existing roads, the Air Force will require construction traffic to use project roads rather than public roads, as much as possible. Where trucks must use existing roads, such as delivering materials and supplies, truck traffic routes will be designated where practical to direct truck traffic to specific routes, thereby limiting the roads which would be affected.

In order to expand and improve the existing transportation system, the Air Force will construct defense access roads where applicable for project needs, during both construction and operation, in accordance with existing DOD regulations and procedures. The specific routes will be determined in further studies. Transportation planning will be coordinated with federal, state, and local transportation agencies. New roads required for the project will be constructed by the Air Force.

The Air Force will advocate community impact assistance for state and local governments for maintaining and improving existing roads that may be damaged by M-X-related traffic.

Other mitigations which the Air Force will implement include paving project roads as early in the project as possible and providing traffic control for construction traffic to insure safe and efficient operation.

OTHER MITIGATIONS UNDER CONSIDERATION (3.29.2)

Reduce Traffic Conflicts (3.29.2.1)

The following measures could reduce the opportunities for potential conflicts with existing traffic. Temporary facilites, such as construction camps, could be located to avoid channeling undesirable amounts of traffic through small communities or through road segments with inadequate capacity. When conflicts between construction traffic and traffic on existing roads cannot be avoided, measures could be implemented to reduce traffic delays to a minimum and to assure safe operating conditions. Possible measures include construction of detours, temporary signing, use of flagmen, and temporary traffic signals.

Transportation Planning (3.29.2.2)

The following planning measures could be included in the cooperative transportation planning process to properly accommodate anticipated growth. The exact locations and sizes of all life support camps should be provided to state and local governments as early as possible so adequate time is available to plan for the growth. As early in the project as possible, those areas where temporary housing, or other facilities to accommodate construction workers and their dependents are likely to develop should be identified. After identification, proper planning can assure orderly development and provision for an adequate road network.

Existing roads that would be utilized by construction traffic should be examined and, where required, improved or reconstructed to accommodate higher traffic volumes and/or heavier vehicles. This could be done in advance of M-X construction activity. An alternative approach is to allow construction vehicles to utilize these roads without improvement, recognizing that significant damage is likely to occur. Following the construction period, the roads could be reconstructed to their preconstruction quality. This latter approach may not be appropriate in all cases. On some roads the damage might be so great that capacity would be severely reduced and major repairs would be required during the construction period.

Road segments or intersections along existing roads where capacity is likely to be approached or exceeded due to project-related traffic could be identified during the early design stage so that appropriate improvements can be made before traffic problems occur. These improvements may include roadway widening, roadway reconstruction, truck climbing lanes, improved traffic control devices, overpasses, or various other measures.

Reduce Traffic (3.29.2.3)

The following measures could be implemented to reduce the traffic on existing roads caused by construction of the system. The measure to provide buses and

encourage carpools could be more effective if workers were required to use buses or form carpools. This could be implemented by prohibiting private vehicles in the construction areas. Workers could be required to assemble at specified locations, possibly temporary park-and-ride lots in neighboring communities, to ride buses or carpools to the work areas. This could substantially reduce the number of vehicles, but there is a tradeoff. While one bus could substitute for 30 or 40 private vehicles, reducing traffic, for example, from 1,000 automobile trips to around 30 bus trips, buses would be significantly heavier vehicles. Some roads possibly could carry a larger number of lighter automobiles, but may be damaged by a smaller number of heavier vehicles. This issue would be considered on a case-by-case basis during the cooperative transportation planning process.

By providing housing for all or most of the construction workers in the life support the number of commute trips could be substantially reduced. This would not only reduce the amount of commute traffic, it could substantially reduce the amount of temporary facilities required within communities.

Funding Assistance (3.29.2.4)

Funds could be provided to state and local governments to assist in maintaining and improving roads that would be utilized by construction vehicles. This could be included within the Community Impact Assistance Program. An alternative would be for the Air Force to take over maintenance responsibility during the construction phase. Following construction, they could repair all roads damaged during construction and then return maintenance responsibility to the state and local governments.

Reduce Operations Traffic (3.29.2.5)

The above measures would apply primarily to the construction period. However, similar measures could be used to reduce the impacts on transportation during the operations phase. Traffic between the operating bases and the DDA facilities that would cause operational problems if it used existing roads could be required to use project roads.

Efforts could be implemented to ensure orderly growth and controlled development in areas near the operating bases that will accommodate base employees and their dependents who are not provided housing on the base. This includes construction of a good road system in new developments and upgrading existing roads where necessary. Final base locations, personnel requirements and estimates of total in-migrants should be provided to state and local governments as early as possible so the growth can be properly planned.

3.30 ENERGY

The M-X project will require substantial amounts of energy during both construction and operation. Mitigation measures need to focus on minimizing energy requirements through design, reducing demand upon existing facilities that would be adversely affected by a large new customer, and designing new facilities for the minimum impacts.

AIR FORCE PROGRAMS (3.30.1)

Energy planning will be coordinated with local utilities to ensure a cooperative effort and an efficient system. In addition, project facilities will use alternative and renewable energy sources where feasible.

The potential for replacement of conventional sources with alternative energy systems will be investigated. A DOD/DOE program is underway to develop alternative energy systems that can provide reliable operating power for the M-X system and accelerate the broad application of renewable energy system (RES). Technologies under study include: solar, thermal, photovoltaics, wind, geothermal, biomass, and storage.

Passive and active solar systems for space heating, cooling and hot water in M-X facilities and in new housing will be utilized to the extent practical. Passive solar energy design includes correct building orientation, amount of southern glazing exposure, appropriate overhangs, inclusion of thermal mass for storage in floors and walls, and venting and ducting for controlled movement of air through a structure. Active solar energy design typically utilizes flat plate collectors and a working fluid for space heating and hot water production.

The base comprehensive plan is being prepared in accordance with the following energy conservation guidelines: minimize energy expenditures; make optimal use of renewable energy resources; plan for future energy flexibility; evaluate/incorporate conservation systems and use energy-efficient construction concepts/systems and technologies.

During planning and design, emphasis is being placed on energy conservation in the mechanical, electrical, and lighting systems. The operating bases will use centralized and computerized energy management and control systems.

OTHER MITIGATIONS UNDER CONSIDERATION (3.30.2)

Energy transmission and production facilities that will be installed and/or modified as the M-X system is implemented could be designed to mitigate potential impacts. In many cases, the selection of specific sites and rights-of-way may contribute toward the mitigation of impacts. Utilities may select transmission line structures designed for minimum right-of-way requirements, and substations may be of the low-profile type construction to maintain low structure height and to avoid the cluttered appearance of highbay lattice type design.

In addition, the design and selection of colors and material for substation fencing and transmission towers could be coordinated with landscaping to provide a pleasing appearance blended with the surroundings. Consideration could also be given to the aesthetic appearance of free-standing towers and structural supports for communications and control equipment. The configuration of conductors could be designed to minimize right-of-way requirements, allowing a possible reduction in the clearing and trimming of vegetative cover. Similar mitigative measures may be possible for petroleum and natural gas facilities. Joint right-of-way use could be explored wherever possible.

New natural gas or petroleum pipelines needed to supply fuel to M-X support facilities can be constructed either above ground or underground. A comparison of

these techniques could be conducted and the technique having the least impact could be utilized. The design and selection of colors and materials for architectural screens, above-ground pipelines, and related facilities can be coordinated with landscaping to provide a pleasing appearance harmonious with its surroundings. The design configuration could minimize right-of-way requirements, thereby allowing a reduction in the clearing and removal of vegetation. The use of joint rights-of-way for roads, fuel, pipelines, and electrical transmission lines could be explored wherever possible.

Electric power consumption for lighting could be reduced by 30-35 percent through reduction of interior and facade lighting and also be use of more efficient lights such as lower wattage incandescent or fluorescent lights. This application could also reduce the cooling loads of the buildings. Other electric savings could be achieved by installation of high efficiency motors, appliances and load management devices. All these measures combined could save up to 15 percent of the total electric consumption of the bases and the new homes in the surrounding communities.

Installation of high efficiency hot water heaters, insulation of hot water tanks and pipes, and reducing the hot water set temperature to 120°F could reduce the energy consumption for domestic hot water by 10 percent.

Ethanol can be used as an internal combustion engine fuel in the form of gasohol, dieselhol, or straight ethanol. If gasohol or dieselhol becomes available at competitive costs, up to 10 percent of the gasoline and diesel fuel requirements could be supplied by ethanol, an alternative energy source.

3.31 NATIVE AMERICAN CULTURAL RESOURCES

The impacts on Native American Cultural Resources would primarily be direct disturbance of cultural resources due to construction, indirect disturbances such as casual collecting due to the influx of personnel into the area and impacts on the culture and religion of the Native Americans due to project activity and the influx of population.

AIR FORCE PROGRAMS (3.31.1)

The Air Force will coordinate and consult with Native Americans on M-X planning activities and siting of project facilities. Native Americans will be involved in cultural/historical resource programs. The Air Force will establish a mechanism for a community impact assistance for Native Americans in parallel with non-Native American assistance program.

A Programmatic Memorandum of Agreement (PMOA) for the preservation of historical properties and resources has been negotiated among the Air Force, the Bureau of Land Management, and the Advisory Council on Historic Preservation. This agreement establishes general procedures for compliance with existing federal laws to protect cultural resources, including Native American ancestrial and sacred sites. Native American ancestral/sacred sites, as properties eligible for nomination to the National Register of Historic Places, are included in the terms of this agreement. The PMOA esablishes that mitigation measures be in effect during various phases of the project.

The Air Force will also implement an education program for M-X personnel and their dependents.

OTHER MITIGATIONS UNDER CONSIDERATION (3.31.2)

Mitigations relevant to Native American cultural resources involve both areal and regional/local siting decisions. Contemporary Native American groups consider Nevada/Utah to be a more sensitive area than Texas/New Mexico, where known cultural resources are less densely distributed and where Native American attachments to deployment area lands have less spatial and temporal continuity. Full or partial siting of the project in the latter two states, therefore, could lessen the overal severity of M-X cultural resource impacts. Within local siting regions, the principal form of mitigation is flexibility in the placement of project facilities in order to maximize avoidance of sites and area which are known to be of cultural and religious significance to Native Americans. An inventory of these sensitive features could be accomplished at three levels: (1) review of existing site data; (2) site data collected from reservation and colony field studies, and (3) onsite pre-construction archaeological and ethnographic survey of areas in which ground disturbance is proposed. The inclusion of Native American cultural resource specialists from local reservations on these pre-construction survey teams could refine the identification procedure and thereby mitigate potential adverse effects.

Cultural resource mitigations applicable to the construction phase include procedures to be followed in the event of accidental or unavoidable disturbance of sensitive sites or features. A number of mitigative strategies will be developed in consultation with appropriate local tribal governments via liaisons established during the pre-construction onsite survey program. Potential mitigations, which will vary according to the situational context, include data recovery and avoidance. In coordination with the BLM and SHPO, excavated artifacts may be returned to local Native American reservations for curation and/or display at existing or proposed tribal museums. Similarly, rare floral species utilized by Native Americans for food, medicinal, or craft purposes may be preserved by transplantation at on-reservation botanical gardens. Financial assistance for the development of tribal museums and botanical gardens is a potential compensatory mitigation. In some instances of accidental disturbance of cultural resources, site or feature avoidance could be instituted. For example a DTN segment may be sited to avoid highly sensitive cultural resources discovered during preliminary ground disturbance.

Indirect impacts to Native American cultural resources are expected during the operations phase as a result of public use of the DTN for recreational access to previously undisturbed areas. Since site destruction through pilfering, vandalism and ORV ground disturbance cannot be effectively controlled over large regions by security patrols, a cultural resource monitoring program is the most feasible mitigative measure. This program could take the form of follow-up archaeological and ethnographic field studies to determine long-range project effects and to develop, as necessary, secondary mitigative programs to promote cultural resource preservation.

Direct Disturbance/Destruction of Cultural Resources (3.31.2.1)

An inventory could be accomplished of sites and areas known by Native Americans to be of cultural and religious significance. M-X facilities will take into

consideration known sensitive areas. Native American cultural resource specialists from local reservations could particpate on pre-construction survey teams.

Mitigative strategies could be developed in consultation with appropriate local tribal governments via liaisons established during pre-construction on-site surveys. At the request of tribal governments, and in coordination with the BLM and State Historic Preservation Officer, excavated artifacts may be returned to local Indian reservations. In some instances of accidental disturbance of cultural resources, site or feature avoidance may be instituted. Cultural resource monitoring could be implemented to promote cultural resource preservation.

Tribal cultural resource advisors could assist in the identification of cultural properties in and near each deployment valley. Also, the Secretary of the Air Force and Executive Director of the Advisory Council for Historic Preservation could appoint a Native American representative to serve on the M-X PMOA Review Committee.

Financial aid to tribal governments for the establishment of reservation museums, and an established program for the return of requested utilitarian and sacred artifacts to tribal groups is a possible mitigative measure. Native American reservations and colonies throughout the proposed deployment area are currently placing emphasis on cultural heritage programs, including the development of tribal museums. Renewed and expanded competition between tribal governments and land management agencies over the jurisdiction, proper treatment, and ultimate curation of this potentially large inventory of Indian artifacts, however, is a possible source of conflict. The issue of curation will be considered in the M-X Cultural Resources PMOA Management Plan.

Indirect Disturbance/Destruction of Cultural Resources (3.31.2.2)

A range of control measure options could be generated by the Air Force and evaluated in coordination with state and local planning programs. The control measures analyzed could include enforcement of laws and regulations protecting cultural resources.

Impact on Religion of Native Americans (3.31.2.3)

The Native American Religious Freedom Act specifically protects and preserves the inherent right of freedom to believe, express, and exercise traditional religions.

The major fear of Native Americans is that information on religious sites could ultimately become public, and that in the briefest time the sites would be disturbed. On the other hand, if they failed to reveal site locations, sites may become M-X siting areas and may be directly impacted. Therefore, a viable strategy that will conform to the environmental legislation and will enable site identification to occur is to establish local review committees with representatives from the various tribes to participate in on-site M-X preconstruction surveys. Such unrecorded verbal communication could ensure the nondisclosure of this highly sensitive information.

Provisions could be made to recognize religious sites as being those areas deemed sacred by Native American people; i.e., that some religiously significant

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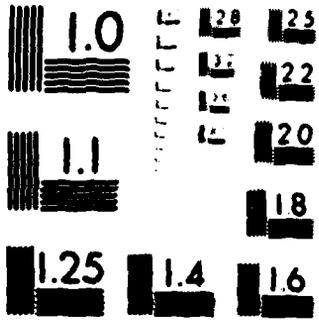
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areas will not render archaeological remains, but may still be afforded protection under the Native American Religious Freedom Act.

Further Dilution of the Native American Cultural Heritage (3.31.2.4)

Funds could be provided for the documenting, recording, and teaching of cultural resources and practices as well as for language instruction. The purpose is to provide younger tribal members with the educational opportunity of learning about their culture. This cultural education, whether in remote areas or in a school setting, is best provided by the Native American people themselves.

The present lifestyle, cultural values, and view of Native Americans currently living on reservations within and adjacent to the DDA could be affected by development and deployment of M-X. To mitigate the potential adverse effects on traditional Native American culture as a consequence of the project, a consultation program is being developed between the Air Force and tribal governments. In this way, effective planning strategies could be adopted to pursue the necessary resources needed to support a larger Native American population. Cooperative participation to produce effective planning could result in mitigation measures that work to alleviate impacts on Native American culture.

3.32 NATIVE AMERICAN SOCIOECONOMICS

Impacts on Native Americans would largely result from the influx of population into the region that would substantially alter the economic environment in the Great Basin. Mitigations should be directed toward insuring that the socioeconomic situation of Native Americans does not deteriorate as a result of this influx, and that Native Americans are able to share in the economic benefits that may result.

AIR FORCE PROGRAMS (3.32.1)

The Air Force will coordinate and consult with Native Americans on M-X planning and siting activities. Furthermore, the Air Force will establish a mechanism for a community impact assistance program for Native Americans in parallel with the non-Native American assistance program. Other federal programs and mitigations for housing, education, health care, public finance, and public safety services would also be available to Native Americans.

OTHER MITIGATIONS UNDER CONSIDERATION (3.32.2)

Mitigations which provide for the maintenance of reservations' economies during the construction phase may be required to preserve the current level of tribal socioeconomic development. If alternative economic foci were created on Native American reservations and colonies, it could reduce the number of members who would leave in search of employment elsewhere. This would contribute to tribal and personal incomes, stabilize, to some extent, reservation economies, and reduce colony dependence on employment in nearby towns.

The Duckwater Tribe's economic development plans include the establishment of a grocery/hardware store. This type of a commercial enterprise could be very successful in the economic environment created by M-X activity. Cottage

industries and other traditionally successful businesses could also be established and could potentially thrive in the boom environment.

This is also true at Moapa where tribal enterprises could be expanded to serve base residents and others. Similarly, Ely could focus the development of its 90 acre parcel on the service and trade needs of a boomtown economy. Also the bands of the Southern Paiutes in Utah could look toward the potential benefits of OB proximity in selecting and developing their lands.

Development strategies such as these could alter the character of M-X impacts tremendously. However, they require capital. Economic assistance to further such development goals is a potential mitigation of negative economic impacts.

In order for Native Americans to take full advantage of the employment opportunities created by M-X activity, steps could be taken early in the pre-construction phase to develop an effective strategy. Based on the Alaskan experience, it would be most effective if both a training program and an affirmative action hiring plan be created prior to construction.

Training, recruitment, and counseling programs for Native Americans could be implemented in the construction of the M-X project. Direct aid to local community colleges or Native American organizations to support relevant vocational skills is one alternative. Job training programs might include Native American administrators and instructors in order to be effective in involving Native American workers in direct employment.

In addition, the Air Force could provide planning and development funds to Native American reservations in order to allow the formation of tribal enterprises to perform direct construction tasks. Since most employment opportunities would occur in the indirect sector, funds could also be provided to begin the development of ancillary businesses in the support and service fields.

Use of public assistance programs established to assist Native Americans could mitigate socioeconomic impacts. Several such programs are listed below. Additionally, Native Americans may be eligible for programs listed in other sections of this volume. These programs are:

- Low Income Housing - Assistance Program (Public Housing)
- Low Income Housing - Homeownership for Low-Income Families (Turnkey III, Mutual Help for Native Americans)
- Native American Health Services - Health Management Development Program (Indian Health)
- Native American Health Services - Sanitation Management Development Program (Public Law 86-121 Program)
- Native American Housing Assistance
- Native American Community Development Block Grant Program (Native American Setaside)

Mitigations appropriate to socioeconomic features of Native American reservations during the construction phase include job-training and job recruitment programs for Native Americans in the deployment area, and increased federal aid to

alleviate infrastructural impacts associated with projected population influxes. Mitigations may also include arrangement with the OEA for waiver of the matching-funds requirement where such requirement cannot be met by economically disadvantaged reservations or colonies.

3.33 NATIVE AMERICAN LAND AND WATER RESOURCES

Impacts on Native American land and water resources would be the loss of lands potentially available to Native Americans, disruption of ranching operations and disturbance to cattle in areas proximal to construction activity, interruptions of ranching activity on BLM grazing lands and reservation lands due to population influx, reduced carrying capacity of grazing lands, interruptions of hunting, gathering and fishing activities due to population influx, and potential water table drawdown or reduced spring or stream flow due to project water use.

AIR FORCE PROGRAMS (3.33.1)

The Air Force will coordinate and consult with Native Americans on M-X planning activities and siting of project facilities. The Air Force will not site any facilities on reservation lands or on Native American grazing lands.

The Air Force will also establish a mechanism for community impact assistance for Native Americans in parallel with a non-Native American assistance program.

The Air Force will establish a comprehensive hydrologic monitoring program in cooperation with state water engineers. The program is discussed in more detail in Section 3.2 (Water Resources).

OTHER MITIGATIONS UNDER CONSIDERATION (3.33.2)

Mitigations relevant to the land and water resources include areal and local siting factors. Since no Native American colonies or reservations are located in or immediately adjacent to the Texas/New Mexico deployment area, a siting decision which results in partial or full utilization of this region for M-X will minimize adverse effects. In Nevada/Utah, potential impacts to Native American land and water resources may be mitigated through planned avoidance. Land areas considered exclusionary include tribal grazing lands and known reservation land withdrawal areas. Due to the protection provided Native American tribes under federal law, planned avoidance of the surface and groundwater resources of Native American reservations and colonies during the project siting phase is a mitigative strategy.

Loss of Lands Potentially Available to Native Americans for Grazing (3.33.2.1)

Ranching operations are central to reservation economics and economic development plans. Air Force coordination with BLM and tribal governments of impacted reservations to maximize the availability of contiguous grazing acreage is a possible mitigation. The Air Force could also work with impacted Native American ranchers to develop range and stock management and improvement plans to compensate for losses in acreage.

Disruption of Ranching Operations and Disturbance to Cattle (3.33.2.2)

The Air Force, in conjunction with BLM and tribal governments, could make available additional grazing lands that are away from project noise and activity for the duration of the construction phase in that area. Additional grazing acreage could be made available to compensate for AUMs lost as a result of project activity.

Regulations could be developed to limit, restrict or control recreational activities on grazing permit lands which may be made accessible by project activity. Trespass laws for reservation lands in the study area and appropriate strategies for developing them could be developed.

Interruption and Restriction of Hunting, Gathering, and Fishing Activities (3.33.2.3)

Subsistence hunting, gathering, and fishing activities play an important role in tribal economics and are depended upon to supplement meagre incomes. To compensate for the limitations imposed on subsistence activities, the Air Force could negotiate with the Fish and Game Department, BLM and other agencies to facilitate hunting and gathering in areas outside of the deployment area by revising hunting and fishing regulations for Native Americans. Further analysis of the extent to which Native Americans in the study area depend on these subsistence activities is, however, necessary before detailed mitigative measures can be formulated. The Air Force, in cooperation with other federal and state agencies, could strictly regulate hunting and fishing by non-Native Americans in the study area to minimize the increased pressure on species necessary for Native American subsistance.

Impacts of Potential Water Table Drawdown or Reduced Spring Or Stream Flow (3.33.2.4)

Potential water table drawdown or reduced spring or stream flow could impact the Duckwater Reservation and Moapa Reservation.

Other than by avoidance, mitigation could be accomplished by the adoption of a strict water regime to minimize use: landscaping with native plants that require no irrigation, rejection of plans for watered recreational areas, flow restrictions on showers, automatic faucet shutoffs, the use of waterless toilets, recycling systems, and minimum possible use of water for health and hygiene. These strategies could reduce water consumption to a low level.

Historically, the most important federal efforts to improve Native American agricultural productivity are capital-intensive irrigation projects (Sarkin, 1978:11). Greenhouses, hydroponic systems, and gardens achieve efficiencies through intensive application of labor, skills, and capital investments in carefully regulated growth environments. Because of their smaller scales of operation, they can accommodate wider sharing of agricultural resources, including water. Theoretically, greenhouses and hydroponic systems could drastically reduce water consumption per pound of produce by utilizing adjustable shade and solar energy to maintain appropriate temperature ranges and recycle water. Recycling of water in small scale systems and use of brackish waste water for cooling large greenhouses could yield further savings. With water supply problems, especially near an OB at Coyote Spring and continual expansion of water developments in the Colorado River Basin, labor intensive agricultural development programs for Native Americans are also

potential mitigation measures. The efficiency of water use in such field systems would, however, be lower then the more capital intensive greenhouse systems.

3.34 ARCHAEOLOGICAL AND HISTORICAL RESOURCES

Mitigation for archaeological and historical resources should be directed toward prevention of direct disturbances and destruction by construction of the project and minimizing casual collecting of artifacts brought about by the increased population in the area.

AIR FORCE PROGRAMS (3.34.1)

The Air Force will establish a cultural resources program in conformance with the Programatic Memorandum of Agreement (PMOA) and consistent with large government programs. The PMOA was established among the Air Force, the Bureau of Land Management (BLM) and the Advisory Council on Historic Preservation in order to protect/recover historical/cultural resources, through approved procedures. The full text of the PMOA is contained in Chapter 5 of the FEIS.

In accordance with the PMOA, the M-X Cultural Resource Management Program will be developed by the Air Force and COE specifically for the project in consultation with SHPO's, Advisory Council on Historic Preservation, BLM, and Native Americans, where appropriate.

OTHER MITIGATIONS UNDER CONSIDERATION (3.34.2)

Cultural resources are evaluated for their potential to establish reliable facts and generalizations about human behavior, particularly explanations of variability and change in societies and cultures. Generalizations and explanations require controlled comparison of relevant data concerning past human life. This includes such things as artifacts, settlements, food remains, and evidence of past environments. Scientific signficance depends on the degree to which archaeological resources in the project or program area contain data appropriate for answering various substantive, technical, methodological, or theoretical questions. The value of these data could best be determined in the regional context of the project or program and in relation to general anthropological problems.

Cultural resources are also evaluated in terms of those values consisting of the direct and indirect ways in which society at large benefits from the study and preservation of cultural resources. Benefits which could be described and included are: (1) the acquisition of knowledge concerning man's past and its potential use, (2) the acquisition and preservation of objects, sites, structures, etc. for public education and enjoyment, (3) education and economic benefits from archaeological exhibits, and (4) practical applications of scientific findings acquired through archaeological investigations.

In addition, sites of cultural significance to Native Americans are assessed for their secular or sacred value.

A regional research design is being developed by the Air Force which can provide a context within which to evaluate the scientific significance of cultural

resources that will be directly and indirectly impacted by project implementation. Other studies, such as Native American regional surveys, provide essential information for assessing the cultural significance of these resources. Thus, when preconstruction studies are implemented, the cultural resources encountered will be assessed as to their National Register eligibility under the procedures outlined in the PMOA Management Plan being prepared by the Air Force.

Mitigation programs for MX cultural resource studies could logically be designed for either direct or indirect impacts, as each results from very different activities.

Direct Impacts

A Cultural Resources Mitigation Program dealing with direct impacts would typically include:

(1) Conduct inventory of cultural resources, evaluate for significance, determine impacts, and coordinate with appropriate agencies.

(2) Avoid impacts to significant cultural resources through design where feasible.

(3) Develop Memorandum of Understanding (MOU) regarding Native American involvement and concerns.

(4) Perform data recovery when resources cannot be avoided and have scientific value.

(5) Relocate resources which cannot be avoided and for which data recovery will not mitigate impacts.

(6) Protect resources from indirect impacts.

(7) Develop educational and interpretive programs for MX employees and the general public designed to aid cultural resource preservation.

(8) Monitor construction activity at select and sensitive areas (e.g. areas with potential for buried deposits).

The adverse effect of land alteration (e.g. ground scarification and earth movement) is associated with construction activities; such activites compromise site integrity and result in a reduction of scientific and cultural information. After sites are located by intensive survey, they may be avoided by project design. Otherwise, it could be necessary to implement data recovery programs according to guidelines developed under the PMOA.

A Cultural Resource Manager with authority to make decisions could be located in each pertinent agency office. Mobile data recovery teams, with back-up lab (including flotation capabilities), analysis, and report personnel and facilities could be available to the managers. This program results in minimal adverse effect on cultural and historic properties and the timely, cost effective completion of the MX project.

A management plan could identify curation facilites on a project by project basis. A long-term curation plan that could include the creation of tribal museums is being developed.

Indirect Impacts

Programs for mitigating indirect impacts generally consider environmental awareness education programs for the public as an approach to reducing incidental collecting in the course of more common recreational activities such as hunting, hiking, wood collecting and cutting for home fuels use, camping, and other such outdoor activities. However, no data exist which suggest that such programs may indeed be effective.

Mitigation of incidental and intentional collecting of artifacts can be partially addressed with educational programs and greater policing efforts. On federal land it is illegal, but no legislation adequately protects cultural resources on private land. Possibly greater policing efforts and protective measures such as fences could reduce such impacts where sanctions are enforceable, but no such effort is possible on private lands.

Through cooperation with existing local organizations, a recreation/education program could be developed for interested workers and their families, including slide shows, interpretative exhibits, demonstrations of Native American crafts, and tours of protected sites. Interpretive programs could be developed for specific audiences, (e.g., school children, Native Americans, temporary workers). All this would be designed to increase sensitivity to preservation. However, no data suggest that fences, signs and barricades are additional methods which can potentially reduce indirect impacts.

If feasible, it may be justifiable to implement data recovery programs at sites predicted to be disturbed or destroyed as a result of MX-induced population growth and recreation. The data recovery program should be designed according to guidelines developed under PMOA and as described above for direct impacts.

Probably the most destructive source of indirect impacts to cultural resources would be uncontrolled ORV recreation (e.g. motocross) and ORV use associated with other recreational activities (e.g., hunting, wood collecting). These activities can be mitigated by prohibiting access to sensitive areas or by designating off-road vehicle parks which have been subjected to appropriate review and mitigation.

3.39 PALEONTOLOGICAL RESOURCES

Mitigation for paleontological resources should be directed toward preventing direct disturbances and destruction by construction of the project and minimizing casual collecting of fossils brought about by the increased population in the area.

AIR FORCE PROGRAMS (3.39.1)

Under the Air Force Cultural Resources Program, the Air Force will provide for the evaluation of paleontological resources encountered during construction and for data recovery as appropriate.

OTHER MITIGATIONS UNDER CONSIDERATION (3.35.2)

An additional mitigation that could be effective in mitigating indirect impacts would be to designate areas of prime importance as Areas of Critical Environmental Concern (ACEC). However, an ACEC requires development of a program for administration of the resource for which funds are not readily available. The Air Force could advocate that funds be provided for establishment and administration of an ACEC program. This measure could be evaluated during subsequent planning.

Additional mitigations, similar to those discussed for cultural and historical resources in Section 3.34.2, could also be applied to paleontogical resources.

3.36 CONSTRUCTION RESOURCES

Managing the requirements for construction resources and procuring materials in a manner to avoid straining the local area's ability to supply them will mitigate many of the impacts on construction resources.

AIR FORCE PROGRAMS (3.36.1)

In order to minimize impacts on other construction projects and material requirements in private sector industries, the Air Force and COE will diversify cement purchase points and sources to the extent possible. The Air Force will also utilize construction methods and procedures to minimize impacts on scarce resources. The Air Force will consider both the use of offsite construction techniques, and the design of permanent facilites such that they also satisfy temporary needs.

The Air Force will provide centralized procurement of materials and equipment to minimize adverse economic impacts to other industries where feasible.

The Air Force and COE will design facilities and establish construction procedures to minimize the amount of area that would be disturbed during construction and operation of the system. This would include controlling construction traffic to project roads to the extent possible.

OTHER MITIGATIONS UNDER CONSIDERATION (3.36.2)

Groundwater (3.36.2.1)

The water required to wash aggregate may be reduced if the quarried rock is of a high quality (low quantity of deleterious material). The application of the mitigation will not be known until the site-specific geotechnical data is available. Using covered trucks to haul the aggregate to the construction sites would reduce evaporation losses, thereby saving some of the water needed for compaction of the aggregate base and surface courses for the roads. Water required for earth compaction could be diminished if silty soils were used in embankments, instead of clayey soils, since these generally require a lower optimum moisture content for compaction. Proper scheduling (time of day or year) for certain construction tasks, such as concrete or road work, could reduce water demands because of climatic conditions.

Energy Requirements (3.36.2.2)

Possible mitigations for increased demands on electrical energy sources and fuel requirements can be found in Section 3.30.

Steel Requirements (3.36.2.3)

The demands for steel could be leveled out by stockpiling in the early years of construction. This could not only reduce the possibility of steel shortages for non-M-X construction, but also help hold down higher prices.

Asphaltic Oil Requirements (3.36.2.4)

A major use of asphaltic oil could be as a dust palliative. The use of other palliatives should be examined and, if feasible, used as an alternative.

3.37 NOISE

Most of the noise that would be associated with the system would be due to increased traffic and aircraft using the new airfields of the operating bases. Mitigations should be directed to these noise sources.

AIR FORCE PROGRAMS (3.37.1)

The airfields will be located in accordance with Air Installation Compatible Use Zone (AICUZ) policy. This includes policies to locate airfields in such a manner as to avoid noise impacts on existing communities or residents.

Construction activities will be planned in consideration of noise impacts. This will include monitoring noise levels in sensitive areas. Baffles and mufflers will be installed on vehicles and equipment, where feasible, and noise absorption and insulation measures will be utilized in project design. Project roads will be sited with consideration of noise impacts.

OTHER MITIGATIONS UNDER CONSIDERATION (3.37.2)

The need for and extent of mitigation methods for noise can be determined by studies which could gather detailed information on topography, type and number of structures, vehicle mixes and speeds, and sound levels.

Noise levels along roads can be reduced by diverting traffic, especially truck traffic, to roads that would bypass populated areas. While the measure could be effective, at most locations it is probably not practical. An alternative mitigation would be to shield existing or new structures from external noise sources by acoustical treatment, including sealing off window areas by double paning or replacement with glass block or brick. If this measure is used however, the affected buildings would have to be air conditioned to offset the lack of circulation caused by permanent window closures. Where this is not practical, barrier walls, earth berms, or combinations of these could be used to break the sound path between the source and the receptor. A reduction of 10 dBA or more is possible with such a barrier. The barrier must have reasonable mass, be impervious to air flow, and block the direct line between the source and the receptor to be effective.

These measures may be appropriate if schools, hospitals or other sensitive buildings are located along routes that would experience large measures of truck traffic.

3.38 WASTEWATER

The major impacts caused by increased wastewater flows will be the necessity to construct expanded conveyance and treatment facilities. This will place a financial burden upon the impacted community. In addition, the larger flows will increase the potential for poor treatment and could contaminate surface or groundwater.

AIR FORCE PROGRAMS (3.38.1)

A wastewater program will be developed to ensure water conservation, compliance with federal, state, and local regulations and monitor wastewater effluent and receiving water. Facilities will be designed with current techniques to minimize the volume of wastewater. Joint-use facilities will be developed where cooperative community planning determines it would be beneficial. The Air Force will advocate reclaiming wastewater.

OTHER MITIGATIONS UNDER CONSIDERATION (3.38.2)

Financial assistance for construction of additional conveyance and treatment facilities could be provided through the community impact assistance program. Without this assistance, many of the communities will not be able to expand their treatment facilities, resulting in discharges of inadequately treated wastewater. Many communities will be impacted for only a short period (1 to 5 years). This time period does not justify the building of permanent facilities. By providing portable facilities where needed, an unnecessary burden on the community can be avoided. Use of dry toilets, in many available forms, would drastically reduce the wastewater volume. Most of the remaining volume could be discharged with little treatment.

Properly treated wastewater sludges could be used as soil additives to help in the landscaping of the proposed facilities. The characteristics of the treated and dried sludge would make it a valuable soil conditioner.

Construction of holding ponds for effluents could allow more control of discharge. This would allow for zero discharges during critical periods or in case of treatment failure.

3.39 SOLID WASTE

Mitigations should be directed toward disposal of solid waste in a manner that does not impact other resources.

AIR FORCE PROGRAMS (3.39.1)

The Air Force will dispose of waste in accordance with federal, state and local regulations. Construction and operation practices will minimize the volume of solid waste and a materials recovery program will be developed. Surface and groundwater quality will be monitored to ensure that solid waste disposal practices do not impact water quality. The Air Force will also seek authority to develop

joint-use facilities where cooperative community planning determines it would be beneficial.

3.40 HAZARDOUS WASTE

Mitigations should be directed toward minimizing the generated quantity of hazardous waste and controlling their use and disposal.

AIR FORCE PROGRAMS (3.40.1)

The Air Force will implement a hazardous waste program to ensure compliance with federal, state and local hazardous waste regulations. A counter-measures and contingency plan will be developed and implemented for potential spills. Methods will be developed to minimize the volume of hazardous waste. Surface and groundwater quality will be monitored.

OTHER MITIGATIONS UNDER CONSIDERATION (3.40.2)

Available hazardous waste disposal sites in the vicinity of the operating bases have limited capacity. Development of another site at or near the proposed OB would alleviate the additional problems caused by M-X and provide a valuable service to the local population. Construction activities will necessitate the handling of many hazardous materials.

Special handling procedures or facilities could be developed to minimize the potential for the chemicals entering the environment. Areas which would be extremely sensitive to any type of hazardous waste contamination could be identified and the generation, handling, or disposal of hazardous materials within these areas could be prohibited.

3.41 HEALTH CONCERNS

This topic is limited to the mitigation of three potential health problems identified in the Nevada/Utah scoping process: valley fever or coccidioidomycosis, radioactive dust, and zeolite induced disease.

AIR FORCE PROGRAMS (3.41.1)

The Air Force will ensure that all contractors supporting M-X construction activity in the Nevada/Utah region include topics related to the recognition and treatment of valley fever in their employee health and safety education programs. Dust control programs identified in Section 3.3 will aid in the mitigation of potential problems resulting from zeolites, valley fever spores and radioactive dust. For zeolites, the Air Force Surgeon General will evaluate the problem to determine if mitigation measures more extensive than those identified for dust suppression are warranted. Prior to commencement of major construction activity, the Air Force Surgeon General will make specific recommendations to the Army Corps of Engineers concerning appropriate mitigative measures.

OTHER MITIGATIONS UNDER CONSIDERATION (3.41.2)

Measurement of atmospheric concentrations of radioactive dust and zeolites could help identify potential problems in these areas. Because health effects of

these materials are manifest many years after exposure, a long-term health record keeping program could be useful.

3.42 VISUAL RESOURCES

Mitigation measures should be directed toward reducing the degree of contrast between project features and the established character of the landscape.

AIR FORCE PROGRAMS (3.42.1)

The Air Force will establish a visual resource management program. This program would include preparation of visual simulations to assess impacts, design and placement of facilities to lessen visual impacts insofar as feasible, and monitoring to protect visual resources.

OTHER MITIGATIONS UNDER CONSIDERATION (3.42.2)

Certain mitigation techniques can, if employed during construction and operation, serve to reduce the degree of contrast between project actions and landscape elements. The most effective opportunities to decrease contrasts are to relate project features to the form and color elements associated with landforms and vegetation.

Where vegetation is disturbed, revegetation will eventually soften color and texture contrasts somewhat, but where the height of the vegetation is limited to eight inches, contrast in color and texture would still be significant.

Several mitigation measures could be effective in reducing soil/color contrasts of the earthberms at the entrances to the shelters. One would be to "age" fresh fill material by application of asphalt emulsion or grey paint to reduce color differences. Another method would be to spread a darker topsoil over the lighter exposed material. Slopes steeper than 2½:1 could be protected from soil erosion by covering with jute matting or a comparable soil erosion preventative material. Revegetation by low-growing shrubs could be effective in reducing color contrasts, although it could take years before the shrubs grow enough to be effective. Revegetation with mature shrubs could be effective immediately, but the cost of such a measure would be very high.

Buildings and other structures may, in some cases, be sited to avoid the more sensitive viewing areas. Whenever possible, colors should be carefully selected to blend with the characteristics of the area. Color contrasts on road surfaces may be reduced effectively where viewed as part of middleground and background distance by adding to the seal coat local earth-colored material, such as cinders and peak gravel from the immediate area. When possible, cut and fill associated with road alignment should be minimized, slopes serrated, and edges of clearings in the rights-of-way "feathered" into the vegetated area.

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